Troubleshooting Manual

2018 AUGUST

TS7149EN

Allison Transmission

Allison 5th Generation Controls: TIDA and TIDB Models

3000 and 4000 Product Families

3000 EVS	3200 TRV	4000 MH	4500 TRV*	B 500P
3000 HS	3500 EVS	4000 RDS	4700 EVS	B 500PR
3000 MH	3500 RDS	4000 TRV	4700 OFS	B 500R
3000 PTS	3500 SP	4500 EVS	4700 RDS	
3000 RDS	3700 SP	4500 HS	4800 EVS	
3000 TRV	4000 EVS	4500 RDS	B 300PR	
3200 SP	4000 HS	4500 SP	B 500	

* Not a current model

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FOREWORD—How to Use This Manual

Welcome to the TS7149EN Troubleshooting Manual. Allison Transmission Incorporated strives to make every effort to keep our service information current and accurate. Because of the time lag involved with writing and printing processes, the Transmission Control Module (TCM) may report a Diagnostic Trouble Code (DTC) that has not yet been added to this document. If you encounter a DTC that is not yet in this publication, please call Allison Transmission, Inc. at 1-800-252-5283.

This manual provides troubleshooting information for the 3000 and 4000 Product Families Transmissions. Service Manuals SM4013EN and SM4014EN, plus Parts Catalogs PC2150EN and PC2456EN may be used in conjunction with this manual.

This manual includes:

- Description of the 3000 and 4000 Product Families Allison 5th Generation Electronic Control system.
- Description of the electronic control system components.
- Description of DTCs, system responses to faults, and troubleshooting steps for active DTCs.
- Wire, terminal, and connector repair information.
- System schematics.
- System wiring diagrams.
- Troubleshooting complaints without DTCs.
- Input/Output Wiring Diagrams.

Instructions for using the service tools used to troubleshoot active DTCs and make connector repairs are included in this manual. Refer to the appropriate service manuals for procedures and instructions to service tools used to overhaul the transmission.

Additional information may be published from time to time in Service Information Letters (SIL) and will be included in future revisions of this and other manuals. Please review all SILs to obtain up-to-date information concerning Allison Transmission products.

This publication is revised periodically to include improvements, new models, special tools, and procedures. A revision is indicated by a new date on the title page and in the lower left corner of the rear cover. Go to *www.allisontransmissionpublications.com* to order publications or see a local distributor or dealer.

Take time to review the Table of Contents and the manual. Reviewing the Table of Contents will aid you in quickly locating information.

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IMPORTANT SAFETY INFORMATION

IT IS YOUR RESPONSIBILITY to be completely familiar with the warnings and cautions in this manual. These warnings and cautions advise of specific methods or actions that can result in personal injury, equipment damage, or cause the equipment to become unsafe. These warnings and cautions are not exhaustive. Allison Transmission could not possibly know, evaluate, or advise the service trade of all conceivable procedures by which service might be performed or of the possible hazardous consequences of each procedure. Accordingly, ANYONE WHO USES A SERVICE PROCEDURE OR TOOL WHICH IS NOT RECOMMENDED BY ALLISON TRANSMISSION MUST first be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized by the service methods used.

Vehicle or equipment manufacturers (collectively hereinafter "manufacturer(s)") integrate Allison transmissions into vehicles or equipment used for a variety of vocations and services. The manufacturer is responsible for identifying the specific operating conditions to which the vehicle or equipment will be subjected and to communicate the appropriate means for preventing unintended vehicle or equipment movement within those conditions, in order to ensure vehicle or equipment safety and operator safety. The vehicle or equipment owner and operator should be aware of and follow the manufacturer's operating instructions and warnings related to parking and preventing unintended vehicle or equipment movement.

Proper service and repair is important to the safe and reliable operation of the equipment. The service procedures recommended by Allison Transmission (or the manufacturer) and described in this manual are effective methods for performing service and diagnostic operations. Some procedures require using specially designed tools. Use special tools when and in the manner recommended.

The WARNINGS, CAUTIONS, and NOTES in this manual apply only to the Allison transmission and not to other vehicle or equipment systems which may interact with the transmission. Be sure to review and observe any vehicle or equipment system information provided by the manufacturer and/or body builder at all times the Allison transmission is being serviced.

WARNINGS, CAUTIONS, NOTES

Three types of headings are used in this manual to attract your attention:

WARNING: A warning is used when an operating procedure, practice, etc., which, if not correctly followed, could result in personal injury or loss of life.

CAUTION: A caution is used when an operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.

NOTE: A note is used when an operating procedure, practice, etc., is essential to highlight.

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ABBREVIATIONS AND ACRONYMS

• ABS	Anti-lock Brake System
• AC	Alternating Current
• ACCT	Allison Calibration Configuration Tool
• AETC	Advertised Engine Torque Curve
• AFRI	Auxiliary Function Range Input
• ARM	Acceleration Rate Management
• ASR	Acceleration Slip Regulation
• ATC	Automatic Traction Control
• ATI	Allison Transmission, Inc.
• C1	Clutch 1
• C2	Clutch 2
• C3	Clutch 3
• C4	Clutch 4
• C5	Clutch 5
• C6	Clutch 6
• CAN	Controller Area Network
• CCVS	Cruise Control/Vehicle Speed
• CIN	Calibration Identification Number
• CMC	Customer Modifiable Constant
• CPA	Connector Position Assurance
• CT	Closed Throttle
• DC	Direct Current
• DCE	Direction Change Enable
• DMD	Display Mode/Diagnostic
• DMM	Digital Multimeter
• DNA	Do Not Adapt
• DNS	Do Not Shift
• DPID	Data Packet Identifier
• DSS	Dynamic Shift Sensing
• DTC	Diagnostic Trouble Code
• DTCs	Diagnostic Trouble Codes
• DVOM	Digital Volt/Ohmmeter
• EBS	Electronic Brake System
• ECM	Engine Control Module
• ECT	Engine Coolant Temperature
• ECU	Electronic Control Unit
• EMI	Electromagnetic Interference
• EVS	Emergency Vehicle Series
• FA	Field Action

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• FLGS	Full Load Governed Speed
• FLI	Filter Life Indicator
• FM	Filter Life Monitor
• GPI	General Purpose Input
• GPO	General Purpose Output
• HSD	High Side Driver
• HSD1	High Side Driver 1
• HSD2	High Side Driver 2
• HSD3	High Side Driver 3
• I/O	Input/Output
• ID	Identification
• ISO	International Organization for Standardization
• LBSS	Load-Based Shift Scheduling
• LRTP	Low Range Torque Protection
• LSD	Low Side Driver
• LU	Lockup
• MM	Main Modulated
• N/C	Normally Closed
• NAS	Neutral at Stop
• NVL	Neutral Very Low
• OBD II	On Board Diagnostics; second generation.
• OEM	Original Equipment Manufacturer
• OFS	Oil Field Series
• OLS	Oil Level Sensor
• OM	Oil Life Monitor
• P2	Planetary 2
• P3	Planetary 3
• PC	Personal Computer
• PCS	Pressure Control Solenoid
• PCS1	Pressure Control Solenoid 1
• PCS2	Pressure Control Solenoid 2
• PCS3	Pressure Control Solenoid 3
• PCS4	Pressure Control Solenoid 4
• PCS5	Pressure Control Solenoid 5
• PCS6	Pressure Control Solenoid 6
• PDC	Parts Distribution Center
• PLC	Programmable Logic Controller
• PS1	Pressure Switch 1
• PS2	Pressure Switch 2
• psi	Pounds per Square Inch
• PTO	Power Takeoff
• PWM	Pulse-Width Modulation

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• RAM	Random Access Memory
• RDS	Rugged Duty Series
• RELS	Reduced Engine Load at Stop
• RFI	Radio Frequency Interference
• RMR	Retarder Modulation Request
• rpm	Revolutions Per Minute
• RSNE	Retarder Selection, Non-Engine
• SA	Source Address
• SAE	Society of Automotive Engineers
• SBS	Service Brake Status
• SCI	Serial Communications Interface
• SCTI	St. Clair Technologies Inc.
• SEM	Shift Energy Management
• SESS	Super Economy Shift Schedule
• SIL	Service Information Letter
• SILs	Service Information Letters
• SOH	State of Health
• SPI	Serial Peripheral Interface
• SPS	Specialty Series
• SS1	Shift Solenoid 1
• SS2	Shift Solenoid 2
• TAC	Technical Assistance Center
• TCC	Torque Converter Clutch
• TCM	Transmission Control Module
• TCMs	Transmission Control Modules
• TFT	Transmission Fluid Temperature
• TID	Transmission Identification Number
• TIR	Total Indicated Runout
• TM	Transmission Health Monitor
• TPA	Terminal Position Assurance
• TPS	Throttle Position Sensor
• TSC1	Torque Speed Control 1
• USB	Universal Serial Bus
• VAC	Vehicle Acceleration Control
• VEPS	Vehicle Electronic Programming Stations
• VIM	Vehicle Interface Module
• VOM	Volt/ohmmeter
• WATCH	Worldwide Allison Transmission Communication Hotline
• WOT	Wide Open Throttle

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LITERATURE

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LIST OF WARNINGS

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- **Assuming proper installation of direction signal wire 134, most Allison shift selectors may still be used to command transmission direction changes for selector display inoperative conditions. However, due to the failure of the SAE J1939 datalink communication, the shift selector cannot display the selected range to the operator. For such a situation, always verify that other people and property are completely clear of the vehicle and that no obstacles or dangerous circumstances exist near the vehicle that could cause personal injury, death, or property damage if struck. Never assume the vehicle is in N (Neutral) if the displays are blank and the engine is running. If both displays are blank and the vehicle needs to be moved, re-select N (Neutral) then re-select the desired direction, such as R (Reverse) or D (Drive). Lightly accelerate the vehicle to move slightly forward or backward to verify the expected direction of travel before continuing on. Never accelerate suddenly from a stop if the displays are inoperative. The feature of using direction signal wire 134 for range selection is not available with "strip pushbutton" shift selector models.**
- **If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured. If you must leave the engine running, DO NOT LEAVE the vehicle until you have completed all of the following procedures:**
  - **Put the transmission in N (Neutral).**
  - **Be sure the engine is at low idle (500–800 rpm).**
  - **Apply the parking and emergency brakes and make sure they are properly engaged.**
  - **Chock the wheels and take other steps necessary to keep the vehicle from moving.**
- **To help avoid unexpected vehicle movement that might cause death, serious injury, or property damage, always have your foot on the brake, the throttle released, and the engine at idle before making a N (Neutral) to D (Drive); N (Neutral) to R (Reverse); D (Drive) to R (Reverse); or R (Reverse) to D (Drive) selection.**
- **To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you:**
  - **Put transmission in N (Neutral)**
  - **Apply the parking brake and service brake**
  - **Chock the wheels and take any other steps necessary to prevent the vehicle from moving**
  - **Warn personnel to keep clear of the vehicle and its path**
- **The vehicle service brakes, parking brake, or emergency brake must be applied whenever N (Neutral) is selected to prevent unexpected vehicle movement. Selecting N (Neutral) does not apply the vehicle brakes unless an auxiliary system to apply the parking brake is installed by the OEM.**

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LIST OF WARNINGS (cont'd)

This manual contains the following warnings—

IT IS YOUR RESPONSIBILITY TO BE FAMILIAR WITH ALL OF THEM.

- **To help avoid injury or property damage caused by sudden movement of the vehicle, do not make shifts from N (Neutral) to D (Drive) or R (Reverse) when the throttle is open. The vehicle may lurch forward or rearward and the transmission can be damaged. Avoid this condition by making shifts from N (Neutral) to a forward range or R (Reverse) only when the throttle is closed and the service brakes are applied.**
- **Prior to working on electrical circuits with potentially hazardous electrically energy, one should be familiar with and understand all safe electrical work practices required to do that work. Do not attempt to work on potentially hazardous electrical circuits if you are not trained to do so.**
- **To help avoid personal injury, such as burns, from hot transmission fluid and/or to help avoid equipment damage, do not stall the torque converter for more than ten seconds maximum and monitor transmission fluid temperature. Immediately return the engine to idle if converter out (to cooler) temperature exceeds 150°C (300°F). Operating the transmission at high engine power at transmission stall or near stall conditions causes a rapid rise in the transmission fluid temperature. The fluid in the transmission torque converter is absorbing all of the engine power and the vehicle cooling system cannot dissipate the excessive heat load. Extended operation under high heat load conditions causes transmission and cooling system damage, and can lead to hydraulic line failure and high temperature fluid leakage.**
- **To help avoid personal injury and equipment damage while conducting a transmission stall test, the vehicle must be prevented from moving. Apply the parking brake, the service brake, and chock the wheels securely. Warn personnel to keep clear of the vehicle and its travel path.**
- **To help avoid personal injury and/or equipment damage, a driving transmission stall test MUST BE PERFORMED by a trained driver and a qualified technician.**
- **The Driveline Test is a troubleshooting procedure only and should not be done during normal vehicle operation. This test cannot be performed on public highways and must be performed on flat, level ground.**

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Section 1—ESSENTIAL TOOLS FOR TROUBLESHOOTING AND CALIBRATION

1–1. GENERAL TOOLS INFORMATION

All tools listed are essential for troubleshooting and calibration of the 3000 and 4000 Product Families 5th Generation controls. The tools listed below are available for purchase from:

Bosch Automotive Service Solutions LLC
28635 Mound Rd.
Warren, Michigan 48092–3499
1-866-621-2128 (US and Canada)
INTERNATIONAL: 1-507-455-7223

1–2. ESSENTIAL TOOLS LIST

Table 1–1. Essential Tools

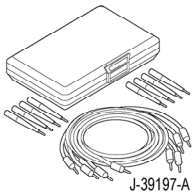
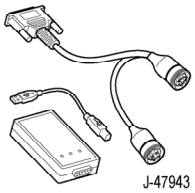
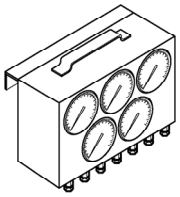
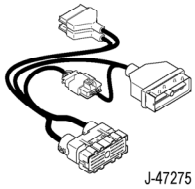
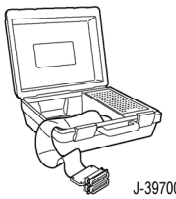
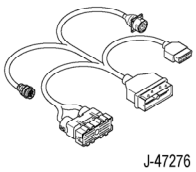
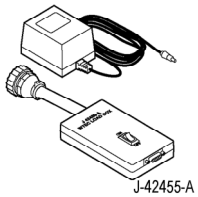
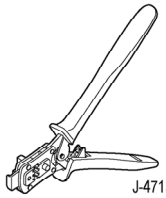
 J-39197-A	J-39197 Jumper Wire Kit or J-39197-A Jumper Wire Kit **NOTE:** J 47277 Terminal Probe is now included in the J-39197-A Jumper Kit.	J-34520-A	J-46708 High Impedance Digital Multimeter or equivalent
 J-47943	J-47943-A DPA4 (Plus) USB Translator Device Kit or J-47943 DPA4 (Plus) USB Translator Device Kit		J-26417-A Pressure Gauge Set or equivalent
 J-47275	J-47275 TCM Breakout Harness Adapter **NOTE:** Used with J-39700 Universal Breakout Box.	 J-39700	J-39700 Universal Breakout Box
 J-47276	J-47276 “T” Breakout and TCM Reflashing Harness	 J-42455-A	J-42455-A Load Box
J-38125-12A	Terminal Remover (80-way connector) GM P/N 12094429 J-38125-12A Terminal Remover (80-way connector)	 J-47139	J-47139 Former Crimper, 63811-6000 Current Crimper

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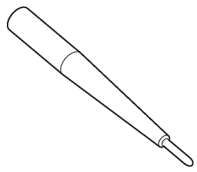
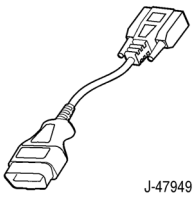
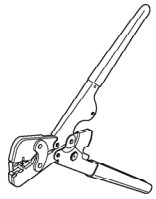
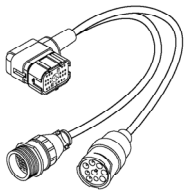
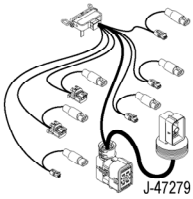
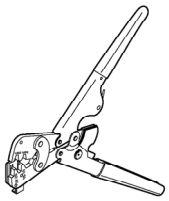
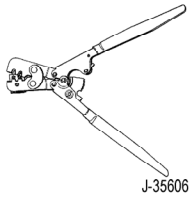
Table 1–1. Essential Tools *(cont'd)*

	J-47277 Terminal Probe **NOTE:** J-47277 Terminal Probe is now included in the J-39197-A Jumper Kit.		J-47949-A GMLAN Cable or J-47949 GMLAN Cable
	J-42215 WT Crimper Tool (WTECIII)		97130 Reflash Harness
	J-47279 3k/4k Transmission Breakout Harness		1535996 Crimper, J-38125 Alternate Crimper
	J-35606 Terminal Crimper, J-38852 Alternate Crimper		Allison DOC®

1–3. ALLISON DOC®

Allison DOC® is a PC-based diagnostic tool for use with 3000 and 4000 Product Families transmissions. The Allison DOC® is a full feature diagnostic software application supporting the Allison 5th Generation Control System. When installed on the user's own PC, it allows the technician to acquire data from the transmission's control system and, using the troubleshooting manuals embedded in the software, conduct systematic troubleshooting of transmission complaints. Refer to the Allison DOC® User Guide, GN7281EN, for complete information.

NOTE: For the latest Allison DOC® information, refer to *https://allison.noregon.com/webstore*.

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Section 2—ALLISON 5TH GENERATION CONTROL SYSTEM OPERATION

2–1. GENERAL SYSTEMS OVERVIEW

Allison 5th Generation Controls provide superior shift quality by using its adaptive shift logic to adjust the shifts over a wide range of operating conditions.

The 3000 and 4000 Product Families transmissions configurations can be programmed to have up to six forward ranges, neutral, and one reverse range. The 3700 SPS can have up to seven forward ranges and one reverse. The 4700 RDS, 4700/4800 EVS, 4700/4800 SPS, 4700/4800 International Series and 4700 OFS can have up to seven forward ranges and two reverse ranges.

After vehicle launch, a lockup clutch shift (to lockup the torque converter) occurs in 1st or 2nd range, depending on TCM calibration. Lockup is maintained (lock-to-lock) for normal vehicle operation during all upshifts and downshifts above 1st or 2nd range. Some calibrations allow lock-to-lock shifts between 1st and 2nd range

The components, features, and functional requirements that are part of an Allison 5th Generation Controls installation include:

- Programmed TCM in 12V or 12/24V versions.
- Keypad Pushbutton Selector or Lever Shift Selector (various configurations), either styles can be dual station.
- SAE J1939 Strip style shift selector (3 or 6 button).
- Fluorescent shift selector displays that relay system information to the operator.
- SAE J1939-based accelerator pedal message, analog TPS signal, or PWM throttle signal.
- Input (Engine), Turbine, and Output Shaft Speed Sensor information.
- Control Valve Module with valves and valve bodies, solenoids (PCS1-PCS4, SS1, TCC, MM), pressure switches (PS1, PS2), fluid temperature sensors, turbine shaft speed (3000 only).
- Internal (transmission) Wiring Harness to connect to vehicle harness.
- Optional VIM with I/O relays for interfacing vehicle functions like neutral start, reverse warning, fused ignition and fused battery power, and specialized vehicle functions.
- Auto-detect of oil level sensor or retarder features for 5th Generation Controls has changed from 4th Generation Controls. The source of the throttle signal and the source of the engine coolant temperature must be specified when the TCM calibration is defined. Refer to Table 2–1 for additional information.

Table 2–1. Auto-detect Features

Feature	5th Generation Controls
Throttle Signal Source*	Specify in TCM Calibration
Engine Coolant Temp Source*	Specify in TCM Calibration
Oil Level Sensor Presence	Auto-detect
Output Retarder Presence	Auto-detect
* No longer auto-detected	

- Retarder control components for retarder equipped transmissions, such as retarder valve body (PCS5), accumulator solenoid (SS2), Retarder (Modulation) Request (RMR) sensor (resistance module), operator selectable and brake pressure switches to RMR sensor (module), analog retarder temperature input.
- Filter Life Switch (PS2).
- OLS (except 3700 SPS and 4700/4800 retarders).

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- C6 valve assembly (includes PCS5 and SS2) in all 7 speeds.

2–2. TRANSMISSION CONTROL MODULE (TCM)

The TCM is a microcomputer embedded with logic to:

- Monitor, process, command a system response for all operator, control systems, or service tool action requests.
- Command automatic shifts and adapt all shifts to achieve world-class shift quality and shift timing.
- Monitor, process, and command response for all sensors, actuators, datalink information, hydraulic performance, and software or calibration logic to achieve optimal automatic shifting and invoke diagnostic response to loss, out-of-limits, or corruption of:
  1. Input (engine), turbine, output shaft speed signals and related calculations to measured gear ratios.
  2. TFT (in sump), retarder fluid temperature (optional), engine coolant temperature (optional).
  3. Diagnostic PS1 and filter life indicator (PS2) switch.
  4. Solenoids pressure control solenoids (PCS1-PCS6), Shift Solenoids (SS1, SS2) for logic valves, Torque Converter Clutch (TCC), and Main (pressure) Mod (MM) solenoid to electrical parameter requirements for the solenoids.
  5. SAE J1939 datalink messages necessary for shift selector(s) operation or from other needed vehicle controllers.
  6. TCM software and calibration integrity.
  7. System battery voltage limits.
- Command Main (pressure) Mod (MM) solenoid to lower or increase main pressure as needed.
- Command TCC solenoid to enable and disable lockup as needed.
- Monitor and process all required system parameters to enabled DTCs; command a DTC system response to an active code; send display sequence of active event; store DTC information.
- Command Range Inhibits and send display messages as needed for denied range requests.
- Invoke fault pending logic to retry shifts as necessary.
- Monitor and process all appropriate datalink(s) messages to command transmission system response.
- Send appropriate datalink(s) messages to other controllers needing transmission messages.
- Process RMR analog signal or datalink messages for proper retarder response.
- Process, send messages, or actuate I/O functions—for either or both analog inputs related to I/O or transmission features.
- Process and send fluid level information at operator request through shift selector interface or Allison DOC®.
- Set fluid type, predict and send display messages for prognostics notification for oil change.
- Process PS2 state to predict filter maintenance (prognostics) and send messages to operator when filter maintenance is required.
- Predict clutch wear and send prognostics display message for clutch maintenance.
- Specialized shift schedules and features such as FuelSense® packages, Dynamic Shift Sensing (DSS) (formerly LBSS), Acceleration Rate Management, EcoCal, Shift Energy Management (SEM), Low Range Torque Protection (LRTP), primary/secondary shift schedules, pre-selected ranges, hold ranges.

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- Process autodetection logic after recalibration of appropriate analog signals or datalink messages that allow use of certain transmission devices, such as retarder and OLS.
- Use an integral inclinometer to determine road grade in order to maximize low speed shifting (when appropriate) to increase fuel economy.

Figure 2–1 is a functional diagram of Allison 5th Generation Control systems interfaced with the TCM.

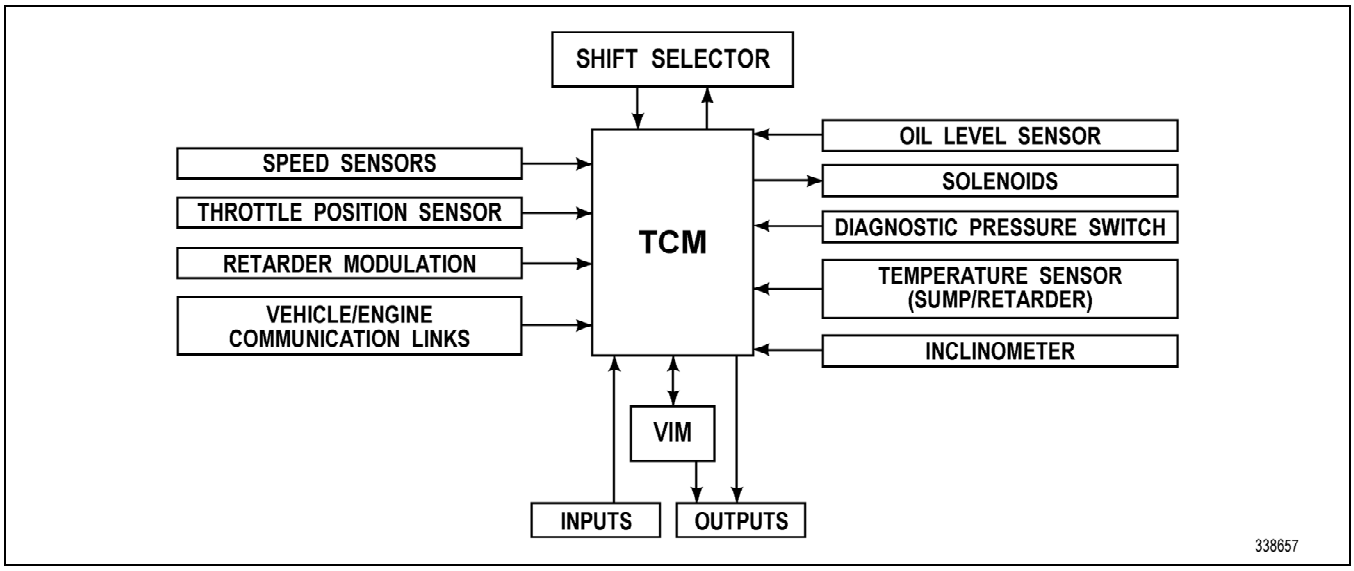

Figure 2–1. Allison 5th Generation Control systems interfaced with the TCM

NOTE: A paper tag on the TCM lists calibration, Allison part number, and TCM serial number. If a TCM will not communicate with the service tool, use the paper tag data as a starting point to calibrate the replacement TCM.

TCMs are either manufactured as a 12V or 12/24V model. The model and part number determines whether it is a base or full feature TCM. The A63 model is a full feature 12/24 volt model and is regarded as the standard service part used to replace any other TCM model since it can be used in both 12 volt vehicles or 24 volt vehicles.

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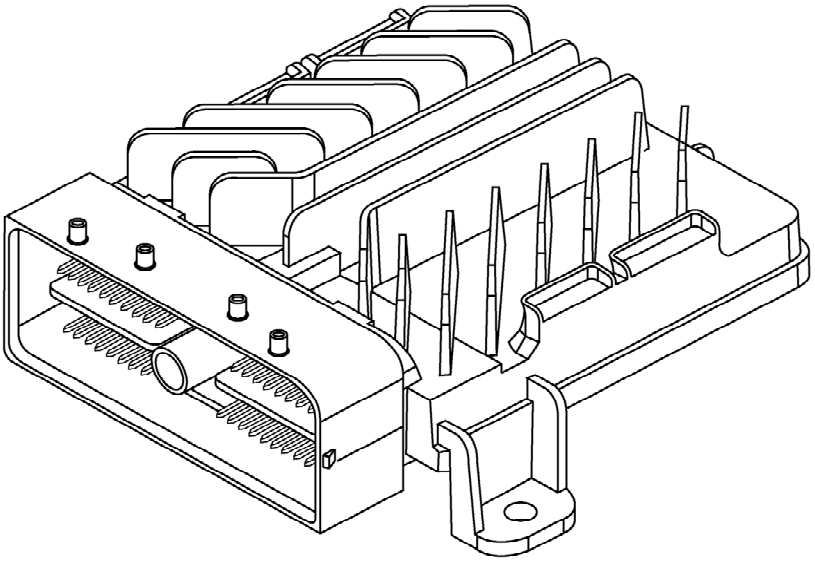

Figure 2–2. 5th Gen TCM

Table 2–2. 5th Gen TCM Models

5th Gen 5th Gen TCM Models	Description
A61 Basic	12 Volt, All 6-speed Transmissions
A62 Expanded	12 Volt, All 6-speed and 7-speed Transmissions, Retarders
A63 Max-Feature	12 and 24 Volt, All Transmissions and Features*

* Use an integral inclinometer to determine road grade in order to maximize low speed shifting (when appropriate) to increase fuel economy.

2–3. SHIFT SELECTORS

A. Selector Classification.

There are many possible Allison Transmission 5th Generation Controls shift selector configurations. This publication only discusses Allison–provided shift selectors. See the vehicle OEM for information about non-Allison shift selectors. An Allison 5th Generation shift selector is classified as either a keypad pushbutton shift selector, a bump-lever shift selector, a SAE J1939 strip style shift selector (3 button or 6 button). Shift selectors also vary by the bezel design. The bezel options are common, standard, compact and International. Use the 3000 and 4000 Parts Catalog, Section 72 to find the needed shift selector.

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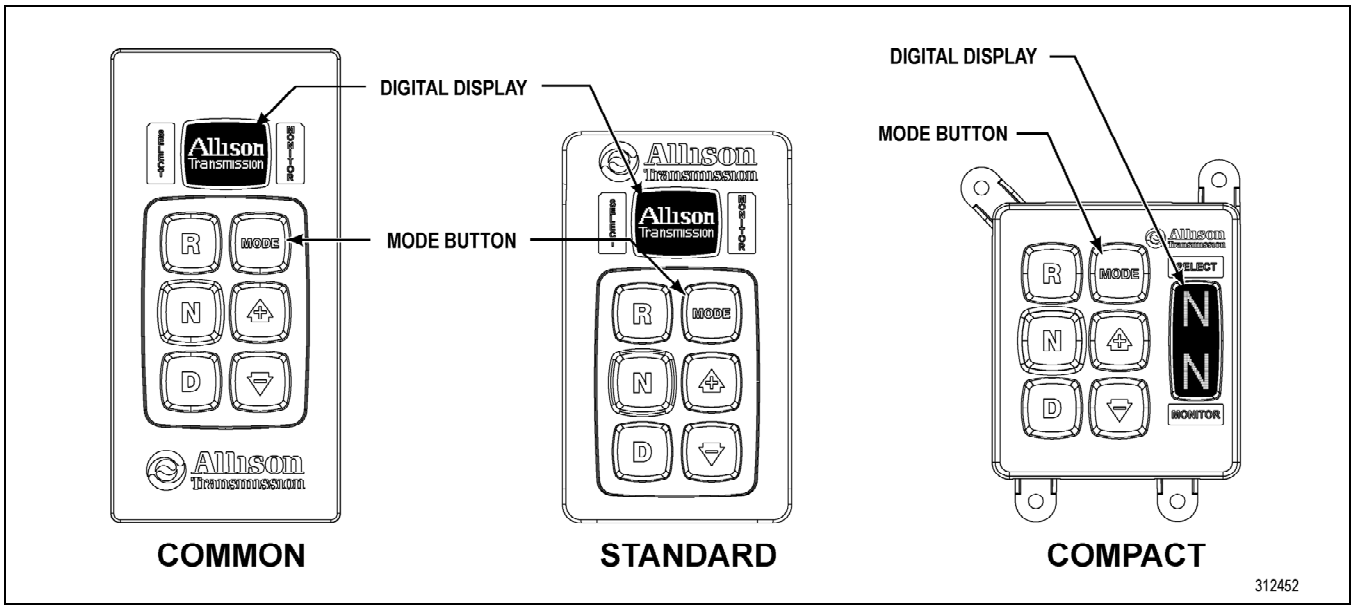

Figure 2–3. Typical 5th Generation Pushbutton Shift Selectors

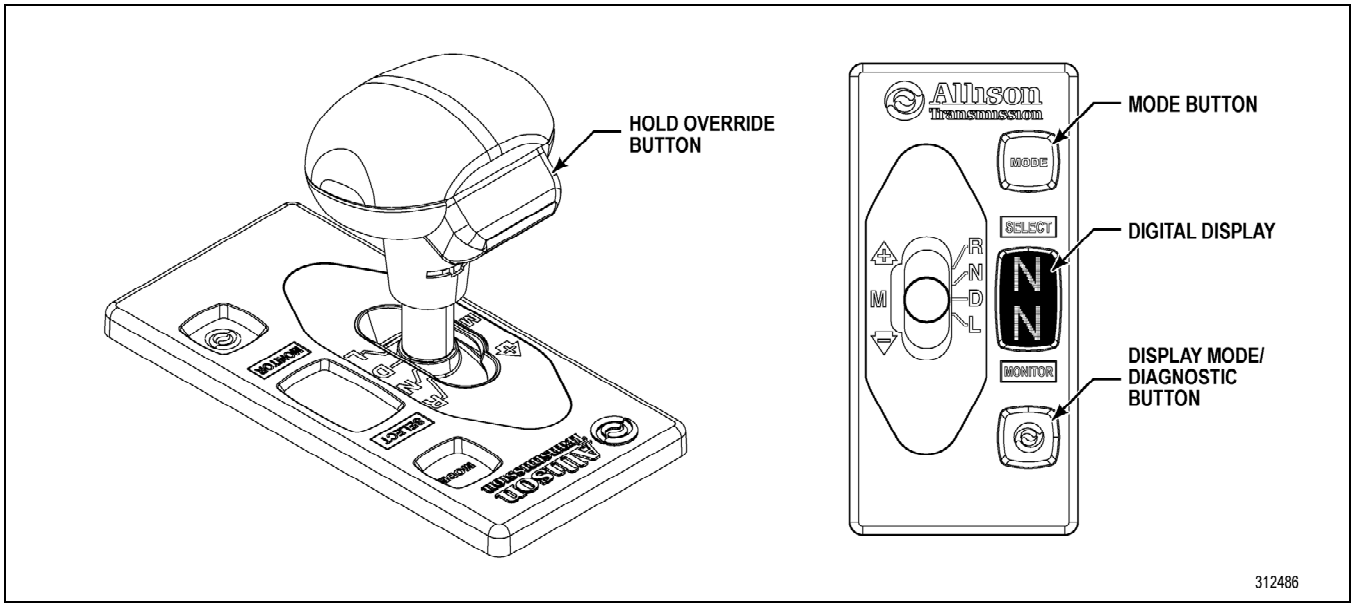

Figure 2–4. Typical 5th Generation Bump Shift Selector

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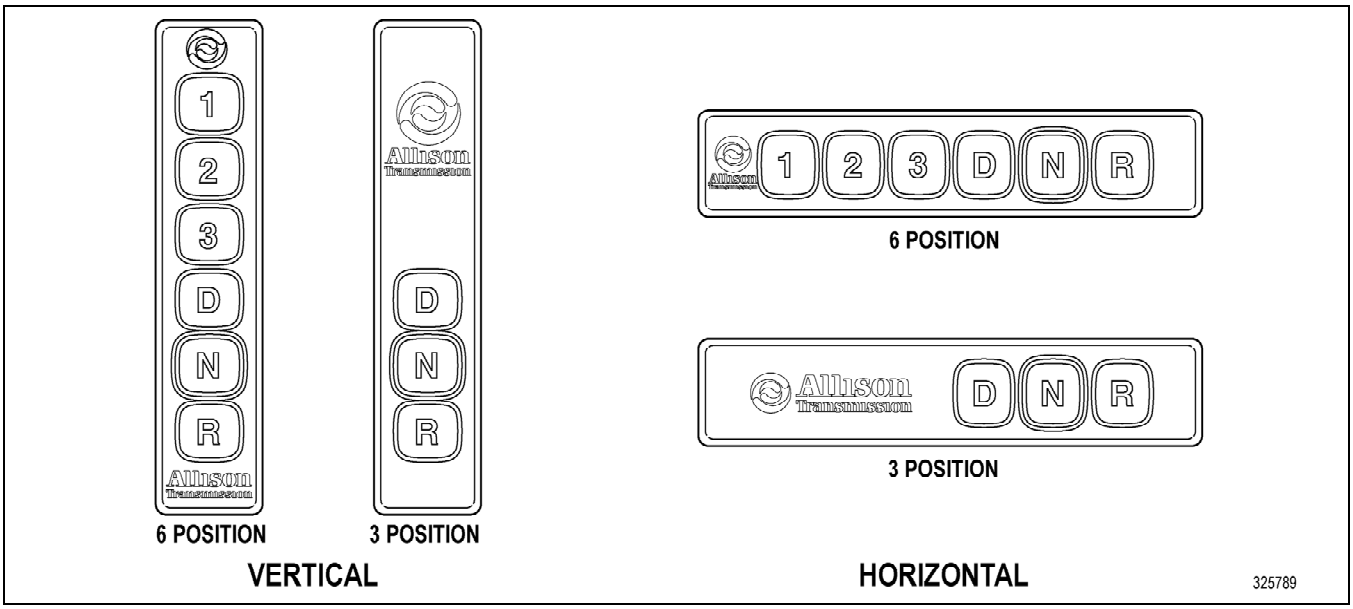

Figure 2–5. Typical 5th Generation SAE J1939 Strip Style Pushbutton Shift Selectors

NOTE:

Lever shift selectors must be specifically chosen for vehicle installation location and bezel style. The following parameters for the shift selector must be considered when changing from a pushbutton to a lever style:

- Desired location for **R** (Reverse) detent, for example, top or bottom of range strip.
- Right-hand or left-hand installation for driver.
- Bezel style.

Shift selectors for the Allison 5th Generation Series communicate with the TCM via the CAN1 or CAN2 SAE J1939 communications datalink.

Approved OEM analog (PDL) selectors, e.g., 3 button, 6 button, joystick, etc., may be installed for 5th Generation controls, but only as primary.

NOTE: The wiring to the shift selector is not sourced or warranted by Allison Transmission. Warranty claims and service parts for shift selector harness assemblies is through the OEM's service channel, not Allison Transmission.

B. Select and Monitor Display.

For a pushbutton shift selector, the left side displays the SELECT range. The lever style shift selector has the SELECT range at the of the top graphic display. While driving the vehicle, the SELECT display is used to show **N** (Neutral), **R** (Reverse), or the highest gear attainable after selecting **D** (Drive). The right side for the (pushbutton) or bottom of the (lever) graphic display, is called the MONITOR graphic. While driving the vehicle, this part of the display shows the current gear commanded by the TCM, for example, N, R, 1, 2, 3, etc.

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Besides range information there are other display messages, special characters and patterns sent to the graphic display to indicate the occurrence and notification for a range inhibit, transmission diagnostic code active, or SAE J1939 communication error with the shift selector. These special characters and patterns are as follows:

1. **SELECT side character flashing:** The flashing display indicates a requested shift is either temporarily or permanently inhibited. The inhibit may clear if the cause of the inhibit clears within 3 seconds of the shift request. Otherwise, the operator must re-select the desired range. Refer to 2–26. SHIFT INHIBIT LOGIC for additional information.
2. **SELECT side character blank:** With an active DTC, the SELECT side on the shift selector is blank. The MONITOR side indicates the range in which the transmission is locked. The **CHECK TRANS** light is also activated. Refer to Section 5. DIAGNOSTIC CODES for information and the procedure on reading and clearing (erasing) DTCs.
3. **All segments illuminated each side:** If all segments of the display are on for more than 6 seconds, the TCM has not completed initialization. A DTC is associated with this condition. It is normal for all segments to illuminate for a brief time during initialization of the shift selector and controls.
4. **SELECT/MONITOR both blank:** This condition indicates either a lack of power to the shift selector or the SAE J1939 communication datalink has failed. Continuous blank indicates loss of power to the shift selector. If the blank display changes to a double cat-eye display, other conditions exist. Refer to double cat-eye discussion below.
5. **Double Cat-eyes:** This display indicates a failure of the SAE J1939 communication link and is always accompanied by a DTC. The cat-eyes are illuminated in both the SELECT and MONITOR locations after approximately 12 seconds of blank display.
6. **SELECTOR DISPLAY IS INOPERATIVE:** In the event communication with the SAE J1939 datalink is lost, limited communication between the TCM and the Allison keypad pushbutton and lever shift selectors continues through direction signal wire 134. This limited communication allows the operator to select **D** (Drive), **N** (Neutral), or **R** (Reverse) in order to get the vehicle to a service location. Operator requests for range upshifts and downshifts will not be recognized, and the shift selector display will not display the selected transmission range due to the lack of a SAE J1939 datalink signal.

WARNING: Assuming proper installation of direction signal wire 134, most Allison shift selectors may still be used to command transmission direction changes for selector display inoperative conditions. However, due to the failure of the SAE J1939 datalink communication, the shift selector cannot display the selected range to the operator. For such a situation, always verify that other people and property are completely clear of the vehicle and that no obstacles or dangerous circumstances exist near the vehicle that could cause personal injury, death, or property damage if struck. Never assume the vehicle is in **N** (Neutral) if the displays are blank and the engine is running. If both displays are blank and the vehicle needs to be moved, re-select **N** (Neutral) then re-select the desired direction, such as **R** (Reverse) or **D** (Drive). Lightly accelerate the vehicle to move slightly forward or backward to verify the expected direction of travel before continuing on. Never accelerate suddenly from a stop if the displays are inoperative. The feature of using direction signal wire 134 for range selection is not available with "strip pushbutton" shift selector models.

7. **Dual Station Display:** In dual station installations, the inactive shift selector display message is SELECTOR/INACTIVE (except strip shift selector installations).

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C. Mode Display.

By pressing the **MODE** button during normal transmission operation, the message **MODE** is shown on the selector graphic display to indicate that a secondary shift schedule (for example, performance or economy, fixed shifts points, alternate number of ranges available), or special operating condition, such as PTO enable, has been selected. During diagnostic display mode, a DTC is displayed above the message ACTIVE or INACTIVE.

D. Mode Button.

The **MODE** button is located on the bezel face of the lever or keypad pushbutton shift selector. The **MODE** button can be pressed anytime after engine start to activate the alternate shift schedule or special function. The **MODE** button performs the following functions:

- Activates a special function programmed into the TCM, which is typically an alternate ECONOMY or PERFORMANCE shift schedule.
- Toggles to the next DTC while in DTC display mode.
- Clears (erases) active and inactive DTCs from the TCM memory.

NOTE: DTCs cannot be cleared individually. All active DTCs clear first, followed by the inactive (historic) DTCs, provided the **MODE** button is pressed long enough while in the DTC display mode. Refer to Section 5. DIAGNOSTIC CODES for information and the procedure on reading and clearing (erasing) DTCs.

A mode ID is located near the **MODE** button to identify the purpose associated with the **MODE** button selection.

E. Trans Service Indicator (Wrench Icon).

NOTE: The term **TRANS SERVICE** indicator almost always refers to the wrench icon in an Allison Transmission, Inc. keypad pushbutton or lever shift selector unless the OEM has used their own shift selector compatible with Allison Transmission 5th Generation prognostics requirements.

Allison Transmission 5th Generation Controls with Prognostics has a **TRANS SERVICE** indicator located between the SELECT and MONITOR characters on all Allison 5th Generation lever and keypad pushbutton shift selectors. The OEM may choose to use their own shift selector that provides the **TRANS SERVICE** indicator for Prognostics as a lamp or a message on a display unit.

When a specified threshold is detected for any of the serviceable conditions, the **TRANS SERVICE** indicator is illuminated to alert the operator. Failure to attend to the service condition and reset the **TRANS SERVICE** indicator within a defined operating period results in illumination of the **CHECK TRANS** light, indicating the increased probability that the service conditions develop into more serious conditions.

F. Backlighting.

During normal vehicle operation, backlighting is provided for all the keypad buttons. Allison 5th generation strip style selector buttons are also backlit. The display intensity and the backlighting levels beneath keypad buttons are controlled by the dash dimmer circuit.

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The shift selector microprocessor, which controls the shift selector backlighting, is initialized by an ignition signal and not by power in the headlight circuit. Therefore, the shift selector backlighting and dimmer are functional only when both the headlights **and** the ignition are turned on.

When the headlights and dimmer are turned off, daylight conditions are assumed and the shift selector lighting is restored to full brightness. If the shift selector is not wired into the dimmer circuit, the display in the shift selector is always at full brightness. The **TRANS SERVICE** indicator on the shift selector is at full brightness if it goes active in this condition.

G. Keypad Pushbutton Shift Selector.

The keypad pushbutton shift selector has six (6) pushbuttons which are **R** (Reverse), **N** (Neutral), **D** (Drive), ↓ (Downshift), ↑ (Upshift), and **MODE**. Manual forward range downshifts and upshifts are made by pressing the ↓ (Downshift) or ↑ (Upshift) arrow buttons after selecting **D** (Drive). The **N** (Neutral) button has a raised lip to aid in finding it by touch. The **MODE** button is pressed to select a secondary or special operating condition, such as ECONOMY shift schedule, PTO enable, etc. Diagnostic, prognostic, and fluid level information is obtained from the shift selector displays by pressing the ↑ (Upshift) and ↓ (Downshift) arrow buttons at the same time as needed to get to the correct display for information desired.

H. Bump Lever Shift Selector.

The lever shift selector can have as many as six forward range positions (seven for the 7-speed models), as well as **R** (Reverse) and **N** (Neutral). There is a **HOLD OVERRIDE** button which **must be pressed** and held in order to move between certain shift selector positions. The **HOLD OVERRIDE** button **must be pressed** when shifting between **R** (Reverse), **N** (Neutral), and **D** (Drive). The **HOLD OVERRIDE** button is released when the desired shift selector position is reached. The lever shift selector can be chosen with the lever on the left side or on the right side and with the **R** (Reverse) position toward the front or toward the rear of the shift selector. The **MODE** button is pressed to select a secondary or special operating condition, such as ECONOMY shift schedule, PTO enable, etc. Diagnostic, prognostic, and fluid level information is obtained from the shift selector displays by pressing the **DISPLAY MODE/DIAGNOSTIC** (DMD) button. Refer to Figure 2–3 and Figure 2–4. Press the **DISPLAY MODE/DIAGNOSTIC** (DMD) button as needed to get to the correct display for information desired.

Manual (preselected) lower forward range downshifts are made by bumping the shift lever over and towards the down arrow (↓) with the minus sign. Repeat until the desired preselected lower range is displayed on the select side of the display. Manual (preselected) higher forward range upshifts are made by bumping the shift lever over and towards the up arrow (↑) with the plus sign. Repeat until the desired preselected higher range is displayed on the select side of the display. It is not necessary to press the hold override button when manually downshifting or upshifting.

I. Strip Pushbutton Shift Selector.

The horizontal and vertical style 3-button or 6-button strip style shift selectors (Figure 2–5) also interfaces with Allison Transmission 5th Generation Controls. Allison 5th Generation strip style shift selectors use the SAE J1939 datalink to communicate information with the TCM. There is no digital display or **MODE** button in these shift selectors.

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J. Dual Stations or Multiple Transmission Control.

If the vehicle has two operator's stations, two shift selectors may be used to control the single transmission. Examples include a dual-station refuse packer and a fire truck pumper with a split-shaft PTO that is controlled from a remote control panel.

A single shift selector may be used to control multiple transmissions in installations where multiple shift selectors are not an option. Examples include oil field pumping operations where multiple powerpacks are driving a large pump and road-train trucks with two or three powertrains and one driver.

K. Dual Allison Shift Selector Capability on CAN2.

- Dual Allison SAE J1939-based shift selectors to be connected to either CAN1 (250 kbps) or CAN2 (500 kbps) interface. Refer to Table 2–3.
- Both shift selectors must be connected to the same CAN interface (either CAN1 or CAN2).
- Any combination of SAE J1939-based Allison 5th Generation shift selectors (Pushbutton, Bump Lever, 3 button CAN Strip, or 6 button CAN Strip) and OEM-supplied shift selectors can be mixed and matched.
- An OEM-supplied shift selector using the analog wires (PDL) can be used in 5th Generation applications, but only in the primary selector location.
- The 5th Generation shift selector will autodetect the communications baud rate, so no jumper wire is required.
- SAE J1939-based strip selectors can be installed as either primary or secondary.

Table 2–3. Dual Allison Shift Selector CAN Integration

CAN Type	Baud Rate	Configuration
CAN1	250 kbps	Single or Dual Shift Selectors
CAN2	500 kpbs	Single or Dual Shift Selectors

2–4. THROTTLE POSITION SENSOR (TPS)

If equipped, the analog TPS can be mounted to the engine, chassis, or transmission. The analog TPS for the transmission usually has a pull actuation cable and a potentiometer. One end of the cable is attached to the engine fuel lever and the other is attached to the TPS potentiometer inside a protective housing. Output voltage from the TPS is directed to the TCM through the external wiring harness. The voltage signal indicates the throttle position and, in combination with other input data, determines shift timing.

NOTE: Accelerator pedal percentage is one of the messages broadcast to the TCM through the J1939 communication link. There are some vehicle applications using either analog TPS signal or Pulse Width Modulation (PWM) TPS. The throttle source can be determined using the Allison DOC®.

2–5. SPEED SENSORS

Three speed sensors, input (engine) speed, turbine speed, and output speed provide speed information to the TCM. The sensors are a variable reluctance type design. The input (engine) speed signal is generated by

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sensing the external ribs on the shell of the torque converter pump. The turbine speed signal is generated by sensing the splines that are part of the rotating clutch drum in the rotating clutch module. The output speed signal is generated by one of the following:

- For 3000 non-retarder models, speed signal wheel (tone wheel) located on P3 carrier
- For all 3000 retarder models, retarder rotor
- For 3700SP models, transfer case idler gear
- For all 4000 models, output nut

The speed ratios between the turbine and output speed sensors allows the TCM to determine when the transmission is at the TCM commanded range. Speed sensor information is also used to control the timing of clutch apply pressures, resulting in the smoothest shifts possible. Some diagnostic tests also compare the calculated speed sensor ratios to a range's specified gear ratio stored in the TCM memory to test for hydraulic or electrical issues.

2–6. CONTROL VALVE MODULE (ELECTROHYDRAULIC)

A. Assembly Overview.

Allison 5th Generation control valve module contains a main body assembly and solenoid valve body assembly, which are mounted to an aluminum channel plate. The TCM issues commands to various solenoids in the two valve bodies to govern fluid flow to the clutches (including torque converter clutch). The solenoids produce an output pressure that is proportional to current from the TCM for clutch control and are identified as Pressure Control Solenoids (PCS).

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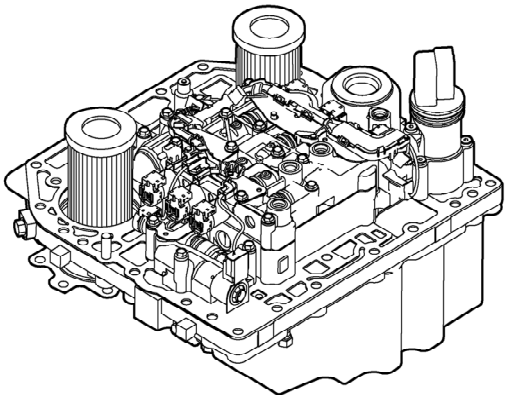
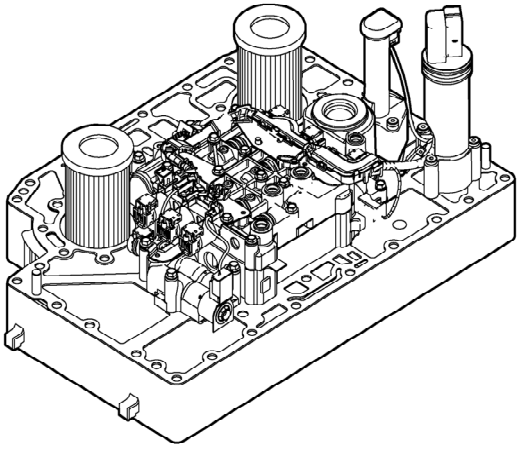


7-SPEED
3000 PRODUCT FAMILY
CONTROL MODULE



7-SPEED
4000 PRODUCT FAMILY
CONTROL MODULE

343902

Figure 2–6. 5th Generation Control Modules Without Filter Life Indicator Assemblies

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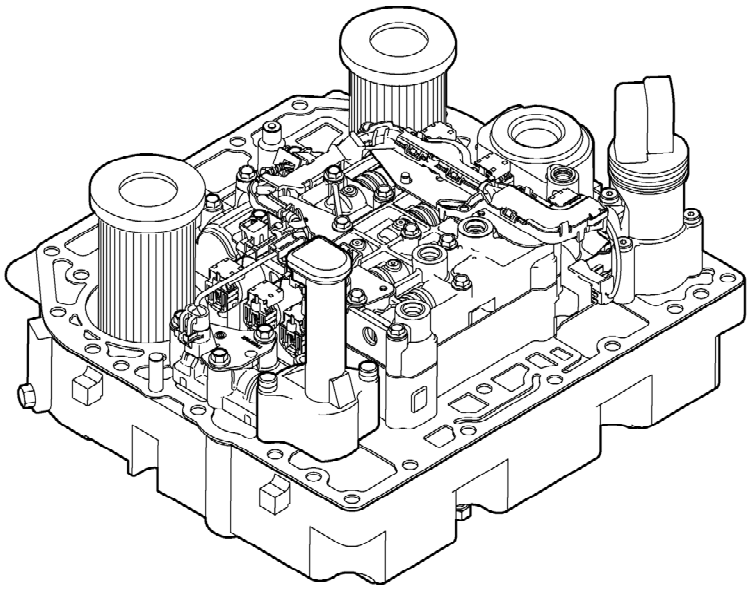
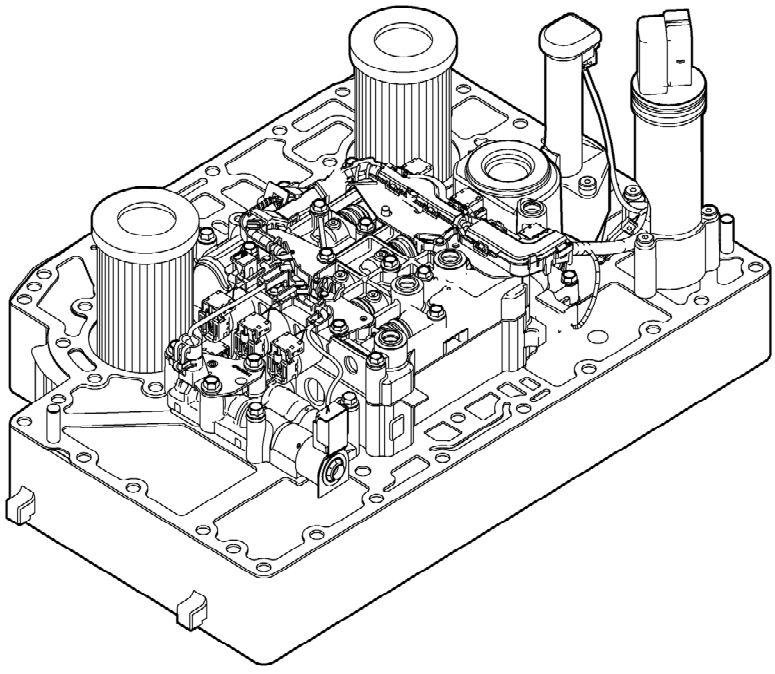


6-SPEED W/PROGNOSTICS
3000 PRODUCT FAMILY
CONTROL MODULE



6-SPEED W/PROGNOSTICS
4000 PRODUCT FAMILY
CONTROL MODULE

25425

Figure 2–7. 5th Generation Control Modules with Prognostics

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The main valve body assembly contains the following:

- Main pressure regulator valve
- Control main regulator valve
- Converter flow valve
- Lube regulator valve
- Converter regulator valve
- Converter relief valve (TIDB Only)
- Exhaust backfill valve
- Two latching logic valves
- On/Off solenoid SS1
- Main Mod accumulator (TIDB Only)

The solenoid valve body assembly contains the following:

- Pressure control solenoid Main Mod
- PCS1 (A trim)
- PCS2 (B trim)
- PCS3 (C trim)
- PCS4 (D trim)
- TCC (lockup)
- Diagnostic pressure switch PS1
- Five solenoid regulator valves
- One diagnostic valve

Solenoid locations, internal wiring harness, pressure switch, and sensor locations in the control module are illustrated in Figure 2–8 and Figure 2–9.

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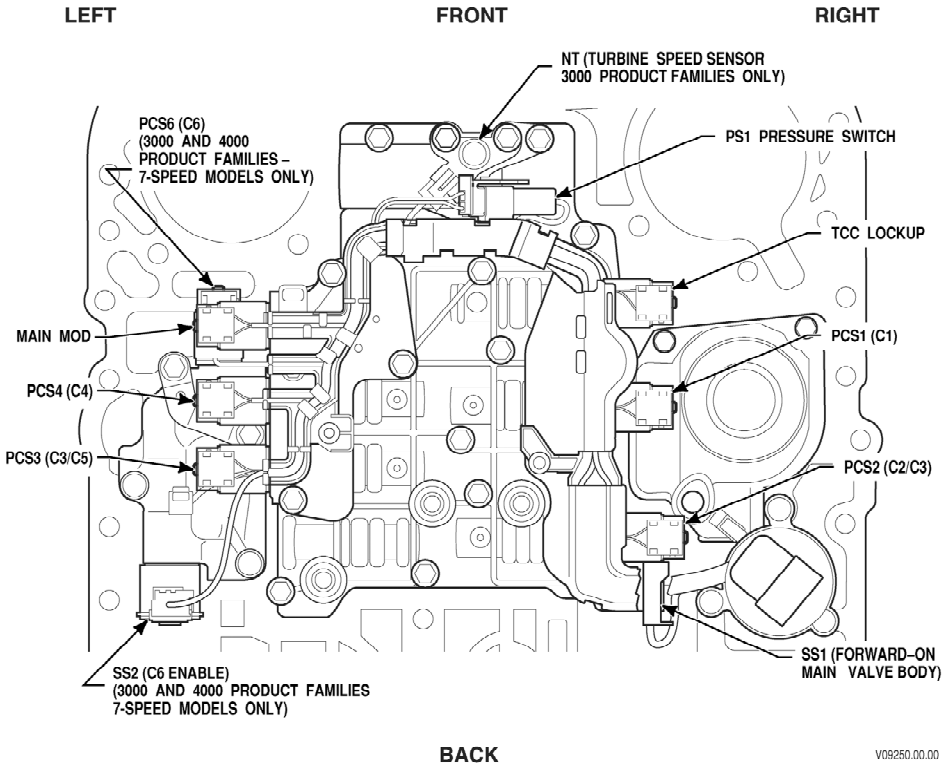

Figure 2–8. Control Module Solenoid Location

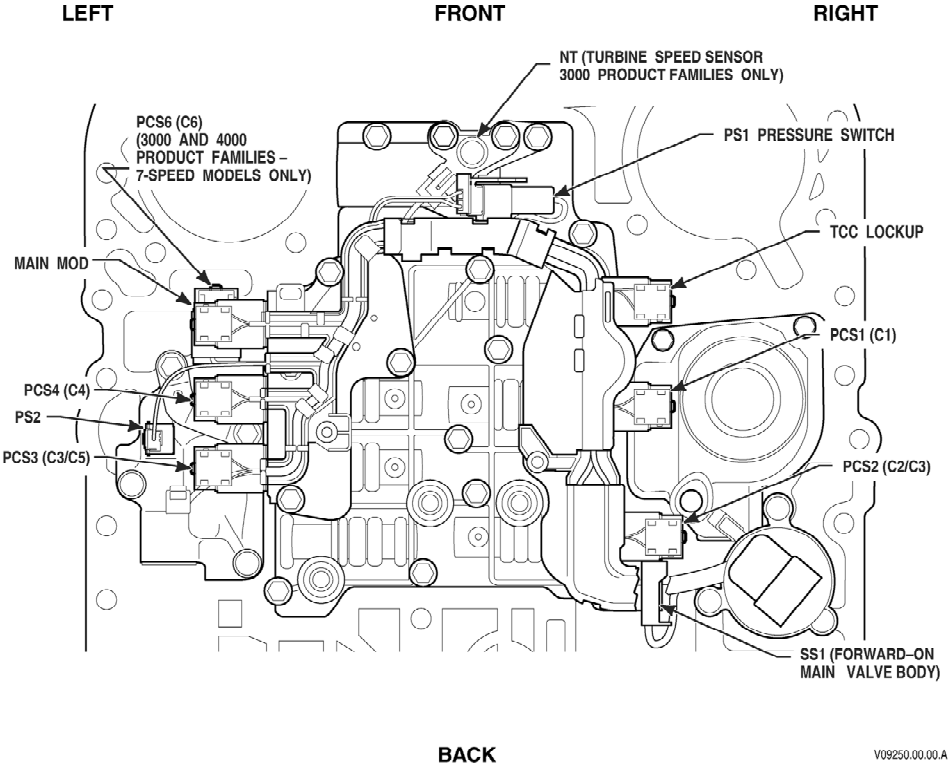

Figure 2–9. Control Module Solenoid Location With Prognostics

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B. C6 Valve Body Assembly (7-speed).

If equipped, the C6 (low) valve body assembly (for 3000 and 4000 Product Families 7-speed models only) contains solenoid PCS6 (C6) and one ON/OFF solenoid SS2 (C6 enable). Refer to the appropriate service manual for valve locations.

C. Filter Life Valve Body Assembly.

The filter life indicator valve body is installed in non 7-speed transmissions. The PS2 is located on top of the Filter Life Indicator (FLI) valve body to indicate when the transmission fluid filters for main and lube need maintenance. Refer to the appropriate service manual and 4–9. FILTER LIFE MONITOR (FM) for additional information.

D. Main Pressure Modulation (MM) Solenoid.

NOTE: For Non-Shift Energy Management transmission calibrations, Step Main Mod logic is active during the 1-2 shift. For SEM transmission calibrations, Variable Main Mod logic is active.

The 5th Generation controls system includes a Main Modulation (MM) solenoid. Modulated main pressure results in improved cooler flow and reduced pump losses when throttle position and output speed is low. The TCM commands the main modulation solenoid to reduce main pressure when all of the following conditions are simultaneously met:

- Sump temperature is less than 150ºC (302ºF)
- Engine speed less than 1200 rpm in all ranges except neutral. There are no restrictions on engine speed in neutral
- Throttle percentage less than 15 percent in reverse, low (7-speed), first, or second range. Main modulation may be commanded ON in neutral at any throttle position
- Output speed is less than 250 rpm in neutral, reverse, low (7-speed), first, or second range
- The PTO input to the TCM indicates the PTO is OFF
- Shift not in progress

The TCM may activate the main modulation solenoid for improved clutch control and transmission response during other unusual operating situations.

Variable modulated main pressure in 3000/4000 Series Transmissions with SEM and/or LRTP calibrations are based on engine torque and improves transmission efficiency.

If vehicle installation utilizes the transmission pressure supply for vehicle systems, such as PTO clutch apply and clutch lubrication in 2nd through 6th lockup ranges, and if more than 125 psi is required, Input Function C: PTO Enable analog input or SAE J1939 messaging is required. If this input function is activated during variable modulated main functionality, the transmission commands an increase in main pressure.

It is highly recommended that all installations utilizing transmission fluid pressure in such a manner also implement Input Function C. PTO Enable, either via analog input or SAE J1939 messaging. 3000/4000 variable modulated main transmissions have the same low pressure threshold as the 3000/4000 step main feature.

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E. Temperature Fluid Temperature (TFT) Sensor.

A temperature sensor (thermistor) is located in the internal wiring harness. Changes in sump fluid temperature are indicated by changes in sensor resistance, which changes the signal sent to the TCM. Refer to the chart in 6–15. TRANSMISSION FLUID TEMPERATURE (TFT) SENSORS for additional information.

F. Oil Level Sensor (OLS).

The OLS is standard on any 3000 and 4000 Product Families 5th Generation Controls transmissions except for the 3700 SPS or any of the 4700/4800 retarder models where it is unavailable.

The OLS is a float type device mounted on the control module channel plate. The OLS senses transmission fluid level by electronically measuring the buoyancy forces on the float. The sensor operates on 5VDC supplied by the TCM. Refer to 3–1. TRANSMISSION FLUID (OIL) (Electronic Fluid Level Check) for additional information.

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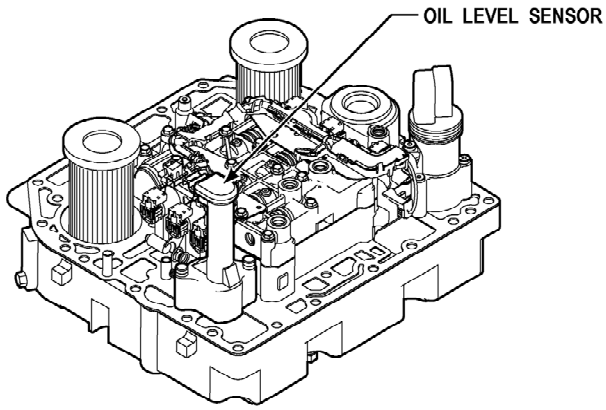
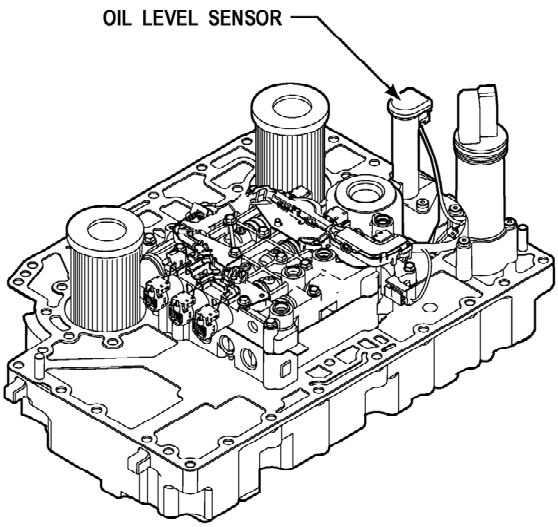
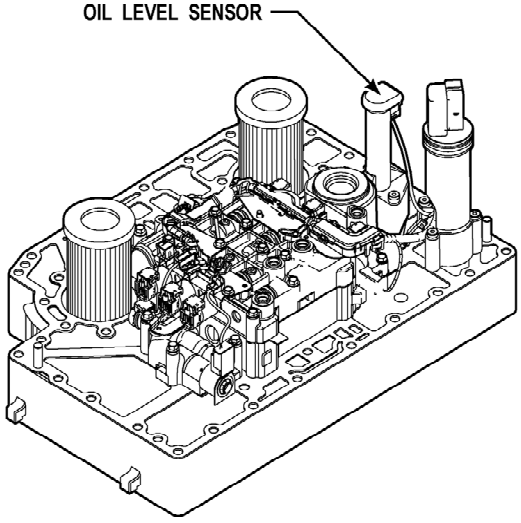


6-SPEED
3000 PRODUCT FAMILY
CONTROL MODULE



6-SPEED
4000 PRODUCT FAMILY
CONTROL MODULE



7-SPEED
4700/4800 PRODUCT FAMILY
CONTROL MODULE
WITHOUT RETARDER

25499

Figure 2–10. Current Oil Level Sensor Orientation

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G. Diagnostic Pressure Switch (PS1).

The diagnostic PS1 is mounted on the solenoid valve body assembly and performs the following two functions:

- When the C5 is filled, PS1 senses the PCS2 regulator valve position to verify proper C3 control in reverse, neutral, and first range.
- When the C5 is exhausted, as in second through sixth ranges, PS1 verifies the position of the C1 and C2 latch valves.

H. Turbine Shaft Speed Sensor (3000 Family).

The turbine shaft speed sensor for the 3000 Product Family Transmission is mounted on the control valve module.

NOTE: The turbine shaft speed sensor on the 4000 Product Family Transmission is externally located on the outside of the main housing.

The turbine shaft speed sensors are variable reluctance type (as are the other speed sensors, input and output) designed to sense the splines passing by it as a measurement of speed. The splines passing by are part of the rotating drum of the rotating clutch module.

2–7. WIRE HARNESSES

A. External Harness.

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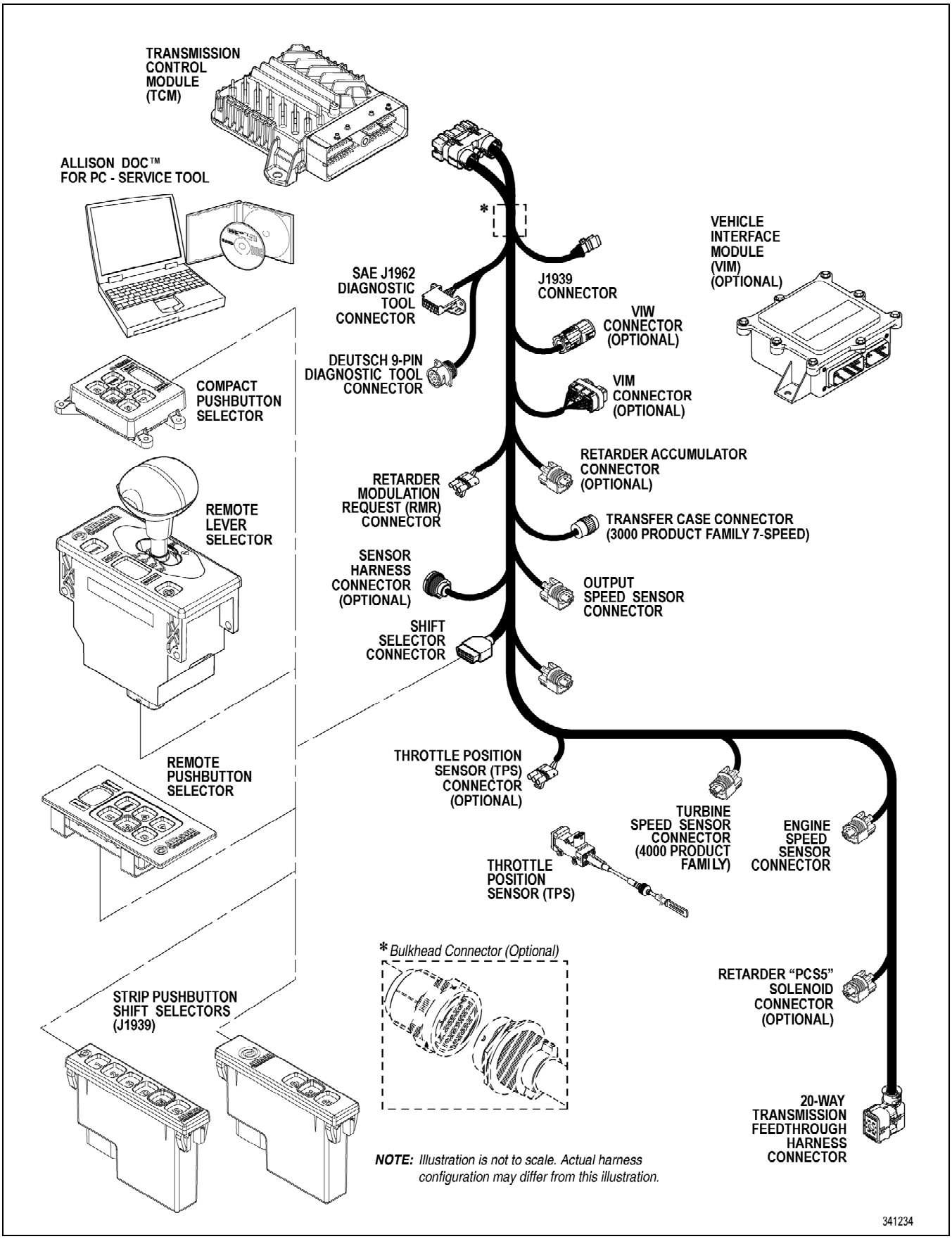

Figure 2–11. Typical 5th Generation Electronic Controls External Wiring Harnesses

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The external harness interfaces with the 80-Way connector of the TCM to all other electrical/electronic 5th generation control components listed:

- Transmission Internal Harness.
- TPS (if equipped).
- Allison DOC® connector.
- Input speed sensor (Engine speed).
- Turbine shaft speed sensor (4000 series only).
- Output shaft speed sensor.
- Vehicle Interface Module (VIM), if equipped.
- Retarder request sensor(s), for example, Retarder Resistance Module(s), if equipped.
- Retarder temperature sensor, if equipped.
- Retarder accumulator solenoid, if equipped.
- SAE J1939 and SAE J2284 Controller Area Network (CAN).

External harnesses (chassis harnesses) often have bulkhead fittings, such as where the harnesses enters or exits the vehicle body. This manual does not have service information for the OEM body bulkhead connectors, except where they directly interface to a component with an Allison part number.

All vehicle OEM-provided components without an Allison released part number, which is the case for almost all external harnesses, are serviced with vehicle OEM service parts, not ATI service parts. The worldwide ATI Parts distribution channel will typically not have service parts for an OEM external harness unless the harness assembly or part has an ATI part number released for it. Allison part numbers are cross-referenced to the supplier or vendor part numbers, if available. Refer to Appendix F. WIRE/CONNECTOR/VIM CHARTS for additional information. Additional connector and terminal parts information and their repair procedures are found in Appendix G. CONNECTOR PART NUMBERS.

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NOTE: Allison Transmission provides service of wiring harnesses and wiring harness components as follows:

- Repair parts for the internal wiring harness and for wiring harness components attached to the shift selector will be available through the Allison Transmission Parts Distribution Center (PDC). Use the P/N from your appropriate parts catalog or from Appendix G. CONNECTOR PART NUMBERS. Allison Transmission is responsible for warranty on these parts.
- Repair parts for the external harnesses and external harness components can be obtained from St. Clair Technologies Inc. (SCTI). SCTI provides parts to any Allison customer or OEM and is responsible for warranty on these parts. SCTI recognizes Allison Transmission, manufacturers, and SCTI part numbers. SCTI provides a technical HELPLINE at 519-627-1673 (Wallaceburg), and a website at *www.stclairtech.com* and parts catalogs are available. The SCTI addresses and phone numbers for parts outlets are:

  St. Clair Technologies, Inc.
  827 Dufferin Avenue
  Wallaceburg, Ontario, Canada N8A 2V5
  519-627-1673
  FAX: 519-627-2860
  www.stclairtech.com

  St. Clair Technologies, Inc.
  Calle Damanti S/N Col Guadalupe—Guaymas
  Sonora, Mexico 85440
  011-526 2222-43834
  FAX: 011-526-2222-43553
  www.stclairtech.com

St. Clair Technologies, Inc. is the source for external harness repair parts.

B. Internal Wiring Harness.

The internal wiring harness (refer to Figure 2–12) provides connection between the following:

- External harness.
- Pressure Control Solenoids (PCS1-PCS4, PCS6).
- Shift Solenoids (SS1, SS2).
- Torque Converter Clutch (TCC) solenoid, also called lock-up clutch.
- Main Pressure Modulation (MM) solenoid.
- Oil Level Sensor (OLS) (except in 3700SP and 4700/4800 Retarder models).
- Diagnostic Pressure Switch (PS1).
- Transmission Fluid Temperature (TFT) sensor.
- Turbine shaft speed sensor (3000 series only).
- Filter Life Indicator (FLI) switch (PS2), if equipped.

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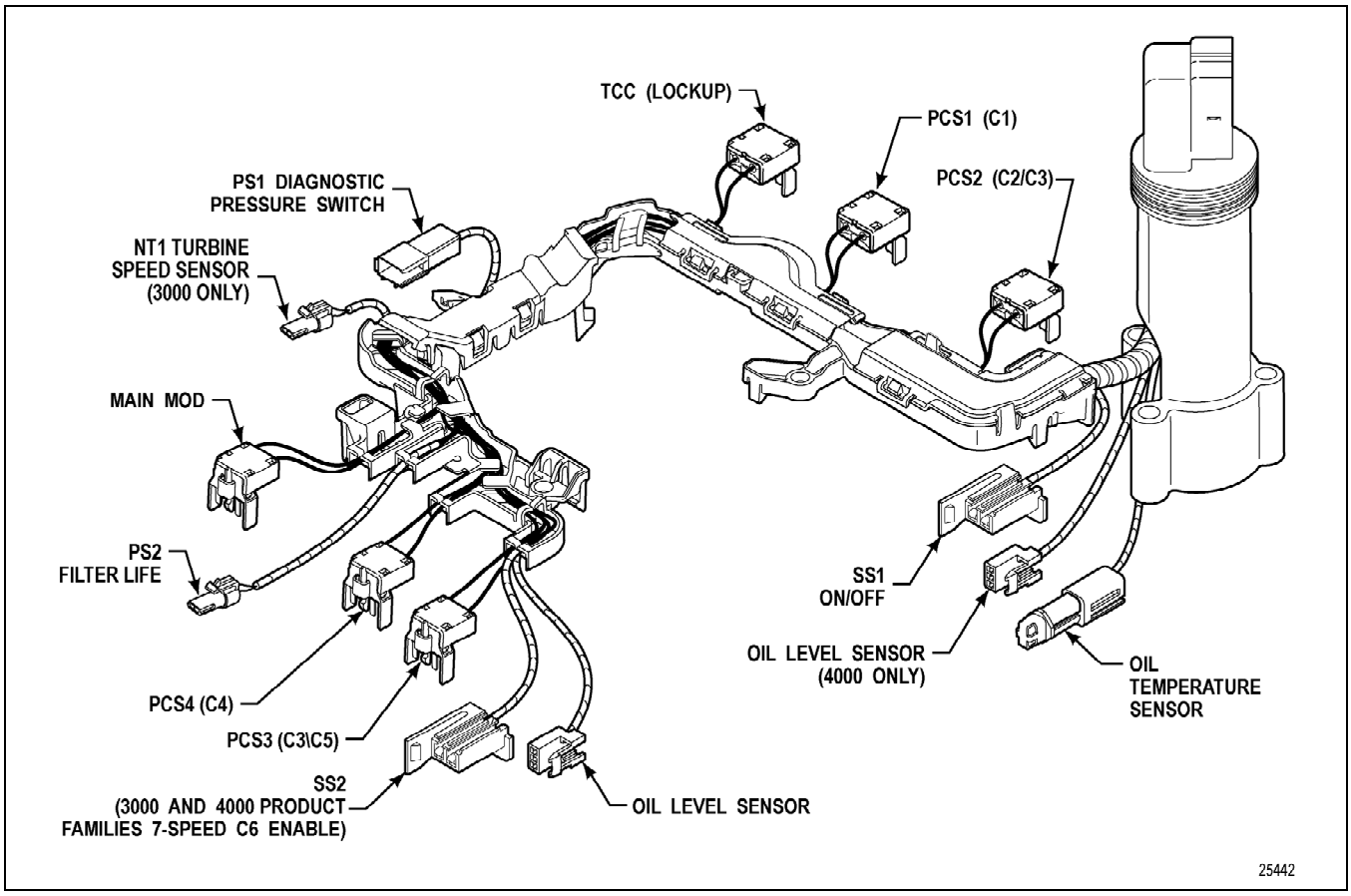

Figure 2–12. 5th Generation Internal Wiring Harness

2–8. OPTIONAL VEHICLE INTERFACE MODULE (VIM)

If equipped, the VIM provides relays, fuses, and connection points for interface with the output side of the vehicle electrical system. VIM(s) are available for both 12V and 24V electrical systems. The VIM for 12V systems uses all 12V relays. The VIM for 24V systems has all 24V relays. Refer to the appropriate parts catalog for the transmission assembly number that you are servicing for detailed parts information. Refer to Appendix F. WIRE/CONNECTOR/VIM CHARTS for VIM wire number and terminal information. Some Original Equipment Manufacturers (OEMs) may provide their own equivalent for the VIM which performs the same functions as the VIM, (refer to Figure 2–13).

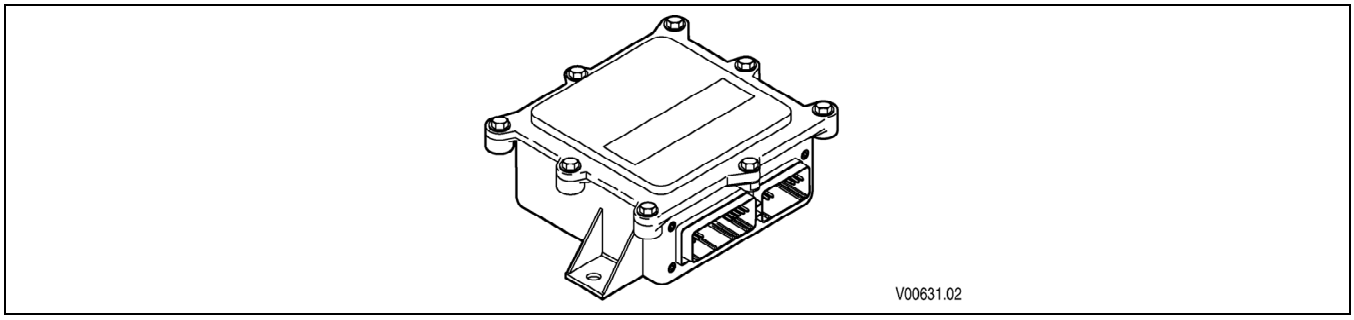

Figure 2–13. Vehicle Interface Module (VIM)

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2–9. AUTO-DETECT LOGIC

A. Overview.

When the Transmission Control Module (TCM) is powered up after a vehicle is assembled, auto-detection logic searches for various input sources and locks onto the most preferred of those available for a given input.

There are two layers of auto-detection logic:

- Input Source Type
- SAE J1939 Source Address auto-detection (multiplexing)

Inputs sources (hard-wired or SAE J1939) are configured when the calibration is established using the Allison Calibration Configuration Tool (ACCT). In some cases, an input may be dependent upon both hard-wired and SAE J1939 inputs - with response to those inputs determined by an AND/OR relationship, also established in the calibration. Therefore, an input may be SAE J1939 only, hard-wired only, OR both, or AND both.

Most Auto-Detect functions are active on the first 25 engine starts and, in the case of throttle source detection logic, may continue past 25 ignition cycles until a valid source is determined. Auto-detect takes place within the first 30 seconds of each engine start monitored. Auto-detect searches for the presence of the following transmission components or data inputs in the priority listed:

- TransID (TID) Level
- Retarder Present, Not Present
- Oil Lever Sensor (OLS) Present, Not Present

B. Reset Auto-Detect.

Resets are necessary if a device that was supposed to have been detected (such as an OLS or retarder solenoid) is undetected. The device may have been missing, disconnected from the harness, or defective when the auto-detection logic was running.

The reset auto-detect function forces the TCM to re-start the auto-detect logic. Resetting auto-detect with the service tool causes the TCM to reinitialize the detection of the OLS and retarder feature.

To activate the reset auto-detect function:

1. Select the Action Request drop-down menu.
2. Click the Reset Auto-detect menu item—the reset auto-detect successful window displays.
3. Click **OK**. Auto-detect runs again after the next normal TCM power-down (for example, an ignition cycle is required to complete auto-detect reset).

To reset auto-detect retarder:

1. Display the Action Request Menu.
2. Click on the Reset Auto-detect Retarder menu item—A message displays indicating that the Auto-detect Retarder feature has been reset.

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3. Click **OK**. Auto-detect runs again after the next normal TCM power-down (for example, an ignition cycle is required to complete auto-detect reset).

NOTE: Selecting RESET ADAPTIVE SHIFT PARAMETERS will not reset auto-detect logic.

C. Override Auto-Detect.

The Allison DOC® can also be used to override auto-detect components by changing the Customer Modifiable Constant (CMC) for a specific component to a forced “to be present” or forced to “not be present” condition. Consult the Allison DOC® User’s Guide, GN7588EN (selected from the help menu in Allison DOC®), for instructions on how to program CMCs.

D. Retarder Auto-Detect Logic.

Retarder auto-detect logic searches for the presence of Pressure Control Solenoid 5 PCS5) installed in the retarder valve body for the first 35 engine starts. A retarder will be identified as present after PCS5 has been detected for three consecutive engine starts. Without three consecutive detections within 35 engine starts, the retarder auto-detect logic will log that there is no retarder and it stops looking. If the retarder is not detected, it will not function on subsequent engine starts and retarder diagnostics are not enabled in the calibration.

If a retarder is present but not auto-detected, the retarder will not function. Follow steps for troubleshooting DTC P2736 and DTC P2739. Reset retarder auto-detect with the Allison DOC® after repair.

E. Oil Level Sensor (OLS) Auto-Detect Logic.

OLS auto-detect logic searches for an OLS for 25 engine starts. The TCM monitors the OLS input voltage on wire 116 for a minimum voltage within 13 seconds of any given engine start to detect the presence of an OLS. If the engine start counter sees 25 cycles and does not detect the OLS, the auto-detect logic logs no OLS present and the OLS auto-detect logic then stops looking. OLS diagnostics are not enabled in the calibration until the OLS is detected.

If an OLS is known to be present but has not been detected, make sure the fluid level is correct before further troubleshooting. Low fluid level may cause the OLS to be undetected. Reset auto-detect after correcting fluid fill. If fluid level is correct but the sensor is not auto-detected, follow the steps for troubleshooting DTC P070C. Reset auto-detect with the Allison DOC® after repair.

F. Auto-Detect Process for Trans ID (TID) Level.

TID auto-detect is initiated after the first key cycle with sensed transmission connection. TID level is locked after 15 consecutive equivalent TID values, with a maximum of 60 key-cycles. If TID is not established after 60 key-cycles, the Learned TID will lock as Indeterminate with DTC P0702 Transmission Control Hardware Not Determined becoming active.

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2–10. Adaptive Controls

Adaptive shifting is a basic design feature of the shift controls which optimizes shift quality. This is accomplished by frequent monitoring of critical characteristics in the clutch engagement process and making continuous adjustments to certain characteristics which improve subsequent shifts.

The transmission shift calibration is based on several different types of shifts, for example, full throttle, part throttle, closed throttle–upshifts, downshifts. Each shift is associated with specific speed and throttle position parameters. In order to optimize each type of shift for normal driving, it is necessary for the shift controls to have experienced operation and shifting in a wide variety of operating conditions. A drive-in period under varied driving conditions is required before the adaptive controls can optimize each and every shift. Shift quality begins to converge to the adapted level after five shifts of a particular shift type.

A. Adapt Shifts Report Patterns and Regions.

To determine if a shift or shifts are converged, connect Allison DOC® and open the Adapt Shifts Section from the reports menu, name and save the report. Select the report from the down arrow and click the load button. Adaptive status of all shifts is displayed.

Definitions of patterns and regions:

- Pattern 0-Primary shift schedule
- Pattern 1-Secondary shift schedule
- Pattern 2-Shift made with lockup applied
- Region 0-Shift at less than 50% throttle
- Region 1-Shift at 50%-80% throttle
- Region 2-Shift at more than 80% throttle

2–11. Shift Schedules

A. Overview.

The points at which transmission upshifts and downshifts occur, commonly called shift schedules, are dependent upon predetermined speeds and other operating conditions. The shift calibration which is programmed into each TCM includes several different shift schedules which govern transmission shifting during a variety of specific vehicle operating conditions. Vehicle performance may be affected when shift schedules change. The actual transition between shift schedules is transparent to the operator.

The transition between shift schedules can be initiated by several different actions:

- from a direct operator request through the dash switch or **MODE** button; for example, performance shift schedule in primary mode and economy shift schedule in secondary mode.
- automatically, as determined by road-load conditions, if the FuelSense® features such as DynActive®, Dynamic Shift Sensing (DSS), or Acceleration Rate Management (ARM) options are programmed into the TCM.
- indirectly from activation of another (non-transmission) vehicle component or system which is interlocked with the transmission control system; for example, modified transmission downshift points when an engine brake is in use, which enhances engine brake performance.

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- when the operator selects a forward drive gear that is not the highest available gear for the transmission. If the transmission is already operating in a higher gear than the newly selected gear, then downshifts to that gear will be at higher than normal speeds. These are commonly called preselect downshifts. Once the preselected gear has been reached, the upshift speed from that gear, commonly called the hold upshift speed, is increased in order to hold the transmission in that gear and inhibit upshifting.
- commanded automatically for certain vehicle or transmission configurations when specific operating conditions are encountered; for example, when the transmission retarder provision is in operation or a transmission over-temperature condition exists.

B. Shift Calibrations.

Each transmission shift calibration includes multiple shift schedules (sets of shift points) which are used to control transmission shifts in various operating conditions; for example, during normal driving, when an engine brake is in use, during an over-temperature condition. The shift points only affect the timing of shifts between gears. The actual number of forward gears which are available for use at any point in time is determined independently based on the transmission model and the shift selector position.

2–12. PRIMARY AND SECONDARY SHIFT SCHEDULES

A. Selection.

The **primary** shift schedule is normally used each time the vehicle is started, and is typically specified in such a way to accommodate normal vehicle operation. The **secondary** shift schedule is an alternate shift schedule that the TCM uses only upon request. The request for this schedule can be a dedicated request from the operator or can be interlocked with the operation of another vehicle system. The primary and secondary shift schedules must be specified when the TCM is programmed. Frequently, either Performance or Economy shift points are selected for the primary shift schedule (reflecting the most commonly used state of the vehicle), and the other set of shift points are selected for the secondary shift schedule.

B. Common Shift Schedule Types.

For the 3000 and 4000 Product Family Transmissions, the most commonly used shift schedules are identified as S1 through S8. Global emphasis on vehicle fuel economy has led to the development of additional shift schedules, identified as S9, SA and SB. The shift schedules available for the 3000/4000 transmissions are described below:

- **S1 & S5**-Performance: Wide Open Throttle (WOT) upshifts near Full Load Governed Speed (FLGS)
- **S2 & S6**-Performance: WOT upshifts at a fixed (less than 100) percent of FLGS
- **S3 & S7**-Economy: Upshifts at speeds which pull engine down to a fixed rpm after the shift
- **S4 & S8**-Economy: Upshifts at speeds which pull engine down to a fixed rpm (and less than S3) after the shift
- **S9**-Economy: Upshifts and downshifts occur at speeds that are even lower than the S4 shift strategy
- **SA**-Economy: WOT upshifts are similar to S5, but the SA part-throttle upshifts and downshifts occur at significantly lower speeds than the S5 part-throttle shifts

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- **SB**-Economy: WOT shifts and downshifts similar to SA, but the SB part-throttle upshifts occur at slightly higher speeds than the SA part-throttle upshifts
- **SC**-Economy: Wide Open Throttle (WOT) upshifts and downshifts are similar to S3, but the SC part throttle upshifts and downshifts occur at significantly lower speeds
- **SD**-Economy: Wide Open Throttle (WOT) upshifts and downshifts are similar to S3, but the SD part throttle upshifts occur at slightly higher speeds than the SC part throttle upshifts

Schedules S1 through S4 are typically used with engines using automotive, variable speed, or all-speed, governors. Schedules S5 through S8 are designed to provide the same WOT upshifts as the corresponding S1 through S4 schedules. However, the S5 through S8 part throttle shift schedules have been modified to accommodate the characteristics of engines with limiting-speed governors. Schedules S9, SA and SB should be reviewed in iSCAAN to confirm that the selected schedule is appropriate for the vehicle configuration and vocation. The vehicle builder is responsible for evaluating the driveability of an S9, SA, SB, SC, or SD shift schedule in the intended vehicle and duty cycle.

2–13. HOLD SCHEDULE FOR UPSHIFTS

As a standard feature of each shift calibration, the transmission controls incorporate a **hold upshift** shift schedule, which the operator may select if the transmission is not operating in its highest range. When this schedule is active, the shift points for upshifts are raised in order to hold the transmission in its current gear and inhibit upshifting beyond the current range. Holds are activated by selecting the current range or a lower range on the shift selector.

CAUTION: A typical use of the hold feature is to maximize engine braking when operating downhill. However, in order to prevent over-speeding the engine, the hold function is not infinite. It permits shifts from the hold range to the next higher range (hold override upshift) at some speed above the shift calibration speed.

2–14. PRESELECT SCHEDULE FOR DOWNSHIFTS

Similar to use of the hold feature, the operator may initiate the preselect downshift shift schedule by selecting any forward gear on the shift selector that is lower than the gear currently in use. When a range has been preselected in this manner, shifts to and from gears above the preselected gear range occur at higher than normal engine speeds. Shifts below the preselected range are not affected. Preselect downshifting is beneficial in maintaining higher engine speed, resulting in increased engine braking or engine brake performance during downhill operation or vehicle deceleration cycles. Preselect shifts are permitted only if an engine over-speed condition will not occur after completion of the downshift. This shift schedule is a standard feature of each shift calibration.

A. During Non-Engine Brake Operation.

Two choices of preselect shift schedules are available for governing preselected downshifts during normal transmission operation. One of these must be selected when the TCM is programmed:

- Standard Preselects–downshifts will occur such that the engine speed after the shift is approximately 300 rpm above the engine governed speed
- Low Preselects–downshifts will occur such that the engine speed after the shift is approximately 150 rpm above the engine governed speed

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B. During Engine Brake Operation.

When the TCM detects that the engine brake is enabled, it commands use of a preselect shift schedule in order to enhance engine brake performance. The default speeds for these shifts are known as the alternate engine brake preselects:

- Alternate Engine Brake Preselects–downshifts will occur at engine speeds approximately midway between 1000 rpm and the Standard Preselects for your transmission model. As an option, the user may choose to use the same preselect shift points during engine brake operation as those used for non-brake operation:
  - Standard Preselects
  - Low Preselects

This selection must be specified when the TCM is programmed.

The preselect schedule chosen above is invoked for downshifts that occur while the engine brake is active and until operation in a specified gear is reached. This specified gear is the Engine Brake Preselect Range Customer Modifiable Constant (CMC). If the value for this CMC is higher than 2nd gear, downshifts from the Engine Brake Preselect Range to 2nd gear are made as standard (non-engine brake) closed throttle downshifts.

If the TCM is programmed to make engine-brake preselect downshifts at Standard Preselects or Low Preselects speeds, downshifts between the Engine Brake Preselected Range to an even lower gear can be specified to use the Alternate Engine Brake Preselect downshift speeds. The lowest gear to use this downshift schedule is also a customer modifiable constant (Alternate Engine Brake Preselect Range). If this option is specified and the Alternate Engine Brake Preselect Range CMC is higher than 2nd gear, downshifts from the Alternate Engine Brake Preselect Range to 2nd gear uses a normal (non-preselect) closed throttle shift speeds.

2–15. CRUISE MODE SHIFT SCHEDULE

This shift schedule is activated when the SAE J1939 datalink message is received to indicate cruise control is active. Shift points for this operation are modified in order to reduce the frequency of upshifts and downshifts during cruise operation. This shift schedule is a standard feature of each shift calibration.

2–16. OVER-TEMPERATURE SHIFT SCHEDULE

Regardless of operator request, the TCM automatically limits transmission operation to 4th range or below during oil over-temperature conditions. If the transmission is above 4th range when over-temperature occurs, the preselect shift schedule is used for all downshifts until 4th range is reached. In TCM calibrations for emergency vehicles, the Over-Temperature Shift Schedule is disabled.

2–17. UNDER-TEMPERATURE (COLD) SHIFT SCHEDULE

Regardless of operator request, the TCM automatically limit transmission operation as shown in Table 2–4 during oil under-temperature conditions.

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Table 2–4. Minimum Fluid Operating Temperatures

Sump Fluid Temperature	CHECK TRANS Light	Operation
Starting below –5ºC (23ºF)	OFF	Inhibited to Neutral, Reverse, Second, until temperature is above –1ºC (30ºF)
Starting above –5ºC (23ºF)	OFF	Full operation in all ranges

Transmission operation at cold ambient temperatures may require preheating or the use of a lower viscosity transmission fluid.

2–18. KICKDOWN SHIFT SCHEDULE

Kickdown is an optional shift schedule which is activated when the kickdown input function is enabled. Refer to the Allison DOC® Technician's Library for additional information.

If shift schedule S2, S3, S4 or S9 is in use and kickdown is active, all shifts revert to schedule S1 WOT shift points. Similarly, if shift schedule S6, S7 or S8 is in use and kickdown is active, all shifts revert to schedule S5 WOT shift points. Kickdown shift points for shift schedules S1, S5, SA and SB are equal to their WOT shift points. Shift schedules S1 through S9, SA and SB are discussed in 2–12. PRIMARY AND SECONDARY SHIFT SCHEDULES.

2–19. OUTPUT RETARDER SHIFT SCHEDULE

A. High Retarder Fluid Temperature.

If the retarder fluid temperature exceeds 143ºC (290ºF), the TCM raises the closed throttle downshift points by activating the preselect downshift schedule. Use of the preselect downshift schedule forces downshifts to occur at higher than normal road speeds, increasing coolant flow through the transmission cooler and engine radiator.

B. Retarder Cruise Control Interactions.

Two control features affect retarder operation when the vehicle is equipped with cruise control:

- Feature 1: Cruise Control Retarder Auto On Disable

  This feature only applies to electronic engines that communicate with the transmission on SAE J1939. The TCM calibration must specify this feature to be either on or off. If the feature is on in the calibration, the TCM prohibits retarder operation when cruise control is active but the throttle is closed, which implies downhill coasting operation. This feature is highly recommended if the retarder apply system automatically applies the retarder at high levels at closed throttle. If the feature is off in the calibration or the engine is not electronic, the TCM commands retarder operation whenever the cruise control goes to zero throttle. This mode of operation is only acceptable if the subsequent level of retarder apply is less than 25%.

- Feature 2: Retarder Cancel Cruise Control

  This feature provides for a short flash of the retarder indicator output whenever the requested retarder level is increased. The retarder indicator output must be wired to the engine cruise control to turn off cruise control when the level of retardation requested is changed. This operation emulates the effect of applying the service brakes. Feature 2 is an optional feature that must be specified for the controls calibration.

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2–20. SHIFT ENERGY MANAGEMENT (SEM) AND LOWER RANGE TORQUE PROTECTION (LRTP)

A. Shift Energy Management (SEM).

SEM manages engine torque during shifts to increase shift quality and reduce clutch wear. Engine control is accomplished through the SAE J1939 datalink; there is no equivalent analog or J1587 implementation of this feature.

B. Lower Range Torque Protection (LRTP).

LRTP reduces engine torque when transmission input power, input torque, converter torque output, or converter speed ratio exceeds Allison-defined limits. These limits occur during torque converter mode or operation in lower gears, where stall or drivetrain torque may reach levels above gearbox capacity.

Engines requiring SEM must also support LRTP. The TCM only activates these functions when connected with a compatible electronic engine and control system that are validated by Allison Transmission, Inc.

Some calibrations may have LRTP enabled without the SEM functionality, provided SEM is not required for the engine and rating in the application.

2–21. DYNAMIC SHIFT SENSING

A. Overview.

The Dynamic Shift Sensing strategy is a continuously-variable method of shift scheduling. Instead of using a shift point table with defined shift points (such as 2000 rpm S1 performance), Dynamic Shift Sensing chooses the most efficient shift point based on the current environmental and vehicle conditions. Dynamic Shift Sensing achieves the best fuel economy for a specified level of performance. Vehicle information such as torque, speed, grade, mass, etc. is constantly analyzed to select the most efficient shift point/speed that can achieve calibration-specified performance level.

Dynamic Shift Sensing is required in all FuelSense® 2.0 packages. Dynamic Shift Shifting can be enabled in primary mode or secondary mode, or both. Dynamic Shift Sensing calibration settings will be used to define the shift point limits. The engine governed speed calibration setting is used for the upper engine speed limit. The minimum engine speed calibration setting is used for the lower engine speed limit. The economy bias settings define the percentage of economy desired during Dynamic Shift Sensing operation. 100% economy bias will provide the lowest available shift points to keep the engine speed just above the minimum engine speed calibration value. 0% economy bias will provide performance shifting using the governed speed setting as the upper limit of available shift points.

B. Super Economy Shift Schedule (SESS).

SESS is a special shift logic that allows an upshift when it calculates that the next gear can be held, regardless of the shift calibration selected.

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C. Acceleration Rate Management.

Acceleration Rate Management automatically limits aggressive driving by controlling engine torque.

2–22. VEHICLE ACCELERATION RATE LIMITING

NOTE: This function should not be confused with the Allison VAC function, where the TCM restricts vehicle acceleration by sending TSC1 commands to the engine.

The vehicle acceleration rate limiting function involves an engine controller restricting the acceleration rate of the vehicle due to end-user concerns such as fuel economy and tire life.

While acceleration rate limiting is actively restricting the engine, accelerator pedal position is no longer representative of operator input or load on the engine. If a vehicle employs acceleration rate limiting, the TCM must know when it is active so the correct information is used for shift modulation and clutch control.

When vehicle acceleration limit status is active, shift points are scheduled based on EEC2 Engine Percent Load at Current Speed rather than EEC2 Accelerator Pedal Position. Shift timing may be modified to prevent shift cycling when the Vehicle Acceleration Limiter is rapidly changing Engine Percent Load at Current Speed.

In non-SEM applications, Engine Percent Load at Current Speed will also be used in estimating torque for clutch control in non-SEM applications when Vehicle Acceleration Limit Status is active.

If an engine is limiting acceleration rate but does not support EEC2 Vehicle Acceleration Limit Status, hanging shifts and poor shift quality may result. No DTCs are logged.

2–23. DYNACTIVE® SHIFTING

DynActive® Shifting uses an algorithm to choose the most efficient shift point based on environmental and vehicle parameters. DynActive® Shifting is an algorithm-based, continuously variable shift program that replaces table-based shift schedules. DynActive® Shifting is required in all FuelSense® 2.0 packages.

The calibration can be programmed to enable DynActive® Shifting in primary or secondary shift schedules, or both. DynActive® Shifting may be overridden for specialty conditions such as minimum engine speed, engine hold override speed, kickdown, engine brake, driver preselects, and ABS. Therefore, a table-based schedule still needs to be defined in the calibration. DynActive® Shifting can be biased for both flat ground operation and on-grade operation in the calibration using a scale of 0% to 100%. 100% provides maximum economy and 0% provides maximum performance.

2–24. INPUT AND OUTPUT (I/O) FUNCTIONS

Each calibration includes the capability for additional functional control of transmission and/or vehicle operations which are tailored to the expected duty of the vehicle.

Some of the controls features, called Input Functions, transmit operator requests to the TCM which indicate a desired operating state. Other input functions are used to relay vehicle data to the TCM to indicate the operating state of other vehicle systems. By being alerted to these conditions, the TCM can then coordinate transmission operation with a specific state of vehicle operation or desire of the operator.

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Other features, called Output Functions, result in data being sent out of the TCM for use in controlling the operation of other non-transmission components. The output functions are commonly turned on and off based on the state of related input function signals and/or the operating state of the transmission.

Various combinations of these functions are assembled into I/O packages. In many cases, multiple but similar I/O packages have been created for vehicles used similarly. These packages are arranged in I/O Groups. The calibration of each TCM contains programming associated with the group and package which has been selected for the vehicle, plus the I/O content of all other packages within the selected group. This is significant because the TCM may be recalibrated, using the Allison DOC®, to use any of the packages included in the programmed I/O group.

2–25. CUSTOMER MODIFIABLE CONSTANTS (CMCs)

In addition to selecting which of the input and output functions are enabled for an installation, the explicit operating conditions related to certain functions may be specified. The term customer modifiable constant is used when referring to the variables associated with these selections when they are associated with the setup of I/O functions. These important values thus become another significant element of the overall shift calibration.

This capability to customize functionality of some control features to a specific vehicle further enhances the benefit of many of the I/O functions. For example, the request to engage a transmission-mounted PTO is limited to a specific range of engine speeds. Both the minimum and maximum limits of this speed range are CMCs. These specific speeds, or default values, must be selected when the TCM is programmed. They may subsequently be modified with the Allison DOC®, but only within allowable limits.

Similarly, the method by which the **TRANS SERVICE** indicator may be reset, and the bias index for the LBSS shift calibration are CMC values and must be specified when the CMC is programmed.

2–26. SHIFT INHIBIT LOGIC

NOTE: Engine speed and direction change inhibits are designed to protect the transmission in the event of abusive operation. They should not be regarded as replacements for "safety interlocks" which restrict vehicle operation during the use of auxiliary equipment or other specialized vehicle functions.

NOTE: Depending on the engine control logic, an operator request for a Neutral-to-Drive or Neutral-to-Reverse shift may cancel an engine high-idle condition via the SAE J1939 ETC2 Transmission Selected Gear parameter. This is true whether the high idle was the result of an engine regen cycle, a PTO-cruise condition, or any other general high-idle operation.

A. Engine Speed Inhibit.

This inhibit prevents an attempt to shift the transmission from neutral to either a forward range or reverse if the engine speed is above idle (900 rpm for non-EVS applications and 1260 rpm for EVS models).

If the elevated engine speed drops below the inhibit threshold within a specified grace period of 3 seconds, the inhibit will self-clear and the requested shift will be commanded.

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NOTE: For vehicles using SEM/LRTP, the Neutral-to-Range Assist feature attempts to reduce the engine speed when the engine speed is greater than the transmission's allowable limit and a shift from **N** (Neutral) to forward or reverse has been requested with the shift selector. The operator must have the service brakes applied. This feature must be requested when the TCM calibration is defined.

B. Direction Change Inhibit.

This inhibit prevents a direction change from **D** (Drive) to **R** (Reverse) or from **R** (Reverse) to **D** (Drive) if the vehicle has detected output speed of more than approximately 245 rpm or if the throttle percent is detected to be more than approximately 40% at the time of the direction change request. Engine speed, including a high idle condition, is not a monitored parameter for determining if a direction change should be granted.

If the elevated output speed or throttle position drops below the inhibit threshold within a specified grace period of approximately 3 seconds, the inhibit self-clears and the requested shift will be commanded.

NOTE: Rocking out by shifting from **D** (Drive) to **R** (Reverse) and **R** (Reverse) to **D** (Drive) is still available to the operator provided the vehicle speed and throttle percent is below the limits for direction change inhibit.

C. Auxiliary Function Range Inhibit.

Shifts from **N** (Neutral) to **D** (Drive) or **N** (Neutral) to **R** (Reverse) are also inhibited when the TCM has been programmed (by input/output function) to detect that auxiliary equipment is in operation and the shift should not be allowed.

D. Hill Hold Inhibit.

When the Hill Hold feature is enabled, this inhibit prevents shifting the transmission from **N** (Neutral) to either a forward range or **R** (Reverse) if the transmission turbine shaft speed is less than 300 rpm.

If the turbine shaft speed attains 300 rpm or greater within 3 seconds of initial range selection, the inhibit is terminated and the transmission will be commanded to range without additional operator input. If turbine shaft speed does not attain 300 rpm or greater within 3 seconds of initial range selection, the range selection request is terminated and the operator must re-select the desired range.

E. Notification in Shift Selector Display.

When shifts are inhibited, the TCM puts the transmission in **N** (Neutral) and the RANGE SELECT character flashes an R for reverse inhibit or the RANGE SELECT character flashes the highest forward range number for a drive inhibit.

F. Reset (Clearing).

After a range inhibit has occurred, the driver must reselect range to exit the inhibit after bringing the vehicle to stop and/or returning to engine idle once the inhibit latches for exceeding the allowed grace period (approximately 3 seconds).

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G. Viewing Inhibits in Allison DOC®.

The Allison DOC® has a shift inhibits grid, data monitor grid with various shift inhibit parameters listed, and also a shift inhibits report that can be run to display shift inhibits that are currently active or shift inhibits that have been active since the last code clear.

H. Transfer Case Inhibit from Allison DOC® Action Requests.

While using Allison DOC® clutch test or full main pressure test action requests, if an exit from either test occurs prior to the driver re-selecting **N** (Neutral) on the shift selector, a transmission inhibit to **N** (Neutral) occurs. This is indicated by the select character flashing in the shift selector. The inhibit table in Allison DOC® shows this condition as a transfer case **N** (Neutral) inhibit. Reselect **N** (Neutral) on the shift selector to exit this inhibit condition or shut the vehicle off. The transfer case neutral inhibit may be avoided during these action request tests by always re-selecting **N** (Neutral) prior to exiting clutch test or full main pressure test.

NOTE: The transfer case inhibit for 3000/4000 is only used to indicate an Allison DOC® device control exit occurred without the driver re-selecting **N** (Neutral). Transfer case inhibit for 3000/4000 models is not enabled for any other sources at this time.

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Section 3—FLUID CHECK PROCEDURES

3–1. TRANSMISSION FLUID (OIL)

A. Importance of Transmission Fluids.

Proper transmission fluid selection is important to transmission performance, reliability, and durability. The fluid used in the transmission does the following:

- Provides the working medium for the torque converter, controls, and clutch application.
- Transfers heat from the transmission to the cooler.
- Lubricates gears and bearings.
- Carries rust inhibiting chemicals throughout the transmission.
- Achieves optimum coefficient of friction for the clutch application.
- Maintains clutch engagement.
- Carries contaminants to the filters.

B. Approved Fluid Types.

Only use fluids meeting Allison Transmission specification TES 295 or TES 389 in your transmission. For a list of currently approved transmission fluids, go to the Allison Transmission web site at: *www.allisontransmission.com*, select SERVICE, Fluids.

Allison Transmission recommends you take the following into consideration when selecting the appropriate fluid type for your transmission:

- Fluids meeting specification TES 295 are preferred over TES 389 fluids for use in all 3000 and 4000 Product Families transmission applications.
- TES 295 fluids are fully qualified for Severe Duty and Extended Drain intervals.
- A TES 295 fluid allows you to operate at a lower ambient temperature than a TES 389 type fluid as shown in Table 3–1.
- A TES 389 fluid is the minimum fluid requirement approved for use in 3000 and 4000 Product Families transmissions.
- To extend the TES 389 fluid drain intervals beyond the recommended mileage or hours change interval, use a fluid analysis program. For additional information on fluid analysis, refer to SM7140EN for 3000 Product Family Transmissions or SM7141EN for 4000 Product Family Transmissions.
- When choosing a fluid type to use, consider what the minimum fluid operating temperature of the fluid will be based on the ambient temperatures reached in the geographical location for the vehicle.

Table 3–1. Transmission Fluid Minimum Operating Temperature Requirements

Fluid Type	Minimum Operating Conditions	
	Celsius	Fahrenheit
TES 295	–35	–31
TES 389	–25	–13

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C. Keeping Fluid Clean.

CAUTION: Containers or fillers that have had antifreeze solution or engine coolant in them must NEVER be used to hold transmission fluid. Antifreeze and coolant solutions contain ethylene glycol and water which, if put into the transmission, can cause damage.

Make sure that transmission fluid is clean, free of chemical contaminants, and within fluid specification limits.

Handle transmission fluid in clean, residue-free containers and fillers to prevent any foreign material or chemical contamination of the transmission fluid.

D. Preheating Requirements.

If ambient temperatures drop below the specified minimum levels for the fluid type, preheat the transmission fluid before beginning transmission operation. The minimum fluid temperatures at which the transmission may be safely operated without preheating are shown in Table 3–1.

3–2. TRANSMISSION FLUID LEVEL CHECKS

A. Cold Check Procedure (Dipstick Method).

NOTE: The correct fluid level cannot be determined unless the transmission is in a level position.

CAUTION: DO NOT start the engine until the presence of sufficient transmission fluid has been confirmed. Remove the transmission fluid dipstick and be sure the static fluid level is near the HOT FULL mark.

WARNING: If you leave the vehicle and the engine is running, the vehicle can move unexpectedly and you or others could be injured. If you must leave the engine running, **DO NOT LEAVE** the vehicle until you have completed all of the following procedures:

- Put the transmission in **N** (Neutral).
- Be sure the engine is at low idle (500–800 rpm).
- Apply the parking and emergency brakes and make sure they are properly engaged.
- Chock the wheels and take other steps necessary to keep the vehicle from moving.

A COLD CHECK determines if the transmission has enough fluid to be operated safely until a HOT CHECK can be made. Complete a COLD CHECK after the presence of transmission fluid has been confirmed with the engine off. The transmission fluid temperature should be between 16-49°C (61-120°F).

NOTE: Always check fluid level with the dipstick in the unscrewed or loose position.

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Complete a COLD CHECK procedure using the dipstick as follows:

1. Move the vehicle to a level surface, put the transmission in **N** (Neutral) and set the parking brake.
2. With the engine idling (500–800 rpm), shift to **D** (Drive) and then to **R** (Reverse) to clear air from the hydraulic circuits.
3. Run the engine at idle (500–800 rpm) in **N** (Neutral) for about one minute.
4. Clean debris from around the end of the fill tube before removing the dipstick.
5. Remove the dipstick and wipe it clean.
6. Insert the dipstick into the fill tube, pushing down until it stops, but still in its loose or unscrewed position.
7. Remove the dipstick and observe the fluid level. If the fluid on the dipstick is within the COLD CHECK band (Figure 3–1), the fluid level is satisfactory. If the fluid level is not within this band, add or drain as necessary to bring the level within the COLD CHECK band. Refer to the Operator's Manual section Transmission Fluid Refill as necessary to bring the level within the COLD CHECK band.
8. Perform a HOT CHECK at the first opportunity after normal operating temperature of 71–93°C (160–200°F) is reached.

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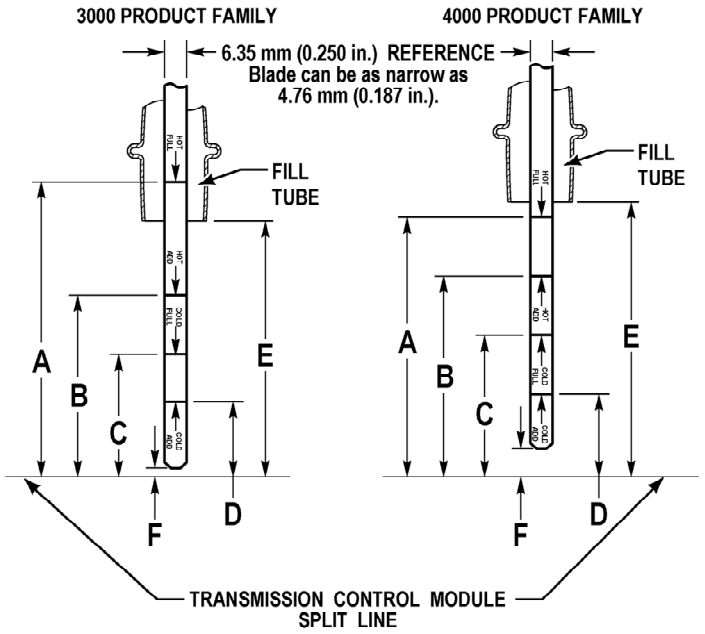

OIL SUMP	TRANSMISSION/SUMP DESCRIPTION	DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	DIMENSION E	DIMENSION F**
2.00 in. and 4.00 in.	4000 PRODUCT FAMILY	106.7 mm (4.20 in.)	76.2 mm (3.00 in.)	66.0 mm (2.60 in.)	*	132.6 mm (5.22 in.)	13.8 mm (0.54 in.)
2.00 in.	3000 PRODUCT FAMILY	101.6 mm (4.00 in.)	73.7 mm (2.90 in.)	50.8 mm (2.00 in.)	*	86.6 mm (3.41 in.)	5.9 mm (0.23 in.)
4.00 in.	3000 PRODUCT FAMILY	101.6 mm (4.00 in.)	63.5 mm (2.50 in.)	45.7 mm (1.80 in.)	*	86.6 mm (3.41 in.)	5.9 mm (0.23 in.)

NOTE: Calibrate level marking locations with respect to transmission control module split line and fill tube.
Scale none.
*Dimension determined by installation.
**Reference dimension only. Actual dimension to be determined by installation.

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Figure 3–1. Standard Transmission Dipstick Markings

CAUTION: DO NOT operate the transmission for extended periods of time until a HOT CHECK has verified proper fluid level. Transmission damage can result from extended operation at improper fluid level conditions.

CAUTION: The fluid level rises as fluid temperature rises. DO NOT fill the transmission above the COLD CHECK band if the transmission fluid is below normal operating temperatures. During operation, an overfull transmission can become overheated, leading to transmission damage.

B. Hot Check Procedure (Dipstick Method).

NOTE: Always check fluid level with the dipstick in the unscrewed or loose position.

To complete a HOT CHECK procedure using the dipstick do the following:

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1. Be sure fluid has reached normal operating temperature of 71-93°C (160-200°F). If a transmission temperature gauge is not present, measure fluid level when the engine water temperature gauge has stabilized.
2. Park the vehicle on a level surface and shift to **N** (Neutral).
3. Apply the parking brake and allow the engine to idle (500-800 rpm).
4. Clean debris from around the end of the fill tube before removing the dipstick.
5. Remove the dipstick and wipe it clean.
6. Insert the dipstick into the fill tube, pushing down until it stops, but still in its loose or unscrewed position.
7. Remove the dipstick and observe the fluid level. The safe operating level is anywhere within the HOT RUN band on the dipstick (Figure 3–1).
8. If the level is not within the HOT RUN band, add or drain fluid as necessary to bring the level within the HOT RUN band. Refer to the Operator's Manual section Transmission Fluid Refill as necessary to bring the level within the HOT RUN band.
9. Measure fluid level more than once. Be sure fluid level measurements are consistent. If readings are not consistent, be sure the transmission breather is clean and not clogged.
10. If readings are still not consistent, contact your nearest Allison distributor or dealer.

C. Checking Dipstick Calibration.

Refer to Figure 3–1 for additional information on correct dipstick calibration.

D. Electronic Fluid Check.

The Oil Level Sensor (OLS) is standard in all models except the 3700 SPS and 4700/4800 models equipped with a retarder. With the OLS and an Allison 5th Generation shift selector, you can get a more accurate electronic fluid level check than with a dipstick.

Prerequisites

- OLS is functional and is auto-detected by the TCM.
- Vehicle has an Allison 5th Generation shift selector.

Detectable Fluid Level Range

The OLS has a detection range of up to LO 4 to HI 3 that can display on the selectors. The actual oil level to add may be greater than 4 liters (4.22 quarts) if the transmission is more than 4 liters (4.22 quarts) low from the full mark. The actual fluid volume to drain may be more than 3 liters (3.17 quarts) if the transmission is overfull by more than 3 liters (3.17 quarts).

Full Function Pushbutton or Lever Shift Selectors

1. Park the vehicle on a level surface and shift to **N** (Neutral). Apply the parking brake.
2. To enter oil level display mode:
   - Pushbutton shift selector—simultaneously press the ↑ (Upshift) and ↓ (Downshift) arrow buttons once.
   - Lever shift selector—press the **DISPLAY MODE** pushbutton once.

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NOTE: The TCM delays the fluid level check until the following conditions are met:

- The fluid temperature is above 40°C (104°F) or below 104°C (220°F).
- The transmission is in **N** (Neutral).
- The vehicle has been stationary for approximately two minutes to allow the fluid to settle.
- The engine is at idle.

When fluid level check is delayed by the TCM, a countdown timer in minutes and seconds appears in the selector graphics display.

3. Correct fluid level is displayed as shown in Figure 3–2.

NOTE: The sensor display and the transmission dipstick may not agree exactly because the OLS compensates for fluid temperature.

NOTE: If the proper conditions to measure oil level have been met, a countdown timer or oil level fault code will be displayed. The actual time remaining before a valid oil level reading can be taken will be displayed as: SETTLING 1:42; where 1:42 indicates the time remaining in minutes and seconds.

Figure 3–2. Correct Fluid Level Display

4. Low fluid level is displayed and the number indicates the number of quarts of fluid the transmission requires (refer to Figure 3–3).

NOTE: Confirm a low fluid level condition by making a manual fluid level check.

Figure 3–3. Low Fluid Level Display

5. High fluid level is displayed followed by a number and the number indicates the number of quarts the transmission is overfilled (refer to Figure 3–4).

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CAUTION: A low or high fluid level causes overheating and irregular shift patterns; if not corrected, transmission damage can occur.

Figure 3–4. High Fluid Level Display

6. To exit the oil level display mode:
   - Pushbutton shift selector—press any pushbutton on the shift selector.
   - Lever shift selector—press the **DISPLAY MODE** button twice.

Invalid for Display Codes

Invalid for Display is activated when conditions do not allow the fluid level to be determined. Refer to Table 3–2 to review the codes and conditions, and correct as necessary. If these conditions cannot be corrected, contact the nearest distributor or dealer in your area (look in the telephone directory for the Allison Transmission service outlet nearest you).

Table 3–2. Fluid Level Fault Codes

Code	Cause of Code
SETTLING / X	Settling time too short
ENG RPM / TOO LOW	Engine speed (rpm) too low
ENG RPM / TOO HIGH	Engine speed (rpm) too high
MUST BE / IN NEU	**N** (Neutral) must be selected
OIL TEMP / TOO LOW	Sump oil temperature too low
OIL TEMP / TOO HI	Sump oil temperature too high
VEH SPD / TOO HI	Output shaft speed
SENSOR FAILED	Sensor failure

E. Fluid Level Check using Allison DOC®.

To check fluid level using Allison DOC®, monitor the Data Monitor grid parameter Oil Deviation. The transmission must be at idle in **N** (Neutral) and the fluid temperature must be between 40–104° C (104–220°F).

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3–3. TRANSMISSION FLUID CAPACITY

Transmission	Sump	Initial Refill		Refill	
		Liters	Quarts	Liters	Quarts
3000 Product Family	4 inch	27	29	18	19
	2 inch	25	26	16	17
4000 Product Family*	4 inch	48	51	40	42
	2 inch	41	43	33	35

* Subtract 2.8 Liters (3 Quarts) for transmissions without PTO

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Section 4—PROGNOSTICS PACKAGE AND FEATURES

4–1. OVERVIEW

A Prognostics system, consisting of control valve module hardware, shift selector, and Transmission Control Module (TCM) calibration is available to monitor fluid life, fluid filter life, and clutch life.

If fluid change, filter change, or clutch service is not performed within a set period of time, a Diagnostic Trouble Code (DTC) sets with a **CHECK TRANS** light, and/or a **TRANS SERVICE** light (shown as the wrench icon) in the shift selector or as an additional light in the dash.

Prognostics can be reset through the Allison DOC® or, if calibrated to allow manual reset, through manipulating the shift selector.

4–2. TRANS SERVICE INDICATOR (WRENCH ICON)

The **TRANS SERVICE** indicator illuminates in the event a service condition relating to a transmission clutch, fluid or filter life occurs. The **TRANS SERVICE** indicator is located on the shift selector display (Figure 4–1).

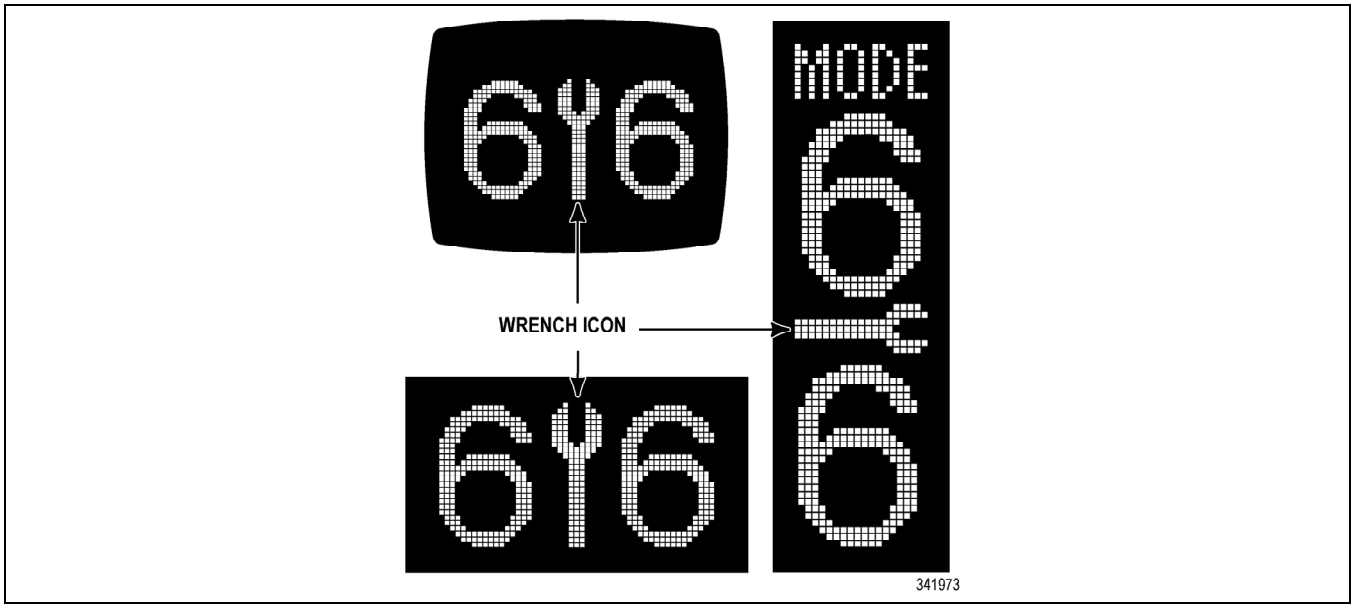

Figure 4–1. Typical Allison 5th Generation Trans Service Indicator

4–3. PROGNOSTICS PREREQUISITES

The following requirements must be met to use the Prognostics features and functions:

- Vehicle harness has a wire for the filter life indicator switch (wire 118).
- The OEM has ordered your calibration from Allison Transmission with Prognostics enabled.

NOTE: It is important to note that if Prognostics is disabled, it is not available at all in the calibration. This is different than the OEM ordering a calibration with Prognostics off. Defaulting Prognostics off means it could be enabled in the future provided the other conditions are met to use Prognostics.

- Use of Allison Transmission High Capacity Main and Lube Filters.
- Use of TES 295 or TES 389 fluid.

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NOTE: Allison Transmission may approve some OEM selectors for Prognostics, provided the **TRANS SERVICE** indicator or message display is integrated by the OEM.

4–4. PROGNOSTICS FEATURES AVAILABILITY

The vehicle manufacturer specifies whether they want Allison Prognostics Feature Package to be made available in the calibration and in what configuration, for example defaulted on or off. The Oil Life Monitor (OM), Filter Life Monitor (FM), and Transmission Health Monitor (TM) are the individual functions included in the Allison Prognostics Feature Package. These individual functions cannot be turned on or off separately within the Allison Prognostics Feature Package.

The transmission calibration can be made for the vehicle manufacturer (or the customer) so the Prognostics Feature is in one of the following states:

- Available and the Prognostics Features are defaulted on and therefore monitoring Oil Life Monitor (OM), Filter Life Monitor (FM), and Transmission Health Monitor (TM) presently.
- Available and the function is defaulted off and therefore available but not monitoring Oil Life Monitor (OM), Filter Life Monitor (FM), and Transmission Health Monitor (TM) presently.
- Disabled and therefore not available within this Transmission Control Module (TCM) calibration.

4–5. TURNING PROGNOSTICS PACKAGE ON OR OFF

Methods to turn the Prognostics Package Features on or off (provided all other requirements are met), include the following:

- Through the shift selector (if allowed by TCM programming).
- Using the Allison DOC®, CMC can be toggled to enabled or disabled for the Allison Prognostics Feature Package provided the OEM ordered a calibration that has the Allison Prognostics Feature Package as a programmable feature.
- Recalibrate the TCM provided wire 118 is in the harness. This can be done at an authorized Allison distributor or dealer.

NOTE: Prognostics should not be turned on after recalibration of the TCM until all other requirements for the fluid filters, selector, and harness are met. If wire 118 is not in the vehicle harness, DTC P0848, Transmission Fluid Pressure Switch 2 Circuit High, will be active.

The OEM initially specifies how they want the calibration configured for operator access regarding reset for Prognostics functions through the selector. The vehicle owner may then have the CMC toggled to either enabled or disabled to allow or disallow the Prognostics Package reset from the shift selector via programming features in Allison DOC®.

WARNING: To help avoid unexpected vehicle movement that might cause death, serious injury, or property damage, always have your foot on the brake, the throttle released, and the engine at idle before making a **N** (Neutral) to **D** (Drive); **N** (Neutral) to **R** (Reverse); **D** (Drive) to **R** (Reverse); or **R** (Reverse) to **D** (Drive) selection.

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The Prognostics feature can be turned on with the Allison DOC® or, if the specific calibration allows it, the operator can do the following:

1. Set the vehicle brakes to prevent movement of the vehicle.
2. With engine off, turn the ignition on (do not start the engine). Wait for initialization to complete (wait for N N to display in the selector).
3. Move the shift selector (for a lever) or press the keypad (for a pushbutton) through the following sequence of range positions, pausing no more than three (3) seconds between consecutive shifts: **N-D-N-R-N-D-N-R-N-D-N-R-N.**
4. Watch for the **TRANS SERVICE** indicator between the SELECT and MONITOR display to illuminate and then turn off. That tells the operator they have successfully enabled the Allison Prognostics Feature Package, consisting of the OM, FM, and TM.

NOTE: If another **TRANS SERVICE** indicator is installed in the dash or incorporated in an OEM message display, it too should also briefly illuminate in similar fashion as the **TRANS SERVICE**.

Disabling the Prognostics feature can be done with Allison DOC® or, if the specific calibration allows it, the operator can do the following:

1. Set the vehicle brakes to prevent movement of the vehicle.
2. With engine off, turn the ignition on (do not start the engine). Wait for initialization to complete (wait for N N to display in the selector).
3. Move the shift selector (for a lever) or press the keypad (for a pushbutton) through the following sequence of range positions, pausing no more than three (3) seconds between consecutive shifts: **N-D-N-R-N-D-N-R-N-D-N-R-N**.
4. Watch for the **TRANS SERVICE** to illuminate and then turn off. That tells the operator they have successfully disabled the Allison Prognostics Feature Package, consisting of the OM, FM, and TM.

NOTE: If another **TRANS SERVICE** indicator is installed in the dash or incorporated in an OEM message display, it too should also briefly illuminate in similar fashion as the **TRANS SERVICE**.

4–6. PROGNOSTICS INDICATION AT ENGINE START

Once Prognostics is monitoring the system, normal operation at engine start is as follows:

1. A system bulb check illuminates the **TRANS SERVICE** indicator located in the shift selector display for approximately 0.5 seconds.
2. If Prognostics features are enabled, the **TRANS SERVICE** indicator illuminates again for 3 seconds after the bulb check.
   - If Prognostics features are disabled, the **TRANS SERVICE** indicator does not illuminate again after the bulb check.

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NOTE: If the shift calibration permits a maximum allowable gear in primary mode that is different than the maximum allowable gear in secondary mode, Prognostics enabling/disabling is only permitted in the shift mode with the highest maximum allowable range. If you have a higher range set of gears in secondary mode than in primary mode to enable Prognostics, push the **MODE** button so MODE appears on the selector display first.

NOTE: The three Prognostics functions, OM, FM, and TM, are enabled or disabled as a package and cannot be enabled or disabled individually.

4–7. SETTING FLUID TYPE

To select transmission fluid type do the following:

- With the engine off and the ignition on, perform the following sequence on the selector, **N-R-N-D-N-R-N-D-N-R-N-D-N**.

The **TRANS SERVICE** flashes if TES 389 is the current setting and illuminates solidly if TES 295 is the current setting. To change the transmission fluid type, wait 5 seconds after entering transmission fluid type mode and perform one of the following sequences to select the proper transmission fluid type:

- **N** (Neutral) **R** (Reverse) **N** (Neutral) to select TES 295 (the **TRANS SERVICE** illuminates solidly showing TES 295 has been selected).
- **N** (Neutral) **D** (Drive) **N** (Neutral) to select TES 389 (the **TRANS SERVICE** begins to flash showing TES 389 has been selected).

The selector exits 30 seconds after entering transmission fluid type mode or the ignition may be turned off to exit earlier. Only one transmission fluid type selection may be made after entering transmission fluid type mode. All other attempts will be ignored. Transmission fluid type mode needs to be entered again if the wrong type of transmission fluid is selected.

4–8. OIL LIFE MONITOR (OM)

Based on the vehicle's duty cycle, this feature determines fluid life and alerts the operator when a fluid change is required.

Oil life is calculated based on hours of engine and transmission operation. Miles are approximated from the hours and calibrated information. The number of shifts per mile (shift density) determines the duty cycle of the transmission and the oil life limits are based on the observed duty cycle. Hours are accumulated when the engine is running, including when the vehicle is stationary for Power Takeoff (PTO) operation, or for extended idle time.

NOTE: Oil life is continuously calculated on the following cumulative effects:

- Operating hours
- Output revolutions
- Shift density (shifts per mile)
- Retarder accumulator applies (if equipped)

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Calendar-based fluid change requirements still apply and are not incorporated into Prognostics. Refer to SIL 10-TR-99 or the operator's manual for additional information.

A. Percentage Fluid Life Remaining Display.

With engine off and ignition on, push the **DISPLAY MODE/DIAGNOSTIC** (DMD) button twice on the lever selector to enter OM mode. With engine off and ignition on, push the ↑ (Upshift) and ↓ (Downshift) arrows simultaneously twice on the keypad pushbutton selector to enter OM mode. The remaining oil life is displayed as a percentage between 0 and 100 in the shift selector display window (refer to Figure 4–2).

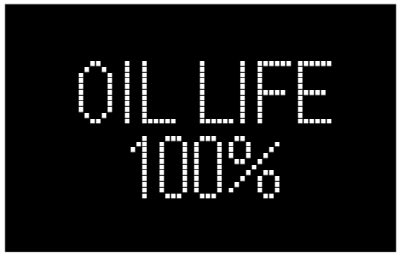

Figure 4–2. Percentage Fluid Life Remaining Display

B. Maintenance Required Notification.

When operating parameters reach or exceed a calibrated value, the TCM illuminates the **TRANS SERVICE** light on the shift selector.

C. OM Reset.

The OM may be reset back to 99% by either of these methods:

- Display the OM information and press and hold the **DISPLAY MODE/DIAGNOSTIC** (DMD) button for 10 seconds.
- With the ignition on and the engine off, shift between **N-D-N-D-N-R-N** to reset the value displayed to 99, pausing no more than 3 seconds between consecutive shifts.

The **TRANS SERVICE** indicator illuminates briefly following a reset to acknowledge the reset was successful.

Reset with Allison DOC®. If the value displayed remains unchanged, then it is possible the reset may be restricted to Allison DOC® only.

D. OM Maintenance History.

NOTE: Fluid must accumulate for at least 50 hours of operation before the OM feature may be reset again.

Allison DOC® may also be used to review reset history and the mileage recorded at the time of reset. Fluid life remaining is displayed from 100% to –100% when viewing records in the service tool. A negative percentage indicates how far past due it is on the oil change. A historical record of the last six resets, including mileage at the time of each reset, may also be viewed using the Allison DOC® Diagnostics Program.

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4–9. FILTER LIFE MONITOR (FM)

Filter deterioration is sensed by a differential pressure switch (PS2) located in the control valve module. The pressure difference between filtered lockup pressure and unfiltered main pressure is compared to a calibrated value. If the TCM determines the filter has deteriorated, the prognostic service indicator icon displays on the shift selector.

A. Filter Life Status Display.

With engine off and ignition on, push the **DISPLAY MODE/DIAGNOSTIC** (DMD) button three times on the lever selector to enter FM mode. With engine off and ignition on, push the ↑ (Upshift) and ↓ (Downshift) arrows simultaneously three times on the keypad pushbutton selector to enter FM mode.

Figure 4–3. Filter Life Display

The message “OIL FILTER OK” or “REPLACE FILTERS” is displayed in the selector display window. An acceptable filter life status is displayed as “OIL FILTER OK”. An unacceptable filter life status is displayed as “REPLACE FILTERS”.

B. Maintenance Required Notification.

The Filter Life Indicator (FLI) pressure switch signals the TCM when fluid exiting the main filter drops below a predetermined pressure. Change both the main and lube filters when the **TRANS SERVICE** indicator in the selector display indicates the main filter should be changed. The differential pressure limit is verified for a period of time to be sure there is no false indication of the need to change filters.

C. Filter Life Monitor (FM) Reset.

The FM automatically resets once the new filters have been installed and the Filter Life Indicator (FLI) pressure switch no longer detects low pressure at the filter.

The FM can also be reset manually by either of these methods:

- Press and hold the **MODE** button for 10 seconds while in FM mode.
- With ignition on, engine off, and brakes applied, shift between **N-R-N-R-N-D-N** pausing less than 3 seconds between each selector movement.

The **TRANS SERVICE** indicator illuminates briefly following a reset to acknowledge the reset was successful. If the value displayed remains unchanged, it is possible the reset may be restricted to Allison DOC® only. The FM still resets automatically even if restricted from manual reset through the selector.

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D. FM Maintenance History.

Allison DOC® Diagnostics Program may be used to display the amount of transmission operation from the initial service indication until the filter reset occurred. Allison DOC® indicates the FM as expired “YES” or “NO”.

E. Filter Life Indicator (FLI) Switch (PS2) Operation.

Filter deterioration is sensed by a PS2 located in the control valve module. Measure the resistance of PS2. If the resistance measures more than 4 Ω closed or less than 20,000 Ω with the switch open then replace the PS2. PS2 is a normally closed (N/C) switch.

4–10. TRANSMISSION HEALTH MONITOR (TM)

Transmission health monitors the running clearance of clutches C1, C2, C3, C4, and C5 to determine clutch plate wear. Clutch running clearance, based upon clutch fill volume, indicates remaining clutch life. The C6 and lockup clutches are not monitored.

A. Clutch System Status Display.

With engine off and ignition on, push the **DISPLAY MODE/DIAGNOSTIC** (DMD) button four times on the lever selector to enter TM mode. With engine off and ignition on, push the ↑ (Upshift) and ↓ (Downshift) arrows simultaneously four times on the keypad pushbutton selector to enter TM mode.

B. Maintenance Required Notification.

An acceptable clutch life status is displayed as TRANS HEALTH OK which means clutch system maintenance is not required at this time. An unacceptable clutch life status is displayed as TRANS HEALTH LO means clutch system maintenance is required (refer to Figure 4–4).

Figure 4–4. TM Display

C. TM Reset.

The TM feature automatically resets when appropriate conditions are detected. TM can only be manually reset using Allison DOC®. When resetting TM with the Allison DOC®, individual clutches or all clutches can be reset. Operator reset through the shift selector is not allowed.

D. TM Maintenance History.

The Allison DOC® may be used to display the amount of transmission operation from the initial service indication until the service reset. The Allison DOC® also displays “OK” or “Not OK” for each clutch.

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4–11. PROGNOSTICS IN ALLISON DOC®

Allison DOC® has been designed to aid the technician in troubleshooting and maintaining Allison transmissions equipped with Allison 5th Generation Controls. Allison DOC® can be used with a desktop PC or with a laptop PC in the cab of the vehicle.

A. Viewing History.

The Prognostics screen shows information stored on the TCM related to oil life, filter life and data for use in prediction transmission health.

1. Select the Prognostics tab —The Prognostics window displays on the PC.

B. Enabling/Disabling Prognostics Package.

Using the Allison DOC®, the Customer Modifiable Constant (CMC) can be toggled to enable or disable the Allison Prognostics Feature Package, provided the OEM ordered a calibration that has the Allison Prognostics Feature Package available as a programmable feature.

C. Reset Prognostics Monitors.

Using the Allison DOC® causes the TCM to reset the Prognostics monitors.

To reset the Oil Life Monitor:

1. Display the Action Request Menu.
2. Click the Reset Prognostics Information menu item.
3. Click the Reset Oil Life Monitor menu item.
4. A dialog box is displayed asking if you are sure you want to reset the OM.
5. Click the **YES** button to reset the OM.

To reset the Filter Life Monitor:

1. Display the Action Request Menu.
2. Click the Reset Prognostics Information menu item.
3. Click the Reset Filter Life Monitor menu item.
4. Click the **YES** button to reset the FM.
5. A confirmation window appears stating the FM was reset successfully. Click the **OK** button.

To reset the Transmission Health Monitor:

1. Display the Action Request Menu.
2. Click the Reset Prognostics Information menu item.
3. Click the Reset Transmission Health Monitor menu item.
4. A dialog box is displayed asking which clutch should be reset.
5. Click the number of the clutch to be reset, or click the **ALL** button to reset all clutches.

NOTE: If the **ALL** button was pressed, a dialog bow displays asking if the transmission was overhauled and if the OM should also be reset.

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6. A confirmation window displays stating that the TM indicator was reset successfully.
7. Click the **OK** button.

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NOTES

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Section 5—DIAGNOSTIC CODES

5–1. OVERVIEW

Diagnostic features are provided with the transmission control system to assist in troubleshooting of malfunctions and/or the monitoring of specific operating parameters. When a control system malfunction is detected, a series of DTCs are used to identify and clarify the nature of the malfunction. Allison DTCs are conveyed through the automotive-style SAE J2012 format. This function allows SAE J1939-based vehicle displays to read and convey DTCs that are in the SAE J2012 format. These DTCs are each named by a 5 character alphanumeric string that refers to a diagnostic algorithm running pass/fail tests to help identify a malfunction in the transmission or vehicle operation. Most DTCs have some kind of diagnostic response that the operator notices, such as an illuminated **CHECK TRANS** light, illuminated **TRANS SERVICE** light (such as the wrench icon in an Allison shift selector) selector display change, lock in range, or inhibit shifts condition.

DTCs are logged in the TCM memory by severity and by their active/inactive status with the most severe and active codes listed first. A maximum of five DTCs (numbered d1-d5) from most recent to oldest may be read from the shift selector. As DTCs are added, the oldest inactive DTC (historic) is dropped from the list. If all DTCs are active, the DTC with the lowest priority is dropped from the list.

An active code is any code that is current in the TCM decision-making process and has failed the DTC test(s) associated with that specific diagnostic algorithm. Historical codes, which are by definition inactive, are codes that are no longer failing their algorithm. These codes are retained in the TCM to help the technician analyze possible causes and provide direction if the vehicle is brought in before they are cleared from the queue.

DTCs can be cleared manually by the operator, or automatically from last (d5) to first (d1) in the queue after a number of warm up cycles, without becoming active again. A warm-up cycle, for 3000/4000 5th generation applications, is defined as key-on and engine running for at least 1 second.

5–2. TYPES OF SYSTEM RESPONSE

The electronic control system is programmed to inform the operator of a problem with the transmission system via the **CHECK TRANS** light, **TRANS SERVICE** (wrench icon), and the shift selector display (blanks SELECT window) while it automatically takes action to protect the operator, vehicle, and transmission. When the TCM flags a DTC as active, the TCM may take a combination of diagnostic responses as listed in the table below. Refer to Table 5–1 for diagnostic response after electrical interruption.

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Table 5–1. Diagnostic Trouble Code (DTC) Response

Category of Response	Actions Taken
Do Not Shift (DNS)	Release Lockup (LU) clutch and inhibit LU operation.
	Inhibit shifts from the current attained range.
	Turn on the **CHECK TRANS** light.
	Display the current attained range in the MONITOR window of the shift selector.
	Blank the SELECT window of the shift selector.
	Disable ability for shift selectors to respond to any range change request from the operator using the shift selector(s).
Solenoids OFF (SOL OFF)	All solenoids are commanded off resulting in hydraulic default operation of the transmission - PCS1 and PCS2 are on hydraulically when off electrically.
Return to Previous Range (RPR)	When speed sensor ratio or PS1 tests do not pass, the TCM commands the same range as commanded before the shift.
Neutral No Clutches (NNC)	When certain speed sensor ratio or PS1 tests do not pass, the TCM commands a neutral condition with no clutches applied.
Do Not Adapt (DNA)	The TCM stops adaptive shift control while the code is active.

5–3. HYDRAULIC OPERATION DURING ELECTRICAL INTERRUPTION

The solenoid regulator valves are controlled by solenoids that control transmission clutch application. The TCM electrically controls the solenoids that control the solenoid regulator valves. Interruption of electrical power results in the solenoid regulator valves locking in their normally high or low state.

The system that enables the transmission to default to totally hydraulic operation has been incorporated to minimize the impact of an electrical interruption. The C1 and C2 latch valves have been designed into the clutch circuits to provide this default feature (Appendix M. HYDRAULIC SCHEMATICS).

When a clutch is applied, clutch feed pressure is routed through the latch valves to the clutch piston. Clutch-apply pressure against the lands of the latch valves hold the latch valves in place or in a normally closed valve allows the fluid to simply flow through the valves. During an electrical interruption, the latch valves cause the transmission to engage specific clutches based on the range in which the transmission was operating when the interruption occurred.

The latch valves (Appendix M. HYDRAULIC SCHEMATICS) are activated by normally low solenoid SS1. When SS1 is energized, control main pressure flows to the top of C1 and C2 latch valves. This pressure forces the valves down to connect the necessary flow passages for clutch engagement. The exception is when C5 clutch is applied. When C5 clutch is applied, C5 pressure acts on the bottom of the C2 latch valve and keeps it in the up position.

During an electrical interruption, the latch valves and two normally high, PCS1 and PCS2, enable the transmission to operate in a “limp mode”, allowing the operator to drive the vehicle to a location where it can be serviced.

On 7-speed models, SS2 latch valve takes the place of C5 on the bottom of the C2 latch valve. When SS2 is on, the valve is kept up by SS2.

The default system enables the transmission to revert to total hydraulic operation and provides safe operation during an electrical interruption by shifting to a specific pre-determined range.

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Table 5–2 lists the operating range and pre-determined default range the transmission shifts to in the event of an electrical interruption.

Table 5–2. Operating Range and Pre-Determined Default Range Table

Initial Operating Range	Hydraulic Default Range* (Power Off; All Solenoids OFF)
Reverse (R)	Neutral (N) (C3 Clutch Applied)
Neutral (N)	Neutral (N) (C3 Clutch Applied)
Low (7-speed only)	3
1	3
2	3 (during shift to 2nd) 4 (following shift)
3	4
4	4
5	4
6	4 (during shift to 6th) 5 (following shift)
* Some transmissions used in oil field service default to Neutral (N) when power is OFF.	

5–4. CHECK TRANS LIGHT

When the TCM detects a serious fault, the **CHECK TRANS** light (usually located on the vehicle instrument panel) illuminates and action is automatically taken to protect operator, vehicle, and the transmission. A DTC will nearly always be registered when the **CHECK TRANS** light is on; however, not all DTC will turn on the **CHECK TRANS** light. Codes related to the **CHECK TRANS** light are detailed in the Diagnostic Trouble Codes and Descriptions Table.

Illumination of the **CHECK TRANS** light indicates that a condition was detected that requires service attention. Operation may or may not be restricted. Depending upon the cause for the **CHECK TRANS** light illumination, the TCM may or may not respond to shift selector requests. The transmission may be locked in a range. That range will be shown on the shift selector display. Both upshifts and downshifts may be restricted when the **CHECK TRANS** light is illuminated.

Each time the engine is started, the **CHECK TRANS** light illuminates briefly and then goes off. This momentary lighting shows the light circuit is working properly.

5–5. USING SELECTOR FOR DIAGNOSTIC TROUBLE CODE (DTC) DISPLAY

DTCs can be displayed on the display portion of the shift selector or Allison DOC®. A DTC is either active or historic. An active DTC is a DTC that is current in the TCM decision-making process. Historic DTCs are retained in the TCM memory and do not necessarily affect the TCM decision-making process.

A. Display Sequence.

Up to five DTCs may be displayed one at a time from the selector once the diagnostic display mode has been initiated by the operator. Each DTC is 5 characters in length. The DTC status active or inactive is shown below the DTC (refer to Figure 5–1).

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Figure 5–1. DTC Display

The operator presses the **MODE** button to read the next DTC in the queue (if any) or requests to exit diagnostics mode. The diagnostics mode times out and returns the selector to normal operating mode after approximately 10 minutes of operator inactivity.

The first character identifies the area of the function of the device which malfunctioned.

- B = Body
- C = Chassis
- P = Powertrain
- U = Network or Datalink

The second character identifies whether the DTC is controlled by the manufacturer or by SAE/ISO.

- 0 or 2 = SAE/ISO controlled
- 1 = Manufacturer controlled
- 3 = Either SAE/ISO or Manufacturer controlled

The third position is a hexadecimal value identifying the area of the vehicle system.

- 0 = Fuel and Air Metering and Auxiliary Emission Controls
- 1 = Fuel and Air Metering and Auxiliary Emission Controls
- 2 = Fuel and Air Metering and Auxiliary Emission Controls
- 3 = Ignition System or Misfire
- 4 = Auxiliary Emission Controls
- 5 = Vehicle Speed, Idle Control and Auxiliary Inputs
- 6 = Computer and Auxiliary Outputs
- 7 = Transmission
- 8 = Transmission
- 9 = Transmission
- A = Hybrid

The final two digits identify a specific fault.

B. Read/Clear DTC with Keypad Pushbutton Selector.

NOTE: The strip shift selector has no display or diagnostic capabilities. Use the Allison DOC® to display DTCs.

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Reading DTCs with Prognostics Package On

To read DTCs with prognostics on using the keypad pushbutton shift selector:

- Simultaneously press the ↑ (Upshift) and ↓ (Downshift) arrows five times to enter diagnostic mode.
- Press the **MODE** button to read the next code in the queue, if any.

NOTE: For 3700SPS and 4700/4800 transmissions equipped with a retarder, press the ↑ (Upshift) and ↓ (Downshift) arrows four times, if prognostics is enabled.

Reading DTCs with Prognostics Package Off

To read DTCs with prognostics off using the keypad pushbutton shift selector:

- Simultaneously press the ↑ (Upshift) and ↓ (Downshift) arrows two times to enter diagnostic mode.
- Press the **MODE** button to read the next code in the queue, if any.

NOTE: For 3700SPS and 4700/4800 transmissions equipped with a retarder, press the ↑ (Upshift) and ↓ (Downshift) arrows once, with prognostics off.

Clearing DTCs

While in diagnostic mode, clear all active codes by pressing and holding the **MODE** button for approximately three seconds. Release the **MODE** button. The MODE message should not remain illuminated if the active DTC shown in the display has cleared.

To clear all stored DTCs, press and hold the **MODE** button for ten seconds. The MODE message flashes a second time indicating all codes are cleared from the queue.

NOTE: If an active status is cleared while the transmission is locked in range because of the diagnostic response to an active DTC, the transmission remains in that locked range even after clearing the active indicator. **N** (Neutral) must be manually selected or the ignition must be cycled.

NOTE: Some codes will self-clear once the conditions that caused the active code are not present. These codes are stored as inactive in the DTC queue. Some DTCs require an ignition cycle before they can be cleared from active status.

NOTE: If the condition(s) that caused the active code are still present, the code becomes active again.

Exiting Diagnostic Mode

Exit the diagnostic mode by one of the following methods:

- Momentarily press the ↑ (Upshift) and ↓ (Downshift) arrows once.
- Press any range button, **D** (Drive), **N** (Neutral), **R** (Reverse).

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- After approximately 10 minutes of inactivity at the pushbutton shift selector, the diagnostic mode automatically exits and returns to normal operating mode.

C. Reading DTCs with Prognostics Package On.

To read DTCs with prognostics on using the lever shift selector:

- Press the **DISPLAY MODE/DIAGNOSTIC** (DMD) five times to enter diagnostic mode.
- Press the **MODE** button to read the next code in the queue, if any.

NOTE: For 3700SPS and 4700/4800 transmissions equipped with a retarder, press the **DISPLAY MODE/DIAGNOSTIC** (DMD) button four times.

Reading DTCs with Prognostics Package Off

To read DTCs with prognostics off using the lever shift selector:

- Press the **DISPLAY MODE/DIAGNOSTIC** (DMD) two times to enter diagnostic mode.
- Press the **MODE** button to read the next code in the queue, if any.

NOTE: For 3700SPS and 4700/4800 transmissions equipped with a retarder, press the **DISPLAY MODE/DIAGNOSTIC** (DMD) button once.

Clearing DTCs

While in diagnostic mode, clear all active codes by pressing and holding the **MODE** button for approximately three seconds until the MODE message flashes. Release the **MODE** button. The MODE message should not remain illuminated if the active DTC shown in the display has cleared.

To clear all stored DTCs, press and hold the **MODE** button for ten seconds. The MODE message flashes a second time indicating all codes are cleared from the queue.

NOTE: If an active indicator is cleared while the transmission is locked in range because of the diagnostic response to an active DTC, the transmission remains in that locked range even after clearing the active indicator. **N** (Neutral) must be manually selected or the ignition must be cycled.

NOTE: Some codes will self-clear once the conditions that caused the active code are not present. These codes will be stored as inactive in the DTC queue. Some DTCs require an ignition cycle before they can be cleared from active status.

NOTE: If the condition(s) that caused the active code are still present, the code becomes active again.

Exiting Diagnostic Mode

Exit the diagnostic mode by one of the following methods:

- Momentarily press the **MODE** button once.

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- Move the lever shift selector to any range.
- After approximately 10 minutes of inactivity at the lever shift selector, the diagnostic mode automatically exits and returns to normal operating mode.

5–6. DIAGNOSTICS IN ALLISON DOC®

Diagnostic data can be displayed in different formats. The Allison DOC® displays data differently which selectable buttons or tabs are selected from the screen. The TCM selected during the connect process also determines if a format is available and displayed for that TCM. Tool tips display a succinct description of each screen.

A. Viewing DTCs.

A default screen (refer to Figure 5–2) serves as the “Home” screen where DTCs and general/basic transmission information is displayed. This screen contains DTC information (with links to troubleshooting manuals), TCM Information, basic Transmission Data (customizable), and Shift Inhibits. From this screen the user can clear codes and access Performance Complaints, Failure Records, and DTC Test.

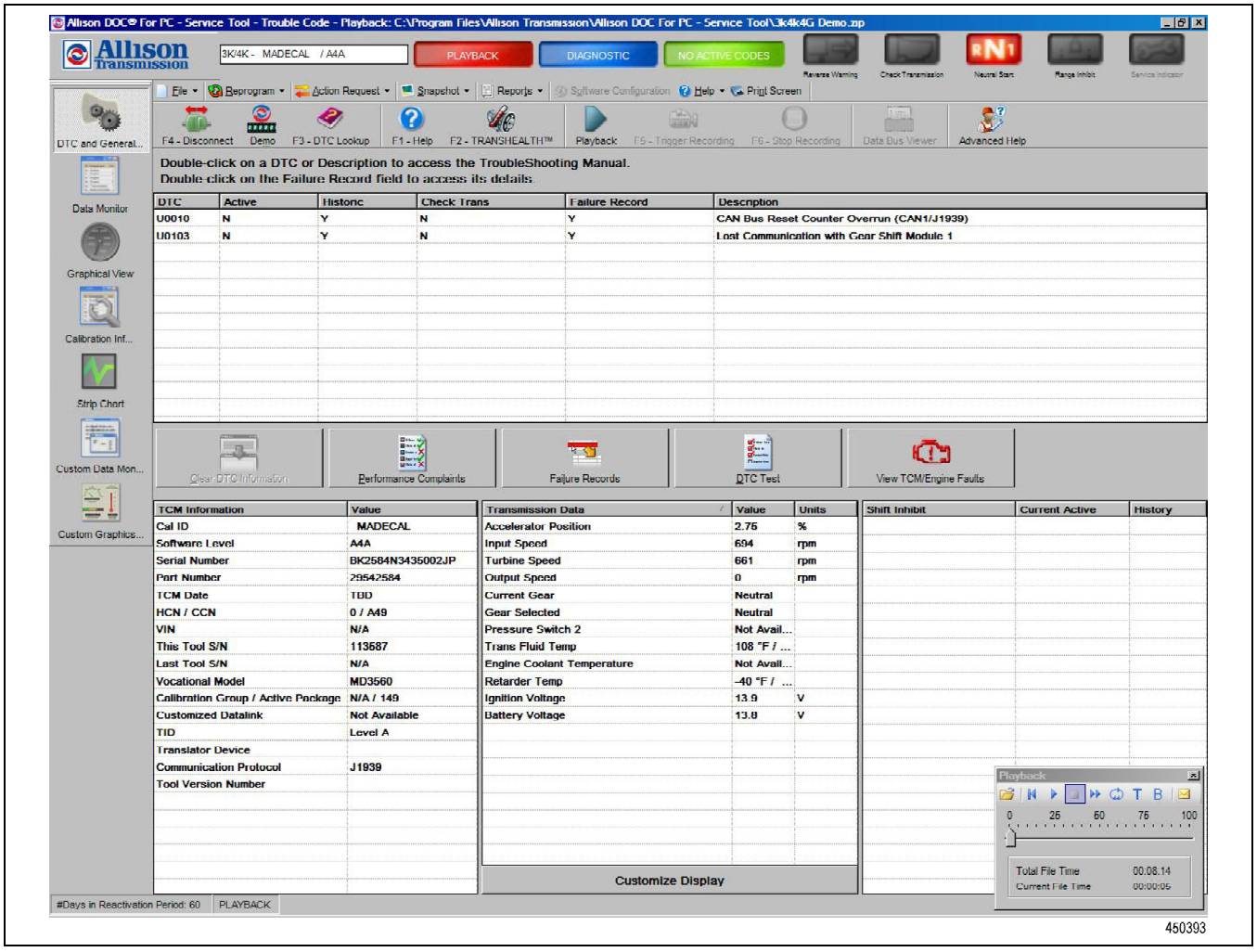

Figure 5–2. Allison DOC® Home Screen

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In the DTC and General Information window of Allison DOC®, double-click the DTC number or DTC description to display troubleshooting steps. Adobe®Acrobat® Reader displays the Troubleshooting Manual page appropriate for the DTC.

B. Clearing DTCs.

1. In the DTC and General Information window, click the **Clear DTC Information** button.
2. A window appears displaying the message, “Clear DTC Information Request Completed Successfully!”
3. Click the **OK** button.

All DTCs and associated information are cleared from the DTC and General Information window. Shift Inhibits are also cleared with this command button. If the cause of the DTC is not corrected, the DTC may immediately reappear.

NOTE: To clear all DTCs, the vehicle must be stopped and in **N** (Neutral). If these conditions are not met, a message will display “Request Denied. Output Speed not less than maximum allowable value.” or “Neutral not attained.”

Allison DOC® displays the data (refer to Table 5–3), showing the DTC information in the DTC and General Information Window Code Position is indicated by row number. Further details on the use of the Allison DOC® are presented in User Guide GN7281EN, available from the Help Menu provided with each tool, and the Universal Allison DOC® Technician's Library.

Table 5–3. DTC Data Overview Display on Home Screen

DTC	Active	Historic	Check Trans	Failure Record	Description
P0880	Y	Y	N	Y	TCM Power Input Signal
P2723	Y	Y	Y	Y	Pressure Control Solenoid 1 Stuck Off
P0727	N	Y	N	Y	Engine Speed Input Circuit No Signal
P0610	N	Y	N	Y	TCM Vehicle Options (TID) Error

DTC and General Information Window

- **Code List Position**—The position which a code occupies in the queue is indicated by the row number the DTC resides in.
- **DTC**— The diagnostic trouble code number referring to the general condition or area of fault detected by the TCM. Double click on the numerical code in the DTC column to link to the specific troubleshooting instructions for the DTC.
- **Active Indicator**— Indicates when a DTC is active. When active, the diagnostic tool displays Y.
- **Historic Indicator—** Indicates when the DTC has met sufficient criteria to be stored in long term memory. Sufficient criteria may mean the DTC occurred over a specific span of time or over multiple test cycles.

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- **Check Trans Indicator—** Indicates when the TCM is requesting the **CHECK TRANS** light as a result of the DTC.
- **Failure Records Indicator**— Indicates when Failure Records are present. Double click on Y in the Failure Records column to display failure record information.
- **Description** —Provides a brief description of the DTC. Double click on the DTC description to link to the specific troubleshooting instructions for the DTC.

5–7. DTC LIST AND DESCRIPTION INDEX

Table 5–4. Diagnostic Trouble Codes and Descriptions

DTC	Description	CHECK TRANS Light	Diagnostic Response	Page
C1312	Retarder Request Sensor Circuit Low	No	Inhibits retarder operation if not using J1939 datalink	5-16
C1313	Retarder Request Sensor Circuit High	No	May inhibit retarder operation if not using J1939 datalink	5-29
P0122	Pedal Position Sensor Circuit Low Voltage	Yes	Use default throttle values. Freezes shift adapts.	5-41
P0123	Pedal Position Sensor Circuit High Voltage	Yes	Use default throttle values. Freezes shift adapts.	5-50
P0218	Transmission Fluid Over Temperature Condition	No	Use default sump temp	5-59
P0562	System Voltage Low	Yes	Inhibit TCC Operation, DNA	5-63
P0600	Internal Serial Peripheral Interface (SPI) Diagnostics	Yes		5-68
P0602	TCM Not Programmed	Yes	Lock in Neutral	5-69
P0603	Internal Control Module Keep Alive Memory Error	Yes	Lock in Neutral	5-71
P0604	Control Module Random Access Memory (RAM)	Yes	Lock in Neutral	5-72
P0607	Control Module Performance	No	Use alternate DSS Data	5-74
P0610	Transmission Control Hardware Incompatible	Yes	No Range Inhibit Use Learned TID Level	5-76
P0614	Torque Control Data Mismatch – ECM/TCM	Yes	Allows operation only in reverse and second range.	5-82
P0634	TCM Internal Temperature Too High	Yes	SOL OFF (hydraulic default)	5-85
P0642	Sensor Reference Voltage “A” Circuit Fault	Yes	Default sensor data used	5-88
P0643	Sensor Reference Voltage “A” Circuit High	Yes	Default sensor data used	5-93
P0657	Actuator Supply Circuit Voltage 1 Open (HSD1)	Yes	SOL OFF, DNA, Inhibit TCC operation, Inhibit main modulation	5-98

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Table 5–4. Diagnostic Trouble Codes and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Diagnostic Response	Page
P0658	Actuator Supply Circuit Voltage 1 Circuit Low (HSD1)	Yes	DNS, SOL OFF (hydraulic default)	5-106
P0659	Actuator Supply Circuit Voltage 1 Circuit High (HSD1)	Yes	DNS, SOL OFF (hydraulic default)	5-112
P0702	Transmission Control Hardware Not Determined	Yes	No Range Inhibit Use Current Key-Cycle TID Level	5-118
P0703	Brake Switch Circuit	No	No Neutral to Drive shifts for refuse packer. TCM inhibits retarder operation if a TPS code is also active.	5-125
P0708	Transmission Range Sensor Circuit High	Yes	Ignore defective strip selector inputs	5-129
P070C	Transmission Fluid Level Sensor Circuit Low	No	None	5-134
P070D	Transmission Fluid Level Sensor Circuit High	No	None	5-145
P0711	Transmission Fluid Temperature Sensor Circuit Performance	Yes	Use default sump temp	5-156
P0712	Transmission Fluid Temperature Sensor Circuit Low	Yes	Use default sump temp	5-163
P0713	Transmission Fluid Temperature Sensor Circuit High	Yes	Use default sump temp	5-168
P0715	Turbine Shaft Speed Sensor Circuit	Yes	DNS, Lock in current range	5-175
P0716	Turbine Shaft Speed Sensor Circuit Performance	Yes	DNS, Lock in current range	5-182
P0717	Turbine Shaft Speed Sensor Circuit No Signal	Yes	DNS, Lock in current range	5-189
P071A	Neutral at Stop Input Failed On	No	Inhibit Neutral at Stop operation	5-196
P071D	General Purpose Input Fault	No	None	5-200
P0720	Output Shaft Speed Sensor Circuit	Yes	DNS, Lock in current range	5-205
P0721	Output Shaft Speed Sensor Circuit Performance	Yes	DNS, Lock in current range	5-210
P0722	Output Shaft Speed Sensor Circuit No Signal	Yes	DNS, Lock in current range	5-215
P0725	Engine Speed Sensor Circuit	No	Default to turbine Speed	5-220
P0726	Engine Speed Sensor Circuit Performance	No	Default to turbine speed	5-225
P0727	Engine Speed Sensor Circuit No Signal	No	Default to turbine speed	5-230
P0729	Incorrect 6th Gear Ratio	Yes	DNS, Attempt 5th, then 3rd	5-235
P0731	Incorrect 1st Gear Ratio	Yes	DNS, Attempt 2nd, then 5th	5-239

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Table 5–4. Diagnostic Trouble Codes and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Diagnostic Response	Page
P0732	Incorrect 2nd Gear Ratio	Yes	DNS, Attempt 3rd, then 5th	5-243
P0733	Incorrect 3rd Gear Ratio	Yes	DNS, Attempt 4th, then 6th	5-247
P0734	Incorrect 4th Gear Ratio	Yes	DNS, Attempt 5th, then 3rd	5-251
P0735	Incorrect 5th Gear Ratio	Yes	DNS, Attempt 6th, then 3rd, then 2nd	5-255
P0736	Incorrect Reverse Ratio	Yes	DNS, Lock in Neutral	5-259
P0741	Torque Converter Clutch (TCC) System Stuck Off	Yes	None	5-263
P0752	Shift Solenoid 1 Valve Performance–Stuck On	Yes	DNS	5-266
P0776	Pressure Control Solenoid (PCS2) Stuck Off	Yes	DNS, RPR	5-268
P0777	Pressure Control Solenoid (PCS2) Stuck On	Yes	DNS, RPR	5-272
P077F	Incorrect Reverse 2 Ratio	Yes	DNS, Lock in Neutral	5-276
P07CE	Neutral At Stop Not Functioning	No		5-280
P0796	Pressure Control Solenoid (PCS3) Stuck Off	Yes	DNS, RPR	5-284
P0797	Pressure Control Solenoid (PCS3) Stuck On	Yes	DNS, RPR	5-288
P0842	Transmission Fluid Pressure Switch 1 Circuit Low	Yes	DNS, Lock in current range	5-292
P0843	Transmission Fluid Pressure Switch 1 Circuit High	Yes	DNS, Lock in current range	5-302
P0847	Transmission Fluid Pressure Switch 2 Circuit Low	Yes	None	5-312
P0848	Transmission Fluid Pressure Switch 2 Circuit High	Yes	None	5-318
P0880	TCM Power Input Signal	No	No	5-323
P0881	TCM Power Input Signal Performance	No	None	5-328
P0882	TCM Power Input Signal Low	Yes	DNS, SOL OFF (hydraulic default)	5-333
P0883	TCM Power Input Signal High	Yes	None	5-338
P088A	Transmission Filter Maintenance Alert	No	None	5-343
P088B	Transmission Filter Maintenance Required	Yes	None	5-347
P0894	Unexpected Mechanical Gear Disengagement	Yes	DNS, Lock in first	5-351
P0897	Transmission Fluid Deteriorated	Yes	None	5-355
P0960	Main Pressure Modulation Solenoid Control Circuit Open	Yes	Full Main Pressure Commanded	5-358

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Table 5–4. Diagnostic Trouble Codes and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Diagnostic Response	Page
P0961	Main Pressure Modulation Solenoid System Performance	No	Full Main Pressure is Commanded	5-363
P0962	Main Pressure Modulation Solenoid Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)	5-367
P0963	Main Pressure Modulation Solenoid Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)	5-372
P0964	Pressure Control Solenoid (PCS2) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)	5-377
P0966	Pressure Control Solenoid (PCS2) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)	5-382
P0967	Pressure Control Solenoid (PCS2) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)	5-387
P0968	Pressure Control Solenoid (PCS3) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)	5-392
P0970	Pressure Control Solenoid (PCS) 3 Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)	5-397
P0971	Pressure Control Solenoid (PCS) 3 Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)	5-402
P0973	Shift Solenoid 1 Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)	5-407
P0974	Shift Solenoid 1 Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)	5-413
P0976	Shift Solenoid 2 Control Circuit Low	Yes	7-speed: Allow 2 through 6, N, R. Inhibit TCC operation	5-418
P0977	Shift Solenoid 2 Control Circuit High	Yes	7-speed: Allow 2 through 6, N, R	5-425
P097A	Shift Solenoid 1 Control Circuit Open	Yes	Lock in range	5-432
P097B	Shift Solenoid 2 Control Circuit Open	Yes	7-speed: Allow 2 through 6, N, R	5-437
P0989	Retarder Pressure Sensor Circuit Low	No	None	5-444
P0990	Retarder Pressure Sensor Circuit High	No	None	5-453
P1739	Incorrect Low Gear Ratio	Yes	Command 2nd and allow shifts 2 through 6, N, R	5-462
P1790	Gear Shift Module 1 Calibration Invalid	Yes	Shift selector language or units incorrect	5-466
P1791	Gear Shift Module 2 Calibrated Invalid	Yes	Shift selector language or units incorrect	5-468
P1891	Throttle Position Sensor PWM Signal Low	No	Use default throttle values	5-470
P1892	Throttle Position Sensor PWM Signal High	No	Use default throttle values	5-475

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Table 5–4. Diagnostic Trouble Codes and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Diagnostic Response	Page
P2184	Engine Coolant Temperature Sensor 2 Circuit Low	No	Use default engine coolant values	5-480
P2185	Engine Coolant Temperature Sensor 2 Circuit High	No	Use default engine coolant values	5-485
P2637	Torque Management Feedback Signal A	Yes	Inhibit SEM	5-491
P2641	Torque Management Feedback Signal B	Yes	Inhibit LRTP	5-494
P2669	Actuator Supply Circuit Voltage 2 Open (HSD2)	Yes	SOL OFF, Inhibit TCC operation, Inhibit main modulation, DNA	5-497
P2670	Actuator Supply Circuit Voltage 2 Low (HSD2)	Yes	DNS, SOL OFF (hydraulic default)	5-505
P2671	Actuator Supply Circuit Voltage 2 High (HSD2)	Yes	DNS, SOL OFF (hydraulic default)	5-511
P2684	Actuator Supply Circuit Voltage 3 Open (HSD3)	Yes	SOL OFF, Inhibit TCC operation, Inhibit main modulation, DNA	5-517
P2685	Actuator Supply Circuit Voltage 3 Low (HSD3)	Yes	DNS, SOL OFF (hydraulic default)	5-528
P2686	Actuator Supply Circuit Voltage 3 High (HSD3)	Yes	DNS, SOL OFF (hydraulic default)	5-538
P2714	Pressure Control Solenoid (PCS) 4 Stuck Off	Yes	DNS, RPR	5-547
P2715	Pressure Control Solenoid (PCS) 4 Stuck On	Yes	DNS, SOL OFF (hydraulic default)	5-552
P2718	Pressure Control Solenoid (PCS) 4 Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)	5-557
P2720	Pressure Control Solenoid (PCS) 4 Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)	5-562
P2721	Pressure Control Solenoid (PCS) 4 Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)	5-567
P2723	Pressure Control Solenoid (PCS) 1 Stuck Off	Yes	DNS, RPR	5-572
P2724	Pressure Control Solenoid (PCS) 1 Stuck On	Yes	DNS, RPR	5-577
P2727	Pressure Control Solenoid (PCS) 1 Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)	5-582
P2729	Pressure Control Solenoid (PCS) 1 Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)	5-587
P2730	Pressure Control Solenoid (PCS) 1 Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)	5-592

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Table 5–4. Diagnostic Trouble Codes and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Diagnostic Response	Page
P2736	Pressure Control Solenoid (PCS) 5 Control Circuit Open	Yes	Inhibit retarder operation	5-597
P2738	Pressure Control Solenoid (PCS) 5 Control Circuit Low	Yes	Allow 2 through 6, N, R. Inhibit retarder and TCC operation	5-603
P2739	Pressure Control Solenoid (PCS) 5 Control Circuit High	Yes	Inhibit retarder operation	5-609
P273F	Retarder Oil Temperature Sensor Over Temperature Condition	No	None	5-615
P2742	Retarder Oil Temperature Sensor Circuit Low	No	Use default retarder temp values	5-619
P2743	Retarder Oil Temperature Sensor Circuit High	No	Use default retarder temp values	5-624
P2761	Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit–Open	Yes	Inhibit TCC operation	5-630
P2763	Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit High	Yes	Inhibit TCC operation	5-635
P2764	Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit Low	Yes	7-speed: allow 2 through 6, N, R. Inhibit TCC operation	5-640
P2789	Transmission Clutch Life Expired (Clutch Adaptive Learning at Limit)	Yes	None	5-645
P2793	Gear Shift Direction Circuit	Yes	Ignores PWM input from shift selector	5-649
P2808	Pressure Control Solenoid (PCS6) Stuck Off	Yes	DNS, RPR	5-654
P2809	Pressure Control Solenoid (PCS6) Stuck On	Yes	DNS, RPR	5-658
P2812	Pressure Control Solenoid (PCS6) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)	5-662
P2814	Pressure Control Solenoid (PCS6) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)	5-667
P2815	Pressure Control Solenoid (PCS6) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)	5-672
U0073	CAN Communication Bus 1 Off	No	Use default values	5-677
U0074	CAN Communication Bus 2 Off	No	Use default values	5-681
U0100	Lost Communications with ECM A	Yes	Use default values	5-685
U0103	Lost Communication With Gear Shift Module 1	Yes	Maintain range selected, observe gear shift direction circuit	5-688

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Table 5–4. Diagnostic Trouble Codes and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Diagnostic Response	Page
U0291	Lost Communication With Gear Shift Module 2	Yes	Maintain range selected, observe gear shift direction circuit	5-695
U0304	Gear Shift Module 1 Incompatible	Yes	None	5-702
U0333	Gear Shift Module 2 Incompatible	Yes	None	5-706
U0400	Invalid Communication Link Data Received (J1939 Brake Switch)	Yes	None	5-710
U0404	Gear Shift Module 1 Invalid Data	Yes	Maintain range selected, observe gear shift direction circuit	5-715
U0592	Gear Shift Module 2 Invalid Data	Yes	Maintain range selected, observe gear shift direction circuit	5-719

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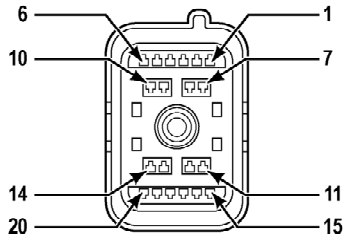
DTC C1312 Retarder Request Sensor Circuit Low

END VIEW OF
20-WAY CONNECTOR
(OEM SIDE)



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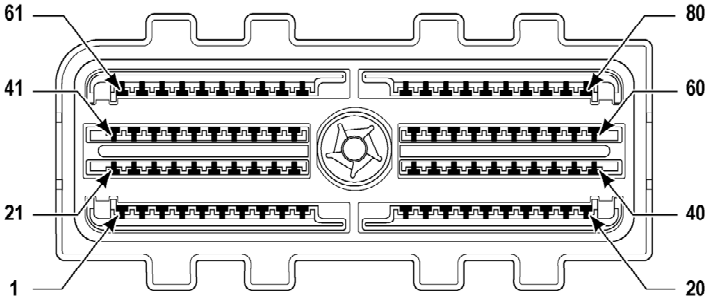
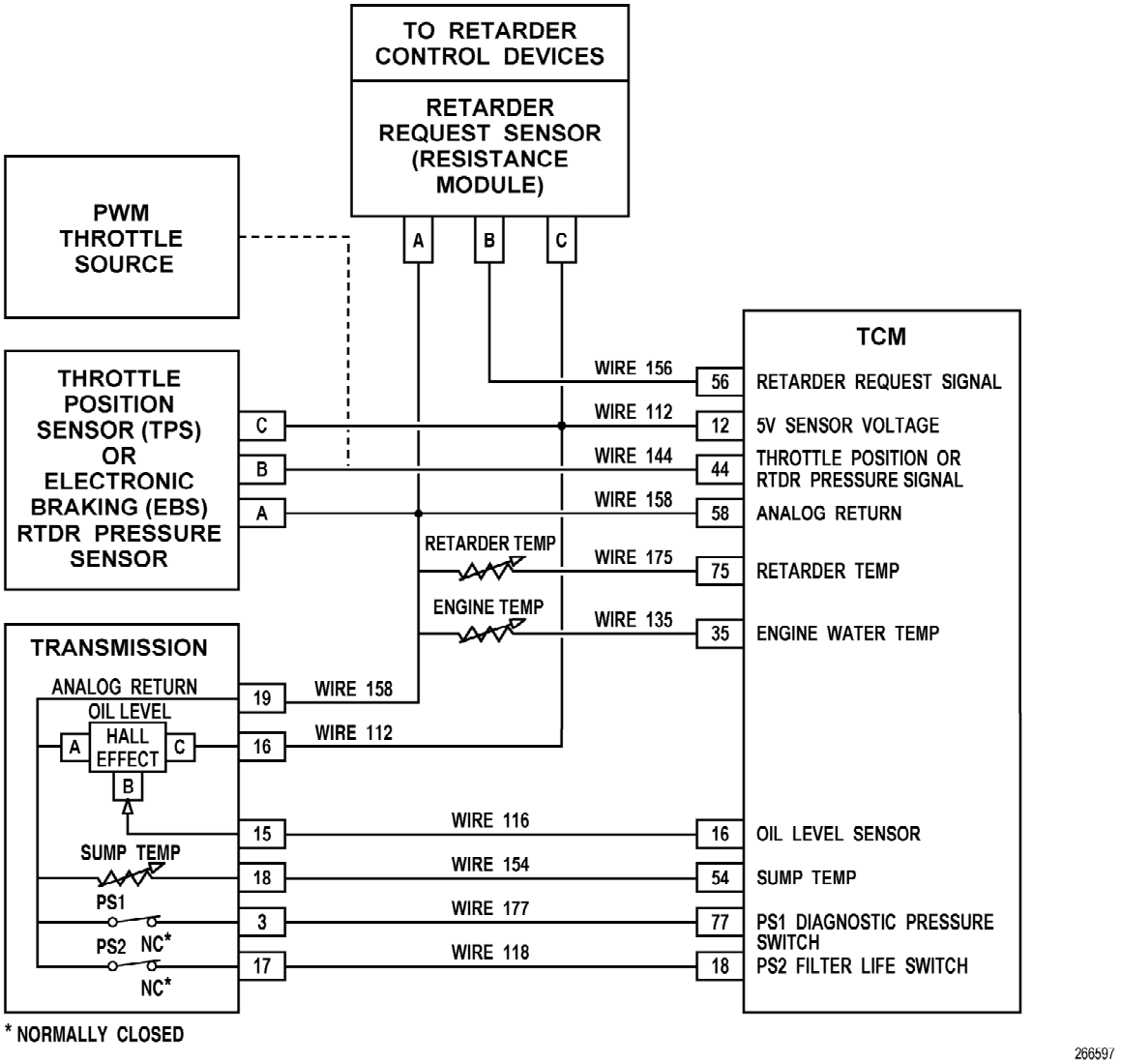
80-WAY CONNECTOR
(OEM SIDE)





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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Circuit Description

The TCM may be calibrated to receive a Retarder Modulation Request (RMR) signal from a retarder request sensor, sometimes called a resistance module or RMR device. If used, the input is monitored by software, which then controls a retarder pressure solenoid.

NOTE: J1939 Retarder Select, Non-Engine (RSNE) and/or TSC1 messages may be used in addition to or instead of an RMR sensor to request the amount of retardation desired.

The TCM is connected to the retarder request sensor by:

- a 5V reference voltage (W112),
- retarder request signal (W156), and
- analog ground (W158).

The sensor produces a retarder request signal in response to inputs from the retarder control device(s). The TCM interprets this signal as a percent retarder request.

Action Taken for Active DTC

When DTC C1312 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The retarder will no longer apply based on input from the RMR sensor.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC C1312 indicates the TCM has detected a voltage signal from the retarder request sensor in the low error zone, and may be caused by the following:

- Open or short to ground in W112 or W156 circuits.

NOTE: Shorts or opens in W112 typically will log other sensor failed low DTCs that are using W112 (5V), such as the Oil Level Sensor (OLS), Electronic Brake System (EBS) pressure sensor, or analog Throttle Position Sensor (TPS). Shorts or opens in W156 (RMR analog signal) only causes DTC C1312.

- Analog retarder request input (i.e. RMR inputs) enabled during TCM programming without RMR module.
- Non-retarder application has autodetected retarder or had the CMC Override Retarder Autodetect set to 'Present'.
- Missing RMR module.
- Defective sensor sharing 5V supply.
- 5V wire open or grounded in transmission internal harness.

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- TCM issue.

For RMR specifications, refer to Table 5–5.

Review applicable information within Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for retarder.
3. Check for presence of W115 and status of CMC Override Retarder Autodetect.
4. Check if missing RMR module.
5. Check for voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W156, and check for voltage.
8. Check for active code.
9. Check for high resistance or open in W156, W112 or W158 for each RMR module installed.
10. Check for short to another wire or ground.
11. Check for DTC P070C.
12. Check for DTC P0122.
13. Check for DTC P0989.
14. Check for DTC P1891.
15. Check all RMR pressure switches, foot pedals, or hand levers meet specification.
16. If TCM is OK, replace any RMR module that does not meet specification in Table 5–5.

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

17. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has responsibility to ensure TCM calibrations, external RMR and retarder control components are integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC C1312 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 17.*
2	Is there a retarder on the transmission?		*Go to Step 4*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Verify W115 for PCS5 retarder solenoid is not connected to the TCM, unless 3700SPS model. **NOTE:** For 3700SPS models, PCS5 solenoid is assigned to the T-case differential lock. 3. Start engine. 4. Using Allison DOC®, reprogram the CMC Override Retarder Autodetect to 'Not Present" and then turn ignition **OFF**. 5. Restart engine and check for active DTC C1312. Is DTC C1312 active?		*Go to Step 16*	*Go to Step 17*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	Are RMR resistance module(s) and all its OEM specified retarder controls (such as pressure switches, hand lever, etc.) integrated into the vehicle harness as shown on the OEM vehicle schematics?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 17 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s). 8. Disconnect OEM chassis harness connector for transmission TPS assembly, if equipped. 9. Disconnect OEM chassis harness connector for transmission EBS pressure sensor, if equipped. 10. Connect 16-way bypass on J-47275 TCM Breakout Harness. 11. Install a J-46708 Digital Multimeter to measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 12. Turn ignition **ON** but do not start engine. 13. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules (Retarder Request Sensor(s)) connector(s) disconnected from the OEM chassis harness. 6. Leave OEM chassis harness connector for transmission TPS disconnected, if equipped. 7. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 8. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 17 after repairs are made.*	*Go to Step 16*
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave transmission TPS assembly disconnected from TPS connector on OEM chassis harness, if equipped. 6. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 7. Leave RMR devices disconnected from OEM harness. 8. Install jumper wire from J-39197-A Jumper Wire Kit (or equivalent), between terminals in OEM RMR resistance connector for W112 (5V supply) and W156 (RMR signal). 9. Connect J-46708 Digital Multimeter to terminals 12 and 56 of J-47275-1 Magnetic Overlay. 10. Turn ignition **ON** but do not start engine. 11. Start Data Monitor feature in Allison DOC® and observe "Retarder Request Voltage". **NOTE:** If Allison DOC® is not connected, use voltage shown on J-46708 Digital Multimeter. Is the "Retarder Request Voltage" within the specified value?	4.5-5.4V	*Go to Step 11*	*Address issue with W156. Go to Step 17 after repairs are made.*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Start engine. 2. Check for active DTC C1312. Is DTC C1312 active?		*Go to Step 9*	*Go to Step 17*
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Leave 20-way OEM transmission connector disconnected from transmission. 7. Leave transmission TPS assembly disconnected from OEM TPS connector on chassis harness. 8. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 9. Disconnect all RMR resistance modules from OEM chassis harness. 10. Install a jumper wire between W158 (Pin A-analog return) and W156 (Pin B-RMR signal) at the OEM harness connector for RMR resistance module. 11. Using a J-46708 Digital Multimeter, measure the resistance between terminals 56 and 58 at J-47275-1 Magnetic Overlay. 12. If vehicle is equipped with two RMR resistance module, repeat tasks 1 through 11 of this step for other RMR devices. 13. Install a jumper wire between W112 (Pin C 5V reference) and W156 (Pin B RMR signal) at the OEM harness connector for RMR resistance module. 14. Measure the resistance between terminals 56 and 12 at J-47275-1 Magnetic Overlay. 15. If vehicle is equipped with two RMR resistance module, repeat tasks 1 through 14 of this step for other RMR devices. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 10*	*Address issue with W156, W112, or W158. Go to Step 17 after repairs are made.*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from OEM chassis harness RMR connector and leave transmission RMR resistance module(s) disconnected from chassis harness. 3. Leave TPS assembly disconnected from OEM chassis harness, if equipped. 4. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 5. Leave OEM 20-way transmission connector disconnected from transmission. 6. Disconnect OEM connector from the retarder temp sensor. 7. Disconnect OEM connector from water temp sensor (if installed). 8. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 9. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 10. Leave J-47275 TCM Breakout Harness connected. 11. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminals 56 and 12 to every other labeled terminal shown on J-47275-1 Magnetic Overlay, and also to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 56 and 12 to all other labeled terminals on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 15*	*Address issue with W156 or W112. Go to Step 17 after repairs are made.*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
11	**NOTE:** Skip this step if 3700SPS or 4700/4800 retarder models and go to Step 12. 1. Turn ignition **OFF**. 2. Connect OEM chassis harness transmission 20-way connector to transmission and tighten bolt to 2.0-3.2 N·m (18-28 lb in). 3. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 4. Leave 16-way bypass of J-47275 TCM Breakout Harness connected. 5. Leave transmission TPS assembly disconnected from OEM chassis harness, if equipped. 6. Leave RMR resistance modules (sensor) to OEM chassis harness disconnected from chassis harness. 7. Leave EBS pressure sensor disconnected from OEM harness, if equipped. 8. Start engine. 9. Using Allison DOC®, check for active DTC P070C Transmission Fluid Level Sensor Circuit Low. Is DTC P070C active?		*Go to DTC P070C*	*Go to Step 12*
12	**NOTE:** Skip this step and go to Step 13 if transmission TPS assembly is not installed. 1. Turn Ignition **OFF**. 2. Reconnect the OEM chassis harness connectors to transmission TPS assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Leave EBS pressure sensor disconnected from OEM harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0122 Pedal Position Sensor Circuit Low Voltage. Is DTC P0122 active?		*Go to DTC P0122*	*Go to Step 13*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
13	**NOTE:** Skip this step and go to Step 14 if EBS pressure sensor is not installed in retarder valve body. 1. Turn Ignition **OFF**. 2. Disconnect the OEM chassis harness connectors from transmission TPS assembly, if equipped. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Connect EBS pressure sensor to OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0989 Retarder Pressure Sensor Circuit Low. Is DTC P0989 active?		*Go to DTC P0989*	*Go to Step 14*
14	**NOTE:** Skip this step and go Step 15 if PWM TPS is not installed. 1. Turn Ignition **OFF**. 2. Connect the OEM chassis harness connector to PWM TPS assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Disconnect EBS pressure sensor from OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P1891 Throttle Position Sensor PWM Signal Low. Is DTC P1891 active?		*Go to DTC P1891*	*Go to Step 8*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
15	1. Turn ignition **OFF**. 2. Connect TCM side 80-way connector of J-47275 TCM Breakout Harness to transmission TCM. 3. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 4. Leave OEM 20-way disconnected from transmission. 5. Connect OEM chassis harness RMR connector to a single resistance module. If using two resistance modules in vehicle, disconnect the OEM harness from the other one. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Disconnect a single retarder control, such as a hand lever, foot lever, or pressure switch from the RMR that is connected to the chassis harness. 8. Turn ignition **ON** and start engine. 9. Using Allison DOC®, check for active DTC C1312. 10. Repeat tasks 1 through 9 of this step after each retarder control is disconnected from the connected RMR device. 11. Repeat tasks 1 through 10 of this step after reconnecting the 2nd resistance module, if a 2nd resistance module was disconnected in task 5 of this step. Did DTC C1312 go inactive after a specific retarder control component was disconnected from a resistance module?		*Address issue with defective retarder control component or circuit. Go to Step 17 after repairs are made.*	*Go to Step 16*
16	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness at 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC C1312 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 17 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace any RMR module that does not meet specifications shown in Table 5–5. Go to Step 17 after repairs are made.*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
17	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC C1312 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC C1312 Retarder Request Sensor Circuit Low *(cont'd)*

Table 5–5. Resistance Module Troubleshooting Data Table

	Resistance Test in Resistance Module*		Voltage Signal**		Wiring to Control Device
Description	**Terminals**	**Resistance KΩ ± 5%**	**% Retarder Application**	**Voltage ± 0.2V**	**Device Terminal**
Auto Full On	A to C	12	100	3.6	No connections
Pressure Switch Full On High	A to C	32	 0 100	 1.1 3.6	 A B
3-Step Bendix E-10R™ Pedal	A to C	32	0 32 58 100	1.1 1.9 2.8 3.6	A B C D
6-Step Hand Lever OFF Position 1 Position 2 Position 3 Position 4 Position 5 Position 6	A to C	32	 0 16 28 48 65 84 100	 1.1 1.5 1.9 2.3 2.8 3.2 3.6	 + 1 2 3 4 5 6
Auto ½ ON	A to C	12	50	2.4	No connections
3 Pressure Switches Low Medium High	A to C	32	0 32 68 100	1.1 1.9 2.3 3.6	 A and B A and B A and B
Auto ⅓ ON 2 Pressure Switches Auto Medium High	A to C	21.4	 32 68 100	 1.9 2.8 3.6	 A B A and B
Dedicated Pedal	No Check	Interface not a resistance module	0 100	0.7−1.2 3.4−3.5	A B

* Resistance module must be disconnected from the wiring harness and retarder control devices.
** These voltages may be measured between TCM pins 56 and 58 using J-47275 TCM Breakout Harness.

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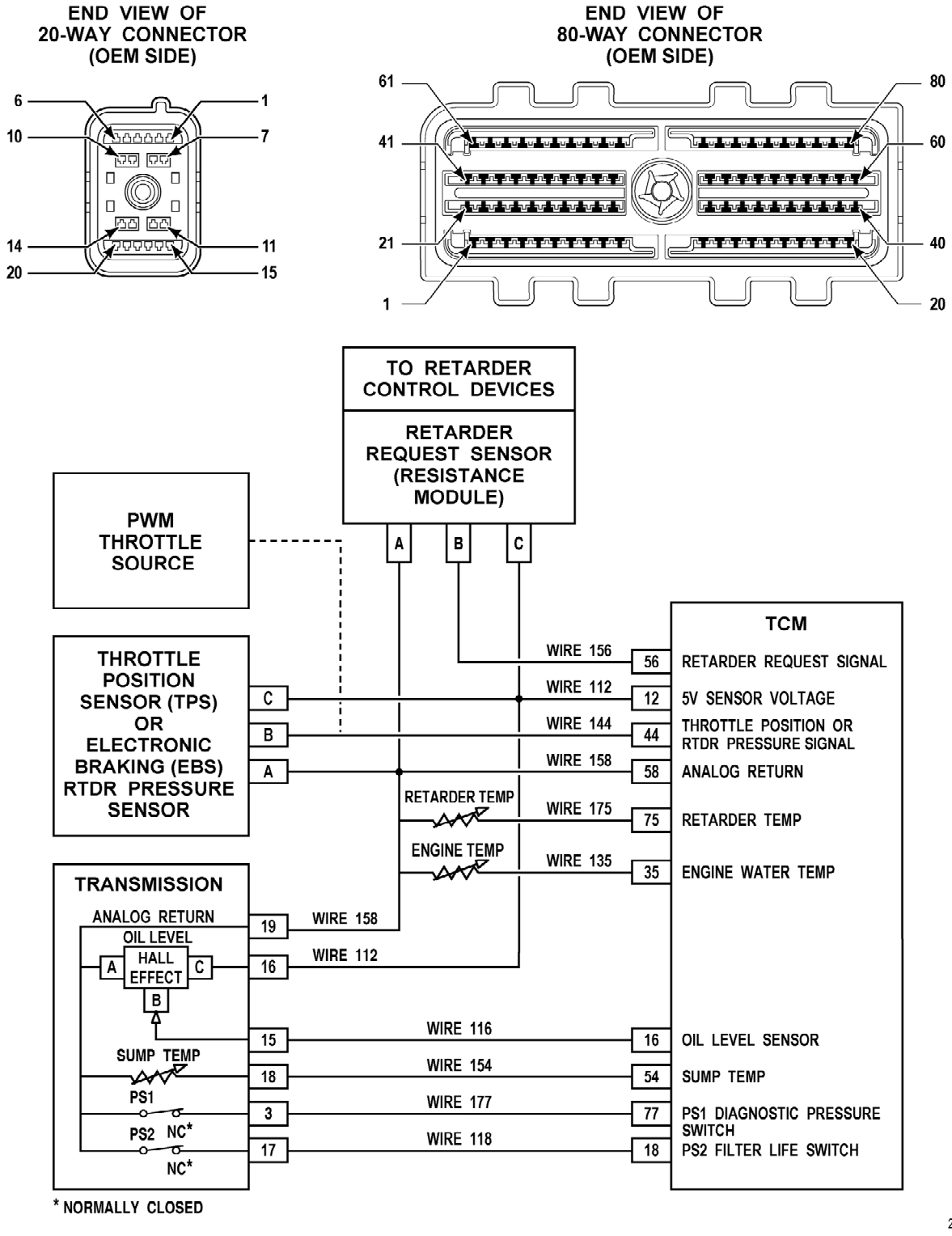
DTC C1313 Retarder Request Sensor Circuit High



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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Circuit Description

The TCM may be calibrated to receive a Retarder Modulation Request (RMR) signal from a retarder request sensor, sometimes called a resistance module or RMR device. If used, the input is monitored by software, which then controls a retarder pressure solenoid.

NOTE: J1939 Retarder Selection, Non-Engine (RSNE) and/or TSC1 messages may be used in addition to or instead of an RMR sensor to request the amount of retardation desired.

The TCM is connected to the retarder request sensor by:

- a 5V reference voltage (W112),
- retarder request signal (W156), and
- analog ground (W158).

The sensor produces a retarder request signal in response to inputs from the retarder control device(s). The TCM interprets this signal as a percent retarder requested.

Action Taken for Active DTC

When DTC C1313 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The retarder will no longer apply based on input from the RMR sensor.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC C1313 indicates the TCM has detected a voltage signal from the retarder request sensor in the high error zone, and may be caused by the following:

- A short to battery in W112 or W156 circuits.

NOTE: Shorts to battery in W112 or opens in W158 typically will log other sensor failed high DTCs that are using W112 (5V) and W158 (GND), such as the OLS, Electronic Brake System (EBS) pressure sensor, or analog TPS. Shorts to battery in W156 (RMR analog signal) only causes DTC C1313.

- Open in W158.
- Non-retarder application has autodetected retarder with a short to battery condition or had the CMC Override Retarder Autodetect set to 'Present' with a short to battery condition.
- Short to battery for RMR module or circuit.
- Defective sensor sharing 5V supply shorted to battery.
- 5V wire shorted to battery in transmission internal harness.

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- TCM issue.

For RMR specifications, refer to Table 5–6.

Review applicable information within Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for retarder.
3. Check for presence of W115 and status of CMC Override Retarder Autodetect.
4. Check if RMR module is shorted to battery or has an open ground.
5. Check for voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W156, and check for voltage.
8. Check for active code.
9. Check for high resistance or open in W112, W156 or W158 for each harness to RMR module installed.
10. Check for short to another wire.
11. Check for DTC P070D.
12. Check for DTC P0123.
13. Check for DTC P0990.
14. Check for DTC P1892.
15. Check all RMR pressure switches, foot pedals, or hand levers meet specification.
16. If TCM is OK, replace any RMR module that does not meet specification in Table 5–6.

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

17. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has responsibility to ensure TCM calibrations, external RMR and retarder control components are integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

Step	Action	Value(s)	Yes	No
1	1. Install Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC C1313 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 17*
2	Is there a retarder on the transmission?		*Go to Step 4*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Verify W115 for PCS5 retarder solenoid is not connected to the TCM, unless 3700SPS model. **NOTE:** For 3700 SPS models, PCS5 solenoid is assigned to the T-case differential lock. 3. Start engine. 4. Using Allison DOC®, reprogram the CMC Override Retarder Autodetect to 'Not Present' and then turn ignition **OFF**. 5. Restart engine and check for active DTC C1313. Is DTC C1313 active?		*Go to Step 16*	*Go to Step 17*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	Are RMR resistance module(s) and all its OEM specified retarder controls (such as pressure switches, hand lever, etc.) integrated into the vehicle harness as shown on the OEM vehicle schematics?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 17 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s). 8. Disconnect OEM chassis harness connector for transmission TPS assembly, if equipped. 9. Disconnect OEM chassis harness connector for transmission EBS pressure sensor, if equipped. 10. Connect 16-way bypass on J-47275 TCM Breakout Harness. 11. Turn ignition **ON** but do not start engine. 12. Install J-46708 Digital Multimeter and measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules (Retarder Request Sensor(s)) connector(s) disconnected from the OEM chassis harness. 6. Leave OEM chassis harness connector for transmission TPS disconnected, if equipped. 7. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 8. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 17 after repairs are made.*	*Go to Step 16*
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave transmission TPS assembly disconnected from TPS connector on OEM chassis harness, if equipped. 6. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 7. Leave RMR devices disconnected from OEM harness. 8. Install jumper wire from J-39197-A Jumper Wire Kit (or equivalent), between terminals in OEM RMR resistance connector for W112 (5V supply) and W156 (RMR signal). 9. Connect J-46708 Digital Multimeter to terminals 12 and 56 of J-47275-1 Magnetic Overlay. 10. Turn ignition **ON** but do not start engine. 11. Start Data Monitor feature in Allison DOC® and observe "Retarder Request Voltage". **NOTE:** If Allison DOC® is not connected, use voltage shown on J-46708 Digital Multimeter. Is the "Retarder Request Voltage" within the specified value?	4.5-5.4V	*Go to Step 11*	*Address issue with W156. Go to Step 17 after repairs are made.*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Start engine. 2. Check for active DTC C1313. Is DTC C1313 active?		*Go to Step 9*	*Go to Step 17*
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 Harness Adapter OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Leave 20-way OEM transmission connector disconnected from transmission. 7. Leave transmission TPS assembly disconnected from OEM TPS connector on chassis harness. 8. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 9. Disconnect all RMR resistance modules from OEM chassis harness. 10. Install a jumper wire between W158 (Pin A-analog return) and W156 (Pin B-RMR signal) at the OEM harness connector for RMR resistance module. 11. Using J-46708 Digital Multimeter, measure the resistance between terminals 56 and 58 at J-47275-1 Magnetic Overlay. 12. If vehicle is equipped with two RMR resistance module, repeat tasks 1 through 11 of this step for other RMR devices. 13. Install a jumper wire between W112 (Pin C 5V reference) and W156 (Pin B RMR signal) at the OEM harness connector for RMR resistance module. 14. Measure the resistance between terminals 56 and 12 at J-47275-1 Magnetic Overlay. 15. If vehicle is equipped with two RMR resistance module, repeat tasks 1 through 14 of this step for other RMR devices. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 10*	*Address issue with W112, W156, or W158. Go to Step 17 after repairs are made.*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from OEM chassis harness RMR connector and leave transmission RMR resistance module(s) disconnected from chassis harness. 3. Leave TPS assembly disconnected from OEM chassis harness, if equipped. 4. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 5. Leave OEM 20-way transmission connector disconnected from transmission. 6. Disconnect OEM connector from the retarder temp sensor. 7. Disconnect OEM connector from water temp sensor (if installed). 8. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 9. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 10. Leave J-47275 TCM Breakout Harness connected. 11. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminals 56 and 12 to every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 56 and 12 to all other labeled terminal on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 15*	*Address issue with W112 or W156. Go to Step 17 after repairs are made.*
11	**NOTE:** Skip this step if 3700SPS or 4700/4800 retarder models and go to Step 12. 1. Turn ignition **OFF**. 2. Connect OEM chassis harness transmission 20-way connector to transmission and tighten bolt to 2.0-3.2 N·m (18-28 lb in). 3. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 4. Leave 16-way bypass of J-47275 TCM Breakout Harness connected. 5. Leave transmission TPS assembly disconnected from OEM chassis harness, if equipped. 6. Leave RMR resistance modules (sensor) to OEM chassis harness disconnected from chassis harness. 7. Leave EBS pressure sensor disconnected from OEM harness, if equipped. 8. Start engine. 9. Using Allison DOC®, check for active DTC P070D Transmission Fluid Level Sensor Circuit High. Is DTC P070D active?		*Go to DTC P070D*	*Go to Step 12*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
12	**NOTE:** Skip this step and go to Step 13 if transmission TPS assembly is not installed. 1. Turn Ignition **OFF**. 2. Reconnect the OEM chassis harness connectors to transmission TPS assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Leave EBS pressure sensor disconnected from OEM harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0123 Pedal Position Sensor Circuit High Voltage. Is DTC P0123 active?		*Go to DTC P0123*	*Go to Step 13*
13	**NOTE:** Skip this step and go to Step 14 if EBS pressure sensor is not installed in retarder valve body. 1. Turn Ignition **OFF**. 2. Disconnect the OEM chassis harness connectors from transmission TPS assembly, if equipped. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Connect EBS pressure sensor to OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0990 Retarder Pressure Sensor Circuit High. Is DTC P0990 active?		*Go to DTC P0990*	*Go to Step 14*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
14	**NOTE:** Skip this step and go Step 15 if PWM TPS is not installed. 1. Turn Ignition **OFF**. 2. Connect the OEM chassis harness connector to PWM TPS assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Disconnect EBS pressure sensor from OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P1892 PWM TPS Signal High Input. Is DTC P1892 active?		*Go to DTC P1892*	*Go to Step 8*
15	1. Turn ignition **OFF**. 2. Connect TCM side 80-way connector of J-47275 Harness Adapter to transmission TCM. 3. Leave OEM chassis harness connected to J-47275 Harness Adapter. 4. Leave OEM 20-way disconnected from transmission. 5. Connect OEM chassis harness RMR connector to a single resistance module. If using two resistance modules in vehicle, disconnect the OEM harness from the other one. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Disconnect a single retarder control, such as a hand lever, foot lever, or pressure switch from the RMR that is connected to the chassis harness. 8. Turn ignition **ON** and start engine. 9. Using Allison DOC®, check for active DTC C1313. 10. Repeat tasks 1 through 9 of this step after each retarder control is disconnected from the connected RMR device. 11. Repeat tasks 1 through 10 of this step after reconnecting the 2nd resistance module, if a 2nd resistance module was disconnected in task 5 of this step. Did DTC C1313 go inactive after a specific retarder control component was disconnected from a resistance module?		*Address issue with defective retarder control component or circuit. Go to Step 17 after repairs are made.*	*Go to Step 16*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
16	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness at 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC C1313 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 17 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace any RMR module that does not meet specifications shown in Table 5–6. Go to Step 17 after repairs are made.*
17	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC C1313 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC C1313 Retarder Request Sensor Circuit High *(cont'd)*

Table 5–6. Resistance Module Troubleshooting Data Table

	Resistance Test in Resistance Module*		Voltage Signal**		Wiring to Control Device
Description	**Terminals**	**Resistance KΩ ± 5%**	**% Retarder Application**	**Voltage ± 0.2V**	**Device Terminal**
Auto Full On	A to C	12	100	3.6	No connections
Pressure Switch Full On High	A to C	32	 0 100	 1.1 3.6	 A B
3-Step Bendix E-10R™ Pedal	A to C	32	0 32 58 100	1.1 1.9 2.8 3.6	A B C D
6-Step Hand Lever OFF Position 1 Position 2 Position 3 Position 4 Position 5 Position 6	A to C	32	 0 16 28 48 65 84 100	 1.1 1.5 1.9 2.3 2.8 3.2 3.6	 + 1 2 3 4 5 6
Auto ½ ON	A to C	12	50	2.4	No connections
3 Pressure Switches Low Medium High	A to C	32	0 32 68 100	1.1 1.9 2.3 3.6	 A and B A and B A and B
Auto ⅓ ON 2 Pressure Switches Auto Medium High	A to C	21.4	 32 68 100	 1.9 2.8 3.6	 A B A and B
Dedicated Pedal	No Check	Interface not a resistance module	0 100	0.7−1.2 3.4−3.5	 A B

* Resistance module must be disconnected from the wiring harness and retarder control devices.
** These voltages may be measured between TCM pins 56 and 58 using J-47275 TCM Breakout Harness.

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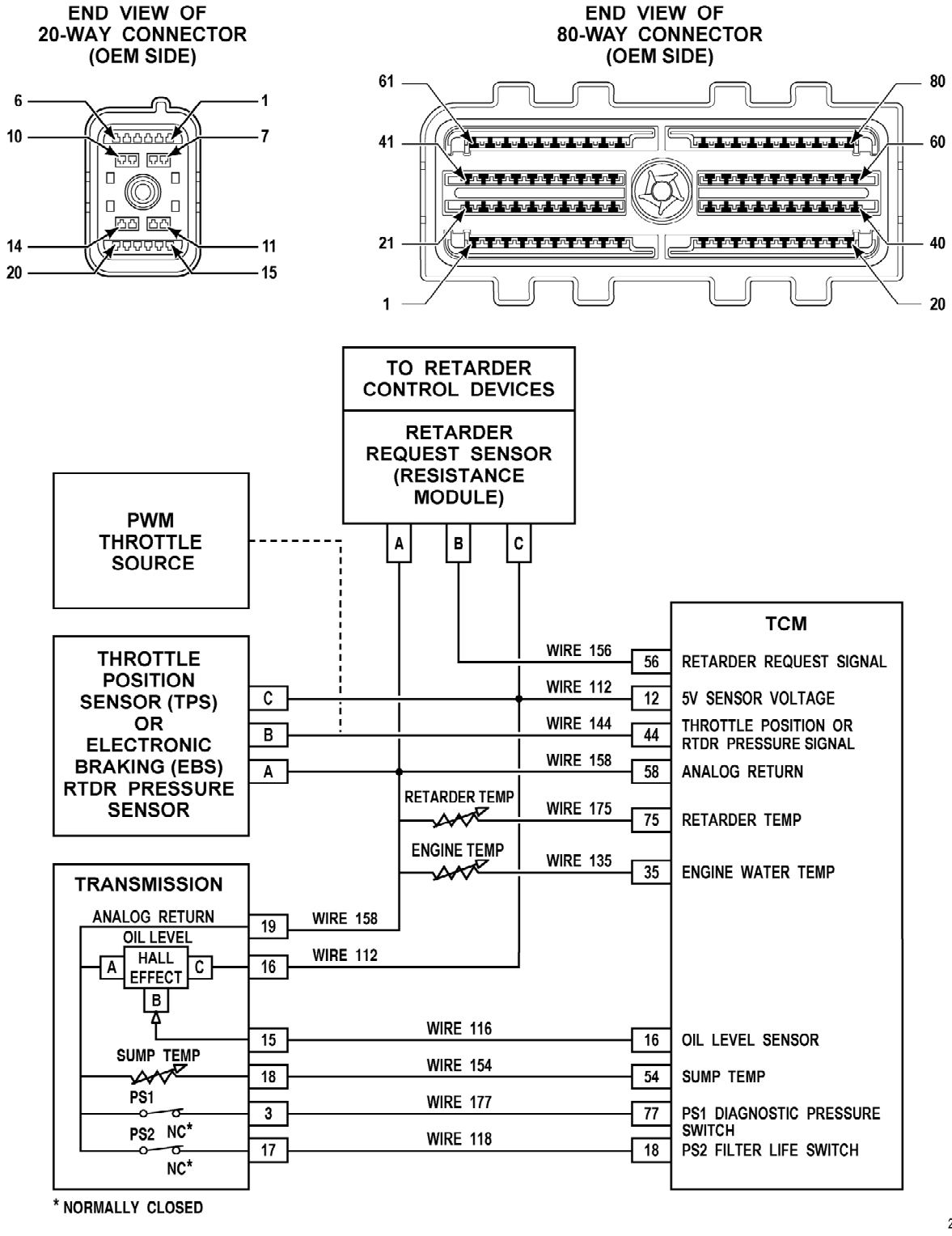
DTC P0122 Pedal Position Sensor Circuit Low Voltage



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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

Circuit Description

The TCM may be calibrated to receive an analog Throttle Position Sensor (TPS) pedal position signal from a TPS. Throttle position information comes from a resistive sensor. The resistive throttle sensor is attached to throttle linkage. This device produces a voltage proportional to throttle position.

NOTE: Refer to 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT for the TPS adjustment procedure and signal voltage specifications.

NOTE: The transmission TPS is not the same accelerator pedal sensor that the driver actuates to accelerate the vehicle. The transmission TPS is not used to fuel, accelerate, or decelerate the engine or vehicle. The transmission TPS is only wired to the transmission TCM and is only used for shift scheduling purposes based on the TPS signal amount (shown as TPS voltage in Data Monitor).

The TCM is connected to the TPS by:

- A 5V reference voltage (W112),
- TPS signal (W144), and
- Analog ground (W158).

The TCM provides a 5V reference voltage to the TPS. The varying voltage at W144 is interpreted as pedal position and the driver's demand for engine torque and vehicle speed. The TCM uses this TPS information for transmission shift scheduling and modulation.

Action Taken for Active DTC

When DTC P0122 is active, the following conditions occur:

- **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Default value used for % throttle based on engine torque and engine speed.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0122 indicates the TCM has detected a voltage signal from the TPS in the low error zone, and may be caused by the following:

- Open or short to ground in W112 or W144 circuits.

NOTE: Shorts or opens in W112 typically will log other sensor failed low DTCs that are using W112 (5V), such as the Oil Level Sensor (OLS), or Retarder Modulation Request (RMR) Sensor. Shorts or opens in W144 (TPS signal) only causes DTC P0122.

- Analog TPS source set in calibration in non-analog TPS applications.

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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

- Analog TPS source set by CMC Override Throttle Source using Allison DOC® in non-analog TPS application.
- Missing, defective, or unplugged TPS.
- Defective sensor sharing 5V supply.
- 5V wire open or grounded in transmission internal harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- TCM issue.
- TPS not adjusted. Refer to 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for TPS assembly.
3. Select correct throttle source for non-analog TPS application.
4. Check for missing or unplugged TPS assembly.
5. Check for voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W144, and check for voltage.
8. Check for active code.
9. Check for high resistance or open in W112, W144, or W158 in TPS wiring.
10. Check for short to another wire or ground.
11. Check for DTC P070C.
12. Check for DTC C1312.

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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

13. Check if TCM is OK. If TCM is OK, replace or adjust the TPS assembly that does not meet specification in 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT.
14. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has the responsibility to ensure that the TCM calibrations and TPS assembly are adjusted and integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0122 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 14.*
2	Is an analog transmission TPS source expected to be on vehicle?		*Go to Step 4*	*Go to Step 3*
3	1. Start engine. 2. Using Allison DOC®, reprogram the CMC Override Throttle Source to correct throttle source for vehicle (SAE J1939, PWM), and then turn ignition **OFF**. 3. Restart engine and check for DTC P0122. Is DTC P0122 active?		*Go to Step 13*	*Go to Step 14*
4	Is the analog TPS assembly connected, adjusted, and integrated into the vehicle harness?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 14 after repairs are made.*

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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s), if equipped. 8. Disconnect OEM chassis harness connector for transmission TPS. 9. Connect 16-way bypass on J-47275 TCM Breakout Harness. 10. Install J-46708 Digital Multimeter to measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 11. Turn ignition **ON** but do not start engine. 12. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules (Retarder Request Sensor(s)) connector(s) disconnected from the OEM chassis harness, if equipped. 6. Leave OEM chassis harness connector for transmission TPS disconnected. 7. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 8. Turn ignition **ON** but do not start engine. 9. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 14 after repairs are made.*	*Go to Step 13*

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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave transmission TPS assembly disconnected from TPS connector on OEM chassis harness. 6. Leave RMR devices disconnected from OEM harness, if equipped. 7. Install jumper wire from J-39197-A (Jumper Wire Kit or equivalent), between Pin C in OEM TPS connector for W112 (5V supply) and Pin B for W144 (TPS signal). 8. Connect J-46708 Digital Multimeter to terminals 12 and 44 of J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Start Data Monitor feature in Allison DOC® and observe "TPS Voltage". **NOTE:** If Allison DOC® is not connected, use voltage shown on J-46708 Digital Multimeter. Is the "TPS Voltage" within the specified value?	4.5-5.4V	*Go to Step 11*	*Address issue with W144. Go to Step 14 after repairs are made.*
8	1. Start engine. 2. Check for active DTC P0122. Is DTC P0122 active?		*Go to Step 9*	*Go to Step 14*

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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Leave 20-way OEM transmission connector disconnected from transmission. 7. Leave transmission TPS assembly disconnected from OEM TPS connector on chassis harness. 8. Disconnect all RMR resistance modules from OEM chassis harness, if equipped. 9. Install a jumper wire between W158 (Pin A-analog return) and W144 (Pin B-TPS signal) at the OEM harness connector for TPS assembly. 10. Using a J-46708 Digital Multimeter, measure the resistance between terminals 44 and 58 at J-47275-1 Magnetic Overlay. 11. Install a jumper wire between W112 (Pin C 5V reference return) and W144 (Pin B TPS signal) at the OEM harness connector for TPS assembly. 12. Measure the resistance between terminals 44 and 12 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 10*	*Address issue with W112, W144, or W158. Go to Step 14 after repairs are made.*

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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from TPS connector and leave TPS assembly disconnected from chassis harness. 3. Leave RMR modules disconnected from OEM chassis harness, if equipped. 4. Leave OEM 20-way transmission connector disconnected from transmission. 5. Disconnect OEM connector from the retarder temp sensor (if installed). 6. Disconnect OEM connector from water temp sensor (if installed). 7. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 8. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 9. Leave J-47275 TCM Breakout Harness connected. 10. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminals 44 and 12, to all other labeled terminals shown on J-47275-1 Magnetic Overlay and also to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 44 and 12 to all other labeled terminals on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 13*	*Address issue with W112 or W144. Go to Step 14 after repairs are made.*
11	**NOTE:** Skip this step if 3700SPS or 4700/4800 retarder models and go to Step 12. 1. Turn ignition **OFF**. 2. Connect OEM chassis harness transmission 20-way connector to transmission and tighten bolt to 2.0-3.2 N·m (18-28 lb in). 3. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 4. Leave 16-way bypass of J-47275 TCM Breakout Harness connected. 5. Leave transmission TPS assembly disconnected from OEM chassis harness, if equipped. 6. Leave RMR resistance modules (sensor) to OEM chassis harness disconnected from chassis harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P070C Transmission Fluid Level Sensor Circuit-Low Input. Is DTC P070C active?		*Go to DTC P070C*	*Go to Step 12*

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DTC P0122 Pedal Position Sensor Circuit Low Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
12	**NOTE:** Skip this step and go to Step 13 if transmission RMR modules are not installed. 1. Turn ignition **OFF**. 2. Reconnect the RMR module connectors to transmission RMR assembly. 3. Leave TPS connectors disconnected from TPS assembly. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Start engine. 7. Using Allison DOC®, check for active DTC C1312 Retarder Request Sensor Failed Low. Is DTC C1312 active?		*Go to DTC C1312*	*Go to Step 8*
13	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness at 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0122 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 14 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace any TPS assembly that does not meet specifications shown in 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT. Go to Step 14 after repairs are made.*
14	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0122 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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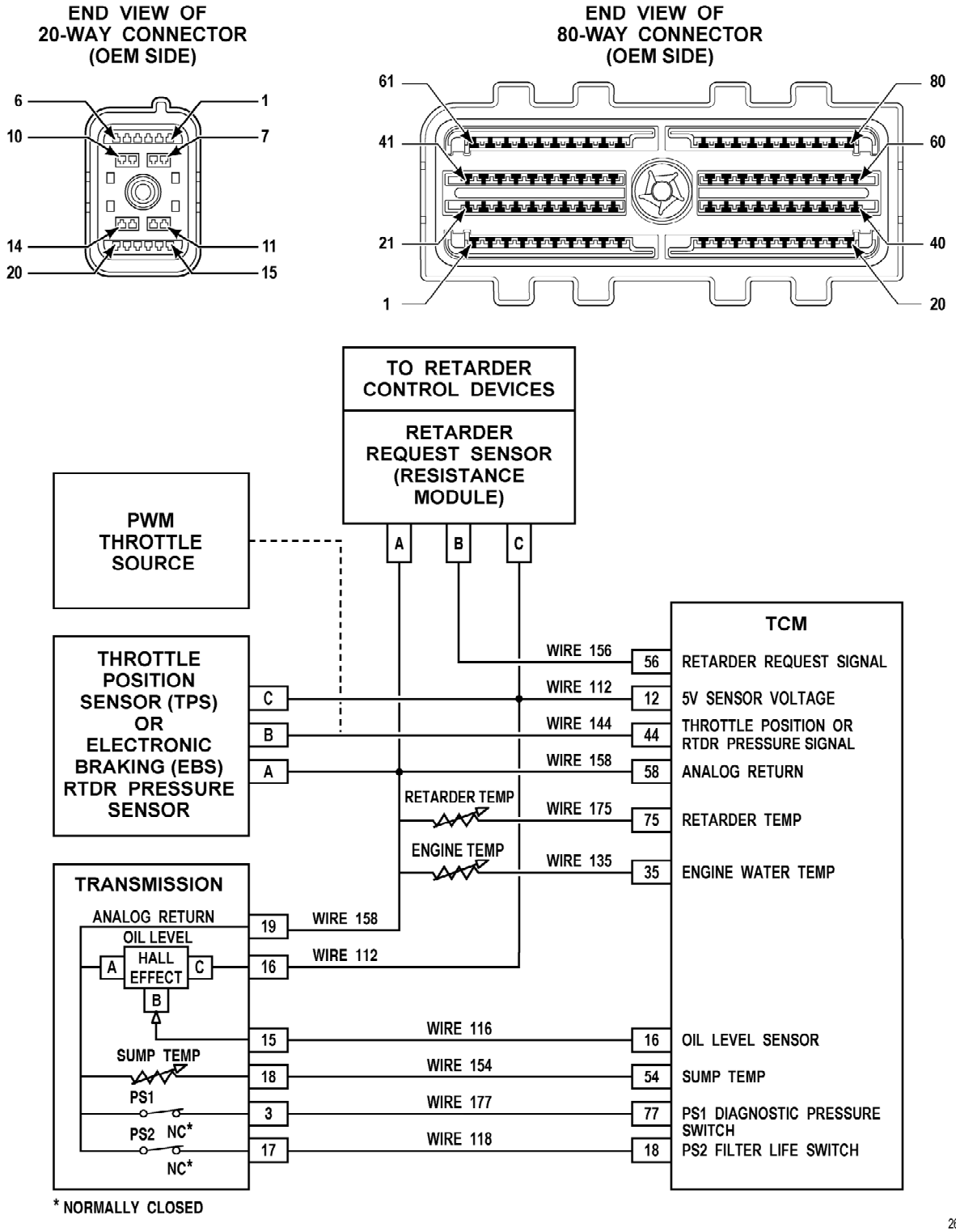
DTC P0123 Pedal Position Sensor Circuit High Voltage



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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

Circuit Description

The TCM may be calibrated to receive an analog Throttle Position Sensor (TPS) pedal position signal from a TPS. Throttle position information comes from a resistive sensor. The resistive throttle sensor is attached to throttle linkage. This device produces a voltage proportional to throttle position.

NOTE: Refer to 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT for the TPS adjustment procedure and signal voltage specifications.

NOTE: The transmission TPS is not the same accelerator pedal sensor that the driver actuates to accelerate the vehicle. The transmission TPS is not used to fuel, accelerate, or decelerate the engine or vehicle. The transmission TPS is only wired to the transmission TCM and is only used for shift scheduling purposes based on the TPS signal amount (shown as TPS voltage in data monitor).

The TCM is connected to the TPS by:

- a 5V reference voltage (W112),
- TPS signal (W144), and
- analog ground (W158).

The TCM provides a 5V reference voltage to the TPS. The varying voltage at W144 is interpreted as pedal position and the driver's demand for engine torque and vehicle speed. The TCM uses this TPS information for transmission shift scheduling and modulation.

Action Taken for Active DTC

When DTC P0123 is active, the following conditions occur:

- **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Default value used for % throttle based on engine torque and engine speed.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0123 indicates the TCM has detected a voltage signal from the TPS in the high error zone, and may be caused by the following:

- A short to battery in W112 or W144 circuits.

NOTE: Shorts to battery in W112 typically will log other sensor failed low DTCs that are using W112 (5V), such as the Oil Level Sensor (OLS), or Retarder Modulation Request (RMR) Sensor. Shorts to battery in W144 (TPS signal) only causes DTC P0123.

- Analog TPS source set in calibration in non-analog TPS applications.

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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

- Analog TPS source set by CMC Override Throttle Source using Allison DOC® in non-analog TPS application.
- Defective sensor sharing 5V supply shorted to battery.
- 5V wire shorted to battery in transmission internal harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- TCM issue.
- TPS not adjusted. Refer to 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for TPS assembly.
3. Select correct throttle source for non-analog TPS application.
4. If TPS assembly circuit is shorted to battery, has high resistance or open in TPS ground circuit, replace defective TPS assembly or address wiring circuit issue. Return vehicle to service.
5. Check for voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W144, and check for voltage.
8. Check for active code.
9. Check for high resistance or open in W112, W144, or W158 in TPS wiring.
10. Check for short to another wire.
11. Check for DTC P070D.
12. Check for DTC C1313.

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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

13. Check if TCM is OK. If TCM is OK, replace or adjust the TPS assembly that does not meet specification in 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT.
14. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has the responsibility to ensure that the TCM calibrations and TPS assembly are adjusted and integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0123 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, Go to Step 14*
2	Is an analog transmission TPS source expected to be on vehicle?		*Go to Step 4*	*Go to Step 3*
3	1. Start engine. 2. Using Allison DOC®, reprogram the CMC Override Throttle Source to correct throttle source for vehicle (SAE J1939, PWM) and then turn ignition **OFF**. 3. Restart engine and check for DTC P0123. Is DTC P0123 active?		*Go to Step 13*	*Go to Step 14*
4	Is the analog TPS assembly connected, adjusted, and integrated into the vehicle harness?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 14 after repairs are made.*

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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s), if equipped. 8. Disconnect OEM chassis harness connector for transmission TPS. 9. Connect 16-way bypass on J-47275 TCM Breakout Harness. 10. Install J-46708 Digital Multimeter to measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 11. Turn ignition **ON** but do not start engine. 12. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules (Retarder Request Sensor(s)) connector(s) disconnected from the OEM chassis harness, if equipped. 6. Leave OEM chassis harness connector for transmission TPS disconnected. 7. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 8. Turn ignition **ON** but do not start engine. 9. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 14 after repairs are made.*	*Go to Step 13*

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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave transmission TPS assembly disconnected from TPS connector on OEM chassis harness. 6. Leave RMR devices disconnected from OEM harness, if equipped. 7. Install jumper wire from J-39197-A (Jumper Wire Kit or equivalent), between Pin C in OEM TPS connector for W112 (5V supply) and Pin B for W144 (TPS signal). 8. Connect J-46708 Digital Multimeter to terminals 12 and 44 of J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Start Data Monitor feature in Allison DOC® and observe "TPS Voltage". **NOTE:** If Allison DOC® is not connected, use voltage shown on J-46708 Digital Multimeter. Is the "TPS Voltage" within the specified value?	4.5-5.4V	*Go to Step 11*	*Address issue with W144. Go to Step 14 after repairs are made.*
8	1. Start engine. 2. Check for active DTC P0123. Is DTC P0123 active?		*Go to Step 9*	*Go to Step 14*

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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Leave 20-way OEM transmission connector disconnected from transmission. 7. Leave transmission TPS assembly disconnected from OEM TPS connector on chassis harness. 8. Disconnect all RMR resistance modules from OEM chassis harness, if equipped. 9. Install a jumper wire between W158 (Pin A-analog return) and W144 (Pin B-TPS signal) at the OEM harness connector for TPS assembly. 10. Using a J-46708 Digital Multimeter, measure the resistance between terminals 44 and 58 at J-47275-1 Magnetic Overlay. 11. Install a jumper wire between W112 (Pin C 5V reference return) and W144 (Pin B TPS signal) at the OEM harness connector for TPS assembly. 12. Measure the resistance between terminals 44 and 12 at J-47275-1 Magnetic Overlay Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 10*	*Address issue with W112, W144, or W158. Go to Step 14 after repairs are made.*

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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from TPS connector and leave TPS assembly disconnected from chassis harness. 3. Leave RMR modules disconnected from OEM chassis harness, if equipped. 4. Leave OEM 20-way transmission connector disconnected from transmission. 5. Disconnect OEM connector from the retarder temp sensor (if installed). 6. Disconnect OEM connector from water temp sensor (if installed). 7. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 8. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 9. Leave J-47275 TCM Breakout Harness connected. 10. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminals 44 and 12 to all other labeled terminals shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 44 and 12 to all other labeled terminals on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 13*	*Address issue with W112 or W144. Go to Step 14 after repairs are made.*
11	**NOTE:** Skip this step if 3700SPS or 4700/4800 retarder models and go to Step 12. 1. Turn ignition **OFF**. 2. Connect OEM chassis harness transmission 20-way connector to transmission and tighten bolt to 2.0-3.2 N·m (18-28 lb in). 3. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 4. Leave 16-way bypass of J-47275 TCM Breakout Harness connected. 5. Leave transmission TPS assembly disconnected from OEM chassis harness, if equipped. 6. Leave RMR resistance modules (sensor) to OEM chassis harness disconnected from chassis harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P070D Transmission Fluid Level Sensor Circuit-High Input. Is DTC P070D active?		*Go to DTC P070D*	*Go to Step 12*

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DTC P0123 Pedal Position Sensor Circuit High Voltage *(cont'd)*

Step	Action	Value(s)	Yes	No
12	**NOTE:** Skip this step and go to Step 13 if transmission RMR modules are not installed. 1. Turn ignition **OFF**. 2. Reconnect the RMR module connectors to transmission RMR assembly. 3. Leave TPS connectors disconnected from TPS assembly. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Start engine. 7. Using Allison DOC®, check for active DTC C1313 Retarder Request Sensor Failed High. Is DTC C1313 active?		*Go to DTC C1313*	*Go to Step 8*
13	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness at 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0123 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 14 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace any TPS assembly that does not meet specifications shown in 6–18. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT. Go to Step 14 after repairs are made.*
14	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0123 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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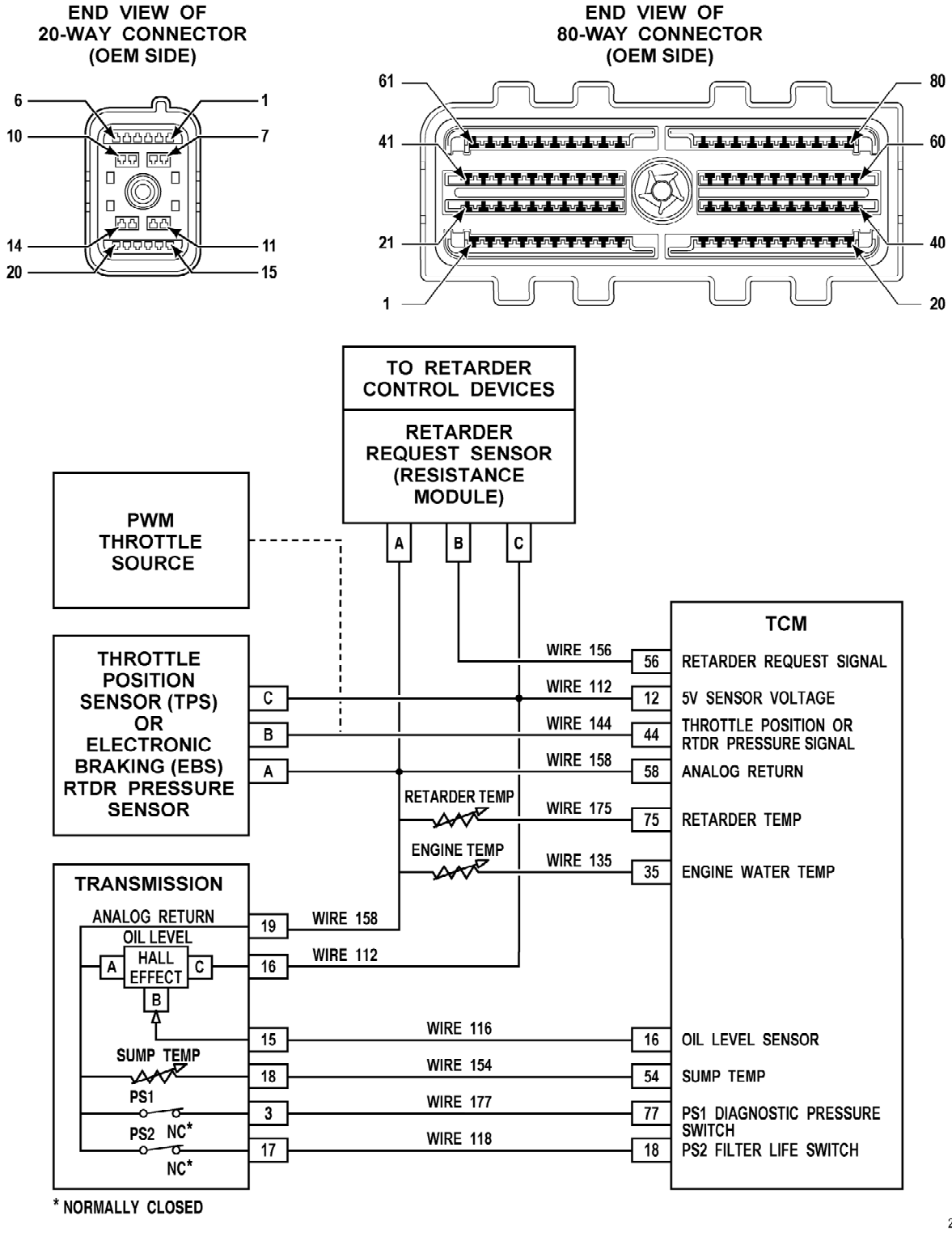
DTC P0218 Transmission Fluid Over Temperature Condition



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DTC P0218 Transmission Fluid Over Temperature Condition *(cont'd)*

Circuit Description

The Transmission Fluid Temperature (TFT) sensor is incorporated into the internal wiring harness and measures the sump temperature. The TFT sensor changes its resistance value based on the temperature of the transmission fluid. This test detects high transmission fluid temperature

Action Taken When the DTC Sets

When DTC P0218 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The TCM freezes shift adapts (DNA).
- TCM defaults to hot mode shift schedule. The hot mode shift schedule limits transmission to no higher than fourth range and TCC (lockup) is inhibited to increase engine speed and improve cooler flow. In addition, if the transmission is above 4th range when an over-temperature occurs, the preselect shift schedule is used for all downshifts until 4th range is reached.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

The DTC goes inactive and the TCM cancels the DTC active actions when the TFT sensor signals that the fluid temperature is below 121°C (250°F) for 10 seconds or more.

Diagnostic Aids

NOTE: DTC may occur in vehicles with history of DTC P0712. Follow the diagnostic steps in DTC P0712 before proceeding to the diagnostic steps for this DTC. Repairing the condition that sets DTC P0712 will likely eliminate DTC P0218.

Using the Allison DOC® for PC–Service Tool, monitor the transmission fluid temperature to verify that it rises in cycles and then stabilizes.

Monitor and record snapshot fluid temperature.

Follow transmission overheat troubleshooting in 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS for problem: OVERHEATING INDICATED BY DTCs P0218, P273F OR FLUID CONDITION, and if equipped with a retarder follow problem RETARDER FEELS WEAK.

TFT sensor resistance is available on the Allison DOC® for PC–Service Tool Data Monitor grid. Prior to 'Connect' for Allison DOC® for PC–Service Tool, check the 'Troubleshoot Specific Problem' box under the "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box. Check if TFT sensor resistance is increasing, decreasing, or stationary with fluctuations in fluid temperature. Normal circuit operation is indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

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DTC P0218 Transmission Fluid Over Temperature Condition *(cont'd)*

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC® for PC–Service Tool

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Is DTC P0712 in history or active?
2. Check if DTC can be duplicated in snapshot if not currently active.
3. Check fluid level.
4. Conduct 30 minute idle in drive test.
5. Check for retarder.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Is there a DTC history active or inactive for P0712?		*Go to DTC P0712*	*Go to Step 2*
2	1. Install the Allison DOC® for PC–Service Tool. 2. Start the engine. 3. Record snapshot using Allison DOC® for PC–Service Tool showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0218 active?		*Go to Step 3*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, Go to Step 6*
3	**NOTE:** Low or high fluid level can cause DTC P0218. 1. With the engine at idle, transmission in **N** (Neutral), and the park brake set, check the transmission fluid level using the Oil Level Sensor (OLS) if equipped or the dipstick. 2. Turn ignition **OFF**. 3. Add or remove fluid as necessary. 4. Start the engine and recheck fluid level. 5. Duplicate conditions from failure record. 6. Check for active DTC P0218. Is DTC P0218 active?		*Go to Step 4*	*Go to Step 6*

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DTC P0218 Transmission Fluid Over Temperature Condition *(cont'd)*

Step	Action	Value(s)	Yes	No
4	**NOTE:** For complete procedures, steps, and specifications to conduct a cooling test, refer to Applications Technical Document, TD157, on the Allison Extranet. Can vehicle idle in drive for 30 minutes at a stop without setting active DTC P0218?		*Go to Step 5*	*See Problem OVERHEATING INDICATED BY DTCs P0218, P273F OR FLUID CONDITION in 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS. After checking for issues, Go to Step 6*
5	Does the transmission have a retarder?		*See Problem RETARDER FEELS WEAK in 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS. After checking for issues, go to Step 6*	*Go to DTC P0712*
6	Verify repair: 1. Clear the DTC. 2. Using Allison DOC® for PC–Service Tool, record snapshot of transmission fluid temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in retarder TFT sensor. Did DTC P0218 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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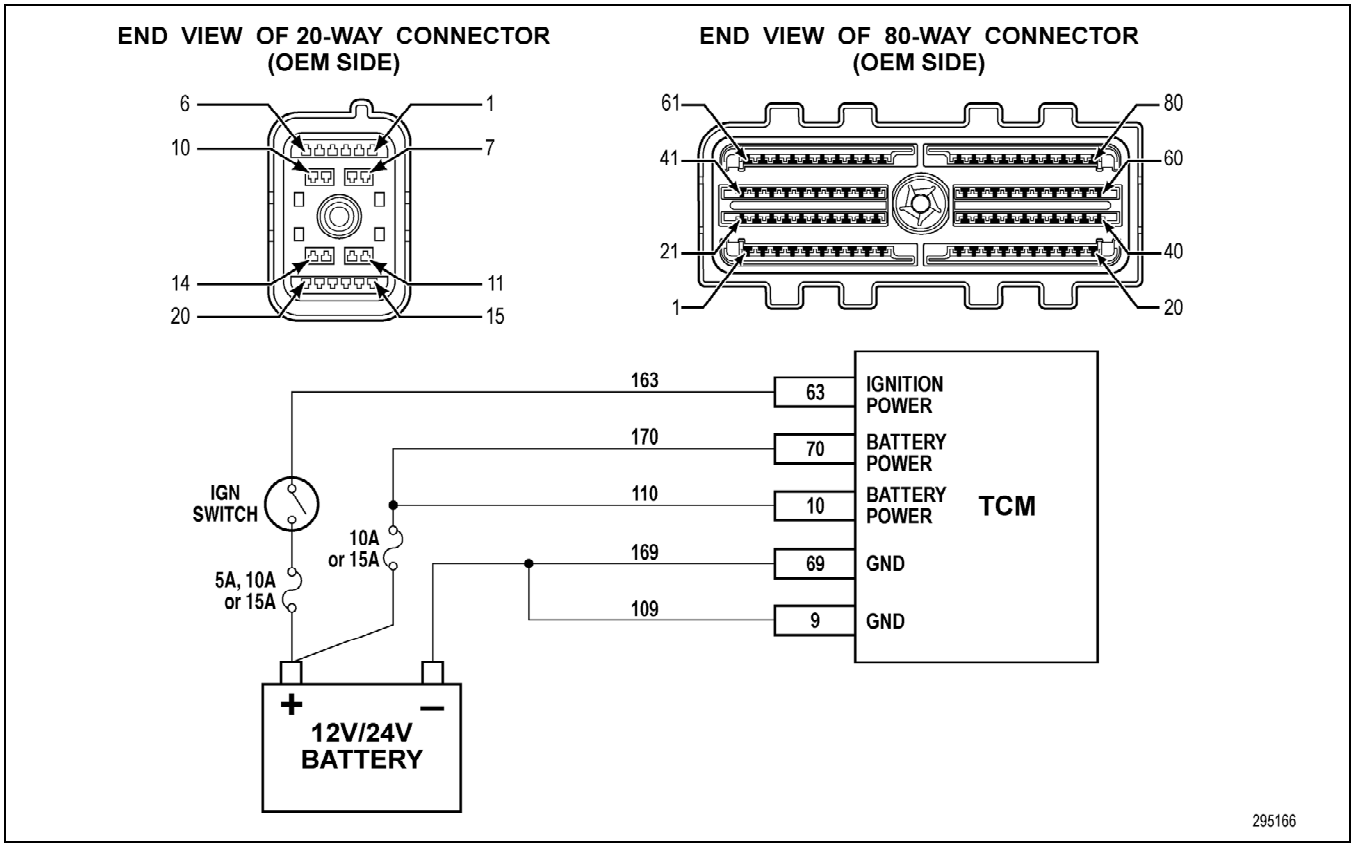
DTC P0562 System Voltage Low



Circuit Description

The TCM requires a switched ignition voltage input to operate. This switched ignition voltage signal originates from the ignition switch or an ignition relay to supply voltage to wire 163 in the 80-way connector at the TCM.

The ignition sense power signal to terminal 63 turns the TCM ON from its power-down state. The TCM reads the calibration data, then commands the transmission and shift selector to **N** (Neutral).

After the ignition switch is turned OFF, the TCM powers-down when both input and output speeds are zero, and the appropriate data has been stored in memory. If the system has a display, the display goes blank after the process is completed. Unswitched battery power must be maintained during the power-down period.

NOTE: The TCM ignition power signal must be provided through a 5A, 10A, or 15A fuse, or a manually-reset circuit breaker.

Action Taken When the DTC Sets

- The TCM illuminates the **CHECK TRANS** light.
- TCM may not re-initialize if ignition is turned OFF.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

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DTC P0562 System Voltage Low *(cont'd)*

Diagnostic Aids

- DTC sets when ignition voltage is detected to be below 5V for a calibrated period of time with engine running.
- A defective vehicle battery may allow this DTC to set. Test all vehicle batteries to OEM specifications for proper voltage and load capacity.
- A defective vehicle charging system may cause this DTC. Test the charging system to all OEM specifications. Low voltage or electrically noisy alternators may prevent clean or ample ignition voltage from reaching TCM pin 63. If alternator performance is preventing clean ignition power on the vehicle, consider implementing the alternate ignition power diagram shown in Allison Tech Data.
- Defective or unsuppressed components in the vehicle ignition system, such as the ignition switch, TCM ignition relay, ignition circuit connector problems, fuse holders, or noisy ignition signals may cause this DTC.
- Ignition input to the TCM must be free of unsuppressed inductive loads, such as solenoids, relays and motors. If the source for ignition power is suspected to have unsuppressed load(s) attached, consider implementing the alternate method for providing ignition voltage to the TCM. Refer to IGNITION POWER (ALTERNATE) diagram in Allison Tech Data. Inductive noise or ignition or relay switch bounce can create noise on ignition W163 and may cause this code. Consider diode suppressing any component such as relays that are causing inductive load noise.
- Ignition voltage is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under the "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.
- The ignition power (W163) must stay powered continually during engine cranking, and during transition from the "crank" position of the start switch to the "ON" or "RUN" position. Once the engine is running, this wire must remain powered at all times in order to achieve proper operation of the relays which control the Neutral Start, Reverse Warning, and other transmission-related vehicle functions. This wire must not be powered in the "accessory" position, as it may cause significant and unnecessary drain on the battery. Ignition power on W163 while in the accessory position may run the batteries down and cause this DTC.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

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DTC P0562 System Voltage Low *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check ignition voltage.
3. Check battery cables.
4. Check W163, W170, W110, W169, W109, W158 for high resistance.
5. Check batteries.
6. Check charging system.
7. Check TCM.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0562 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*
2	1. Check ignition voltage value in Data Monitor from snapshot when DTC was active. Is the ignition voltage below the specified value?	Voltage should be above 5V	*Go to Step 3*	*Go to Step 7*

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DTC P0562 System Voltage Low *(cont'd)*

Step	Action	Value(s)	Yes	No
3	**NOTE:** Loose or corroded connections can result in low ignition voltage or ignition noise that may cause this DTC. 1. Disconnect TCM from chassis harness. 2. Check for poor power and ground connections of all battery cables (power and ground) at the following: battery box, alternator, engine block, starter, starter relay, ignition switch, frame, cab chassis, fuse holders or circuit breakers, master disconnect switches, and any other components that have battery cabling attached such as battery equalizers. 3. Check that resistance of all battery cables meets specification. Do battery cables and connections meet specifications?	Resistance of battery cables must not exceed 0.1 Ω (100 mΩ)	*Go to Step 4*	*Correct condition that is out of specification and go to Step 8*
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Do not connect TCM to TCM side of J-47275 TCM Breakout Harness. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Disconnect W163, W170, W110, W169, W109, and W158 from OEM connections on chassis side. 7. Install a jumper between W158 and W163 at location described in task 6. Measure resistance between terminal 58 and terminal 63 at J-47275-1 Magnetic Overlay. 8. Move jumper from W163 chassis side to another location (e.g., W170 and measure resistance between terminal 58 and terminal 70). Continue moving jumper to W110, W169, and W109 (and moving to terminals 10, 69, 9 on J-47275-1 Magnetic Overlay) to acquire resistance value for each wire pair. Does circuit resistance measure 2 Ω or less after tool resistance is subtracted from J-46708 DMM reading for all wire pairs discussed in task 7 and 8?	2 Ω or less	*Go to Step 5*	*Address issue with high resistance in OEM harness for power or grounds to TCM. Go to Step 8 after repairs are made.*
5	1. Test all vehicle batteries per OEM instructions, including a voltage test and a load test. Do all the batteries meet OEM specifications?	See OEM for correct battery specifications	*Go to Step 6*	*Replace any batteries that do not meet specification and go to Step 8*

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DTC P0562 System Voltage Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Test the vehicle charging system per the OEM recommended testing procedure. Does the charging system meet OEM specifications?	See OEM for correct charging system specifications	*Go to Step 7*	*Repair the charging system and go to Step 8*
7	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0562 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0562 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0600 Internal Serial Peripheral Interface (SPI) Diagnostics

Circuit Description

This DTC is set when the TCM detects an internal communication fault between the microprocessor and the solenoid control integrated circuits internal to the TCM.

Actions Taken When the DTC Sets

When DTC P0600 is active, the following conditions occur:

- The **MALFUNCTION INDICATOR LAMP** illuminates on first occurrence.
- The DTC is stored in the TCM history.
- Transmission operates in hydraulic default: **R** (Reverse), **N** (Neutral), and **3** (Third Range).

Conditions for Clearing the DTC

Replace the TCM.

Test Description

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

1. This step tests for an active DTC.
2. Validate the DTC.
3. Replace the TCM.

Step	Action	Value(s)	Yes	No
1	1. Connect the Allison DOC® software. 2. Start engine. 3. Using the Allison DOC® software, record snapshot showing active or inactive DTC(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0600 active?		*Go to Step 3*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 2*
2	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). **NOTE:** This DTC is intended to detect an internal TCM failure. Did DTC P0600 return?		*Go to Step 3*	*System OK. Clear inactive DTCs and return vehicle to service*
3	1. Turn ignition **OFF**. 2. Install a new TCM and tighten the bolt to 2.0 – 3.2 N·m (18-28 lb in). 3. Install or reconnect OEM components and connectors. 4. Start engine. 5. Using the Allison DOC® software, check for active DTCs. Is DTC P0600 active with the new TCM?		*Begin the diagnosis again. Go to Step 1*	*Repair complete.*

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DTC P0602 TCM Not Programmed

NO SCHEMATIC FOR THIS DTC

Circuit Description

This test verifies VEPS calibration within TCM is valid.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- The TCM inhibits shifts to range.

Conditions for Clearing the DTC

TCM must be recalibrated.

Diagnostic Aids

Indication of invalid VEPS calibration include:

- Not able to connect to TCM with Allison DOC®.
- Cat-eyes in shift selector windows.
- Blank selector windows occurs after pressing any selector button.
- Check that the TCM is getting battery power, battery grounds, and ignition sense signal.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

Tool Requirements:

- Allison DOC®
- Allison TCM Reflash

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for cat-eyes ( ).
2. Check for Allison DOC® communication.
3. Check for **N N**.
4. Check TCM.
5. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS and related Appendices.

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DTC P0602 TCM Not Programmed *(cont'd)*

Step	Action	Value(s)	Yes	No
1	**NOTE:** Do not press selector button prior to checking for cat-eyes ( ). Displays may go blank with button press. After TCM initialization, does range select and range monitor windows show cat-eyes?		*Install the TCM Reflash and recalibrate TCM. Go to Step 2 after recalibration.*	*Go to Step 2*
2	1. Start engine. Does Allison DOC® communicate with the TCM?		*Go to Step 3*	*Check TCM is getting battery power, battery grounds, and ignition sense signal. Check datalink circuits per the Allison DOC® Technician's Library. Also refer to 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS—SHIFT SELECTOR ISSUES. Go to Step 3*
3	After TCM initialization, does range selected and range attained windows show **N N**?		*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 5*	*Go to Step 4*
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector to 2.0-3.2 N·m (18-28 lb in). 3. Start engine. 4. Using Allison DOC®, check for active codes. 5. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 6. Restart engine and check again for active DTCs. Is DTC P0602 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 5 after repairs are made.*	*If DTC active or selector shows cat-eyes with both the test TCM and the original TCM, do not replace TCM. Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
5	Recheck for active DTCs and cat-eyes. Are either DTCs or cat-eyes active?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0603 Internal Control Module Keep Alive Memory Error

NO SCHEMATIC FOR THIS DTC

Circuit Description

The TCM performs an internal memory self-test at power up that tests Flash Memory.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- Hydraulic default (solenoids commanded off). Selector displays message "INIT FAULT".

Conditions for Clearing the DTC

Replace TCM.

Diagnostic Aids

Replace TCM.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active or inactive DTC.

Step	Action	Value(s)	Yes	No
1	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records. Is DTC P0603 shown active or in history in the snapshot?		*Replace TCM. Return vehicle to service.*	*Return vehicle to service.*

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DTC P0604 Control Module Random Access Memory (RAM)

NO SCHEMATIC FOR THIS DTC

Circuit Description

This diagnostic test verifies TCM memory is functional.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history on next key cycle.
- All-segments symbol ( ) illuminates in both shift selector displays.
- The TCM inhibits shifts to range.

Conditions for Clearing the DTC

Replace TCM.

Diagnostic Aids

Replace TCM.

Tool Requirements:

- Allison DOC®
- Allison TCM Reflash

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active or inactive DTC.
2. Check for all-segments () and **CHECK TRANS** light illuminated.
3. Check for cat-eyes ( ) illuminated.

Step	Action	Value(s)	Yes	No
1	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records. Is DTC P0604 shown active or in history in the snapshot?		*Replace TCM. Return vehicle to service.*	*Go to Step 2*

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DTC P0604 Control Module Random Access Memory (RAM) *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF** 2. Turn ignition **ON** 3. Start vehicle if possible. **NOTE:** Both all-segments symbols in the shift selector displays and the **CHECK TRANS** light in the dash will briefly illuminate then go out as a bulb check at each ignition key **ON**; however, neither of these indicators should stay illuminated beyond 6 seconds after starting engine. Does the all-segments or the **CHECK TRANS** light stay illuminated for more than 6 seconds?		*Replace TCM. Return vehicle to service.*	*Go to Step 3*
3	After TCM initialization, does range selected and range attained windows show cat-eye symbols or does TCM snapshot data indicate erroneous DTCs present and/or erroneous prognostics data or prognostics DTCs?		*Replace TCM. Return vehicle to service.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0607 Control Module Performance

NO SCHEMATIC FOR THIS DTC

Circuit Description

The TCM is equipped with an internal inclinometer used for Dynamic Shift Sensing DSS and a variety of other purposes. This diagnostic test reports when the inclinometer is malfunctioning.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in the TCM history.
- DSS estimates are calculated based on other transmission parameters besides inclinometer data.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0607 may be caused by:

- Defective TCM.
- Error in TCM installation angle learning procedure.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Reset Inclinometer Installation Angle Learning using Allison DOC®.
3. Check TCM.
4. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P0607 Control Module Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0607 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 4*
2	1. Using Allison DOC®, Reset Inclinometer Installation Angle Learning. 2. Start engine. 3. Using Allison DOC®, record snapshot showing active or inactive code(s). Is DTC P0607 active?		*Go to Step 3*	*Go to Step 4*
3	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. Torque to specification, as required. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 4 after repair.*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Contact Allison TAC at 1-800-252-5283 or regional service representative.*
4	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Using Allison DOC®. acquire new snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0607 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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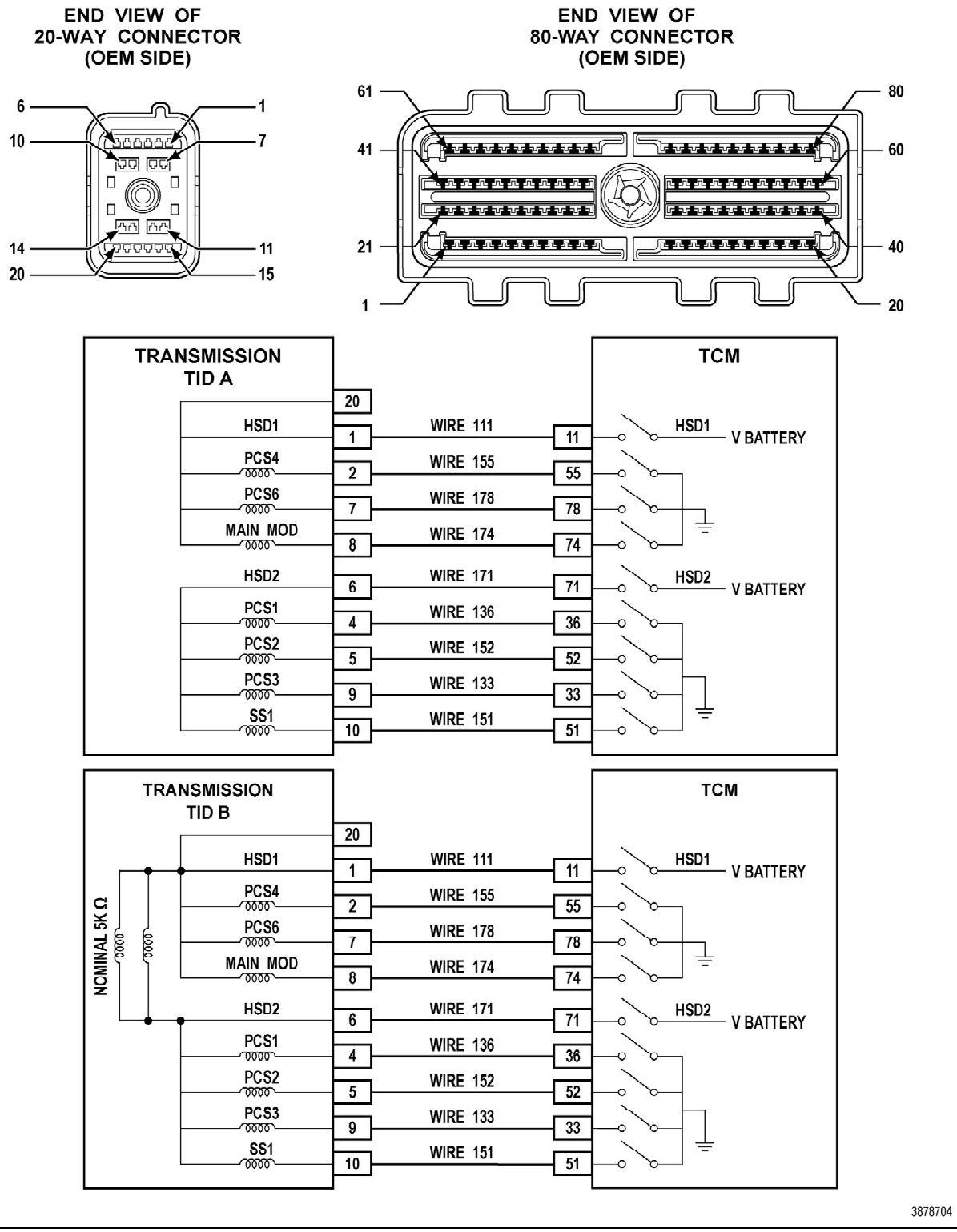
DTC P0610 Transmission Control Hardware Incompatible



Circuit Description

Trans ID (TID) in TID A and TID B transmissions is determined by the electrical relationship between High Side Driver 1 (HSD1) (20-Way Terminal 1) and High Side Driver 2 (HSD2) (20-Way Terminal 6) in the internal

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DTC P0610 Transmission Control Hardware Incompatible *(cont'd)*

wiring harness of the transmission. In TID A models, there is no continuity between these terminals. In TID B models, there is continuity with a nominal resistance value of 5k Ω.

TID A and TID B model transmissions are visibly distinguishable by the TID level displayed on the transmission data tag (nameplate) and by the color of the internal wiring harness standoff. The TID A model 20-Way standoff is black in color; the TID B model 20-Way standoff is tan in color.

Conditions for Running the DTC

Immediately after key-on, this test evaluates resistance between transmission 20-Way terminals 1 and 6 to determine TID level.

Conditions for Setting the DTC

This test compares the current key cycle TID level to the learned Autodetected TID level. If the current and Autodetected TID levels are not equivalent for 5 consecutive key cycles, DTC P0610 becomes active. When the diagnostic is active, the TCM continues to use the learned TID level for transmission control. There is no inhibit of transmission function when the DTC is active.

Action Taken When the DTC Sets

When DTC P0610 is active, the following conditions occur:

- The **CHECK TRANS** light is illuminated.
- DTC is stored in TCM history.
- The TCM uses learned TID level for control of operation.
- There is no inhibit of transmission operation.

Conditions for Clearing the DTC

Use Allison DOC® or the shift selector to clear the DTC from TCM history. The TCM automatically clears the DTC from TCM history if the vehicle completes 40 warm-up cycles without test failure. Be aware that clearing the DTC code does not change learned TID level.

Diagnostic Aids

DTC P0610 may be caused by:

- Broken or defective connector assemblies.
- Unlocked connectors.
- Expanded terminals, poor pin crimps, or unlocked pins.
- Internal wiring harness issues resulting in improper resistance between 20-Way terminals 1 HSD1 and 6 HSD2.
- Defective TCM. Only replace the TCM if the problem is not resolved after performing the following troubleshooting steps. TCM replacement should only occur after performing the A-B-A component search process with the problem following the suspect TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

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DTC P0610 Transmission Control Hardware Incompatible *(cont'd)*

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description (TID A Models)

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check transmission nameplate and 20-Way Standoff color – verify TID A level.
2. Connect with Allison DOC®. Determine if DTC is active or in history.
3. Check Learned TID level and Detected TID level in Data Monitor window.
4. Check resistance of W111/W171 circuit at TCM 80-Way connector terminals 11 and 71.
5. Check resistance of Internal Wiring Harness at transmission 20-Way connector terminals 1 and 6.
6. Remove hydraulic control module assembly to inspect for cause of continuity outside of specification range.
7. Using Action Request: Reset Transmission Identification Learning, execute relearn of TID.
8. Clear DTC from history and execute minimum of 15 key-on/key-off cycles to verify proper Transmission ID Learns and Locks and DTC does not become active.

Step	Action	Value(s)	Yes	No
1	Verify TID displayed on transmission nameplate and color of internal wiring harness 20-Way standoff. Does TID A display on nameplate? Is the 20-Way standoff color black?		*Go to Step 2*	*Go to TID B Troubleshooting Tree*
2	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0610 active?		*Go to Step 3*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 3*
3	Open Data Monitor window. Review Learned TID and “Detected TID fields. Do both Learned TID and Detected TID display "A"?		*Go to Step 8*	*Go to Step 4*

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DTC P0610 Transmission Control Hardware Incompatible *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-Way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-Way harness. 5. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 6. With ignition **OFF** and using J-46708 DMM, measure resistance between terminals 11 and 71 on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from terminal 11 to terminal 71? Does resistance measure 20 kΩ or more from terminal 11 and terminal 71 to ground?	20 kΩ or more	*Go to Step 7*	*Go to Step 5*
5	1. Connect J-47279 Transmission Breakout Harness to J-39700 Breakout Box. 2. Connect J-47279 Transmission Breakout Harness to transmission 20-Way connector. 3. Install J-47279-1 Magnetic Overlay. 4. Check resistance from J-47279-1 Magnetic Overlay terminal 1 to terminal 6. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 1 to terminal 6?	20 kΩ or more	*Troubleshoot Vehicle Wiring Harness. Verify electrical isolation of wires W111 and W171. Repair as needed and go to Step 7*	*Go to Step 6*
6	Remove hydraulic control module and inspect for cause of continuity between 20-Way terminal 1 and terminal 6. Is cause of continuity found?		*Repair or replace internal wiring harness or solenoid valves as needed. Go to Step 7*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
7	1. Using Allison DOC® execute Action Request: Reset Transmission Identification Learning. 2. Disconnect Allison DOC® from the vehicle and execute 15 key-on/key-off cycles minimum. 3. Reconnect with Allison DOC®, and verify TID Detection Complete = Yes, Learned TID = TID A, Detected TID = TID A. Did correct levels display for TID Detection Complete, Learned TID, Detected TID?	TID Detection Complete = Yes, Learned TID = TID A, Detected TID = TID A	*Go to Step 8*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
8	1. Using Allison DOC®, clear DTC from history. 2. Execute 5 key-on/key-off cycles minimum. Did DTC P0610 become active?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*Return vehicle to service*

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DTC P0610 Transmission Control Hardware Incompatible *(cont'd)*

DTC Troubleshooting Step Description (TID B Models)

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check transmission nameplate and 20-Way Standoff color – verify TID B level.
2. Connect with Allison DOC®. Determine if DTC is active or in history.
3. Check Learned TID level and Detected TID level in Data Monitor window.
4. Check resistance of W111/W171 circuit at TCM 80-Way connector terminals 11 and 71.
5. Check resistance of Internal Wiring Harness at transmission 20-Way connector terminals 1 and 6.
6. Remove hydraulic control module assembly to inspect for cause of continuity outside of specification range.
7. Using Action Request: Reset Transmission Identification Learning, execute relearn of TID.
8. Clear DTC from history and execute minimum of 5 key-on/key-off cycles to verify proper Transmission ID Learns and Locks and DTC does not become active.

Step	Action	Value(s)	Yes	No
1	Verify TID displayed on transmission nameplate and color of internal wiring harness 20-Way standoff. Does TID B display on nameplate? Is the 20-Way standoff color tan?		*Go to Step 2*	*Go to TID A Troubleshooting Tree*
2	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0610 active?		*Go to Step 3*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 3*
3	Open Data Monitor window. Review Learned TID and “Detected TID fields. Do both Learned TID and Detected TID display "B"?		*Go to Step 8*	*Go to Step 4*

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DTC P0610 Transmission Control Hardware Incompatible *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-Way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-Way harness. 5. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 6. With ignition **OFF** and using J-46708 DMM, measure resistance between terminals 11 and 71 on J-47275-1 Magnetic Overlay. Does resistance measure 4.95-5.05k Ω from terminal 11 to terminal 71? Does resistance measure 20k Ω or more from terminal 11 and terminal 71 to ground?	4.95-5.05k Ω	*Go to Step 7*	*Go to Step 5*
5	1. Connect J-47279 Transmission Breakout Harness to J-39700 Breakout Box. 2. Connect J-47279 Transmission Breakout Harness to transmission 20-Way connector. 3. Install J-47279-1 Magnetic Overlay. 4. Check resistance from J-47279-1 Magnetic Overlay terminal 1 to terminal 6. Does resistance measure 4.95-5.05k Ω or more from J-47279-1 Magnetic Overlay terminal 1 to terminal 6?	4.95-5.05k Ω	*Troubleshoot Vehicle Wiring Harness. Verify electrical isolation of wires W111 and W171. Repair as-needed and go to Step 7*	*Go to Step 6*
6	Remove hydraulic control module and inspect for cause of improper resistance between 20-Way terminal 1 and terminal 6. Is cause of improper resistance found?		*Repair or replace internal wiring harness or solenoid valves as needed. Go to Step 7*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
7	1. Using Allison DOC® execute Action Request: Reset Transmission Identification Learning. 2. Disconnect Allison DOC® from the vehicle and execute 15 key-on/key-off cycles minimum. 3. Reconnect with Allison DOC®, and verify TID Detection Complete = Yes, Learned TID = TID B, Detected TID = TID B. Did correct levels display for TID Detection Complete, Learned TID, Detected TID?	TID Detection Complete = Yes, Learned TID = TID B, Detected TID = TID B	*Go to Step 8*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
8	1. Using Allison DOC®, clear DTC from history. 2. Execute 5 key-on/key-off cycles minimum. Did DTC P0610 become active?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*Return vehicle to service*

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DTC P0614 Torque Control Data Mismatch – ECM/TCM

NO SCHEMATIC FOR THIS DTC

Circuit Description

Shift Energy Management (SEM) allows the TCM to request torque reduction from the engine controller. By reducing torque, shifts can be made quicker and at a more consistent output torque, which reduces clutch temperatures allowing increased clutch life. When an engine torque rating exceeds certain limits, Low Range Torque Protection (LRTP) is used. This feature limits engine torque in lower ranges to protect the transmission from damage if a stall condition occurs.

This test detects:

- If a high-rated engine (as determined by the selection of transmission calibration) supports SEM/LRTP as required.
- If the engine rating (as broadcast by SAE J1939 Advertised Engine Torque Curve (AETC)) is acceptable for the transmission.

For high torque applications, the engine must support the required messages to allow SEM and LRTP. For low torque applications, SEM may or may not be active.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- The TCM allows operation in Reverse (R), Neutral (N), and Second (2^{nd}) range only.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.
- DTCs P2637 and/or P2641 may also be active.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0614 may be caused by:

- Incorrect engine calibration.
- Incorrect transmission calibration.
- Engine calibration that does not support all required SAE J1939 SEM/LRTP messages.
- Communication link problem.
- Defective TCM.

Review applicable information in the Universal Allison DOC® Technician's Library,7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS –SHIFT SELECTOR ISSUES, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS , and other related Appendices.

Tool Requirements:

- Allison DOC®

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DTC P0614 Torque Control Data Mismatch – ECM/TCM *(cont'd)*

- Allison TCM Reflash

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC P0614.
2. Check for DTC U0100.
3. Verify engine is recognized as an SEM/LRTP engine.
4. Verify correct calibrations are installed.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0614 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 6*
2	Is DTC U0100 active or in history with DTC P0614?		*Go to DTC U0100*	*Go to Step 3*
3	While monitoring Engine Hardware Status in SEM/LRTP, drive vehicle and make upshifts into all forward ranges. Does Engine Hardware Status show SEM, LRTP, or SEM/LRTP recognized and does DTC P0614 become inactive?	Recognized or Not Recognized	*Go to Step 6*	*Go to Step 4*
4	Check with vehicle OEM that ECM (engine) calibration and TCM (transmission) calibration are a correct match for vehicle. Are calibrations correct?		*Go to Step 5*	*Recalibrate engine and/or transmission calibrations. Go to Step 6*

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DTC P0614 Torque Control Data Mismatch – ECM/TCM *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0614 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 6*
6	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0614 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0634 TCM Internal Temperature Too High

NO SCHEMATIC FOR THIS DTC

Circuit Description

The TCM is equipped with an internal temperature sensor mounted directly to its circuit board. The TCM takes action to protect against damage from overheating.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in the TCM history.
- The TCM commands **OFF** all solenoids (SOL OFF).
- TCM shutdown.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0634 may be caused by:

- Defective TCM.
- Debris on TCM.
- External heat source such as vehicle exhaust in vicinity of TCM.

Clean the TCM if necessary. Excessive road debris will reduce the effectiveness of the heat sink on the TCM and could cause internal temperature to rise.

TCM Substrate Temperature is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for debris and external heat in vicinity of TCM.
3. Check TCM.

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DTC P0634 TCM Internal Temperature Too High *(cont'd)*

4. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0634 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 4*
2	1. Inspect the TCM and surrounding area for debris. 2. Inspect TCM area for high temperature components such as engine exhaust pipes mounted in the vicinity of the TCM. **NOTE:** Repairs due to vehicle environmental issues that do not meet ATI requirements defined in Tech Data are not covered by Allison Transmission warranty. Was debris or external heat source found in vicinity or on TCM?		*Clean debris from TCM and/or relocate or shield TCM from external heat source. Go to Step 4*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. Torque to specification, as required. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 4 after repair.*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Shield or relocate the TCM, or relocate the source of the high temperature. Go to Step 4 after repair.*

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DTC P0634 TCM Internal Temperature Too High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0634 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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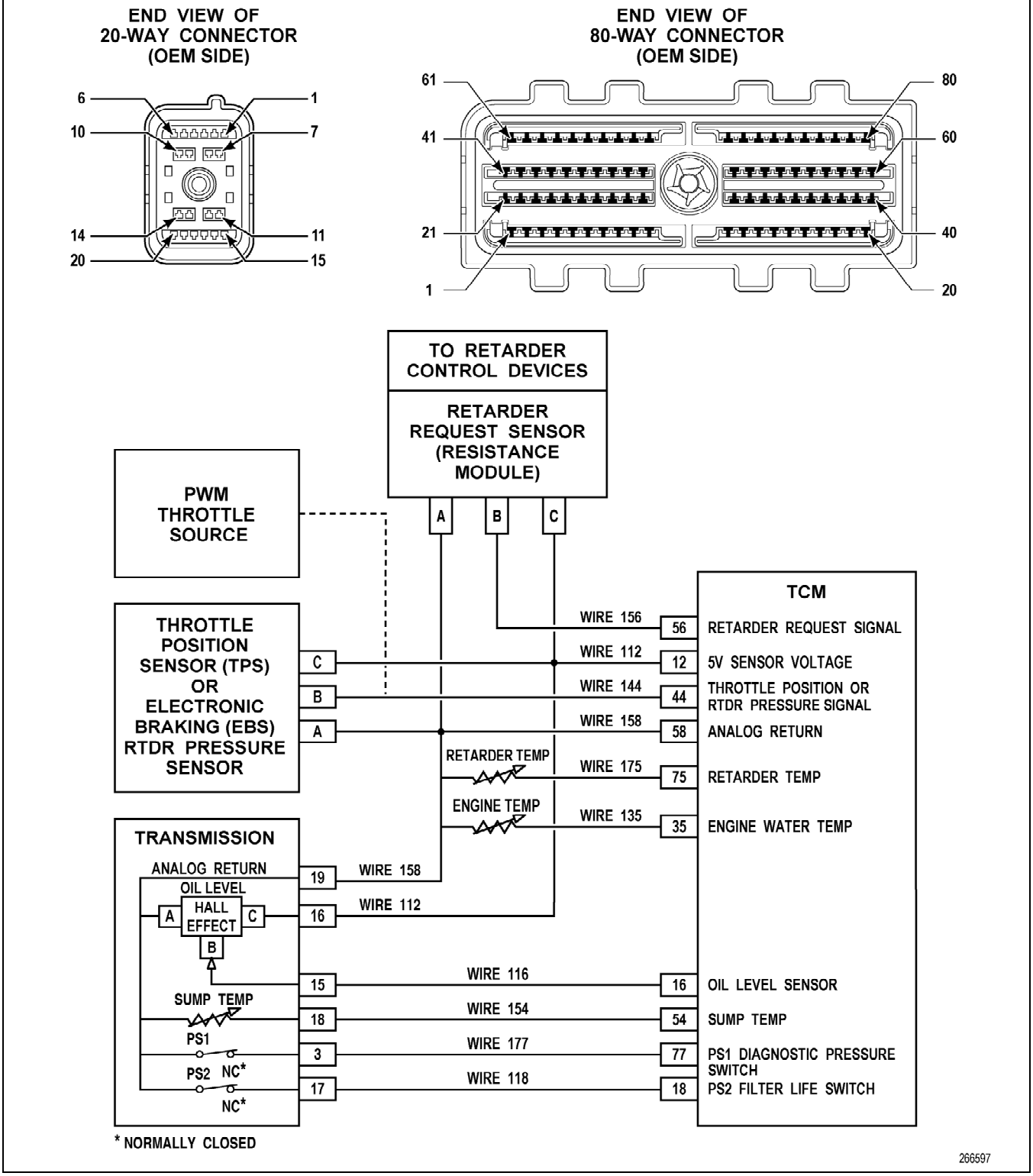
DTC P0642 Sensor Reference Voltage “A” Circuit Fault



Circuit Description

The sensor reference voltage diagnostic checks the integrity of the 5 volt reference used to power all of the analog input sensors such as Transmission Fluid Temperature (TFT), Throttle Position Sensor (TPS), and

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DTC P0642 Sensor Reference Voltage “A” Circuit Fault *(cont'd)*

the 6-Speed Three-Position Switch Interface circuits. DTC P0642 is set if the 5V reference from the TCM to provide power to analog sensors is disabled or outside the allowed voltage range.

Action Taken When the DTC Sets

When DTC P0642 is active, the following conditions occur:

- The **CHECK TRANS** light is illuminated.
- DTC is stored in TCM history.
- Additional DTCs active depending on 5V reference to function normally.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes forty warm-up cycles without failure.

Diagnostic Aids

DTC P0642 can be caused by:

- Irregular TCM or vehicle power.
- Poor TCM or vehicle grounds.
- If multiple DTCs are noted in failure records, this may indicate unapproved components spliced into W158 or W112, or W112 shorted to chassis ground.
- W112 or W158 short to ground, short to battery power, high resistance or open.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective 5V sensor, e.g., TFT sensor, TPS.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay

Test Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.

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DTC P0642 Sensor Reference Voltage “A” Circuit Fault *(cont'd)*

2. Check W112 and W158 for short to ground, or short to another wire in chassis harness.
3. Check for reference voltage with 16-way bypass connector connected.
4. Check for reference voltage with 16-way bypass connector disconnected.
5. Check for high resistance or open circuits in W112 (without sensors or devices connected) or W158.
6. Check TCM.
7. If DTC is still active, review Diagnostic Aids.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0642 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*

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DTC P0642 Sensor Reference Voltage “A” Circuit Fault *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Disconnect the OEM chassis harness 20-way from the transmission. Disconnect any OEM or Allison sensors or devices using W112, such as the TPS, RMR. etc. 5. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 6. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 7. With ignition **OFF** and using J-46708 DMM, measure resistance between terminal 12 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and chassis ground. Move to terminal 58 on J-47275-1 and repeat resistance check to all other terminals on overlay and chassis ground. Does resistance measure 20 KΩ or more from J-47275-1 Magnetic Overlay terminal for either terminal 12 or 58 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 KΩ or more	*Go to Step 3*	*Address issue with W112 or W158. Go to Step 7 after repairs are made.*
3	1. Turn ignition **OFF**. 2. Keep J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Keep OEM chassis harness connected to J-47275 TCM Breakout Harness 80-way harness. 4. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 5. Keep 20-way OEM connector disconnected from transmission. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Turn ignition **ON** but do not start engine. 8. Install J-46708 DMM and measure voltage between terminals 12 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Go to Step 5*	*Go to Step 4*

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DTC P0642 Sensor Reference Voltage "A" Circuit Fault *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave J-46708 DMM connected between terminals 12 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 6. Turn ignition **ON** but do not start engine. 7. Measure voltage between terminals 12 and 58 at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 7 after repairs are made.*	*Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box and leave OEM 80-way connector disconnected from TCM. Leave OEM 20-way connector disconnected from transmission. 3. Using a J-46708 DMM measure W112 resistance with sensors or OEM devices disconnected from W112. Measure W158 resistance from terminal 58 of 80-way connector to terminal 19 of 20-way connector. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading for both W112 and W158?	4 Ω or less	*Go to Step 6*	*Address issue with W112 or W158. Go to Step 7 after repairs are made.*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0642 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
7	Acquire new Allison DOC® snapshot under same conditions, if possible, noted in failure records from Step 1. Did DTC P0642 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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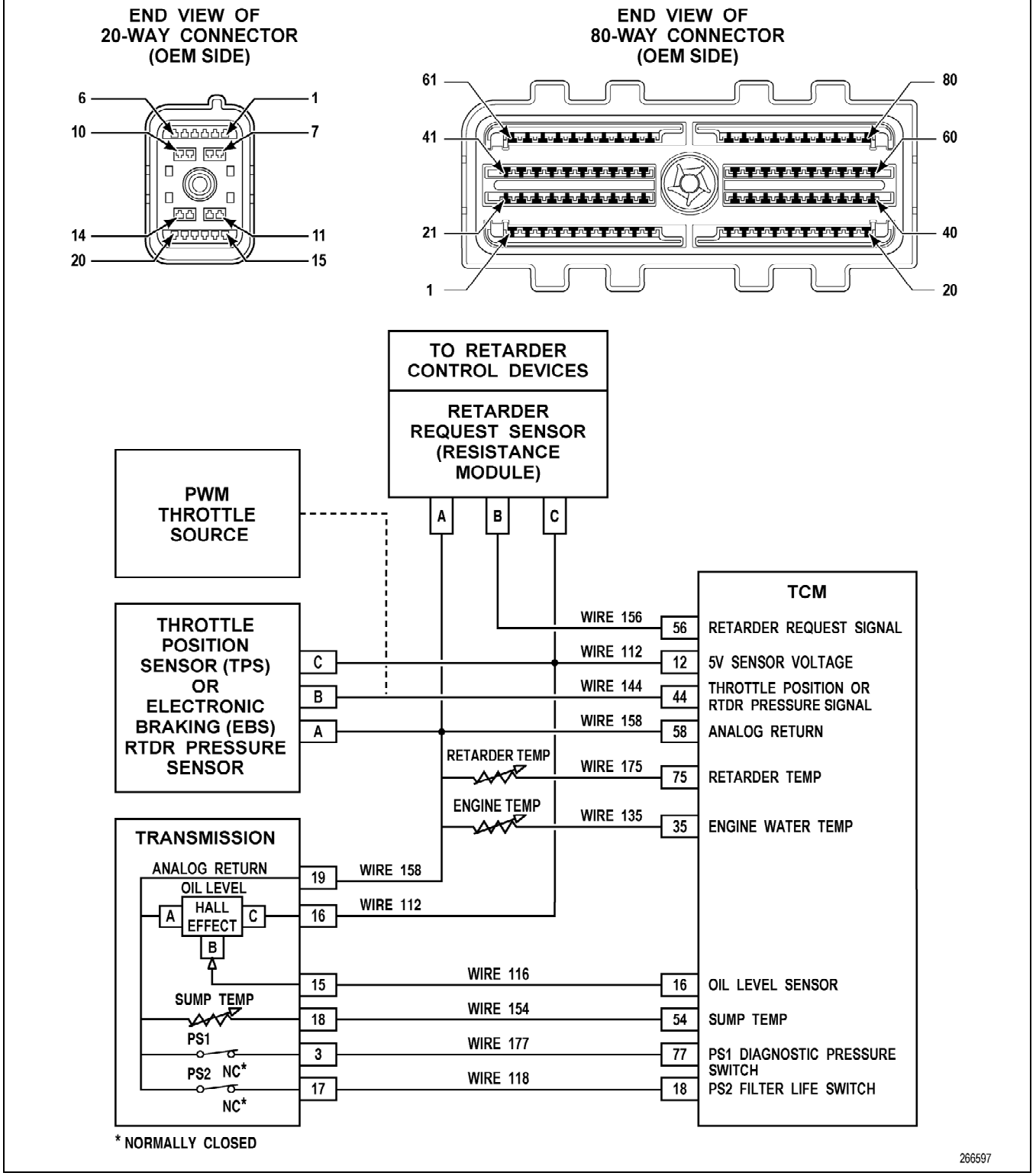
DTC P0643 Sensor Reference Voltage “A” Circuit High



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DTC P0643 Sensor Reference Voltage “A” Circuit High *(cont'd)*

Circuit Description

This test detects when the 5V reference circuit voltage provided by the TCM and used by certain transmission control components such as the oil level sensor, TFT, analog TPS, and RMR device is detected above specification for a period of time.

Action Taken When the DTC Sets

When DTC P0643 is active, the following conditions occur:

- The **CHECK TRANS** light is illuminated.
- DTC is stored in TCM history.
- Additional DTCs active depending on 5V reference to function normally.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes forty warm-up cycles without failure.

Diagnostic Aids

DTC P0643 may be caused by:

- Irregular TCM or vehicle power.
- Poor TCM or vehicle grounds.
- If multiple DTCs are noted in failure records, this DTC may indicate Allison Transmission unapproved components spliced into W158 or W103, or W103 is shorted to chassis ground.
- W112 or W158 short to ground, short to power, high resistance or open.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

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DTC P0643 Sensor Reference Voltage “A” Circuit High *(cont'd)*

1. Check for active DTC.
2. Check for reference voltage with 16-way bypass connector connected.
3. Check for reference voltage with 16-way bypass connector disconnected.
4. Check for short circuit in W112 or W158 in chassis harness.
5. Check for W112 or W158 for open.
6. Check TCM.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0643 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Connect 16-way bypass on J-47275 TCM Breakout Harness. 8. Turn ignition **ON** but do not start engine. 9. Install J-46708 Digital Multimeter and measure voltage between terminals 12 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Go to Step 4*	*Go to Step 3*

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DTC P0643 Sensor Reference Voltage “A” Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave J-46708 Digital Multimeter connected between terminals 12 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 6. Turn ignition **ON** but do not start engine. 7. Measure voltage between terminals 12 and 58 at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 7 after repairs are made.*	*Go to Step 4*
4	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 12 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 12 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 5*	*Address issue with W112. Go to Step 7 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box and leave OEM 80-way connector disconnected from TCM. Leave OEM 20-way connector disconnected from transmission. 3. Using a J-46708 Digital Multimeter measure W112 resistance from terminal 12 of 80-way connector to terminal 16 of 20-way connector. Measure W158 resistance from terminal 58 of 80-way connector to terminal 19 of 20-way connector. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Address issue with W112 or W158. Go to Step 7 after repairs are made.*

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DTC P0643 Sensor Reference Voltage “A” Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0643 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Review Diagnostic Aids for this DTC. Begin the diagnosis again if not resolved by Diagnostic Aids. Go to Step 1*
7	1. Acquire new Allison DOC® snapshot under same conditions, if possible, noted in failure records from Step 1. Did DTC P0643 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again if not resolved by Diagnostic Aids. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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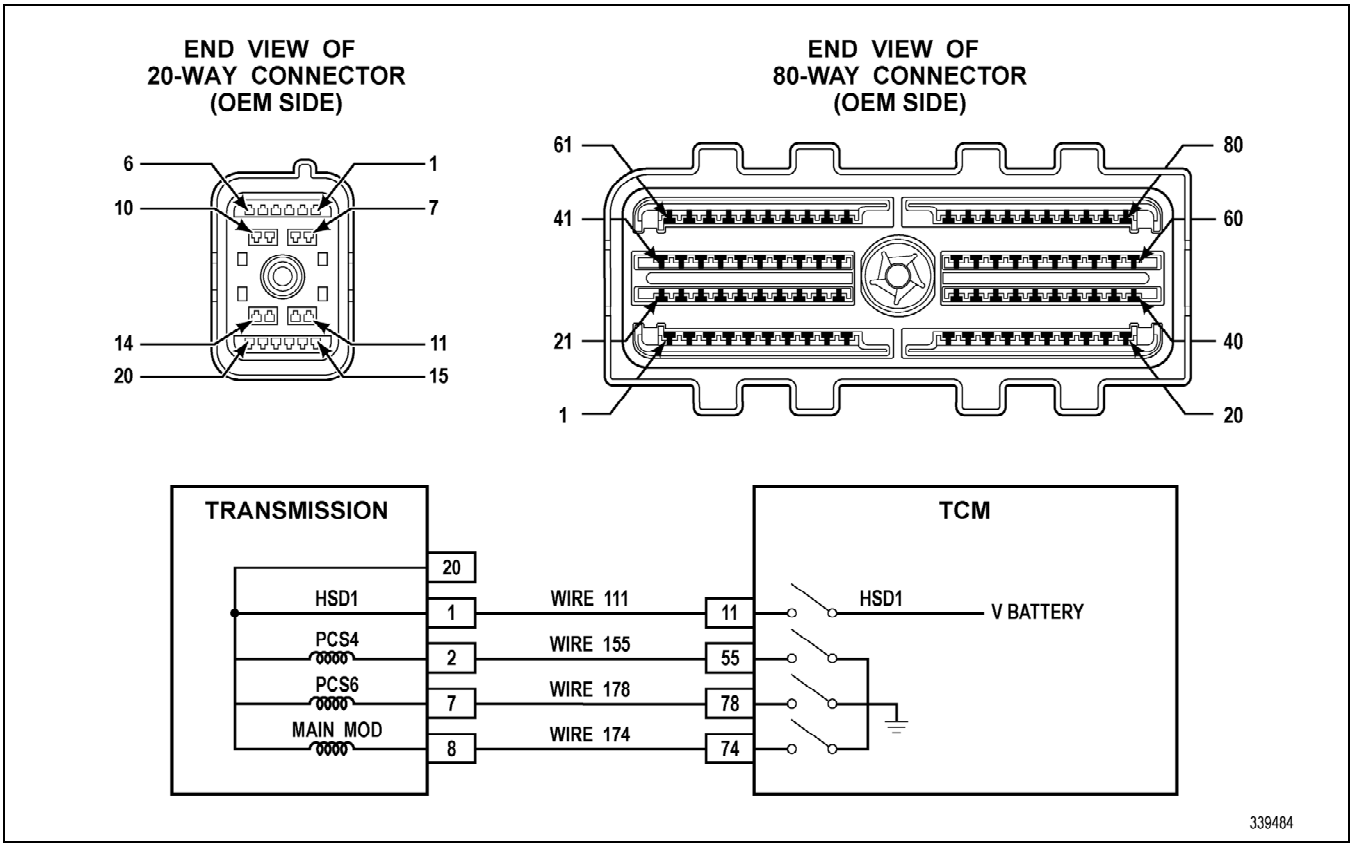
DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1)



Circuit Description

This test detects if the voltage measured at the High side Driver (HSD) shows that multiple low side drivers indicate open, but the HSD indicates high voltage.

Action Taken When the DTC Sets

When DTC P0657 is active:

- The DTC sets while in a forward range, then shifts to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission is locked in this range and there is no response to shift selector requests.
- The TCM inhibits TCC engagement.
- Main Modulation is inhibited.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1) *(cont'd)*

Diagnostic Aids

DTC P0657 can be caused by:

- HSD1 circuit issues such as:
  - W111 shorted to another wire in chassis harness.
  - W111 (terminal 1 of 20-way) shorted to another wire in the internal transmission harness.
  - W111 open circuit in chassis harness.
  - W111 (terminal 1 of 20-way) open circuit in internal transmission harness.
- Two or more low side driver circuit issues with Main Mod, PCS4, or PCS6.
- Main Mod issues such as:
  - W174 shorted to another wire in chassis harness.
  - W174 shorted (terminal 8 of 20-way) to another wire in the internal transmission harness.
  - W174 open circuit in chassis harness.
  - W174 (terminal 8 of 20-way) open circuit in internal transmission harness.
- PCS4 issues such as:
  - W155 shorted to another wire in chassis harness.
  - W155 shorted (terminal 2 of 20-way) to another wire in the internal transmission harness.
  - W155 open circuit in chassis harness.
  - W155 (terminal 2 of 20-way) open circuit in internal transmission harness.
  - PCS4 solenoid open or shorted.
- PCS6 (7-speed only) issues such as:
  - W178 shorted to another wire in chassis harness.
  - W178 shorted (terminal 7 of 20-way) to another wire in the internal transmission harness.
  - W178 open circuit in chassis harness.
  - W178 (terminal 7 of 20-way) open circuit in internal transmission harness.
- Defective solenoids Main Mod, PCS4, and PCS6.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness

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DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1) *(cont'd)*

- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W111 in chassis harness for open or high resistance.
3. Check W111 for short to ground or short to another wire.
4. Check TCM.
5. Check internal harness HSD1 (terminal 1) for short to ground or short to another wire.
6. Check internal harness HSD1 (terminal 1) for high resistance or open.
7. Check for multiple low side solenoid wires in internal harness shorted to ground or to another wire.
8. Check for multiple low side solenoid wires in internal harness with high resistance or opens.
9. Check solenoid resistance.
10. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

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DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0657 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 10*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between pin 1 and 2 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 11 and 55 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 3*	*Address issue with W111. Go to Step 10 after repairs are made.*
3	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 11 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 11 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W111. Go to Step 10 after repairs are made.*

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DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0657 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 10 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect solenoids PCS4, Main Mod, and PCS6 (7-speed only) from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 1 to all other labeled terminals on J-47279-1 Magnetic Overlay (except terminal 20) and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 1 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 10*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Measure resistance between terminals 1 and 20 at J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 7*	*Repair or replace W111 in internal harness. Go to Step 10*

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DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave PCS4, Main Mod, and PCS6 (7-speed only) disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 2 to all other labeled terminals on J-47279-1 Magnetic Overlay and the control module assembly. 4. Repeat task 3 for terminals 8 and 7 (7-speed only). Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 2, 7, 8, to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 8*	*Repair any shorted internal harness wires or replace internal harness. Go to Step 10*
8	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed and leave solenoids disconnected from internal harness. 3. Install jumper across terminals A and B of PCS4 internal harness connector. 4. Measure resistance between terminals 1 and 2 at J-47279-1 Magnetic Overlay. 5. Move jumper to Main Mod connector and repeat tasks 3 and 4 for terminals 1 and 8. Move jumper to PCS6 (7-speed only) connector and repeat task 3 and 4 for terminals 1 and 7. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 9*	*Repair wire that is high resistance or open or replace internal harness. Go to Step 10*

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DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS4, Main Mod, and PCS6 (7-speed only) to internal harness connectors. 4. Measure resistance between terminals 1 and 2 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 1 and 8. Repeat task 4 for terminals 1 and 7 (7-speed only). Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–3 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–3	*Go to Step 10*	*Replace solenoid that is not within specification. Go to Step 10*
10	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0657 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0657 Actuator Supply Circuit Voltage 1 Open (HSD1) *(cont'd)*

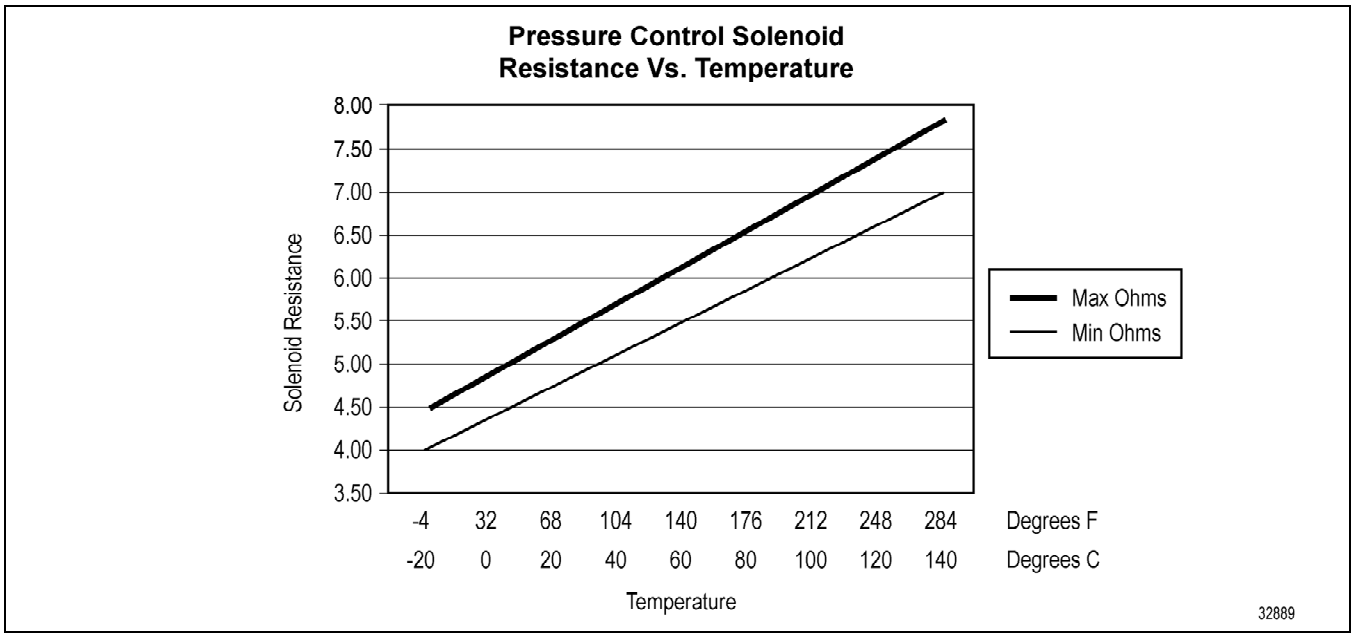

Figure 5–3. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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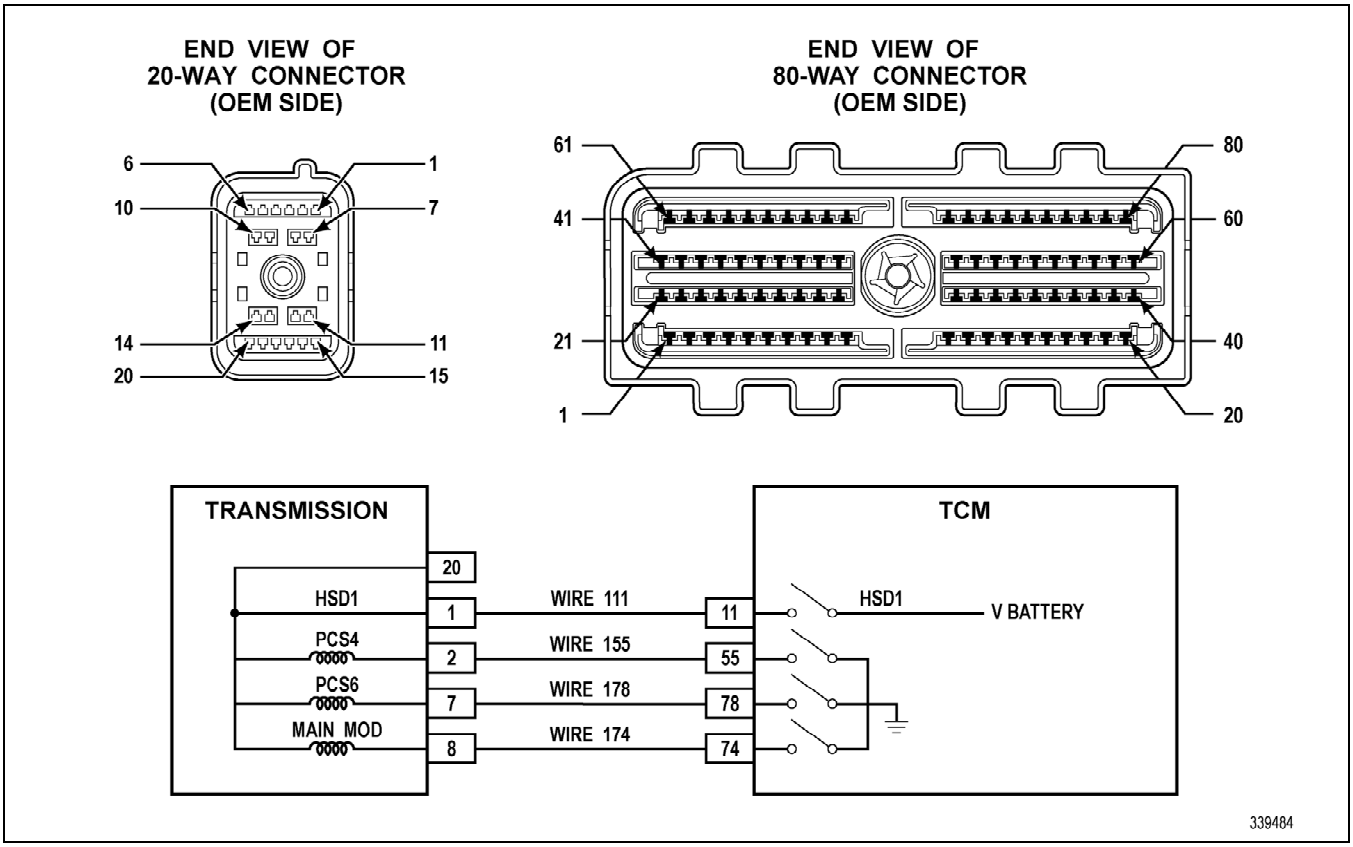
DTC P0658 Actuator Supply Circuit Voltage 1 Circuit Low (HSD1)



Circuit Description

This test detects low voltage on High side Driver (HSD) when high voltage is expected indicating a short to ground at that circuit.

Action Taken When the DTC Sets

When DTC P0658 is active:

- The DTC sets while in a forward range, then shifts to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission is locked in this range and there is no response to shift selector requests.
- The TCM inhibits TCC engagement.
- Main Modulation is inhibited.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P0658 Actuator Supply Circuit Voltage 1 Circuit Low (HSD1) *(cont'd)*

Diagnostic Aids

DTC P0658 can be caused by:

- HSD1 circuit issues such as:
  - W111 shorted to another wire in chassis harness.
  - W111 (terminal 1 of 20-way) shorted to another wire in the internal transmission harness.
- Two or more low side driver circuit issues with Main Mod, PCS4, or PCS6.
- Main Mod issues such as:
  - W174 shorted to another wire in chassis harness.
  - W174 shorted (terminal 8 of 20-way) to another wire in the internal transmission harness.
  - Main Mod solenoid shorted.
- PCS4 issues such as:
  - W155 shorted to another wire in chassis harness.
  - W155 shorted (terminal 2 of 20-way) to another wire in the internal transmission harness.
  - PCS4 solenoid shorted.
- PCS6 (7-speed only) issues such as:
  - W178 shorted to another wire in chassis harness.
  - W178 shorted (terminal 7 of 20-way) to another wire in the internal transmission harness.
  - PCS6 shorted.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

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DTC P0658 Actuator Supply Circuit Voltage 1 Circuit Low (HSD1) *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W111 for short to ground or short to another wire.
3. Check TCM.
4. Check internal harness HSD1 (terminal 1) for short to ground or short to another wire.
5. Check for multiple low side solenoid wires in internal harness shorted to ground or to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0658 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*

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DTC P0658 Actuator Supply Circuit Voltage 1 Circuit Low (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 11 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 11 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 3*	*Address issue with W111. Go to Step 7 after repairs are made.*
3	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0658 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 4*
4	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect solenoids PCS4, Main Mod, and PCS6 (7-speed only) from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 1 and to all other labeled terminals (except terminal 20) on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 1 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 5*	*Repair or replace internal harness. Go to Step 7*

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DTC P0658 Actuator Supply Circuit Voltage 1 Circuit Low (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave PCS4, Main Mod, and PCS6 (7-speed only) disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 2 to all other labeled terminals on J-47279-1 Magnetic Overlay and the control module assembly. 4. Repeat task 3 for terminals 8 and 7 (7-speed only). Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 2, 7, 8, to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair any shorted internal harness wires or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS4, Main Mod, and PCS6 (7-speed only) to internal harness connectors. 4. Measure resistance between terminals 1 and 2 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 1 and 8. Repeat task 4 for terminals 1 and 7 (7-speed only). Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–4 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–4	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0658 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0658 Actuator Supply Circuit Voltage 1 Circuit Low (HSD1) *(cont'd)*

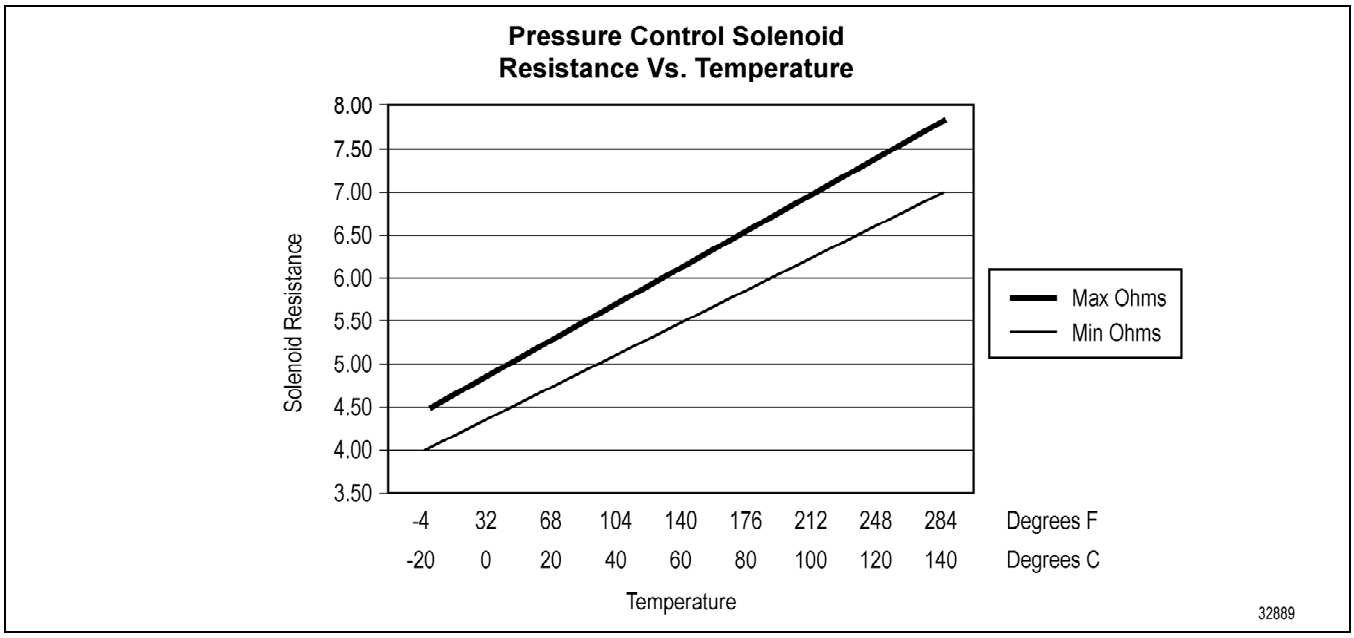

Figure 5–4. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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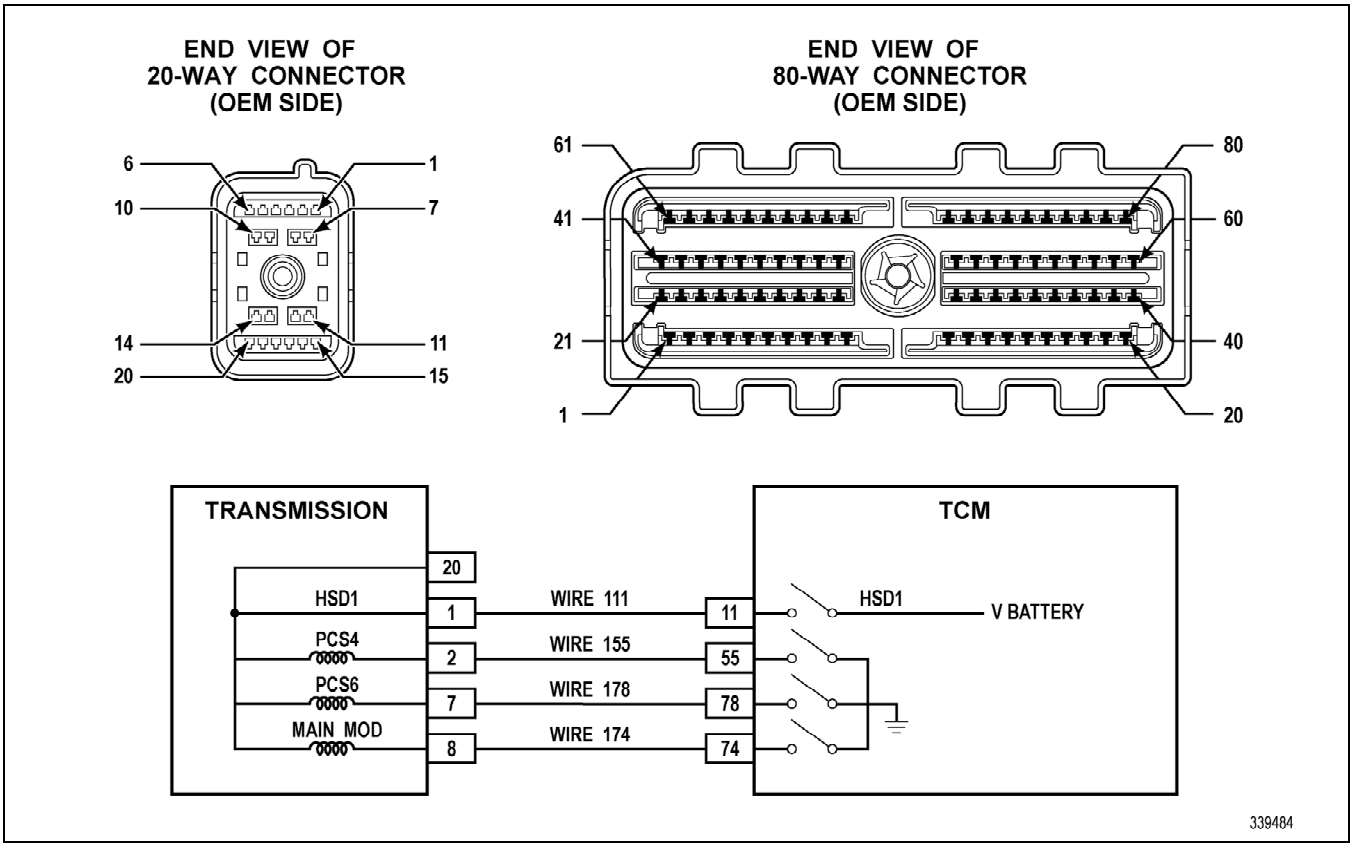
DTC P0659 Actuator Supply Circuit Voltage 1 Circuit High (HSD1)



Circuit Description

This test detects if the voltage measured at High Side Driver (HSD) is high when the circuit is expected to be off.

Action Taken When the DTC Sets

When DTC P0659 is active:

- Transmission fails to Neutral (N).
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0659 can be caused by:

- HSD1 circuit issues such as:
  - W111 shorted to another wire in chassis harness.
  - W111 (terminal 1 of 20-way) shorted to another wire in the internal transmission harness.

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DTC P0659 Actuator Supply Circuit Voltage 1 Circuit High (HSD1) *(cont'd)*

- Two or more low side driver circuit issues with Main Mod, PCS4, or PCS6.
- Main Mod issues such as:
  - W174 shorted to another wire in chassis harness.
  - W174 shorted (terminal 8 of 20-way) to another wire in the internal transmission harness.
- PCS4 issues such as:
  - W155 shorted to another wire in chassis harness.
  - W155 shorted (terminal 2 of 20-way) to another wire in the internal transmission harness.
- PCS6 (7-speed only) issues such as:
  - W178 shorted to another wire in chassis harness.
  - W178 shorted (terminal 7 of 20-way) to another wire in the internal transmission harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W111 for short to another wire.
3. Check TCM.
4. Check internal harness HSD1 (terminal 1) for short to another wire.
5. Check for multiple low side solenoid wires in internal harness shorted to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P0659 Actuator Supply Circuit Voltage 1 Circuit High (HSD1) *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0659 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 11 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 11 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 3*	*Address issue with W111. Go to Step 7 after repairs are made.*

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DTC P0659 Actuator Supply Circuit Voltage 1 Circuit High (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0659 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 4*
4	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS4, Main Mod, and PCS6 (7-speed only) from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 1 and to all other labeled terminals (except terminal 20) on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 1 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 5*	*Repair or replace internal harness. Go to Step 7*
5	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave PCS4, Main Mod, and PCS6 (7-speed only) disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 2 to all other labeled terminals on J-47279-1 Magnetic Overlay. 4. Repeat task 3 for terminals 8 and 7 (7-speed only). Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 2, 7, 8 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*

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DTC P0659 Actuator Supply Circuit Voltage 1 Circuit High (HSD1) *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS4, Main Mod, and PCS6 (7-speed only) to internal harness connectors. 4. Measure resistance between terminals 1 and 2 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 1 and 8. Repeat task 4 for terminals 1 and 7 (7-speed only). Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–5 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–5	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0659 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0659 Actuator Supply Circuit Voltage 1 Circuit High (HSD1) *(cont'd)*

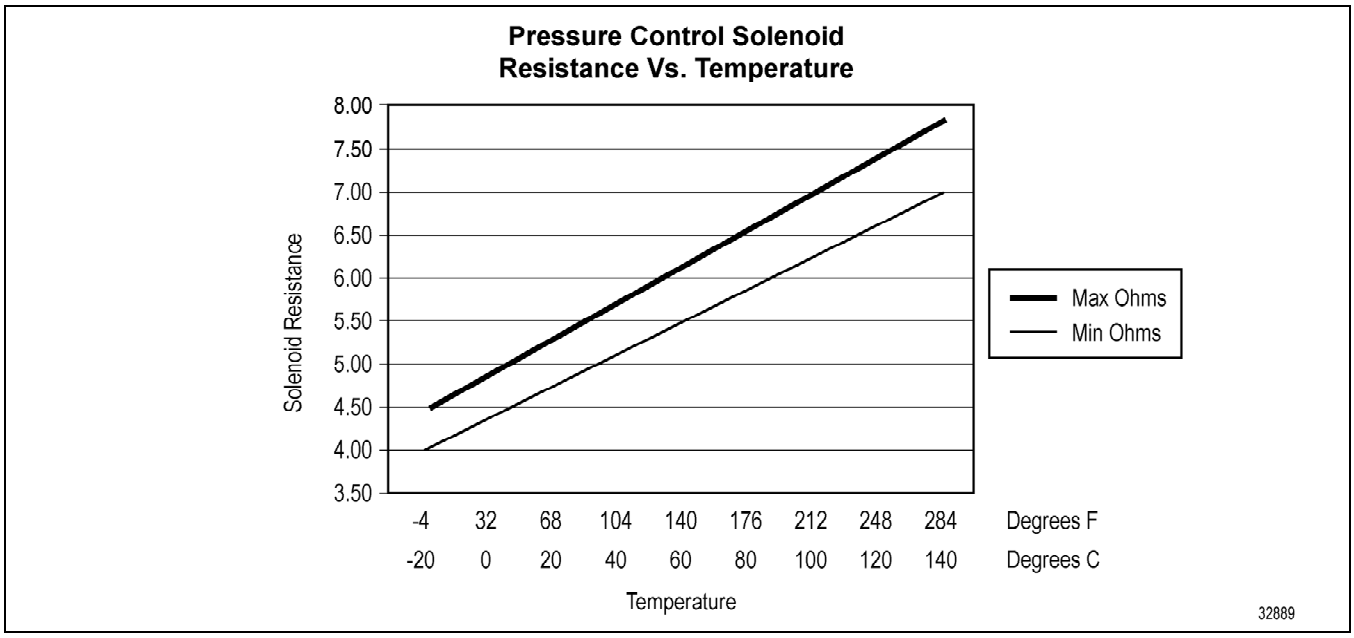

Figure 5–5. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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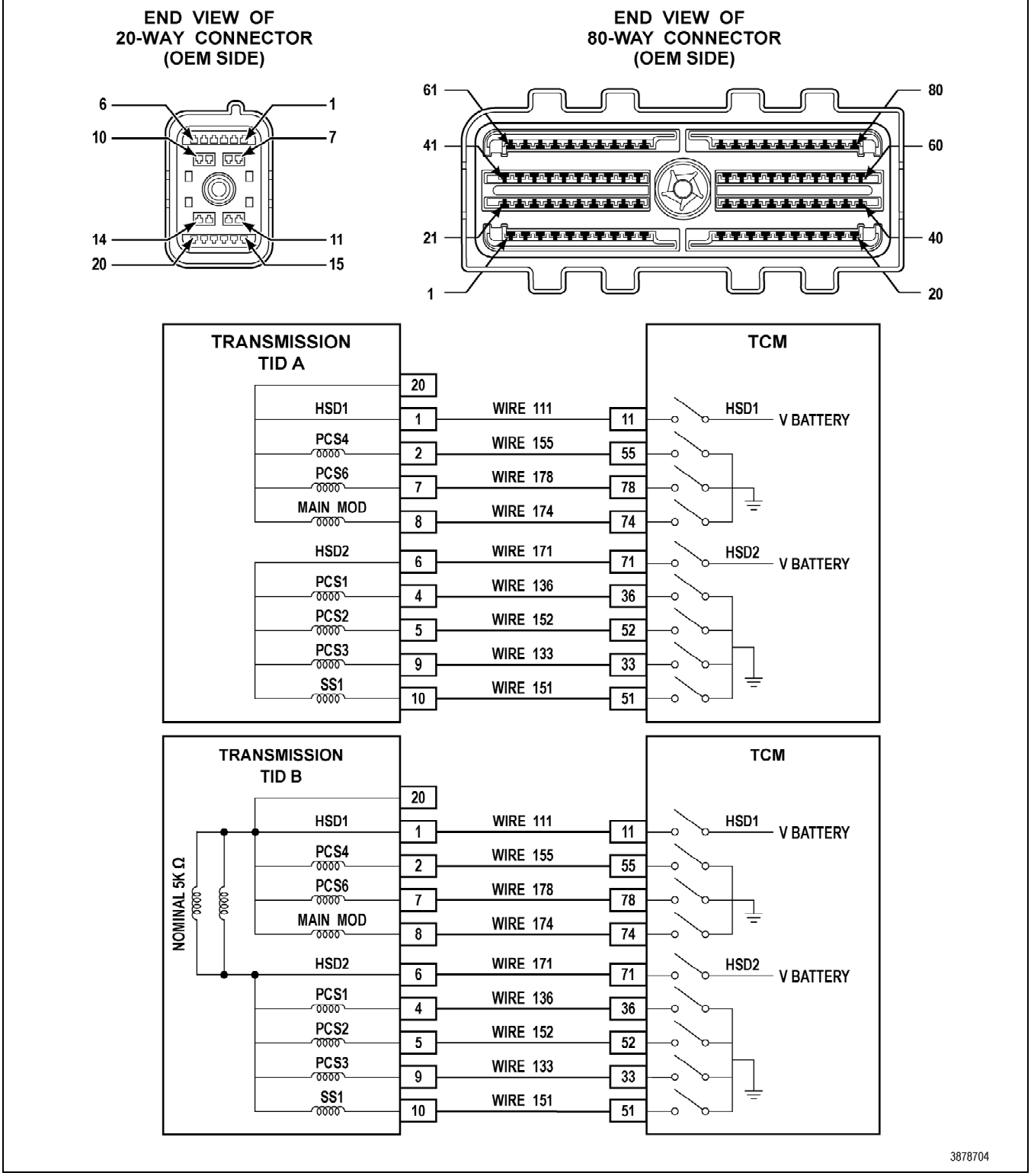
DTC P0702 Transmission Control Hardware Not Determined



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DTC P0702 Transmission Control Hardware Not Determined *(cont'd)*

DTC Troubleshooting Step Description (TID A Models)

Circuit Description

Trans ID (TID) in TID A and TID B transmissions is determined by the electrical relationship between High Side Driver 1 (HSD1) (20-Way Terminal 1) and High Side Driver 2 (HSD2) (20-Way Terminal 6) in the internal wiring harness of the transmission. In TID A models, there is no continuity between these terminals. In TID B models, there is continuity with a nominal resistance value of 5k Ω.

The Transmission Control Module (TCM) evaluates TID level as part of the Autodetect process. The Autodetect process is initiated after the first key-cycle with sensed transmission connection. TID level is locked after fifteen (15) consecutive equivalent TID levels, with a maximum of sixty (60) key cycles. If TID is not found after 60 key cycles, the Learned will lock as Indeterminate.

TID A and TID B model transmissions are visibly distinguishable by the TID level displayed on the transmission data tag (nameplate) and by the color of the internal wiring harness standoff. The TID A model 20-Way standoff is black in color; the TID B model 20-Way standoff is tan in color.

Conditions for Running the DTC

Immediately after initial key-on along with a sensed connection to the transmission by the TCM, this test evaluates resistance between transmission 20-Way terminals 1 and 6 to determine TID level.

Conditions for Setting the DTC

If the TCM does not sense 15 consecutive equivalent TID levels in the first sixty key cycles, the TCM will lock the TID level as “Indeterminate”. Code clear of the DTC does not initiate relearn of TID level.

Action Taken When the DTC Sets

When DTC P0702 is active, the following conditions occur:

- The **CHECK TRANS** light is illuminated.
- DTC is stored in TCM history.
- The TCM uses current key-cycle TID level for control of operation.
- There is no inhibit of transmission operation.

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from TCM. Code clear of the DTC alone does address the problem of an indeterminate TID level. For DTC P0702, the described troubleshooting steps must be followed including reset of TID learning, followed by the minimum number of key-cycles to establish correct TID level.

Diagnostic Aids

The troubleshooting process for DTC P0702 is dependent upon transmission model, TID A or TID B. DTC P0702 may be caused by:

- Broken or defective connector assemblies.
- Unlocked connectors.
- Expanded terminals, poor pin crimps, or unlocked pins.

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DTC P0702 Transmission Control Hardware Not Determined *(cont'd)*

- Internal wiring harness issues resulting in improper resistance between 20-Way terminals 1 HSD1 and 6 HSD2.
- Defective TCM. Only replace the TCM if the problem is not resolved after performing the following troubleshooting steps. TCM replacement should only occur after performing the A-B-A component search process with the problem following the suspect TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description (TID A Models)

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check transmission nameplate and 20-Way Standoff color – verify TID A level.
2. Connect with Allison DOC®. Determine if DTC is active or in history.
3. Check TID Detected Complete and Learned TID fields in Data Monitor window.
4. Check resistance of W111/W171 circuit at TCM 80-Way connector terminals 11 and 71.
5. Check resistance of internal wiring harness at transmission 20-Way connector terminals 1 and 6.
6. Remove hydraulic control module assembly to inspect for cause of continuity between High Side Driver 1 (HSD1) and High Side Driver 2 (HSD2).
7. Using Action Request: Reset Transmission Identification Learning, execute relearn of TID.
8. Clear DTC from history.

Step	Action	Value(s)	Yes	No
1	Verify TID displayed on transmission nameplate and color of internal wiring harness 20-Way standoff. Does TID A display on nameplate? Is the 20-Way standoff color black?		*Go to Step 2*	*Go to TID B Troubleshooting Tree*

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DTC P0702 Transmission Control Hardware Not Determined *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0702 active or in history?		*Go to Step 8*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 3*
3	Open Data Monitor window. Review “TID Detection Complete” and “Learned TID” fields. Do TID Detection compete display “Yes” and Learned TID display “Indeterminate?		*Go to Step 4*	*Go to Step 4*
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-Way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-Way harness. 5. Leave TCM side of J-47275 Breakout Harness disconnected from TCM. 6. With ignition **OFF** and using J-46708 DMM, measure resistance between terminals 11 and 71 on J-47275-1 Magnetic Overlay. 7. With ignition **OFF** and using J-46708 DMM, measure resistance between terminals 11 and 71 on J-47275-1 Magnetic Overlay and ground. Does resistance measure 20k Ω or more from J-47275-1 Magnetic Overlay terminal 11 to terminal 71? Does resistance measure 20k Ω or more from terminal 11 and terminal 71 to ground?	20k Ω or more	*Go to Step 7*	*Go to Step 5*
5	1. Connect J-47279 Transmission Breakout Harness to J-39700 Breakout Box. 2. Connect J-47279 Transmission Breakout Harness to transmission 20-Way connector. 3. Install J-47279-1 Magnetic Overlay. 4. Check resistance from J-47279-1 Magnetic Overlay terminal 1 to terminal 6. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 1 to terminal 6?	20 kΩ or more	*Troubleshoot Vehicle Wiring Harness. Verify electrical isolation of wires W111 and W171. Repair as-needed and go to Step 7*	*Go to Step 6*
6	Remove hydraulic control module and inspect for cause of continuity between 20-Way terminal 1 and terminal 6. Is cause of continuity found?		*Repair or replace internal wiring harness or solenoid valves as needed. Go to Step 7*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*

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DTC P0702 Transmission Control Hardware Not Determined *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Using Allison DOC® execute Action Request: Reset Transmission Identification Learning. 2. Disconnect Allison DOC® from the vehicle and execute 15 key-on/key-off cycles minimum. 3. Reconnect with Allison DOC®, and verify TID Detection Complete = Yes, Learned TID = TID A, Detected TID = TID A. Did correct levels display for TID Detection Complete, Learned TID, Detected TID?	TID Detection Complete = Yes, Learned TID = TID A, Detected TID = TID A	*Go to Step 8*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
8	1. Using Allison DOC®, clear DTC from history. 2. Open Data Monitor Window. Are TID levels in Learned TID, Detected TID, and on transmission data tag equivalent?		*Return vehicle to service*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*

DTC Troubleshooting Step Description (TID B Models)

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check transmission nameplate and 20-Way Standoff color – verify TID B level.
2. Connect with Allison DOC®. Determine if DTC is active or in history.
3. Check TID Detected Complete and Learned TID fields in Data Monitor window.
4. Check resistance of W111/W171 circuit at TCM 80-Way connector terminals 11 and 71.
5. Check resistance of internal wiring harness at transmission 20-Way connector terminals 1 and 6.
6. Remove hydraulic control module assembly to inspect for cause of improper resistance between High Side Driver 1 (HSD1) and High Side Driver 2 (HSD2).
7. Using Action Request: Reset Transmission Identification Learning, execute relearn of TID.
8. Clear DTC from history.

Step	Action	Value(s)	Yes	No
1	Verify TID displayed on transmission nameplate and color of internal wiring harness 20-Way standoff. Does TID B display on nameplate? Is the 20-Way standoff color tan?		*Go to Step 2*	*Go to TID A Troubleshooting Tree*
2	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0702 active or in history?		*Go to Step 3*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 3*

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DTC P0702 Transmission Control Hardware Not Determined *(cont'd)*

Step	Action	Value(s)	Yes	No
3	Open Data Monitor window. Review “TID Detection Complete” and “Learned TID” fields. Do TID Detection compete display “Yes” and Learned TID display “Indeterminate?		*Go to Step 4*	*Go to Step 4*
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-Way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-Way harness. 5. Leave TCM side of J-47275 Breakout Harness disconnected from TCM. 6. With ignition **OFF** and using J-46708 DMM, measure resistance between terminals 11 and 71 on J-47275-1 Magnetic Overlay. 7. With ignition **OFF** and using J-46708 DMM, measure resistance between terminals 11 and 71 on J-47275-1 Magnetic Overlay and ground. Does resistance measure between 4.95-5.05k Ω from the J-47275-1 Magnetic Overlay terminal 11 to terminal 71? Does resistance measure 20k Ω or more from J-47275-1 Magnetic Overlay terminal 11 to terminal 71 to ground?	4.95-5.05k Ω without short to ground	*Go to Step 7*	*Go to Step 5*
5	1. Connect J-47279 Transmission Breakout Harness to J-39700 Breakout Box. 2. Connect J-47279 Transmission Breakout Harness to transmission 20-Way connector. 3. Install J-47279-1 Magnetic Overlay. 4. Check resistance from J-47279-1 Magnetic Overlay terminal 1 to terminal 6. Does resistance measure 4.95-5.05k Ω from J-47279-1 Magnetic Overlay terminal 1 to terminal 6?	4.95-5.05k Ω	*Troubleshoot Vehicle Wiring Harness. Verify electrical isolation of wires W111 and W171. Repair as-needed and go to Step 7*	*Go to Step 6*
6	Remove hydraulic control module and inspect for cause of resistance outside of specification range between 20-Way terminal 1 and terminal 6. Is cause of resistance found?		*Repair or replace internal wiring harness or solenoid valves as needed. Go to Step 7*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
7	1. Using Allison DOC® execute Action Request: Reset Transmission Identification Learning. 2. Disconnect Allison DOC® from the vehicle and execute 15 key-on/key-off cycles minimum. 3. Reconnect with Allison DOC®, and verify TID Detection Complete = Yes, Learned TID = TID B, Detected TID = TID B. Did correct levels display for TID Detection Complete, Learned TID, Detected TID?	TID Detection Complete = Yes, Learned TID = TID B, Detected TID = TID B	*Go to Step 8*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*

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DTC P0702 Transmission Control Hardware Not Determined *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Using Allison DOC®, clear DTC from history. 2. Open Data Monitor Window. Are TID levels in Learned TID, Detected TID, and on transmission data tag equivalent?		*Return vehicle to service*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*

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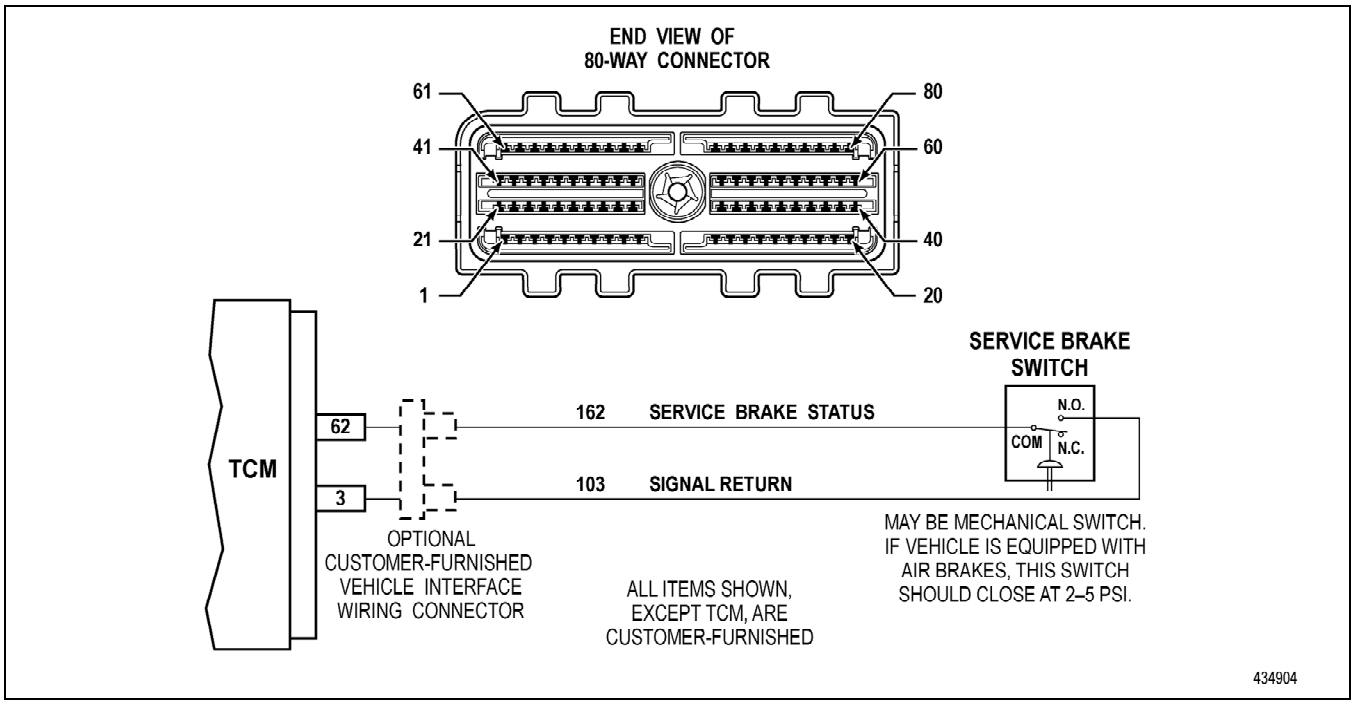
DTC P0703 Brake Switch Circuit



Circuit Description

This test monitors whether vehicle service brake switch status is in a stuck "ON" or "OFF" state.

Service brake status is relayed to the TCM by a mechanical switch, or over the J1939 datalink indicating the service brake has been applied. Input wire 162 is used to send a positive signal to the TCM. Wire 103 is used in this circuit as the signal return to the TCM.

DTC P0703 is only triggered when input wire 162 is being used for the service brake status signal and when the number of vehicle accelerations with brake switch “ON” exceeds a calibration value. This DTC may also set when the number of vehicle decelerations to a stop with the brake switch “OFF” exceeds a calibration value. This code will not be triggered if the Service Brake Status Input is broadcast on J1939 datalink.

This test counts how many accelerations events occur while the brake switch input indicates "ON". Failure is reported when the number of events exceeds 3 acceleration while Neutral at Stop is "ON".

In some applications, this test counts how many deceleration events occur while the brake switch input indicates “OFF” and the engine running time while in range. Failure is reported when the number of events exceeds 20 deceleration events and the engine running time exceeds a calibration.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- The **CHECK TRANS** indicator is illuminated on Emergency Vehicle Series (EVS) and Specialty Series (SPS) only.
- DTC is stored in TCM history.
- Some feature ranges may be inhibited when a valid Service Brake Status (SBS) state is not detected by the TCM. The range inhibit light will illuminate when range is inhibited.

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DTC P0703 Brake Switch Circuit *(cont'd)*

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® software to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

This DTC may be caused by:

- Open or short in wire 103 or wire 162.
- Malfunctioning brake system control components such as:
  - miswired or defective brake system wiring.
  - defective brake pressure switches.
- Defective TCM.

Review applicable information in the Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC® software
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for short to ground or another wire in input wire.
3. Check for high resistance or open in input wire.
5. Recalibrate TCM with updated version of original calibration.

   Install a test TCM.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0703 Brake Switch Circuit *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect the Allison DOC® software. 2. Start the engine. 3. Record snapshot using the Allison DOC® software showing active or inactive code(s). 4. Review the failure records report from the snapshot to determine conditions when DTC occurs. Is DTC P0703 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 6.*
2	1. Turn ignition **OFF**. 2. Connect the J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect the OEM chassis harness 80-way connected to the J-47275 TCM Breakout Harness OEM side. 4. Leave the TCM side of the J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect input wire at SBS signal source end of circuit. Leave SBS wire installed in the OEM TCM 80-way. 6. Using the J-46708 Digital Multimeter, measure the resistance from the terminal for the Service Brake Status (SBS) analog input (e.g., terminal 62 for most calibrations) on the J-47275-1 Magnetic Overlay to all other labeled terminals on the J-47275-1 Magnetic Overlay and to chassis ground. Does circuit resistance measure 20 kΩ or more to all other terminals and chassis ground?	20 kΩ or more	*Go to Step 3*	*Resolve OEM input wiring issue. Go to Step 6*
3	1. Turn ignition **OFF**. 2. Remove the J-39700 Universal Breakout Box. 3. Using the J-46708 Digital Multimeter, check for high resistance or open circuit in W162. Does circuit resistance measure 2 Ω or less through W162?	2 Ω or less	*Go to Step 5*	*Resolve OEM input wiring issue. Go to Step 6*

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DTC P0703 Brake Switch Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. If the service outlet is authorized to use the TCM Reflash software, recalibrate the original TCM with the latest calibration and software 2. Once the TCM recalibration is complete, use Allison DOC® to check for active DTCs. Is DTC P0703 active after reprogramming the TCM?		*Go to Step 5*	*Go to Step 6*
5	1. Turn ignition **OFF**. 2. Install test a TCM and torque bolt in the TCM to 2.0-3.2 N·m (18-28 lb in). 3. Start engine. 4. Using the Allison DOC® software and the snap shot feature, check for active codes. 5. If codes are not active with the test TCM installed, then turn ignition **OFF** and re-install the original TCM. 6. Restart engine and check again for active DTCs. **NOTE:** Vehicle must be road tested in order for this code to go active. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Resolve OEM integration issue, e.g., defective brake switch, multiplex signal source, etc. Go to Step 6*
6	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use the Allison DOC® software to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC P0703 return?		*Begin the diagnosis again. Go to Step 1.*	*Repair complete.*

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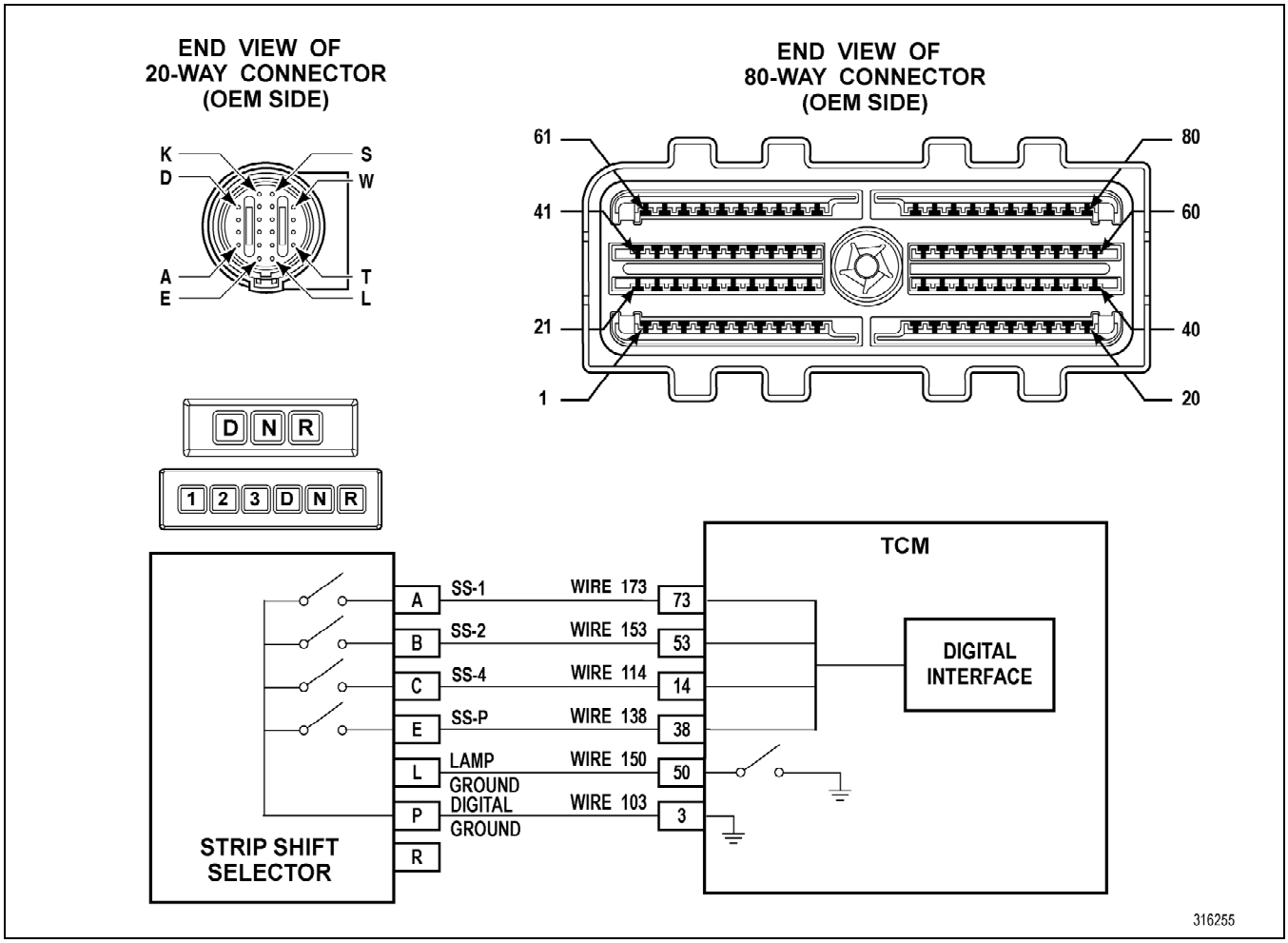
DTC P0708 Transmission Range Sensor Circuit High



Circuit Description

This test monitors whether the transmission range data from the analog strip shift selector is valid.

Action Taken When the DTC Sets

When DTC P0708 is active, the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.
- The TCM ignores input from the analog strip shift selector.
- Locks in **N** (Neutral).

Conditions for Clearing the DTC/CHECK TRANS Light

Allison DOC® may be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Tool Requirements

- Allison DOC®
- J-47275 TCM Breakout Harness

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DTC P0708 Transmission Range Sensor Circuit High *(cont'd)*

- J-39700 Universal Breakout Box
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay

Diagnostic Aids

This DTC may be caused by:

- Short to power or short to another wire in W114, W138, W153, or W173.
- High resistance or open in W114, W138, W153, or W173.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors, unlocked pins, causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for strip shift selector.
- Defective TCM.
- Defective strip shift selector.

The PWM signal characteristics are shown in Table 5–7.

Table 5–7. Strip Shift Selector Parallel Data Table

		Wire Number			
		SS-1 (A)	SS-2 (B)	SS-4 (C)	SS-Parity (E)
Button	Sel Out	173	153	114	138
R	REVERSE	Low**	Low**	Low**	High***
N	NEUTRAL	Low**	High***	High***	High***
D	DRIVE-A	Low**	Low**	High***	Low**
3*	DRIVE-B	High***	Low**	High***	High***
2**	DRIVE-C	High***	Low**	Low**	Low**
1***	DRIVE-D	High***	High***	Low**	High***

* Six-button shift selectors only
** Low is <1V
*** High is >3V

DTC Troubleshooting Test Descriptions

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for shorts to ground or to another wire in chassis harness strip shift selector wiring.
3. Check for high resistance or open circuits in chassis harness strip shift selector wiring.

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DTC P0708 Transmission Range Sensor Circuit High *(cont'd)*

4. Check TCM.
5. Check strip shift selector.
6. If DTC is still active, review diagnostic aids, and applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0708 active?		*Go to Step 2*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect strip selector harness connector from strip selector. 6. Using J-46708 Digital Multimeter, measure the resistance from terminals 14, 38, 53, and 73 J-47275-1 Magnetic Overlay to all other labeled terminals on J-47275-1 Magnetic Overlay and to chassis ground. Does circuit resistance measure 20 kΩ or more from these terminals to all other terminals and chassis ground?	20 kΩ or more	*Go to Step 3*	*Resolve wiring issue with strip shift selector wiring. Go to Step 6*

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DTC P0708 Transmission Range Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Remove J-47275 TCM Breakout Harness and J-39700 Universal Breakout Box. 3. Leave TCM disconnected from chassis harness. 4. Leave strip selector harness disconnected from selector. 5. Using a J-46708 Digital Multimeter, and matching terminals that can be inserted in OEM selector and TCM harness connectors, measure the resistance between terminals A of the strip selector to terminal 73 of the TCM OEM 80-way connector. 6. Repeat task 5 between terminal B of the strip selector and terminal 53 of the OEM 80-way. 7. Repeat task 5 between terminal C of the strip selector and terminal 14 of the OEM 80-way. 8. Repeat task 5 between terminal E of the strip selector and terminal 38 of the OEM 80-way. 9. Repeat task 5 between terminal P of the strip selector and terminal 3 of the OEM 80-way. 10. Repeat task 5 between terminal R of the strip selector and switched power source for selector. **NOTE:** Disconnect switched power source to strip selector before checking resistance in this task. Does circuit resistance measure 2 Ω or less for each wire?	2 Ω or less	*Go to Step 4*	*Address issue with strip shift selector wiring. Go to Step 6 after repairs are made.*
4	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes during road test using the strip shift selector to select all ranges. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Go to Step 5*

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DTC P0708 Transmission Range Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Install test strip shift selector and connect OEM harnesses to strip shift selector 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active DTCs. 6. If DTCs are not active with test strip shift selector installed, then turn ignition **OFF** and reinstall original strip shift selector. 7. Restart engine and check again for active DTCs. Is DTC active with the original strip shift selector and inactive with a test strip shift selector?		*Replace strip shift selector. Go to Step 6*	*If DTC is active with both test strip shift selector and original strip shift selector, then reinstall the original strip shift selector. Review Diagnostic Aids. Go to Step 1*
6	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Acquire new Allison DOC® snapshot while operating vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0708 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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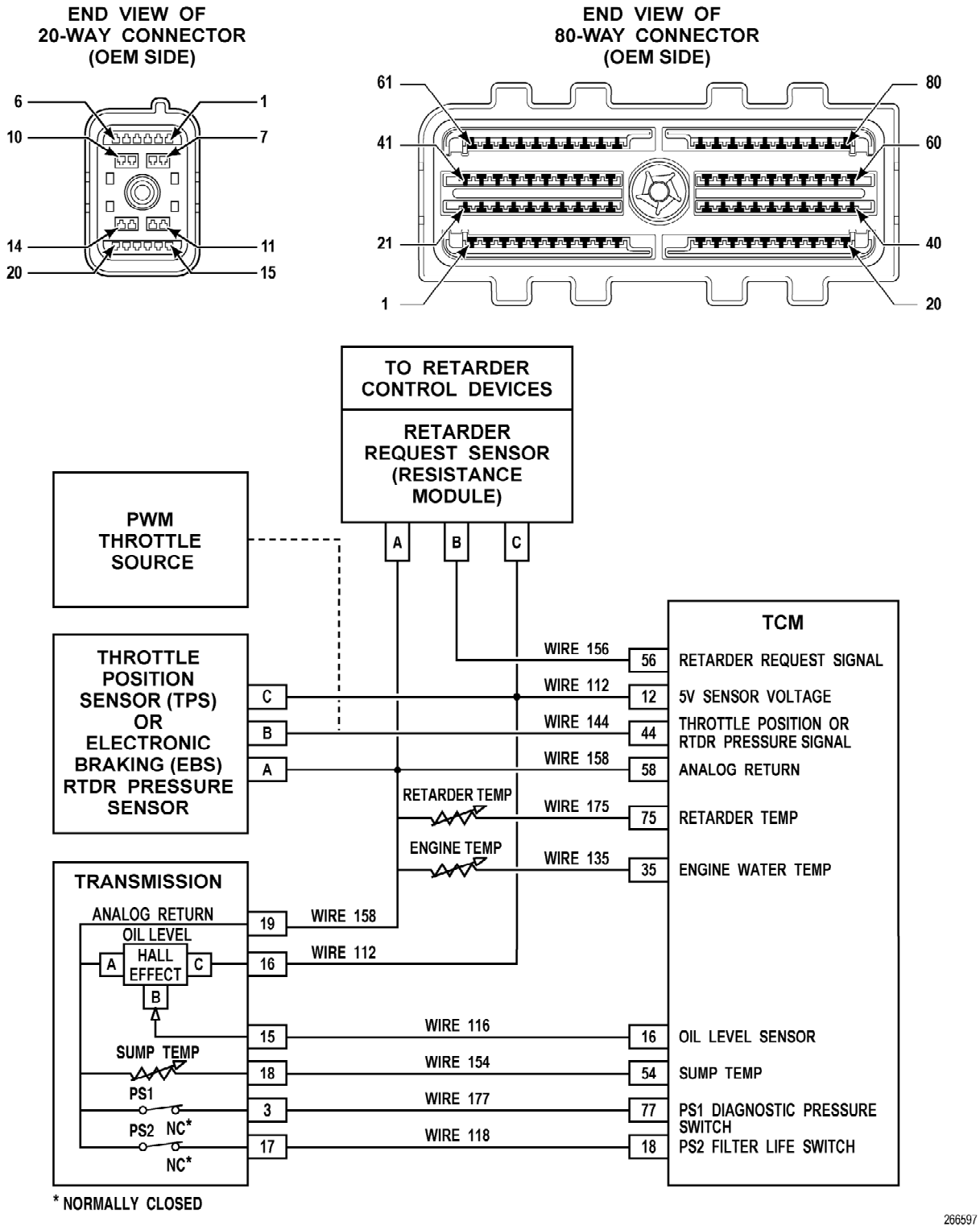
DTC P070C Transmission Fluid Level Sensor Circuit Low



Circuit Description

Most 3000/4000 transmission are equipped with an analog transmission fluid Oil Level Sensor (OLS). This test detects if the OLS signal voltage is in the low error zone.

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

NOTE: The OLS is standard on any 3000 and 4000 Product Families 5th Generation Controls transmissions except for the 3700SPS and 4700/4800 retarder models where it is unavailable.

The TCM is connected to the OLS by:

- a 5V reference voltage (W112),
- OLS signal (W116)
- analog ground (W158).

Action Taken for Active DTC

When DTC P070C is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- Fluid level may not be checked with the OLS.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes forty warm-up cycles without failure.

Diagnostic Aids

NOTE: The OLS may be damaged using a continuity tester or continuity check function using a DMM. Damage to the OLS occurs if 12V is applied to the OLS.

- DTC P070C indicates the TCM has detected a voltage signal from the OLS in the low error zone. This may be caused by the following:
  - open or short to ground in W112 or W116 circuits

NOTE: Shorts or opens in W112 typically will log other sensor failed low DTCs that are using W112 (5V), such as the analog TPS, Electronic Brake System (EBS) pressure sensor, or Retarder Modulation Request (RMR) sensor. Shorts or opens in W116 (OLS signal) only causes DTC P070C.

  - non-OLS application has been autodetected or programmed to 'Present' by the CMC 'Override Oil Level Sensor' as having an OLS when an OLS is not installed
  - missing, defective, or unplugged OLS
  - defective sensor sharing 5V supply with an OLS
  - 5V wire open or grounded in transmission internal harness
  - TCM issue
  - transmission low on fluid
- OLS voltage (signal voltage on W116) is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under the “Connection Options” and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

- The J-39700 Universal Breakout Box may also be used to acquire OLS signal (sensor) voltage on W116. The data monitor values for 'Oil Level Sensor Voltage' and 'Oil Level Deviation' should be checked with the TCM initialized, engine running, and transmission in **N** (Neutral). Transmission fluid temperature must be over the minimum threshold before noting the 'Oil Level Deviation' amount. Both values are useful for troubleshooting OLS performance by:
  - if the sensor signal voltage does not meet requirements shown in "Conditions for Setting the DTC"
  - how the oil level deviation changes when a known quantity of oil is added or removed from the transmission
- Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for transmission model.
3. Check for active code in non-OLS applications.
4. Check fluid level.
5. Check voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing the 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W116, and check the voltage.
8. Check for active code.
9. Check for high resistance or open in W112, W116 or W158 in OLS wiring.
10. Check for short to another wire or ground.
11. Check for DTC P0122.
12. Check for DTC C1312.
13. Check for DTC P0989.

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

14. Check for DTC P1891.
15. Check TCM.
16. Check for shorted internal harness.
17. Check for high resistance in internal harness. If not open, replace the OLS.
18. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P070C active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, Go to Step 18*
2	Is the transmission model a 3700SPS or 4700/4800 Retarder model?		*Set CMC Oil Level Sensor to 'Not Present'. Go to Step 3*	*Go to Step 4*
3	Is DTC P070C still active?		*Go to Step 15*	*Go to Step 18*
4	1. Check transmission fluid is at least to the "Cold Full" mark on the transmission fluid level dipstick with park brake set, engine at idle, and transmission in Neutral. Add approved fluid as necessary. 2. Turn ignition **OFF**. **NOTE:** Low fluid level can cause DTC P070C. 3. Restart engine and check for active DTC P070C. Is DTC P070C active?		*Go to Step 5*	*Go to Step 18*

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s), if equipped. 8. Disconnect OEM chassis harness connector for transmission TPS. 9. Disconnect OEM chassis harness connector for transmission EBS pressure sensor, if equipped. 10. Connect 16-way bypass on J-47275 TCM Breakout Harness. 11. Install J-46708 Digital Multimeter to measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 12. Turn ignition **ON** but do not start engine. 13. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules connector(s) disconnected from the OEM chassis harness, if equipped. 6. Leave OEM chassis harness connector for transmission TPS disconnected. 7. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 8. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 18 after repairs are made.*	*Go to Step 15*

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave transmission TPS assembly disconnected from TPS connector on OEM chassis harness. 6. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 7. Leave RMR devices disconnected from OEM harness, if equipped. 8. Install jumper wire from J-39197-A (Jumper Wire Kit or equivalent), between terminals 15 and 16 of the OEM 20-way transmission connector. 9. Connect J-46708 Digital Multimeter to terminals 12 and 16 of J-47275-1 Magnetic Overlay. 10. Turn ignition **ON** but do not start engine. 11. Start Data Monitor feature in Allison DOC® and observe "OLS Voltage". **NOTE:** If Allison DOC® is not connected, use voltage shown on J-46708 Digital Multimeter. Does voltage meet specification?	4.5-5.4V	*Go to Step 11*	*Address issue with W116. Go to Step 18 after repairs are made.*
8	1. Start engine. 2. Check for active DTC P070C. Is DTC P070C active?		*Go to Step 9*	*Go to Step 18*

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Disconnect 20-way OEM transmission connector from the transmission. 7. Leave transmission TPS assembly disconnected from OEM TPS connector on chassis harness. 8. Leave EBS sensor disconnected from OEM chassis harness, if equipped. 9. Disconnect all RMR resistance modules from OEM chassis harness, if equipped. 10. Install a jumper wire between pin 15 and 19 of the OEM 20-way transmission connector. 11. Using a J-46708 Digital Multimeter, measure the resistance between terminals 16 and 58 at J-47275-1 Magnetic Overlay. 12. Move jumper wire to connect pin 16 and pin 19 in OEM 20-way transmission connector. 13. Measure resistance between terminals 12 and 58 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 10*	*Address issue with W116, W112, or W158. Go to Step 18 after repairs are made.*

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from the OEM 20-way transmission connector and leave connector disconnected from the transmission. 3. Leave RMR modules disconnected from OEM chassis harness, if equipped. 4. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 5. Leave TPS connector disconnected. 6. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 7. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 8. Leave J-47275 TCM Breakout Harness connected. 9. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 16 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and the control valve module and chassis ground. 10. Disconnect OEM connectors for water temp sensor and retarder temp sensor (if equipped). 11. Measure resistance between terminal 12 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and the control valve module and chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 12 and 16 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to the control valve module and chassis ground?	20 kΩ or more	*Go to Step 15*	*Address issue with W116 or W112. Go to Step 18 after repairs are made.*
11	**NOTE:** Skip this step and go to Step 12 if the transmission TPS assembly is not installed. 1. Turn ignition **OFF**. 2. Reconnect the OEM chassis harness connectors to TPS sensor assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from the transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Leave EBS pressure sensor disconnected from OEM harness, if so equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0122. Is DTC P0122 active?		*Go to DTC P0122*	*Go to Step 12*

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
12	**NOTE:** Skip this step and go to Step 13 if transmission RMR modules are not installed. 1. Turn ignition **OFF**. 2. Reconnect the RMR module connectors to transmission RMR assembly. 3. Leave TPS connectors disconnected from TPS assembly. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Leave EBS pressure sensor disconnected from OEM harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC C1312. Is DTC C1312 active?		*Go to DTC C1312*	*Go to Step 13*
13	**NOTE:** Skip this step and go to Step 14 if EBS pressure sensor is not installed in retarder valve body. 1. Turn ignition **OFF**. 2. Disconnect the OEM chassis harness connectors from transmission TPS sensor assembly, if equipped. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Connect EBS pressure sensor to OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0989. Is DTC P0989 active?		*Go to DTC P0989*	*Go to Step 14*

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
14	**NOTE:** Skip this step and go to Step 16 if Pulse Width Modulated (PWM) TPS is not installed. 1. Turn ignition **OFF**. 2. Connect the OEM chassis harness connector to PWM TPS sensor assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Disconnect EBS pressure sensor from OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P1891. Is DTC P1891 active?		*Go to DTC P1891*	*Go to Step 8*
15	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P070C active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 18 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 16*

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DTC P070C Transmission Fluid Level Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
16	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect OLS connector from OLS. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance on J-47279-1 Magnetic Overlay for terminals 16 and 15 and to all other labeled terminals and to the control module. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 15 and 16 to all other labeled terminal locations on J-47279-1 Magnetic Overlay, and also to the control valve module?	20 kΩ or more	*Go to Step 17*	*Repair or replace internal harness. Go to Step 18*
17	1. Turn ignition **OFF**. 2. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Leave magnetic overlay J-47279-1 Magnetic Overlay installed. 4. Install jumper across terminals B and C of OLS internal harness connector. 5. Measure resistance between terminals 15 and 16 at J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace OLS. Go to Step 18*	*Repair or replace internal harness. Go to Step 18*
18	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P070C return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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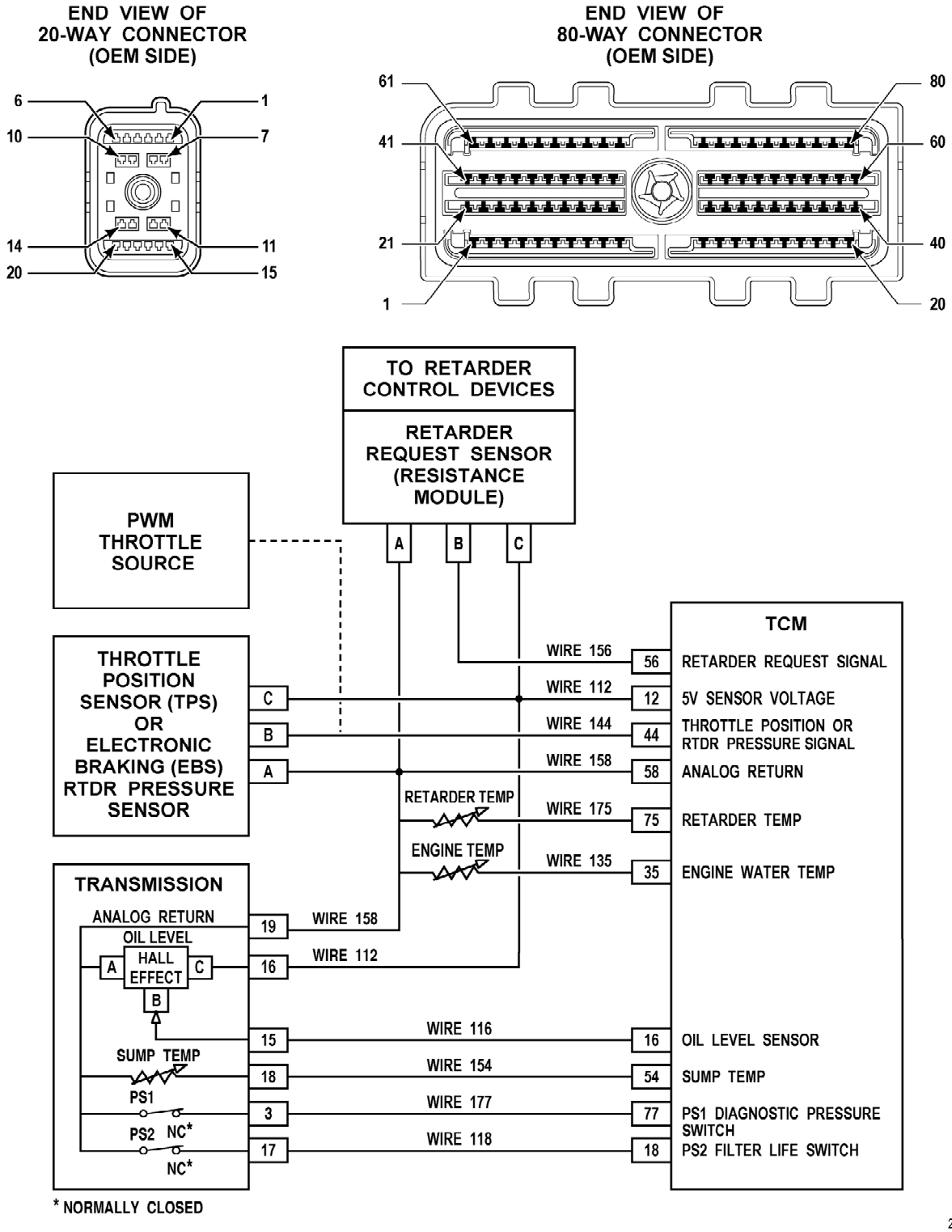
DTC P070D Transmission Fluid Level Sensor Circuit High



Circuit Description

Most 3000/4000 transmission are equipped with an analog transmission fluid Oil Level Sensor (OLS). This test detects if the OLS signal voltage is in the high error zone.

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

NOTE: The OLS is standard on any 3000 and 4000 Product Families transmissions except for the 3700SPS and 4700/4800 retarder models where it is unavailable.

The TCM is connected to the OLS by:

- a 5V reference voltage (W112),
- OLS signal (W116)
- analog ground (W158).

Action Taken for Active DTC

When DTC P070D is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- Fluid level may not be checked with the OLS.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes forty warm-up cycles without failure.

Diagnostic Aids

DTC P070D indicates the TCM has detected a voltage signal from the OLS in the high error zone. This may be caused by the following:

- short to battery in W112 or W116 circuits

NOTE: Shorts to battery in W112 typically will log other sensor failed high DTCs that are using W112 (5V), such as the analog TPS, Electronic Brake System (EBS) pressure sensor, or Retarder Modulation Request (RMR) sensor. Shorts to battery in W116 (OLS signal) only causes DTC P070D.

- non-OLS application has been autodetected or programmed to 'Present' by the CMC 'Override Oil Level Sensor' as having an OLS when an OLS is not installed and W116 or W112 is shorted to battery
- defective OLS
- defective sensor sharing 5V supply with an OLS
- 5V wire shorted to battery in transmission internal harness or chassis harness
- TCM issue
- transmission overfilled
- W158 high resistance or open

OLS voltage (signal voltage on W116) is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under the “Connection Options” and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

The J-39700 Universal Breakout Box may also be used to acquire OLS signal (sensor) voltage on W116. The data monitor values for 'Oil Level Sensor Voltage' and 'Oil Level Deviation' should be checked with the TCM initialized, engine running, and transmission in **N** (Neutral). Transmission fluid temperature must be over the minimum threshold before noting the 'Oil Level Deviation' amount. Both values are useful for troubleshooting OLS performance by:

- if the sensor signal voltage does not meet requirements shown in "Conditions for Setting the DTC"
- how the oil level deviation changes when a known quantity of oil is added or removed from the transmission

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for transmission model.
3. Check for active code in non-OLS applications.
4. Check fluid level.
5. Check voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing the 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W116, and check the voltage.
8. Check for active code.
9. Check for high resistance or open in W112, W116 or W158 in OLS wiring.
10. Check for short to another wire.
11. Check for DTC P0123.
12. Check for DTC C1313.
13. Check for DTC P0990.

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

14. Check for DTC P1892.
15. Check TCM.
16. Check for shorted internal harness.
17. Check for high resistance in internal harness. If not open, replace the OLS.
18. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P070D active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, Go to Step 18*
2	Is the transmission model a 3700SPS or 4700/4800 Retarder model?		*Set CMC Oil Level Sensor to 'Not Present'. Go to Step 3*	*Go to Step 4*
3	Is DTC P070D still active?		*Go to Step 15*	*Go to Step 18*
4	1. Check transmission fluid is not beyond the “Hot Full” mark on the transmission fluid level dipstick with park brake set, engine at idle, and transmission in Neutral. Drain fluid as necessary. 2. Turn ignition **OFF**. **NOTE:** High fluid level can cause DTC P070D. 3. Restart engine and check for active DTC P070D. Is DTC P070D active?		*Go to Step 5*	*Go to Step 18*

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s), if equipped. 8. Disconnect OEM chassis harness connector for transmission TPS. 9. Disconnect OEM chassis harness connector for transmission EBS pressure sensor, if equipped. 10. Connect 16-way bypass on J-47275 TCM Breakout Harness. 11. Install J-46708 Digital Multimeter to measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 12. Turn ignition **ON** but do not start engine. 13. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules connector(s) disconnected from the OEM chassis harness, if equipped. 6. Leave OEM chassis harness connector for transmission TPS disconnected. 7. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 8. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 18 after repairs are made.*	*Go to Step 15*

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave transmission TPS assembly disconnected from TPS connector on OEM chassis harness. 6. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 7. Leave RMR devices disconnected from OEM harness, if equipped. 8. Install jumper wire from J-39197-A (Jumper Wire Kit or equivalent), between terminals 15 and 16 of the OEM 20-way transmission connector. 9. Connect J-46708 Digital Multimeter to terminals 12 and 16 of J-47275-1 Magnetic Overlay. 10. Turn ignition **ON** but do not start engine. 11. Start Data Monitor feature in Allison DOC® and observe "OLS Voltage". **NOTE:** If Allison DOC® is not connected, use voltage shown on J-46708 Digital Multimeter. Does voltage meet specification?	4.5-5.4V	*Go to Step 11*	*Address issue with W116. Go to Step 18 after repairs are made.*
8	1. Start engine. 2. Check for active DTC P070D. Is DTC P070D active?		*Go to Step 9*	*Go to Step 18*

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Disconnect 20-way OEM transmission connector from the transmission. 7. Leave transmission TPS assembly disconnected from OEM TPS connector on chassis harness. 8. Leave EBS sensor disconnected from OEM chassis harness, if equipped. 9. Disconnect all RMR resistance modules from OEM chassis harness, if equipped. 10. Install a jumper wire between pin 15 and 19 of the OEM 20-way transmission connector. 11. Using a J-46708 Digital Multimeter, measure the resistance between terminals 16 and 58 at J-47275-1 Magnetic Overlay. 12. Move jumper wire to connect pin 16 and pin 19 in OEM 20-way transmission connector. 13. Measure resistance between terminals 12 and 58 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 10*	*Address issue with W116, W112, or W158. Go to Step 18 after repairs are made.*

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from the OEM 20-way transmission connector and leave connector disconnected from the transmission. 3. Leave RMR modules disconnected from OEM chassis harness, if equipped. 4. Leave EBS pressure sensor disconnected from OEM chassis harness, if equipped. 5. Leave TPS connector disconnected. 6. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 7. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 8. Leave J-47275 TCM Breakout Harness connected. 9. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 16 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 10. Disconnect OEM connectors for water temp sensor and retarder temp sensor (if equipped). 11. Measure resistance between terminal 12 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 12. Measure resistance between terminal 58 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 12, 16, and 58 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 15*	*Address issue with W116, W112, or W158. Go to Step 18 after repairs are made.*
11	**NOTE:** Skip this step and go to Step 12 if the transmission TPS assembly is not installed. 1. Turn ignition **OFF**. 2. Reconnect the OEM chassis harness connectors to TPS sensor assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from the transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Leave EBS pressure sensor disconnected from OEM harness, if so equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0123. Is DTC P0123 active?		*Go to DTC P0123*	*Go to Step 12*

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
12	**NOTE:** Skip this step and go to Step 13 if transmission RMR modules are not installed. 1. Turn ignition **OFF**. 2. Reconnect the RMR module connectors to transmission RMR assembly. 3. Leave TPS connectors disconnected from TPS assembly. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Leave EBS pressure sensor disconnected from OEM harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC C1313. Is DTC C1313 active?		*Go to DTC C1313*	*Go to Step 13*
13	**NOTE:** Skip this step and go to Step 14 if EBS pressure sensor is not installed in retarder valve body. 1. Turn ignition **OFF**. 2. Disconnect the OEM chassis harness connectors from transmission TPS sensor assembly, if equipped. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Connect EBS pressure sensor to OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P0990. Is DTC P0990 active?		*Go to DTC C1313*	*Go to Step 14*

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
14	**NOTE:** Skip this step and go to Step 16 if Pulse Width Modulated (PWM) TPS is not installed. 1. Turn ignition **OFF**. 2. Connect the OEM chassis harness connector to PWM TPS sensor assembly. 3. Leave all OEM chassis harness RMR connectors disconnected from RMR resistance modules. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Disconnect EBS pressure sensor from OEM harness. 7. Start engine. 8. Using Allison DOC®, check for active DTC P1892. Is DTC P1892 active?		*Go to DTC P1892*	*Go to Step 8*
15	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P070D active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 18 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 16*
16	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect OLS connector from OLS. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminals 15, 16, and 19 and to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 15, 16, and 19 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 17*	*Repair or replace internal harness. Go to Step 18*

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DTC P070D Transmission Fluid Level Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
17	1. Turn ignition **OFF**. 2. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Leave magnetic overlay J-47279-1 Magnetic Overlay installed. 4. Install jumper across terminals B and C of OLS internal harness connector. 5. Measure resistance between terminals 15 and 16 of J-47279-1 Magnetic Overlay. 6. Install jumper across terminal A and C of OLS internal harness connector. 7. Measure resistance between terminals 19 and 16 at J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace OLS. Go to Step 18*	*Repair or replace internal harness. Go to Step 18*
18	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P070D return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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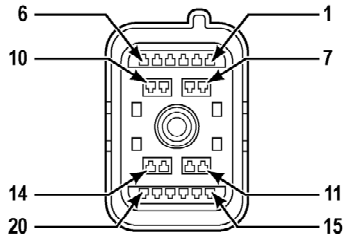
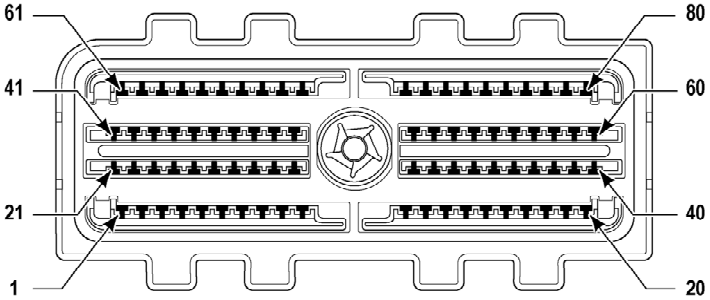
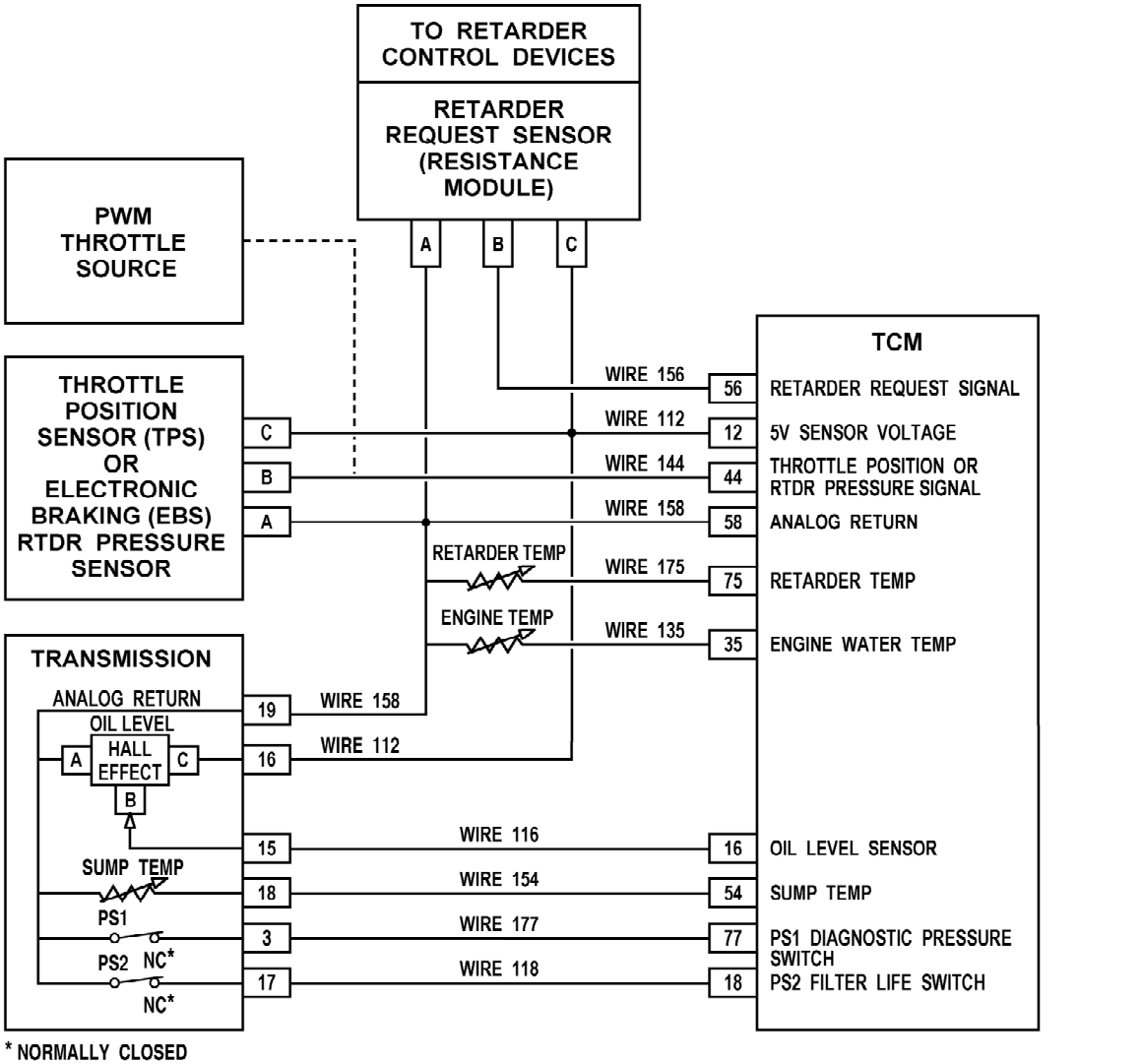
DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance

END VIEW OF
20-WAY CONNECTOR
(OEM SIDE)



END VIEW OF
80-WAY CONNECTOR
(OEM SIDE)





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DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance *(cont'd)*

Circuit Description

The TFT sensor is incorporated into the internal wiring harness. The TFT sensor is a thermistor (thermally sensitive resistor) that changes its resistance value based on the temperature of the transmission fluid. Low fluid temperatures produces a high resistance value while high fluid temperatures produce a low resistance value. This test monitors whether measured fluid temperature change is reasonable.

Action Taken When the DTC Sets

When DTC P0711 is active, the following conditions occur:

- The **CHECK TRANS** light is illuminated.
- DTC is stored in TCM history.
- TCM uses default temperature calibration values for transmission fluid temperature.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes forty warm-up cycles without failure.

Diagnostic Aids

DTC P0711 may be caused by:

- Irregular TCM or vehicle battery power.
- Poor TCM or vehicle battery grounds.
- Incorrect transmission fluid.
- W154 intermittently shorted to another wire or to chassis ground in chassis harness.
- W154 intermittently shorted to another wire or to chassis ground in the internal transmission harness.
- W154 intermittently open circuit in chassis harness.
- W154 (terminal 18 of 20-way) intermittently open circuit in internal transmission harness.
- W158 intermittently open circuit in chassis harness.
- W158 (terminal 19 of 20-way) intermittently open circuit in internal transmission harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked or loose connectors, missing seal plugs allowing moisture in connectors.
- Defective or loose TFT sensor.
- Defective TCM.

TFT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under the “Connection Options” and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if TFT sensor resistance is increasing, decreasing, or stationary with fluid temperature rise and fall. Normal circuit operation is indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

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DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance *(cont'd)*

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for reference voltage with 20-way disconnected.
3. Check for reference voltage with bypass connector disconnected.
4. Check for intermittent open circuit in W154 or W158 in chassis harness.
5. Check for intermittent short from W154 to another wire in chassis harness or to chassis ground.
6. Check TCM.
7. Check for intermittent open circuit in internal harness.
8. Check for intermittent short circuit to another wire in internal harness to the control valve module; also, check for loose or defective TFT sensor.
9. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0711 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 9*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Connect 16-way bypass on J-47275 TCM Breakout Harness. 8. Turn ignition **ON** but do not start engine. 9. Install J-46708 DMM and measure voltage between terminals 54 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Go to Step 4*	*Go to Step 3*

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DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave J-46708 DMM connected between terminals 54 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 6. Turn ignition **ON** but do not start engine. 7. Measure voltage between terminals 54 and 58 at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Address issue with W154 or W158. Go to Step 9 after repairs are made.*	*Go to Step 6*
4	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave 20-way OEM transmission connector disconnected from the transmission. 6. Install a jumper wire between pin 18 and 19 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 54 and 58 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 5*	*Address issue with W154 or W158. Go to Step 9 after repairs are made.*

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DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect retarder TFT sensor and engine water temp sensor (if used as analog signal to TCM). 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 54 and every other labeled terminal shown on J-47275-1 Magnetic Overlay, and to the control valve module. 7. Repeat task 6 using terminals 35 and 75 (if equipped). Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 54, 35, and 75 to all other labeled terminal locations on J-47275-1 Magnetic Overlay, and to the control valve module?	20 kΩ or more	*Go to Step 6*	*Address issue with W154, W175, or W135. Go to Step 9 after repairs are made.*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0711 active with original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 9 after repairs are made.*	*If DTC active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect TFT sensor connector from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 18 to all other labeled terminals on J-47279-1 Magnetic Overlay, and to the control valve module. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 18 to all other labeled terminal locations on J-47279-1 Magnetic Overlay, and to the control valve module?	20 kΩ or more	*Go to Step 8*	*Repair or replace internal harness. Go to Step 9*
8	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Install jumper across terminals A and B of TFT sensor internal harness connector. 4. Measure resistance between terminals 18 and 19 at J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace TFT sensor. Go to Step 9*	*Repair or replace internal harness. Go to Step 9*
9	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0711 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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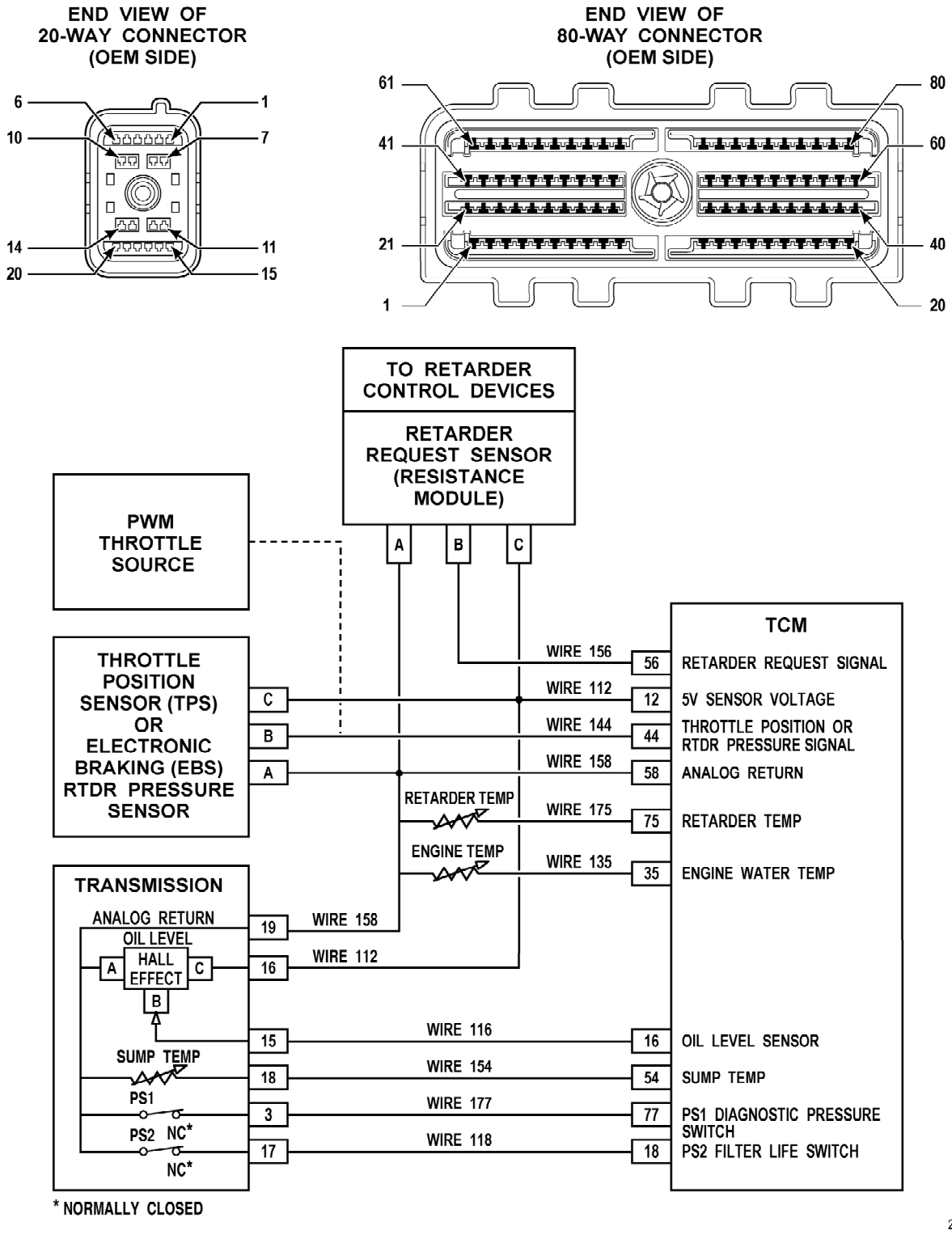
DTC P0712 Transmission Fluid Temperature Sensor Circuit Low



Circuit Description

The Transmission Fluid Temperature (TFT) sensor is incorporated into the internal wiring harness. The TFT sensor changes its resistance value based on the temperature of the transmission fluid. Low fluid

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DTC P0712 Transmission Fluid Temperature Sensor Circuit Low *(cont'd)*

temperatures produces a high resistance value while high fluid temperatures produce a low resistance value. This test detects whether the TFT sensor resistance is in the low error zone.

Action Taken When the DTC Sets

When DTC P0712 is active, the following conditions occur:

- The **CHECK TRANS** light is illuminated.
- DTC is stored in TCM history.
- TCM uses engine coolant temperature or default temperature calibration value for transmission fluid temperature.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes forty warm-up cycles without failure.

Diagnostic Aids

DTC P0712 can be caused by:

- Incorrect transmission fluid.
- W154 shorted to ground or to another wire in chassis harness.
- W154 shorted to ground or to another wire in the internal transmission harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TFT sensor.
- Defective TCM.
- Transmission fluid temperature in control valve module reaching over 160°C (320°F). Monitor fluid temperature using Allison DOC® and review transmission overheat information in 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS.

TFT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under the “Connection Options” and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if TFT sensor resistance is increasing, decreasing, or stationary with fluctuations in fluid temperature. Normal circuit operation is indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness

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DTC P0712 Transmission Fluid Temperature Sensor Circuit Low *(cont'd)*

- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check fluid level is correct.
3. Check for W154 for short to ground or shorted to another wire in chassis harness.
4. Check TCM.
5. Check for short to ground or short to another wire at terminal location 18 of transmission internal harness.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0712 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*

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DTC P0712 Transmission Fluid Temperature Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
2	**NOTE:** Low or high fluid level can cause DTC P0712. 1. With the engine at idle, transmission in **N** (Neutral), and the park brake set, check the transmission fluid level using the OLS (if equipped) or the dipstick. 2. Turn ignition **OFF**. 3. Add or remove fluid as necessary. 4. Start engine and recheck fluid level. 5. Check for active DTC P0712. Is DTC P0712 active?		*Go to Step 3*	*Go to Step 6*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 6. Disconnect OEM 20-way connector from transmission. 7. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 54 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 54 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W154. Go to Step 6 after repairs are made.*
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0712 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*

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DTC P0712 Transmission Fluid Temperature Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect TFT sensor connector from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 18 and to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 18 to all other labeled terminal locations on J-47279-1 Magnetic Overlay, and also to the control module?	20 kΩ or more	*Replace TFT sensor. Go to Step 6*	*Repair or replace internal harness. Go to Step 6*
6	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0712 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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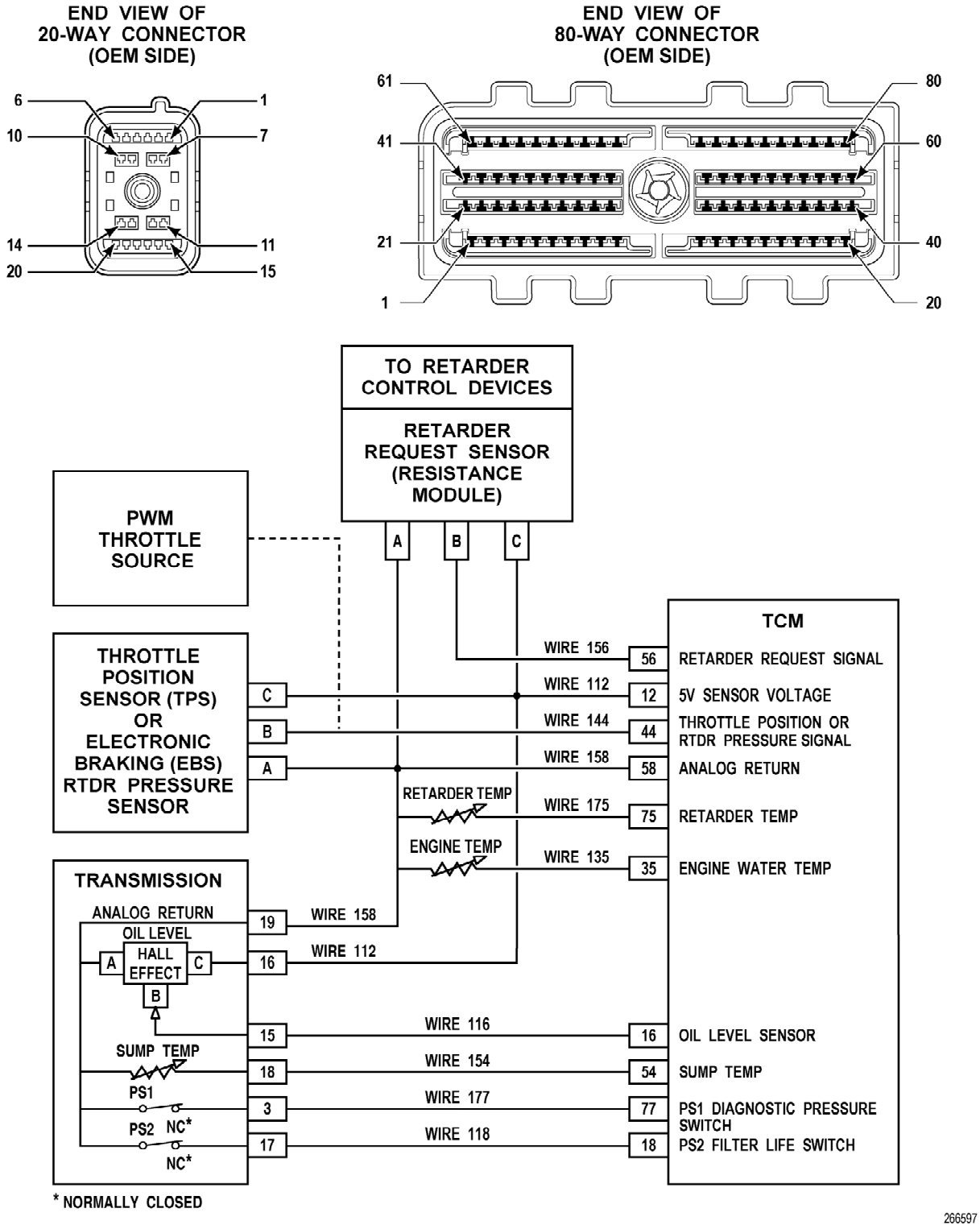
DTC P0713 Transmission Fluid Temperature Sensor Circuit High



Circuit Description

The Transmission Fluid Temperature (TFT) sensor is incorporated into the internal wiring harness. The TFT sensor changes its resistance value based on the temperature of the transmission fluid. Low fluid

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DTC P0713 Transmission Fluid Temperature Sensor Circuit High *(cont'd)*

temperatures produces a high resistance value while high fluid temperatures produce a low resistance value. This test detects whether the TFT sensor resistance is in the high error zone.

Action Taken When the DTC Sets

When DTC P0713 is active, the following conditions occur:

- The **CHECK TRANS** light is illuminated.
- DTC is stored in TCM history.
- TCM uses engine coolant temperature or default temperature calibration value for transmission fluid temperature.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes forty warm-up cycles without failure.

Diagnostic Aids

NOTE: If DTC P0713 is accompanied by DTC P2743 or P2185, check for short to battery on W135, W154 or W175. Follow DTC P0713 steps first if in history with DTC 2743 or P2185.

DTC P0713 can be caused by:

- Transmission fluid not correct.
- W154 shorted to another wire in chassis harness.
- W154 shorted to another wire in the internal transmission harness.
- W154 open circuit in chassis harness.
- W154 (terminal 18 of 20-way) open circuit in internal transmission harness.
- W158 open circuit in chassis harness.
- W158 (terminal 19 of 20-way) open circuit in internal transmission harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TFT sensor.
- Defective TCM.
- Transmission fluid temperature in control valve module below -10°C (-40°F).

TFT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under the “Connection Options” and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if TFT sensor resistance is increasing, decreasing, or stationary with fluid temperature increase and decrease. Normal circuit operation indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

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DTC P0713 Transmission Fluid Temperature Sensor Circuit High *(cont'd)*

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for reference voltage with 20-way disconnected.
3. Check for reference voltage with bypass connector disconnected.
4. Check for open circuit in W154 or W158 in chassis harness.
5. Check for short from W154 to another wire in chassis harness.
6. Check TCM.
7. Check for open circuit in internal harness.
8. Check for short circuit to another wire in internal harness or defective TFT sensor.
9. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0713 Transmission Fluid Temperature Sensor Circuit High *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0713 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 9*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Connect 16-way bypass on J-47275 TCM Breakout Harness. 8. Turn ignition **ON** but do not start engine. 9. Install J-46708 Digital Multimeter and measure voltage between terminals 54 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Go to Step 4*	*Go to Step 3*

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DTC P0713 Transmission Fluid Temperature Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave J-46708 Digital Multimeter connected between terminals 54 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 6. Turn ignition **ON** but do not start engine. 7. Measure voltage between terminals 54 and 58 at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Address issue with W154 or W158. Go to Step 9 after repairs are made.*	*Go to Step 6*
4	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave 20-way OEM transmission connector disconnected from the transmission. 6. Install a jumper wire between pin 18 and 19 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 54 and 58 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 5*	*Address issue with W154, or W158. Go to Step 9 after repairs are made.*

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DTC P0713 Transmission Fluid Temperature Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect retarder TFT sensor and engine water temp sensor if used as analog signal for transmission. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 54 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 7. Repeat task 6 using terminals 35 and 75 (if equipped). Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 54, 35, and 75 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Address issue with W154, W175, or W135. Go to Step 9 after repairs are made.*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0713 active with original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 9 after repairs are made.*	*If DTC active with both test TCM and original TCM, do not replace TCM. Go to Step 7*
7	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect TFT sensor connector from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 18 and to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 18 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 8*	*Repair or replace internal harness. Go to Step 9*

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DTC P0713 Transmission Fluid Temperature Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Install jumper across terminals A and B of TFT sensor internal harness connector. 4. Measure resistance between terminals 18 and 19 at J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace TFT sensor. Go to Step 9*	*Repair or replace internal harness. Go to Step 9*
9	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0713 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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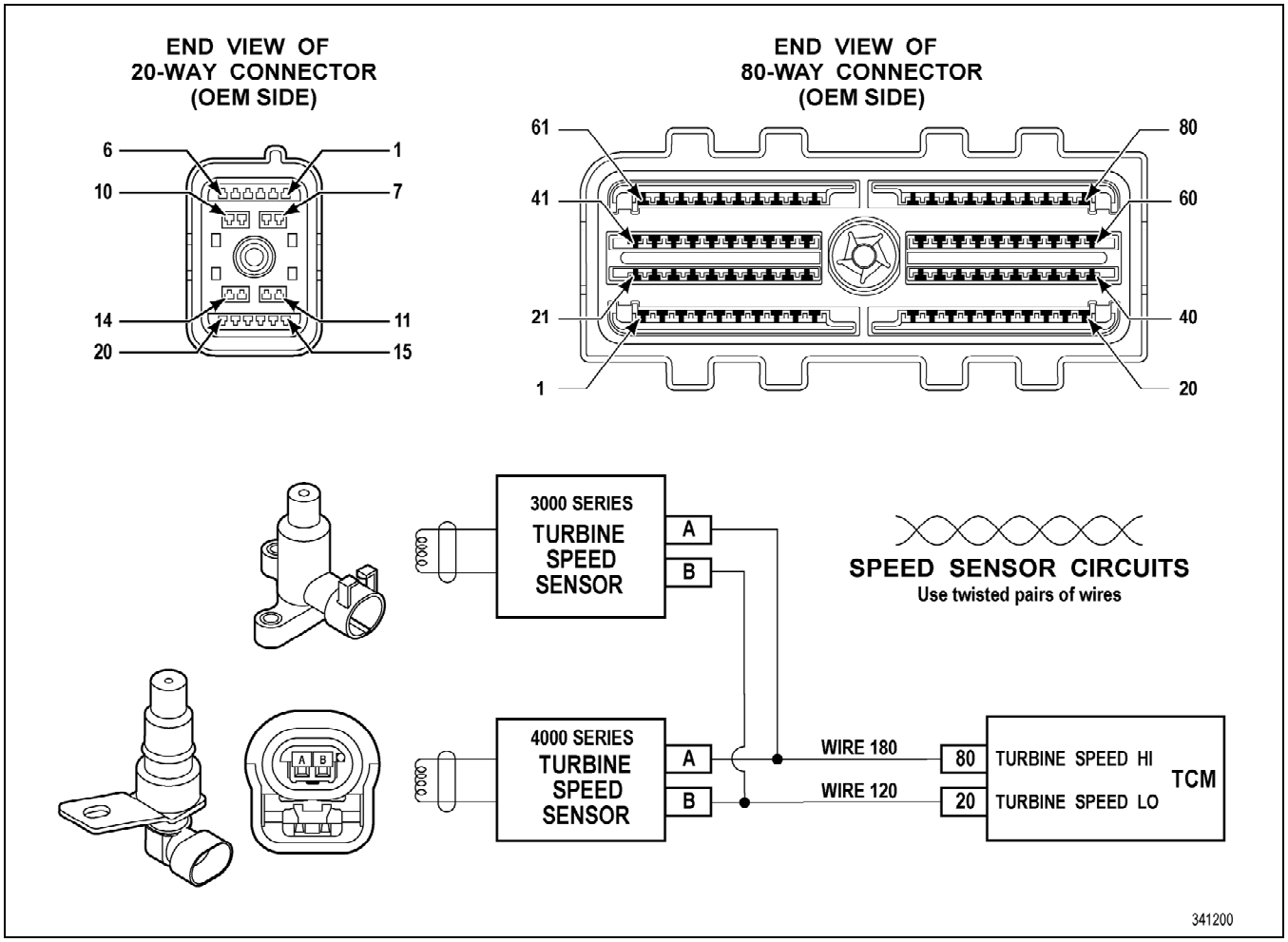
DTC P0715 Turbine Shaft Speed Sensor Circuit



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test detects a turbine speed sensor circuit short to battery, ground, or open.

Action Taken When the DTC Sets

When DTC P0715 is active, the following conditions occur:

- If the DTC sets while shift not in process, remains in current range.
- If the DTC sets while shift is in process, complete shift and lock in that range.
- There is no response to shift selector requests.
- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts.

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DTC P0715 Turbine Shaft Speed Sensor Circuit *(cont'd)*

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0715 may be caused by:

- W120 and/or W180 shorted to another wire in chassis harness or to ground.
- W120 and/or W180 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective turbine shaft speed sensor.
- Defective TCM.
- Damaged rotating clutch drum.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Confirm that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

NOTE: Allison Transmission warranty, or the extended coverage for parts and labor, does not cover transmission or vehicle damage caused by drivelines that do not meet Allison Transmission, Inc. specifications.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-472791 Magnetic Overlay

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DTC P0715 Turbine Shaft Speed Sensor Circuit *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check turbine shaft speed sensor circuit resistance.
3. Check W120 and W180 for high resistance.
4. Check W120 and W180 for short to another wire or ground.
5. Check TCM.
6. For 3000 Product Families, check internal harness for short to another wire or short to ground.
7. For 3000 Product Families, check internal harness for high resistance or open circuit.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0715 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*

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DTC P0715 Turbine Shaft Speed Sensor Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 20 and 80 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–8?	Table 5–8	*Go to Step 4*	*Go to Step 3*
3	1. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 2. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. For 4000 Product Families, follow tasks 5 and 6. For 3000 Product Families, follow tasks 7 and 8. 5. Disconnect turbine shaft speed sensor from OEM harness. 6. Install a jumper wire between terminals A and B of turbine shaft speed sensor harness connector. 7. Disconnect OEM 20-way connector from transmission. 8. Install a jumper wire between terminals 13 and 14 of OEM 20-way transmission connector. 9. Using a J-46708 Digital Multimeter, measure the resistance between terminals 20 and 80 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*For 4000 Product Families, replace turbine shaft speed sensor and go to Step 8. For 3000 Product Families, go to Step 6*	*Address issue with W120 or W180. Go to Step 8 after repairs are made.*

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DTC P0715 Turbine Shaft Speed Sensor Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. For 4000 Product Families, disconnect turbine shaft speed sensor from chassis harness, if not disconnected yet. For 3000 Product Families, disconnect 20-way transmission connector. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 20 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 5. Repeat task 4 using terminal 80. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 20 and 80 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W120 or W180. Go to Step 8 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0715 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. For 4000 Product Families, replace turbine shaft speed sensor and go to Step 8. For 3000 Product Families, go to Step 6*

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DTC P0715 Turbine Shaft Speed Sensor Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect connector from turbine shaft speed sensor. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminals 13 and 14 and to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control valve module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 13 and 14 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 7*	*Repair or replace internal harness. Go to Step 8*
7	1. Leave ignition **OFF**. 2. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Leave magnetic overlay J-47279-1 Magnetic Overlay installed. 4. Install a jumper across terminals A and B of turbine shaft speed sensor internal harness connector. 5. Measure resistance between terminals 13 and 14 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace turbine shaft speed sensor. Go to Step 8*	*Repair or replace internal harness. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0715 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0715 Turbine Shaft Speed Sensor Circuit *(cont'd)*

Table 5–8. Turbine Shaft Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°
* Sensors meet specification at ± 25 Ω of nominal value		

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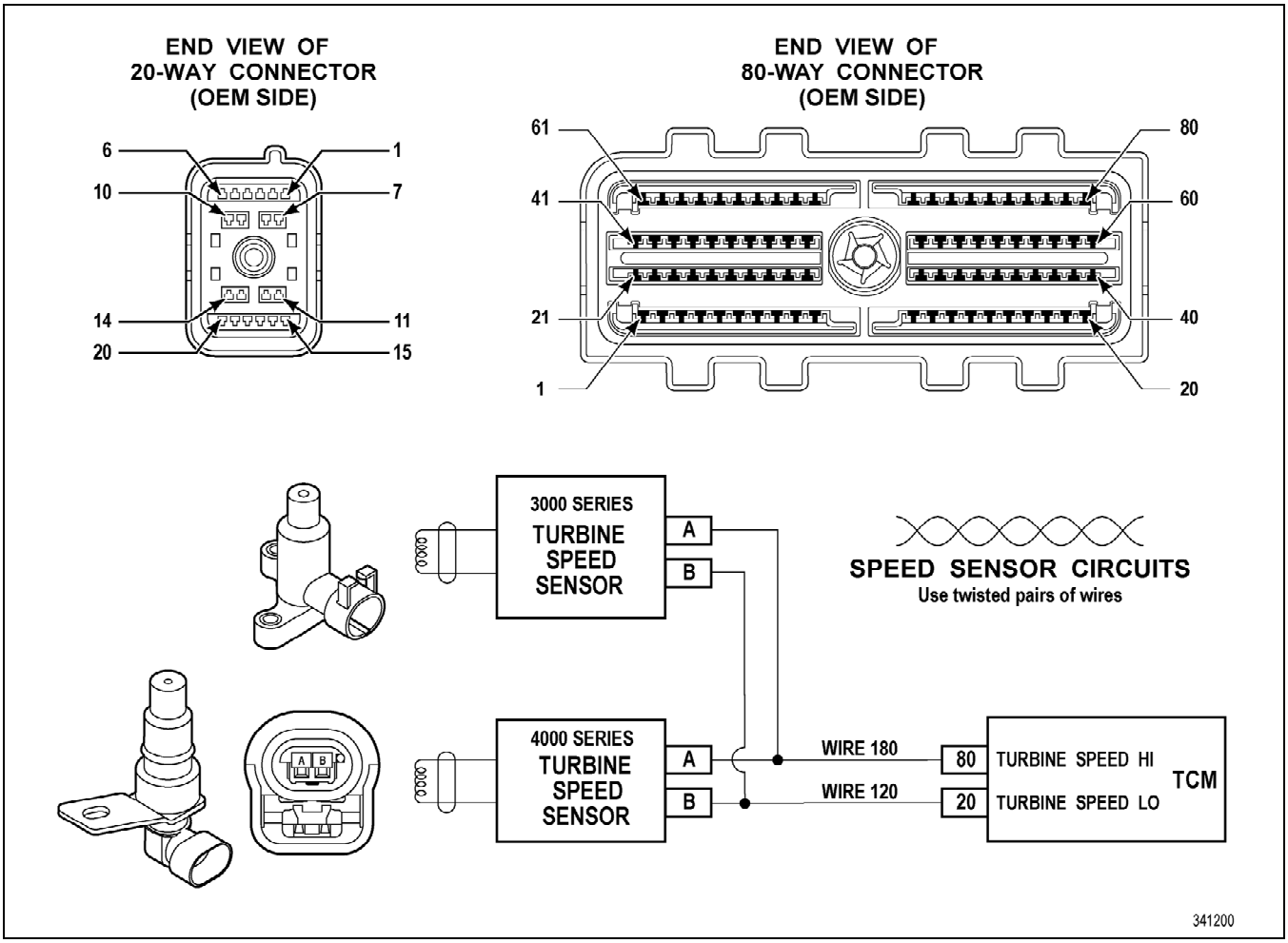
DTC P0716 Turbine Shaft Speed Sensor Circuit Performance



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test monitors whether measured turbine speed change is reasonable.

Action Taken When the DTC Sets

When DTC P0716 is active, the following conditions occur:

- If the DTC sets while shift not in process, remains in current range.
- If the DTC sets while shift is in process, complete shift and lock in that range.
- There is no response to shift selector requests.
- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts.

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DTC P0716 Turbine Shaft Speed Sensor Circuit Performance *(cont'd)*

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0716 may be caused by:

- W120 and/or W180 shorted to another wire in chassis harness or to ground.
- W120 and/or W180 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective turbine shaft speed sensor.
- Defective TCM.
- Damaged rotating clutch drum.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Confirm that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

NOTE: Allison Transmission warranty, or the extended coverage for parts and labor, does not cover transmission or vehicle damage caused by drivelines that do not meet Allison Transmission, Inc. specifications.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-472791 Magnetic Overlay

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DTC P0716 Turbine Shaft Speed Sensor Circuit Performance *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check turbine shaft speed sensor circuit resistance.
3. Check W120 and W180 for high resistance.
4. Check W120 and W180 for short to another wire or ground.
5. Check TCM.
6. For 3000 Product Families, check internal harness for short to another wire or short to ground.
7. For 3000 Product Families, check internal harness for high resistance or open circuit.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0716 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*

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DTC P0716 Turbine Shaft Speed Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 20 and 80 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–9?	Table 5–9	*Go to Step 4*	*Go to Step 3*
3	1. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 2. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. For 4000 Product Families, follow tasks 5 and 6. For 3000 Product Families, follow tasks 7 and 8. 5. Disconnect turbine shaft speed sensor from OEM harness. 6. Install a jumper wire between terminals A and B of turbine shaft speed sensor harness connector. 7. Disconnect OEM 20-way connector from transmission. 8. Install a jumper wire between terminals 13 and 14 of OEM 20-way transmission connector. 9. Using a J-46708 Digital Multimeter, measure the resistance between terminals 20 and 80 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*For 4000 Product Families, replace turbine shaft speed sensor and go to Step 8. For 3000 Product Families, go to Step 6*	*Address issue with W120 or W180. Go to Step 8 after repairs are made.*

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DTC P0716 Turbine Shaft Speed Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. For 4000 Product Families, disconnect turbine shaft speed sensor from chassis harness, if not disconnected yet. For 3000 Product Families, disconnect 20-way transmission connector. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 20 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 5. Repeat task 4 using terminal 80. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 20 and 80 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W120 or W180. Go to Step 8 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0716 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. For 4000 Product Families, replace turbine shaft speed sensor and go to Step 8. For 3000 Product Families, go to Step 6*

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DTC P0716 Turbine Shaft Speed Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect connector from turbine shaft speed sensor. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminals 13 and 14 and to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control valve module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 13 and 14 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 7*	*Repair or replace internal harness. Go to Step 8*
7	1. Leave ignition **OFF**. 2. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Leave magnetic overlay J-47279-1 Magnetic Overlay installed. 4. Install a jumper across terminals A and B of turbine shaft speed sensor internal harness connector. 5. Measure resistance between terminals 13 and 14 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace turbine shaft speed sensor. Go to Step 8*	*Repair or replace internal harness. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0716 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0716 Turbine Shaft Speed Sensor Circuit Performance *(cont'd)*

Table 5–9. Turbine Shaft Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°
* Sensors meet specification at ± 25 Ω of nominal value		

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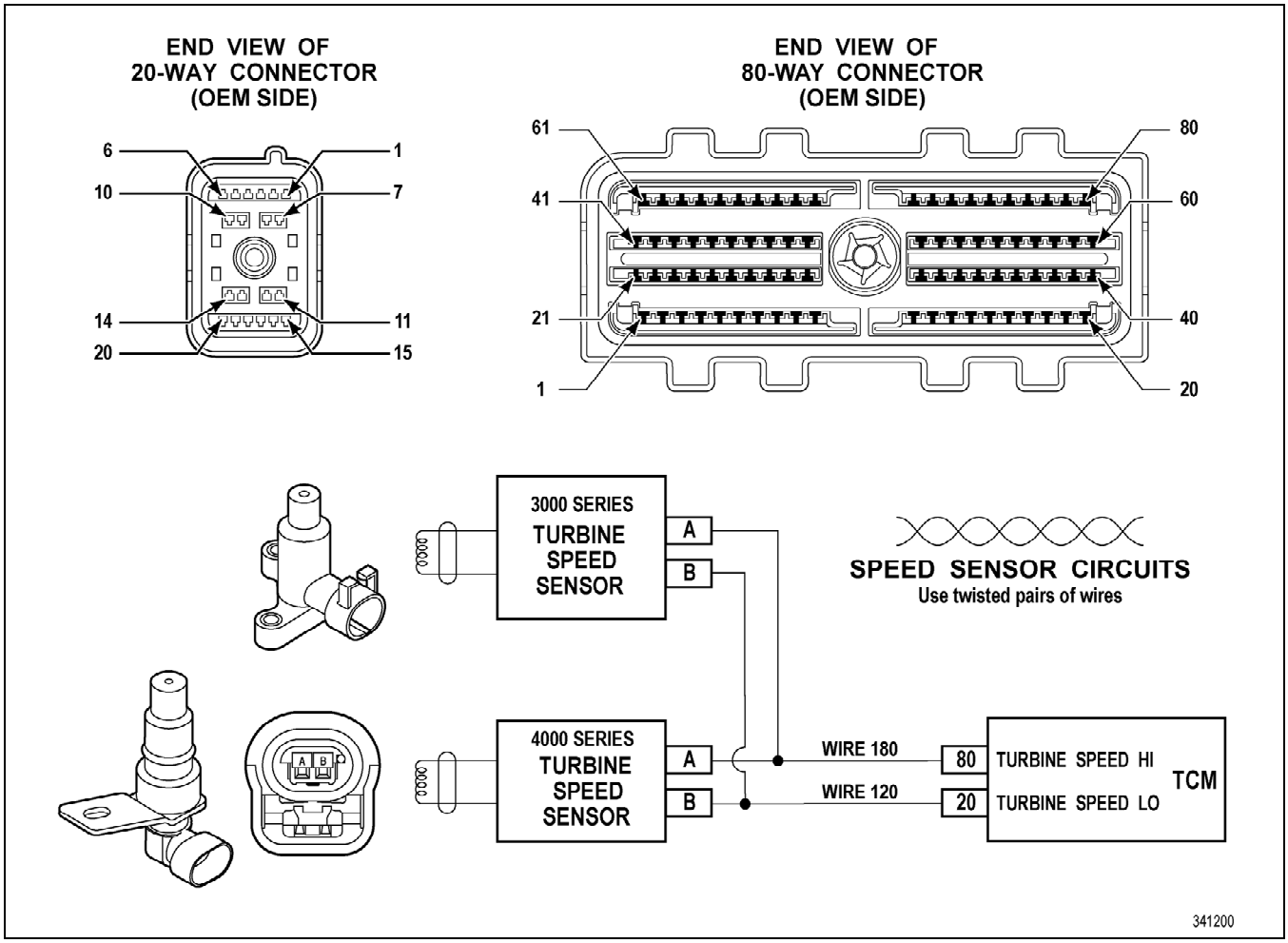
DTC P0717 Turbine Shaft Speed Sensor Circuit No Signal



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test checks for unrealistically low values for turbine speed.

Action Taken When the DTC Sets

When DTC P0717 is active, the following conditions occur:

- If the DTC sets while shift not in process, remains in current range.
- If the DTC sets while shift is in process, complete shift and lock in that range.
- There is no response to shift selector requests.
- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts.

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DTC P0717 Turbine Shaft Speed Sensor Circuit No Signal *(cont'd)*

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0717 may be caused by:

- W120 and/or W180 shorted to another wire in chassis harness or to ground.
- W120 and/or W180 high resistance or open circuit.
- Broken or defective connector assemblies causing pins to short together.
- Unlocked connectors, missing or damaged seals, missing seal plugs that allow moisture into connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective turbine shaft speed sensor.
- Defective TCM.
- Damaged rotating clutch drum.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Confirm that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

NOTE: Allison Transmission warranty, or the extended coverage for parts and labor, does not cover transmission or vehicle damage caused by drivelines that do not meet Allison Transmission, Inc. specifications.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-472791 Magnetic Overlay

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DTC P0717 Turbine Shaft Speed Sensor Circuit No Signal *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check turbine shaft speed circuit resistance.
3. Check W120 and W180 for high resistance.
4. Check W120 and W180 for short to another wire or ground.
5. Check TCM.
6. For 3000 Product Families, check internal harness for short to another wire or short to ground.
7. For 3000 Product Families, check internal harness for high resistance or open circuit.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0717 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*

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DTC P0717 Turbine Shaft Speed Sensor Circuit No Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 20 and 80 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–10?	Table 5–10	*Go to Step 4*	*Go to Step 3*
3	1. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 2. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. For 4000 Product Families, follow tasks 5 and 6. For 3000 Product Families, follow tasks 7 and 8. 5. Disconnect turbine shaft speed sensor from OEM harness. 6. Install a jumper wire between terminals A and B of turbine shaft speed sensor harness connector. 7. Disconnect OEM 20-way connector from transmission. 8. Install a jumper wire between terminals 13 and 14 of OEM 20-way transmission connector. 9. Using a J-46708 Digital Multimeter, measure the resistance between terminals 20 and 80 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*For 4000 Product Families, replace turbine shaft speed sensor and go to Step 8. For 3000 Product Families, go to Step 6*	*Address issue with W120 or W180. Go to Step 8 after repairs are made.*

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DTC P0717 Turbine Shaft Speed Sensor Circuit No Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. For 4000 Product Families, disconnect turbine shaft speed sensor from chassis harness, if not disconnected yet. For 3000 Product Families, disconnect 20-way transmission connector. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 20 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 5. Repeat task 4 using terminal 80. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 20 and 80 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W120 or W180. Go to Step 8 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and drive vehicle above 150 rpm output speed. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0717 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. For 4000 Product Families, replace turbine shaft speed sensor and go to Step 8. For 3000 Product Families, go to Step 6*

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DTC P0717 Turbine Shaft Speed Sensor Circuit No Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect connector from turbine shaft speed sensor. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminals 13 and 14 and to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control valve module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 13 and 14 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 7*	*Repair or replace internal harness. Go to Step 8*
7	1. Leave ignition **OFF**. 2. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Leave magnetic overlay J-47279-1 Magnetic Overlay installed. 4. Install a jumper across terminals A and B of turbine shaft speed sensor internal harness connector. 5. Measure resistance between terminals 13 and 14 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace turbine shaft speed sensor. Go to Step 8*	*Repair or replace internal harness. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0717 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0717 Turbine Shaft Speed Sensor Circuit No Signal *(cont'd)*

Table 5–10. Turbine Shaft Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°
* Sensors meet specification at ± 25 Ω of nominal value		

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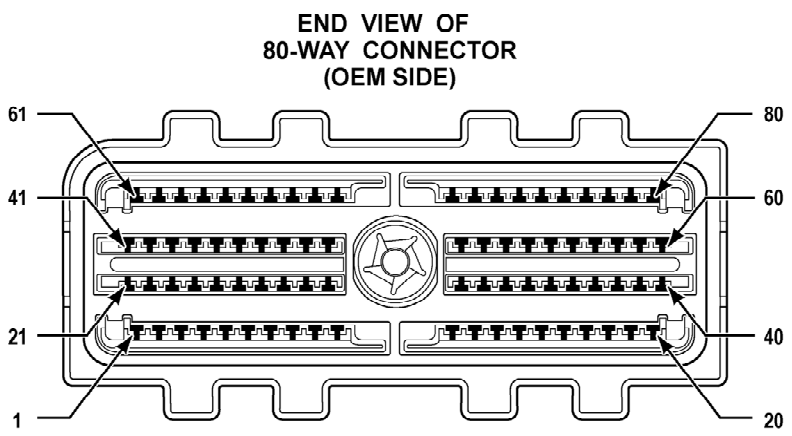
DTC P071A Neutral at Stop Input Failed On



Circuit Description

When Function AS: Neutral at Stop is active, the Transmission Control Module (TCM) automatically commands transmission operation at a reduced load state similar to Neutral (N). The purpose of the function is to reduce the load on the engine when the vehicle is stopped which improves fuel economy and also reduces heat load of the transmission in high start/stop duty cycles. To activate Neutral at Stop, the vehicle must be in first range, at a stop, service brakes applied, accelerator pedal approximately at 0%, and the TCM GPI terminal for Neutral at Stop must see V+, V Ign, or V Bat. Neutral at Stop deactivates when the service brake is released. Supplemental controls such as a door switch or a Neutral at Stop enable dash switch may be wired in series with the service brake pressure switch; alternately, a vehicle Programmable Logic Controller (PLC) output may switch the Neutral at Stop signal as a result of a service brake pressure switch input to the PLC. The signal used to activate Neutral at Stop may be on W102, W123 or W143, depending upon which Input/Output (I/O) package was selected in the TCM calibration. Neutral at Stop typically uses a switch-to-battery input (analog). Refer to the Allison DOC® Technician's Library 5th Gen I/O Functions for Neutral at Stop wiring diagrams. This test monitors whether the Neutral at Stop input status is in a stuck "ON" or "OFF" state.

In some applications, in addition, this test counts how many deceleration events occur while Neutral At Stop indicates “OFF” and the engine running time while in range. Failure is when the number of event exceeds a calibration and the engine running time exceeds a calibrated time.

Table 5–11. Neutral at Stop

GPI#	GPI Type	TCM Pin Number	Wire Number	Wire Color	Termination Point(s)
1	+	23	123	Green	Service Brake Pressure Switch to V+ or PLC Output
2	+	2	102	Yellow	Service Brake Pressure Switch to V+ or PLC Output
3	+	43	143	Blue	Service Brake Pressure Switch to V+ or PLC Output

Action Taken When the DTC Sets

When DTC P071A is active, the following conditions occur:

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DTC P071A Neutral at Stop Input Failed On *(cont'd)*

- The DTC is stored in the TCM history.
- The TCM does not illuminate the **CHECK TRANS** light.
- TCM inhibits Neutral at Stop operation.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC® software may be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Tool Requirements

- Allison DOC®

Diagnostic Aids

This DTC may be caused by:

- Short to power or short to another wire for the GPI circuit controlling Neutral at Stop feature; i.e., W102, W123, or W143.
- Service brake integrations: defective switch or incorrect wiring; e.g., pressure switches are closed when they should be open. If Neutral at Stop enable switch or door switch is integrated in series, all switches would need to be stuck closed or wired on the wrong side of switches; e.g., normally closed side versus normally open side.
- PLC Neutral at Stop integrations: a miswired, misprogrammed, or defective circuit from PLC controlling the TCM GPI signal for Neutral at Stop that is maintaining circuit above 3.4 volts with service brakes released.
- Neutral at Stop enabled in TCM programming error.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for switching GPI circuit controlling Neutral at Stop; e.g., PLC, vehicle ignition, body controller, etc.
- Defective TCM.

DTC Troubleshooting Test Descriptions

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for Neutral at Stop response.
3. Check Neutral at Stop response with wire removed from OEM TCM 80-way connector.
4. Check the TCM.
5. If DTC is still active, review diagnostic aids, and applicable information in the Universal Allison DOC® Technician's Library.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to BEGINNING THE TROUBLESHOOTING PROCESS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P071A Neutral at Stop Input Failed On *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or body builder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect the Allison DOC® software. 2. Start engine. 3. Record snapshot using the Allison DOC® software showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P071A active?		*Go to Step 2*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 6*
2	1. Start engine. 2. Select **D** (Drive) and release the service brake. 3. Start Data Monitor feature in Allison DOC®. 4. Check status of Neutral at Stop input function and wire state. Are Neutral at Stop function and wire state OFF?		*Go to Step 5*	*Go to Step 3*
3	1. Turn ignition **ON**. 2. Remove Neutral at Stop input wire from OEM side of TCM 80-way. 3. Repeat tasks listed in Step 2. Are Neutral at Stop function and wire state OFF?		*Repair condition causing high voltage on Neutral at Stop input wire. Review Diagnostic Aids. Go to Step 6*	*Go to Step 5*
4	1. If the service outlet is authorized to use the TCM Reflash software, recalibrate the original TCM with the latest calibration and software 2. Once the TCM recalibration is complete, use the Allison DOC® software to check for active DTCs. Is DTC P071A active after reprogramming the TCM?		*Go to Step 5*	*Go to Step 6*

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DTC P071A Neutral at Stop Input Failed On *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine, select **D** (Drive) and release service brake. 5. Using the Allison DOC® software, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Repeat tasks 4 and 5. Is DTC P071A active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
6	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P071A return?		*Begin the diagnosis again. Go to Step 1*	*Repair complete.*

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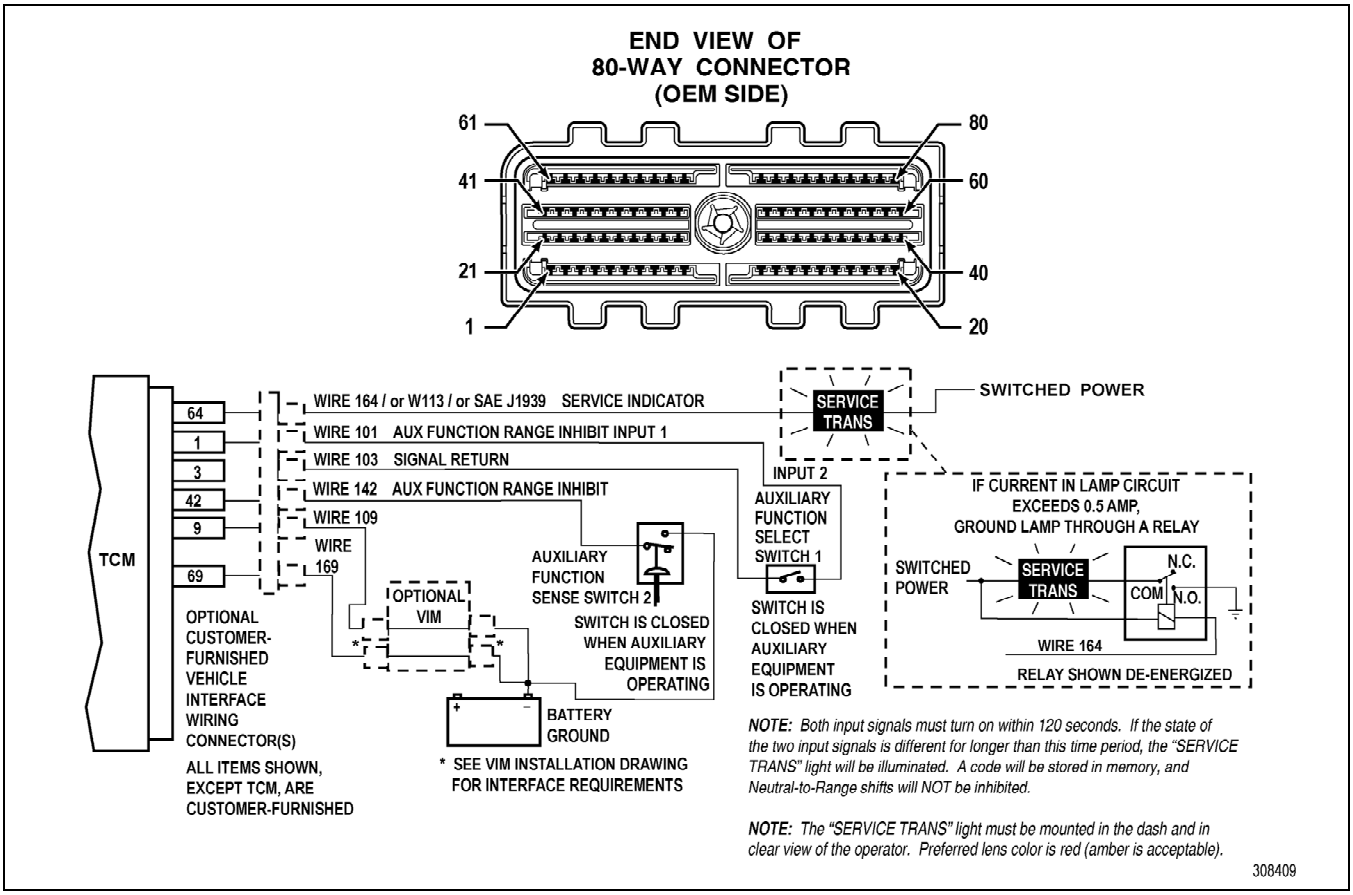
DTC P071D General Purpose Input Fault



Circuit Description

Some vehicles are integrated for Dual Input Auxiliary Function Range Inhibit (AFRI), which prevents inadvertent range selection when auxiliary equipment is operating. This function is enabled under the following conditions:

- Input wire 101 is connected to signal return wire 103 and,
- Input wire 142 is connected to battery ground.

In a typical installation, a dash-mounted auxiliary equipment selector switch completes the circuit between wires 101 and 103. A second switch closes during operation of the auxiliary equipment to complete the circuit between wire 142 and battery ground. Both switches must be closed for the function to be enabled. When the two input wires (101 and 142) are **ON**, the TCM inhibits all Neutral-to-Range shifts. The inhibit remains in effect until either one of the two input wires changes state to **OFF**, or transmission output speed exceeds a preset value. The TCM sets P071D if it detects that the two input wires are in two different states (**ON** or **OFF**) for longer than allowed.

The AFRI service indicator is available via a datalink message or an analog signal. Select the appropriate schematic for the wire number specified in the TCM calibration listed in Table 5–12. Also refer to refer to the Allison DOC® Technician's Library for additional information.

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DTC P071D General Purpose Input Fault *(cont'd)*

Table 5–12. Wiring Schematics for Input F: AFRI (Special)

TYPE OF ACTIVATION	PRODUCT FAMILY	FUNCTION I.D.	WIRE ASSIGNMENT
Switch	3000/4000	F	101, 142, 113
Switch	3000/4000	F	101, 142, 113
Switch with Service Indicator on SAE J1939	3000/4000	F	101, 142

Action Taken When the DTC Sets

When DTC P071D is active, the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM does not illuminate the **CHECK TRANS** light.
- TCM inhibits AFRI (Special) operation allowing transmission to make range shifts from Neutral (N).

Conditions for Clearing the DTC/CHECK TRANS Light

Allison DOC® may be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Tool Requirements

- Allison DOC®
- J-47275 TCM Breakout Harness
- J-39700 Universal Breakout Box
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay

Diagnostic Aids

AFRI (Special) functionality may be checked by installing jumpers for W101 and W142 in place of Original Equipment Manufacturer (OEM) input wires. With brake applied, select **D** (Drive) and then switch input jumpers to a known good vehicle ground. Transmission should shift to Neutral (N) if TCM and programming are OK. If TCM CIN and wire package are correct, but AFRI (Special) is inhibited with active code, then change TCM with known good TCM and recheck.

This DTC may be caused by:

- Short to power or short to another wire in either W101 or W142.
- High resistance or open in either W101 or W142.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors, unlocked pins, causing shorts in connectors.
- AFRI (Special) enabled in TCM programming in error.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for switching GPI circuit controlling AFRI (Special).

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DTC P071D General Purpose Input Fault *(cont'd)*

- Defective TCM.

DTC Troubleshooting Test Descriptions

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for shorts to ground or to another wire.
3. Check for high resistance or open circuits in W101 or W103.
4. Check for high resistance or open circuits in W142.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, and applicable information in the Allison DOC® Technician's Library.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P071D active?		*Go to Step 2*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 6*

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DTC P071D General Purpose Input Fault *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect W142 input wire from battery ground. Close all switches in W101 and W142 circuits. 6. Using J-46708 Digital Multimeter, measure the resistance from the terminal 1 on J-47275-1 Magnetic Overlay to all other labeled terminals on J-47275-1 Magnetic Overlay and to chassis ground. 7. Repeat task 6 for terminal 42. 8. Repeat task 6 for terminal 3. Does circuit resistance measure 20 kΩ or more for each terminal 1, 3, 42 to all other terminals and chassis ground?	20 kΩ or more	*Go to Step 3*	*Resolve OEM input wiring issue with W101, W103, W142, or OEM switches. Go to Step 6*
3	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Leave switch in W101 circuit closed. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 1 and 3 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 5 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	5 Ω or less	*Go to Step 4*	*Address issue with W101, W103, or OEM switch. Go to Step 6 after repairs are made.*
4	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box. 3. Leave input switches closed. 4. Leave W142 disconnected from battery ground end of OEM circuit. 5. Using a J-46708 Digital Multimeter and matching terminals for OEM connectors, check for high resistance or open circuit in W142. Does circuit resistance measure 5 Ω or less through W142?	5 Ω or less	*Go to Step 5*	*Resolve OEM input wiring issue with W142 or switch issue. Go to Step 6*

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DTC P071D General Purpose Input Fault *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 4. Start engine. 5. Apply brake. 6. Select **D** (Drive). 7. Activate AFRI (Special). 8. Using Allison DOC® and the snapshot feature, check for active codes. 9. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 10. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Review Diagnostic Aids. Go to Step 1*
6	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Acquire new Allison DOC® snapshot while operating vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P071D return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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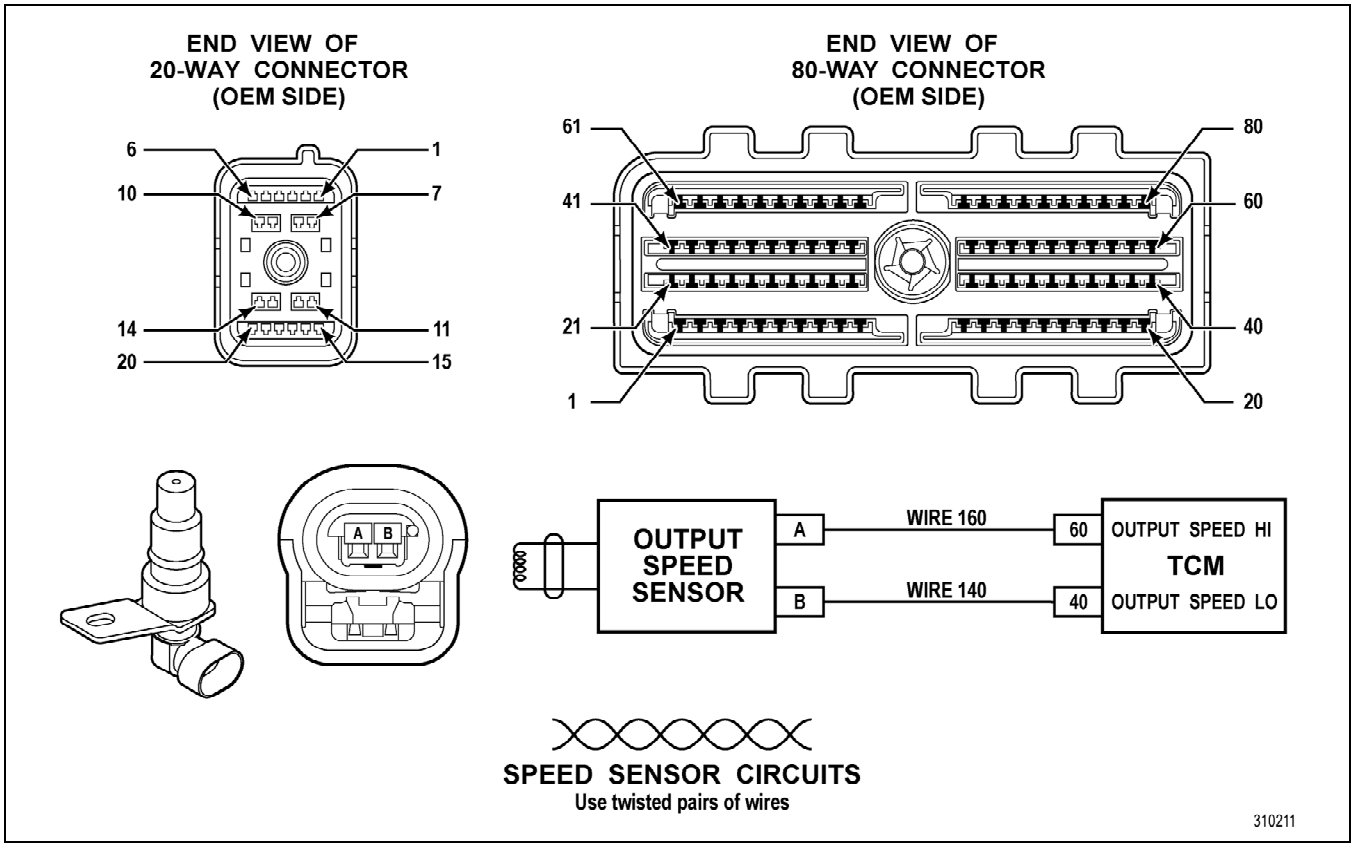
DTC P0720 Output Shaft Speed Sensor Circuit



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test detects an output speed sensor circuit short to battery, ground, or open.

Action Taken When the DTC Sets

When DTC P0720 is active, the following conditions occur:

- If the DTC sets while shift not in process, remains in current range.
- If the DTC sets while shift is in process, complete shift and lock in that range.
- There is no response to shift selector requests.
- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0720 may be caused by:

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DTC P0720 Output Shaft Speed Sensor Circuit *(cont'd)*

- W140 and/or W160 shorted to another wire in chassis harness or to ground.
- W140 and/or W160 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective output shaft speed sensor.
- Defective TCM.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Confirm that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

NOTE: Allison Transmission warranty, or the extended coverage for parts and labor, does not cover transmission or vehicle damage caused by drivelines that do not meet Allison Transmission, Inc. specifications.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check output shaft speed sensor circuit resistance.
3. Check W140 and W160 for high resistance.
4. Check W140 and W160 for short to another wire or ground.
5. Check TCM.

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DTC P0720 Output Shaft Speed Sensor Circuit *(cont'd)*

6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0720 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 40 and 60 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–13?	Table 5–13	*Go to Step 4*	*Go to Step 3*

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DTC P0720 Output Shaft Speed Sensor Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 2. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect output shaft speed sensor from OEM harness. 5. Install a jumper wire between terminals A and B of output shaft speed sensor harness connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 40 and 60 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 4*	*Address issue with W140 or W160. Go to Step 6 after repairs are made.*
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. Disconnect output shaft sensor from chassis harness, if not disconnected yet. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 40 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and chassis ground. 5. Repeat task 4 using terminal 60. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 40 and 60 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W140 or W160. Go to Step 6 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle above 800 rpm output speed. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0720 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace output shaft speed sensor and go to Step 6*

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DTC P0720 Output Shaft Speed Sensor Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0720 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

Table 5–13. Output Shaft Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°
* Sensors meet specification at ± 25 Ω of nominal value		

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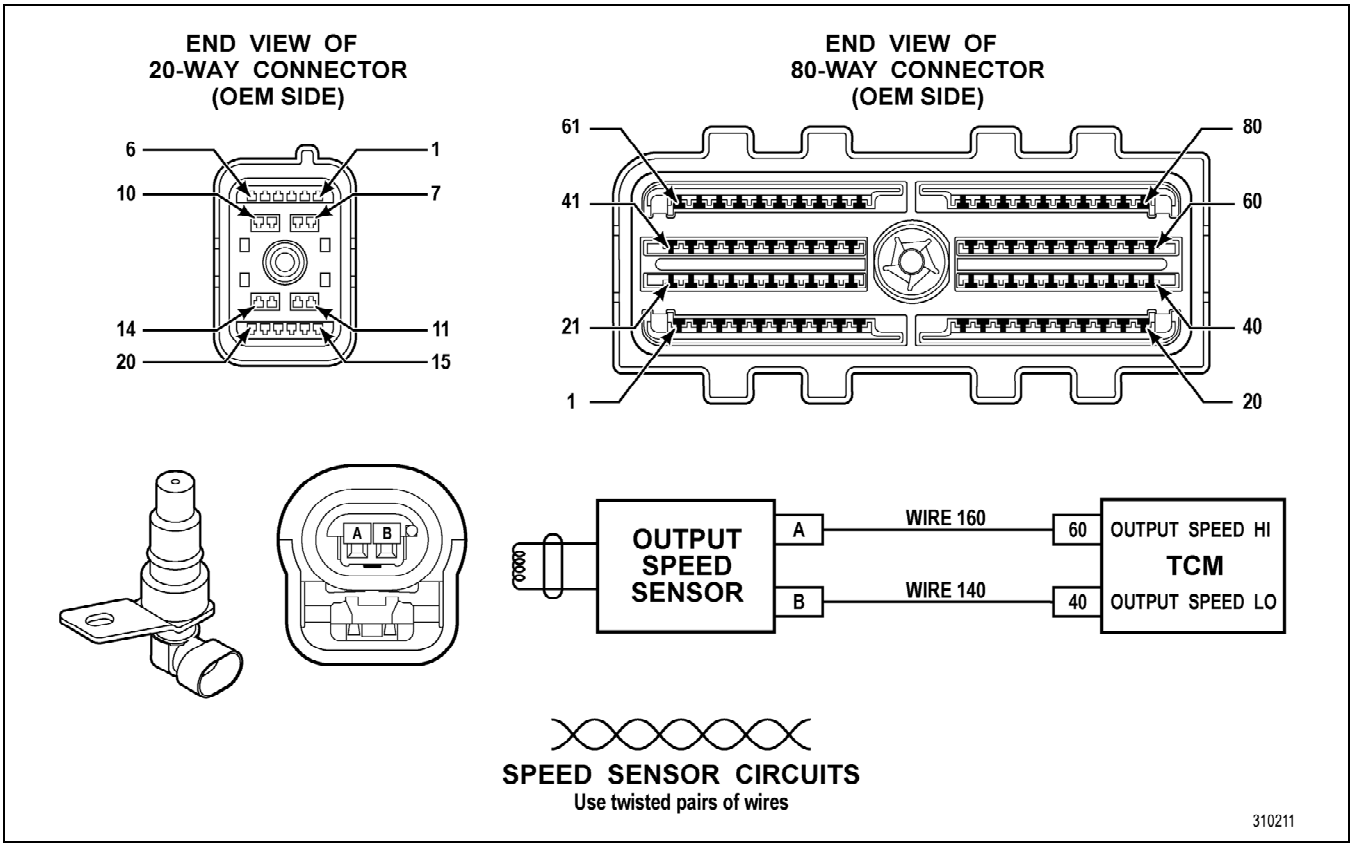
DTC P0721 Output Shaft Speed Sensor Circuit Performance



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test detects whether output speed is reasonable.

Action Taken When the DTC Sets

When DTC P0721 is active, the following conditions occur:

- If the DTC sets while shift not in process, remains in current range.
- If the DTC sets while shift is in process, complete shift and lock in that range.
- There is no response to shift selector requests.
- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0721 may be caused by:

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DTC P0721 Output Shaft Speed Sensor Circuit Performance *(cont'd)*

- W140 and/or W160 shorted to another wire in chassis harness or to ground.
- W140 and/or W160 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective output shaft speed sensor.
- Defective TCM.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Confirm that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

NOTE: Allison Transmission warranty, or the extended coverage for parts and labor, does not cover transmission or vehicle damage caused by drivelines that do not meet Allison Transmission, Inc. specifications.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check output shaft speed sensor circuit resistance.
3. Check W140 and W160 for high resistance.
4. Check W140 and W160 for short to another wire or ground.
5. Check TCM.

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DTC P0721 Output Shaft Speed Sensor Circuit Performance *(cont'd)*

6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0721 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 40 and 60 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–14?	Table 5–14	*Go to Step 4*	*Go to Step 3*

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DTC P0721 Output Shaft Speed Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 2. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect output shaft speed sensor from OEM harness. 5. Install a jumper wire between terminals A and B of output shaft speed sensor harness connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 40 and 60 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 4*	*Address issue with W140 or W160. Go to Step 6 after repairs are made.*
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. Disconnect output shaft sensor from chassis harness, if not disconnected yet. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 40 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and chassis ground. 5. Repeat task 4 using terminal 60. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 40 and 60 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W140 or W160. Go to Step 6 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle above 800 rpm output speed. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0721 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace output shaft speed sensor and go to Step 6*

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DTC P0721 Output Shaft Speed Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0721 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCsand return vehicle to service.*

Table 5–14. Output Shaft Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°

* Sensors meet specification at ± 25 Ω of nominal value

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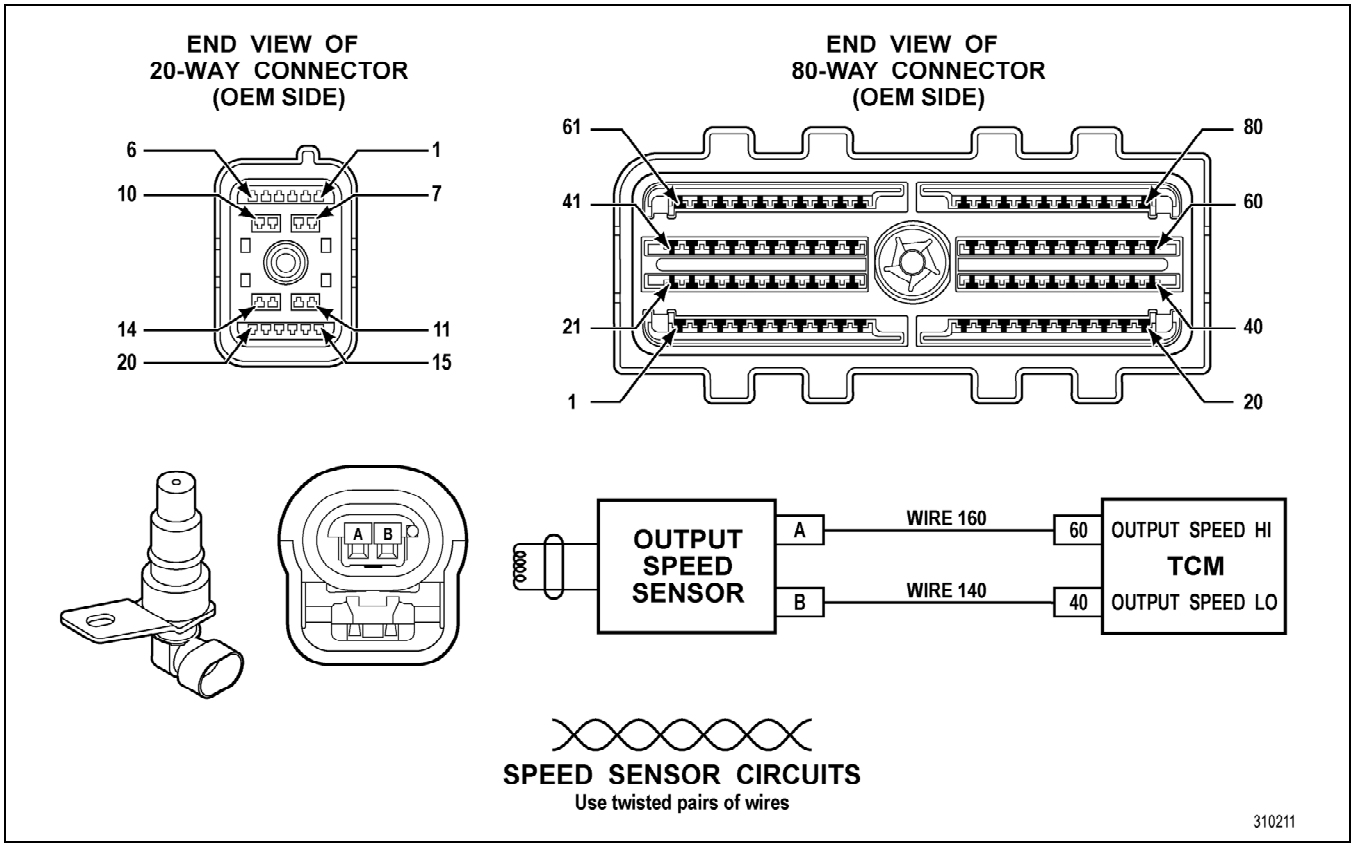
DTC P0722 Output Shaft Speed Sensor Circuit No Signal



Circuit Description

The speed sensors are devices which convert mechanical motion to an AC voltage. This test checks for unrealistically low values for output speed.

Action Taken When the DTC Sets

When DTC P0722 is active, the following conditions occur:

- If the DTC sets while shift not in process, remains in current range.
- If the DTC sets while shift is in process, complete shift and lock in that range.
- There is no response to shift selector requests.
- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0722 may be caused by:

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DTC P0722 Output Shaft Speed Sensor Circuit No Signal *(cont'd)*

- W140 and/or W160 shorted to another wire in chassis harness or to ground.
- W140 and/or W160 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective output shaft speed sensor.
- Defective TCM.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Confirm that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

NOTE: Allison Transmission warranty, or the extended coverage for parts and labor, does not cover transmission or vehicle damage caused by drivelines that do not meet Allison Transmission, Inc. specifications.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check output shaft speed circuit resistance.
3. Check W140 and W160 for high resistance.
4. Check W140 and W160 for short to another wire or ground.
5. Check TCM.

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DTC P0722 Output Shaft Speed Sensor Circuit No Signal *(cont'd)*

6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0722 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 40 and 60 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–15?	Table 5–15	*Go to Step 4*	*Go to Step 3*

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DTC P0722 Output Shaft Speed Sensor Circuit No Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 2. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect output shaft speed sensor from OEM harness. 5. Install a jumper wire between terminals A and B of output shaft speed sensor harness connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 40 and 60 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 4*	*Address issue with W140 or W160. Go to Step 6 after repairs are made.*
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. Disconnect output shaft speed sensor from chassis harness if not disconnected yet. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 40 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and chassis ground. 5. Repeat task 4 using terminal 60. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 40 and 60 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W140 or W160. Go to Step 6 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle above 800 rpm output shaft speed. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0722 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace output shaft speed sensor and go to Step 6*

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DTC P0722 Output Shaft Speed Sensor Circuit No Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0722 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

Table 5–15. Output Shaft Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°
* Sensors meet specification at ± 25 Ω of nominal value		

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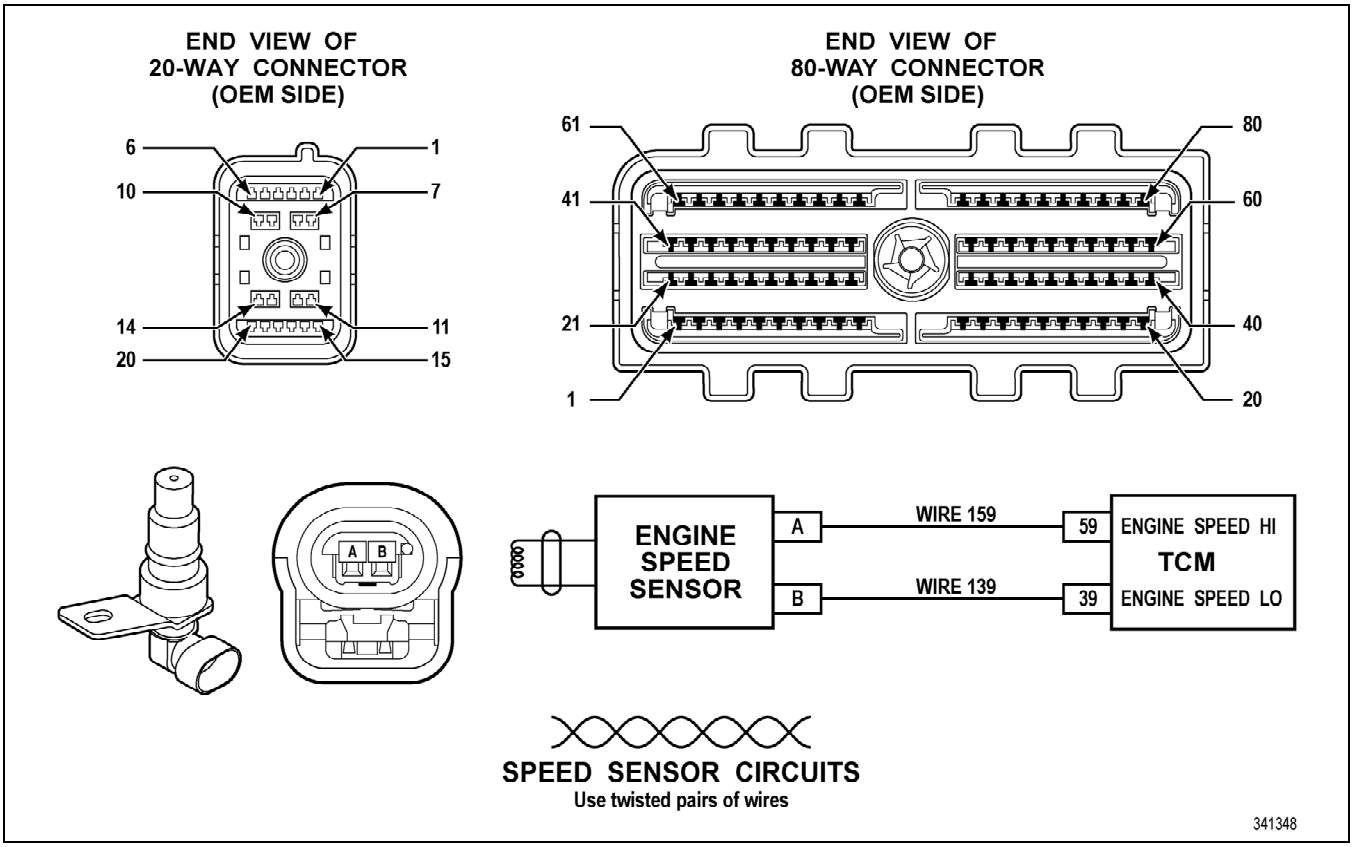
DTC P0725 Engine Speed Sensor Circuit



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test detects an engine speed sensor circuit short to battery, ground, or open.

Action Taken When the DTC Sets

When DTC P0725 is active, the following conditions occur:

- DTC P0725 is stored in the TCM history.
- The TCM does not illuminate the **CHECK TRANS** light.
- If ignition is **OFF**, then engine speed is set to 0. If turbine shaft speed is greater than the engine speed calibration default value, then substitute turbine shaft speed as engine speed.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0725 may be caused by:

- W139 and/or W159 shorted to another wire in chassis harness or to ground.
- W139 and/or W159 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.

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DTC P0725 Engine Speed Sensor Circuit *(cont'd)*

- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective engine speed sensor.
- Defective TCM.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Inspect that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check engine speed circuit resistance.
3. Check W139 and W159 for high resistance.
4. Check W139 and W159 for short to another wire or ground.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0725 Engine Speed Sensor Circuit *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0725 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 39 and 59 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–16?	Table 5–16	*Go to Step 4*	*Go to Step 3*

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DTC P0725 Engine Speed Sensor Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 2. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect engine speed sensor from OEM harness. 5. Install a jumper wire between terminals A and B of engine speed sensor harness connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 39 and 59 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace engine speed sensor. Go to Step 6*	*Address issue with W139 or W159. Go to Step 6 after repairs are made.*
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. Disconnect engine speed sensor from chassis harness, if not disconnected yet. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 39 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 5. Repeat task 4 using terminal 59. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 39 and 59 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W139 or W159. Go to Step 6 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0725 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace engine speed sensor. Go to Step 6*

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DTC P0725 Engine Speed Sensor Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0725 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

Table 5–16. Engine Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°

* Sensors meet specification at ± 25 Ω of nominal value

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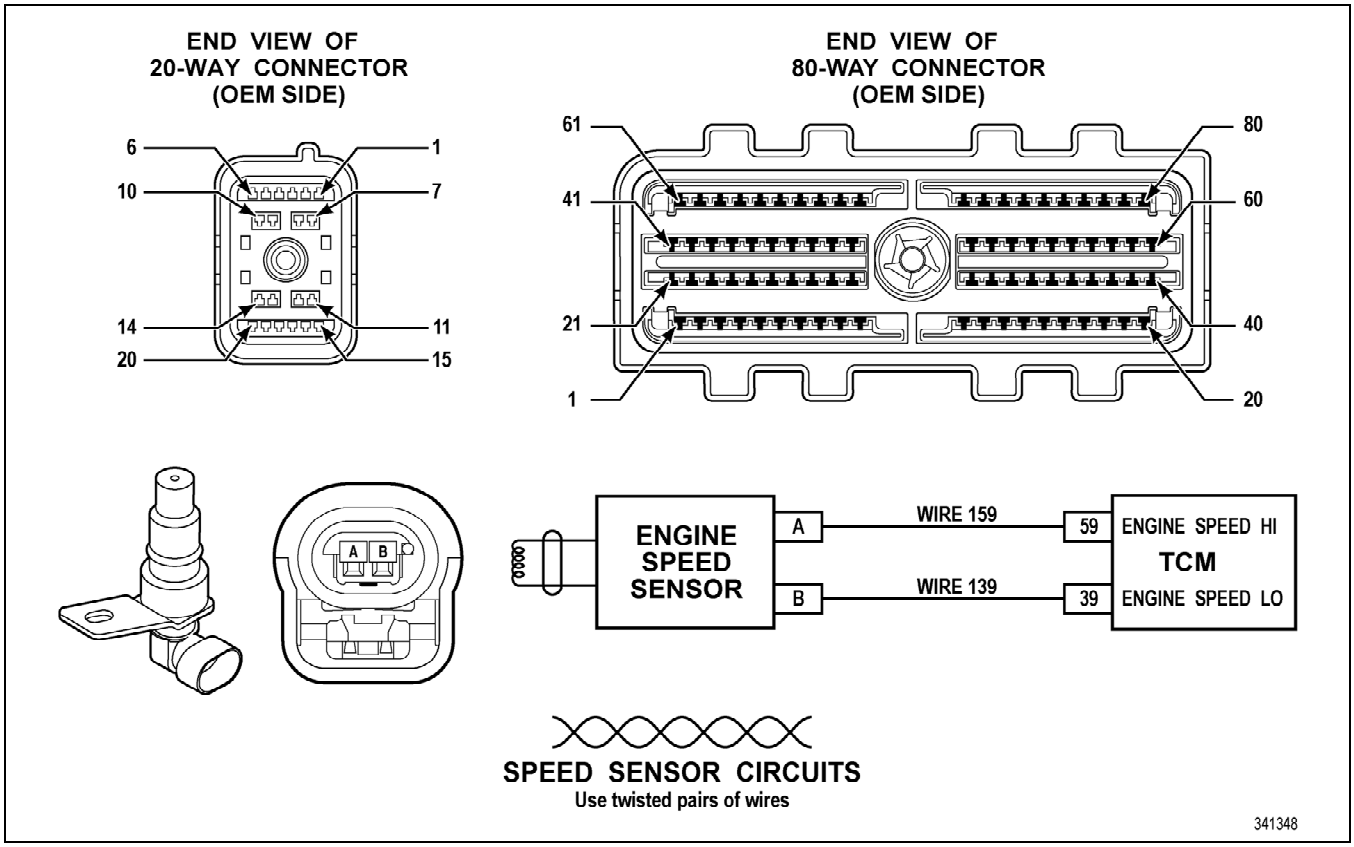
DTC P0726 Engine Speed Sensor Circuit Performance



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test detects whether engine speed is reasonable.

Action Taken When the DTC Sets

When DTC P0726 is active, the following conditions occur:

- DTC P0726 is stored in the TCM history.
- The TCM does not illuminate the **CHECK TRANS** light.
- If ignition is **OFF**, then engine speed is set to 0. If turbine shaft speed is greater than the engine speed calibration default value, then substitute turbine shaft speed as engine speed.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0726 may be caused by:

- W139 and/or W159 shorted to another wire in chassis harness or to ground.
- W139 and/or W159 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.

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DTC P0726 Engine Speed Sensor Circuit Performance *(cont'd)*

- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective engine speed sensor.
- Defective TCM.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Inspect that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check engine speed circuit resistance.
3. Check W139 and W159 for high resistance.
4. Check W139 and W159 for short to another wire or ground.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0726 Engine Speed Sensor Circuit Performance *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0726 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 39 and 59 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–17?	Table 5–17	*Go to Step 4*	*Go to Step 3*

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DTC P0726 Engine Speed Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 2. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect engine speed sensor from OEM harness. 5. Install a jumper wire between terminals A and B of engine speed sensor harness connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 39 and 59 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace engine speed sensor. Go to Step 6*	*Address issue with W139 or W159. Go to Step 6 after repairs are made.*
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. Disconnect engine speed sensor from chassis harness, if not disconnected yet. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 39 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 5. Repeat task 4 using terminal 59. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 39 and 59 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W139 or W159. Go to Step 6 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0726 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace engine speed sensor. Go to Step 6*

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DTC P0726 Engine Speed Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0726 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

Table 5–17. Engine Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°

* Sensors meet specification at ± 25 Ω of nominal value

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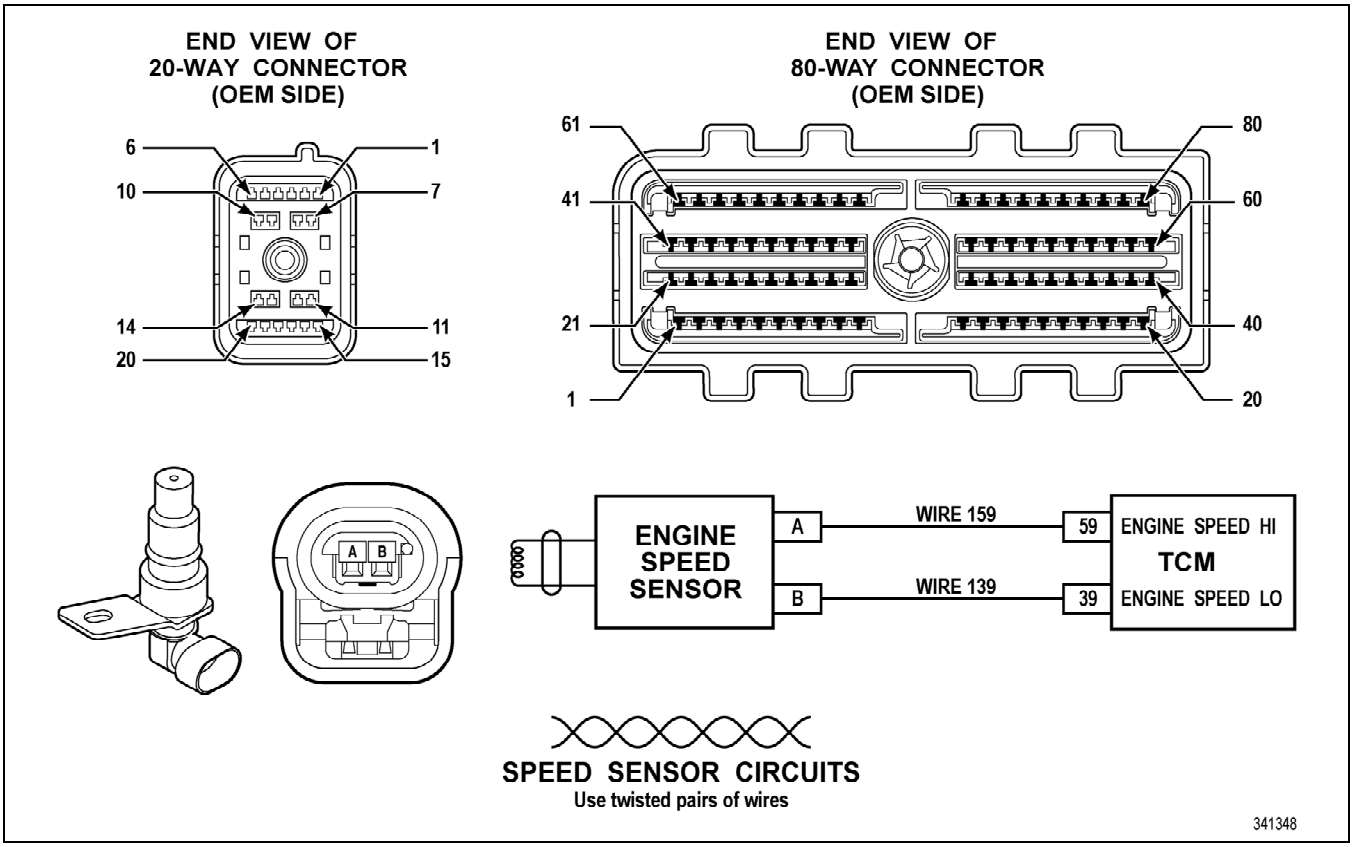
DTC P0727 Engine Speed Sensor Circuit No Signal



Circuit Description

The speed sensors are devices which convert mechanical motion to an electrical signal. This test detects whether output speed is unreasonably low.

Action Taken When the DTC Sets

When DTC P0727 is active, the following conditions occur:

- DTC P0727 is stored in the TCM history.
- The TCM does not illuminate the **CHECK TRANS** light.
- If ignition is **OFF**, then engine speed is set to 0. If turbine shaft speed is greater than the engine speed calibration default value, then substitute turbine shaft speed as engine speed.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0727 may be caused by:

- W139 and/or W159 shorted to another wire in chassis harness or to ground.
- W139 and/or W159 high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.

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DTC P0727 Engine Speed Sensor Circuit No Signal *(cont'd)*

- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Fatigued wires at speed sensor connectors (broken strands).
- Incorrect pin crimps or expanded terminals.
- Defective engine speed sensor.
- Defective TCM.
- Wire pair not twisted or not sufficiently twisted.

NOTE: Inspect that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check engine speed circuit resistance.
3. Check W139 and W159 for high resistance.
4. Check W139 and W159 for short to another wire or ground.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0727 Engine Speed Sensor Circuit No Signal *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0727 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Do not connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Connect 16-way bypass on J-47275 TCM Breakout Harness. 7. Install J-46708 Digital Multimeter and measure resistance between terminals 39 and 59 at J-47275-1 Magnetic Overlay. Does resistance meet specification shown in Table 5–18?	Table 5–18	*Go to Step 4*	*Go to Step 3*

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DTC P0727 Engine Speed Sensor Circuit No Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 2. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect engine speed sensor from OEM harness. 5. Install a jumper wire between terminals A and B of engine speed sensor harness connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 39 and 59 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Replace engine speed sensor. Go to Step 6*	*Address issue with W139 or W159. Go to Step 6 after repairs are made.*
4	1. Leave chassis harness connected to J-47275 TCM Breakout Harness. 2. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 3. Disconnect engine speed sensor from chassis harness, if not disconnected yet. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 39 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 5. Repeat task 4 using terminal 59. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 39 and 59 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W139 or W159. Go to Step 6 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0727 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace engine speed sensor. Go to Step 6*

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DTC P0727 Engine Speed Sensor Circuit No Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0727 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

Table 5–18. Engine Speed Sensor Nominal Resistance vs. Temperature

Nominal* Resistance	Temp C	Temp F
250	-40°	-40°
340	20°	68°
450	110°	230°

* Sensors meet specification at ± 25 Ω of nominal value

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DTC P0729 Incorrect 6th Gear Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON SIXTH RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Conditions for Setting the DTC

This test verifies the transmission is maintaining proper ratio while in sixth range.

Action Taken When the DTC Sets

When DTC P0729 is active, the following conditions will occur:

- The TCM attempts to shift to fifth range. If unsuccessful, the TCM commands third range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0729 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going or on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.

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DTC P0729 Incorrect 6th Gear Ratio *(cont'd)*

4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0729?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0729?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0729?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0729 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0729 Incorrect 6th Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 6th range at idle. Record main and apply pressure for C2 and C4. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C1, C3, and C5 to verify clutches are exhausted while in 6th range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed rpm again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P0729 Incorrect 6th Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS2 and PCS4 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0729 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0729 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0731 Incorrect 1st Gear Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON FIRST RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in first range

Action Taken When the DTC Sets

When DTC P0731 is active, the following conditions will occur:

- The TCM attempts to shift to second range. If unsuccessful, the TCM commands fifth range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0731 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going or on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.

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DTC P0731 Incorrect 1st Gear Ratio *(cont'd)*

4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Check for output speed sensor DTCs. Are there output shaft speed sensor DTCs in history or active with DTC P0731?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0731?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0731?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0731 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0731 Incorrect 1st Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 1st range at idle. Record main and apply pressure for C1 and C5. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C2, C3, and C4 to verify clutches are exhausted while in 1st range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed rpm again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P0731 Incorrect 1st Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS1, PCS3, and SS1 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0731 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0731 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0732 Incorrect 2nd Gear Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON SECOND RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in second range.

Action Taken When the DTC Sets

When DTC P0732 is active, the following conditions will occur:

- The TCM attempts to shift to third range. If unsuccessful, the TCM commands fifth range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0732 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going or on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.

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DTC P0732 Incorrect 2nd Gear Ratio *(cont'd)*

4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0732?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0732?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0732?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0732 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0732 Incorrect 2nd Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 2nd range at idle. Record main and apply pressure for C1 and C4. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C2, C3, and C5 to verify clutches are exhausted while in 2nd range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed rpm again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P0732 Incorrect 2nd Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS1, PCS4, and SS1 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0732 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0732 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0733 Incorrect 3rd Gear Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON THIRD RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in third range.

Action Taken When the DTC Sets

When DTC P0733 is active, the following conditions will occur:

- The TCM attempts to shift to fourth. If unsuccessful, the TCM commands sixth range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0733 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going and on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.

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DTC P0733 Incorrect 3rd Gear Ratio *(cont'd)*

4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0733?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0733 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0733 Incorrect 3rd Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 3rd range at idle. Record main and apply pressure for C1 and C3. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C2, C4, and C5 to verify clutches are exhausted while in 3rd range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed rpm again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P0733 Incorrect 3rd Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS1 and PCS3 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0733 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0733 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0734 Incorrect 4th Gear Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON FOURTH RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in 4th range.

Action Taken When the DTC Sets

When DTC P0734 is active, the following conditions will occur:

- The TCM attempts to shift to fifth range. If unsuccessful, the TCM commands third range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0734 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going and on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.

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DTC P0734 Incorrect 4th Gear Ratio *(cont'd)*

4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0734?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0734?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0734?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0734 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0734 Incorrect 4th Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 4th range at idle. Record main and apply pressure for C1 and C2. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C3, C4, and C5 to verify clutches are exhausted while in 4th range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed rpm again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P0734 Incorrect 4th Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS1 and PCS2 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0734 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Rremove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0734 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0735 Incorrect 5th Gear Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON FIFTH RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in fifth range.

Action Taken When the DTC Sets

When DTC P0735 is active, the following conditions will occur:

- The TCM attempts to shift to sixth range. If unsuccessful, the TCM commands third range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0735 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going or on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.

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DTC P0735 Incorrect 5th Gear Ratio *(cont'd)*

4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0735?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0735 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0735 Incorrect 5th Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 5th range at idle. Record main and apply pressure for C2 and C3. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C1, C4, and C5 to verify clutches are exhausted while in 5th range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed rpm again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P0735 Incorrect 5th Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS2 and PCS3 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0735 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0735 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0736 Incorrect Reverse Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON REVERSE (R1) RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in reverse range.

Action Taken When the DTC Sets

When DTC P0736 is active, the following conditions will occur:

- Locks in**N** (Neutral).
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0736 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going and on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.

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DTC P0736 Incorrect Reverse Ratio *(cont'd)*

5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0736?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0736 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P0736 Incorrect Reverse Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 1st range at idle. Record main and apply pressure for C1 and C5. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in other clutch ports to verify proper clutches are exhausted. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed rpm again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 6. Repeat task 4 selecting 5th range. Record turbine shaft speed, main, and apply pressures for C2 and C3. 7. Repeat task 5 selecting 5th range. Record turbine shaft speed, main, and apply pressures for C2 and C3. 8. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*

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DTC P0736 Incorrect Reverse Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS2, PCS3, and SS1 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0736 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0736 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0741 Torque Converter Clutch (TCC) System Stuck Off

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This test detects if there is excessive lockup slip speed while TCC lockup commanded.

Action Taken When the DTC Sets

- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- TCC (lockup clutch) commanded off.

Conditions for Clearing the DTC/ CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0741 may be caused by:

- Turbine shaft speed sensor signal circuit issues.
- Low TCC pressure and/or main pressure.
- Control module issues like stuck/sticky valves, mechanically defective TCC solenoid, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Transmission issues such as worn and/or damaged seals or seal rings, worn TCC damper, mechanical TCC issues, rotating drum damage (affecting turbine shaft speed pickup), debris, excessive hydraulic circuit leaks to exhaust or other hydraulic circuits.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for turbine shaft speed sensor codes.
4. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
5. Check TCM.
6. Check TCC lockup pressure.
7. Disassemble and inspect control valve module.
8. Check for DTC.

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DTC P0741 Torque Converter Clutch (TCC) System Stuck Off *(cont'd)*

9. Disassemble and inspect transmission.
10. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 10*
3	Are there turbine shaft speed sensor DTCs in history or active with DTC P0741?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there active or inactive DTCs for any solenoid HSD or LSD?		*Go to solenoid HSD or LSD DTC*	*Go to Step 5*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0741 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 10 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 6*
6	1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Test drive vehicle in all forward ranges making sure to achieve TCC apply in all ranges above 50% throttle. Take Allison DOC® snapshot during this task. 5. Check TCC lockup pressure during test drive in all ranges. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Does TCC lockup pressure meet specification in all ranges?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 9*	*Go to Step 7*

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DTC P0741 Torque Converter Clutch (TCC) System Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
7	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 10*	*Replace TCC solenoid in the control valve module. Go to Step 8*
8	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0741 return?		*Go to Step 9*	*System OK. Clear inactive DTCs and return vehicle to service.*
9	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 10*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
10	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0741 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0752 Shift Solenoid 1 Valve Performance–Stuck On

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This test determines if either latch valves are stuck in a stroked position.

Action Taken When the DTC Sets

- DTC is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- Range limited to **N** (Neutral), **R** (Reverse), and 2nd through 4th range.

Conditions for Clearing the DTC/ CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

NOTE: C1 latch valve does not have a solenoid located in the valve bore. C2 latch valve has SS1 located in the valve bore. This test determines if C1 latch valve is stuck.

DTC P0752 may be caused by:

- Stuck C1 latch valve.
- Issue with SS1.
- Issue with TCM.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active or inactive DTC.
2. Check for C1 latch valve issues.
3. Check for DTC.
4. Check TCM.

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DTC P0752 Shift Solenoid 1 Valve Performance–Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Check 5. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0752 active?		*Go to Step 2*	*System OK. Clear inactive DTCs and return vehicle to service.*
2	Disassemble and inspect control valve module for a stuck or sticky C1 latch valve. **NOTE:** Valves should move easily dry by their own weight in valve bores. Do not recondition edges of valves. Sharp valve edges are needed to clear any debris from the bore. Was C1 latch valve stuck or sticky?		*Repair or replace any defective C1 latch valve and/or main valve body causing the C1 valve to stick. Go to Step 3*	*Replace SS1 in the control valve module. Go to Step 3*
3	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. **NOTE:** This DTC will not return unless conditions are met to run the DTC logic. During road test, make at least 10 stops where the vehicle can be shut off and restarted. Did DTC P0752 return?		*Go to Step 4*	*System OK. Clear inactive DTCs and return vehicle to service.*
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. **NOTE:** This DTC will not return unless conditions are met to run the DTC logic. During road test, make at least 10 stops where the vehicle can be shut off and restarted. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0752 active with the original TCM and inactive with a test TCM?		*Install a new TCM. System OK. Return vehicle to service.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*

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DTC P0776 Pressure Control Solenoid (PCS2) Stuck Off

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the on-coming clutch controlled by Pressure Control Solenoid 2 (PCS2) maintains engagement during a range shift. PCS2 controls the C2 for 4th through 6th gears and C3 for Reverse or Reverse 2. PCS2 also controls C3 in the 3700 model for Low range.

Action Taken When the DTC Sets

When DTC P0776 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0776 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS2 controls either the C2 or C3. However, this code may also occur when any other clutch did not maintain engagement while PCS2 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P0776 Pressure Control Solenoid (PCS2) Stuck Off *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check clutch pressures and turbine shaft speed during clutch test.
8. Verify turbine shaft speed at 0-1 rpm.
9. Disassemble and inspect control valve module.
10. Check for DTC.
11. Disassemble and inspect transmission.
12. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 12*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0776?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0776?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P0776 Pressure Control Solenoid (PCS2) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0776 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 12 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and record main pressure and apply clutch pressures for all range clutches. Check exhaust pressures in clutches commanded Off in all ranges. Record turbine shaft speed rpm in all ranges. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 9*

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DTC P0776 Pressure Control Solenoid (PCS2) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 11*
9	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 12*	*Replace all solenoids in the control valve module. Go to Step 10*
10	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0776 return?		*Go to Step 11*	*System OK. Clear inactive DTCs and return vehicle to service.*
11	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 12*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
12	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0776 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0777 Pressure Control Solenoid (PCS2) Stuck On

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the off-going clutch controlled by Pressure Control Solenoid 2 (PCS2) remains engaged during a range shift. PCS2 controls the C2 for 4th through 6th gears and C3 for Reverse or Reverse 2. PCS2 also controls C3 in the 3700 model for Low range.

Action Taken When the DTC Sets

When DTC P0777 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0777 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS2 controls either the C2 or C3. However, this code may also occur for any other off-going clutch issue while PCS2 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P0777 Pressure Control Solenoid (PCS2) Stuck On *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check clutch pressures and turbine speed during clutch test.
8. Verify turbine shaft speed at 0-1 rpm.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0777?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0777?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0777?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P0777 Pressure Control Solenoid (PCS2) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCMBreakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0777 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode. Record main pressure and apply clutch pressures for all range clutches. Check exhaust pressures in clutches commanded off in all ranges. Record turbine shaft speed rpm in all ranges. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*

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DTC P0777 Pressure Control Solenoid (PCS2) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace all solenoids in the control valve module. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0777 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0777 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P077F Incorrect Reverse 2 Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON REVERSE (R2) RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in Reverse 2 range.

Action Taken When the DTC Sets

When DTC P077F is active, the following conditions will occur:

- Locks in **N** (Neutral).
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P077F may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going and on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.

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DTC P077F Incorrect Reverse 2 Ratio *(cont'd)*

5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P077F?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P077F active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P077F Incorrect Reverse 2 Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Select R2. Record main and apply pressure for C3 and C6. **NOTE:** Install remaining gauges in other clutch ports to verify clutches are exhausted while in R2 range **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during partial stall condition. 5. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS2, PCS6, and SS2 solenoids. Go to Step 11*

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DTC P077F Incorrect Reverse 2 Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P077F return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P077F return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P07CE Neutral At Stop Not Functioning

Description:

This DTC is set when the Neutral At Stop (NAS) is not functioning. This test monitors the inputs that affect the NAS functionality. This DTC is enabled when the Neutral At Stop: Emissions Credit Vehicle is enabled.

How to Determine "NEUTRAL At Stop: Emission Credit Vehicle" Calibration Setting in the TCM:

The setting for "NEUTRAL At Stop: Emission Credit Vehicle" can be found using Allison DOC® Premium version 2018.1 or later by choosing "Additional Calibration Information" on the Calibration Information screen.

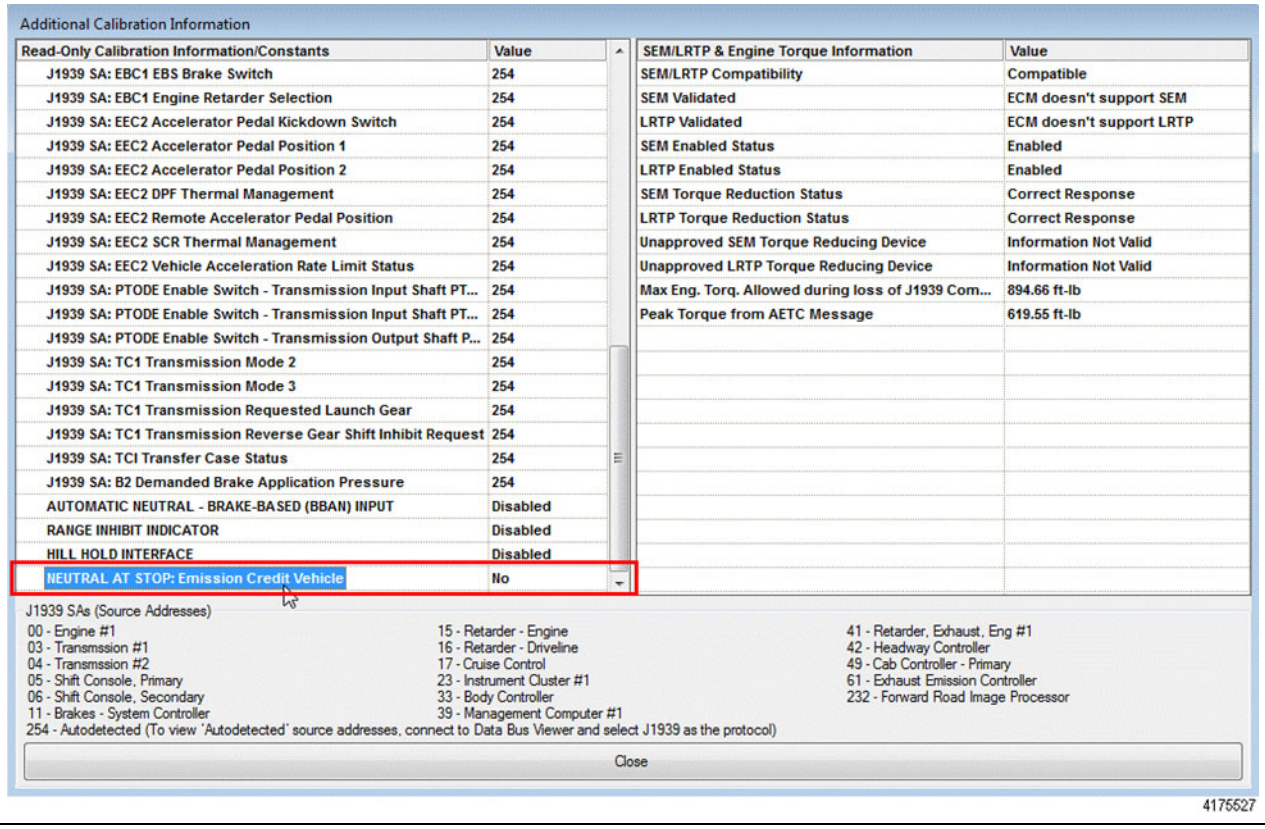

Figure 5–6. Calibration Information Screen

The setting for "NEUTRAL At Stop: Emission Credit Vehicle" can also be found in the FuelSense® section of Allison Calibration Configuration Tool (ACCT), which can be found in the Engineering section of the *http://hub.allisontransmission.com/*. The ACCT Calibration Summary Report will display this new parameter and calibration setting only if the answer is set to YES in the calibration.

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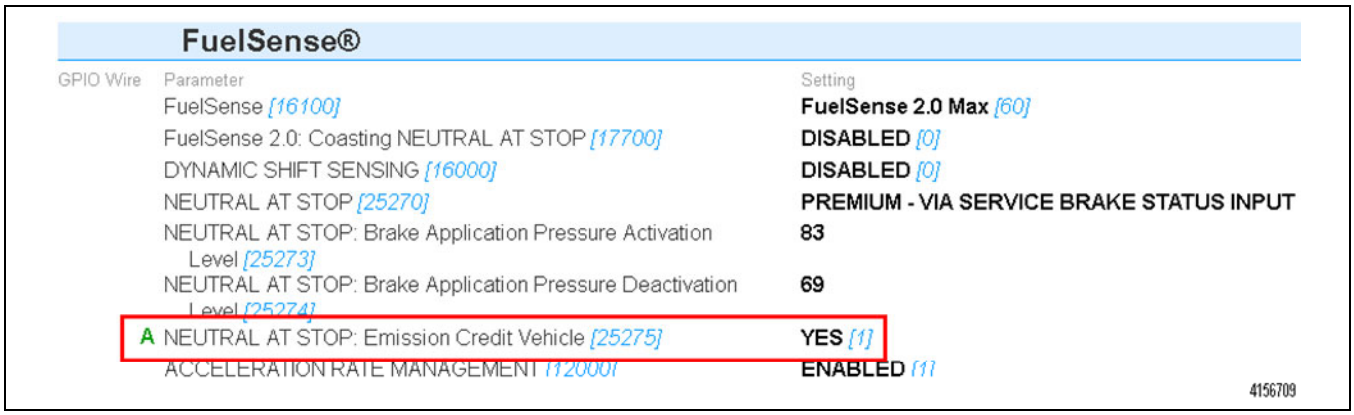
DTC P07CE Neutral At Stop Not Functioning *(cont'd)*



When viewing or editing service calibration requests in ACCT, a green leaf icon will appear next to the “NEUTRAL At Stop: Emission Credit Vehicle” and “NEUTRAL AT STOP” parameters if the answer to “NEUTRAL At Stop: Emission Credit Vehicle” parameter is set to YES. In this case, these parameters can only be modified by Allison service personnel upon receipt of OEM authorization.

Action Taken When the DTC Sets

When DTC P07CE is active, the following conditions occur:

- The **CHECK TRANS** indicator is illuminated.
- The DTC is stored in the TCM history.
- TCM inhibits Neutral at Stop operation.

Conditions for Clearing the DTC/CHECK TRANS Light

Use Allison DOC® Premium to clear the DTC from TCM history. The TCM automatically clears the DTC from TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

Setting one or more of the following conditions will cause NAS not to function and DTC P07CE to set:

- The Service Brake Input has failed setting DTC(s)
  - U0400 Invalid Communication Link Data Received
  - P0703 Brake Switch Circuit
- Engine Speed
  - P0725 Engine Speed Sensor Circuit
  - P0726 Engine Speed Sensor Circuit - Performance
  - P0727 Engine Speed Sensor Circuit - No Signal
- NAS input fails
  - When NAS is configured as a wired input, will set a P071A in addition to the P07CE
- Transmission Sump Temperature
  - P0711 Transmission Fluid Temperature Sensor Circuit – Performance
  - P0712 Transmission Fluid Temperature Sensor Circuit – Low Input
  - P0713 Transmission Fluid Temperature Sensor Circuit – High Input

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DTC P07CE Neutral At Stop Not Functioning *(cont'd)*

- Throttle Input failed when input is over the CAN bus
  - Verify throttle signal is present on the Data Bus using the Data Bus Viewer
- Throttle Input failed when input is an analog signal or a Pulse Width Modulation (PWM) signal
  - P0122 Pedal Positon Sensor Circuit – Low Voltage
  - P0123 Pedal Positon Sensor Circuit – High Voltage
  - P1891 Throttle Position Sensor (TPS) PWM Signal – Low Input
  - P1892 Throttle Position Sensor (TPS) PWM Signal – High Input

Test Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for NAS not functioning.
3. Recalibrate TCM with updated version of original calibration.
4. Install a test TCM.

Step	Action	Value(s)	Yes	No
1	1. Connect the Allison DOC® software. 2. Start engine. 3. Record snapshot using the Allison DOC® software showing active or inactive code(s). 4. Review the failure records report from snapshot to determine conditions when the DTC occurs. Is DTC P07CE active?		*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 5*	*Go to Step 2*
2	1. Clear the DTC. 2. Start the engine and test drive the vehicle. **NOTE:** This DTC is intended to detect NAS not functioning due to a failed input. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). Did DTC P07CE return?		*Go to Step 4*	*System OK. Clear inactive DTCs and return vehicle to service.*
3	1. If the service outlet is authorized to use the TCM Reflash software, recalibrate the original TCM with the latest calibration and software. 2. Once the TCM recalibration is complete, use Allison DOC® to check for active DTCs. Is DTC P07CE active after reprogramming the TCM?		*Go to Step 4*	*Go to Step 5*

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DTC P07CE Neutral At Stop Not Functioning *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install a test TCM and tighten the bolt to 2.0–3.2 N·m (8-28 lb in). 3. Install or reconnect OEM components and connectors. 4. Start engine. 5. Using the Allison DOC® software, check for active DTCs. 6. If DTC are not active with a test TCM installed, then turn ignition off and reinstall the original TCM. 7. Restart engine and check again for active DTCs. Is DTC P07CE active with original TCM and inactive with test TCM?		*Install a new TCM. Go to Step 5 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace the TCM. Review Diagnostic Aids for this DTC. Begin diagnosis again. Go to Step 1*
5	Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P07CE return?		*Begin the diagnosis again. Go to Step 1*	*Repair complete.*

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DTC P0796 Pressure Control Solenoid (PCS3) Stuck Off

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the on-coming clutch controlled by Pressure Control Solenoid 3 (PCS3) maintains engagement during a forward range shift. PCS3 controls C5 for Neutral, 1st, and Reverse. PCS3 does not control clutches for Reverse 2. PCS3 controls C3 in 3rd and 5th range.

Action Taken When the DTC Sets

When DTC P0796 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0796 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS3 controls either the C3 or C5. However, this code may also occur when any other clutch did not maintain engagement while PCS3 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P0796 Pressure Control Solenoid (PCS3) Stuck Off *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check clutch pressures and turbine shaft speed during clutch test.
8. Verify turbine shaft speed at 0-1 rpm.
9. Disassemble and inspect control valve module.
10. Check for DTC.
11. Disassemble and inspect transmission.
12. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 12*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0796?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0796?		*Go toDTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P0796 Pressure Control Solenoid (PCS3) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0796 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 12 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and record main pressure and apply clutch pressures for all range clutches. Check exhaust pressures in clutches commanded Off in all ranges. Record turbine shaft speed rpm in all ranges. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 9*

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DTC P0796 Pressure Control Solenoid (PCS3) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 11*
9	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 12*	*Replace all solenoids in the control valve module. Go to Step 10*
10	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0796 return?		*Go to Step 11*	*System OK. Clear inactive DTCs and return vehicle to service.*
11	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 12*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
12	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0796 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0797 Pressure Control Solenoid (PCS3) Stuck On

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the off-going clutch controlled by Pressure Control Solenoid 3 (PCS3) remains engaged during a forward range shift. PCS3 controls C5 for Neutral, 1st, and Reverse. PCS3 does not control clutches for Reverse 2. PCS3 controls C3 in 3rd and 5th range.

Action Taken When the DTC Sets

When DTC P0797 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0797 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS3 controls either the C3 or C5. However, this code may also occur for any other off going clutch issue while PCS3 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P0797 Pressure Control Solenoid (PCS3) Stuck On *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0796?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0796?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P0797?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P0797 Pressure Control Solenoid (PCS3) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0797 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode. Record main pressure and apply clutch pressures for all range clutches. Check exhaust pressures in clutches commanded off in all ranges. Record turbine shaft speed rpm in all ranges. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*

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DTC P0797 Pressure Control Solenoid (PCS3) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace all solenoids in the control valve module. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0797 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0797 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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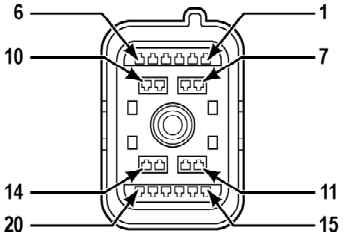
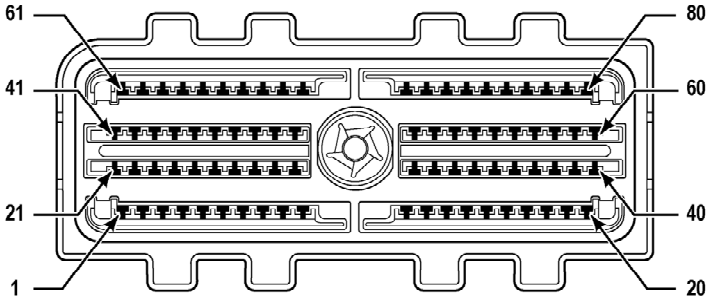
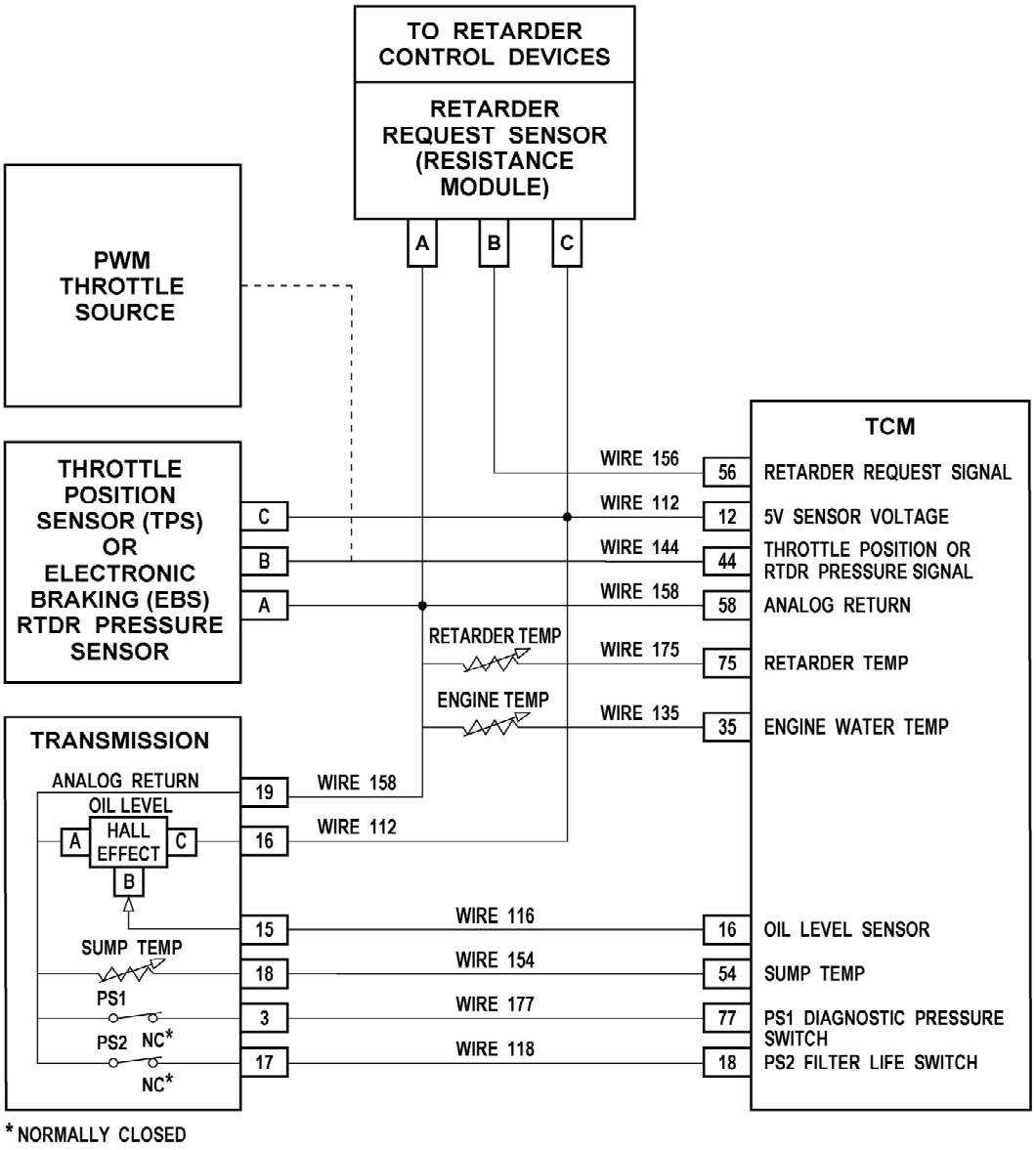
DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low

END VIEW OF
20-WAY CONNECTOR
(OEM SIDE)



END VIEW OF
80-WAY CONNECTOR
(OEM SIDE)





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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Circuit Description

C1 and C2 latch valve logic states (stroked/destroked) control clutch pressure routing based on latch valve location. The four possible combinations for C1/C2 latch valve location are the following:

C1 Latch Valve	C2 Latch Valve	Transmission Range*
Destroked	Destroked	N, R2, R1
Stroked	Destroked	L, 1
Destroked	Stroked	6
Stroked	Stroked	2, 3, 4, 5

* Latch valve logic and attained ranges shown are during normal operation.

The TCM knows which solenoids should be commanded to attain a specific range and will use the PS1 switch state (open = PRESSURIZED and closed = EXHAUSTED) to confirm if the actual transmission range attained matches the TCMs known commanded range.

PS1 is used by the TCM to sense the PCS2 regulator (trim) valve position (stroked or destroked) and the C3 clutch state (pressurized or exhausted) when the C5 clutch is filled. C5 is filled in Reverse, Neutral, and 1st range. Also, PS1 is used to sense the C1 and C2 latch valve positions (stroked/destroked) when the C5 clutch is exhausted. C5 is exhausted in Low (7-speed) and 2nd through 6th ranges.

During normal operation the TCM expects PS1 to indicate PRESSURIZED (open) in Reverse and 2nd through 5th ranges. The TCM expects PS1 to indicate EXHAUSTED (closed) in Neutral (N), Low (for 7 speeds), 1st and 6th range. DTC P0842 becomes active if the PS1 switch is detected as EXHAUSTED (closed) when it should be detected PRESSURIZED (open). This DTC may set while commanding Reverse or 2nd through 5th ranges.

With key **ON** and engine **OFF**, normal PS1 state is EXHAUSTED.

When PS1 is closed, W177 (PS1 input) is switched to W158 (analog return) and Allison DOC® shows the switch EXHAUSTED. When PS1 is open, Allison DOC® shows the switch PRESSURIZED.

Action Taken When the DTC Sets

When DTC P0842 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- The TCM inhibits TCC engagement.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Diagnostic Aids

DTC P0842 can be caused by:

- Unapproved fluid, contaminated fluid, e.g., glycol, water, etc.
- W177 shorted to ground in chassis harness.
- W177 (terminal 3 of 20-way) shorted to ground in internal transmission harness.
- PS1 issues such as:
  - PS1 switch stuck mechanically closed.
  - PS1 intermittently will not open.
  - PS1 shorted to ground.
- PCS1, PCS2, PCS3 solenoid or trim valve issues such as:
  - Broken trim spring.
  - Debris in trim valve bores causing sticking valves.
  - Solenoids mechanically defective.
- C1/C2 latch valve issues such as:
  - Debris in valve body sticking C1 or C2 latch valve.
- Defective solenoids SS1 or SS2 (7-speed models).
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Incorrect service parts installed, e.g., non-prognostics channel plate gasket used on prognostics control module, etc.

NOTE: Channel plates, solenoid and main valve bodies, separator plates, and channel plates are incompatible between former non-prognostics control valve modules and current prognostics control valve modules. Do not intermix parts because DTCs will result.

- Low or loss of C5 pressure.
- Low main pressure.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter

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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay
- J-47275 Bypass Connector

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check condition of fluid and filters.
3. Check fluid level.
4. Check for active and historic PCS controlled clutch stuck ON or OFF DTCs.
5. Check for active or historic electrical codes for solenoids.
6. Check for PS1 state with bypass connected on J-47275 TCM Breakout Harness in Reverse (R) range.
7. Check for Key **ON** engine **OFF** PS1 state with bypass disconnected on J-47275 TCM Breakout Harness using jumper at bypass connector.
8. Check for short to ground or another wire in chassis harness for PS1 switch circuit.
9. Check TCM.
10. Check main and clutch pressures.
11. Check for short to ground or another wire in the internal harness for PS1.
12. Check for broken trim springs, sticky valves, etc. in control valve module.
13. Check for active DTC.
14. Disassemble and inspect transmission.
15. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0842 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 15*
2	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul; e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 3*
3	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 4*	*Correct fluid level with approved fluid. Go to Step 15*
4	Are any solenoid stuck on or stuck off DTCs in history with DTC P0842?		*Go to solenoid DTC*	*Go to Step 5*
5	Are there active or inactive DTCs for any electrical circuits of solenoids located in the control valve module with DTC P0842?		*Go to solenoid DTC*	*Go to Step 6*
6	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Turn ignition **OFF**. 2. Install the J-39700 Breakout Box and J-47275 TCM Breakout Harness Adapter between the TCM and the OEM 80-way connector, and the J-47275-1 Magnetic Overlay for the TCM. 3. Verify the 16-way bypass is connected on J-47275 TCM Breakout Harness (Figure 5–7). 4. Start engine and select **R** (Reverse). 5. Connect Allison DOC® to the vehicle datalink and start Data Monitor function. 6. Observe the PS1 switch state. Is PS1 switch state displayed as "Pressurized" in Data Monitor?		*Go to Step 7*	*Go to Step 8*

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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness Adapter between the TCM and the OEM 80-way connector. 3. Disconnect the bypass connector at J-47275 TCM Breakout Harness. 4. Install jumper on TCM side of 16-way J-47275 Bypass Connector between terminal M (W177, PS1 input) and terminal K (W158, Analog Return) (Figure 5–7). 5. Turn ignition **ON** but do not start engine. 6. Observe the PS1 switch state in Data Monitor. Is PS1 switch state displayed as "Exhausted" in Data Monitor?		*Go to Step 8*	*Go to Step 9*
8	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCMBreakout Harness. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Connect 16-way J-47275 Bypass Connector. 6. Disconnect 20-way OEM transmission connector from the transmission. 7. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 77 to every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 77 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 9*	*Address issue with W177 in chassis harness. Go to Step 15 after repairs are made.*

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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Install test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. Drive vehicle in all ranges, making sure to make all shifts at least once. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and drive the vehicle in all ranges, and check again for active DTCs. Is DTC P0842 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 15 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 10*

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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
10	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and record main pressure, clutch apply pressures, and the clutch exhausted pressures during the clutch test of 2nd through 5th range. 5. Repeat task 4 by slowly increasing engine speed until attaining at least 1200 to 1500 rpm and record pressures again. **NOTE:** Main mod solenoid reduces main pressure in 1st and 2nd range below 1400 rpm engine speed. Main pressure and clutch pressure will approach full main pressure using the Full Main Pressure Test in Allison DOC®. Turning on the PTO enable switch also will command full main pressure. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Does main pressure and clutch pressures meet specifications?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 11*	*Go to Step 12*

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DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Remove control valve module from transmission. Refer to service manual. 2. Install J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 3. Install J-47279-1 Magnetic Overlay. 4. Disconnect PS1 switch from internal harness. 5. Measure resistance from terminal 3 to every other terminal on J-47279-1 Magnetic Overlay and to the control valve module. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 3 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control valve module?	20 kΩ or more	*Go to Step 12*	*Repair or replace internal harness. Go to Step 15*
12	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 15*	*Replace control valve module solenoids and PS1 switch. Go to Step 13*
13	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0842 return?		*Go to Step 14*	*Go to Step 15*
14	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. **NOTE:** DTC P0842 may be caused by low main or C5 pressure. Was a transmission issue identified that was causing this DTC?		*Go to Step 15*	*Go to Step 15*

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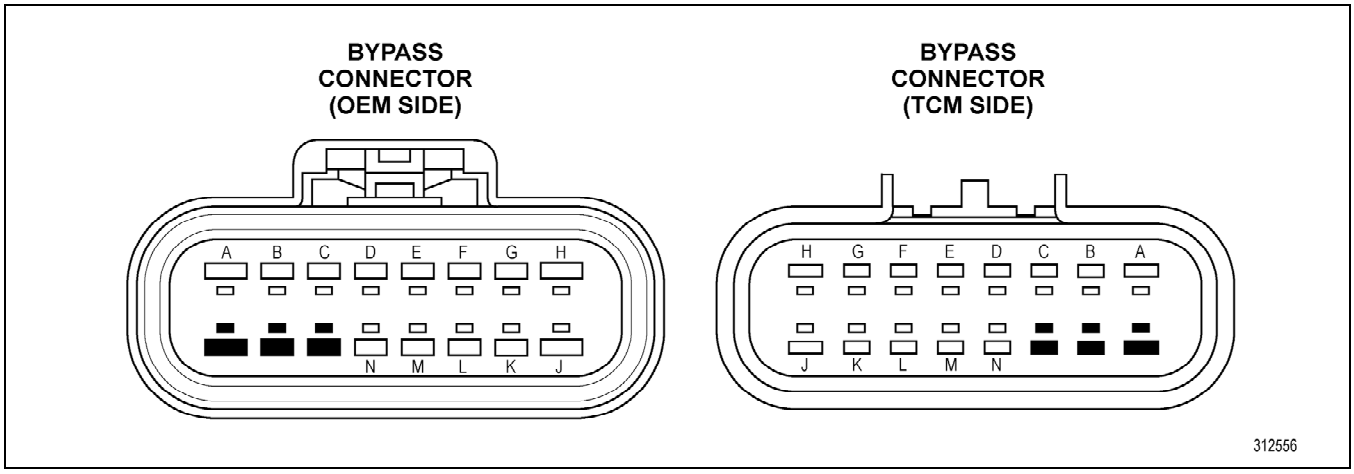
DTC P0842 Transmission Fluid Pressure Switch 1 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
15	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0842 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*



(A) – TCM pin 12 (5V Sensor Supply)
(B) – TCM pin 17 (GPI 10)
(C) – TCM pin 22 (GPI 4)
(D) – TCM pin 34 (Selector PWM Directional Signal)
(E) – TCM pin 38 (Strip Selector Parity)
(F) – TCM pin 53 (Strip Selector Bit 2)
(G) – TCM pin 57 (GPI 12)
(H) – TCM pin 14 (Strip Selector Bit 4)
(J) – TCM pin 54 (TFT Sensor)
(K) – TCM pin 58 (Analog Return)
(L) – TCM pin 73 (Strip Selector Bit 1)
(M) – TCM pin 77 (PS1 Switch)
(N) – TCM pin 79 (GPI 11)

Figure 5–7. 16-Way Bypass Connector

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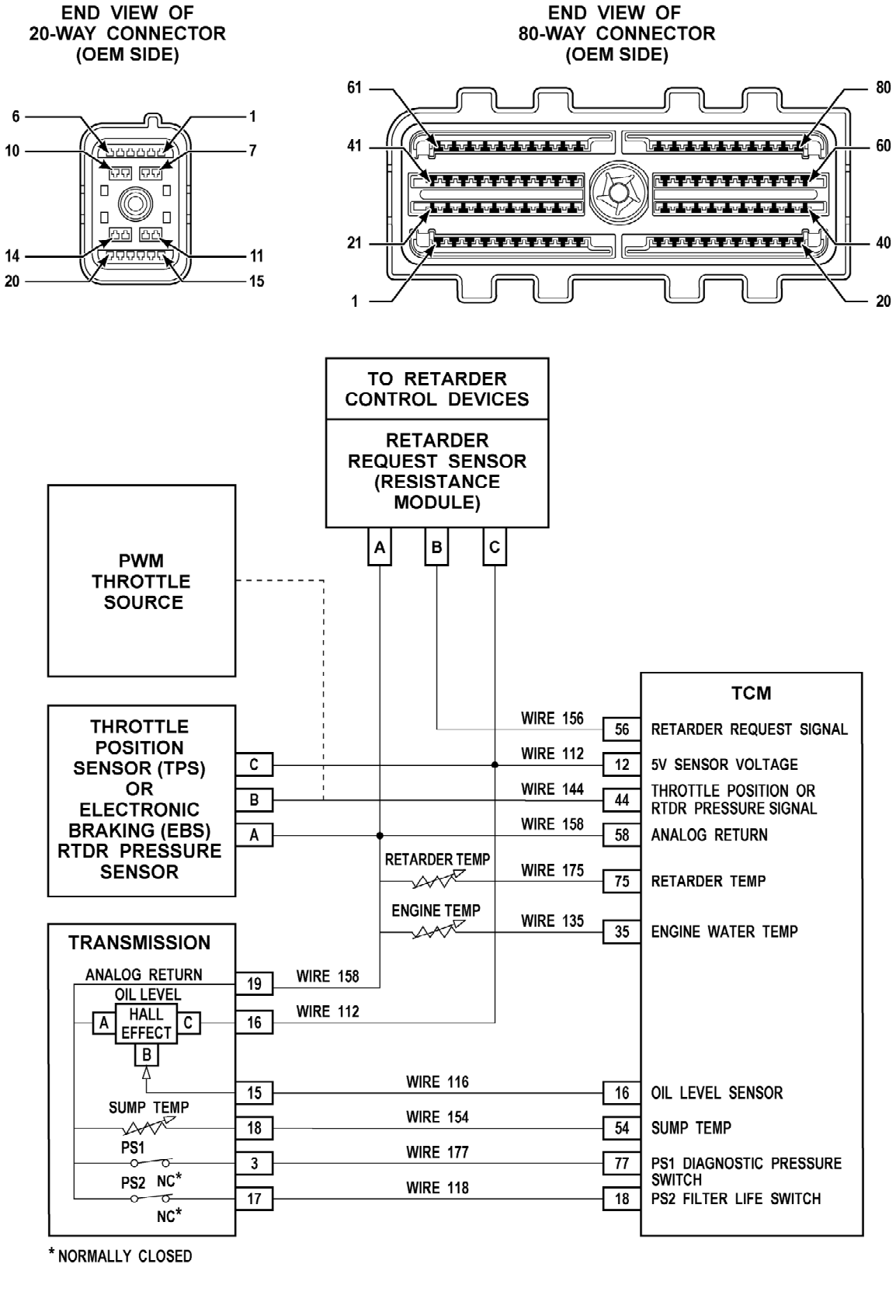
DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High



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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

Circuit Description

C1 and C1 latch valve logic states (stroked/destroked) control clutch pressure routing based on latch valve location. The four possible combinations for C1/C2 latch valve location are the following:

C1 Latch Valve	C2 Latch Valve	Transmission Range*
Destroked	Destroked	N, R2, R1
Stroked	Destroked	L, 1
Destroked	Stroked	6
Stroked	Stroked	2, 3, 4, 5

* Latch valve logic and attained ranges shown are during normal operation.

The TCM knows which solenoids should be commanded to attain a specific range and will use the PS1 switch state (open = PRESSURIZED and closed = EXHAUSTED) to confirm if the actual transmission range attained matches the TCMs known commanded range.

PS1 is used by the TCM to sense the PCS2 regulator (trim) valve position (stroked or destroked) and the C3 clutch state (pressurized or exhausted) when the C5 clutch is filled. C5 is filled in Reverse, Neutral, and 1st range. Also, PS1 is used to sense the C1 and C1 latch valve positions (stroked/destroked) when the C5 clutch is exhausted. C5 is exhausted in Low (7-speed) and 2nd through 6th ranges.

During normal operation the TCM expects PS1 to indicate PRESSURIZED (open) in Reverse and 2nd through 5th ranges. The TCM expects PS1 to indicate EXHAUSTED (closed) in Neutral (N), Low (for 7 speeds), 1st and 6th range. DTC P0843 becomes active if the PS1 switch is detected as PRESSURIZED (open) when it should be detected EXHAUSTED (closed). This DTC may set while commanding shifts to Neutral (N), Low, 1st, 6th, R2.

With key **ON** and engine **OFF**, normal PS1 state is EXHAUSTED because it is a Normally Closed (N/C) switch.

When PS1 is closed, W177 (PS1 input) is switched to W158 (analog return) and Allison DOC® shows the switch EXHAUSTED. When PS1 is open, Allison DOC® shows the switch PRESSURIZED.

Action Taken When the DTC Sets

When DTC P0843 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- The TCM inhibits TCC engagement.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

Diagnostic Aids

DTC P0843 can be caused by:

- Unapproved fluid, contaminated fluid, e.g., glycol, water, etc.
- W177, W151, or W158 high resistance or an open circuit in chassis harness.
- W177 (terminal 3 of 20-way), W158 (terminal 19 of 20-way), or W151 (terminal 10 of 20-way) high resistance or an open circuit in internal transmission harness.
- PS1 issues such as:
  - PS1 switch stuck mechanically open.
  - PS1 intermittently will not close.
  - PS1 high resistance or open circuit.
- PCS2 trim valve or PCS2 solenoid issues such as:
  - Broken trim spring.
  - Debris in PCS2 trim valve bore sticking valve.
  - PCS2 will not exhaust.
- C1/C1 latch valve issues such as:
  - Debris in valve body sticking C1 or C2 latch valve.
- Defective solenoids PCS2, PCS3, SS1, or SS2 (7-speed models).
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Incorrect service parts installed, e.g., non-prognostics channel plate gasket used on prognostics control module, etc.

NOTE: Channel plates, solenoid and main valve bodies, separator plates, and channel plates are incompatible between former non-prognostics control valve modules and current prognostics control valve modules. Do not intermix parts because DTCs will result.

- Low or loss of C5 pressure.
- Low main pressure.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness

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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay
- J-47275 Bypass Connector

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check condition of fluid and filters.
3. Check fluid level.
4. Check for active and historic PCS controlled clutch stuck ON or OFF DTCs.
5. Check for active or historic electrical codes for solenoids.
6. Check for Key **ON** engine **OFF** PS1 state with bypass connected on J-47275 TCM Breakout Harness.
7. Check for Key **ON** engine **OFF** PS1 state with bypass disconnected on J-47275 TCM Breakout Harness.
8. Check for high resistance or open in chassis harness for PS1 switch circuit.
9. Check for high resistance or open in chassis harness for SS1 circuit.
10. Check TCM.
11. Check main and C5 pressure.
12. Check for high resistance or open in the internal harness for PS1 and SS1.
13. Check PS1 switch resistance.
14. Check SS1 solenoid resistance.
15. Check for broken trim springs, sticky valves, etc. in control valve module.
16. Check for active DTC.
17. Disassemble and inspect transmission.
18. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0843 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 18*
2	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul; e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 3*
3	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 4*	*Correct fluid level with approved fluid. Go to Step 18*
4	Are any solenoids stuck on or stuck off DTCs in history with DTC P0843?		*Go to solenoid DTC*	*Go to Step 5*
5	Are there active or inactive DTCs for any electrical circuits of solenoids located in the control valve module with DTC P0843?		*Go to solenoid DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the J-39700 Breakout Box and J-47275 TCM Breakout Harness Adapter between the TCM and the OEM 80-way connector, and the J-47275-1 Magnetic Overlay for the TCM. 3. Verify the 16-way bypass is connected on J-47275 TCM Breakout Harness (Figure 5–8). 4. Turn ignition **ON** but do not start engine. 5. Connect Allison DOC® to the vehicle datalink and start Data Monitor function. 6. Observe the PS1 switch state. Is PS1 switch state displayed as "Exhausted" in Data Monitor?		*Go to Step 7*	*Go to Step 8*

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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness Adapter between the TCM and the OEM 80-way connector. 3. Disconnect the 16–way bypass connector at J-47275 TCM Breakout Harness (Figure 5–8). 4. Turn ignition **ON** but do not start engine. 5. Using Allison DOC®, start Data Monitor function. 6. Observe the PS1 switch state. Is PS1 switch state displayed as "Pressurized" in Data Monitor?		*Go to Step 8*	*Go to Step 10*
8	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between pin 3 and 19 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 58 and 77 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 5 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	5 Ω or less	*Go to Step 9*	*Address issue with W158 or W177 in chassis harness. Go to Step 18 after repairs are made.*
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Leave 20-way OEM transmission connector disconnected from the transmission. 6. Install a jumper wire between terminals 6 and 10 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 51 and 71 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 5 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	5 Ω or less	*Go to Step 10*	*Address issue with W151 or W171 in chassis harness. Go to Step 18 repairs are made.*

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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Install test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. Drive vehicle in all ranges, making sure to make all shifts at least once. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and drive the vehicle in all ranges, and check again for active DTCs. Is DTC P0843 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 18 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 11*
11	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Leave transmission in **N** (Neutral). 5. Record main pressure and C5 pressure at 0% throttle and again at 100%. **NOTE:** Main mod solenoid reduces main pressure in **N** (Neutral) at idle speed. Use Full Main Test in Allison DOC® or enable PTO switch (if available) to acquire full main and C5 pressure in **N** (Neutral) at idle. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Does main pressure and C5 pressure meet specifications?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 12*	*Go to Step 15*

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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
12	1. Remove control valve module from transmission. Refer to service manual. 2. Install J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 3. Install J-47279-1 Magnetic Overlay. 4. Disconnect PS1 switch, SS1 solenoid from internal harness. 5. Install jumper between internal harness terminals A and B for PS1 switch. 6. Measure resistance between terminals 3 and 19 at J-47279-1 Magnetic Overlay. 7. Move jumper to terminals A and B for SS1. 8. Measure resistance between terminals 6 and 10 of J-47279-1 Magnetic Overlay. Does resistance measure 5 Ω or less for each circuit after tool resistance is subtracted from J-46708 Digital Multimeter reading?	5 Ω or less	*Go to Step 13*	*Repair or replace internal harness. Go to Step 18*
13	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect SS1 and PS1 switch to internal harness. 4. Measure resistance between terminals 3 and 19 at J-47279-1 Magnetic Overlay. Does resistance measure 5 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	5 Ω or less	*Go to Step 14*	*Replace PS1 switch. Go to Step 18*
14	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Leave solenoids connected to internal harness. 4. Measure resistance between terminals 10 and 6 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for SS1 in Figure 5–9 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–9	*Go to Step 15*	*Replace SS1 solenoid that is not within specification. Go to Step 18*

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DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
15	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 18*	*Replace SS1, SS2 (7–speed) solenoid, PCS2, PCS3 solenoids, PS1 switch. Go to Step 16*
16	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0843 return?		*Go to Step 17*	*Go to Step 18*
17	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. **NOTE:** DTC P0843 may be caused by low main or C5 pressure. Was a transmission issue identified that was causing this DTC?		*Go to Step 18*	*Go to Step 18*
18	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0843 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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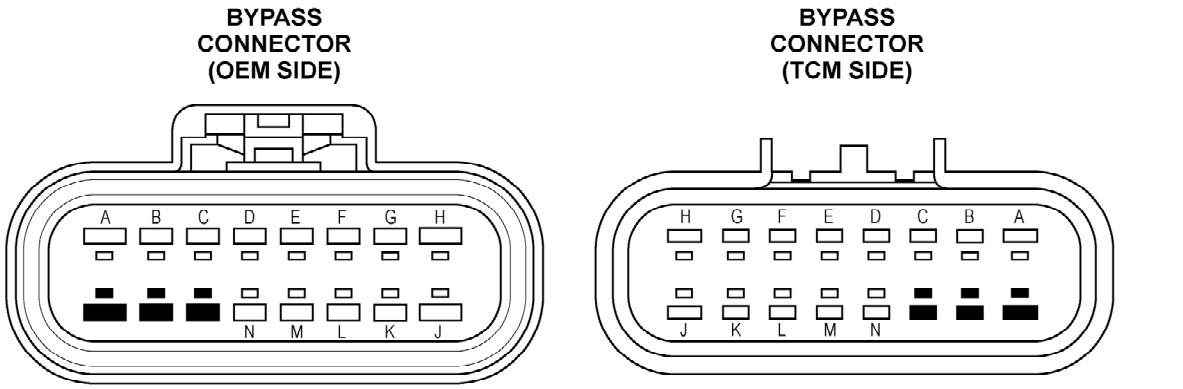
DTC P0843 Transmission Fluid Pressure Switch 1 Circuit High *(cont'd)*



(A) – TCM pin 12 (5V Sensor Supply)
(B) – TCM pin 17 (GPI 10)
(C) – TCM pin 22 (GPI 4)
(D) – TCM pin 34 (Selector PWM Directional Signal)
(E) – TCM pin 38 (Strip Selector Parity)
(F) – TCM pin 53 (Strip Selector Bit 2)
(G) – TCM pin 57 (GPI 12)
(H) – TCM pin 14 (Strip Selector Bit 4)
(J) – TCM pin 54 (TFT Sensor)
(K) – TCM pin 58 (Analog Return)
(L) – TCM pin 73 (Strip Selector Bit 1)
(M) – TCM pin 77 (PS1 Switch)
(N) – TCM pin 79 (GPI 11)

Figure 5–8. 16-Way Bypass Connector

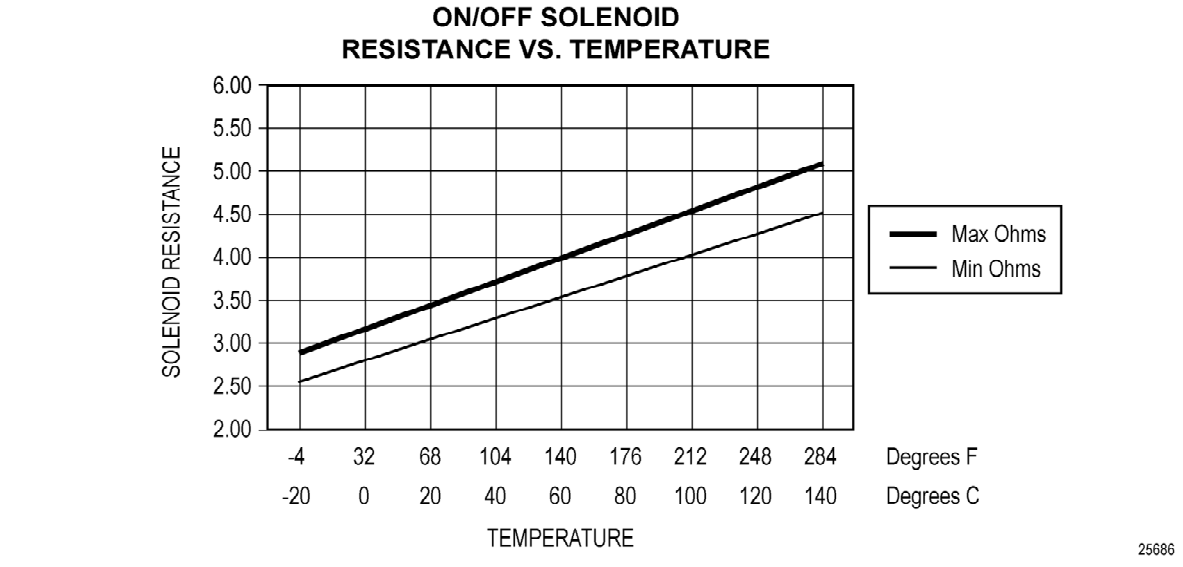


Figure 5–9. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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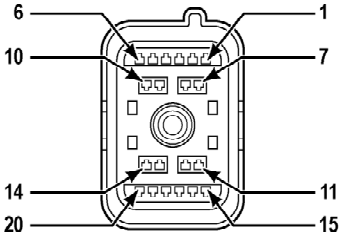
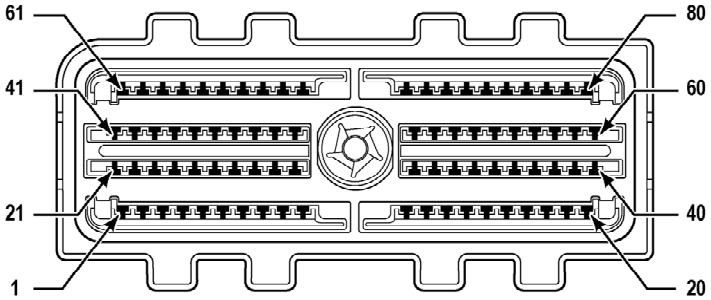
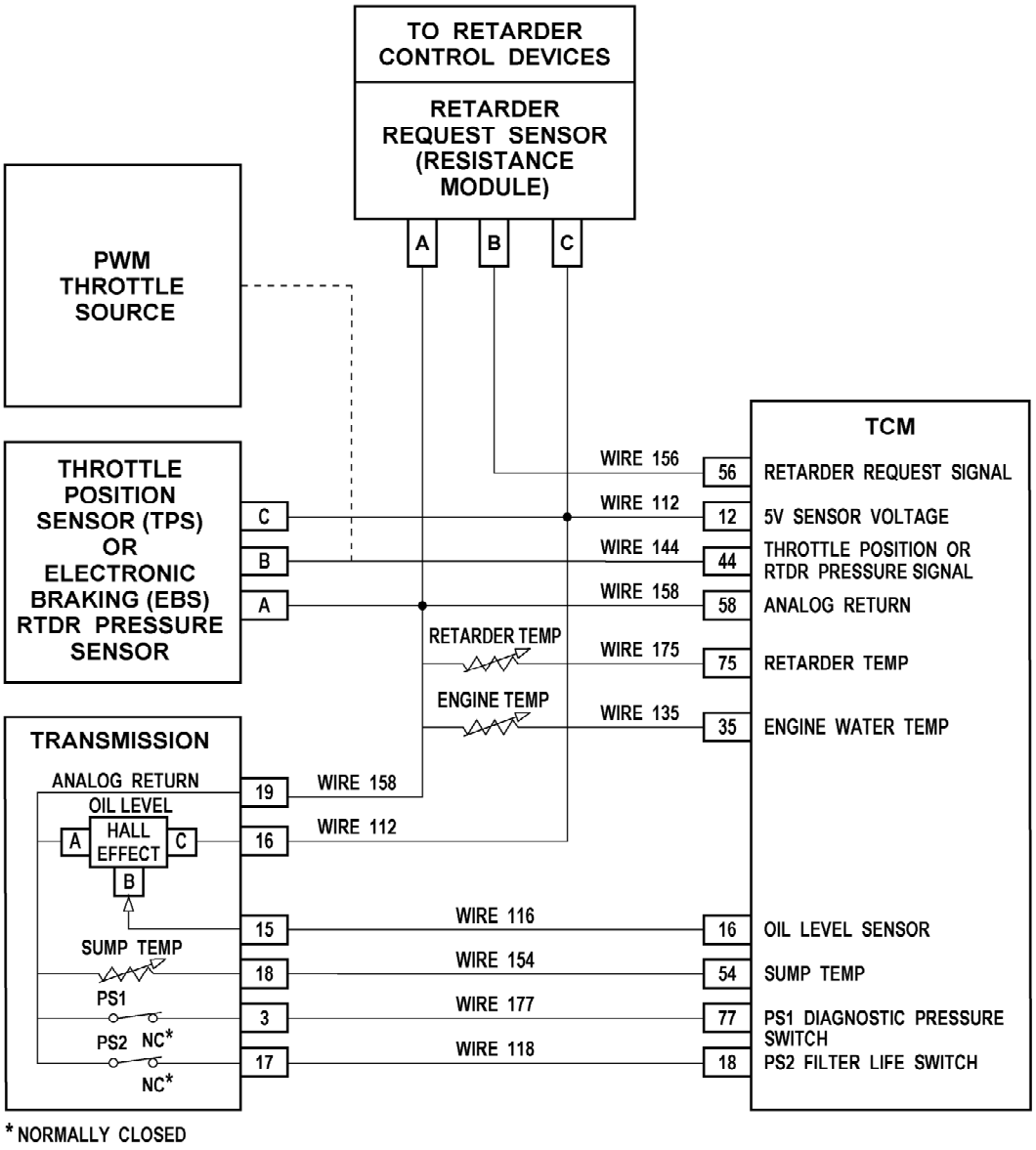
DTC P0847 Transmission Fluid Pressure Switch 2 Circuit Low

END VIEW OF
20-WAY CONNECTOR
(OEM SIDE)



END VIEW OF
80-WAY CONNECTOR
(OEM SIDE)





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DTC P0847 Transmission Fluid Pressure Switch 2 Circuit Low *(cont'd)*

Circuit Description

An active DTC P0847 indicates that the PS2 circuit is detected exhausted (closed) when it should be pressurized (open) while in converter mode.

Action Taken When the DTC Sets

When DTC P0847 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the code. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

Refer to Section 2. ALLISON 5TH GENERATION CONTROL SYSTEM OPERATION and Section 4. PROGNOSTICS PACKAGE AND FEATURES for important information about Oil Life Monitor (OM), Filter Life Monitor (FM), and Transmission Health Monitor (TM). These sections discuss prognostics principles of operation, feature requirements, maintenance alerts, reports, and processes to reset features or change fluid type (January 2010 and later TCM software) using either Allison DOC® or an Allison-supplied shift selector.

DTC P0847 may be caused by:

- Pin/terminal damage in a connector populated with wire 118.
- Shorted wire 118 to chassis or another circuit in vehicle harness.
- Shorted wire 118 to chassis or another circuit in control module wire harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Issue with PS2.
- Sticky FLI (PS2) pressure valve.
- Issues with PS2 valve spring.
- Hydraulic pressure issue e.g., low fluid, low main pressure, low control main pressure, incorrect or damaged control module gasket, etc.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout harness
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

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DTC P0847 Transmission Fluid Pressure Switch 2 Circuit Low *(cont'd)*

- J-39197-A Jumper Wire Kit
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for correct transmission oil level.
3. Check transmission main pressure.
4. Check W118 for short to another wire in chassis harness or ground.
5. Check TCM.
6. Check for short to another wire in the internal harness or to the control valve module.
7. Check PS2 resistance.
8. Disassemble and inspect control valve module for PS2 hydraulic circuit issue.
9. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine and drive vehicle in converter mode. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0847 active?		*Go to Step 2*	*Troubleshoot any other DTCs, if present. If no DTCs are active, then go to Step 9.*

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DTC P0847 Transmission Fluid Pressure Switch 2 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Check transmission fluid is at least to the "Cold Full" mark on the transmission fluid level dipstick with park brake set, engine at idle, and transmission in **N** (Neutral). Add approved fluid as necessary. 2. Check for active DTC. **NOTE:** An output speed of 60 rpm or greater is required in converter mode. Is DTC P0847 active?		*Go to Step 3*	*Adjust fluid level using electronic OLS method. Go to Step 9*
3	Install J-26417-A Pressure Gauge Set or equivalent and check main pressure at idle and at high engine speed in **N** (Neutral). Does main pressure meet minimum specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS while in **N** (Neutral) at idle and at high engine speed?		*Go to Step 4*	*See Problem Low Transmission Fluid Pressures in Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS. After checking for issues, go to Step 9*
4	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 18 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 18 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W118. Go to Step 9 after repairs are made.*

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DTC P0847 Transmission Fluid Pressure Switch 2 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. **NOTE:** An output speed of 60 rpm or greater is required in converter mode. Is DTC P0847 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 9 after repairs are made.*	*If DTC active with both test TCM and original TCM, do not replace TCM. Go to Step 6*
6	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PS2 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 17 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 17 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 7*	*Repair or replace internal harness. Go to Step 9*
7	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PS2 to internal harness connectors. 4. Measure resistance between terminals 17 and 19 at J-47279-1 Magnetic Overlay. Does PS2 circuit resistance measure 5 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	5 Ω or less	*Go to Step 8*	*Replace PS2 switch that is not within specification. Go to Step 9*

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DTC P0847 Transmission Fluid Pressure Switch 2 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
8	Disassemble, inspect, and correct any issues causing hydraulic circuit issues for the PS2, such as damaged FLI pressure valve, broken valve springs, debris, damaged gaskets, wrong gaskets, wrong main valve body, defective channel plate, etc. Were there any control valve body issues to correct that were causing hydraulic circuit issues to the PS2?		*Go to Step 9*	*Replace the PS2 and reassemble control valve assembly. Go to Step 9*
9	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0847 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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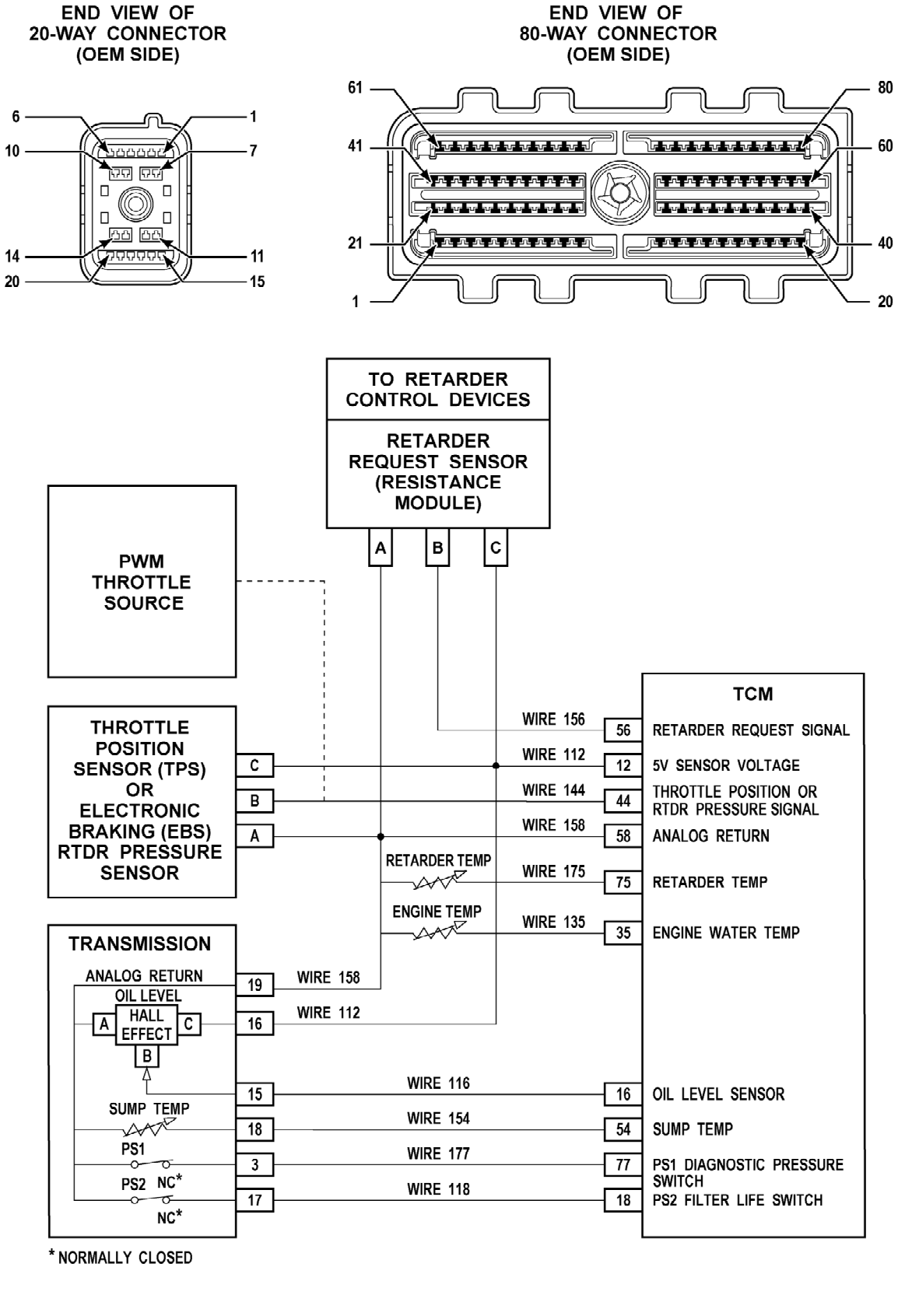
DTC P0848 Transmission Fluid Pressure Switch 2 Circuit High



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DTC P0848 Transmission Fluid Pressure Switch 2 Circuit High *(cont'd)*

Circuit Description

An active DTC P0848 indicates that the PS2 circuit is detected pressurized (open) when it should be exhausted (closed).

Action Taken When the DTC Sets

When DTC P0848 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the code. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

Refer to Section 2. ALLISON 5TH GENERATION CONTROL SYSTEM OPERATION and Section 4. PROGNOSTICS PACKAGE AND FEATURES for important information about Oil Life Monitor (OM), Filter Life Monitor (FM), and Transmission Health Monitor (TM). These sections discuss prognostics principles of operation, feature requirements, maintenance alerts, reports, and processes to reset features or change fluid type (January 2010 and later TCM software) using either Allison DOC® or an Allison-supplied shift selector.

DTC P0848 may be caused by:

- Prognostics enabled calibration and no W118 in chassis harness or non-prognostics control valve module.
- Open or high resistance in W118 or W158 in chassis harness.
- Open or high resistance from terminal 17 to PS2 or from PS2 to terminal 19 in control module wire harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Issue with PS2.
- Issue with TCM.

NOTE: This DTC sets only when there is an electrical circuit issue in the PS2 circuit (e.g. (missing W118). Hydraulic circuit troubleshooting is not required.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout harness
- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay

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DTC P0848 Transmission Fluid Pressure Switch 2 Circuit High *(cont'd)*

- J-47279-1 Magnetic Overlay
- J-39197-A Jumper Wire Kit
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for presence of W118.
3. Check if W118 or W158 is high resistance or open circuit.
4. Check TCM.
5. Check for high resistance or open circuit from terminal 17 to 19 of internal harness in control valve module.
6. Check PS2 switch resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Turn ignition **ON** but do not start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. **NOTE:** Transmission fluid temperature must be above 40°C (104°F) to set DTC. Is DTC P0848 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 7.*

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DTC P0848 Transmission Fluid Pressure Switch 2 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
2	Check for W118 installed in chassis harness. Is W118 installed in chassis harness?		*Go to Step 3*	*Correct issue with W118. Go to Step 7*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 17 and 19 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 18 and 58 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W118 or W158. Go to Step 7 after repairs are made.*
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Turn ignition **ON** but do not start engine. **NOTE:** Transmission fluid temperature must be above 40°C (104°F) to set DTC. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Turn ignition **ON**, but do not start engine, and check again for active DTCs. Is DTC P0848 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 5*

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DTC P0848 Transmission Fluid Pressure Switch 2 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PS2 from internal harness. 4. Install jumper wire between A and B terminals of PS2 connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 17 and 19 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 17 to terminal 19 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PS2 to internal harness connectors. 4. Measure resistance between terminals 17 and 19 at J-47279-1 Magnetic Overlay. Does PS2 circuit resistance measure 5 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	5 Ω or less	*Replace FLI valve body, valve, and spring. Go to Step 7*	*Replace PS2 that is not within specification. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while operating vehicle under same conditions, if possible, noted in failure records from Step 1. **NOTE:** This DTC does not run at engine idle. Turn ignition **ON** but do not start engine. Fluid temperature must be above 40°C (104°F). Did DTC P0848 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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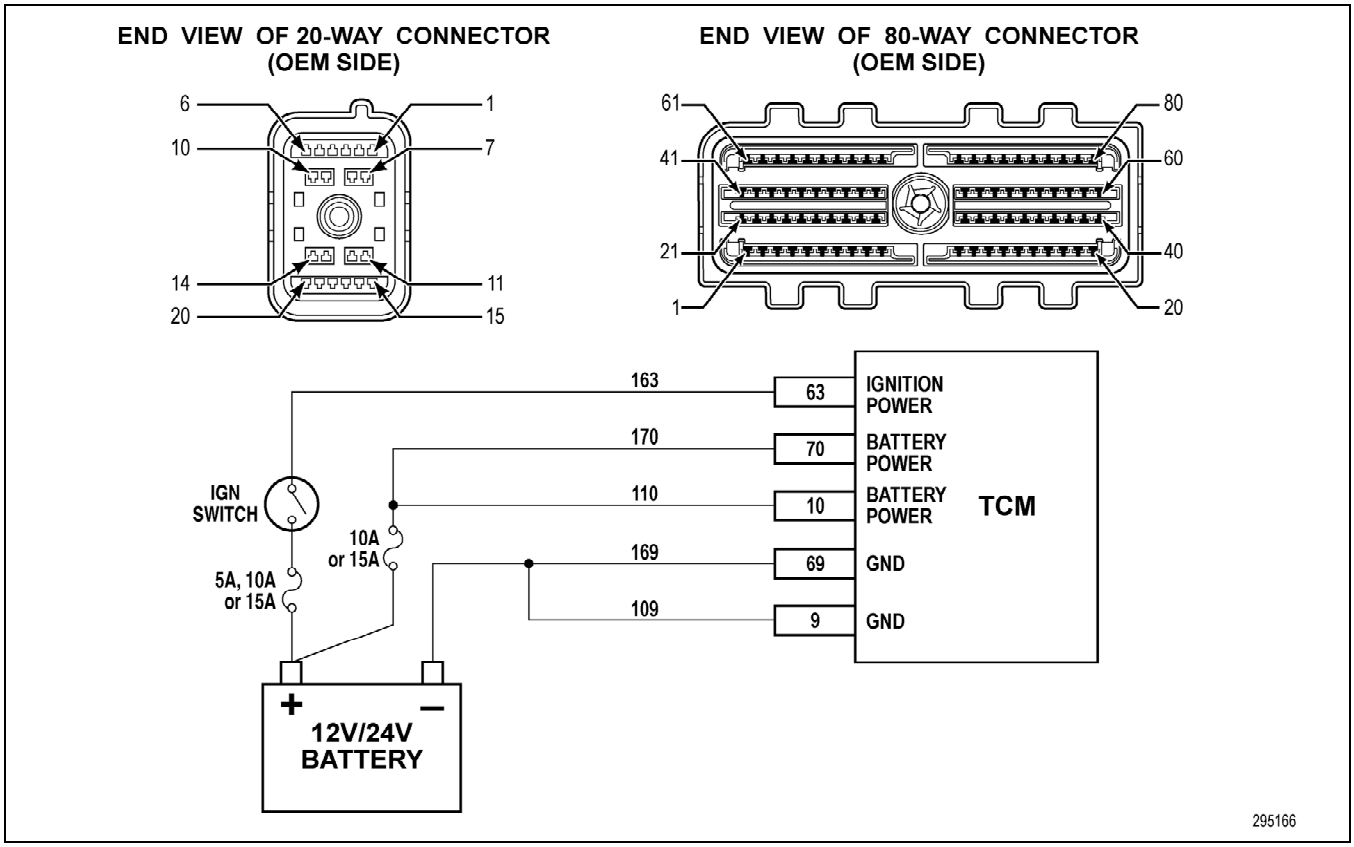
DTC P0880 TCM Power Input Signal



Circuit Description

The TCM requires direct battery voltage input to operate. This test detects abnormal power down of battery voltage to the TCM on terminals 10 and 70 with ignition sense ON. DTC P0880 sets during the next ignition cycle if battery power is lost before the power down process is complete. Normal power down of the TCM takes 2 to 3 seconds after ignition switch input W163 is switched OFF. The selector stays illuminated during this 2 to 3 second process as power OFF data, such as adaptive information, is saved to memory.

NOTE: The TCM battery power signal must be provided through a 10A or 15A fuse, or a manually-reset circuit breaker.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- TCM may not reset if ignition is turned **OFF**.
- TCM reset.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

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DTC P0880 TCM Power Input Signal *(cont'd)*

Diagnostic Aids

- A defective vehicle battery may allow this DTC to set. Test all vehicle batteries to OEM specifications for proper voltage and load capacity.
- A defective vehicle charging system may cause this DTC. Test the charging system to all OEM specifications.
- Battery voltage is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.
- Disconnecting battery power (e.g., via master disconnect) before switching OFF ignition power is a common cause for this DTC. Direct battery power must be maintained for at least 2 to 3 seconds after ignition is switched OFF.
- Defective TCM may cause this code.

NOTE: If a DTC with either a "lock in range" or "shift to alternate range" response was present during the previous power cycle and a DTC P0880 is detected during TCM initialization, the TCM will not complete initialization. An incomplete TCM initialization is indicated by a specific behavior of the shift selector; (i.e. the shift selector will illuminate all segments in the shift display ( ) for 12 or more seconds). The TCM may still be checked for code history using Allison DOC® at this time as long as power has been restored to the TCM. Use the troubleshooting manual to troubleshoot stored DTCs that are present during the incomplete TCM initialization.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for history of DTC.
2. Check for other system symptoms (e.g., selector displays cat-eyes).
3. Check battery cables.
4. Check W170, W110, W169, W109, W158 for high resistance.
5. Check batteries.

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DTC P0880 TCM Power Input Signal *(cont'd)*

6. Check charging system.
7. Check TCM.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0880 in history?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*
2	Are there other symptoms such as cat-eyes on selector displays, blank selector displays, intermittent no start symptoms, or any other history of DTCs with this DTC?		*Go to Step 7*	*Go to Step 3*
3	**NOTE:** Loose or corroded connections, or battery voltage changes may cause this DTC. 1. Disconnect TCM from chassis harness. 2. Check for poor power and ground connections of all battery cables (power and ground) at the following: battery box, alternator, engine block, starter, starter relay, ignition switch, frame, cab chassis, fuse holders or circuit breakers, master disconnect switches, and any other components that have battery cabling attached such as battery equalizers. 3. Check that resistance of all battery cables meets specification. Do battery cables and connections meet specifications?	Resistance of battery cables must not exceed 0.1 Ω (100 mΩ).	*Go to Step 4*	*Correct condition that is out of specification and go to Step 8*

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DTC P0880 TCM Power Input Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Do not connect TCM to TCM side of J-47275 TCM Breakout Harness. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Disconnect W170, W110, W169, W109, and W158 from OEM connections on chassis side. 7. Install a jumper between W158 and W170 at location described in task 6. Measure resistance between terminal 58 and terminal 70 at J-47275-1 Magnetic Overlay. 8. Move jumper from W170 chassis side to another location (e.g., W109 and measure resistance between terminal 58 and terminal 9). Continue moving jumper to W110, W169, and W109 (and moving to terminals 10, 69, 9 on J-47275-1 Magnetic Overlay) to acquire resistance value for each wire pair. Does circuit resistance measure 2 Ω or less after tool resistance is subtracted from J-46708 DMM reading for all wire pairs discussed in task 7 and 8?	2 Ω or less	*Go to Step 5*	*Address issue with high resistance in OEM harness for power or grounds to TCM. Go to Step 8 after repairs are made.*
5	Test all vehicle batteries per OEM instructions, including a voltage test and a load test. Do all the batteries meet OEM specifications?	See OEM for correct battery specifications	*Go to Step 6*	*Replace any batteries that do not meet specification and go to Step 8*
6	Test the vehicle charging system per the OEM recommended testing procedure. Does the charging system meet OEM specifications?	See OEM for correct charging system specifications	*Go to Step 7*	*Repair the charging system and go to Step 8*

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DTC P0880 TCM Power Input Signal *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0880 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0880 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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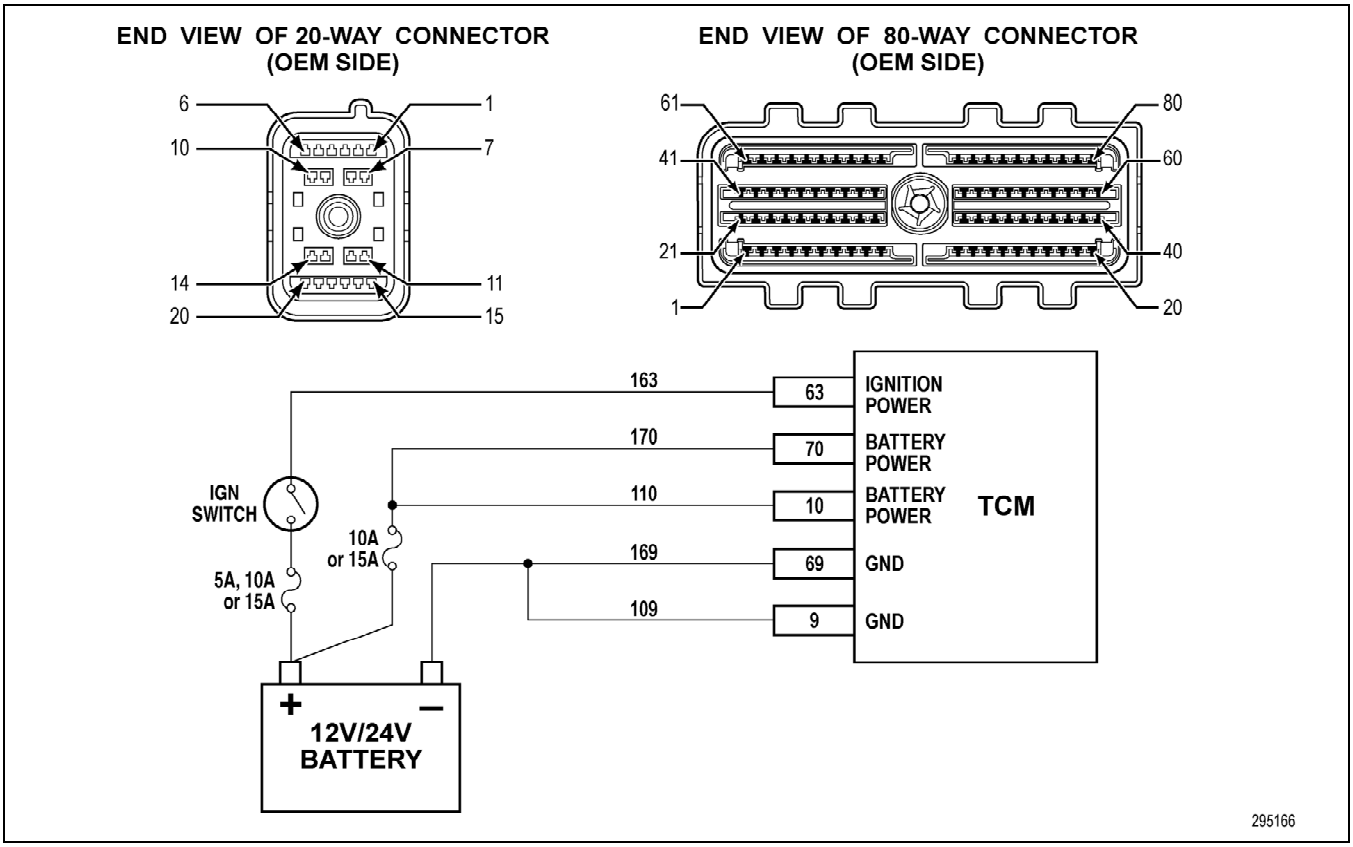
DTC P0881 TCM Power Input Signal Performance



Circuit Description

The TCM requires direct battery voltage input to operate. This test monitors for low or excessive swings in battery voltage to the TCM on terminals 10 and 70.

NOTE: The TCM battery power signal must be provided through a 10A or 15A fuse, or a manually-reset circuit breaker.

Action Taken When the DTC Sets

- The TCM illuminates the **CHECK TRANS** light.
- TCM may not reset if ignition is turned **OFF**.
- Solenoids OFF (Hydraulic default).
- TCC solenoid OFF.
- Main Mod solenoid OFF.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- A defective vehicle battery may allow this DTC to set. Test all vehicle batteries to OEM specifications for proper voltage and load capacity.

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DTC P0881 TCM Power Input Signal Performance *(cont'd)*

- A defective vehicle charging system may cause this DTC. Test the charging system to all OEM specifications. Low voltage or electrically noisy alternators may prevent clean or ample battery voltage from reaching the TCM. If alternator performance is preventing clean battery power on the vehicle, consider using the alternate ignition power diagram shown in Allison Tech Data.
- Battery voltage is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.
- Disconnecting battery power (e.g., via master disconnect) before switching OFF ignition power may cause this DTC. Direct battery power must be maintained for at least 2 to 3 seconds after ignition is switched OFF.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM may cause this code.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check battery voltage.
3. Check battery cables.
4. Check W170, W110, W169, W109, W158 for high resistance.
5. Check batteries.
6. Check charging system.
7. Check TCM.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P0881 TCM Power Input Signal Performance *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0881 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*
2	Check battery voltage value in Data Monitor from snapshot when DTC was active. Does battery voltage meet specifications?	6.5V minimum. The difference between battery voltage minimum and maximum must not exceed 6V.	*Go to Step 7*	*Go to Step 3*
3	**NOTE:** Loose or corroded connections, or battery voltage changes may cause this DTC. 1. Disconnect TCM from chassis harness. 2. Check for poor power and ground connections of all battery cables (power and ground) at the following: battery box, alternator, engine block, starter, starter relay, ignition switch, frame, cab chassis, fuse holders or circuit breakers, master disconnect switches, and any other components that have battery cabling attached such as battery equalizers. 3. Check that resistance of all battery cables meets specification. Do battery cables and connections meet specifications?	Resistance of battery cables must not exceed 0.1 Ω (100 mΩ).	*Go to Step 4*	*Correct condition that is out of specification and go to Step 8*

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DTC P0881 TCM Power Input Signal Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Do not connect TCM to TCM side of J-47275 TCM Breakout Harness. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Disconnect W170, W110, W169, W109, and W158 from OEM connections on chassis side. 7. Install a jumper between W158 and W170 at location described in task 6. Measure resistance between terminal 58 and terminal 70 at J-47275-1 Magnetic Overlay. 8. Move jumper from W170 chassis side to another location (e.g., W109 and measure resistance between terminal 58 and terminal 9). Continue moving jumper to W110, W169, and W109 (and moving to terminals 10, 69, 9 on J-47275-1 Magnetic Overlay) to acquire resistance value for each wire pair. Does circuit resistance measure 2 Ω or less after tool resistance is subtracted from J-46708 DMM reading for all wire pairs discussed in task 7 and 8?	2 Ω or less	*Go to Step 5*	*Address issue with high resistance in OEM harness for power or grounds to TCM. Go to Step 8 after repairs are made.*
5	Test all vehicle batteries per OEM instructions, including a voltage test and a load test. Do all the batteries meet OEM specifications?	See OEM for correct battery specifications	*Go to Step 6*	*Replace any batteries that do not meet specification and go to Step 8*
6	Test the vehicle charging system per the OEM recommended testing procedure. Does the charging system meet OEM specifications?	See OEM for correct charging system specifications	*Go to Step 7*	*Repair the charging system and go to Step 8*

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DTC P0881 TCM Power Input Signal Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0881 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0881 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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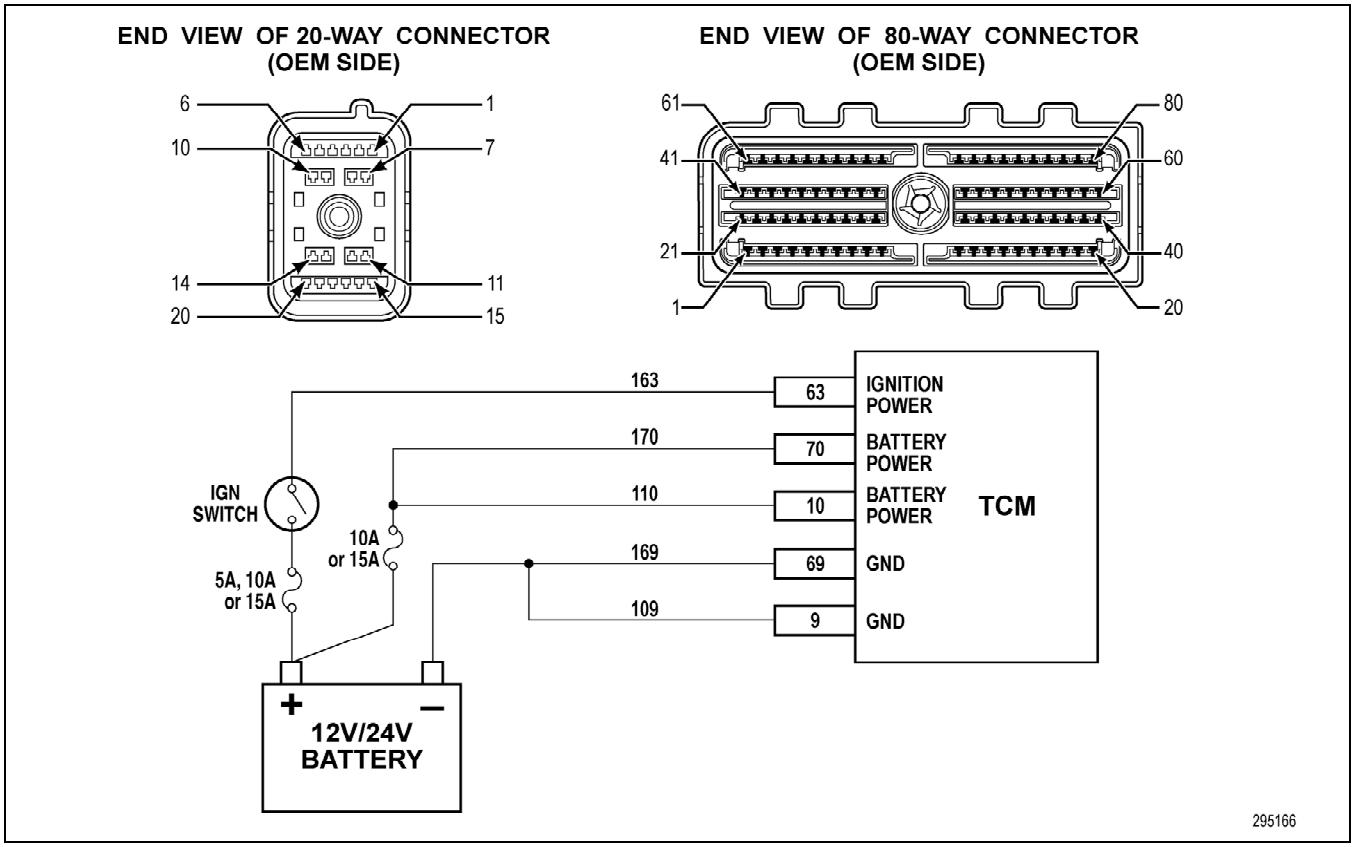
DTC P0882 TCM Power Input Signal Low



Circuit Description

The TCM requires direct battery voltage input to operate. This test monitors for low battery voltage to the TCM on terminals 10 and 70.

NOTE: The TCM battery power signal must be provided through a 10A or 15A fuse, or a manually-reset circuit breaker.

Action Taken When the DTC Sets

- The TCM illuminates the **CHECK TRANS** light.
- TCM may not re-set if ignition is turned **OFF**.
- Solenoids OFF (Hydraulic default).
- TCC solenoid OFF.
- Main Mod solenoid OFF.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- A defective vehicle battery may allow this DTC to set. Test all vehicle batteries to OEM specifications for proper voltage and load capacity.

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DTC P0882 TCM Power Input Signal Low *(cont'd)*

- A defective vehicle charging system may cause this DTC. Test the charging system to all OEM specifications.
- Battery voltage is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.
- Disconnecting battery power (e.g., via master disconnect) before switching OFF ignition power may cause this DTC. Direct battery power must be maintained for at least 2 to 3 seconds after ignition is switched OFF.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM may cause this code.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check battery voltage.
3. Check battery cables.
4. Check W170, W110, W169, W109, W158 for high resistance.
5. Check batteries.
6. Check charging system.
7. Check TCM.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer toAppendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0882 TCM Power Input Signal Low *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0882 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*
2	Check battery voltage value in Data Monitor from snapshot when DTC was active. Does battery voltage meet specifications?	9.0V at fluid temperature over -40°C (-40°F)	*Go to Step 7*	*Go to Step 3*
3	**NOTE:** Loose or corroded connections, or battery voltage changes may cause this DTC. 1. Disconnect TCM from chassis harness. 2. Check for poor power and ground connections of all battery cables (power and ground) at the following: battery box, alternator, engine block, starter, starter relay, ignition switch, frame, cab chassis, fuse holders or circuit breakers, master disconnect switches, and any other components that have battery cabling attached such as battery equalizers. 3. Check that resistance of all battery cables meets specification. Do battery cables and connections meet specifications?	Resistance of battery cables must not exceed 0.1 Ω (100 mΩ).	*Go to Step 4*	*Correct condition that is out of specification and go to Step 8*

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DTC P0882 TCM Power Input Signal Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Do not connect TCM to TCM side of J-47275 TCM Breakout Harness. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Disconnect W170, W110, W169, W109, and W158 from OEM connections on chassis side. 7. Install a jumper between W158 and W170 at location described in task 6. Measure resistance between terminal 58 and terminal 70 at J-47275-1 Magnetic Overlay. 8. Move jumper from W170 chassis side to another location (e.g., W109 and measure resistance between terminal 58 and terminal 9). Continue moving jumper to W110, W169, and W109 (and moving to terminals 10, 69, 9 on J-47275-1 Magnetic Overlay) to acquire resistance value for each wire pair. Does circuit resistance measure 2 Ω or less after tool resistance is subtracted from J-46708 DMM reading for all wire pairs discussed in task 7 and 8?	2 Ω or less	*Go to Step 5*	*Address issue with high resistance in OEM harness for power or grounds to TCM. Go to Step 8 after repairs are made.*
5	Test all vehicle batteries per OEM instructions, including a voltage test and a load test. Do all the batteries meet OEM specifications?	See OEM for correct battery specifications	*Go to Step 6*	*Replace any batteries that do not meet specification and go to Step 8*
6	Test the vehicle charging system per the OEM recommended testing procedure. Does the charging system meet OEM specifications?	See OEM for correct charging system specifications	*Go to Step 7*	*Repair the charging system and go to Step 8*

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DTC P0882 TCM Power Input Signal Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0882 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0882 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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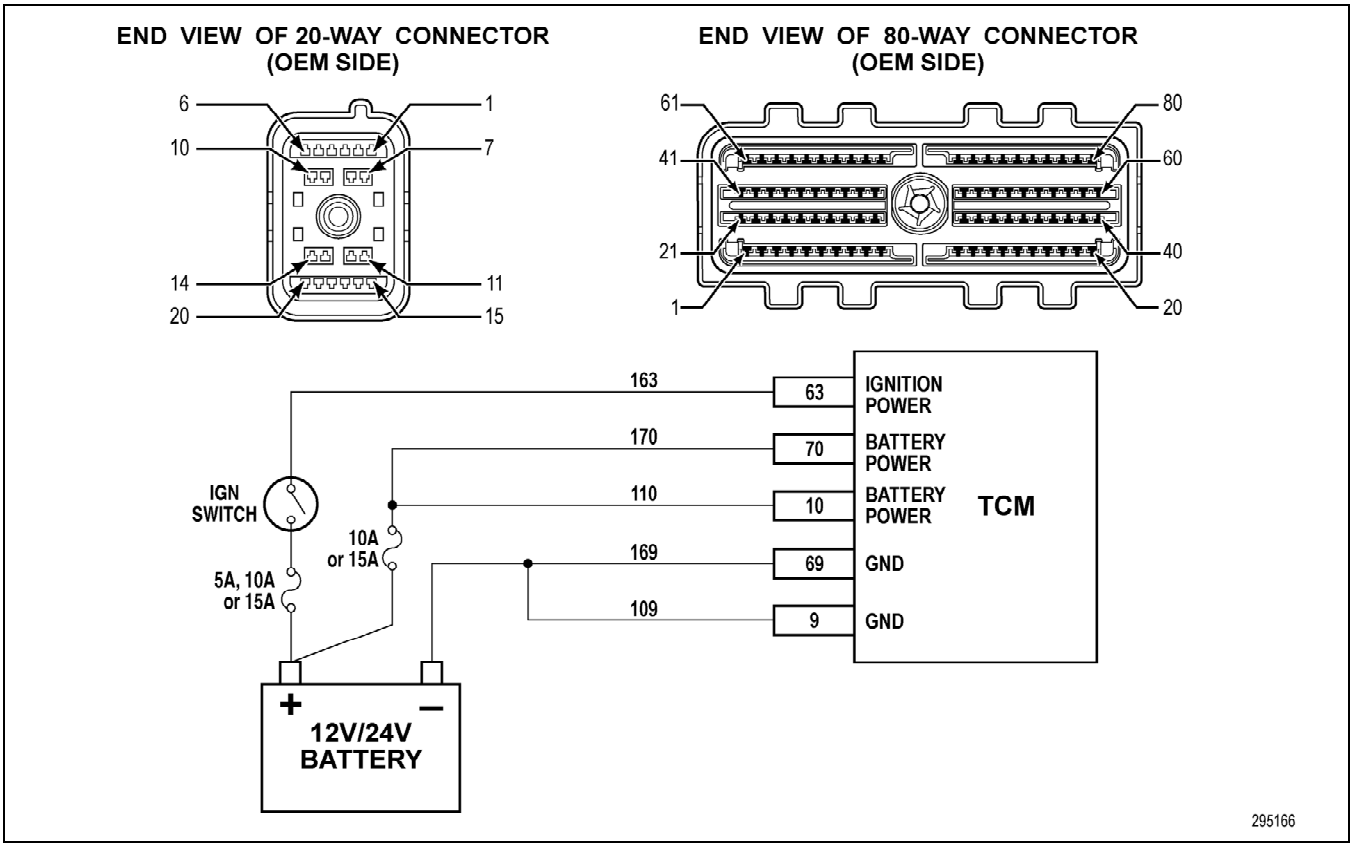
DTC P0883 TCM Power Input Signal High



Circuit Description

The TCM requires direct battery voltage input to operate. This test monitors for high battery voltage to the TCM on terminals 10 and 70.

NOTE: The TCM battery power signal must be provided through a 10A or 15A fuse, or a manually-reset circuit breaker.

Action Taken When the DTC Sets

- The TCM illuminates the **CHECK TRANS** light.
- Solenoids OFF (Hydraulic default).
- TCC solenoid OFF.
- Main Mod solenoid OFF.

Conditions for Clearing the DTC

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- A defective vehicle battery may allow this DTC to set. Test all vehicle batteries to OEM specifications for proper voltage and load capacity.

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DTC P0883 TCM Power Input Signal High *(cont'd)*

- A defective vehicle charging system may cause this DTC. Test the charging system to all OEM specifications.
- Over-voltage from battery charger.
- Battery voltage is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM may cause this code.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check battery voltage.
3. Check battery cables.
4. Check W170, W110, W169, W109, W158 for high resistance.
5. Check batteries.
6. Check charging system.
7. Check TCM.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0883 TCM Power Input Signal High *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0883 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8*
2	Check battery voltage value in Data Monitor from snapshot when DTC was active. Does battery voltage meet specifications?	12V TCM is < 18 volts, 24V TCM is < 32 volts	*Go to Step 7*	*Go to Step 3*
3	1. Disconnect TCM from chassis harness. 2. Check for poor power and ground connections of all battery cables (power and ground) at the following: battery box, alternator, engine block, starter, starter relay, ignition switch, frame, cab chassis, fuse holders or circuit breakers, master disconnect switches, and any other components that have battery cabling attached such as battery equalizers. 3. Check that resistance of all battery cables meets specification. Do battery cables and connections meet specifications?	Resistance of battery cables must not exceed 0.1 Ω (100 mΩ).	*Go to Step 4*	*Correct condition that is out of specification and go to Step 8*

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DTC P0883 TCM Power Input Signal High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Do not connect TCM to TCM side of J-47275 TCM Breakout Harness. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Disconnect W170, W110, W169, W109, and W158 from OEM connections on chassis side. 7. Install a jumper between W158 and W170 at location described in task 6. Measure resistance between terminal 58 and terminal 70 at J-47275-1 Magnetic Overlay. 8. Move jumper from W170 chassis side to another location (e.g., W109 and measure resistance between terminal 58 and terminal 9). Continue moving jumper to W110, W169, and W109 (and moving to terminals 10, 69, 9 on J-47275-1 Magnetic Overlay) to acquire resistance value for each wire pair. Does circuit resistance measure 2 Ω or less after tool resistance is subtracted from J-46708 DMM reading for all wire pairs discussed in task 7 and 8?	2 Ω or less	*Go to Step 5*	*Address issue with high resistance in OEM harness for power or grounds to TCM. Go to Step 8 after repairs are made.*
5	Test all vehicle batteries per OEM instructions, including a voltage test and a load test. Do all the batteries meet OEM specifications?	See OEM for correct battery specifications	*Go to Step 6*	*Replace any batteries that do not meet specification and go to Step 8*
6	Test the vehicle charging system per the OEM recommended testing procedure. Does the charging system meet OEM specifications?	See OEM for correct charging system specifications	*Go to Step 7*	*Repair the charging system and go to Step 8*

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DTC P0883 TCM Power Input Signal High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0883 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0883 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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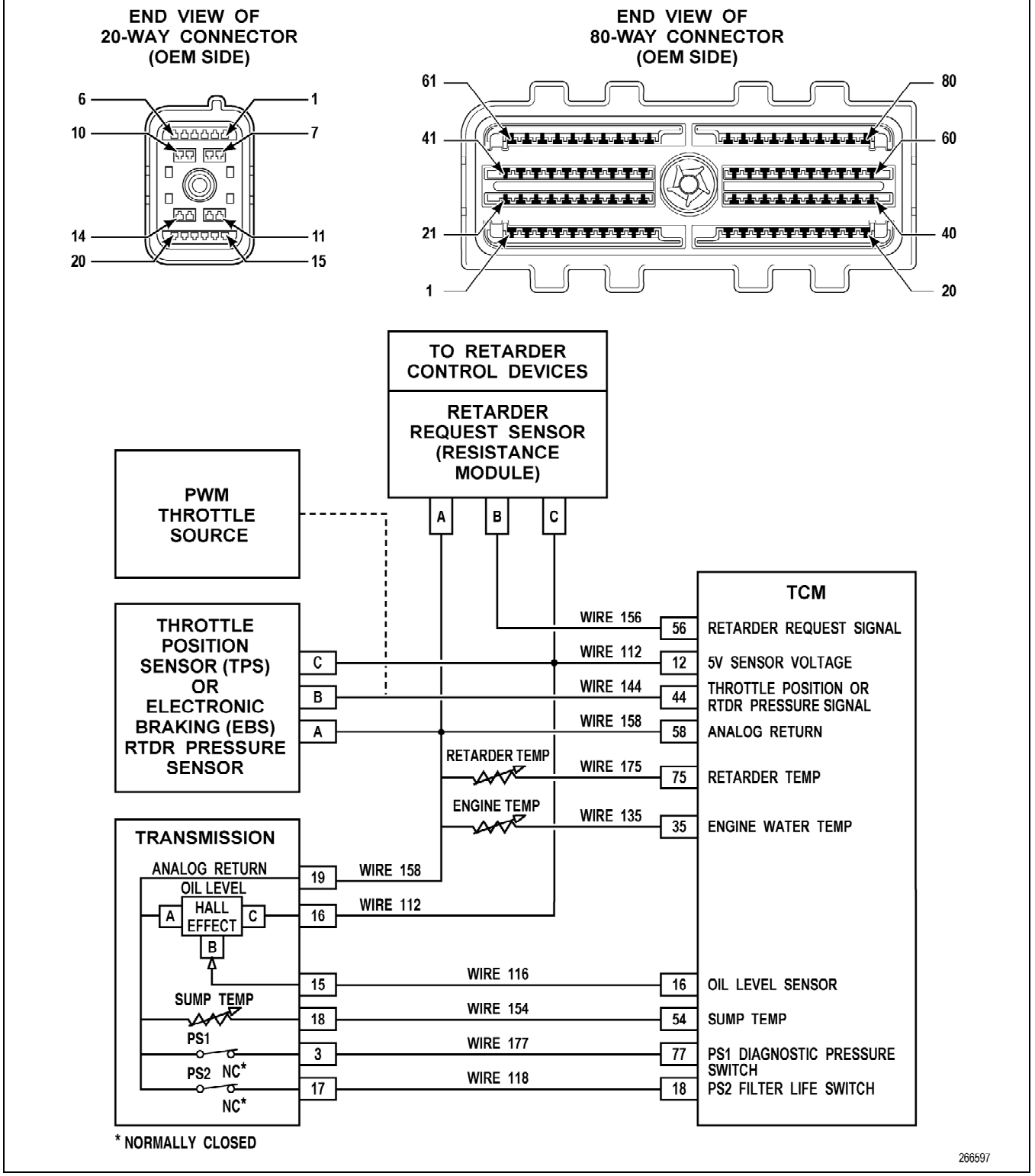
DTC P088A Transmission Filter Maintenance Alert



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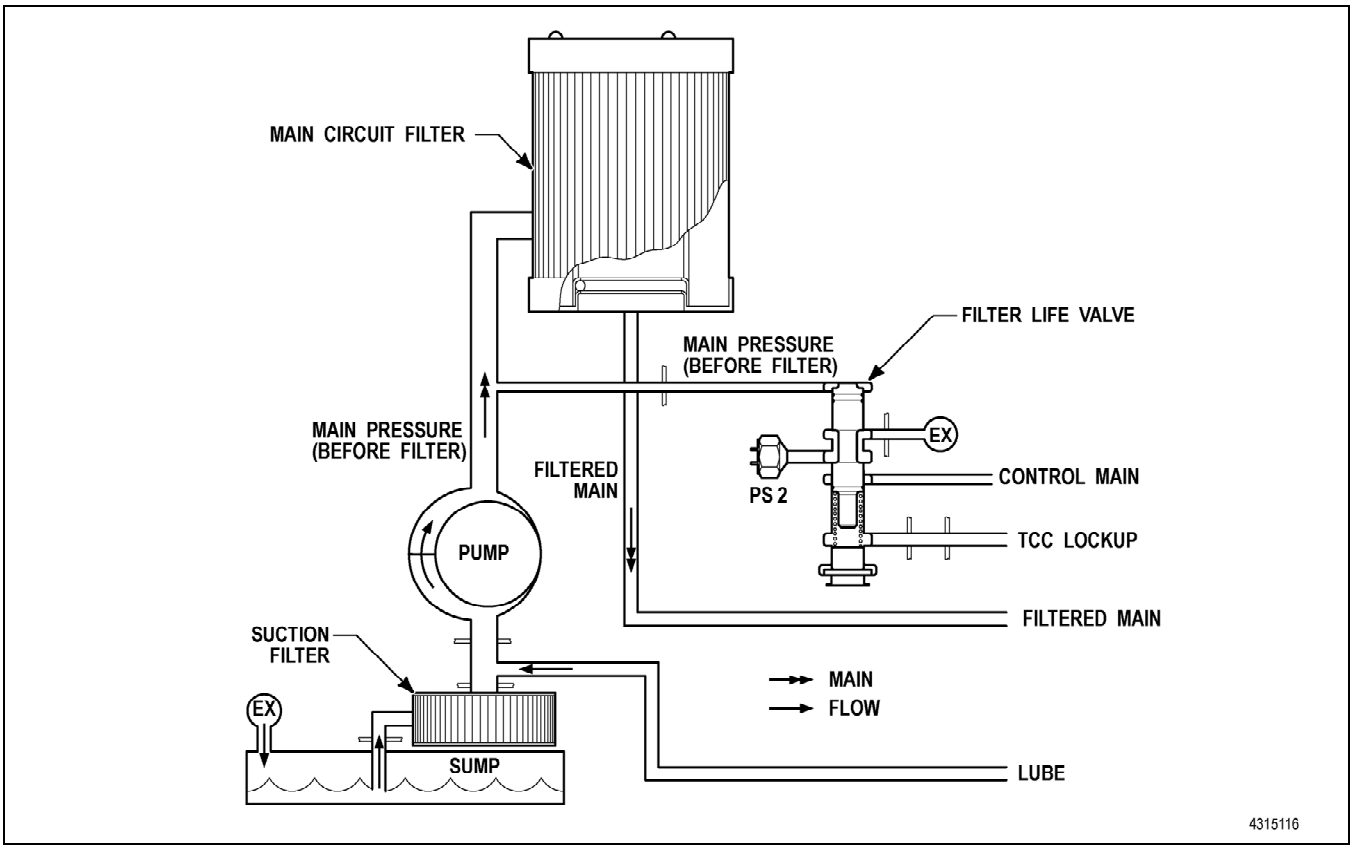
DTC P088A Transmission Filter Maintenance Alert *(cont'd)*



Circuit Description

The Filter Life Monitor (FM) feature alerts the driver when a filter change is needed by illuminating the **SERVICE TRANS** indicator (wrench icon display). FM also activates any OEM-provided **SERVICE TRANS** indicator or datalink message center display (when integrated to receive the message). If the filter is detected as restricted, the wrench icon in the selector flashes ON and OFF for approximately 2 minutes the first time **D** (Drive) is selected after each engine start. Also, DTC P088A becomes active concurrently with these other visible filter maintenance alerts. This DTC monitors the electrical state of the PS2 FLI pressure switch. If PS2 is detected as open (pressurized) while the transmission is in a forward range and with the Torque Converter Clutch (TCC) (lockup) solenoid energized, the DTC becomes active.

An approximate 172 kPa (25 psi) difference between main pressure (before the filter) and TCC lockup pressure determines whether to stroke or de-stroke the FLI pressure switch valve in the prognostics valve body within the control valve module. An open switch with the TCC solenoid energized causes an active DTC P088A. The **CHECK TRANS** light does not illuminate for this DTC.

An active DTC and **SERVICE TRANS** indicator occurs at next engine start when the operator selects **D** (Drive).

Action Taken When the DTC Sets

- DTC P088A is stored in the TCM history for a number of ignition cycles.
- The wrench icon in the shift selector display will flash ON and OFF for approximately 2 minutes the first time **D** (Drive) is selected after each engine start.

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DTC P088A Transmission Filter Maintenance Alert *(cont'd)*

Conditions for Clearing the DTC

- The feature is designed to reset itself automatically after the main filter has been changed.
- Allison DOC® can clear the DTC from TCM history.
- The operator may clear the code and flashing **SERVICE TRANS** indicator by pressing the **MODE** button for 10 seconds provided the CMC to disable a reset from the shift selector was not enabled. However, if the filters are not changed, or the pressure loss in the TCC Lockup circuit isn't corrected, the DTC will most likely become active again.
- FM may also be reset by selecting **N-R-N-R-N-D-N** on the shift selector, pausing briefly (less than 3 seconds) between each selector movement when the ignition is on and the engine not running.
- FM may be reset with a SAE J1939 message.
- Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

Refer to Section 2. ALLISON 5TH GENERATION CONTROL SYSTEM OPERATION and Section 4. PROGNOSTICS PACKAGE AND FEATURES for important information about OM, FM, and TM. These sections discuss prognostics principles of operation, feature requirements, maintenance alerts, reports, and processes to reset features or change fluid type (January 2010 and later TCM software) using either Allison DOC® or an Allison-supplied (MY09 and later) shift selector.

Allison DOC® will show PS2 PRESSURIZED when PS2 is open and PS2 EXHAUSTED when PS2 is closed.

DTC P088A can be caused by:

- Restricted Main Filter.

NOTE: Change both main and lube filters if main filter is restricted.

- Low lockup pressure.
  - Turbine Hub Sealring wear/leakage
  - Worn TCC bore in Solenoid Valve Body
  - Front support to ground sleeve leakage
  - Channel plate leakage
  - Leakage within FLI Valve Body assembly
- Open or high resistance in W118 or W158 in chassis harness.
- Open or high resistance from terminal 17 to PS2, or from PS2 to terminal 19, in control module wire harness.
- Issue with PS2.
- Issue with TCM.

Tool Requirements:

- Allison DOC®

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DTC P088A Transmission Filter Maintenance Alert *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Change filters and recheck for codes.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0848 active or in history with P088A?		*Go to DTC P0848*	*Go to Step 2*
2	Change main filter and lube filter using Allison high capacity filters. **NOTE:** Prognostics package must be disabled if not using Allison high capacity filters.		*Go to Step 3*	*Go to Step 3*
3	1. Record snapshot during test drive of vehicle. 2. Test drive vehicle with fluid above 80°C (175°F) and in all ranges that apply lockup clutch. 3. Recheck for DTC P088A. 4. After completion of test drive, review Allison DOC® snapshot for any incidence of PS2 indicating pressurized while TCC Lockup was commanded on. Check all ranges with TCC Lockup applied. Did DTC P088A or P088B go active during test drive? Did PS2 indicate pressurized in any range?		*Go to Step 4*	*System OK. Clear inactive DTCs and return vehicle to service.*
4	1. Install pressure gauges on Channel Plate Main and TCC Lockup diagnostic ports. 2. Achieve transmission fluid temperature of 80°C (175°F) or higher. 3. Operate vehicle to achieve TCC Lockup apply. 4. Record main and TCC Lockup pressures with TCC Lockup applied. Was pressure differential between Main pressure and TCC Lockup pressure greater than 25 psi?	Main Pressure minus TCC Lockup Pressure exceeds 25 psi	*Troubleshoot source of TCC Lockup pressure loss. Review potential causes of pressure loss in Diagnostic Aids. Repair as needed and go to Step 3.*	*Troubleshoot potential intermittent open circuit condition between TCM and PS2 or defective PS2. Repair as needed and go to Step 3.*

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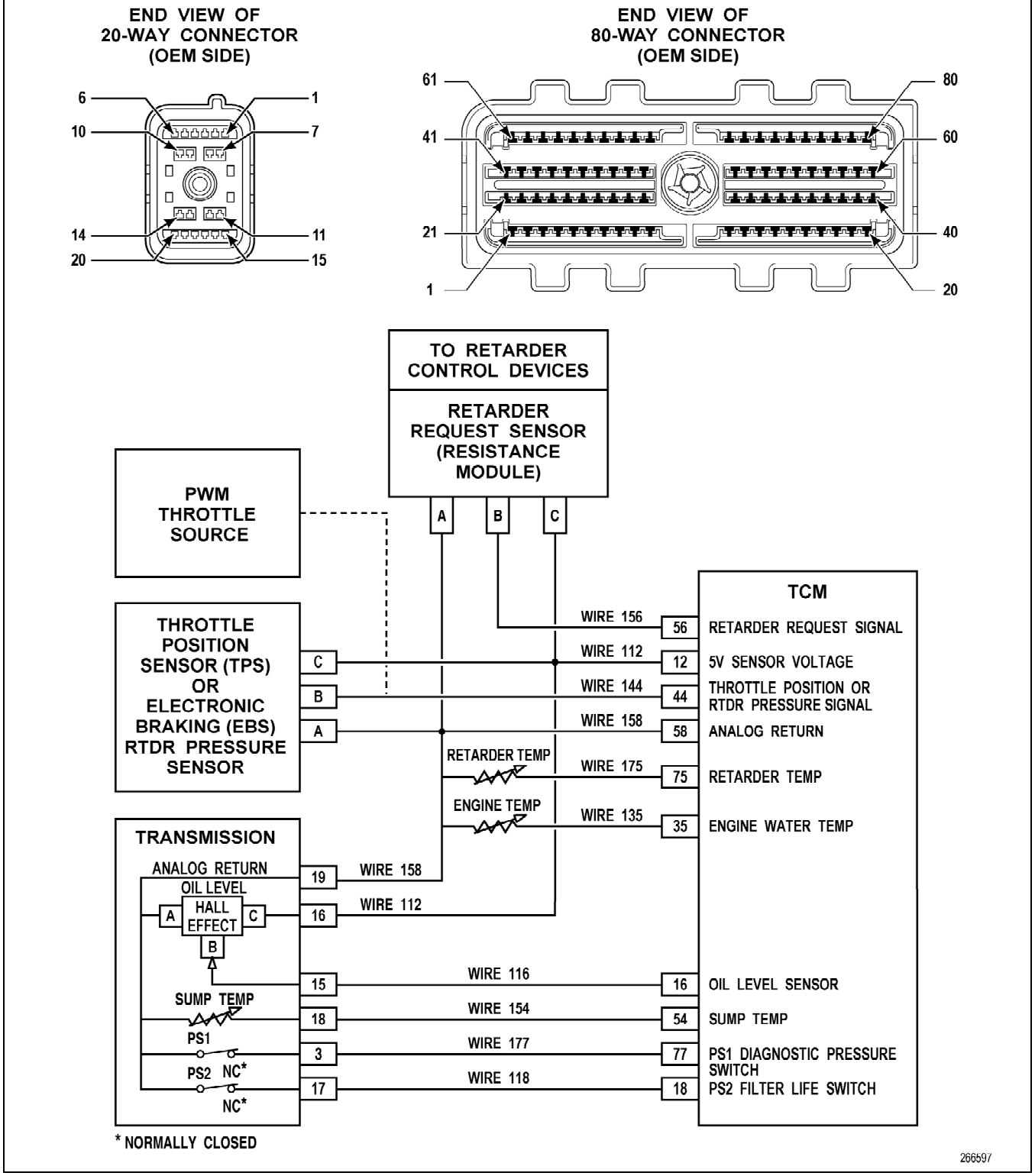
DTC P088B Transmission Filter Maintenance Required



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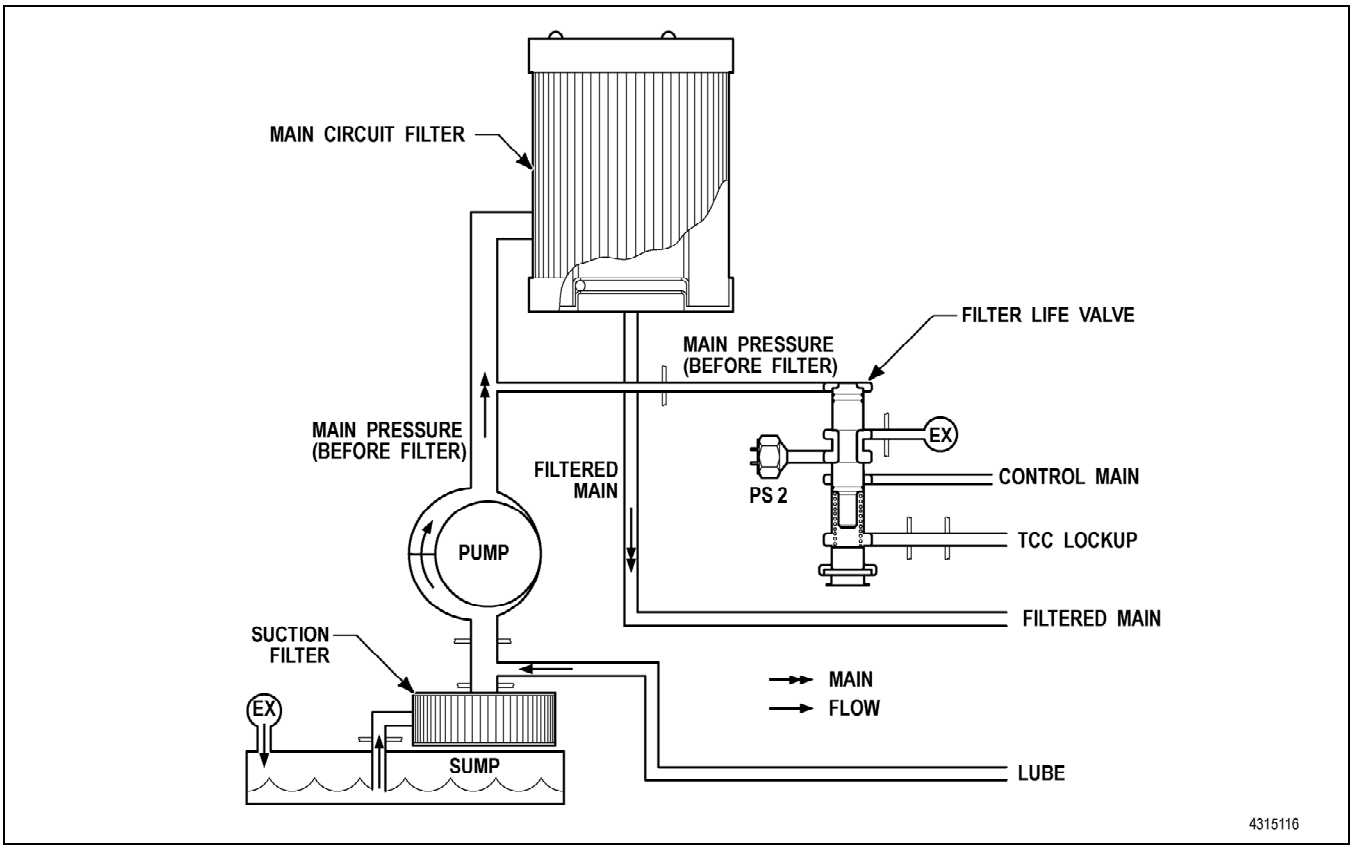
DTC P088B Transmission Filter Maintenance Required *(cont'd)*



Circuit Description

The Filter Life Monitor (FM) feature alerts the driver when a filter change is needed by illuminating the **SERVICE TRANS** indicator (wrench icon in keypad or lever shift selector display). FM also activates any OEM-provided **SERVICE TRANS** indicator or datalink message center display (when integrated to receive the message). If the filter is detected as restricted, the wrench icon in the selector flashes ON and OFF for approximately 2 minutes the first time **D** (Drive) is selected after each engine start. Also, DTC P088A becomes active concurrently with these other visible filter maintenance alerts. This DTC monitors the electrical state of the PS2 Filter Life Indicator (FLI) pressure switch. If PS2 is detected as open (pressurized) while the transmission is in a forward range and with the Torque Converter Clutch (TCC) (lockup) solenoid energized, the DTC becomes active. If several alerts are sent, but the PS2 switch is still detected as pressurized, DTC P088B becomes active.

An approximate 172 kPa (25 psi) difference between main pressure (before the filter) and TCC lockup pressure determines whether to stroke or de-stroke the FLI pressure switch valve in the prognostics valve body within the control valve module.

An active DTC and **SERVICE TRANS** indicator occurs at next engine start when the operator selects **D** (Drive).

Action Taken When the DTC Sets

- DTC P088B is stored in the TCM history for a number of ignition cycles.
- The wrench icon in the display of an Allison shift selector will flash ON and OFF for approximately 2 minutes the first time **D** (Drive) is selected after each engine start.
- The TCM illuminates the **CHECK TRANS** light.

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DTC P088B Transmission Filter Maintenance Required *(cont'd)*

Conditions for Clearing the DTC

- The feature is designed to reset itself automatically after the main filter has been changed.
- Allison DOC® can clear the DTC from TCM history.
- The operator may clear the code and flashing **SERVICE TRANS** indicator by pressing the **MODE** button for 10 seconds provided the CMC to disable a reset from the shift selector was not enabled. However, if the filters are not changed, or the pressure loss in the TCC Lockup circuit isn't corrected, the DTC will most likely become active again.
- FM may also be reset by selecting **N-R-N-R-N-D-N** on the shift selector, pausing briefly (less than 3 seconds) between each selector movement when the ignition is on and the engine not running.
- FM may be reset with a SAE J1939 message.
- Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

Refer to Section 2. ALLISON 5TH GENERATION CONTROL SYSTEM OPERATION and Section 4. PROGNOSTICS PACKAGE AND FEATURES for important information about Oil Life Monitor (OM), FM, and Transmission Health Monitor (TM). These sections discuss prognostics principles of operation, feature requirements, maintenance alerts, reports, and processes to reset features or change fluid type (January 2010 and later TCM software) using either Allison DOC® or an Allison-supplied shift selector.

Allison DOC® will show PS2 PRESSURIZED when PS2 is open and PS2 EXHAUSTED when PS2 is closed.

DTC P088B can be caused by:

- Restricted Main Filter.

NOTE: Change both main and lube filters if main filter is restricted.

- Low lockup pressure.
  - Turbine Hub Sealring wear/leakage
  - Worn TCC bore in Solenoid Valve Body
  - Front support to ground sleeve leakage
  - Channel plate leakage
  - Leakage within FLI Valve Body assembly
- Open or high resistance in W118 or W158 in chassis harness.
- Open or high resistance from terminal 17 to PS2, or from PS2 to terminal 19, in control module wire harness.
- Issue with PS2.
- Issue with TCM.

Tool Requirements:

- Allison DOC®

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DTC P088B Transmission Filter Maintenance Required *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Change filters and recheck for codes.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0848 active or in history with P088B?		*Go to DTC P0848*	*Go to Step 2*
2	Change main filter and lube filter using Allison high capacity filters. **NOTE:** Prognostics package must be disabled if not using Allison high capacity filters.		*Go to Step 3*	*Go to Step 3*
3	1. Record snapshot during test drive of vehicle. 2. Test drive vehicle with fluid above 80°C (175°F) and in all ranges that apply lockup clutch. 3. Recheck for DTC P088B. 4. After completion of test drive, review Allison DOC® snapshot for any incidence of PS2 indicating pressurized while TCC Lockup was commanded on. Check all ranges with TCC Lockup applied. Did DTC P088A or P088B go active during test drive? Did PS2 indicate pressurized in any range?		*Go to Step 4*	*System OK. Clear inactive DTCs and return vehicle to service.*
4	1. Install pressure gauges on Channel Plate Main and TCC Lockup diagnostic ports. 2. Achieve transmission fluid temperature of 80°C (175°F) or higher. 3. Operate vehicle to achieve TCC Lockup apply. 4. Record main and TCC Lockup pressures with TCC Lockup applied. Was pressure differential between Main pressure and TCC Lockup pressure greater than 25 psi?	Main Pressure minus TCC Lockup Pressure exceeds 25 psi	*Troubleshoot source of TCC Lockup pressure loss. Review potential causes of pressure loss in Diagnostic Aids. Repair as needed and go to Step 3.*	*Troubleshoot potential intermittent open circuit condition between TCM and PS2 or defective PS2. Repair as needed and go to Step 3.*

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DTC P0894 Unexpected Mechanical Gear Disengagement

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This test detects no turbine pull-down or ratio when turbine pull-down or ratio is expected.

Action Taken When the DTC Sets

When DTC P0894 is active, the following conditions will occur:

- Lock in range.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0894 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid stuck on or stuck off codes.

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DTC P0894 Unexpected Mechanical Gear Disengagement *(cont'd)*

6. Check for PS1 codes.
7. Check for electrical circuit codes for solenoids.
8. Check TCM.
9. Check for partial stall clutch slip and also acquire clutch pressures.
10. Compare all pressures to specifications including the exhausted clutches.
11. Disassemble and inspect control valve module.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul; e.g, fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0894?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0894?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are any solenoids stuck on or stuck off DTCs in history with DTC P0894?		*Go to solenoid DTC*	*Go to Step 6*
6	Is DTC P0842 or P0843 active or in history with DTC P0894?		*Go to DTC P0842 or DTC P0843*	*Go to Step 7*
7	Are there active or inactive DTCs for any electrical circuits of solenoids located in the control valve module with DTC P0894?		*Go to solenoid DTC*	*Go to Step 8*
8	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt to 2.0-3.2 N·m (18-28 lb in). 3. Start engine and test drive vehicle. 4. Using Allison DOC®, check for active codes. 5. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 6. Restart engine and check again for active DTCs. Is DTC P0894 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 9*

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DTC P0894 Unexpected Mechanical Gear Disengagement *(cont'd)*

Step	Action	Value(s)	Yes	No
9	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode for each available range. Record main and clutch apply pressures for each range. **NOTE:** Verify exhausted clutches meet specification. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures in all forward ranges except Low range for 7-speed models. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. Is turbine shaft speed at 0-1 rpm?		*Go to Step 13*	*Go to Step 10*
10	Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 12*	*Go to Step 11*
11	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Go to Step 12*

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DTC P0894 Unexpected Mechanical Gear Disengagement *(cont'd)*

Step	Action	Value(s)	Yes	No
12	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0894 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0897 Transmission Fluid Deteriorated

NO SCHEMATIC FOR THIS DTC

Circuit Description

The Oil Life Monitor (OM) is part of the Allison 5th Generation Control System Prognostics Package. OM calculates the remaining life of the transmission fluid (oil).

When the remaining fluid life reaches approximately 1-2%, the **SERVICE TRANS** indicator (wrench icon in an Allison shift selector) illuminates, denoting a required change of transmission fluid. The indicator illuminates at each initialization of the TCM and remains illuminated for approximately 1-2 minutes after the first selection of a drive range until a fluid change service is done and the OM function is reset. DTC P0897 sets if the OM function is not reset within 100 run time hours from the initial warning for remaining fluid life at 1-2% indicated by the illuminated **SERVICE TRANS** indicator.

If the OM function is not reset within some period of time from the initial warning indicated by the illuminated **SERVICE TRANS** indicator, then a **CHECK TRANS** light illuminates indicating that DTC P0897, Transmission Fluid Deteriorated, has set. This indicates that the remaining transmission fluid life has reached 1-2%. Reset the **SERVICE TRANS** indicator with the Allison DOC® diagnostic program or by pressing and holding the **MODE** button for 10 seconds. It may also be reset by selecting **N-D-N-D-N-R-N** on the shift selector, pausing briefly (less than 3 seconds) between each selector movement with the ignition **ON** and the engine not running. Finally, it may be reset with a SAE J1939 message.

Action Taken When the DTC Sets

- The TCM illuminates the **CHECK TRANS** light.
- DTC is stored in the TCM history

Conditions for Clearing the DTC

Allison DOC® may be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- Required calendar-based fluid change intervals are not monitored by the OM and remain applicable.
- Refer to Section 4. PROGNOSTICS PACKAGE AND FEATURES for additional information.
- Refer to Section 3. FLUID CHECK PROCEDURES for additional information.

NOTE: Fifty hours of TCM time must accumulate before another reset of OM is allowed, either through the shift selector method or by action request in Allison DOC®. Programming mode "offsets" for OM are not affected and may be set to various numbers regardless of the TCM time.

NOTE: Refer to 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS for indicator lamp issues. Allison DOC® action requests, lamp tests, may be used to check functionality of **SERVICE TRANS** (wrench icon).

Tool Requirements

- Allison DOC®

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DTC P0897 Transmission Fluid Deteriorated *(cont'd)*

DTC Test Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC P0897.
2. Check if OM current percent is below 2%.
3. After fluid change and OM reset, check for active DTC P0897.
4. Check TCM.
5. If DTC is still active, review diagnostic aids, applicable information in Section 4. PROGNOSTICS PACKAGE AND FEATURES, and related Appendices.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0897 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 5*
2	**NOTE:** When transmission fluid requires changing, the **SERVICE TRANS** indicator illuminates at ignition **ON**, and goes off 1-2 minutes after a shift to **D** (Drive). Using Allison DOC®, click the Prognostic tab and check the current percentage of oil life displayed. Is the OM current percentage less than 2%?	Less than 2%	*Change fluid, reset prognostics fluid type (if required), reset OM. Go to Step 3*	*Go to Step 4*
3	Does DTC P0897 reoccur again shortly after the fluid change and OM reset?		*Go to Step 4*	*Go to Step 5*
4	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. Torque to specification, as required. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 5 after repair.*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Go to Step 5 after repair.*

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DTC P0897 Transmission Fluid Deteriorated *(cont'd)*

Step	Action	Value(s)	Yes	No
5	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0897 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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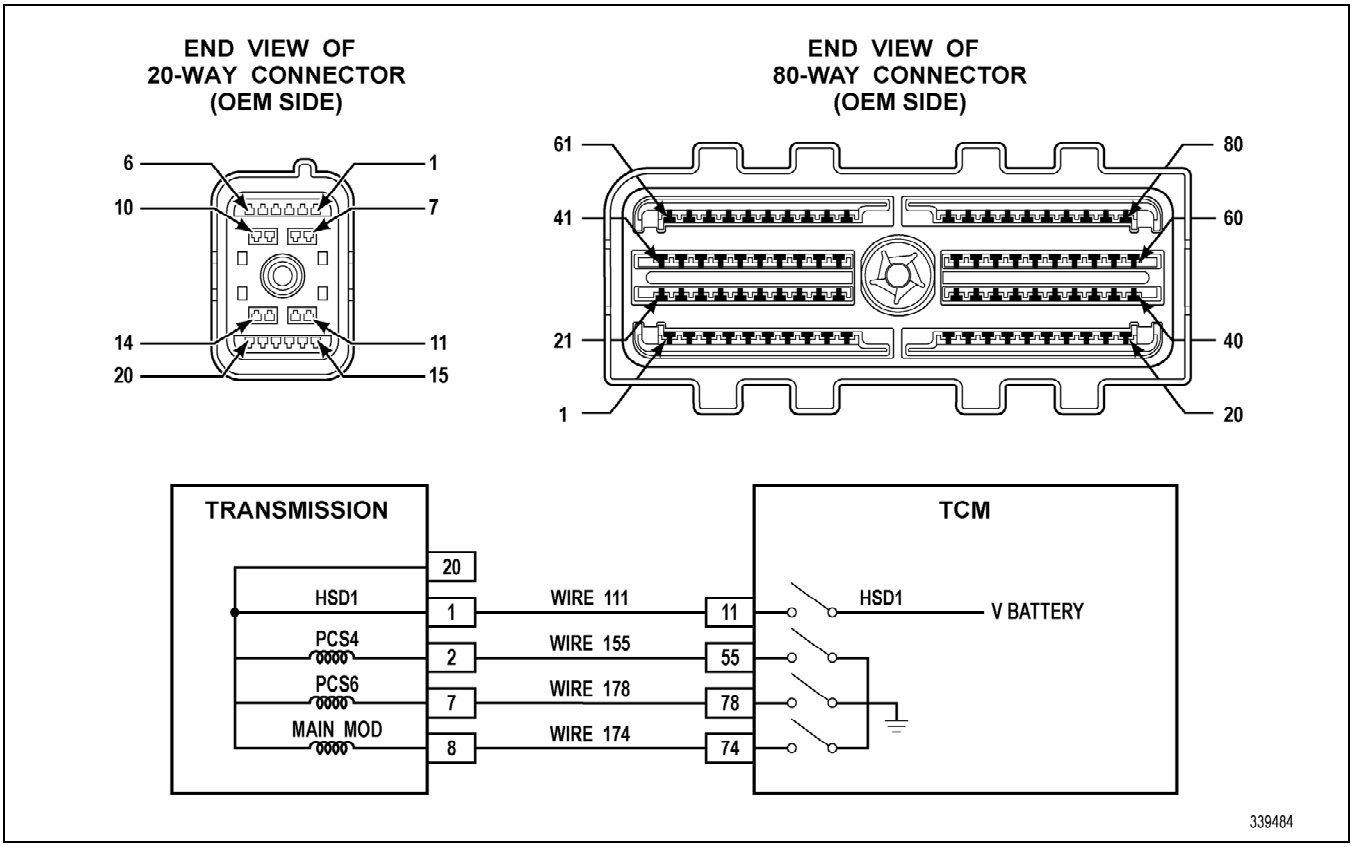
DTC P0960 Main Pressure Modulation Solenoid Control Circuit Open



Circuit Description

Pressure control Main Mod solenoid is used to modulate the transmission main pressure schedule. DTC P0960 indicates that the TCM has detected an open condition in the Main Mod solenoid electrical circuit. The open condition may exist in the high side (wire 111) or low side (wire 174).

Action Taken When the DTC Sets

When DTC P0960 is active:

- Main Modulation is inhibited which results in full main pressure commands.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0960 can be caused by:

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DTC P0960 Main Pressure Modulation Solenoid Control Circuit Open *(cont'd)*

- Main Mod issues such as:
  - W174 high resistance or an open circuit in chassis harness.
  - W174 (terminal 8 of 20-way) high resistance or an open circuit in internal transmission harness.
  - Main Mod solenoid defective.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W174 in chassis harness for open or high resistance.
4. Check TCM.
5. Check internal harness wire for Main Mod Low Side Driver (terminal 8) for high resistance or open.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0960 Main Pressure Modulation Solenoid Control Circuit Open *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0960 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0657, P2718, or P2812 present or in history with active DTC P0960?		*Go to DTC P0657*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 8 and 2 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 74 and 55 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W174. Go to Step 7 after repairs are made.*

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DTC P0960 Main Pressure Modulation Solenoid Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0960 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect Main Mod solenoid from internal harness. 4. Install jumper wire between A and B terminals of Main Mod solenoid connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 1 and 8 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 1 to terminal 8 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect Main Mod solenoid to internal harness connectors. 4. Measure resistance between terminals 1 and 8 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–10 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–10	*Go to Step 7*	*Replace Main Mod solenoid that is not within specification. Go to Step 7*

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DTC P0960 Main Pressure Modulation Solenoid Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0960 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

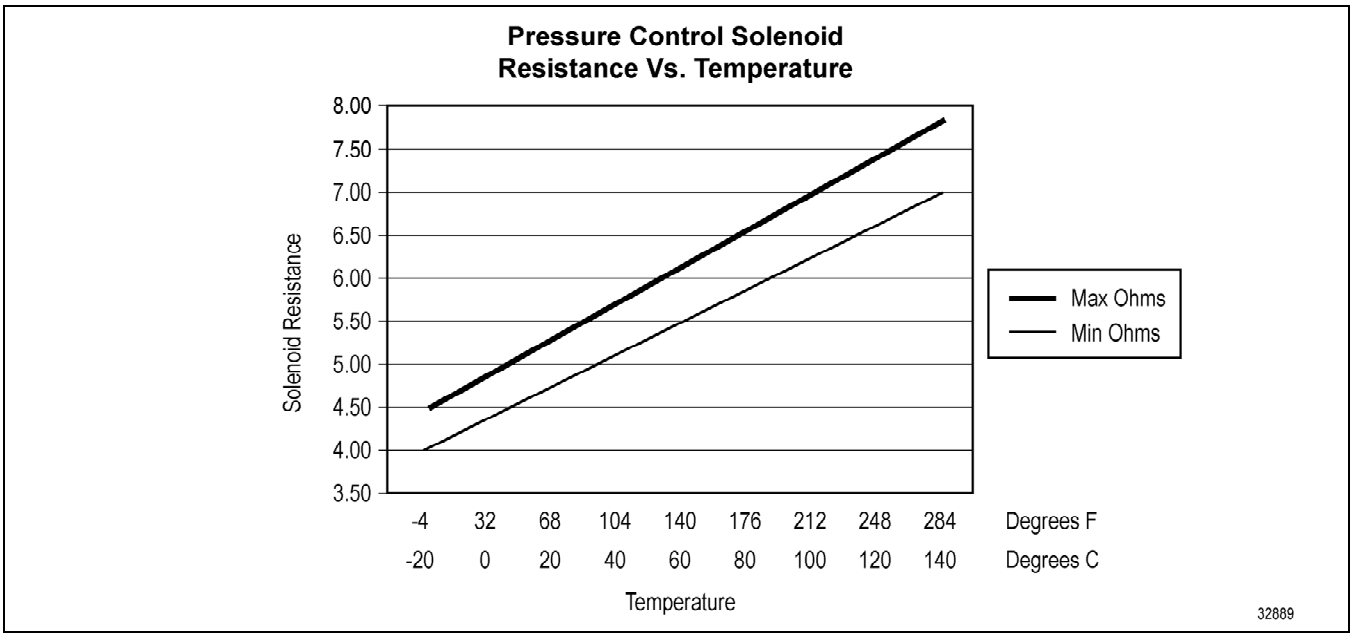

Figure 5–10. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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DTC P0961 Main Pressure Modulation Solenoid System Performance

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

The Main Mod solenoid is used to reduce transmission main pressure as needed. This test checks for transmission slip when main pressure is reduced.

Action Taken When the DTC Sets

When DTC P0961 is active, the following conditions will occur:

- The **CHECK TRANS** light does not illuminate.
- DTC is stored in the TCM history.
- Full main pressure is commanded.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P0961 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid stuck on or stuck off codes.
6. Check for PS1 codes.

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DTC P0961 Main Pressure Modulation Solenoid System Performance *(cont'd)*

7. Check for electrical circuit codes for solenoids.
8. Check TCM.
9. Check for partial stall clutch slip and also acquire clutch pressures.
10. Compare all pressures to specifications including the exhausted clutches.
11. Disassemble and inspect control valve module.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul; e.g, fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0961?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0961?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are any solenoids stuck on or stuck off DTCs in history with DTC P0961?		*Go to solenoid DTC*	*Go to Step 6*
6	Is DTC P0842 or P0843 active or in history with DTC P0961?		*Go to DTC P0842 or DTC P0843*	*Go to Step 7*
7	Are there active or inactive DTCs for any electrical circuits of solenoids located in the control valve module with DTC P0961?		*Go to solenoid DTC*	*Go to Step 8*
8	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt to 2.0-3.2 N·m (18-28 lb in). 3. Start engine and test drive vehicle. 4. Using Allison DOC®, check for active codes. 5. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 6. Restart engine and check again for active DTCs. Is DTC P0961 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 9*

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DTC P0961 Main Pressure Modulation Solenoid System Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
9	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode for each available range. Record main and clutch apply pressures for each range. **NOTE:** Verify exhausted clutches meet specification. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures in all forward ranges except Low range for 7-speed models. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. Is turbine shaft speed at 0-1 rpm?		*Go to Step 13*	*Go to Step 10*
10	Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 12*	*Replace Main Mod Solenoid. Go to Step 11*
11	Besides replacing Main mod solenoid, disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. 1. Test drive vehicle. Did DTC P0961 return?		*Go to Step 12*	*Go to Step 13*

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DTC P0961 Main Pressure Modulation Solenoid System Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0961 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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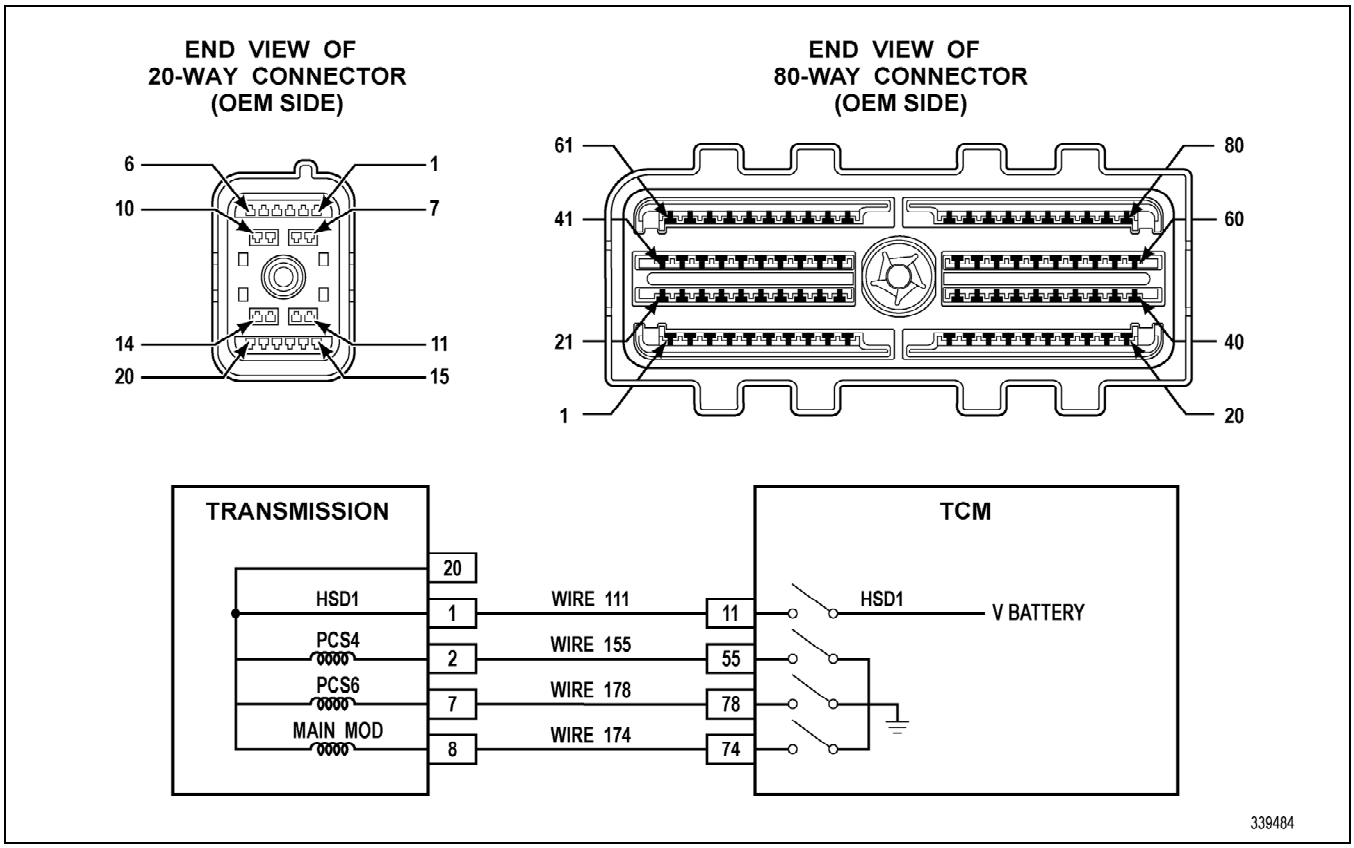
DTC P0962 Main Pressure Modulation Solenoid Control Circuit Low



Circuit Description

Pressure control Main Mod solenoid is used to modulate the transmission main pressure schedule. DTC P0962 indicates that the TCM has detected a failed low condition in the Main Mod solenoid electrical circuit. The failed low condition may exist in the high side (wire 111) or low side (wire 174).

Action Taken When the DTC Sets

When DTC P0962 is active:

- Main Modulation is inhibited which results in full main pressure commands.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0962 can be caused by:

- Main Mod issues such as:
  - W174 short in chassis harness.

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DTC P0962 Main Pressure Modulation Solenoid Control Circuit Low *(cont'd)*

  - W174 (terminal 8 of 20-way) short in internal transmission harness.
  - Main Mod solenoid defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W174 in chassis harness for short to another wire or chassis.
4. Check TCM.
5. Check internal harness wire for Main Mod Low Side Driver (terminal 8) for short to another wire or control module.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0962 Main Pressure Modulation Solenoid Control Circuit Low *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0962 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0658, P2720, or P2814 present or in history with active DTC P0962?		*Go to DTC P0658*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 74 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 74 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W174. Go to Step 7 after repairs are made.*

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DTC P0962 Main Pressure Modulation Solenoid Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0962 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect Main Mod solenoid from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 8 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 8 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect Main Mod solenoid to internal harness connectors. 4. Measure resistance between terminals 1 and 8 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–11 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–11	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P0962 Main Pressure Modulation Solenoid Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0962 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

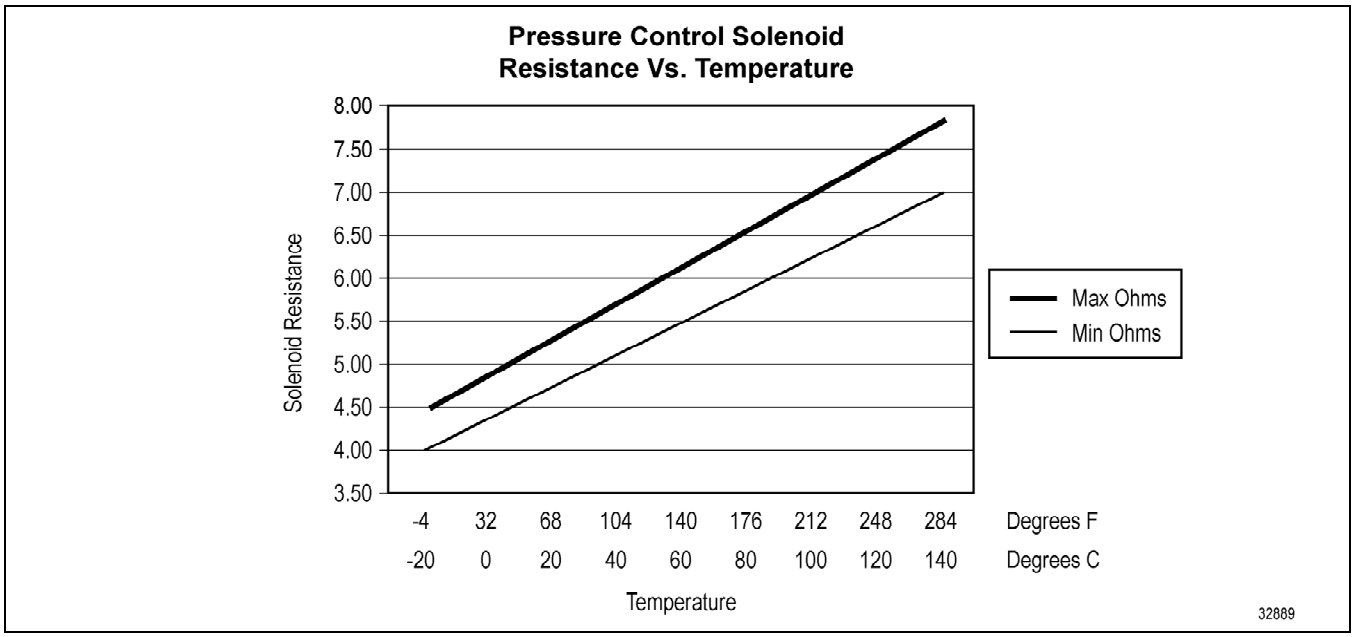

Figure 5–11. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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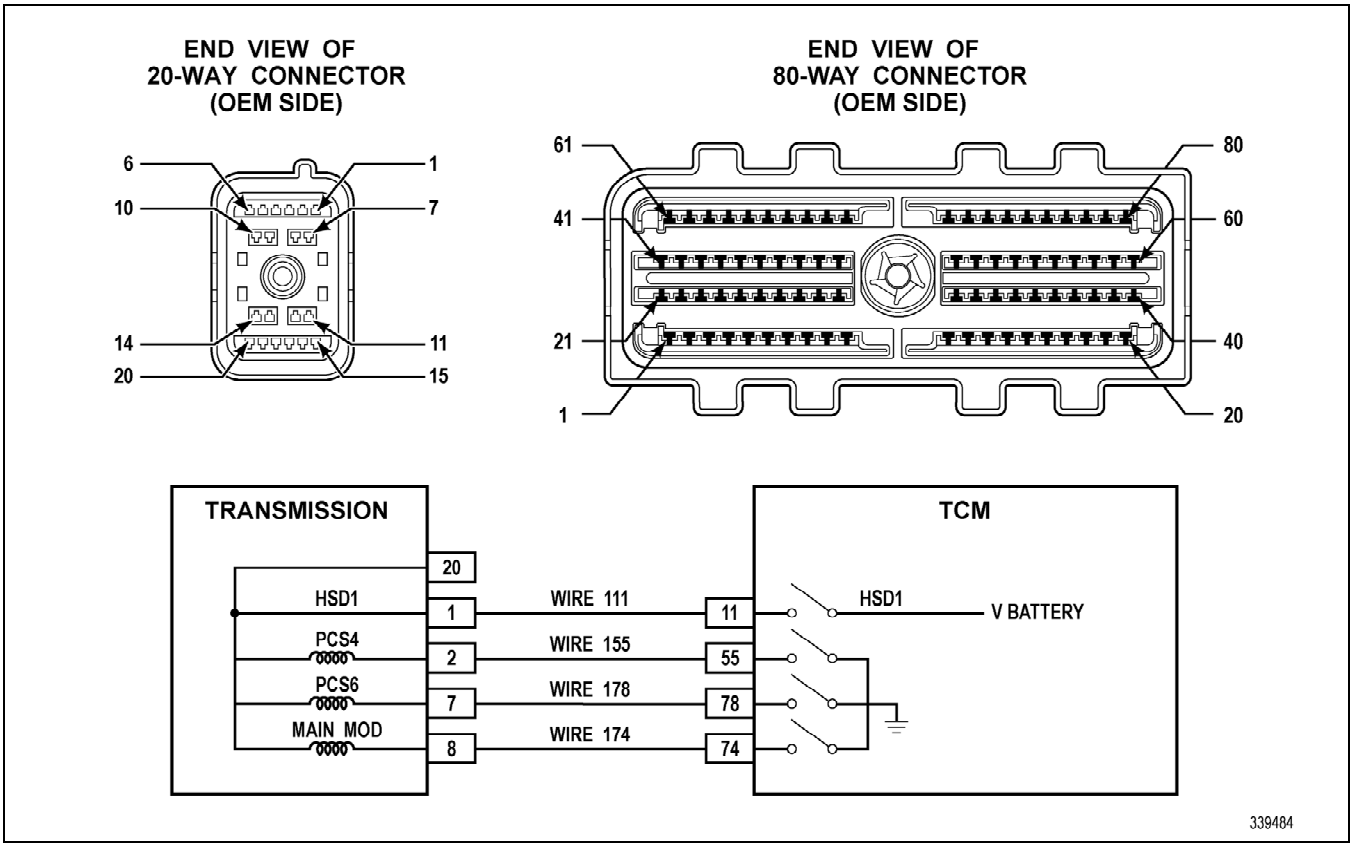
DTC P0963 Main Pressure Modulation Solenoid Control Circuit High



Circuit Description

Pressure control Main Mod solenoid is used to modulate the transmission main pressure schedule. DTC P0963 indicates that the TCM has detected a failed high condition in the Main Mod solenoid electrical circuit.

Action Taken When the DTC Sets

When DTC P0963 is active:

- Main Modulation is inhibited.
- DTC is stored in the TCM history which results in full main pressure commands.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0963 can be caused by:

- Main Mod issues such as:
  - W174 short in chassis harness.
  - W174 (terminal 8 of 20-way) short in internal transmission harness.

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DTC P0963 Main Pressure Modulation Solenoid Control Circuit High *(cont'd)*

  - Main Mod solenoid defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W174 in chassis harness for short to another wire or chassis.
4. Check TCM.
5. Check internal harness wire for Main Mod Low Side Driver (terminal 8) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0963 Main Pressure Modulation Solenoid Control Circuit High *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0963 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0659, P2721, or P2815 present or in history with active DTC P0963?		*Go to DTC P0659*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 74 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20k Ω or more from J-47275-1 Magnetic Overlay terminal 74 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20k Ω or more	*Go to Step 4*	*Address issue with W174. Go to Step 7 after repairs are made.*

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DTC P0963 Main Pressure Modulation Solenoid Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0963 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect Main Mod solenoid from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 8 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20k Ω or more from J-47279-1 Magnetic Overlay terminal 8 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20k Ω or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect Main Mod solenoid to internal harness connectors. 4. Measure resistance between terminals 1 and 8 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–12 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–12	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P0963 Main Pressure Modulation Solenoid Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0963 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

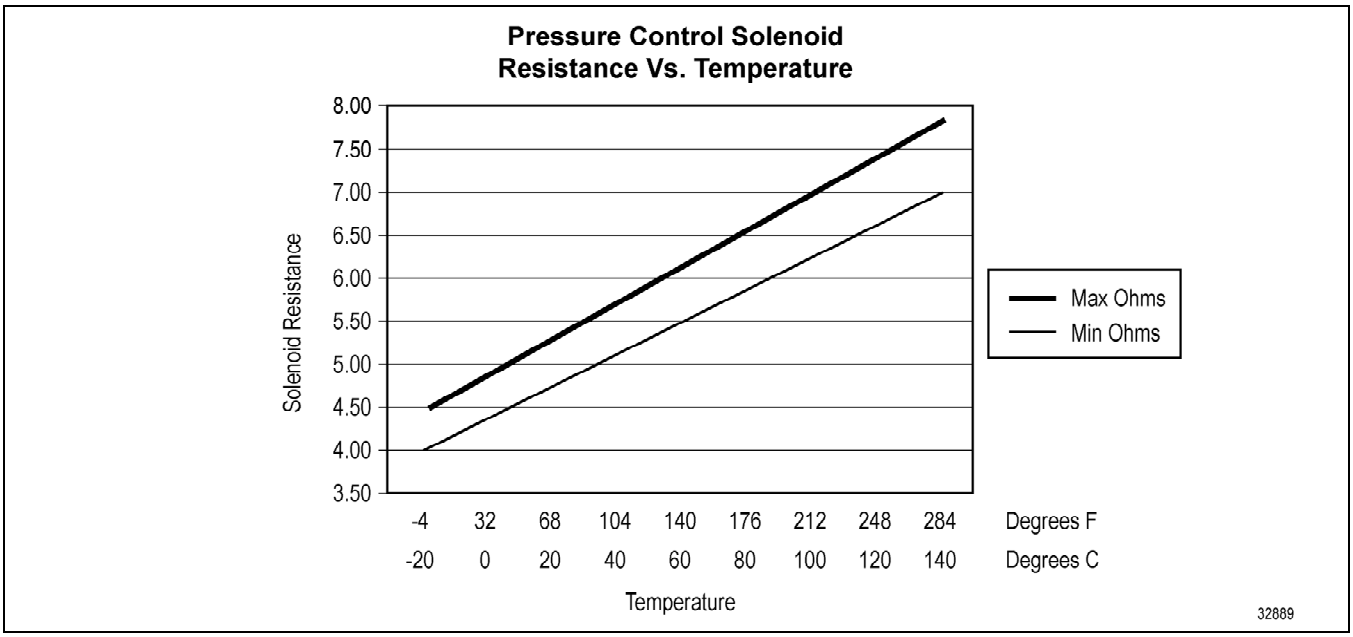

Figure 5–12. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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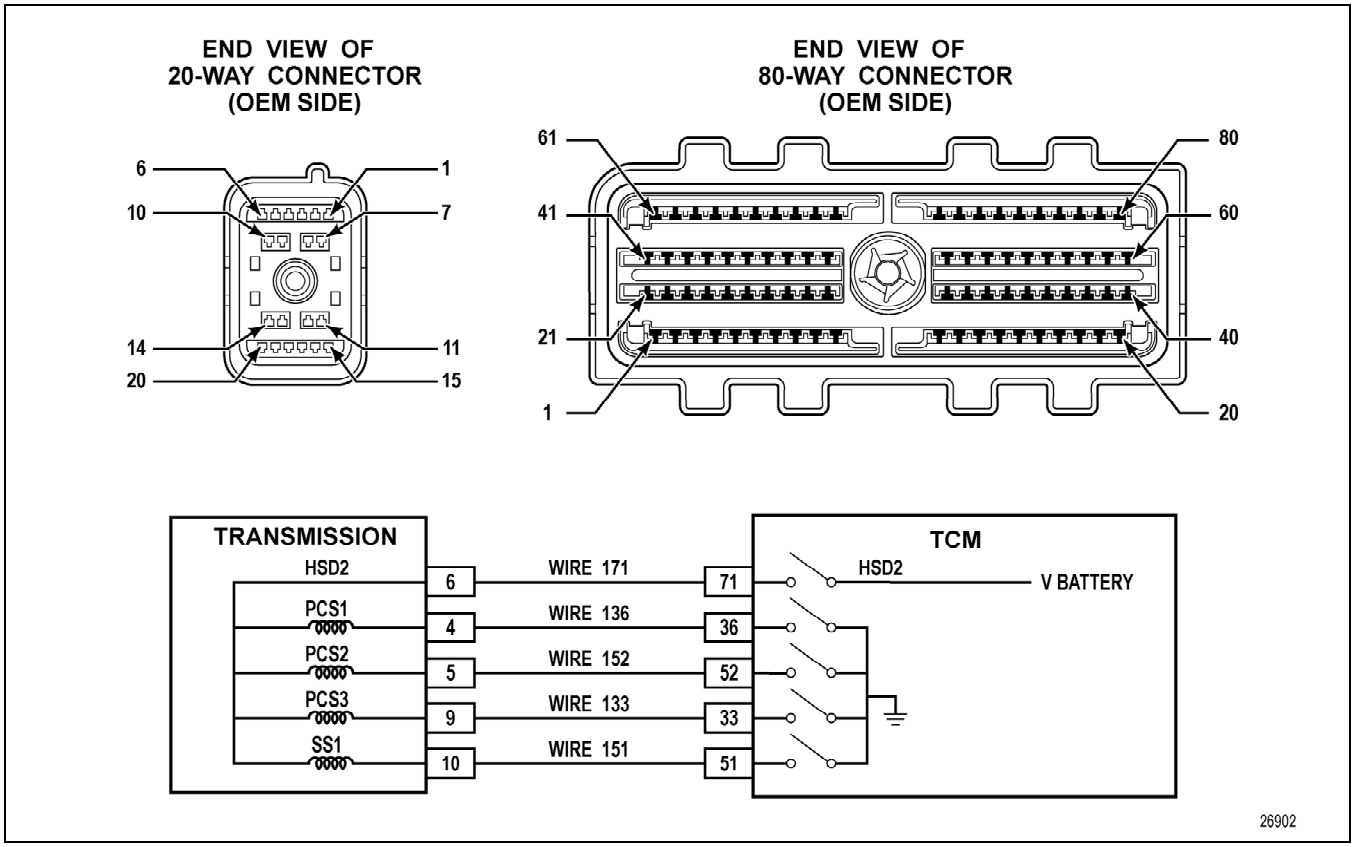
DTC P0964 Pressure Control Solenoid (PCS2) Control Circuit Open



Circuit Description

DTC P0964 indicates that the TCM has detected an open condition in the PCS2 electrical circuit. The open condition may exist in the high side (wire 171) or low side (wire 152).

Action Taken When the DTC Sets

When DTC P0964 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0964 can be caused by:

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DTC P0964 Pressure Control Solenoid (PCS2) Control Circuit Open *(cont'd)*

- PCS2 issues such as:
  - W152 high resistance or an open circuit in chassis harness.
  - W152 (terminal 5 of 20-way) high resistance or an open circuit in internal transmission harness.
  - PCS2 defective.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W152 in chassis harness for open or high resistance.
4. Check TCM.
5. Check internal harness wire for PCS2 Low Side Driver (terminal 5) for high resistance or open.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0964 Pressure Control Solenoid (PCS2) Control Circuit Open *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0964 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2669, P2727, or P0968, present or in history with active DTC P0964?		*Go to DTC P2669*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 5 and 6 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 52 and 71 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 4*	*Address issue with W152. Go to Step 7 after repairs are made.*

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DTC P0964 Pressure Control Solenoid (PCS2) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0964 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS2 from internal harness. 4. Install jumper wire between A and B terminals of PCS2 connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 5 and 6 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 5 to terminal 6 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS2 to internal harness connectors. 4. Measure resistance between terminals 5 and 6 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–13 after tool resistance is subtracted from J-46708 DMM reading?	Figure 5–13	*Go to Step 7*	*Replace PCS2 that is not within specification. Go to Step 7*

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DTC P0964 Pressure Control Solenoid (PCS2) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0964 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

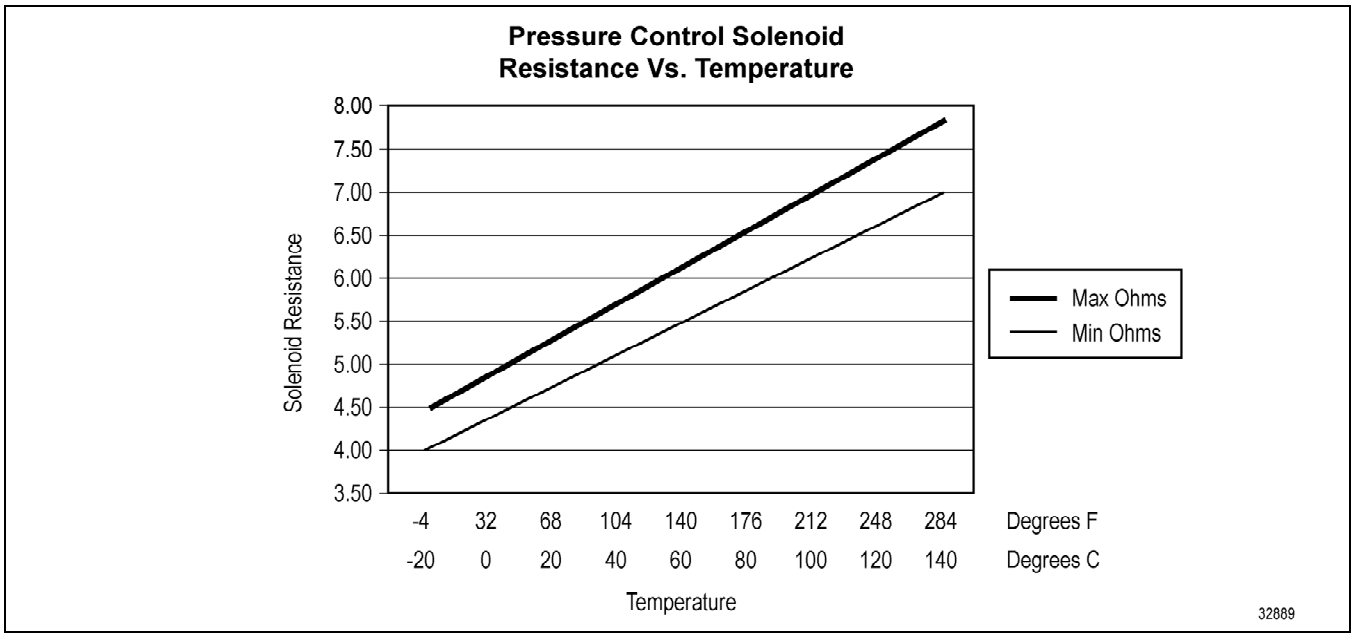

Figure 5–13. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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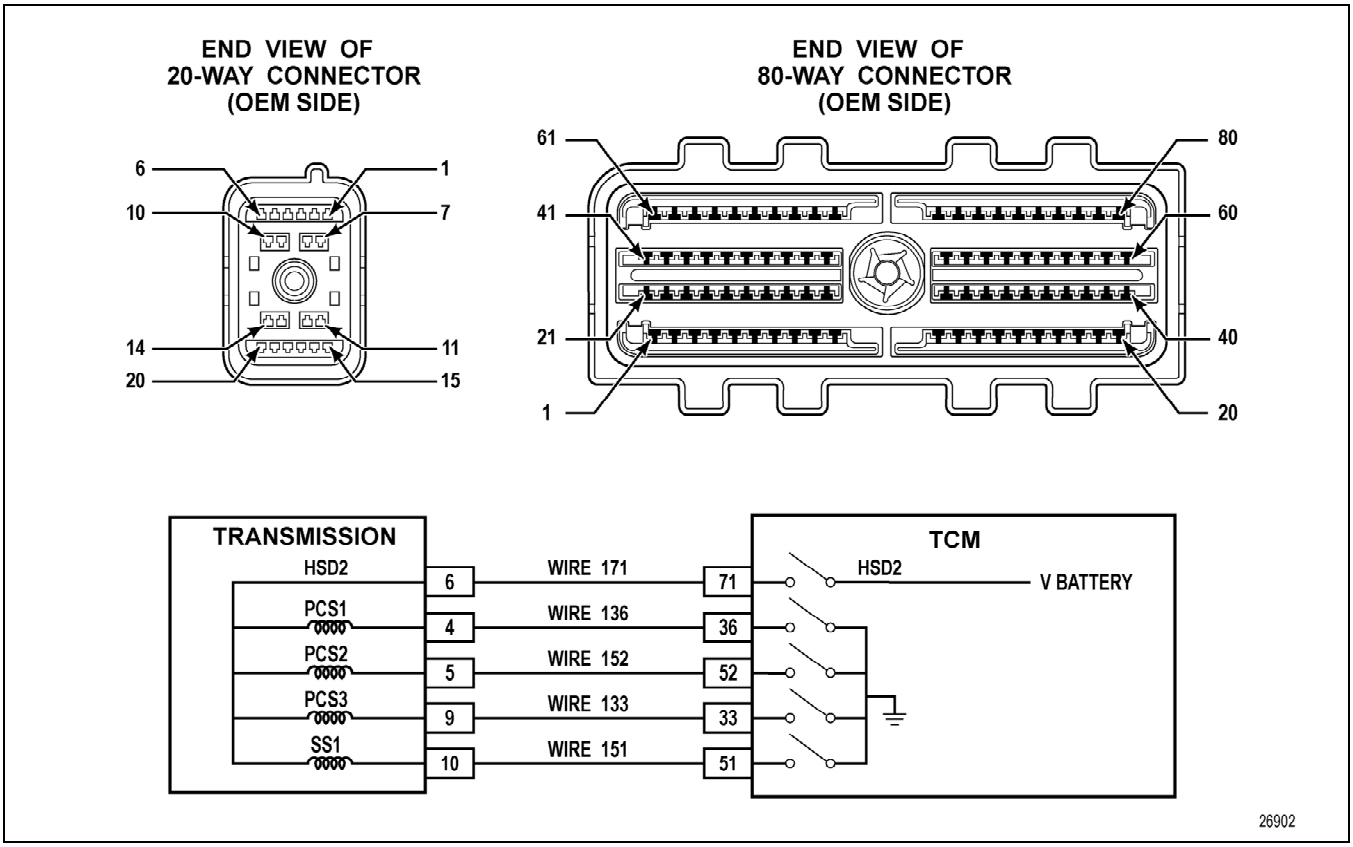
DTC P0966 Pressure Control Solenoid (PCS2) Control Circuit Low



Circuit Description

DTC P0966 indicates that the TCM has detected a failed low condition in the PCS2 electrical circuit. The condition may exist in the high side (wire 171) or low side (wire 152).

Action Taken When the DTC Sets

When DTC P0966 is active:

- If failure occurs while in a forward range, then shifts to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0966 can be caused by:

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DTC P0966 Pressure Control Solenoid (PCS2) Control Circuit Low *(cont'd)*

- PCS2 issues such as:
  - W152 shorted to another wire or ground in chassis harness.
  - W152 (terminal 5 of 20-way) shorted to another wire or ground in internal transmission harness.
  - PCS2 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W152 in chassis harness for short to another wire or to chassis.
4. Check TCM.
5. Check internal harness wire for PCS2 Low Side Driver (terminal 5) for short to another wire or control module.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0966 Pressure Control Solenoid (PCS2) Control Circuit Low *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0966 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2670, P2729, P0970, or P0973 present or in history with active DTC P0966?		*Go to DTC P2670*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 52 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 52 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W152. Go to Step 7 after repairs are made.*

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DTC P0966 Pressure Control Solenoid (PCS2) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0966 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS2 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 5 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 5 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS2 to internal harness connectors. 4. Measure resistance between terminals 1 and 5 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–14 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–14	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P0966 Pressure Control Solenoid (PCS2) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0966 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

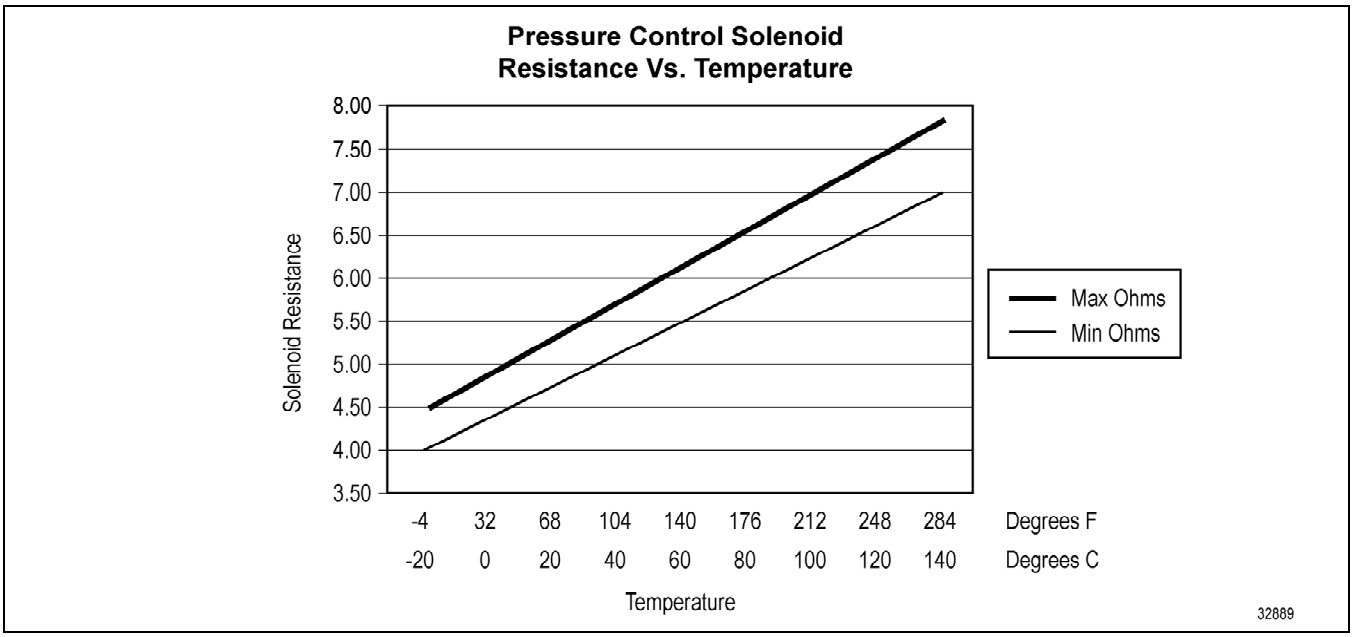

Figure 5–14. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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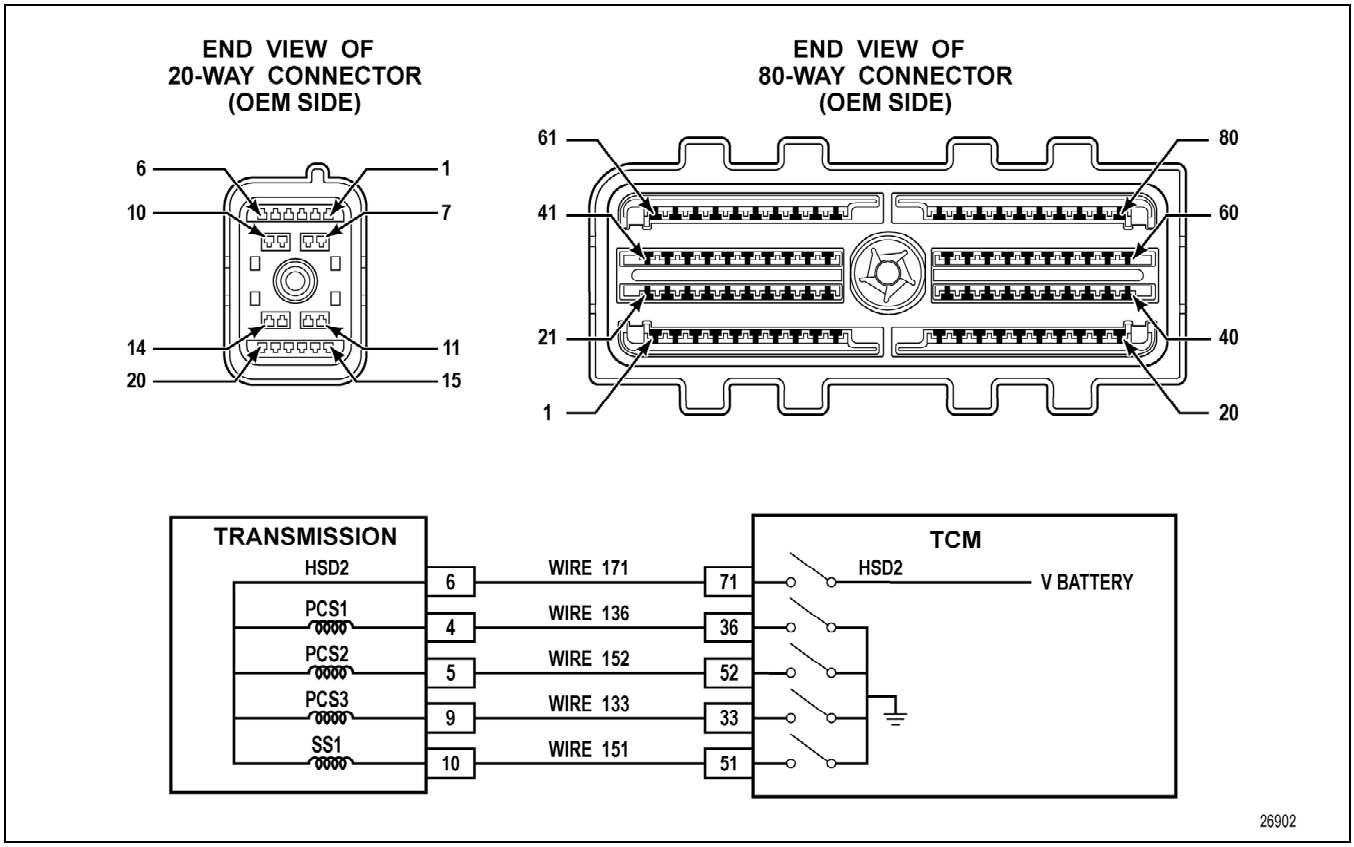
DTC P0967 Pressure Control Solenoid (PCS2) Control Circuit High



Circuit Description

DTC P0967 indicates that the TCM has detected a failed high condition in the PCS2 electrical circuit. The condition may exist in the high side (wire 171) or low side (wire 152).

Action Taken When the DTC Sets

When DTC P0967 is active:

- If failure occurs while in a forward range, then shifts to another forward range. If failure occurs while in **N** (Neutral), the transmission remains in **N** (Neutral). If failure occurs while in **R** (Reverse), the transmission remains in **R** (Reverse) or shifts to **N** (Neutral). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P0967 Pressure Control Solenoid (PCS2) Control Circuit High *(cont'd)*

Diagnostic Aids

DTC P0967 can be caused by:

- PCS2 issues such as:
  - W152 shorted to another wire in chassis harness.
  - W152 (terminal 5 of 20-way) shorted to another wire in internal transmission harness.
  - PCS2 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W152 in chassis harness for short to another wire.
4. Check TCM.
5. Check internal harness wire for PCS2 Low Side Driver (terminal 5) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P0967 Pressure Control Solenoid (PCS2) Control Circuit High *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0967 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2671, P2730, P0971, or P0974 present or in history with active DTC P0967?		*Go to DTC P2671*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 52 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 52 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W152. Go to Step 7 after repairs are made.*

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DTC P0967 Pressure Control Solenoid (PCS2) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0967 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS2 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 5 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 5 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS2 to internal harness connectors. 4. Measure resistance between terminals 1 and 5 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–15 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–15	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P0967 Pressure Control Solenoid (PCS2) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0967 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

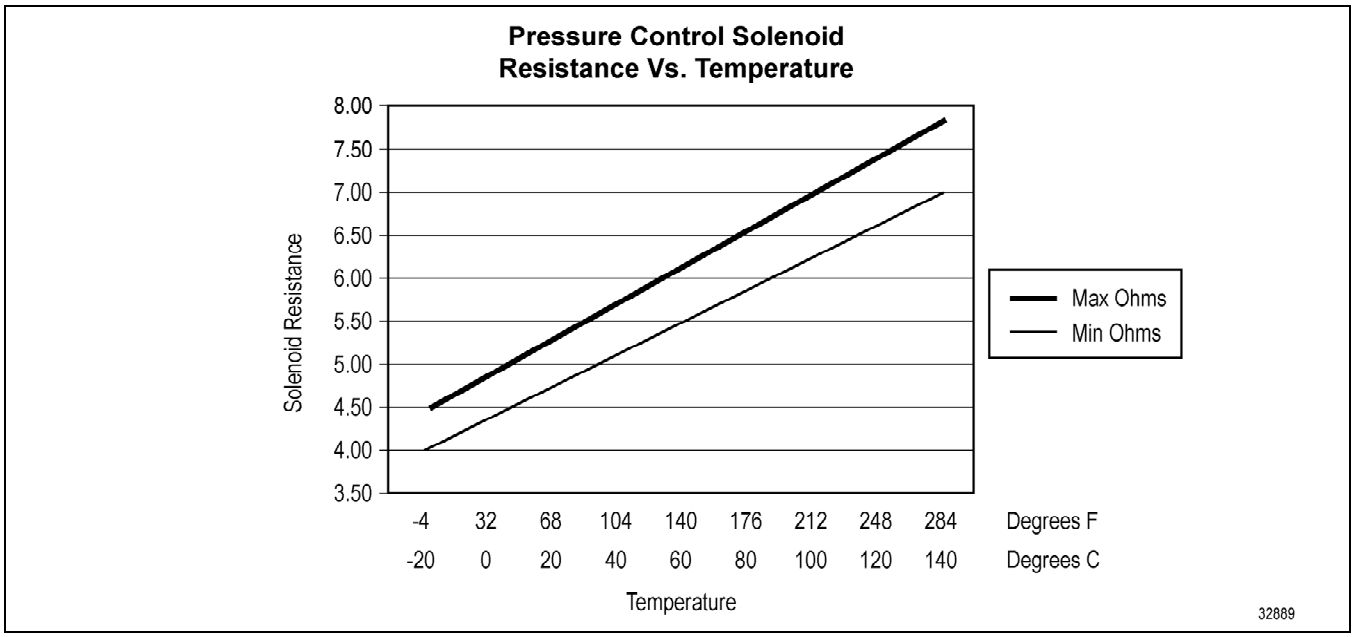

Figure 5–15. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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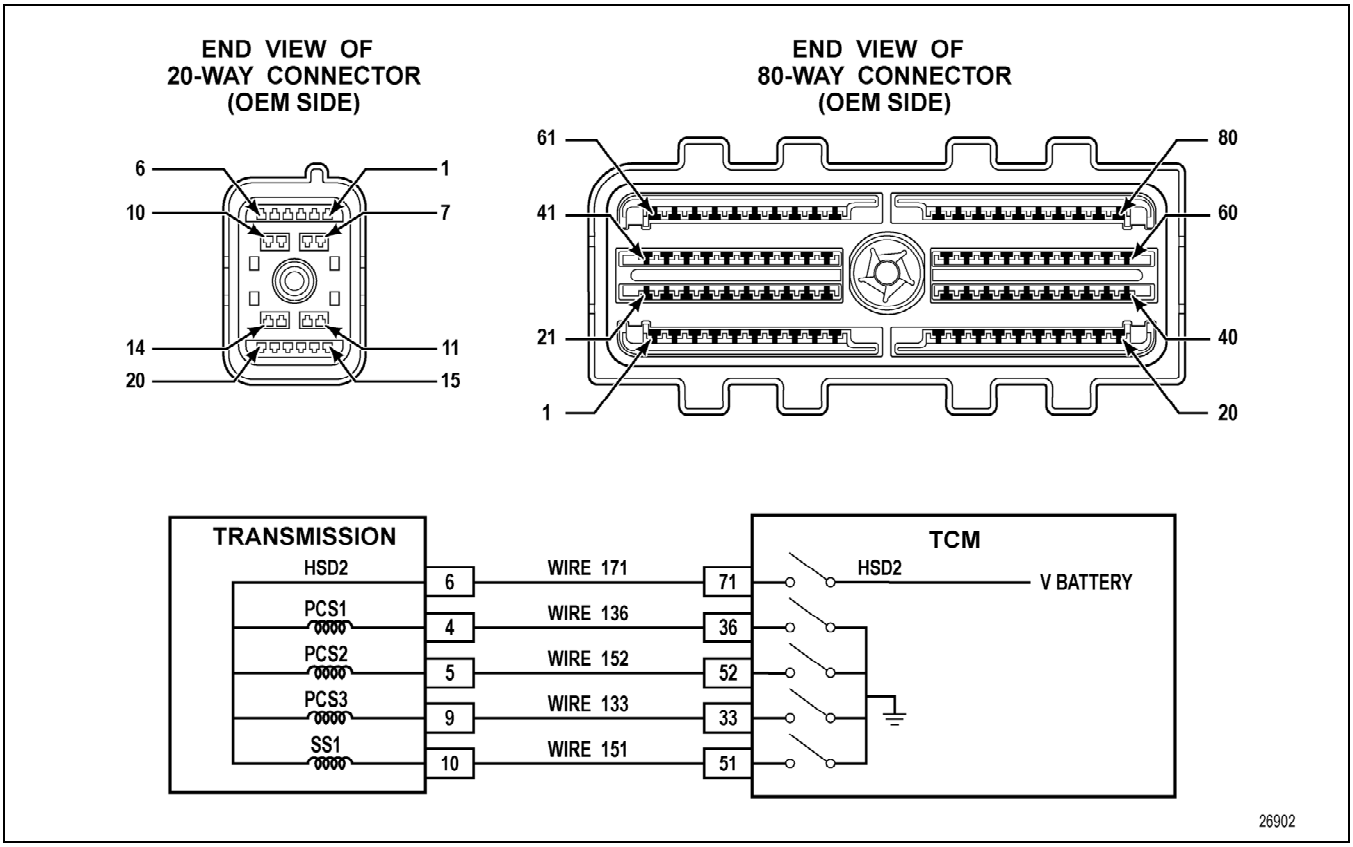
DTC P0968 Pressure Control Solenoid (PCS3) Control Circuit Open



Circuit Description

DTC P0968 indicates that the TCM has detected an open condition in the PCS3 electrical circuit. The open condition may exist in the high side (wire 171) or low side (wire 133).

Action Taken When the DTC Sets

When DTC P0968 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0968 can be caused by:

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DTC P0968 Pressure Control Solenoid (PCS3) Control Circuit Open *(cont'd)*

- PCS3 issues such as:
  - W133 open circuit in chassis harness.
  - W133 (terminal 9 of 20-way) open circuit in internal transmission harness.
  - PCS3 defective.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W133 in chassis harness for open or high resistance.
4. Check TCM.
5. Check internal harness wire for PCS3 Low Side Driver (terminal 9) for high resistance or open.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0968 Pressure Control Solenoid (PCS3) Control Circuit Open *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0968 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0964, P0974, P2669, or P2727 present or in history with active DTC P0968?		*Go to DTC P2669*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 6 and 9 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 33 and 71 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W133. Go to Step 7 after repairs are made.*

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DTC P0968 Pressure Control Solenoid (PCS3) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0968 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS3 from internal harness. 4. Install jumper wire between A and B terminals of PCS3 connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 6 and 9 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 6 to terminal 9 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS3 to internal harness connectors. 4. Measure resistance between terminals 6 and 9 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–16 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–16	*Go to Step 7*	*Replace PCS3 that is not within specification. Go to Step 7*

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DTC P0968 Pressure Control Solenoid (PCS3) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0968 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

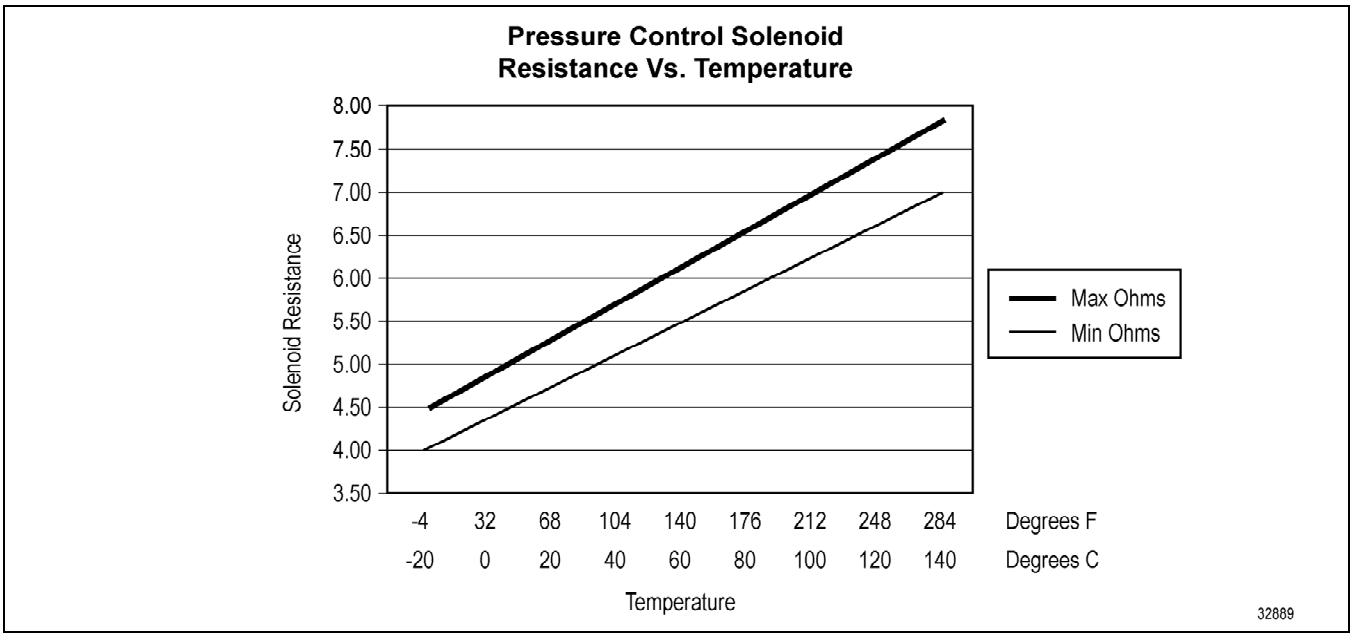

Figure 5–16. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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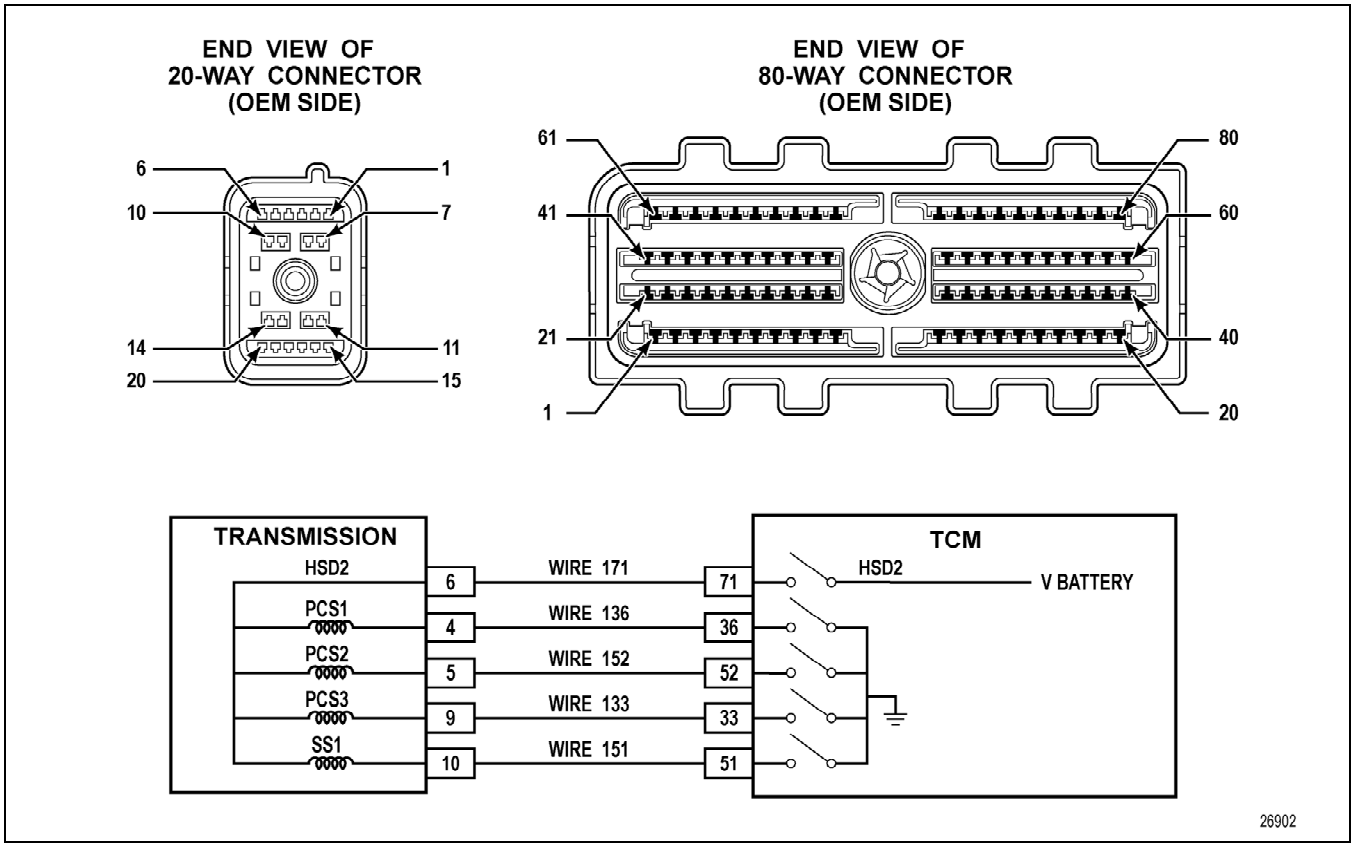
DTC P0970 Pressure Control Solenoid (PCS) 3 Control Circuit Low



Circuit Description

DTC P0970 indicates that the TCM has detected a failed low condition in the PCS3 electrical circuit. The failed low condition may exist in the high side (wire 171) or low side (wire 133).

Action Taken When the DTC Sets

When DTC P0970 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0970 can be caused by:

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DTC P0970 Pressure Control Solenoid (PCS) 3 Control Circuit Low *(cont'd)*

- PCS3 issues such as:
  - W133 shorted to another wire or ground in chassis harness.
  - W133 (terminal 9 of 20-way) shorted to another wire or ground in internal transmission harness.
  - PCS3 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W133 in chassis harness for short to another wire or chassis.
4. Check TCM.
5. Check internal harness wire for PCS3 Low Side Driver (terminal 9) for short to another wire or control module.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0970 Pressure Control Solenoid (PCS) 3 Control Circuit Low *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0970 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2670, P2729, P0966, or P0973 present or in history with active DTC P0970?		*Go to DTC P2670*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 33 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 33 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W133. Go to Step 7 after repairs are made.*

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DTC P0970 Pressure Control Solenoid (PCS) 3 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0970 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS3 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 9 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 9 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS3 to internal harness connectors. 4. Measure resistance between terminals 1 and 9 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–17 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–17	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P0970 Pressure Control Solenoid (PCS) 3 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0970 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

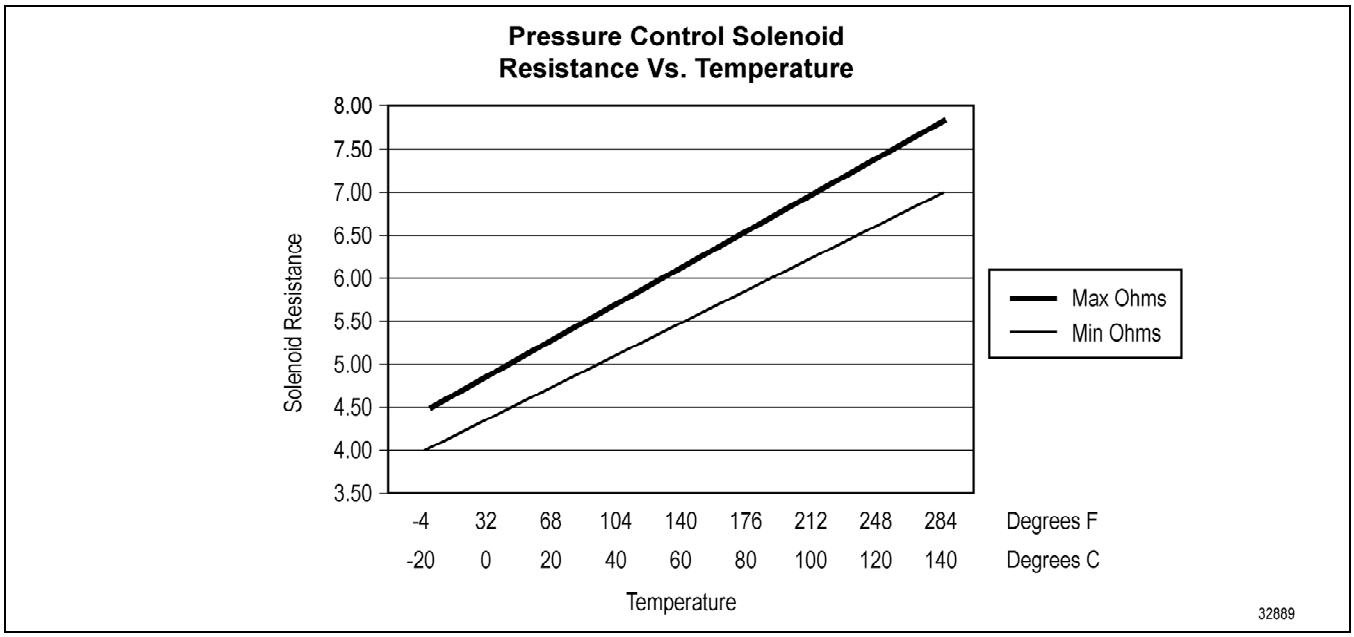

Figure 5–17. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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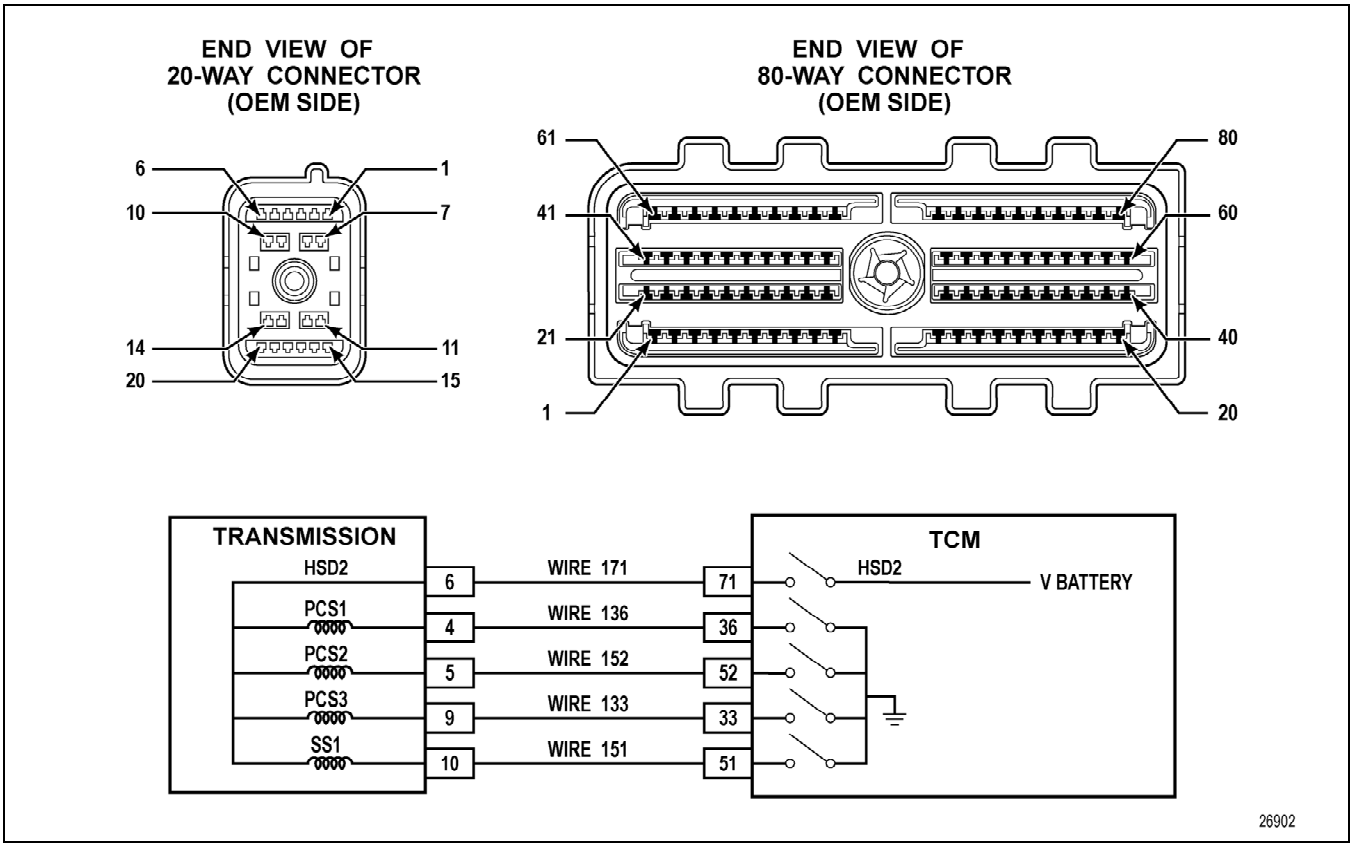
DTC P0971 Pressure Control Solenoid (PCS) 3 Control Circuit High



Circuit Description

DTC P0971 indicates that the TCM has detected a failed high condition in the PCS3 electrical circuit. The failed high condition may exist in the high side (wire 171) or low side (wire 133).

Action Taken When the DTC Sets

When DTC P0971 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P0971 Pressure Control Solenoid (PCS) 3 Control Circuit High *(cont'd)*

Diagnostic Aids

DTC P0971 can be caused by:

- PCS3 issues such as:
  - W133 shorted to another wire in chassis harness.
  - W133 (terminal 9 of 20-way) shorted to another wire in internal transmission harness.
  - PCS3 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W133 in chassis harness for short to another wire.
4. Check TCM.
5. Check internal harness wire for PCS3 Low Side Driver (terminal 9) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P0971 Pressure Control Solenoid (PCS) 3 Control Circuit High *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0971 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2671, P2730, P0967, or P0974 present or in history with active DTC P0971?		*Go to DTC P2671*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 33 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 33 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W133. Go to Step 7 after repairs are made.*

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DTC P0971 Pressure Control Solenoid (PCS) 3 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0971 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS3 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 9 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 9 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS3 to internal harness connectors. 4. Measure resistance between terminals 1 and 9 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–18 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–18	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P0971 Pressure Control Solenoid (PCS) 3 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0971 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

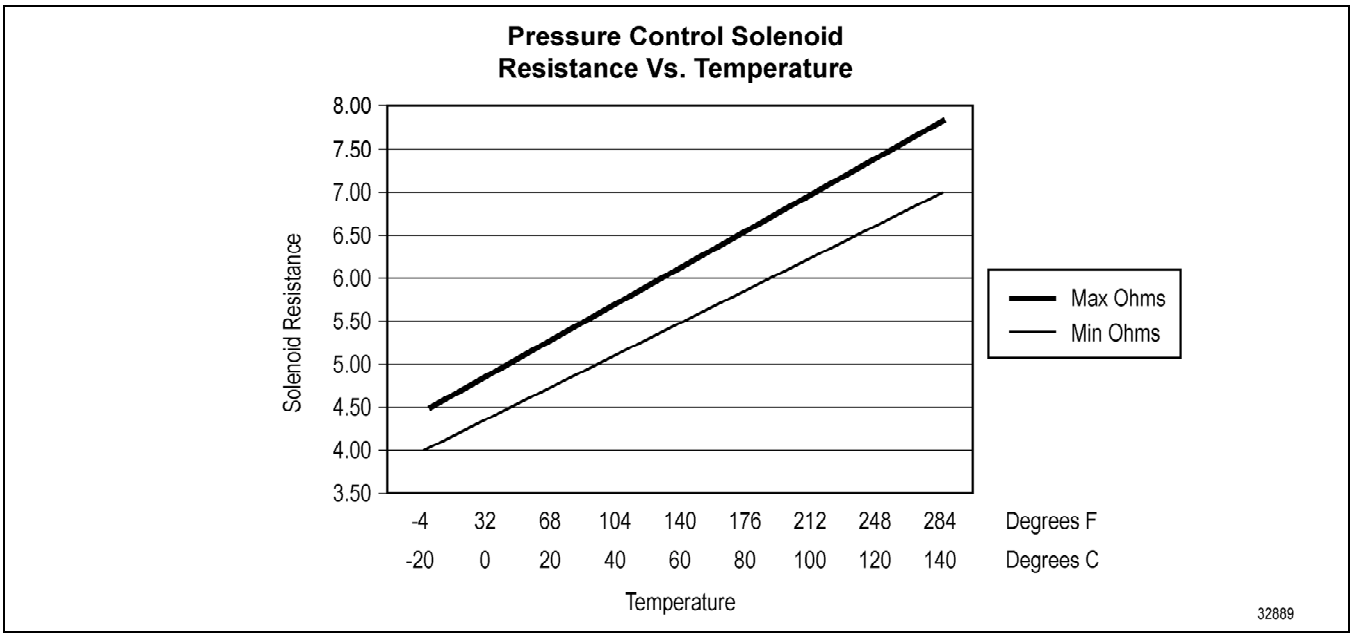

Figure 5–18. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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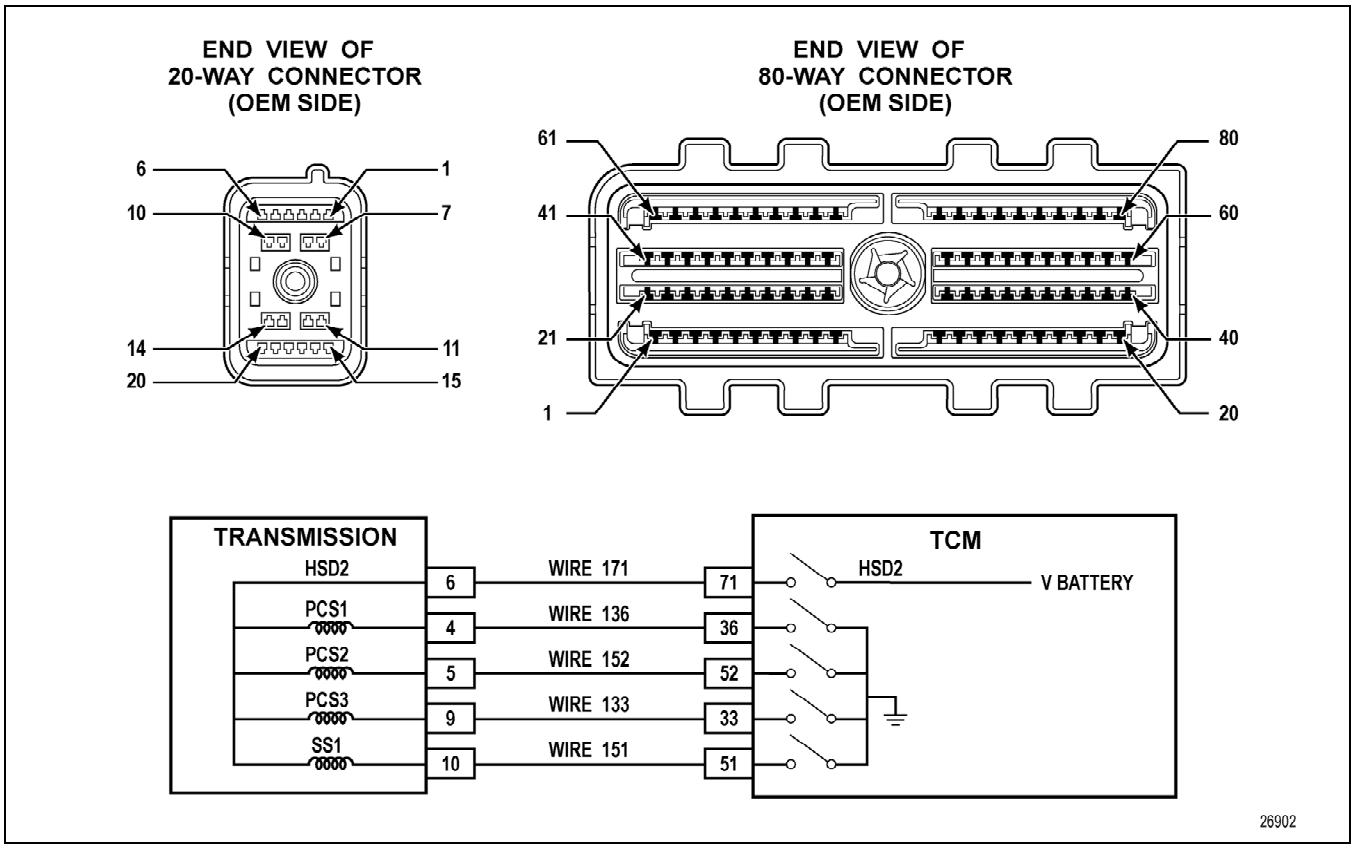
DTC P0973 Shift Solenoid 1 Control Circuit Low



Circuit Description

DTC P0973 indicates that the TCM has detected a failed low condition in the low side of the SS1 electrical circuit.

Action Taken When the DTC Sets

When DTC P0973 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0973 can be caused by:

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DTC P0973 Shift Solenoid 1 Control Circuit Low *(cont'd)*

- SS1 issues such as:
  - W151 high resistance, open, or shorted to another wire in chassis harness or chassis ground.
  - W151 (terminal 10 of 20-way) high resistance, open, or shorted to another wire or to the control valve module in the internal transmission harness.
  - SS1 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W151 in chassis harness for high resistance or open.
4. Check W151 in chassis harness for short to another wire or chassis ground.
5. Check TCM.
6. Check internal harness wire for SS1 Low Side Driver (terminal 10) for short to another wire or to the control module.
7. Check internal harness wire for SS1 Low Side Driver (terminal 10) for high resistance or open.
8. Check solenoid resistance.
9. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P0973 Shift Solenoid 1 Control Circuit Low *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0973 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 9*
2	Are there any active or inactive DTCs P2669, P2670, P0964, P0966, P0968, P0970, P2727, or P2729 present or in history with active DTC P0973?		*Go to DTC P2669*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 6 and 10 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 51 and 71 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W151. Go to Step 9 after repairs are made.*

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DTC P0973 Shift Solenoid 1 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 51 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 51 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 5*	*Address issue with W151. Go to Step 9 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0973 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 9 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 6*
6	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect SS1 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 10 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 10 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 7*	*Repair or replace internal harness. Go to Step 9*

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DTC P0973 Shift Solenoid 1 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave SS1 disconnected from internal harness. 3. Install jumper wire between A and B terminals of SS1 connector on internal harness. 4. Leave J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Leave J-47279-1 Magnetic Overlay installed. 6. Check resistance between terminal 6 and 10 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 6 to terminal 10 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 8*	*Repair or replace internal harness. Go to Step 9*
8	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect SS1 to internal harness connectors. 4. Measure resistance between terminals 6 and 10 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–25 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–25	*Go to Step 9*	*Replace solenoid that is not within specification. Go to Step 9*
9	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0973 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P0973 Shift Solenoid 1 Control Circuit Low *(cont'd)*

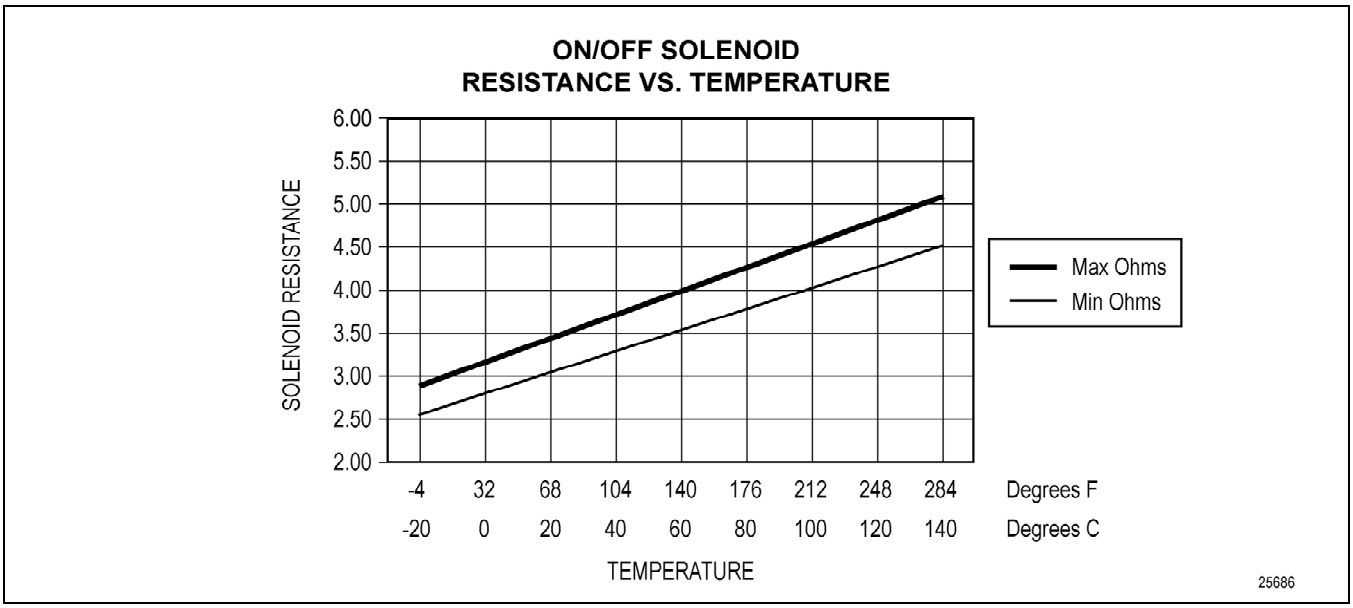

Figure 5–19. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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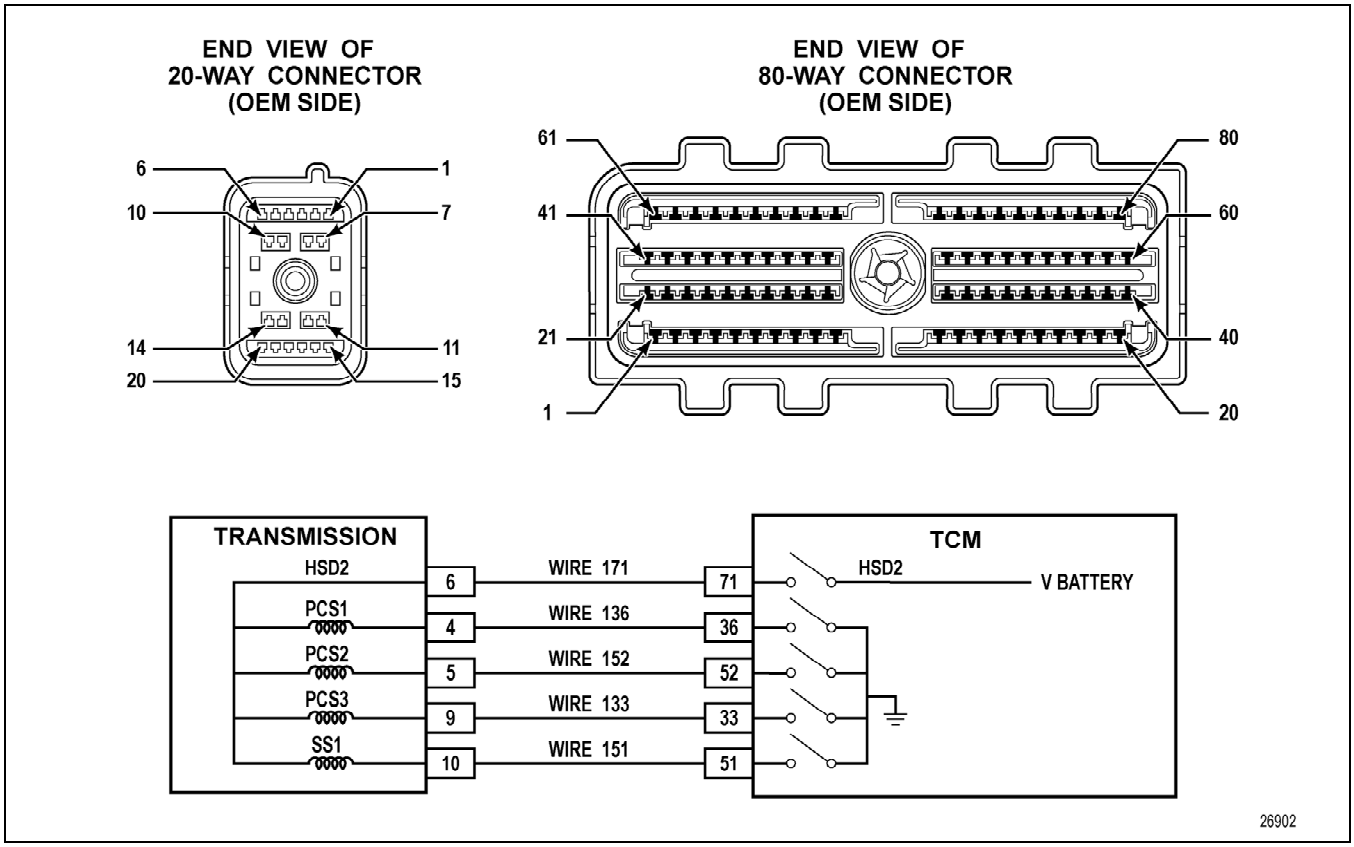
DTC P0974 Shift Solenoid 1 Control Circuit High



Circuit Description

DTC P0974 indicates that the TCM has detected a short-to-battery condition in the low side of the SS1 electrical circuit.

Action Taken When the DTC Sets

When DTC P0974 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P0974 Shift Solenoid 1 Control Circuit High *(cont'd)*

Diagnostic Aids

DTC P0974 can be caused by:

- SS1 issues such as:
  - W151 shorted to another wire in chassis harness.
  - W151 (terminal 10 of 20-way) shorted to another wire in internal transmission harness.
  - SS1 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W151 in chassis harness for short to another wire.
4. Check TCM.
5. Check internal harness wire for SS1 Low Side Driver (terminal 10) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P0974 Shift Solenoid 1 Control Circuit High *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0974 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2671, P2730, P0967, or P0971 present or in history with active DTC P0974?		*Go to DTC P2671*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 51 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 51 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W151. Go to Step 7 after repairs are made.*

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DTC P0974 Shift Solenoid 1 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0974 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect SS1 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 10 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 10 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect SS1 to internal harness connectors. 4. Measure resistance between terminals 1 and 10 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–20 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–20	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P0974 Shift Solenoid 1 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0974 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

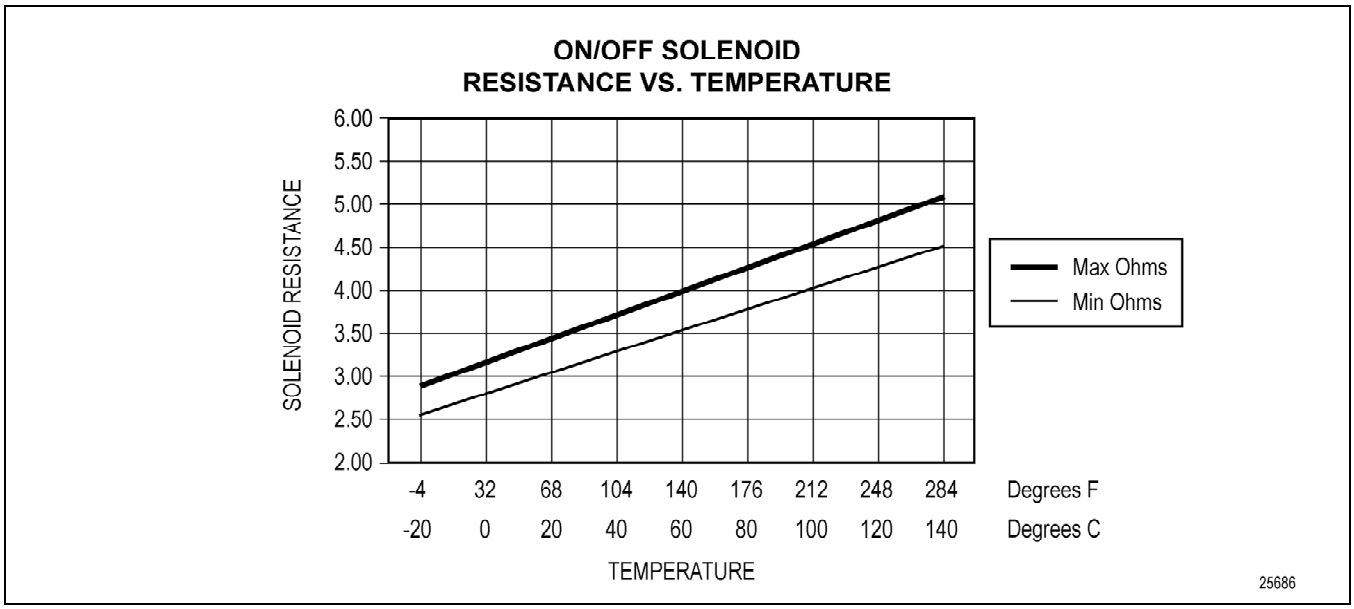

Figure 5–20. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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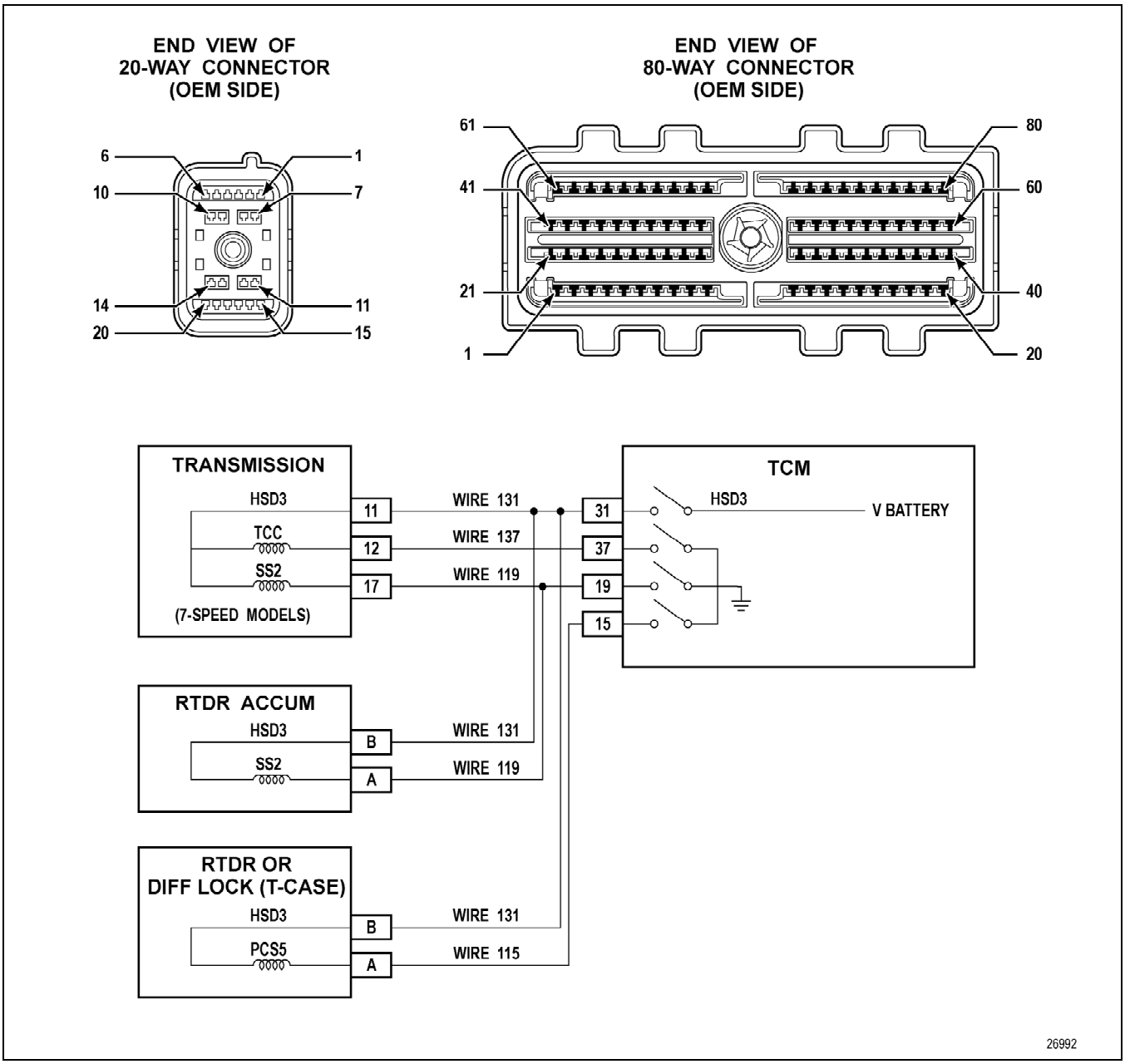
DTC P0976 Shift Solenoid 2 Control Circuit Low



Circuit Description

. DTC P0976 indicates that the TCM has detected a failed low condition in the SS2 solenoid electrical circuit. The failed low condition may exist in the high side (wire 131) or low side (wire 119).

Action Taken When the DTC Sets

When DTC P0976 is active:

- For 7-speed models, limit ranges to **R** (Reverse), **N** (Neutral) and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.
- DTC is stored in the TCM history.

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DTC P0976 Shift Solenoid 2 Control Circuit Low *(cont'd)*

- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0976 can be caused by:

- SS2 (7-speed only) issues such as:
  - W119 shorted to another wire in chassis harness.
  - W119 (terminal 17 of 20-way) shorted to another wire in internal transmission harness.
- Air solenoid (SS2) issues such as:
  - W119 shorted to another wire in chassis harness.
- Defective air solenoid (SS2).
- Defective SS2 (7-speed only).
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.

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DTC P0976 Shift Solenoid 2 Control Circuit Low *(cont'd)*

3. Check if 7-speed model.
4. Check for air solenoid.
5. Check W119 in chassis harness for short to another wire and to chassis ground.
6. Check air solenoid (SS2) wires.
7. Check internal harness for short to another wire and to the control valve module.
8. Check air solenoid (SS2) resistance.
9. Check TCM.
10. Check SS2 (7-speed only) resistance.
11. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0976 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 11*
2	Are there any active or inactive DTCs P2685, P2738, or P2764 present or in history with active DTC P0976?		*Go to DTC P2685*	*Go to Step 3*
3	Is transmission a 7-speed model?		*Go to Step 5*	*Go to Step 4*
4	Is transmission equipped with an air solenoid (SS2)?		*Go to Step 6*	*Go to Step 9*

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DTC P0976 Shift Solenoid 2 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminal 19 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 19 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 9*	*Address issue with W119. Go to Step 11 after repairs are made.*
6	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Disconnect air solenoid (SS2) from OEM chassis harness. 5. Using a J-46708 Digital Multimeter, measure the resistance between terminal 19 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 19 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 8*	*Address issue with OEM harness wire for the air solenoid (SS2). Go to Step 11*
7	1. Remove control module from transmission. Refer to service manual. 2. Connect J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Install J-47279-1 Magnetic Overlay. 4. Disconnect SS2 solenoid. 5. Using a J-46708 Digital Multimeter, measure the resistance between terminals 17 and every other labeled terminal shown on J-47279-1 Magnetic Overlay and to the control valve module. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 17 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control valve module?	20 kΩ or more	*Go to Step 10*	*Repair or replace internal harness. Go to Step 11*

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DTC P0976 Shift Solenoid 2 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect air solenoid (SS2) to OEM chassis harness. 5. Measure resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–22 for air solenoid (SS2) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–22	*Go to Step 9*	*Replace air solenoid (SS2). Go to Step 11*
9	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0976 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 11 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 7 for 7-speed models. Go to Step 11 for retarder models with air solenoid (SS2).*
10	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect SS2 to internal harness connectors. 4. Measure resistance between terminals 11 and 17 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–21 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–21	*Go to Step 11*	*Replace solenoid that is not within specification. Go to Step 11*

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DTC P0976 Shift Solenoid 2 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0976 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

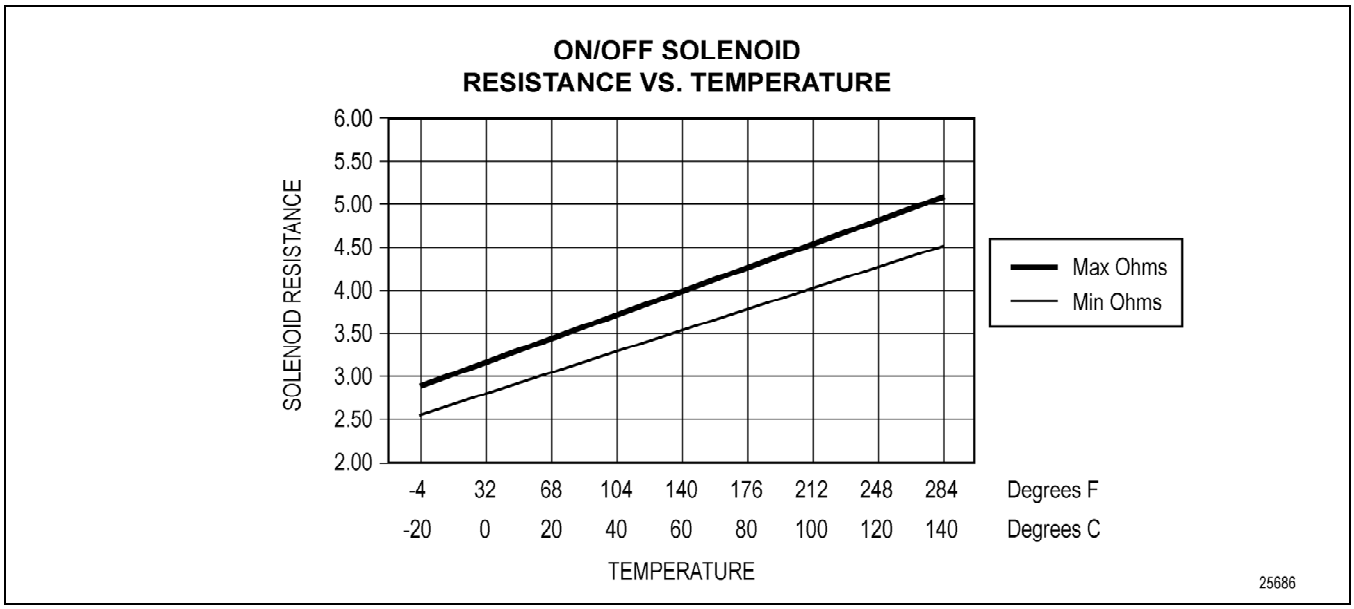

Figure 5–21. ON/OFF Solenoid– SS1, SS2 (7-Speed Only), PCS5(Differential Lock 3700SP Only)

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DTC P0976 Shift Solenoid 2 Control Circuit Low *(cont'd)*

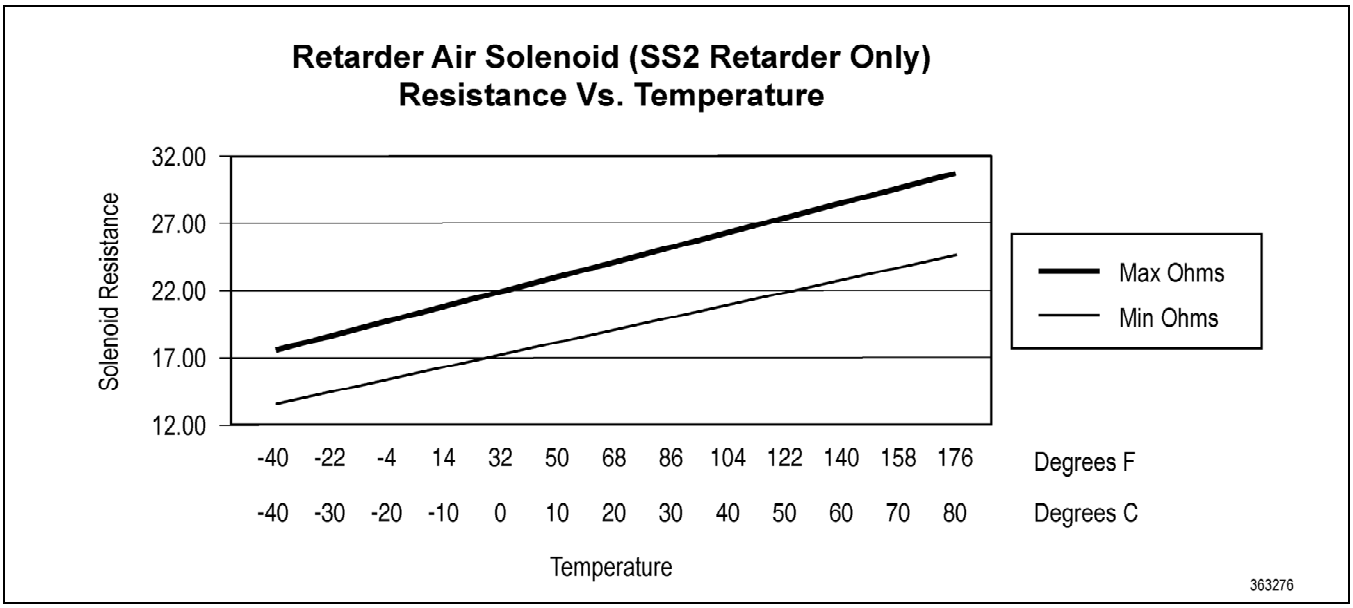

Figure 5–22. Retarder Air Solenoid (SS2) Retarder Equipped Transmissions

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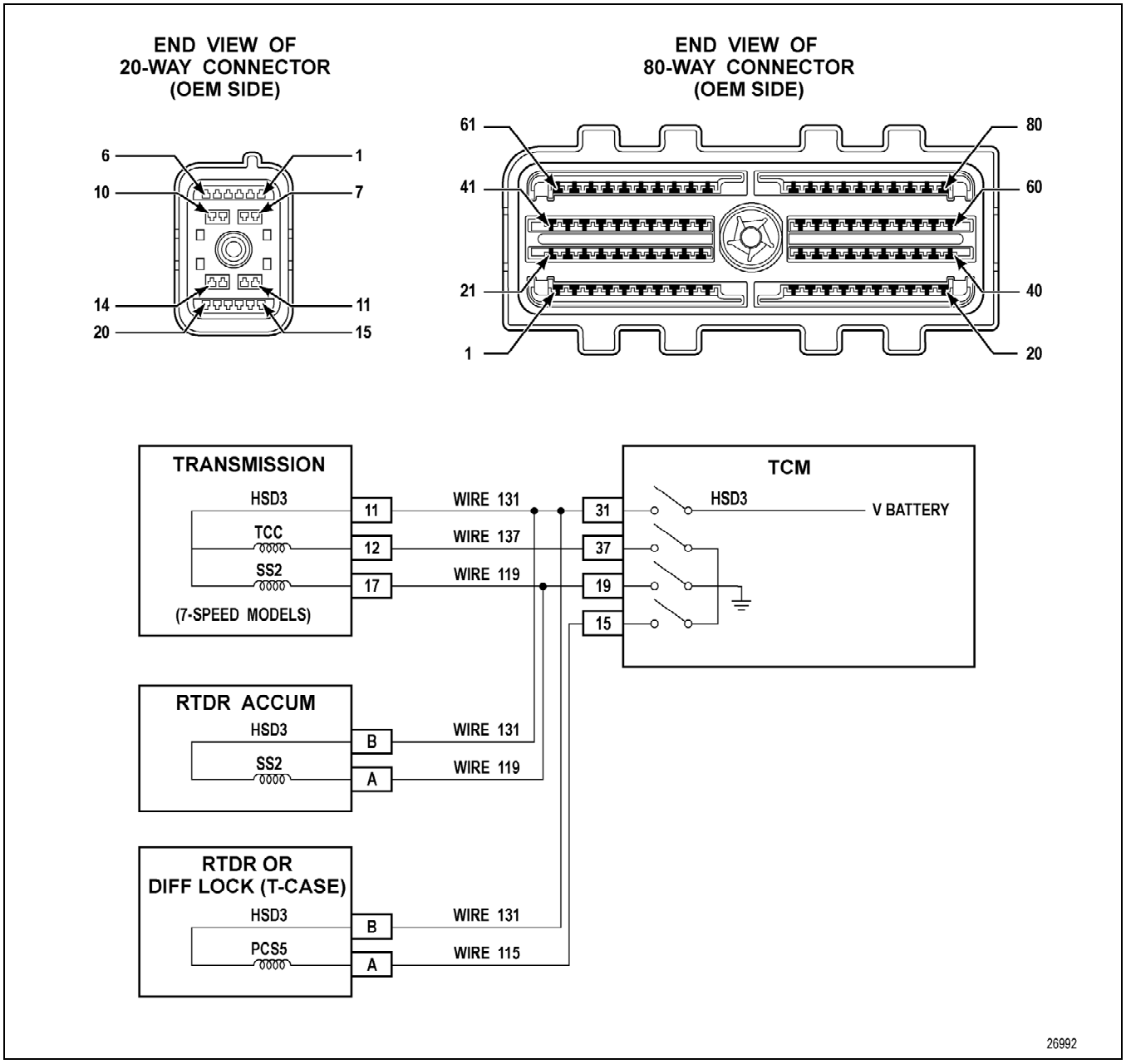
DTC P0977 Shift Solenoid 2 Control Circuit High



Circuit Description

DTC P0977 indicates that the TCM has detected a failed high condition in the SS2 solenoid electrical circuit. The failed high condition may exist in the high side (wire 131) or low side (wire 119).

Action Taken When the DTC Sets

When DTC P0977 is active:

- For 7-speed models, limit ranges to Reverse (R), Neutral (N) and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.

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DTC P0977 Shift Solenoid 2 Control Circuit High *(cont'd)*

- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0977 can be caused by:

- SS2 (7-speed only) issues such as:
  - W119 shorted to another wire in chassis harness.
  - W119 (terminal 17 of 20-way) shorted to another wire in internal transmission harness.
- Air solenoid (SS2) issues such as:
  - W119 shorted to another wire in chassis harness.
- Defective air solenoid (SS2).
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.

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DTC P0977 Shift Solenoid 2 Control Circuit High *(cont'd)*

3. Check if 7-speed model.
4. Check for air solenoid.
5. Check W119 in chassis harness for short to another wire.
6. Check air solenoid (SS2) wires.
7. Check internal harness.
8. Check air solenoid (SS2) resistance.
9. Check TCM.
10. Check solenoid resistance.
11. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0977 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 11*
2	Are there any active or inactive DTCs P2686, P2739, or P2763 present or in history with active DTC P0977?		*Go to DTC P2686*	*Go to Step 3*
3	Is transmission a 7-speed model?		*Go to Step 5*	*Go to Step 4*
4	Is transmission equipped with an air solenoid (SS2)?		*Go to Step 6*	*Go to Step 9*

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DTC P0977 Shift Solenoid 2 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminal 19 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 19 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 9*	*Address issue with W119. Go to Step 11 after repairs are made.*
6	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Disconnect air solenoid (SS2) from OEM chassis harness. 5. Using a J-46708 Digital Multimeter, measure the resistance between terminal 19 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 19 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 8*	*Address issue with OEM harness wire for the air solenoid (SS2). Go to Step 11*
7	1. Remove control module from transmission. Refer to service manual. 2. Connect J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Install J-47279-1 Magnetic Overlay. 4. Disconnect SS2 solenoid. 5. Using a J-46708 Digital Multimeter, measure the resistance between terminals 17 and every other labeled terminal shown on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 17 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 10*	*Repair or replace internal harness. Go to Step 11*

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DTC P0977 Shift Solenoid 2 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect air solenoid (SS2) to OEM chassis harness. 5. Measure resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–24 for air solenoid (SS2) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–24	*Go to Step 9*	*Replace air solenoid (SS2). Go to Step 11*
9	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0977 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 11 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 7 for 7-speed models. Go to Step 11 for retarder models with air solenoid (SS2).*
10	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect SS2 to internal harness connectors. 4. Measure resistance between terminals 11 and 17 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–23 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–23	*Go to Step 11*	*Replace solenoid that is not within specification. Go to Step 11*

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DTC P0977 Shift Solenoid 2 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0977 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

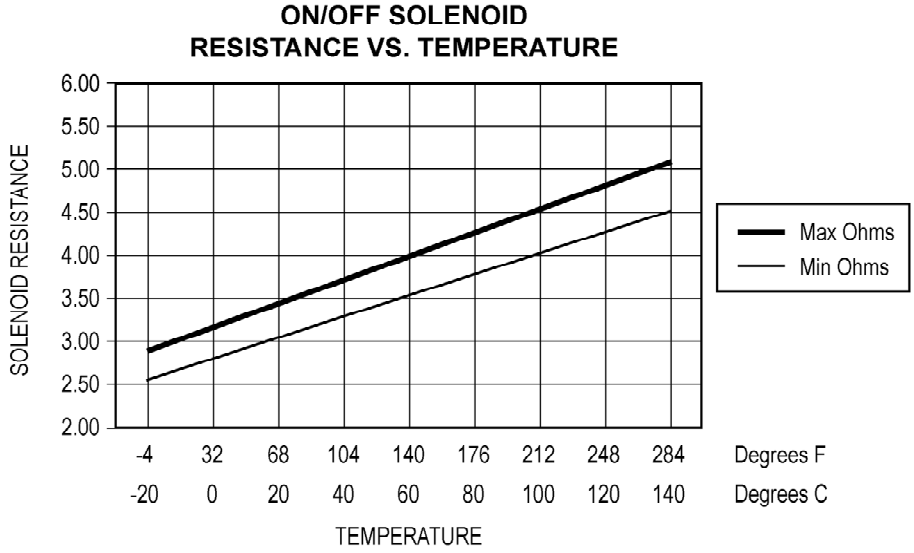

Figure 5–23. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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DTC P0977 Shift Solenoid 2 Control Circuit High *(cont'd)*

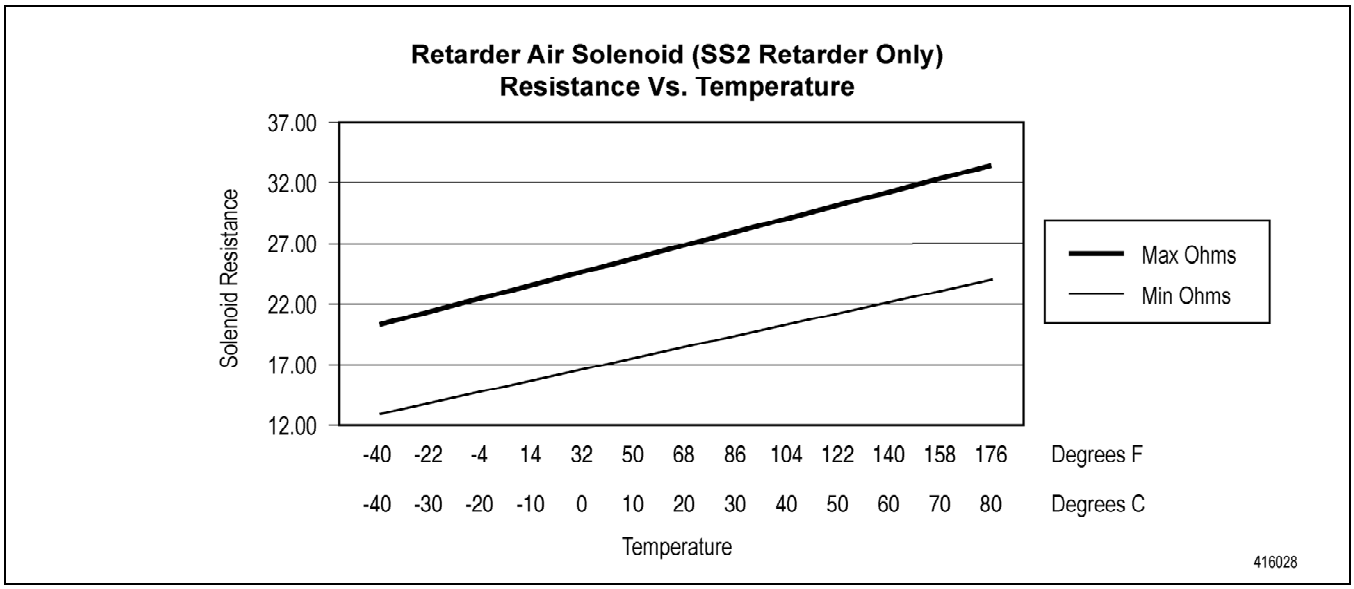

Figure 5–24. Retarder Air Solenoid (SS2) Retarder Equipped Transmissions

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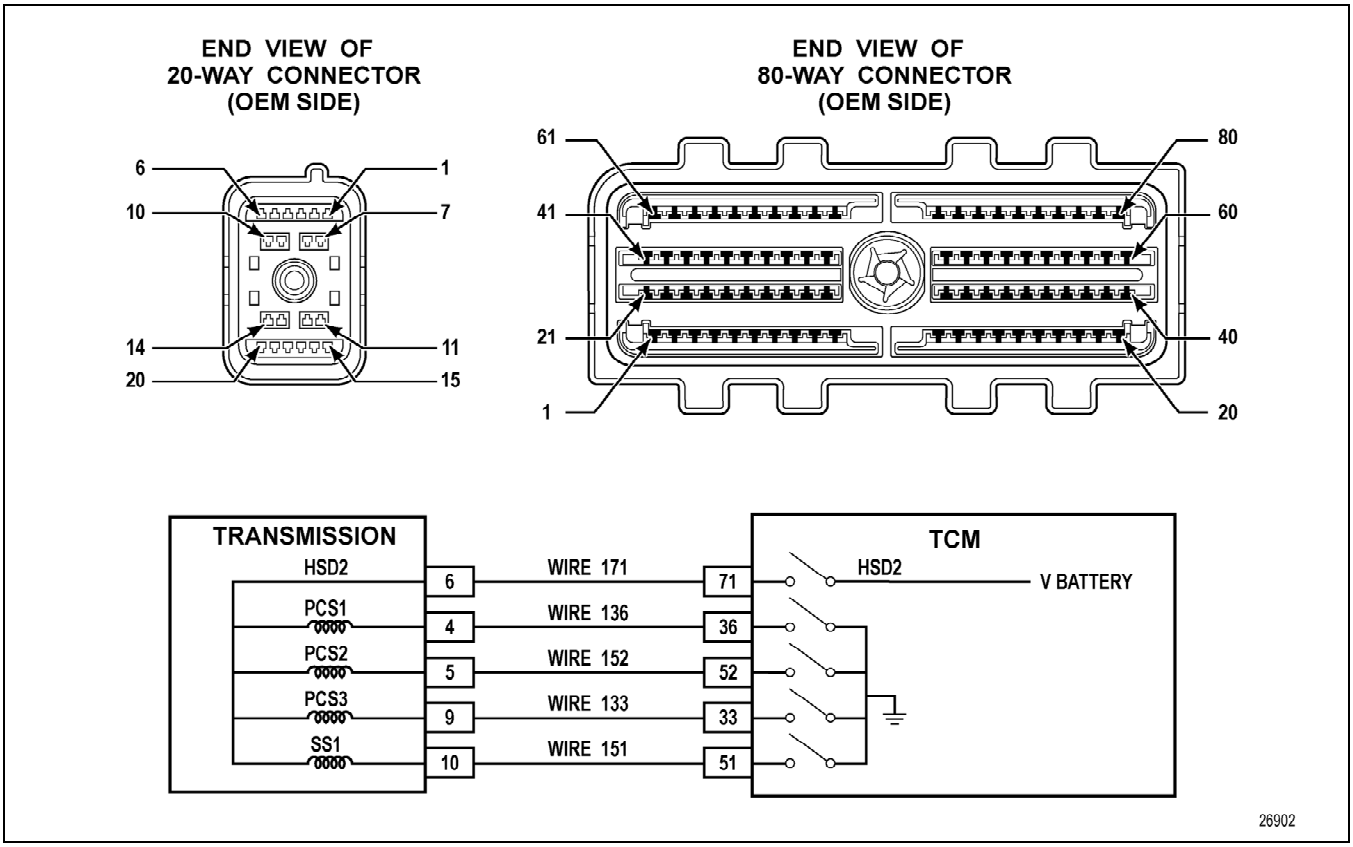
DTC P097A Shift Solenoid 1 Control Circuit Open



Circuit Description

DTC P097A indicates that the TCM has detected a failed open condition in the low side of the SS1 electrical circuit.

Action Taken When the DTC Sets

When DTC P097A is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P097A Shift Solenoid 1 Control Circuit Open *(cont'd)*

Diagnostic Aids

DTC P097A can be caused by:

- SS1 issues such as:
  - W151 high resistance or open.
  - W151 (terminal 10 of 20-way) high resistance or open wire in the control valve module in the internal transmission harness.
  - SS1 defective.
- Broken or defective connector assemblies allowing pushed back pins.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W151 in chassis harness for high resistance or open.
4. Check TCM.
5. Check internal harness wire for SS1 Low Side Driver (terminal 10) for high resistance or open.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P097A Shift Solenoid 1 Control Circuit Open *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P097A active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Is DTC P2669 present or in history with active DTC P097A?		*Go to DTC P2669*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 6 and 10 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 51 and 71 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W151. Go to Step 7 after repairs are made.*

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DTC P097A Shift Solenoid 1 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P097A active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Disconnect SS1 from internal harness. 3. Install jumper wire between A and B terminals of SS1 connector on internal harness. 4. Leave J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Leave J-47279-1 Magnetic Overlay installed. 6. Check resistance between terminal 6 and 10 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 6 to terminal 10 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect SS1 to internal harness connectors. 4. Measure resistance between terminals 6 and 10 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–25 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–25	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P097A Shift Solenoid 1 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P097A return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

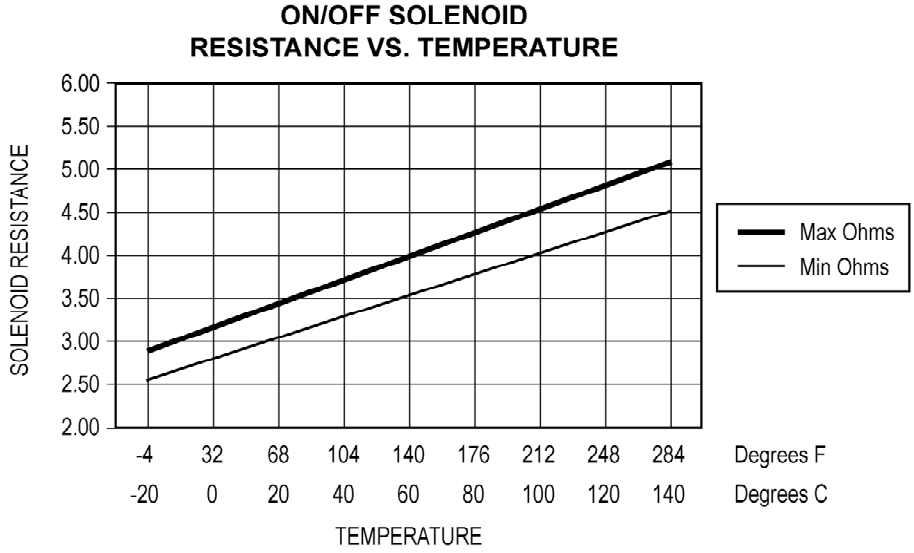

Figure 5–25. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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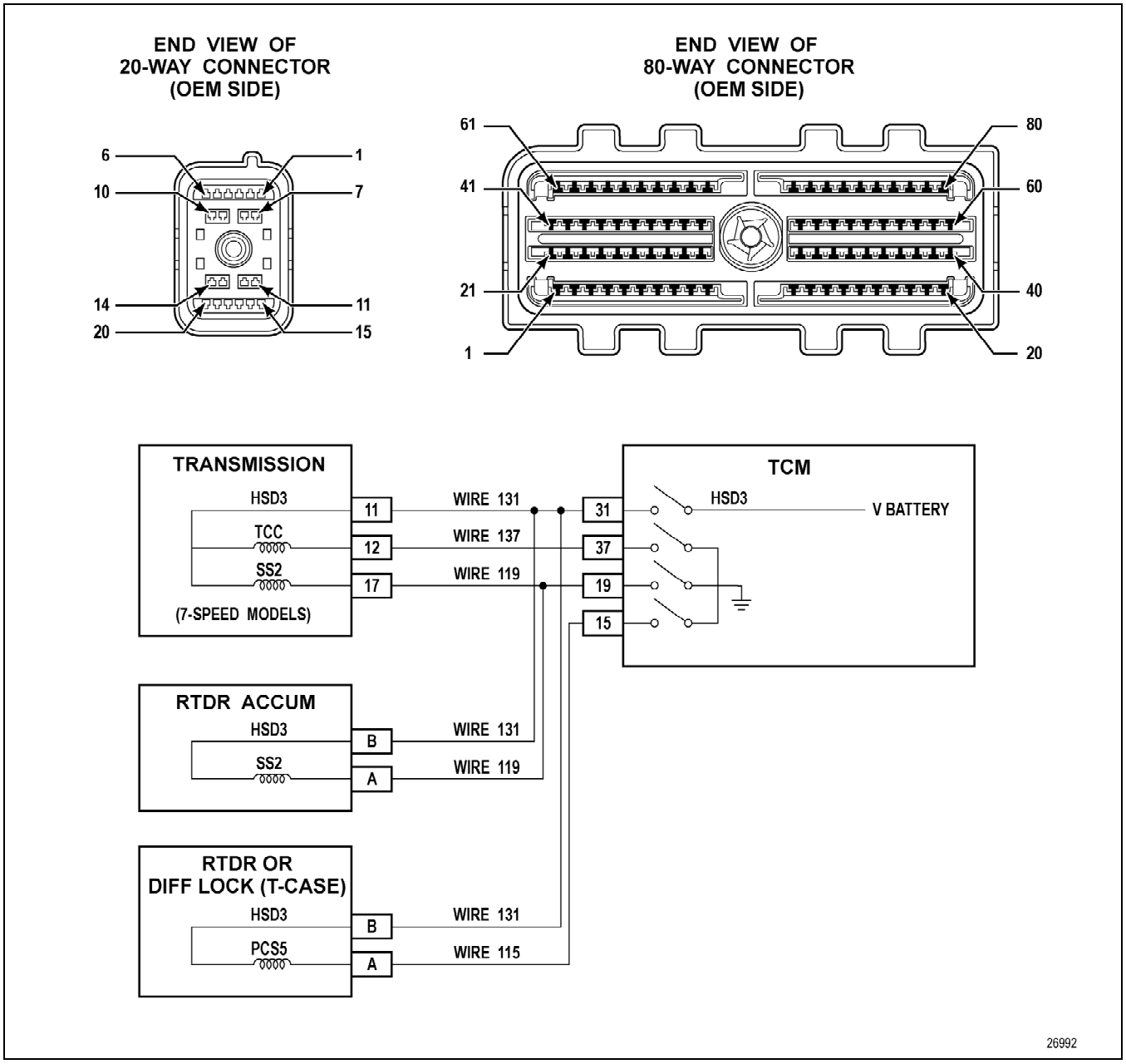
DTC P097B Shift Solenoid 2 Control Circuit Open



Circuit Description

DTC P097B indicates that the TCM has detected an open condition in the SS2 solenoid electrical circuit. The open condition may exist in the high side (wire 131) or low side (wire 119).

Action Taken When the DTC Sets

When DTC P097B is active:

- For 7-speed models, limit ranges to Reverse (R) and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.

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DTC P097B Shift Solenoid 2 Control Circuit Open *(cont'd)*

- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P097B can be caused by:

- SS2 (7-speed only) issues such as:
  - W119 high resistance or open circuit in chassis harness.
  - W119 (terminal 17 of 20-way) high resistance or open circuit in internal transmission harness.
- Air solenoid (SS2) issues such as:
  - W119 high resistance or open circuit in chassis harness.
- Defective air solenoid (SS2).
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information inSection 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.
3. Check if 7-speed model.

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DTC P097B Shift Solenoid 2 Control Circuit Open *(cont'd)*

4. Check for air solenoid.
5. Check for high resistance or open in SS2 wires for 7-speed models.
6. Check air solenoid (SS2) wires.
7. Check internal harness.
8. Check air solenoid (SS2) resistance.
9. Check TCM.
10. Check SS2 resistance for 7-speed models.
11. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P097B active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 11*
2	Are there any active or inactive DTCs P2684, P2761, or P2736 present or in history with active DTC P097B?		*Go to DTC P2684*	*Go to Step 3*
3	Is transmission a 7-speed model?		*Go to Step 5*	*Go to Step 4*
4	Is transmission equipped with air solenoid (SS2)?		*Go to Step 6*	*Go to Step 9*

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DTC P097B Shift Solenoid 2 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between pin 11 and 17 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 9*	*Address issue with W119. Go to Step 11 after repairs are made.*
6	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Disconnect air solenoid (SS2) from OEM chassis harness. 5. Install a jumper wire between terminals A and B of the air solenoid (SS2) connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 8*	*Address issue with OEM harness wire that is high resistance or open for the air solenoid (SS2). Go to Step 11*
7	1. Remove control module from transmission. Refer to service manual. 2. Connect J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Install J-47279-1 Magnetic Overlay. 4. Disconnect SS2. 5. Leave solenoids disconnected from internal harness. 6. Install jumper between internal harness terminals A and B for SS2. 7. Measure resistance between terminals 11 and 17 at J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 10*	*Repair or replace internal harness. Go to Step 11*

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DTC P097B Shift Solenoid 2 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect air solenoid (SS2) to OEM chassis harness. 5. Measure resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–27 for air solenoid (SS2) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–27	*Go to Step 9*	*Replace air solenoid (SS2). Go to Step 11*
9	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P097B active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 11 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 7 for 7-speed models. Go to Step 11 for retarder models with air solenoid (SS2).*
10	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect SS2 to internal harness connectors. 4. Measure resistance between terminals 11 and 17 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–26 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–26	*Go to Step 11*	*Replace solenoid that is not within specification. Go to Step 11*

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DTC P097B Shift Solenoid 2 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P097B return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

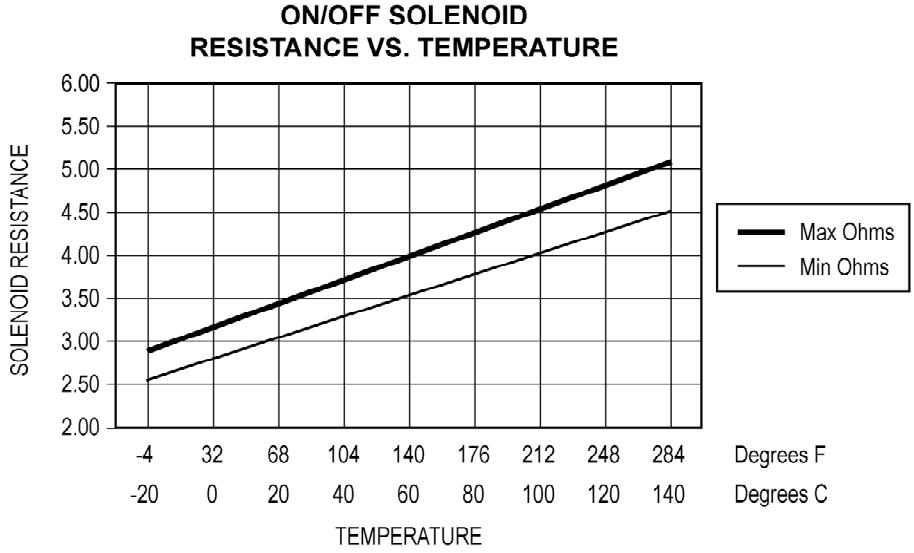

Figure 5–26. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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DTC P097B Shift Solenoid 2 Control Circuit Open *(cont'd)*

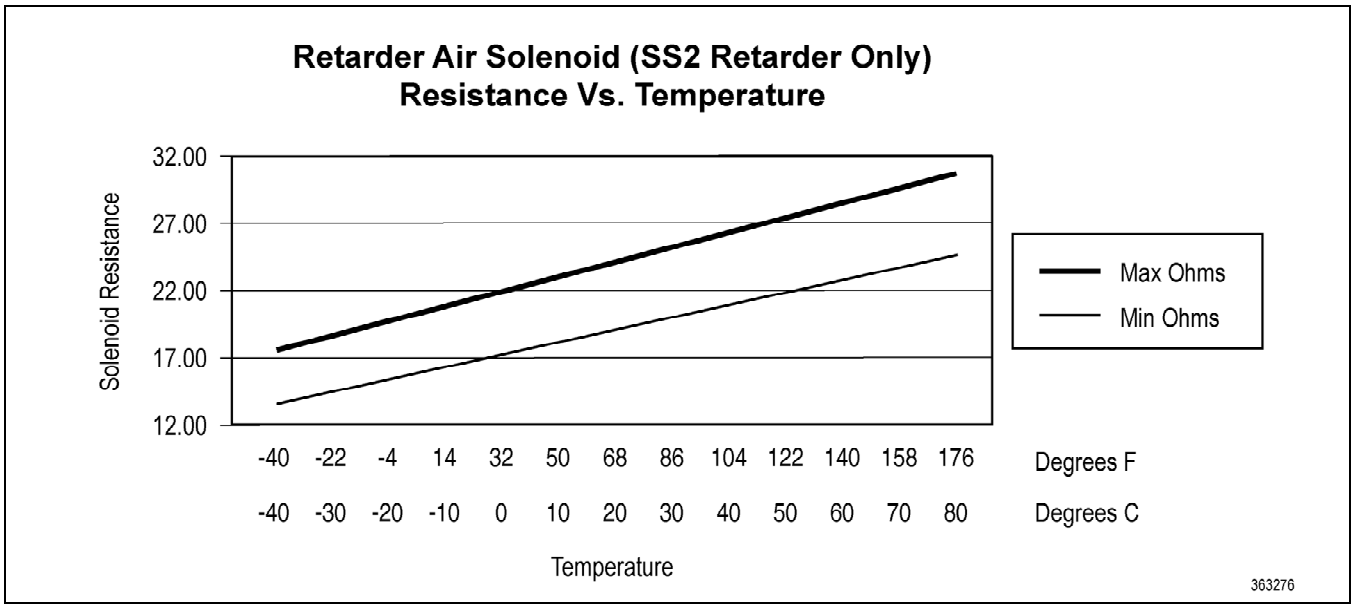

Figure 5–27. Retarder Air Solenoid (SS2) Retarder Equipped Transmissions

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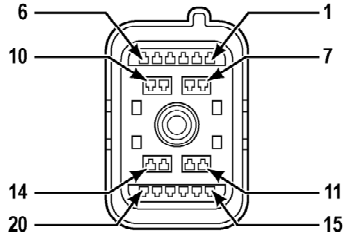
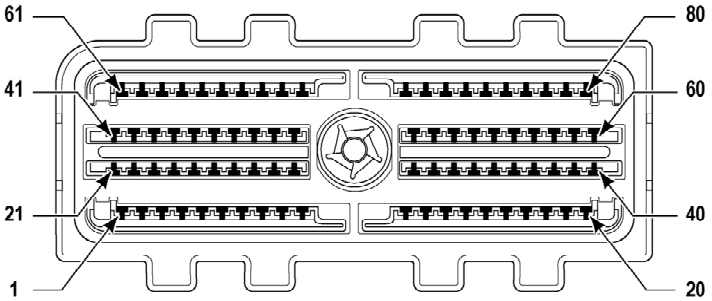
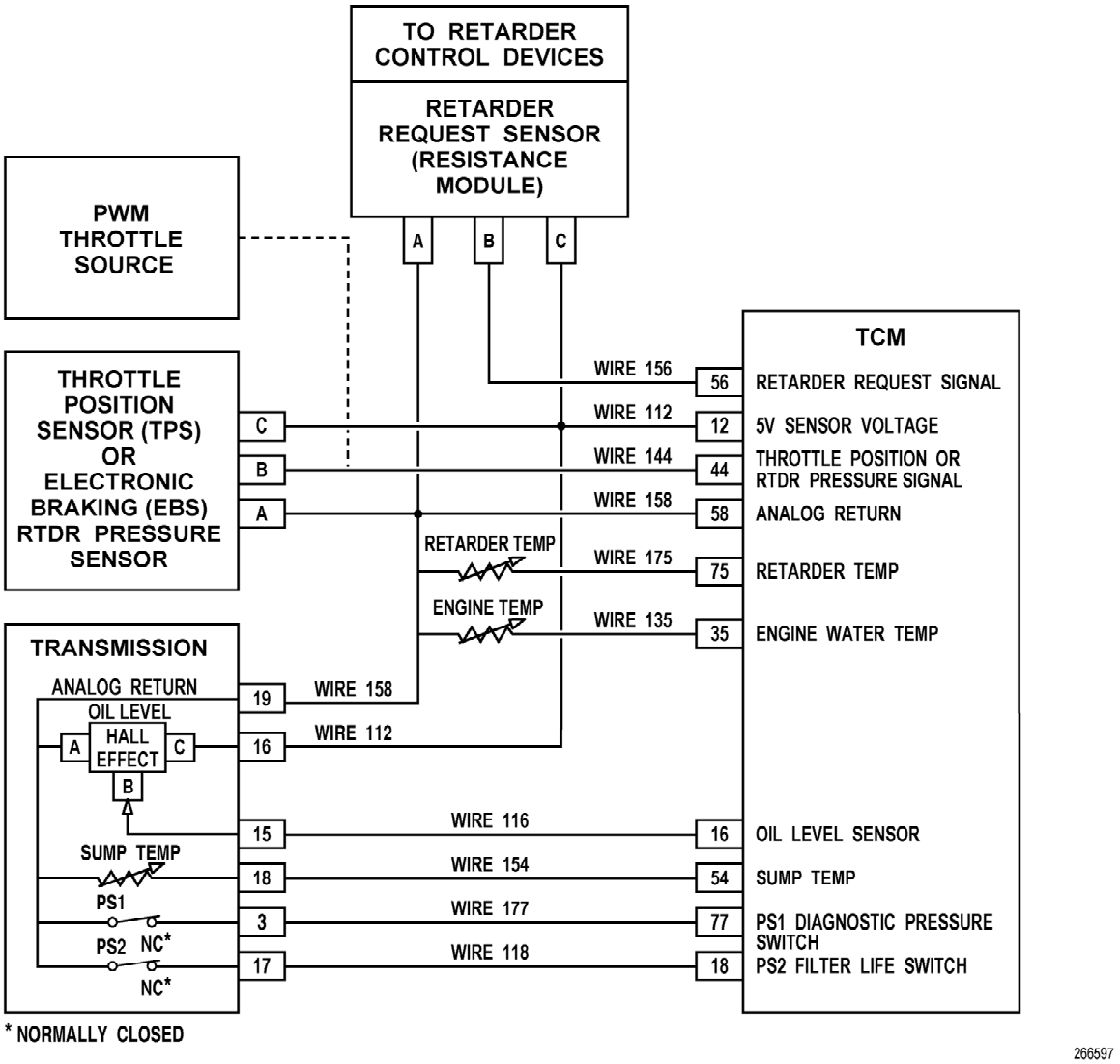
DTC P0989 Retarder Pressure Sensor Circuit Low

END VIEW OF
20-WAY CONNECTOR
(OEM SIDE)



END VIEW OF
80-WAY CONNECTOR
(OEM SIDE)





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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

Circuit Description

Some transmission retarder applications may use an optional retarder pressure sensor (also called Electronic Braking System (EBS) pressure sensor, and/or retarder pressure transducer). DTC P0989 indicates the TCM has detected a signal on wire 144 in the low error zone.

NOTE: The retarder pressure sensor interface uses the same three TCM pin locations and wire numbers as those assigned to an analog TPS. Therefore, a retarder pressure sensor cannot be integrated on a vehicle with an analog or PWM TPS source.

The TCM is connected to the retarder pressure sensor by:

- a 5V reference voltage (W112),
- a retarder pressure sensor signal (W144), and
- an analog ground (W158).

Action Taken for Active DTC

When DTC P0989 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The CAN message containing retarder torque data is broadcast as “Not Available” (FE hex or 254 decimal).

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0989 indicates the TCM has detected a voltage signal from the retarder pressure sensor in the low error zone, and may be caused by the following:

- Open or short to ground in W112 or W144 circuits.

NOTE: Shorts or opens in W112 will typically log other sensor failed low DTCs that are using W112 (5V), such as the Oil Level Sensor (OLS) or Retarder Modulation Request (RMR) Sensor. Shorts or opens in W144 (retarder pressure sensor signal) only causes DTC P0989.

- Retarder pressure sensor set in calibration for a non-retarder pressure sensor transmission application.
- Missing, defective, or unplugged retarder pressure sensor.
- Defective retarder pressure sensor sharing 5V supply.
- 5V wire open or grounded in transmission internal harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- TCM issue.

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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

Checking the 'Autodetected and SEM Information' Data Grid on the Allison DOC® for the 'Retarder Pressure Transducer Status' will display whether the retarder pressure sensor is enabled or not enabled in the calibration. 'Present' means enabled, 'Not Present' means not enabled.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for retarder pressure sensor.
3. Check for active DTC after recalibration.
4. Check for missing or unplugged retarder pressure sensor.
5. Check for voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W144, and check for voltage.
8. Check for active code.
9. Check for high resistance or open in W112, W144, or W158 in retarder pressure sensor wiring.
10. Check for short to another wire or ground.
11. Check for DTC P070C.
12. Check for DTC C1312.
13. Check if TCM is OK. If TCM is OK, replace retarder pressure sensor.
14. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has the responsibility to ensure that the calibrations and retarder pressure sensor are integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0989 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 14.*
2	Is a retarder pressure sensor source expected to be on vehicle?		*Go to Step 4*	*Recalibrate TCM with correct CIN that does not have the retarder pressure sensor enabled in the calibration. Go to Step 3*
3	Restart engine and check for DTC P0989. Is DTC P0989 active?		*Go to Step 13*	*Go to Step 14*
4	Is the retarder pressure sensor connected to the vehicle harness?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 14 after repairs are made.*

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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s), if equipped. 8. Disconnect OEM chassis harness connector for transmission retarder pressure sensor. 9. Connect 16-way bypass on J-47275 TCM Breakout Harness. 10. Install J-46708 Digital Multimeter to measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 11. Turn ignition **ON** but do not start engine. 12. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules (Retarder Request Sensor(s)) connector(s) disconnected from the OEM chassis harness, if equipped. 6. Leave OEM chassis harness connector for retarder pressure sensor disconnected. 7. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 8. Turn ignition **ON** but do not start engine. 9. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 14 after repairs are made.*	*Go to Step 13*

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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave retarder pressure sensor disconnected. 6. Leave RMR devices disconnected from OEM harness, if equipped. 7. Install jumper wire from J-39197-A (Jumper Wire Kit or equivalent), between Pin C in OEM retarder pressure sensor connector for W112 (5V supply) and Pin B for W144 (retarder pressure sensor signal). 8. Connect J-46708 Digital Multimeter to terminals 12 and 44 of J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Measure voltage. Is the voltage within the specified value?	4.5-5.4V	*Go to Step 11*	*Address issue with W144. Go to Step 14 after repairs are made.*
8	1. Start engine. 2. Check for active DTC P0989. Is DTC P0989 active?		*Go to Step 9*	*Go to Step 14*

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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Leave 20-way OEM transmission connector disconnected from transmission. 7. Leave retarder pressure sensor disconnected from chassis harness. 8. Disconnect all RMR resistance modules from OEM chassis harness, if equipped. 9. Install a jumper wire between W158 (Pin A-analog return) and W144 (Pin B-retarder pressure sensor signal) at the OEM harness connector for retarder pressure sensor. 10. Using a J-46708 Digital Multimeter, measure the resistance between terminals 44 and 58 at J-47275-1 Magnetic Overlay. 11. Install a jumper wire between W112 (Pin C 5V reference return) and W144 (Pin B retarder pressure sensor) at the OEM harness connector for retarder pressure sensor. 12. Measure the resistance between terminals 44 and 12 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 10*	*Address issue with W112, W144, or W158. Go to Step 14 after repairs are made.*

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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from retarder pressure sensor connector and leave retarder pressure sensor disconnected from chassis harness. 3. Leave RMR modules disconnected from OEM chassis harness, if equipped. 4. Leave OEM 20-way transmission connector disconnected from transmission. 5. Disconnect OEM connector from the retarder temp sensor (if installed). 6. Disconnect OEM connector from water temp sensor (if installed). 7. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 8. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 9. Leave J-47275 TCM Breakout Harness connected. 10. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminals 44 and 12, to all other labeled terminals shown on J-47275-1 Magnetic Overlay and also to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 44 and 12 to all other labeled terminals on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 13*	*Address issue with W112 or W144. Go to Step 14 after repairs are made.*
11	**NOTE:** Skip this step if 3700SPS or 4700/4800 retarder models and go to Step 12. 1. Turn ignition **OFF**. 2. Connect OEM chassis harness transmission 20-way connector to transmission and tighten bolt to 2.0-3.2 N·m (18-28 lb in). 3. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 4. Leave 16-way bypass of J-47275 TCM Breakout Harness connected. 5. Leave transmission retarder pressure sensor disconnected from OEM chassis harness. 6. Leave RMR resistance modules (sensor) to OEM chassis harness disconnected from chassis harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P070C Transmission Fluid Level Sensor Circuit-Low Input. Is DTC P070C active?		*Go to DTC P070C*	*Go to Step 12*

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DTC P0989 Retarder Pressure Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
12	**NOTE:** Skip this step and go to Step 13 if transmission RMR modules are not installed. 1. Turn ignition **OFF**. 2. Reconnect the RMR module connectors to transmission RMR assembly. 3. Leave retarder pressure sensor connectors disconnected from harness. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Start engine. 7. Using Allison DOC®, check for active DTC C1312 Retarder Request Sensor Failed Low. Is DTC C1312 active?		*Go to DTC C1312*	*Go to Step 8*
13	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0989 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 14 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace retarder pressure sensor. Go to Step 14 after repairs are made.*
14	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0989 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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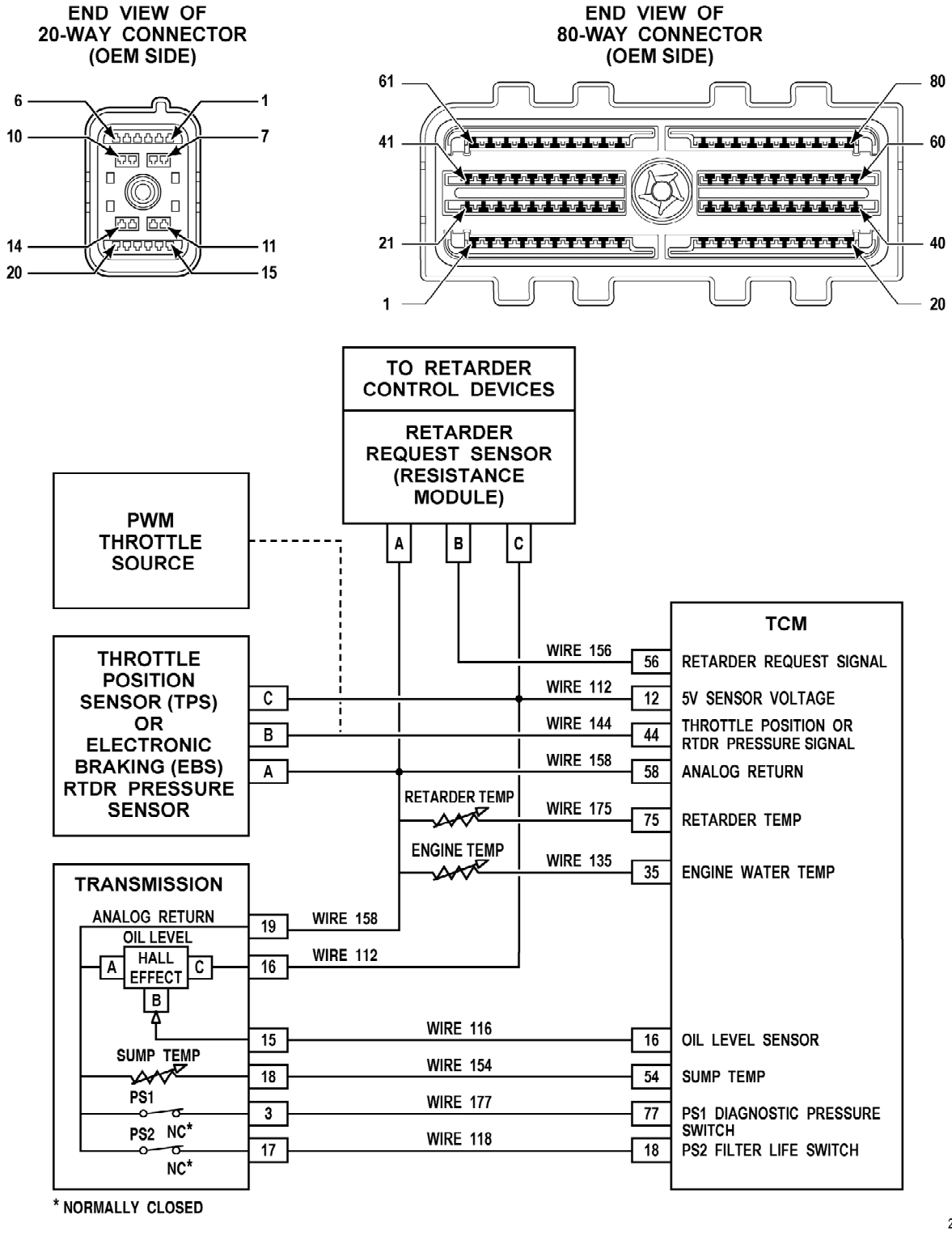
DTC P0990 Retarder Pressure Sensor Circuit High



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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

Circuit Description

Some transmission retarder applications may use an optional retarder pressure sensor (also called Electronic Braking System (EBS) pressure sensor and/or retarder pressure transducer). DTC P0990 indicates the TCM has detected a signal on wire 144 in the high error zone

NOTE: The retarder pressure sensor interface uses the same three TCM pin locations and wire numbers as those assigned to an analog TPS. Therefore, a retarder pressure sensor cannot be integrated on a vehicle with an analog or PWM TPS source.

The TCM is connected to the retarder pressure sensor by:

- A 5V reference voltage (W112),
- A retarder pressure sensor signal (W144), and
- An analog ground (W158).

Action Taken for Active DTC

When DTC P0990 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The CAN message containing retarder torque data is broadcast as “Not Available” (FE hex or 254 decimal).

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P0990 indicates the TCM has detected a voltage signal from the retarder pressure sensor in the high error zone, and may be caused by the following:

- Retarder pressure sensor set in calibration for a non-retarder pressure sensor transmission application.
- Defective retarder pressure sensor.
- Defective retarder pressure sensor sharing 5V supply.
- W144 shorted to battery.

NOTE: Short to battery in W144 (retarder pressure sensor signal) only causes DTC P0990. Short to battery in W112 or open in W158, may cause other sensor DTCs like P070D, and/or C1313.

- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- W158 open circuit.
- TCM issue.

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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

Checking the 'Autodetected and SEM Information' Data Grid on the Allison DOC® for the 'Retarder Pressure Transducer Status' will display whether the retarder pressure sensor is enabled or not enabled in the calibration. 'Present' means enabled; 'Not Present' means not enabled.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for retarder pressure sensor.
3. Check for active DTC after recalibration to set retarder pressure sensor to 'Not Present'.
4. Check for retarder pressure sensor is connected to the vehicle harness.
5. Check for voltage between terminals 12 (5V supply) and 58 (analog ground) after disconnecting other devices sharing 5V supply.
6. Disconnect J-47275 TCM Breakout Harness 16-way bypass connector, and check for voltage.
7. Install jumper between W112 and W144, and check for voltage.
8. Check for DTC.
9. Check for high resistance or open in W112, W144, or W158 in retarder pressure sensor wiring.
10. Check for short to battery in chassis harness.
11. Check for DTC P070D.
12. Check for DTC C1313.
13. Check if TCM is OK. If TCM is OK, replace retarder pressure sensor.
14. If DTC is still active, review diagnostic aids, applicable information inSection 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has the responsibility to ensure that the calibrations and retarder pressure sensor are integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P0990 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 14.*
2	Is a retarder pressure sensor source expected to be on vehicle?		*Go to Step 4*	*Recalibrate TCM with correct CIN that does not have the retarder pressure sensor enabled in the calibration. Go to Step 3*
3	Restart engine and check for DTC P0990. Is DTC P0990 active?		*Go to Step 13*	*Go to Step 14*
4	Is the retarder pressure sensor connected to the vehicle harness?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 14 after repairs are made.*

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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Disconnect RMR resistance module (Retarder Request Sensor(s)) connector(s) from the resistance module(s), if equipped. 8. Disconnect OEM chassis harness connector from transmission retarder pressure sensor. 9. Connect 16-way bypass on J-47275 TCM Breakout Harness. 10. Install J-46708 Digital Multimeter to measure voltage between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 11. Turn ignition **ON** but do not start engine. 12. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Go to Step 7*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave all RMR resistance modules (Retarder Request Sensor(s)) connector(s) disconnected from the OEM chassis harness, if equipped. 6. Leave OEM chassis harness connector for retarder pressure sensor disconnected. 7. Leave J-46708 Digital Multimeter connected between terminals 12 (5V supply) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 8. Turn ignition **ON** but do not start engine. 9. Measure voltage. Does voltage meet specification?	4.5-5.4V	*Address issue with W112 or W158. Go to Step 14 after repairs are made.*	*Go to Step 13*

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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM harness. 3. Reconnect 16-way bypass of J-47275 TCM Breakout Harness. 4. Leave 20-way OEM transmission connector disconnected from transmission. 5. Leave retarder pressure sensor disconnected. 6. Leave RMR devices disconnected from OEM harness, if equipped. 7. Install jumper wire from J-39197-A (Jumper Wire Kit or equivalent), between Pin C in OEM retarder pressure sensor connector for W112 (5V supply) and Pin B for W144 (retarder pressure sensor signal). 8. Connect J-46708 Digital Multimeter to terminals 12 and 44 of J-47275-1 Magnetic Overlay. 9. Turn ignition **ON** but do not start engine. 10. Measure voltage. Is the voltage within the specified value?	4.5-5.4V	*Go to Step 11*	*Address issue with W144. Go to Step 14 after repairs are made.*
8	1. Start engine. 2. Check for active DTC P0990. Is DTC P0990 active?		*Go to Step 9*	*Go to Step 14*

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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave J-47275 TCM Breakout Harness connected. 6. Leave 20-way OEM transmission connector disconnected from transmission. 7. Leave retarder pressure sensor disconnected from chassis harness. 8. Disconnect all RMR resistance modules from OEM chassis harness, if equipped. 9. Install a jumper wire between W158 (Pin A-analog return) and W144 (Pin B-retarder pressure sensor signal) at the OEM harness connector for retarder pressure sensor. 10. Using a J-46708 Digital Multimeter, measure the resistance between terminals 44 and 58 at J-47275-1 Magnetic Overlay. 11. Install a jumper wire between W112 (Pin C 5V reference return) and W144 (Pin B retarder pressure sensor signal) at the OEM harness connector for retarder pressure sensor. 12. Measure the resistance between terminals 44 and 12 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 10*	*Address issue with W112, W144, or W158. Go to Step 14 after repairs are made.*

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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Remove jumper wire from retarder pressure sensor connector and leave retarder pressure sensor disconnected from chassis harness. 3. Leave RMR modules disconnected from OEM chassis harness, if equipped. 4. Leave OEM 20-way transmission connector disconnected from transmission. 5. Disconnect OEM connector from the retarder temp sensor (if installed). 6. Disconnect OEM connector from water temp sensor (if installed). 7. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 8. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 9. Leave J-47275 TCM Breakout Harness connected. 10. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminals 44 and 12, to all other labeled terminals shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminals 44 and 12 to all other labeled terminals on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 13*	*Address issue with W112 or W144. Go to Step 14 after repairs are made.*
11	**NOTE:** Skip this step if 3700SPS or 4700/4800 retarder models and go to Step 12. 1. Turn ignition **OFF**. 2. Connect OEM chassis harness transmission 20-way connector to transmission and tighten bolt to 2.0-3.2 N·m (18-28 lb in). 3. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 4. Leave 16-way bypass of J-47275 TCM Breakout Harness connected. 5. Leave retarder pressure sensor assembly disconnected from OEM chassis harness. 6. Leave RMR resistance modules (sensor) to OEM chassis harness disconnected from chassis harness, if equipped. 7. Start engine. 8. Using Allison DOC®, check for active DTC P070D Transmission Fluid Level Sensor Circuit-High Input. Is DTC P070D active?		*Go to DTC P070D*	*Go to Step 12*

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DTC P0990 Retarder Pressure Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
12	**NOTE:** Skip this step and go to Step 13 if transmission RMR modules are not installed. 1. Turn ignition **OFF**. 2. Reconnect the RMR module connectors to transmission RMR assembly. 3. Leave retarder pressure sensor connectors disconnected from harness. 4. Leave OEM chassis harness transmission 20-way connector disconnected from transmission. 5. Reconnect J-47275 TCM Breakout Harness 80-way to TCM. 6. Start engine. 7. Using Allison DOC®, check for active DTC C1313 Retarder Request Sensor Failed High. Is DTC C1313 active?		*Go to DTC C1313*	*Go to Step 8*
13	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P0990 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 14 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace retarder pressure sensor. Go to Step 14 after repairs are made.*
14	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P0990 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P1739 Incorrect Low Gear Ratio

REFER TO Appendix M. HYDRAULIC SCHEMATICS FOR INFORMATION ON LOW RANGE HYDRAULIC SCHEMATICS WITH OR WITHOUT PROGNOSTICS

Circuit Description

This test verifies the transmission is maintaining proper ratio while in low range.

Action Taken When the DTC Sets

When DTC P1739 is active, the following conditions will occur:

- For a 3700SPS model, the transmission locks in first range. For a 4700/4800 model, the transmission locks in second range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P1739 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Off-going and on-coming clutch issue.
- Issue with TCM.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.

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DTC P1739 Incorrect Low Gear Ratio *(cont'd)*

3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate transmission requires overhaul, e.g., fluid is extremely discolored, odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P0733?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P1739?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P1739 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P1739 Incorrect Low Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select Low range at idle. Record turbine shaft speed, main and apply pressure for C3 and C6 (3700SPS models). Record turbine shaft speed, main and apply pressures for C1 and C6, (4700/4800 models). **NOTE:** It is normal to see turbine speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm during a shift or during idle stall condition. **NOTE:** Install remaining gauges in other clutch ports to verify clutches are exhausted while in Low range. 5. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P1739 Incorrect Low Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS2, PCS6, SS1, and SS2 solenoids (3700SPS models). Replace PCS1, PCS6, SS1, and SS2 solenoids (4700/4800 models). Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P1739 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue identified that was causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P1739 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P1790 Gear Shift Module 1 Calibration Invalid

NO SCHEMATIC FOR THIS DTC

Circuit Description

This test determines if the primary shift selector calibration is invalid.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- Display may be in the wrong language and/or units (English/Metric) could be formatted incorrectly

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

None

Tool Requirements:

- Allison DOC®
- J-46708 Digital Multimeter
- J-39197A Jumper Wire Kit

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC P1790.
2. Check shift selector wiring and vehicle power and ground circuits.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P1790 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, Go to Step 2*

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DTC P1790 Gear Shift Module 1 Calibration Invalid *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Using J-39197A Jumper Wire Kit and the J-46708 DMM, check OEM shift selector wiring for opens, shorts, high resistance, pushed back terminals, unlocked connectors, and expanded terminals. Check for low batteries and power and ground wiring. Did DTC P1790 return?		*Replace shift selector. Clear inactive DTCs and return vehicle to service.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P1791 Gear Shift Module 2 Calibrated Invalid

NO SCHEMATIC FOR THIS DTC

Circuit Description

This test determines if the secondary shift selector calibration is invalid.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- Display may be in the wrong language and/or units (English/Metric) could be formatted incorrectly

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

None

Tool Requirements:

- Allison DOC®
- J-46708 Digital Multimeter
- J-39197A Jumper Wire Kit

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC P1791.
2. Check shift selector wiring and vehicle power and ground circuits.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P1791 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, Go to Step 2*

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DTC P1791 Gear Shift Module 2 Calibrated Invalid *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Using J-39197A Jumper Wire Kit and the J-46708 DMM, check OEM shift selector wiring for opens, shorts, high resistance, pushed back terminals, unlocked connectors, and expanded terminals. Check for low batteries and power and ground wiring. 2. Acquire new Allison DOC® snapshot after engine start. Did DTC P1791 return?		*Replace shift selector. Clear inactive DTCs and return vehicle to service.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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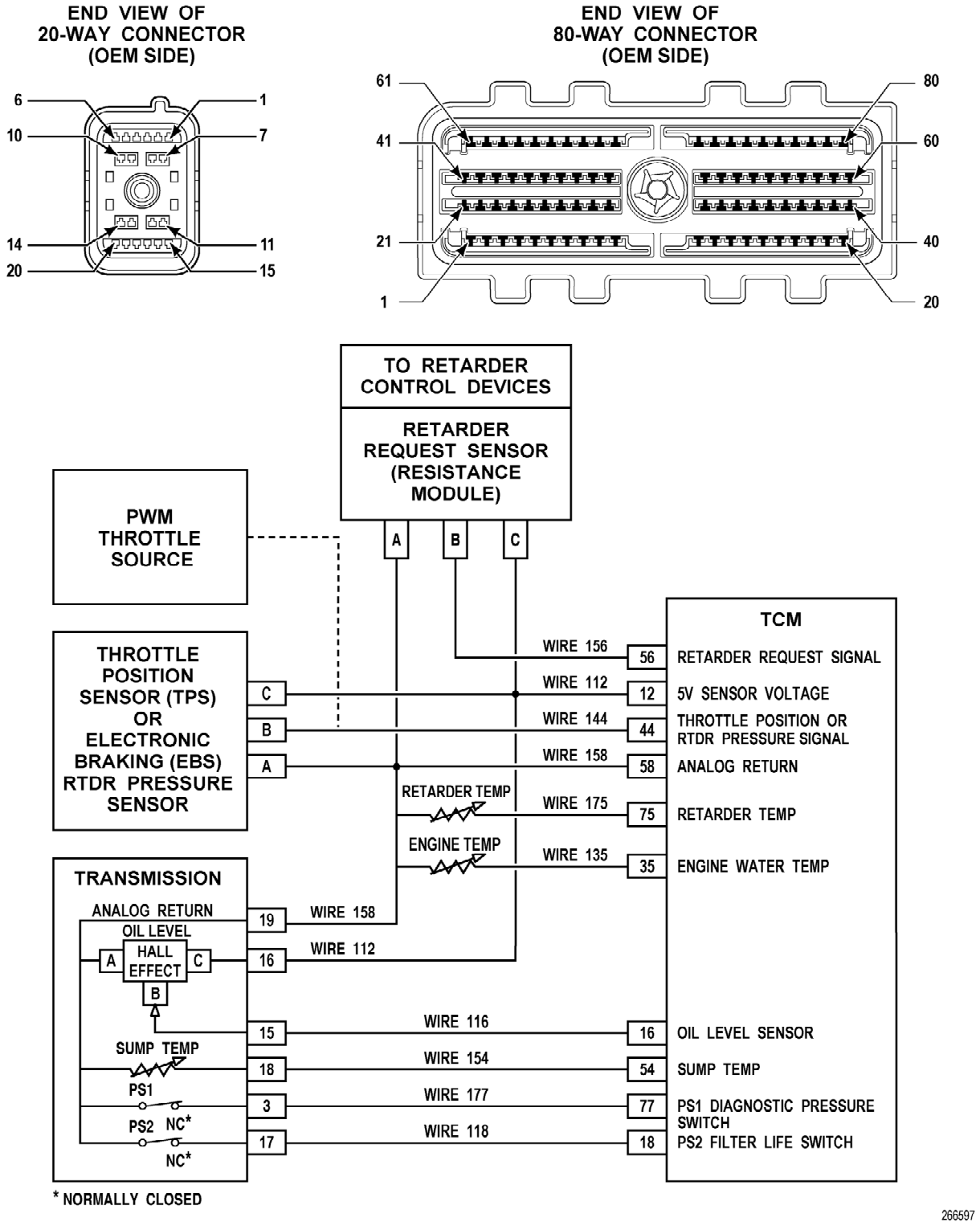
DTC P1891 Throttle Position Sensor PWM Signal Low



Circuit Description

The TCM can be calibrated to receive a PWM TPS pedal position signal. DTC P1891 sets if the PWM throttle frequency is in the low error zone.

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DTC P1891 Throttle Position Sensor PWM Signal Low *(cont'd)*

The TCM is connected to the TPS by:

- PWM TPS signal (W144)

Action Taken for Active DTC

When DTC P1891 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light, unless January 2010 software or later.
- DTC is stored in TCM history.
- Default value used for % throttle is based on engine torque and engine speed.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P1891 indicates the TCM has detected a PWM throttle percentage in the low error zone, and may be caused by the following:

- Open or short to ground in W144 circuit.
- PWM TPS source set in calibration in non-PWM TPS applications.
- PWM TPS source set by Override using Allison DOC® in non-PWM TPS applications.
- Missing, defective, or unplugged PWM TPS.
- Signal wire (W144) open or grounded.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- TCM issue.
- TPS not adjusted. Check with OEM for PWM TPS specifications and adjustment procedures.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

PWM may be monitored using Data Monitor in Allison DOC®. Absolute throttle % should increase and decrease from Closed Throttle (CT) to Wide Open Throttle (WOT).

PWM throttle frequency should increase and decrease from CT to WOT if using a DMM. Refer to Appendix D. TROUBLESHOOTING WITH A DIGITAL MULTIMETER (DMM) for instructions on measuring frequency with a DMM.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter

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DTC P1891 Throttle Position Sensor PWM Signal Low *(cont'd)*

- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for PWM TPS assembly.
3. Select correct throttle source for non-PWM TPS application.
4. Check for missing or unplugged PWM TPS assembly.
5. Check for high resistance or open in W144.
6. Check for short to another wire or ground.
7. Check if TCM is OK. If TCM is OK, replace PWM TPS assembly.
8. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has the responsibility to ensure that the TCM calibrations and TPS sensor assembly are adjusted and integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

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DTC P1891 Throttle Position Sensor PWM Signal Low *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P1891 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 8.*
2	Is a PWM TPS source expected to be on vehicle?		*Go to Step 4*	*Go to Step 3*
3	1. Start engine. 2. Using Allison DOC®, reprogram the CMC Override Throttle Source to correct throttle source for vehicle (SAE J1939, PWM), and then turn ignition **OFF**. 3. Restart engine and check for DTC P1891. Is DTC P1891 active?		*Go to Step 7*	*Go to Step 8*
4	Is the PWM TPS assembly connected, adjusted, and integrated into the vehicle harness?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 8 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness connector to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect PWM TPS assembly from OEM PWM TPS connector on chassis harness. 6. Install a jumper wire between W144 (PWM TPS signal) at the OEM harness connector for TPS assembly and chassis. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 44 and chassis ground at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Address issue with W144. Go to Step 8 after repairs are made.*

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DTC P1891 Throttle Position Sensor PWM Signal Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove jumper wire from PWM TPS connector and leave PWM TPS assembly disconnected from chassis harness. 3. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminal 44 to all other labeled terminals shown on J-47275-1 Magnetic Overlay and also to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 44 to all other labeled terminals on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 7*	*Address issue with W144. Go to Step 8 after repairs are made.*
7	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness at 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P1891 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repairs are made.*	*Replace any PWM TPS assembly that does not meet OEM specifications. Go to Step 8 after repairs are made.*
8	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P1891 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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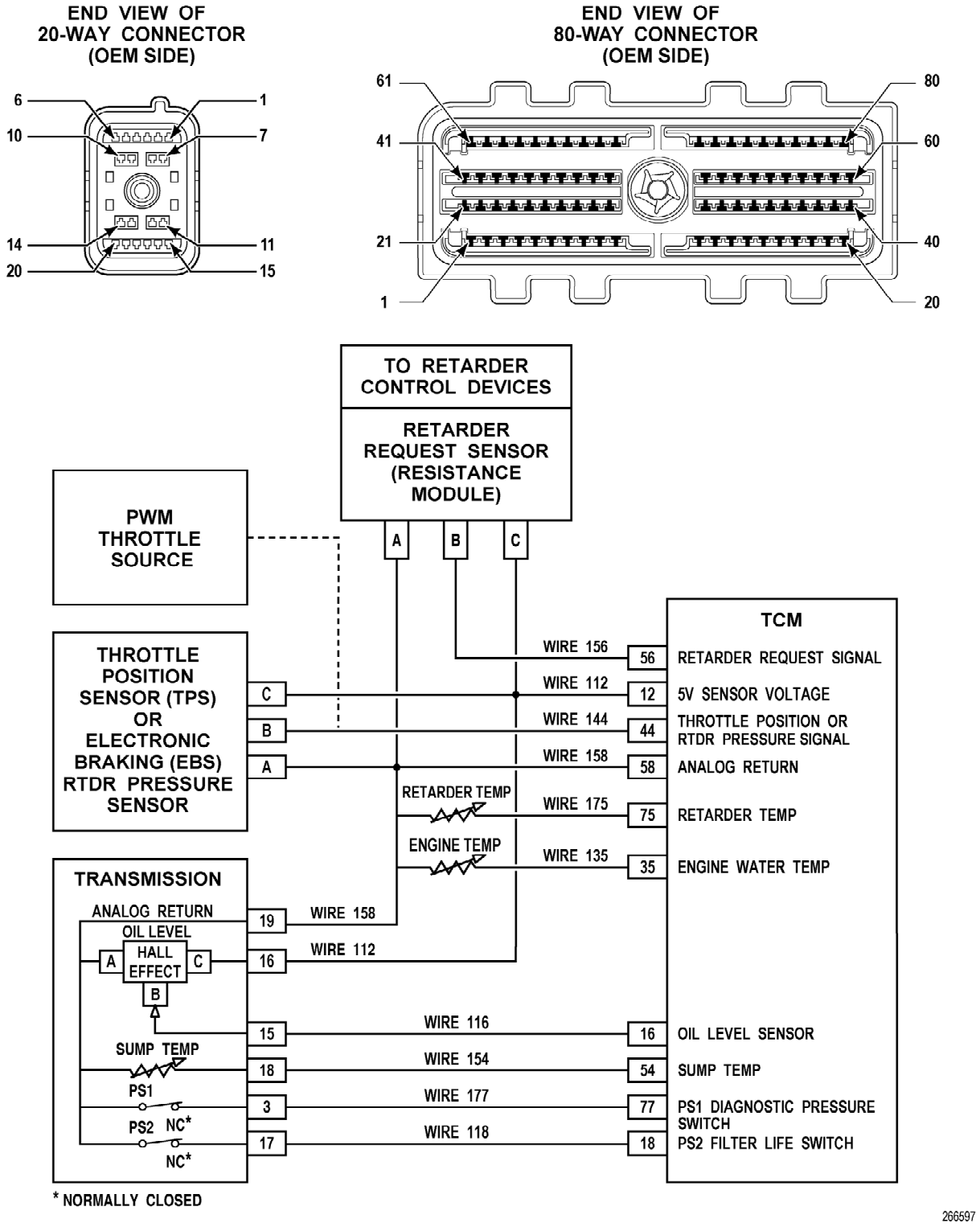
DTC P1892 Throttle Position Sensor PWM Signal High



Circuit Description

The TCM can be calibrated to receive a PWM TPS pedal position signal. DTC P1891 sets if the PWM throttle frequency is in the high error zone.

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DTC P1892 Throttle Position Sensor PWM Signal High *(cont'd)*

The TCM is connected to the TPS by:

- PWM TPS signal (W144)

Action Taken for Active DTC

When DTC P1892 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light, unless January 2010 software or later.
- DTC is stored in TCM history.
- Default value used for % throttle is based on engine torque and engine speed.

Conditions for Clearing DTC/CHECK TRANS Light

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P1892 indicates the TCM has detected a PWM throttle percentage in the high error zone, and may be caused by the following:

- short to battery in W144 circuit
- PWM TPS source set in non-PWM TPS applications
- PWM TPS source set by Override using Allison DOC® in non-PWM TPS applications
- defective PWM TPS
- TCM issue.
- TPS not adjusted. Check with OEM for PWM TPS specifications and adjustment procedures.

PWM may be monitored using Data Monitor in Allison DOC®. Absolute throttle % should increase and decrease from Closed Throttle (CT) to Wide Open Throttle (WOT).

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

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DTC P1892 Throttle Position Sensor PWM Signal High *(cont'd)*

1. Check for active DTC.
2. Check for PWM TPS assembly.
3. Select correct throttle source for non-PWM TPS application.
4. Check for missing or unplugged PWM TPS assembly.
5. Check for short from W144 to another wire.
6. Check if TCM is OK. If TCM is OK, replace PWM TPS assembly.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

NOTE: The vehicle OEM has the responsibility to ensure that the TCM calibrations and TPS sensor assembly are adjusted and integrated correctly to the vehicle. Do not file a warranty claim for repairs that result from OEM integration issues.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P1892 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7.*
2	Is a PWM TPS source expected to be on vehicle?		*Go to Step 4*	*Go to Step 3*

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DTC P1892 Throttle Position Sensor PWM Signal High *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Start engine. 2. Using Allison DOC®, reprogram the CMC Override Throttle Source to correct throttle source for vehicle (SAE J1939, PWM), and then turn ignition **OFF**. 3. Restart engine and check for DTC P1892. Is DTC P1892 active?		*Go to Step 6*	*Go to Step 7*
4	Is the PWM TPS assembly connected, adjusted, and integrated into the vehicle harness?		*Go to Step 5*	*Address issue with vehicle integration. Go to Step 7 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Leave OEM chassis harness connected to J-47275 TCM Breakout Harness. 3. Do not connect TCM side of J-47275 TCM Breakout Harness to TCM. 4. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance from J-47275-1 Magnetic Overlay terminal 44 to all other labeled terminals shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 44 to all other labeled terminals on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Address issue with W144. Go to Step 7 after repairs are made.*
6	1. Turn ignition **OFF**. 2. Install test TCM and tighten bolt in TCM 80-way connector on J-47275 TCM Breakout Harness at 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P1892 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*Replace any PWM TPS assembly that does not meet OEM specifications. Go to Step 7 after repairs are made.*

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DTC P1892 Throttle Position Sensor PWM Signal High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	To verify the repair: 1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P1892 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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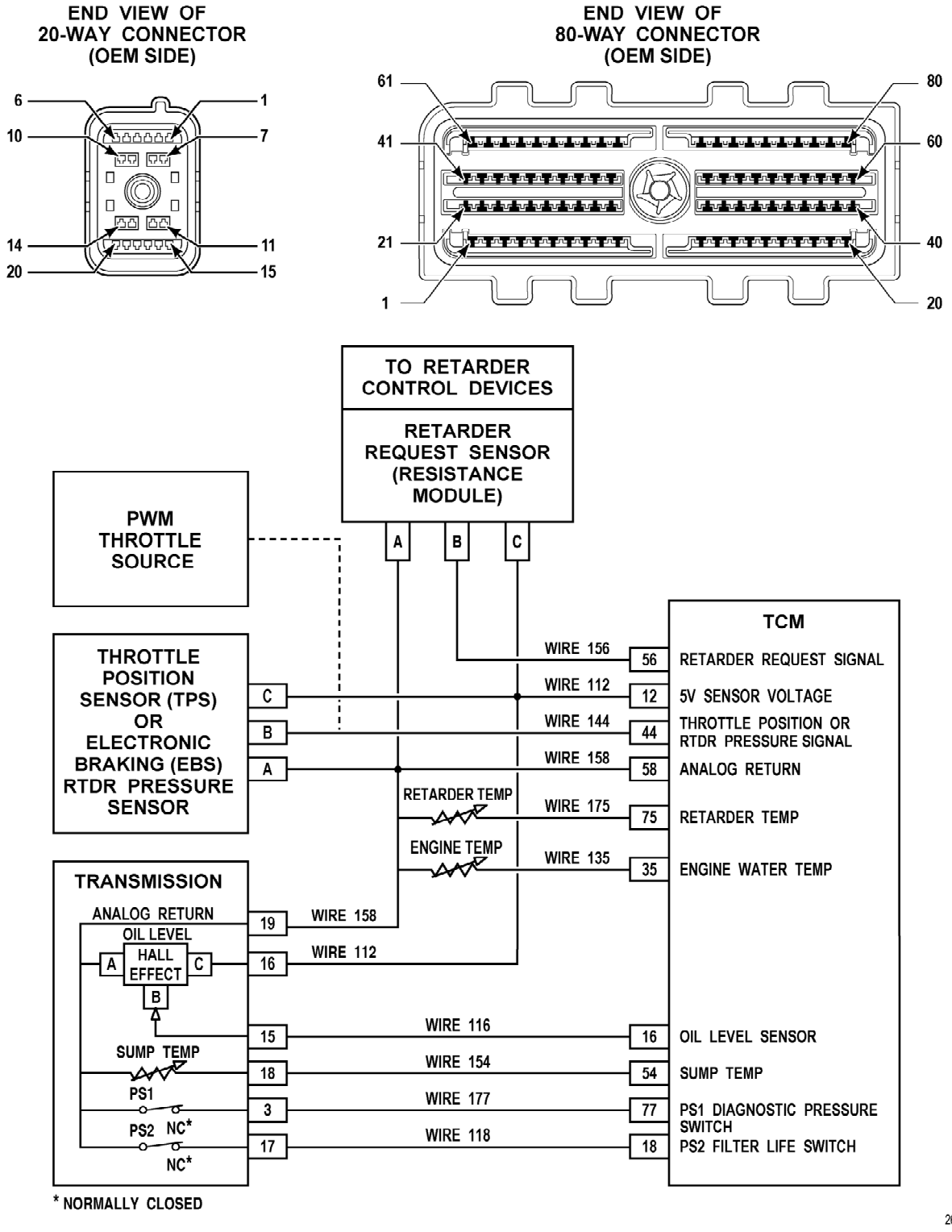
DTC P2184 Engine Coolant Temperature Sensor 2 Circuit Low



Circuit Description

The TCM may receive an input from an ECT sensor on W135. This test monitors if coolant sensor signal is in the low error zone.

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DTC P2184 Engine Coolant Temperature Sensor 2 Circuit Low *(cont'd)*

Actions Taken When the DTC Sets

When DTC P2184 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM uses default engine coolant temperature values.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2184 may be caused by:

- Incorrect transmission fluid fill.
- W135 shorted to ground, or shorted to another wire in chassis harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective ECT sensor.
- Defective TCM.
- High transmission fluid temperature.
- Inadequate or obstructed vehicle cooling system.
- Non-bypassed engine coolant thermostats that are not opening in time may cause overheat condition for transmission fluid temperature. Monitor transmission fluid temperature using Allison DOC® and review transmission overheat and retarder information in 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS.

The ECT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if ECT sensor resistance is increasing, decreasing, or stationary with fluctuations in fluid temperature.

Refer to DTC P273F and DTC P0218 or 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS as guidelines for troubleshooting vehicle cooling issues.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter

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DTC P2184 Engine Coolant Temperature Sensor 2 Circuit Low *(cont'd)*

- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check fluid levels are correct.
3. Check W135 short to ground, or short to another wire in chassis harness.
4. Check for active DTC.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2184 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*

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DTC P2184 Engine Coolant Temperature Sensor 2 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
2	**NOTE:** Low or high transmission fluid, coolant, or engine oil levels can cause DTC P2184. 1. With the engine at idle, transmission in **N** (Neutral), and the park brake set, check the transmission fluid level using the OLS (if equipped) or the dipstick. 2. Turn ignition **OFF**. 3. Add or remove transmission fluid as necessary. 4. Start engine and recheck transmission fluid level. 5. Adjust engine oil and engine coolant levels as needed. 6. Repeat failure record conditions. 7. Check for active DTC P2184. Is DTC P2184 active?		*Go to Step 3*	*Go to Step 6*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 35 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 35 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Replace ECT sensor. Go to Step 4*	*Address issue with W135. Go to Step 6 after repairs are made.*
4	Repeat conditions from failure record. Is DTC P2184 active?		*Go to Step 5*	*Go to Step 6*

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DTC P2184 Engine Coolant Temperature Sensor 2 Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2184 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. See Problem OVERHEATING INDICATED BY DTCs P0218, P273F OR FLUID CONDITION in 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS. After checking for issues, go to Step 6*
6	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2184 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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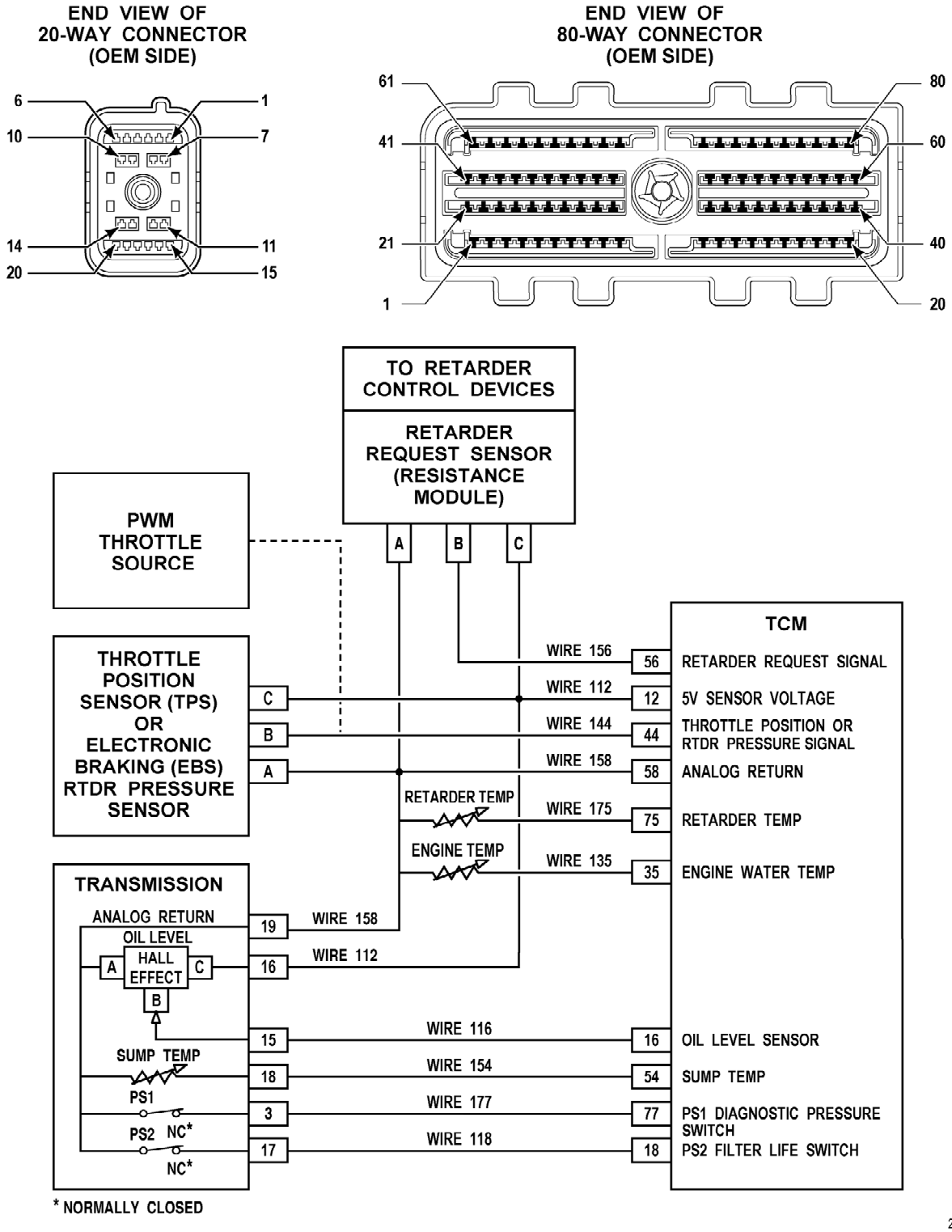
DTC P2185 Engine Coolant Temperature Sensor 2 Circuit High



Circuit Description

The TCM may receive an input from an ECT sensor. This test monitors if coolant sensor signal is in the high error zone.

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DTC P2185 Engine Coolant Temperature Sensor 2 Circuit High *(cont'd)*

Actions Taken When the DTC Sets

When DTC P2185 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM uses default engine coolant temperature values.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

NOTE: If DTC P2185 is accompanied by DTC P0713 or P2743, check for short to battery on W135, W154 and W175. Follow DTC P0713 steps first, if in history with this DTC.

DTC P2185 may be caused by:

- Incorrect transmission fluid fill.
- W135 shorted to another wire in chassis harness.
- W135 open circuit in chassis harness.
- W158 open circuit in chassis harness.
- Broken or defective connector assemblies that cause pins to short together.
- Unlocked connectors, missing or damaged seals, missing seal plugs that allow moisture into connectors.
- Defective ECT sensor.
- Defective TCM.

The ECT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if ECT sensor resistance is increasing, decreasing, or stationary with fluctuations in fluid temperature. Normal circuit operation is indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter

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DTC P2185 Engine Coolant Temperature Sensor 2 Circuit High *(cont'd)*

- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for reference voltage with 20-way connector disconnected.
3. Check for reference voltage with 16-way bypass connector disconnected.
4. Check for open circuit in W135 or W158 in chassis harness.
5. Check W135 short to another wire in chassis harness.
6. Check TCM.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2185 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*

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DTC P2185 Engine Coolant Temperature Sensor 2 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Connect 16-way bypass on J-47275 TCM Breakout Harness. 8. Turn ignition **ON** but do not start engine. 9. Install J-46708 Digital Multimeter and measure voltage between terminals 35 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Go to Step 4*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave J-46708 Digital Multimeter connected between terminals 35 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 6. Turn ignition **ON** but do not start engine. 7. Measure voltage between terminals 35 and 58 at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Address issue with W135 or W158. Go to Step 7 after repairs are made.*	*Go to Step 6*

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DTC P2185 Engine Coolant Temperature Sensor 2 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave 20-way OEM transmission connector disconnected from the transmission. 6. Disconnect ECT sensor from OEM harness. 7. Install a jumper wire between terminals A and B of ECT sensor harness connector. 8. Using a J-46708 Digital Multimeter, measure the resistance between terminals 35 and 58 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 5*	*Address issue with W135 or W158. Go to Step 7 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect retarder TFT sensor and ECT sensor. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 35 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 7. Repeat task 6 using terminals 54 and 75. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 75, 54, and 35 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Address issue with W175, W154, or W135. Go to Step 7 after repairs are made.*

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DTC P2185 Engine Coolant Temperature Sensor 2 Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2185 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC is active with both the test TCM and the original TCM, do not replace TCM. Replace ECT sensor. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2185 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2637 Torque Management Feedback Signal A

NO SCHEMATIC FOR THIS DTC

Circuit Description

Shift Energy Management (SEM) allows the TCM to request torque reduction from the engine controller. By reducing torque, shifts can be made quicker and at a more consistent output torque, which reduces clutch temperatures allowing increased clutch life. When an engine torque rating exceeds certain limits, Low Range Torque Protection (LRTP) is used. This feature limits engine torque in lower ranges to protect the transmission from damage if a stall condition occurs.

This test detects:

- Electronic Control Module (ECM) response to SAE J1939 transmission torque reduction commands during upshifts.

For high torque applications, the engine must support the required messages to allow SEM and LRTP. For low torque applications, SEM may or may not be active.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- Clutch pressures are increased, which may result in shift quality issues.
- Some shifts may be inhibited.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.
- DTCs P0614 and/or P2641 may also be active.

Conditions for Clearing the DTC

The TCM will continue attempting to use SEM, and will self-clear the active DTC if engine response returns to within acceptable criteria for a number of shifts.

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2637 may be caused by:

- Incorrect engine calibration.
- Incorrect transmission calibration.
- Engine calibration that does not support all required SAE J1939 SEM/LRTP messages.
- Communication link problem.
- Vehicle controller (such as a headway controller) preventing transmission control of the engine during the shift process.
- Defective TCM.

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DTC P2637 Torque Management Feedback Signal A *(cont'd)*

Review applicable information in the Universal Allison DOC® Technician's Library, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®
- Allison TCM Reflash

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC P2637.
2. Verify correct calibrations are installed.
3. Snapshot over-torque condition and active code.
4. Check TCM.
5. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2637 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 5*
2	Check with vehicle OEM that ECM (engine) calibration and TCM (transmission) calibration are a correct match for vehicle. Are calibrations correct?		*Go to Step 3*	*Recalibrate engine and/or transmission calibrations. Go to Step 5*
3	1. Select 'Collect Engine Parameters' at Allison DOC® Connect screen. 2. Snapshot test drive that reproduces active DTC. 3. Review failure records and the acquired snapshot, and review collected engine parameters in data monitor and the SEM/LRTP calibration information grid. Does actual engine torque exceed TSC1 torque request by greater than 75 N·m (55 ft lb) or is there an unapproved torque reducing device indicated in the calibration information grid at the point in the snapshot when the DTC becomes active?		*Resolve issue with vehicle controller that is interfering with TSC1 request to engine or resolve engine issue causing transmission TSC1 to be ignored. Go to Step 4*	*Go to Step 5*

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DTC P2637 Torque Management Feedback Signal A *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2637 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 5 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2637 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2641 Torque Management Feedback Signal B

NO SCHEMATIC FOR THIS DTC

Circuit Description

This test detects if Low Range Torque Protection (LRTP) have net engine torque values exceeding LRTP torque limit.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- Transmission sends default torque limit and/or stop transmission broadcast of SAE J1939/71 ETC1.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.
- DTCs P0614 and/or P2637 may also be active.

Conditions for Clearing the DTC

The TCM will continue attempting to use LRTP, and will self-clear the active DTC if engine response returns to within acceptable criteria.

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2641 may be caused by:

- Incorrect engine calibration.
- Incorrect transmission calibration.
- Engine calibration that does not support all required SAE J1939 LRTP messages.
- Communication link problem.
- Vehicle controller (such as a headway controller) preventing transmission control of the engine during the shift process.
- Defective TCM.

Review applicable information in the Universal Allison DOC® Technician's Library, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®
- Allison TCM Reflash

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

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DTC P2641 Torque Management Feedback Signal B *(cont'd)*

1. Check for active DTC P0614.
2. Verify correct calibrations are installed.
3. Snapshot over-torque condition and active code.
4. Check TCM.
5. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2641 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 5*
2	Check with vehicle OEM that ECM (engine) calibration and TCM (transmission) calibration are a correct match for vehicle. Are calibrations correct?		*Go to Step 3*	*Recalibrate engine and/or transmission calibrations. Go to Step 5*
3	1. Select 'Collect Engine Parameters' at Allison DOC® Connect screen. 2. Snapshot test drive that reproduces active DTC. **NOTE:** If engine parameters are not available, then repeat Step 1 through Step 2, except use Data Bus Viewer to collect log file. 3. Review failure records and the acquired snapshot, and review collected engine parameters in data monitor and the SEM/LRTP calibration information grid. Does actual engine torque exceed TSC1 torque request by greater than 75 N·m (55 ft lb) or is there an unapproved torque reducing device indicated in the calibration information grid at the point in the snapshot when the DTC becomes active?		*Resolve issue with vehicle controller that is interfering with TSC1 request to engine or resolve engine issue causing transmission TSC1 to be ignored. Go to Step 5*	*Go to Step 4*

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DTC P2641 Torque Management Feedback Signal B *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2641 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 5 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2641 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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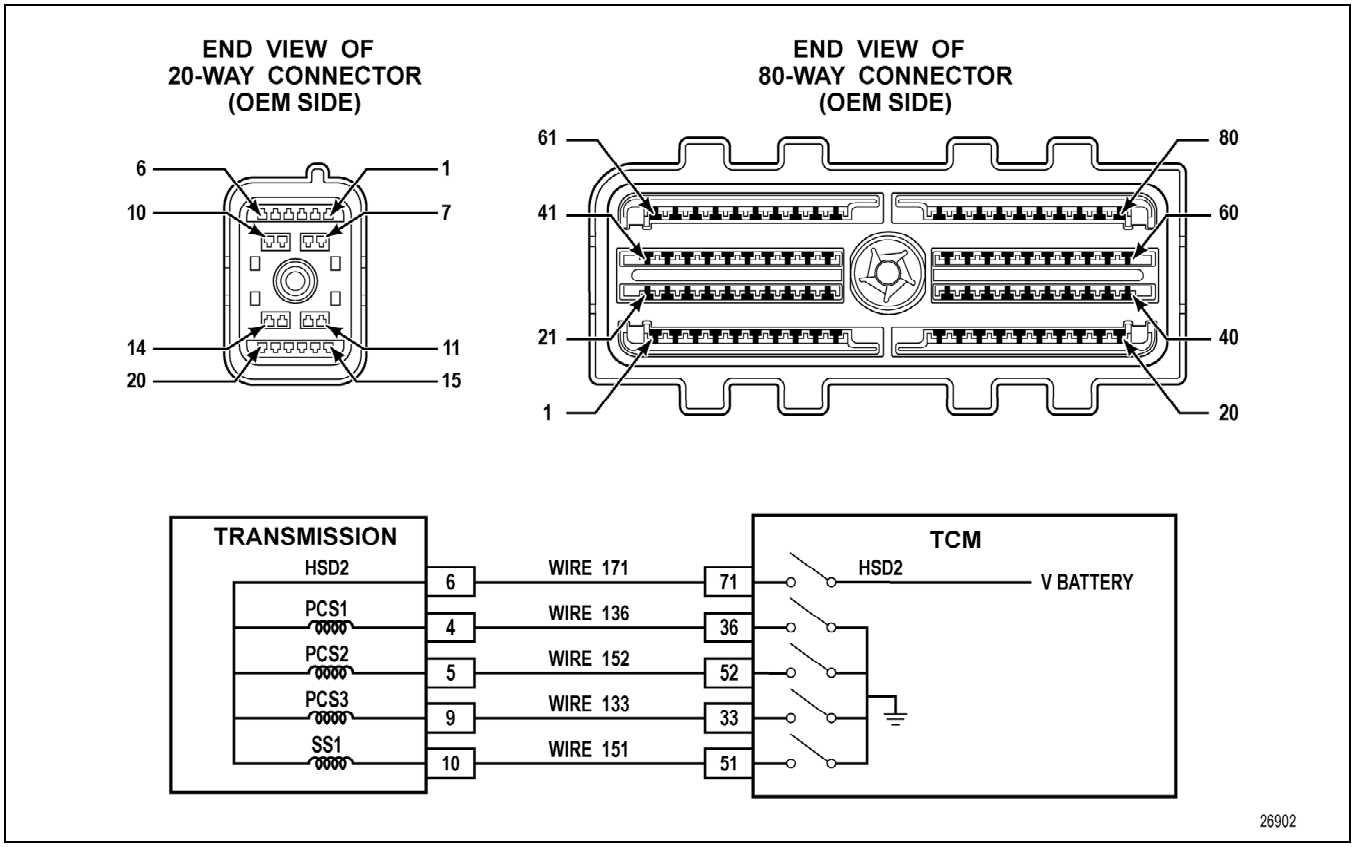
DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2)



Circuit Description

This test detects if the voltage measured at the HSD shows that multiple low side drivers indicate open, but the HSD indicates high voltage.

Action Taken When the DTC Sets

When DTC P2669 is active:

- If the DTC sets while in a forward range then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission is locked in this range, and there is no response to shift selector requests.
- The TCM inhibits TCC engagement.
- Main Modulation is inhibited.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2) *(cont'd)*

Diagnostic Aids

DTC P2669 can be caused by:

- HSD2 circuit issues such as:
  - W171 shorted to another wire in chassis harness.
  - W171 (terminal 6 of 20-way) shorted to another wire in the internal transmission harness.
  - W171 high resistance or an open circuit in chassis harness.
  - W171 (terminal 6 of 20-way) high resistance or an open circuit in internal transmission harness.
- Two or more low side driver circuit issues with PCS1, PCS2, PCS3, or SS1.
- PCS1 issues such as:
  - W136 shorted to another wire in chassis harness.
  - W136 shorted (terminal 4 of 20-way) to another wire in the internal transmission harness.
  - W136 high resistance or an open circuit in chassis harness.
  - W136 (terminal 4 of 20-way) high resistance or an open circuit in internal transmission harness.
- PCS2 issues such as:
  - W152 shorted to another wire in chassis harness.
  - W152 shorted (terminal 5 of 20-way) to another wire in the internal transmission harness.
  - W152 high resistance or an open circuit in chassis harness.
  - W152 (terminal 5 of 20-way) high resistance or an open circuit in internal transmission harness.
- PCS3 issues such as:
  - W133 shorted to another wire in chassis harness.
  - W133 shorted (terminal 9 of 20-way) to another wire in the internal transmission harness.
  - W133 high resistance or an open circuit in chassis harness.
  - W133 (terminal 9 of 20-way) high resistance or an open circuit in internal transmission harness.
- SS1 issues such as:
  - W151 shorted to another wire in chassis harness.
  - W151 shorted (terminal 10 of 20-way) to another wire in the internal transmission harness.
  - W151 high resistance or an open circuit in chassis harness.
  - W151 high resistance or an open circuit (terminal 10 of 20-way) in internal transmission harness.
- Defective solenoids PCS1, PCS2, PCS3, SS1.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

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DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2) *(cont'd)*

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W171 in chassis harness for open or high resistance.
3. Check W171 for short to ground or short to another wire.
4. Check TCM.
5. Check internal harness HSD2 (terminal 6) for short to ground or short to another wire.
6. Check internal harness HSD2 (terminal 6) for high resistance or open.
7. Check for multiple low side solenoid wires in internal harness shorted to ground or to another wire.
8. Check for multiple low side solenoid wires in internal harness with high resistance or opens.
9. Check solenoid resistance.
10. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

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DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2669 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, Go to Step 10*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between pin 6 and 5 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 71 and 52 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708DMM reading?	4 Ω or less	*Go to Step 3*	*Address issue with W171. Go to Step 10 after repairs are made.*
3	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 71 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 71 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W171. Go to Step 10 after repairs are made.*

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DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2669 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 10 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS1, PCS2, PCS3, and SS1 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 6 and to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 6 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 10*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Install jumper between internal harness terminals A and B for PCS1. 4. Measure resistance between terminals 4 and 6 at J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 7*	*Repair or replace W136 or W171 in internal harness. Go to Step 10*

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DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave PCS1, PCS2, PCS3, and SS1 disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 4 to all other labeled terminals on J-47279-1 Magnetic Overlay and the control module assembly. 4. Repeat task 3 for terminals 5, 9, and 10. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 4, 5, 9, and 10, to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 8*	*Repair any shorted internal harness wires or replace internal harness. Go to Step 10*
8	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed and leave solenoids disconnected from internal harness. 3. Install jumper across terminals A and B of PCS2 internal harness connector. 4. Measure resistance between terminals 5 and 6 at J-47279-1 Magnetic Overlay. 5. Repeat tasks 3 and 4 for terminals 5 and 6. Move jumper to PCS3 connector and repeat tasks 3 and 4 for terminals 6 and 9. Move jumper to SS1 connector and repeat tasks 3 and 4 for terminals 6 and 10. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 9*	*Repair wire that is high resistance or open or replace internal harness. Go to Step 10*
9	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS1, PCS2, PCS3, and SS1 to internal harness connectors. 4. Measure resistance between terminals 4 and 6 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 5 and 6. Repeat task 4 for terminals 6 and 9. Repeat task 4 for terminals 6 and 10. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–28 and Figure 5–29 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–28 and Figure 5–29	*Go to Step 10*	*Replace solenoid that is not within specification. Go to Step 10*

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DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2669 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

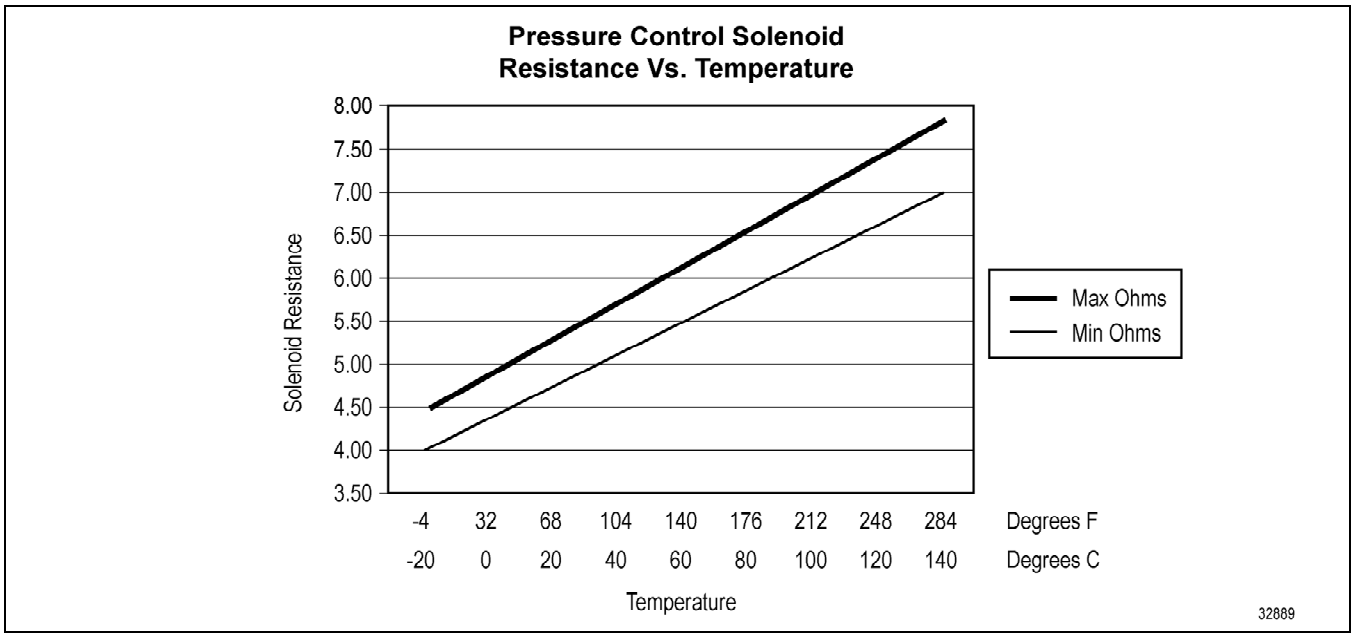

Figure 5–28. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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DTC P2669 Actuator Supply Circuit Voltage 2 Open (HSD2) *(cont'd)*

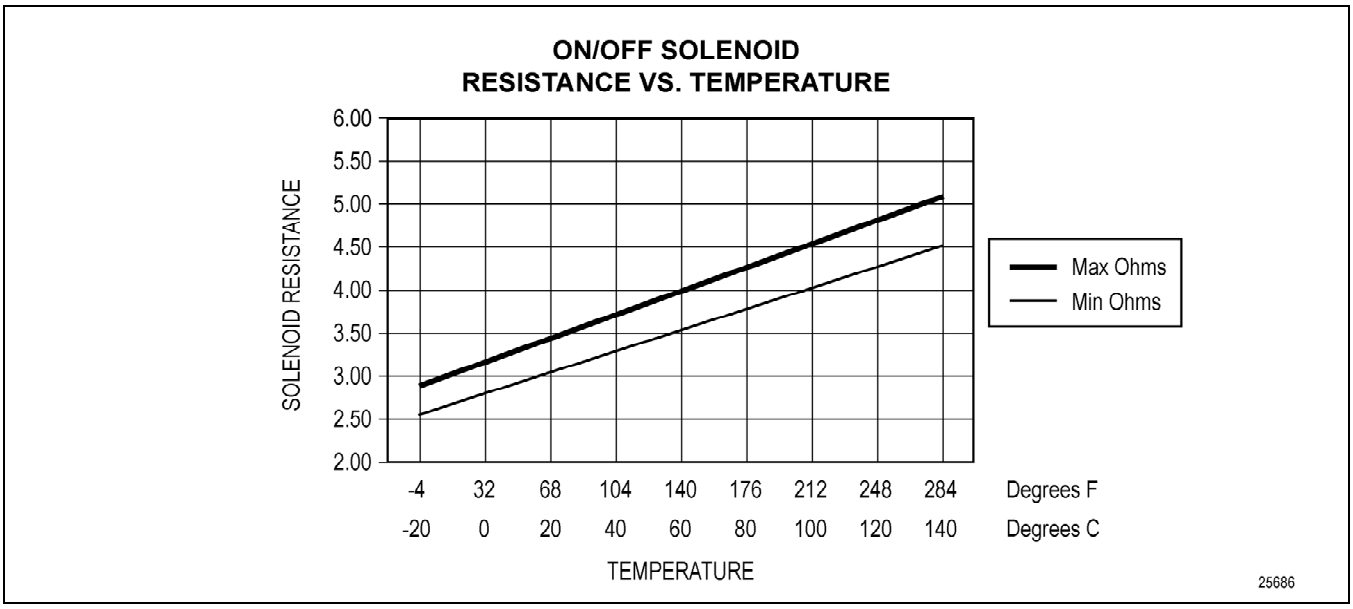

Figure 5–29. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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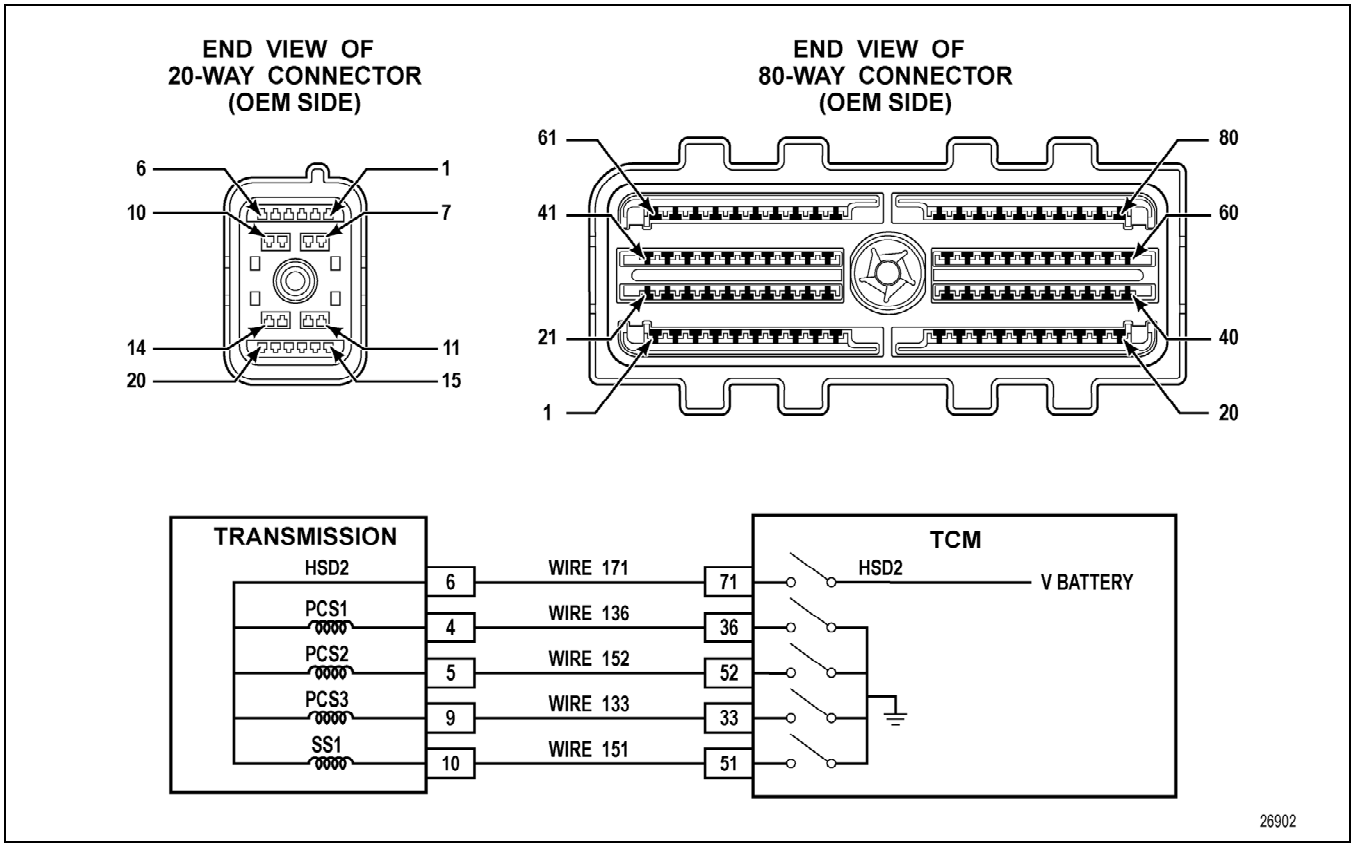
DTC P2670 Actuator Supply Circuit Voltage 2 Low (HSD2)



Circuit Description

This test detects low voltage on HSD when high voltage is expected indicating a short to ground at that circuit.

Action Taken When the DTC Sets

When DTC P2670 is active:

- The DTC sets while in a forward range, then shifts to another forward range. If failure occurs while in **N** (Neutral), the transmission remains in **N** (Neutral). If failure occurs while in **R** (Reverse), the transmission remains in **R** (Reverse) or shifts to **N** (Neutral). Once range is attained, transmission is locked in this range and there is no response to shift selector requests.
- The TCM inhibits TCC engagement.
- Main Modulation is inhibited.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P2670 Actuator Supply Circuit Voltage 2 Low (HSD2) *(cont'd)*

Diagnostic Aids

DTC P2670 can be caused by:

- HSD2 circuit issues such as:
  - W171 shorted to another wire in chassis harness.
  - W171 (terminal 6 of 20-way) shorted to another wire in the internal transmission harness.
- Two or more low side driver circuit issues with HSD2, PCS1, PCS2, PCS3, or SS1.
- PCS1 issues such as:
  - W136 shorted to another wire in chassis harness.
  - W136 shorted (terminal 4 of 20-way) to another wire in the internal transmission harness.
  - PCS1 shorted.
- PCS2 issues such as:
  - W152 shorted to another wire in chassis harness.
  - W152 shorted (terminal 5 of 20-way) to another wire in the internal transmission harness.
  - PCS2 shorted.
- PCS3 issues such as:
  - W133 shorted to another wire in chassis harness.
  - W133 shorted (terminal 9 of 20-way) to another wire in the internal transmission harness.
  - PCS3 shorted.
- SS1 issues such as:
  - W151 shorted to another wire in chassis harness.
  - W151 shorted (terminal 10 of 20-way) to another wire in the internal transmission harness.
  - SS1 shorted.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, expanded terminals, unlocked pins, causing open circuit in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

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DTC P2670 Actuator Supply Circuit Voltage 2 Low (HSD2) *(cont'd)*

- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W171 for short to ground or short to another wire.
3. Check TCM.
4. Check internal harness HSD2 (terminal 6) for short to ground or short to another wire.
5. Check for multiple low side solenoid wires in internal harness shorted to ground or to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2670 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*

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DTC P2670 Actuator Supply Circuit Voltage 2 Low (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 71 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 71 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 3*	*Address issue with W171. Go to Step 7 after repairs are made.*
3	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2670 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 4*
4	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS1, PCS2, PCS3, and SS1 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 6 and to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 6 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 5*	*Repair or replace internal harness. Go to Step 7*

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DTC P2670 Actuator Supply Circuit Voltage 2 Low (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave PCS1, PCS2, PCS3, and SS1 disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 4 to all other labeled terminals on J-47279-1 Magnetic Overlay and the control module assembly. 4. Repeat task 3 for terminals 5, 9, and 10. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 4, 5, 9, and 10, to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair any shorted internal harness wires or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS1, PCS2, PCS3, and SS1 to internal harness connectors. 4. Measure resistance between terminals 4 and 6 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 6 and 9. Repeat task 4 for terminals 6 and 10. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–30 and Figure 5–31 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–30 and Figure 5–31	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2670 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2670 Actuator Supply Circuit Voltage 2 Low (HSD2) *(cont'd)*

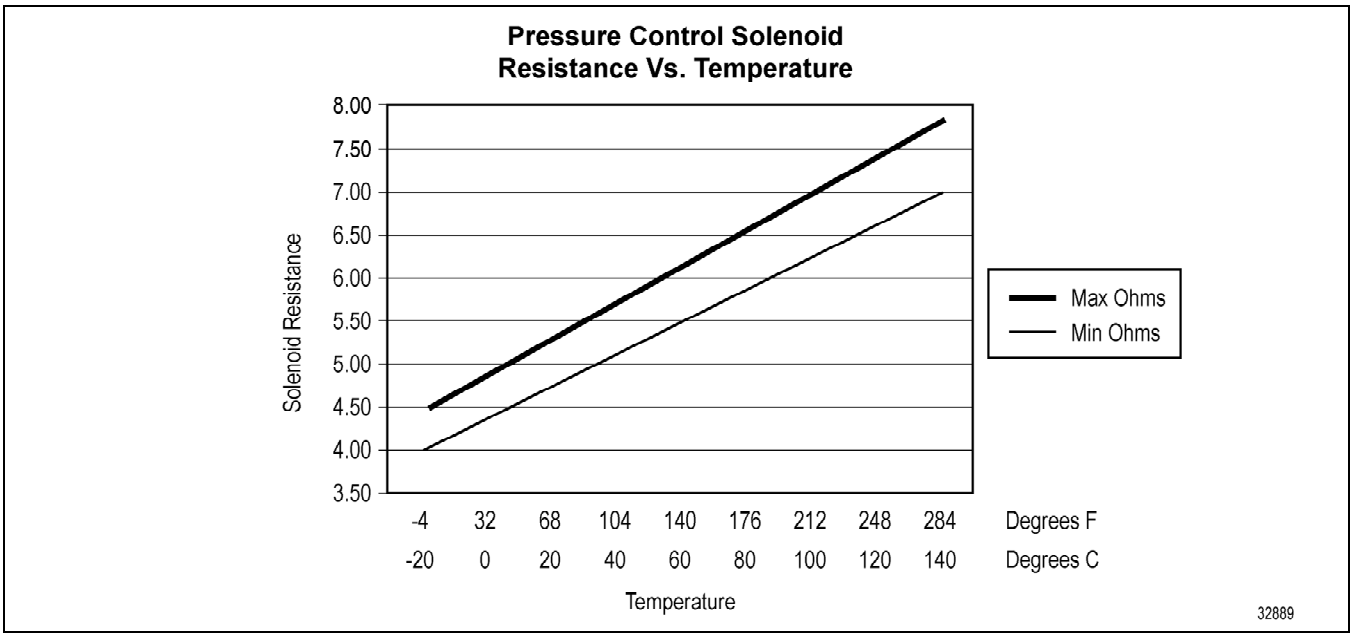

Figure 5–30. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5Retarder Only, PCS6

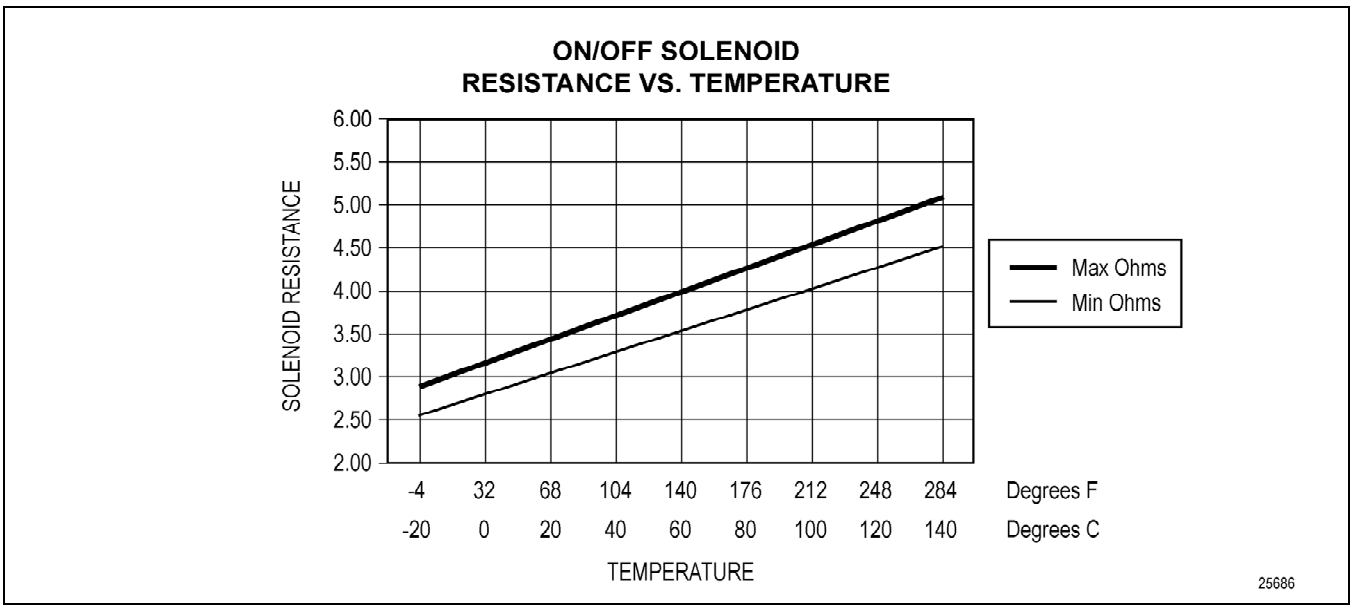

Figure 5–31. ON/OFF Solenoid–SS1, SS2(7-Speed Only), PCS5 (Differential Lock 3700SP Only)

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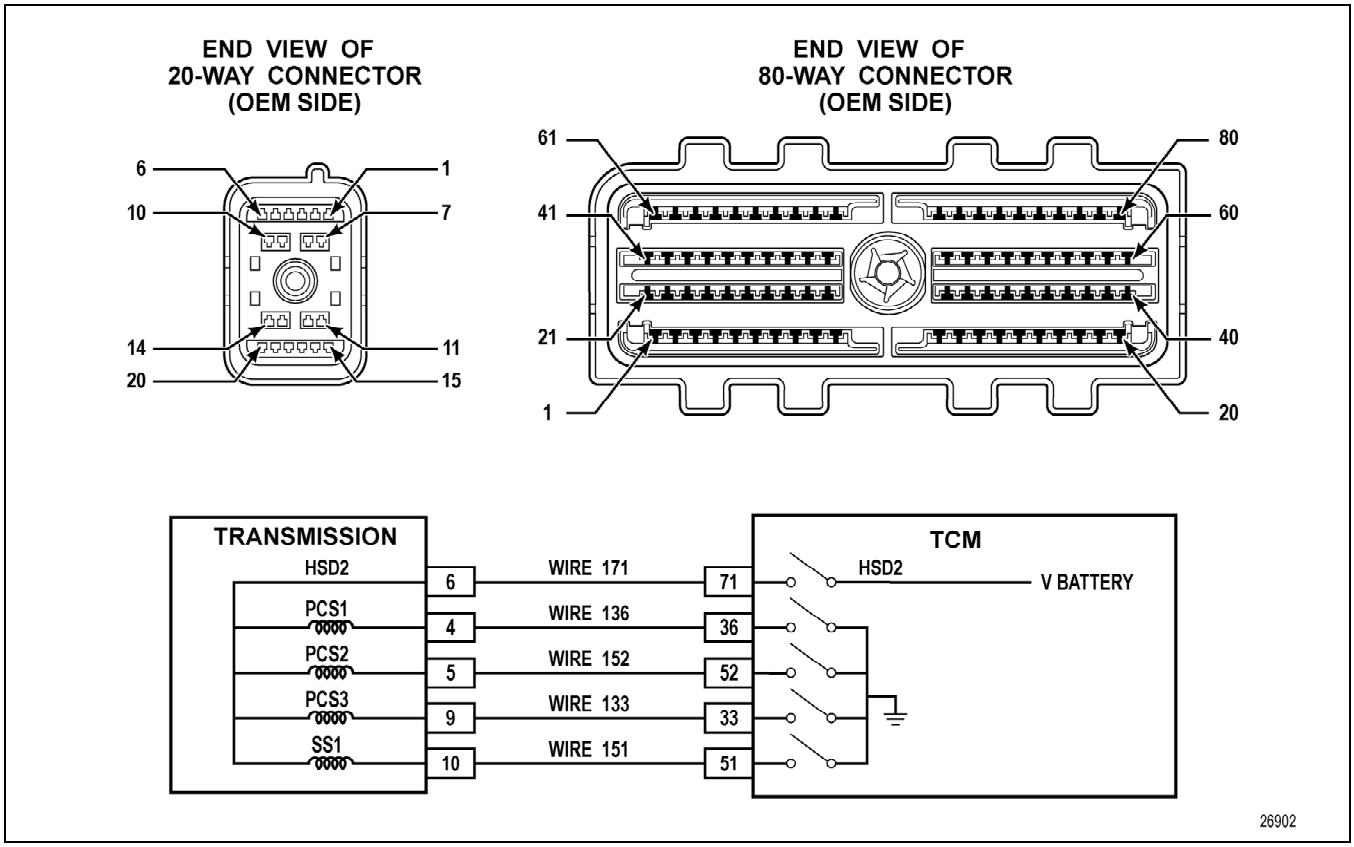
DTC P2671 Actuator Supply Circuit Voltage 2 High (HSD2)



Circuit Description

This test detects if the voltage measured at HSD is high when the circuit is expected to be off.

Action Taken When the DTC Sets

When DTC P2671 is active:

- Transmission fails to Neutral (N).
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2671 can be caused by:

- HSD2 circuit issues such as:
  - W171 shorted to another wire in chassis harness.
  - W171 (terminal 6 of 20-way) shorted to another wire in the internal transmission harness.

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DTC P2671 Actuator Supply Circuit Voltage 2 High (HSD2) *(cont'd)*

- Two or more low side driver circuit issues with PCS1, PCS2, PCS3, or SS1.
- PCS1 issues such as:
  - W136 shorted to another wire in chassis harness.
  - W136 shorted (terminal 4 of 20-way) to another wire in the internal transmission harness.
- PCS2 issues such as:
  - W152 shorted to another wire in chassis harness.
  - W152 shorted (terminal 5 of 20-way) to another wire in the internal transmission harness.
- PCS3 issues such as:
  - W133 shorted to another wire in chassis harness.
  - W133 shorted (terminal 9 of 20-way) to another wire in the internal transmission harness.
- SS1 issues such as:
  - W151 shorted to another wire in chassis harness.
  - W151 shorted (terminal 10 of 20-way) to another wire in the internal transmission harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W171 for short to another wire.
3. Check TCM.
4. Check internal harness HSD2 (terminal 6) for short to another wire.

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DTC P2671 Actuator Supply Circuit Voltage 2 High (HSD2) *(cont'd)*

5. Check for multiple low side solenoid wires in internal harness shorted to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS , and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2671 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 71 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 71 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 3*	*Address issue with W171. Go to Step 7 after repairs are made.*

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DTC P2671 Actuator Supply Circuit Voltage 2 High (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2671 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 4*
4	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS1, PCS2, PCS3, and SS1 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 6 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 6 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 5*	*Repair or replace internal harness. Go to Step 7*
5	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave PCS1, PCS2, PCS3, and SS1 disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 4 to all other labeled terminals on J-47279-1 Magnetic Overlay. 4. Repeat task 3 for terminals 5, 9, and 10. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 4, 5, 9, and 10 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*

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DTC P2671 Actuator Supply Circuit Voltage 2 High (HSD2) *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS1, PCS2, PCS3, and SS1 to internal harness connectors. 4. Measure resistance between terminals 4 and 6 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 6 and 9. Repeat task 4 for terminals 6 and 10. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–32 and Figure 5–33 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–32 and Figure 5–33	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2671 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2671 Actuator Supply Circuit Voltage 2 High (HSD2) *(cont'd)*

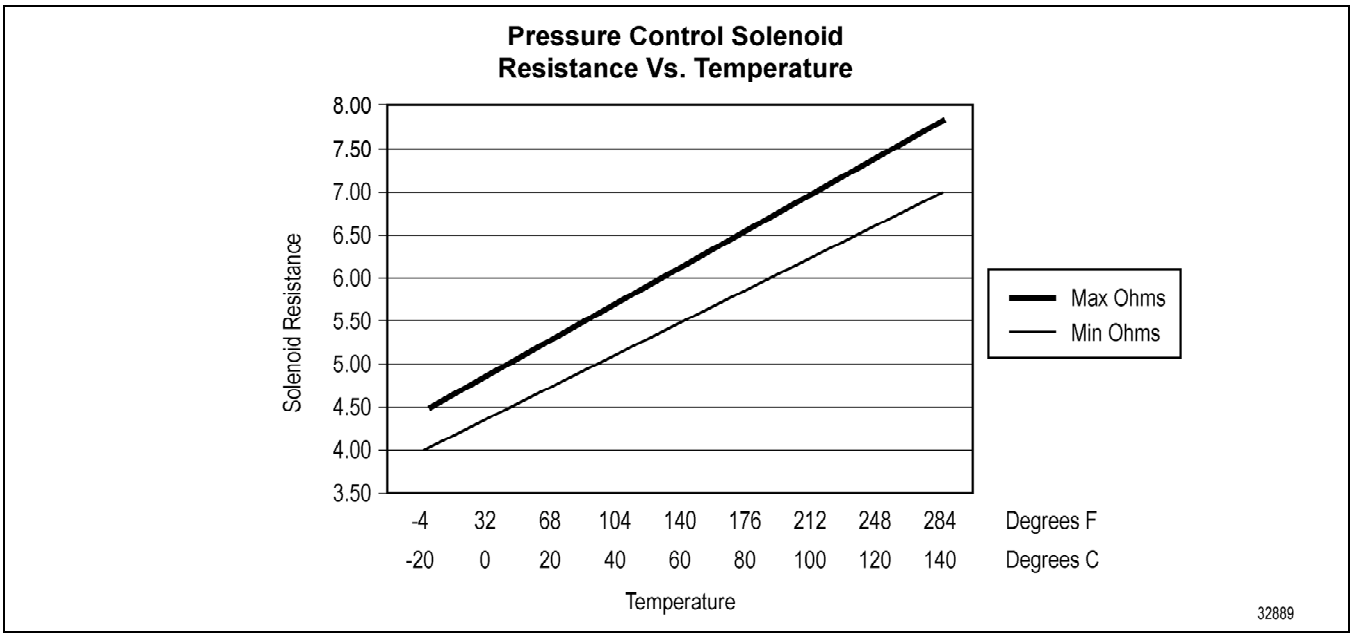

Figure 5–32. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, Retarder Only, PCS6

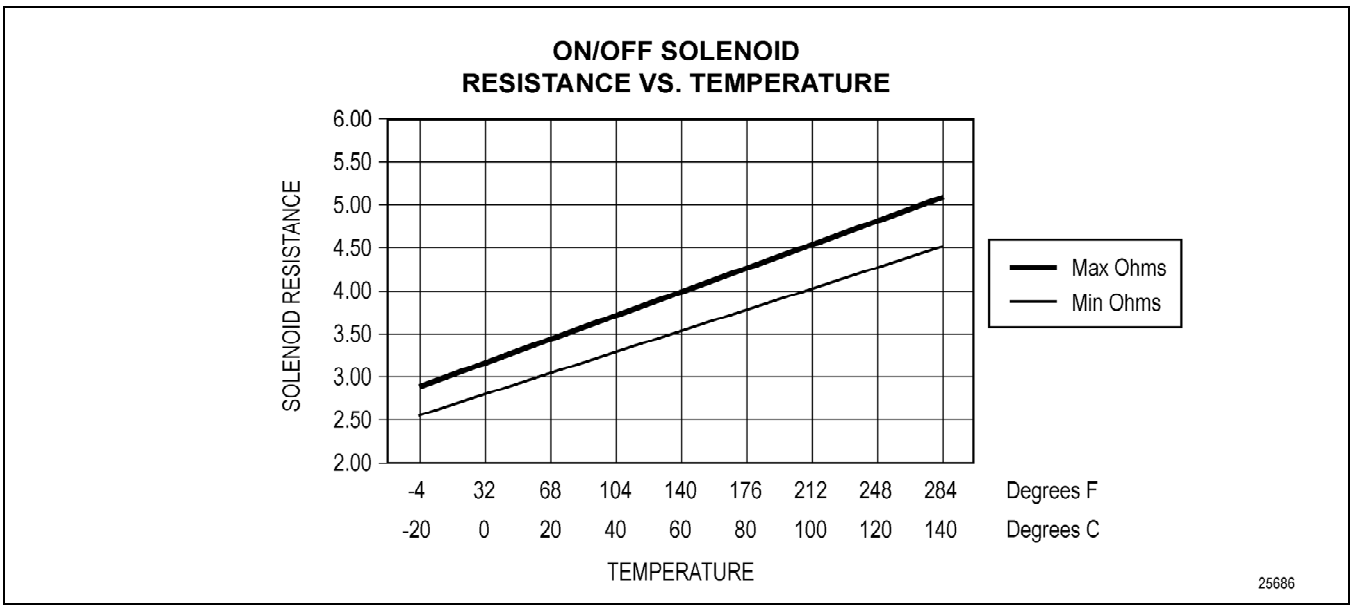

Figure 5–33. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SP Only)

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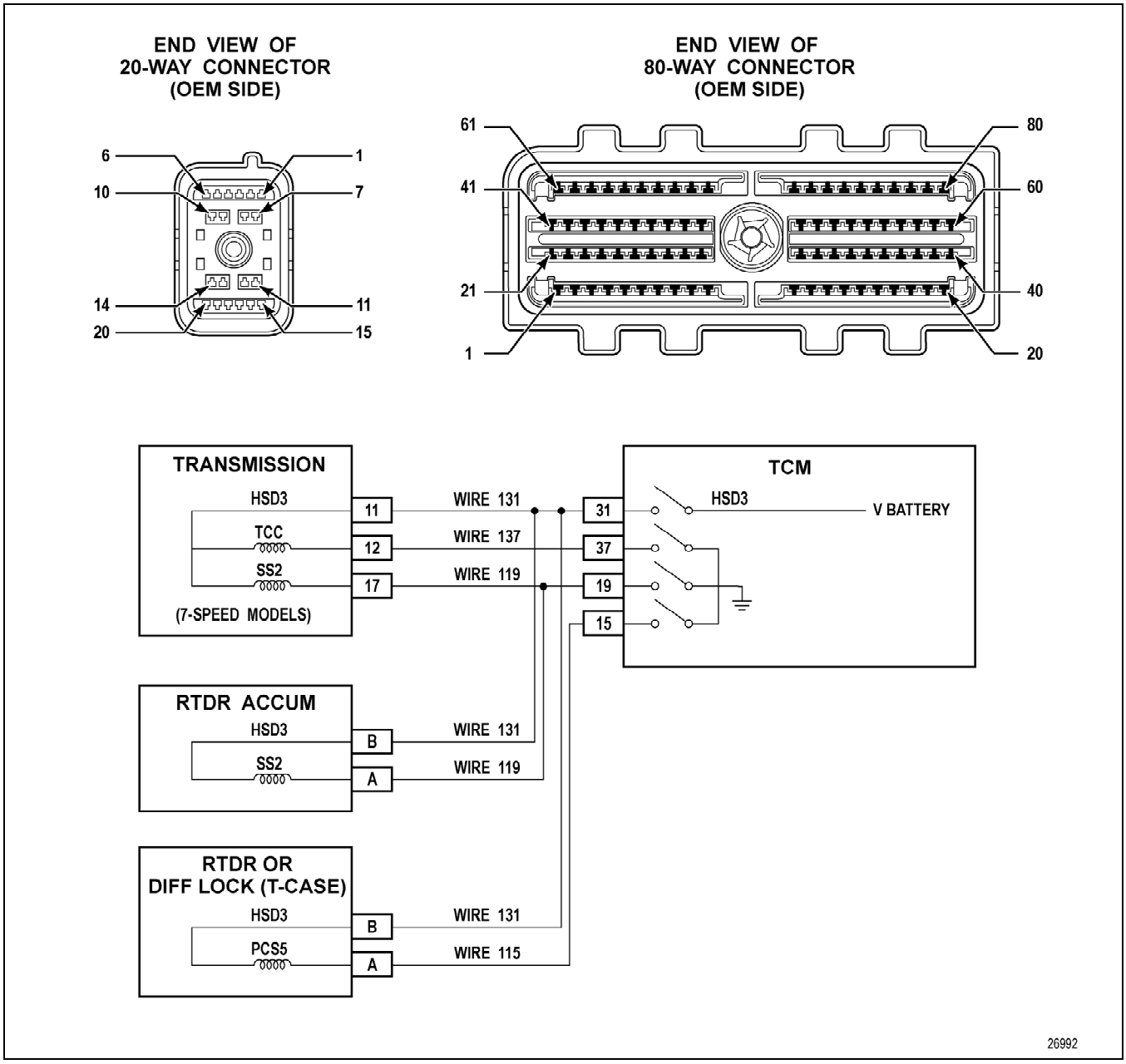
DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3)



Circuit Description

This test detects if the voltage measured at the HSD shows that multiple low side drivers indicate open, but the HSD indicates high voltage.

Action Taken When the DTC Sets

When DTC P2684 is active:

- For 7-speed models, limit ranges to Reverse (R), Neutral (N) and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2684 can be caused by:

- HSD3 circuit issues such as:
  - W131 shorted to another wire in chassis harness.
  - W131 (terminal 11 of 20-way) shorted to another wire in the internal transmission harness.
  - W131 high resistance or an open circuit in chassis harness.
  - W131 (terminal 11 of 20-way) high resistance or an open circuit in internal transmission harness.
- TCC issues such as:
  - W137 shorted to another wire in chassis harness.
  - W137 shorted (terminal 12 of 20-way) to another wire in the internal transmission harness.
  - W137 high resistance or an open circuit in chassis harness.
  - W137 (terminal 12 of 20-way) high resistance or an open circuit in internal transmission harness.
- PCS5 (7-speed Differential Lock, retarder) issues such as:
  - W115 shorted to another wire in chassis harness.
  - W115 high resistance or an open circuit in chassis harness.
- SS2 issues such as:
  - W119 shorted to another wire in chassis harness.
  - W119 shorted (terminal 17 of 20-way) to another wire in the internal transmission harness.
  - W119 high resistance or an open circuit in chassis harness.
  - W119 (terminal 17 of 20-way) high resistance or an open circuit in internal transmission harness.
- Air solenoid (SS2) issues such as:
  - W119 shorted to another wire in chassis harness.
  - W119 high resistance or an open circuit in chassis harness.
- Defective solenoids TCC, PCS5 (retarder or diff lock), SS2 (air solenoid or C6 solenoid for 7-speed models).
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W131 in chassis harness for open or high resistance.
3. Check W131 for short to ground or short to another wire.
4. Check for retarder.
5. Check for short to ground or to another wire on retarder solenoid (PCS5) wires or air solenoid (SS2) wires.
6. Check for Differential Lock (3700 SPS) solenoid.
7. Check for high resistance or open on retarder solenoid (PCS5) wires or air solenoid (SS2) wires.
8. Check air solenoid (SS2) and retarder solenoid (PCS5) resistance.
9. Check TCM.
10. Check internal harness HSD3 (terminal 11) for short to ground or short to another wire.
11. Check PCS5 Differential Lock wires for short to ground or another wire.
12. Check PCS5 Differential Lock wires for high resistance or open.
13. Check Differential Lock solenoid resistance.
14. Check for multiple low side solenoid wires in internal harness shorted to ground or to another wire.
15. Check for multiple low side solenoid wires in internal harness with high resistance or opens.
16. Check TCC and SS2 (7-speed) solenoid resistance.
17. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2684 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 17*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminals 11 and 12 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 31 and 37 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 3*	*Address issue with W131. Go to Step 17 after repairs are made.*

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. For retarder transmissions, disconnect retarder solenoid (PCS5), and air solenoid (SS2) from chassis harness. For 3700SPS transmissions, disconnect differential lock solenoid (PCS5) at transfer case. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 31 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 31 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W131. Go to Step 17 after repairs are made.*
4	Is transmission equipped with retarder?		*Go to Step 5*	*Go to Step 6*
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect OEM harness connectors from retarder solenoid (PCS5) and air solenoid (SS2). 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal A of retarder solenoid (PCS5) connector to all other labeled terminals shown on J-47275-1 Magnetic Overlay and to chassis ground. 7. Repeat task 6 for terminal B of retarder solenoid (PCS5) connector. 8. Repeat tasks 6 and 7 for terminal A and B of air solenoid (SS2). Does resistance measure 20 kΩ or more from each of the solenoid connector terminals A and B wires to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 7*	*Address issue with OEM harness wire that is shorted to another wire or to chassis ground for the retarder solenoid (PCS5) and/or air solenoid (SS2). Go to Step 17*
6	Is transmission equipped with a 7-speed?		*Go to Step 11*	*Go to Step 9*

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave OEM harness connectors from retarder solenoid (PCS5) and air solenoid (SS2) disconnected from solenoids. 6. Install a jumper wire between terminals A and B of the retarder solenoid (PCS5) connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 31 and 15 at J-47275-1 Magnetic Overlay. 8. Move jumper wire between terminals A and B of the air solenoid (SS2). 9. Using a J-46708 Digital Multimeter, measure the resistance between terminals 31 and 19 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 8*	*Address issue with OEM harness wire that is high resistance or open for the retarder solenoid (PCS5) and/or air solenoid (SS2). Go to Step 17*
8	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Connect air solenoid (SS2) to OEM chassis harness. 6. Measure resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. 7. Connect retarder solenoid (PCS5) to OEM chassis. 8. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–34 for retarder solenoid (PCS5) and Figure 5–36 for air solenoid (SS2) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–34 for retarder solenoid (PCS5) and Figure 5–36 for air solenoid (SS2)	*Go to Step 9*	*Replace air solenoid (SS2) or retarder solenoid (PCS5) that is not within specification. Go to Step 17*

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2684 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 17 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 10*
10	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect TCC solenoid and SS2 (if equipped) from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 11 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 11 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 14*	*Repair or replace internal harness. Go to Step 17*

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect OEM harness connectors from PCS5 Differential Lock (Transfer case) solenoid. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal A of Differential Lock solenoid connector to all other labeled terminals shown on J-47275-1 Magnetic Overlay and to chassis ground. 7. Repeat task 6 for terminal B of Differential Lock solenoid connector. Does resistance measure 20 kΩ or more from each of the solenoid connector terminals A and B wires to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 12*	*Address issue with OEM harness wire that is shorted to another wire or to chassis ground for the Differential Lock solenoid (PCS5). Go to Step 17*
12	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave OEM harness connector disconnected from PCS5 Differential Lock solenoid. 6. Install a jumper wire between terminals A and B of the Differential Lock solenoid PCS5 connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 31 and 15 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 13*	*Address issue with OEM harness wire that is high resistance or open for the Differential Lock solenoid (PCS5). Go to Step 17*

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
13	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Connect PCS5 Differential Lock solenoid to OEM chassis harness. 6. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–35 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–35	*Go to Step 10*	*Replace PCS5 Differential Lock solenoid that is not within specification. Go to Step 17*
14	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Leave solenoids disconnected from internal harness. 4. Install jumper between internal harness terminals A and B for TCC solenoid. 5. Measure resistance between terminals 11 and 12 at J-47279-1 Magnetic Overlay. 6. Move jumper to terminals A and B for SS2, if equipped. 7. Measure resistance between terminals 11 and 17 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 15*	*Repair or replace internal harness. Go to Step 17*
15	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave solenoids disconnected from internal harness. 3. Remove jumpers from 20-way OEM connector, if installed. 4. Check resistance for J-47279-1 Magnetic Overlay terminal 12 to all other labeled terminals on J-47279-1 Magnetic Overlay and the control module assembly. 5. Repeat task 4 for terminal 17 if equipped with 7-speed. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 12 and 17 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 16*	*Repair any shorted internal harness wires or replace internal harness. Go to Step 17*

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
16	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect TCC solenoid and SS2 (7-speed models) to internal harness connectors. 4. Measure resistance between terminals 11 and 12 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 11 and 17. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–34 and Figure 5–35 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–34 and Figure 5–35	*Go to Step 17*	*Replace solenoid that is not within specification. Go to Step 17*
17	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2684 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

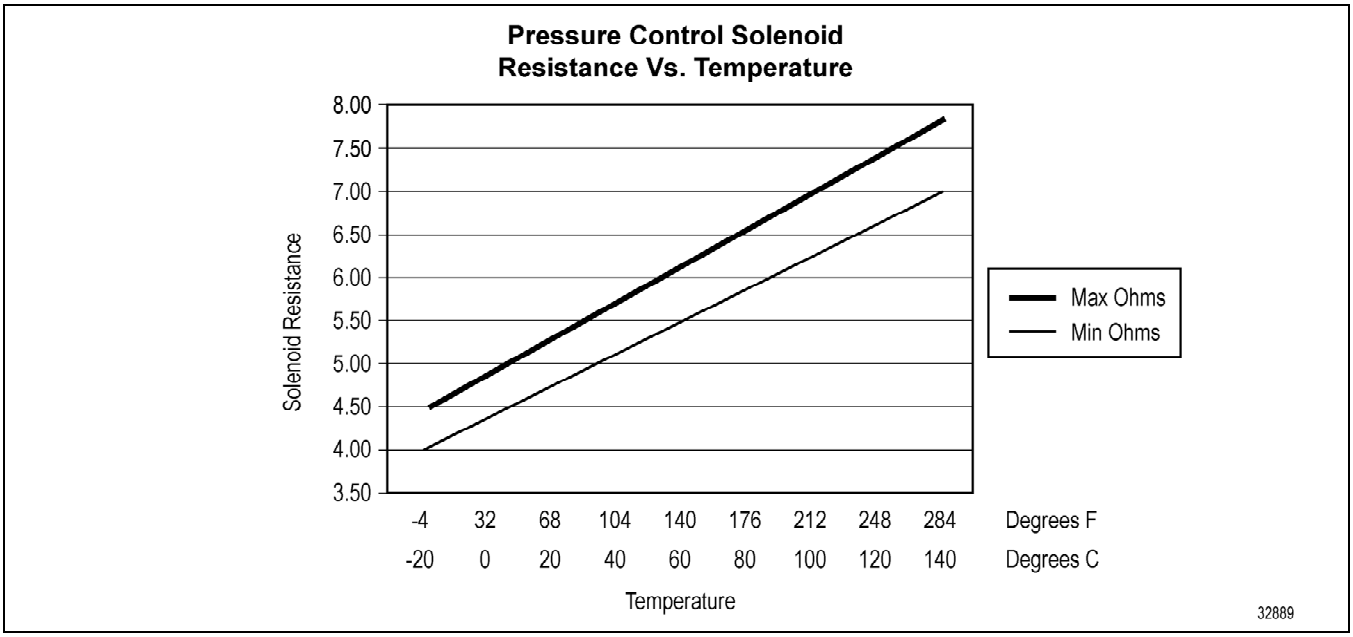

Figure 5–34. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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DTC P2684 Actuator Supply Circuit Voltage 3 Open (HSD3) *(cont'd)*

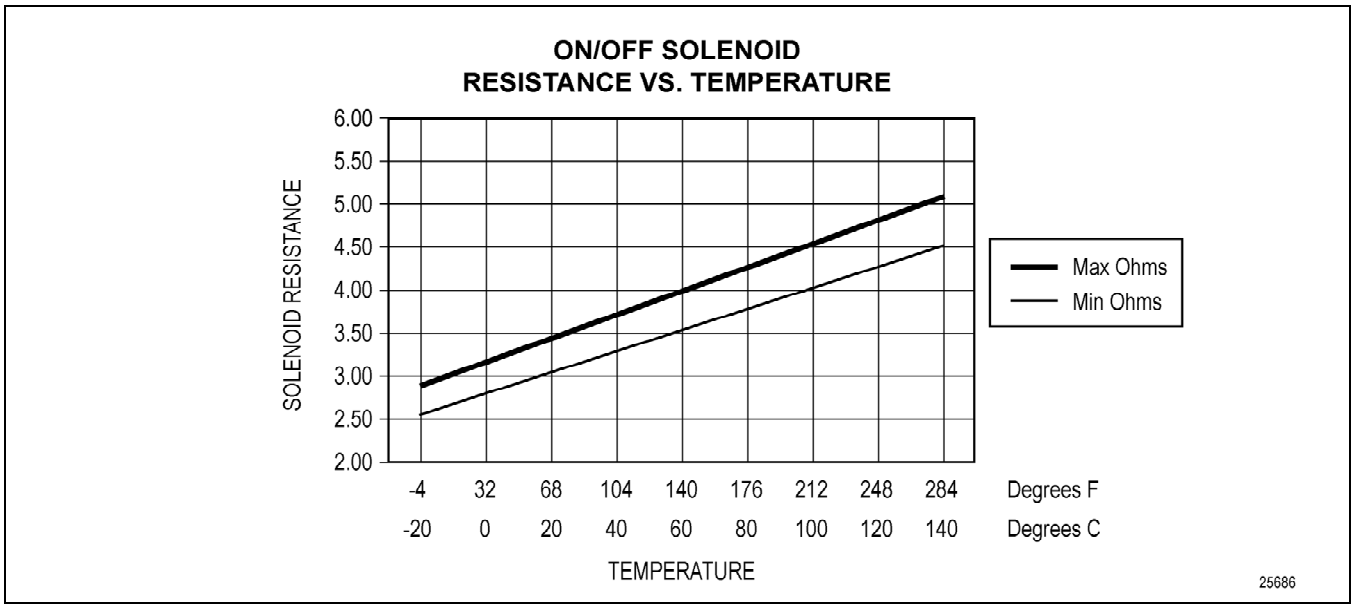

Figure 5–35. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

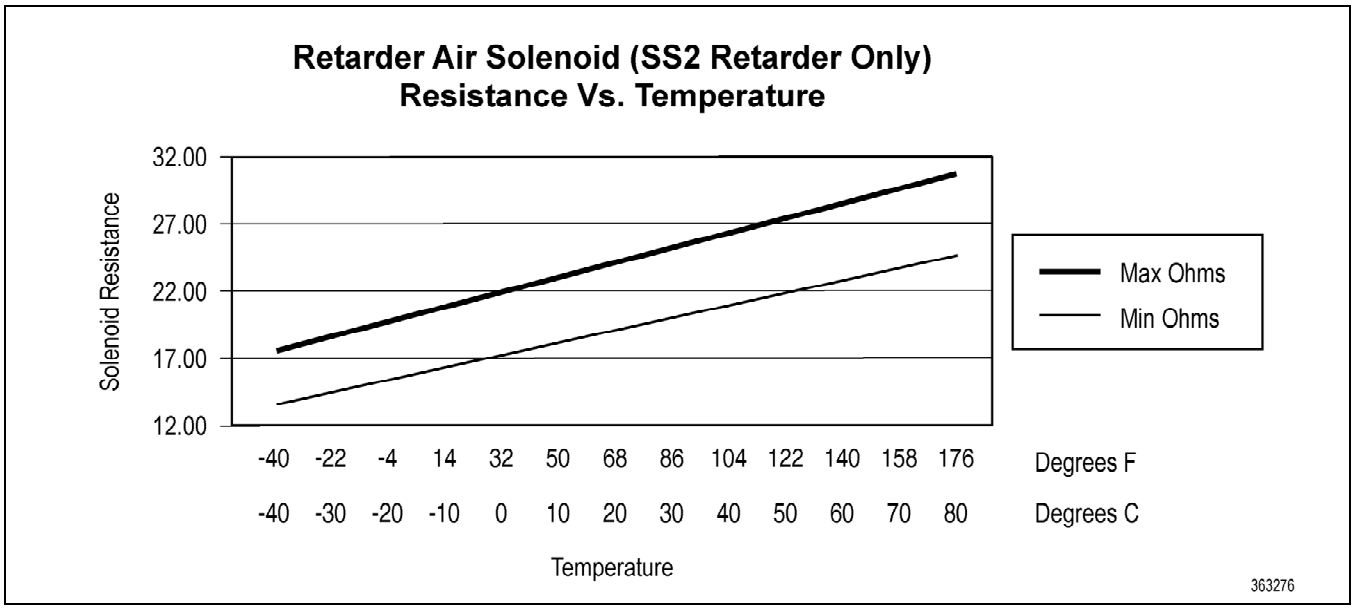

Figure 5–36. Retarder Air Solenoid—SS2 in Retarder Equipped Transmissions

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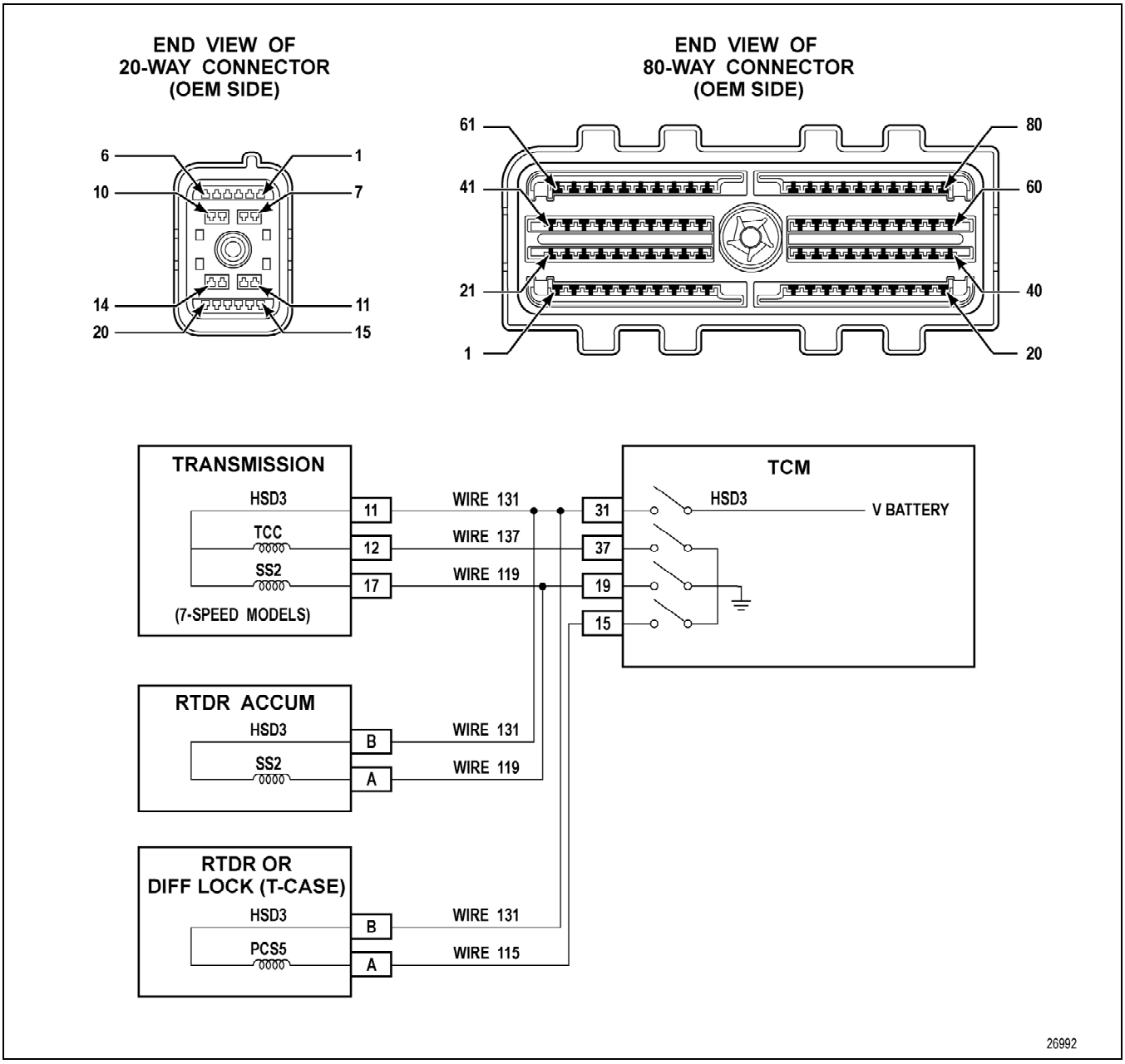
DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3)



Circuit Description

This test detects low voltage on the HSD when high voltage is expected indicating a short to ground at that circuit.

Action Taken When the DTC Sets

When DTC P2685 is active:

- For 7-speed, limit ranges to Reverse (R), Neutral (N), and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2685 can be caused by:

- HSD3 circuit issues such as:
  - W131 shorted to another wire in chassis harness or to chassis ground.
  - W131 (terminal 11 of 20-way) shorted to another wire in the internal transmission harness or to the control module.
- TCC issues such as:
  - W137 shorted to another wire in chassis harness or to chassis ground.
  - W137 shorted (terminal 12 of 20-way) to another wire in the internal transmission harness or to the control module.
- PCS5 (7-speed Differential Lock, retarder) issues such as:
  - W115 shorted to another wire in chassis harness or to chassis ground.
- SS2 issues such as:
  - W119 shorted to another wire in chassis harness or to chassis ground.
  - W119 shorted (terminal 17 of 20-way) to another wire in the internal transmission harness or to the control module.
- Air solenoid (SS2) issues such as:
  - W119 shorted to another wire in chassis harness or to chassis ground.
- Defective solenoids TCC, retarder solenoid (PCS5), air solenoid (SS2), or differential lock solenoid (PCS5).
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W131 for short to ground or short to another wire.
3. Check for retarder.
4. Check for short to ground or to another wire on retarder solenoid (PCS5) wires or air solenoid (SS2) wires.
5. Check for Differential Lock (3700 SPS) solenoid.
6. Check air solenoid (SS2) and retarder solenoid (PCS5) resistance.
7. Check TCM.
8. Check internal harness HSD3 (terminal 11) for short to ground or short to another wire.
9. Check PCS5 Differential Lock wires for short to ground or another wire.
10. Check Differential Lock solenoid resistance.
11. Check for multiple low side solenoid wires in internal harness shorted to ground or to another wire.
12. Check TCC and SS2 (7-speed) solenoid resistance.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2685 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 13*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness. 5. Disconnect OEM 20-way connector from transmission. 6. For retarder transmissions, disconnect retarder solenoid (PCS5) and air solenoid (SS2) from chassis harness. For 3700SPS transmissions, disconnect differential lock solenoid (PCS5) at transfer case. 7. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 31 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 31 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 3*	*Address issue with W131. Go to Step 13 after repairs are made.*
3	Is transmission equipped with retarder?		*Go to Step 4*	*Go to Step 5*

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect OEM harness connectors from retarder solenoid (PCS5) and air solenoid (SS2). 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal A of retarder solenoid (PCS5) connector to all other labeled terminals shown on J-47275-1 Magnetic Overlay and to chassis ground. 7. Repeat task 6 for terminal B of retarder solenoid (PCS5) connector. 8. Repeat tasks 6 and 7 for terminal A and B of air solenoid (SS2). Does resistance measure 20 kΩ or more from each of the solenoid connector terminals A and B wires to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 6*	*Address issue with OEM harness wire that is shorted to another wire or to chassis ground for the retarder solenoid (PCS5) and/or air solenoid (SS2). Go to Step 13*
5	Is transmission equipped with a 7-speed?		*Go to Step 9*	*Go to Step 7*
6	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Connect air solenoid (SS2) to OEM chassis harness. 6. Measure resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. 7. Connect retarder solenoid (PCS5) to OEM chassis harness. 8. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–37 for retarder solenoid (PCS5), and Figure 5–39 for air solenoid (SS2) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–37 for retarder solenoid (PCS5) and Figure 5–39 for air solenoid (SS2)	*Go to Step 7*	*Replace air solenoid (SS2) or retarder solenoid (PCS5) that is not within specification. Go to Step 13*

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2685 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 8*
8	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect TCC solenoid and SS2 (if equipped) from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 11 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 11 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 11*	*Repair or replace internal harness. Go to Step 13*

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect OEM harness connectors from PCS5 Differential Lock (Transfer case) solenoid. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal A of Differential Lock solenoid connector to all other labeled terminals shown on J-47275-1 Magnetic Overlay and to chassis ground. 7. Repeat task 6 for terminal B of Differential Lock solenoid connector. Does resistance measure 20 kΩ or more from each of the solenoid connector terminals A and B wires to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 10*	*Address issue with OEM harness wire that is shorted to another wire or to chassis ground for the Differential Lock Solenoid (PCS5). Go to Step 13*
10	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Connect PCS5 Differential Lock solenoid to OEM chassis harness. 6. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–38 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–38	*Go to Step 7*	*Replace Differential Lock Solenoid (PCS5) that is not within specification. Go to Step 13*

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave solenoids disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 12 to all other labeled terminals on J-47279-1 Magnetic Overlay and the control module assembly. 4. Repeat task 3 for terminal 17 if equipped with 7-speed. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 12 and 17 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control module assembly?	20 kΩ or more	*Go to Step 12*	*Repair any shorted internal harness wires or replace internal harness. Go to Step 13*
12	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect TCC solenoid and SS2 (7-speed models) to internal harness connectors. 4. Measure resistance between terminals 11 and 12 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 11 and 17. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–37 and Figure 5–38 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–37 and Figure 5–38	*Go to Step 13*	*Replace solenoid that is not within specification. Go to Step 13*
13	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2685 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

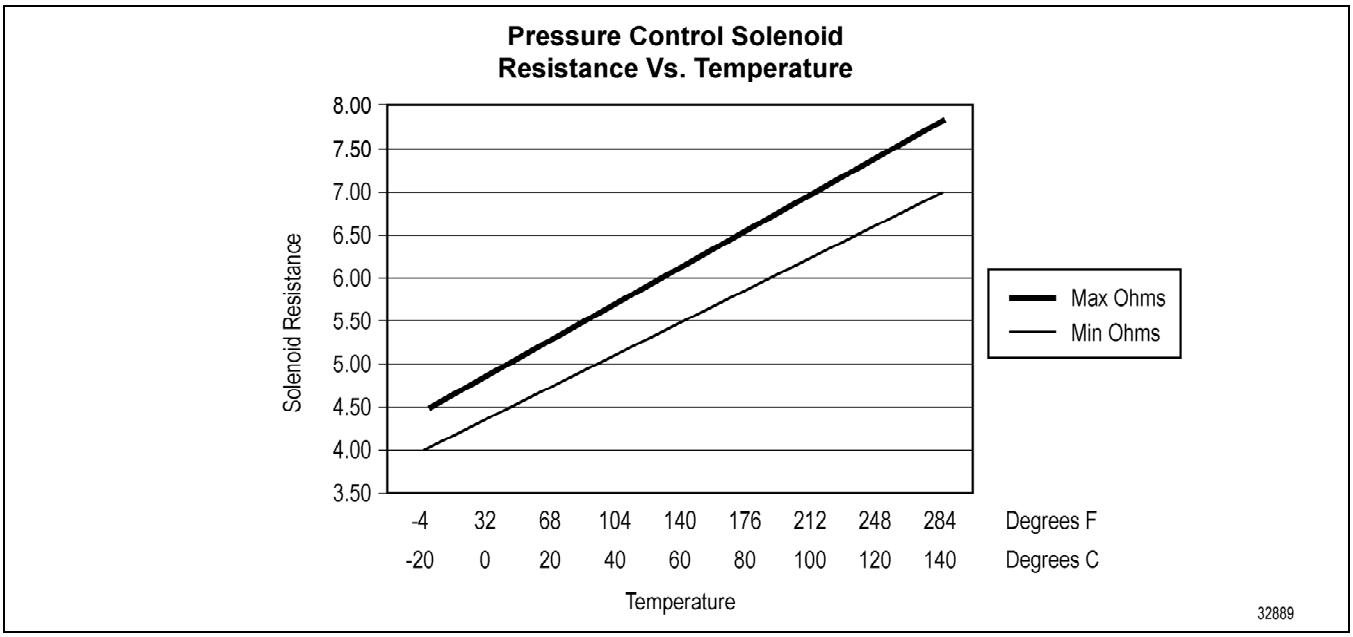

Figure 5–37. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

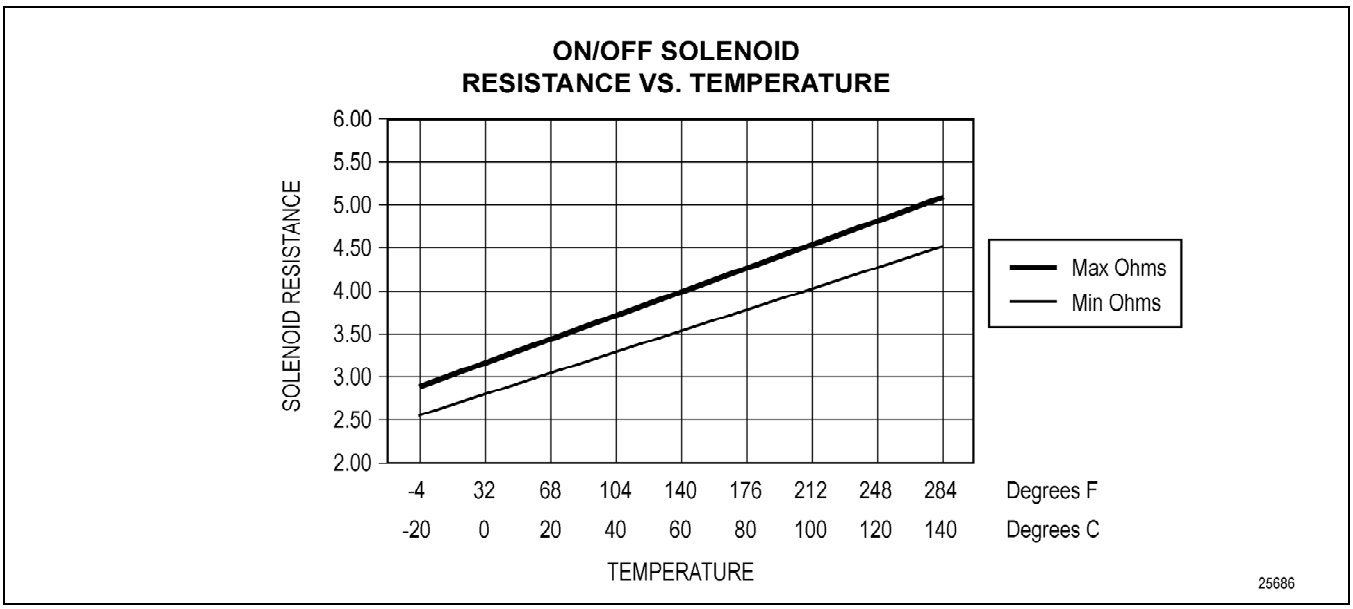

Figure 5–38. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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DTC P2685 Actuator Supply Circuit Voltage 3 Low (HSD3) *(cont'd)*

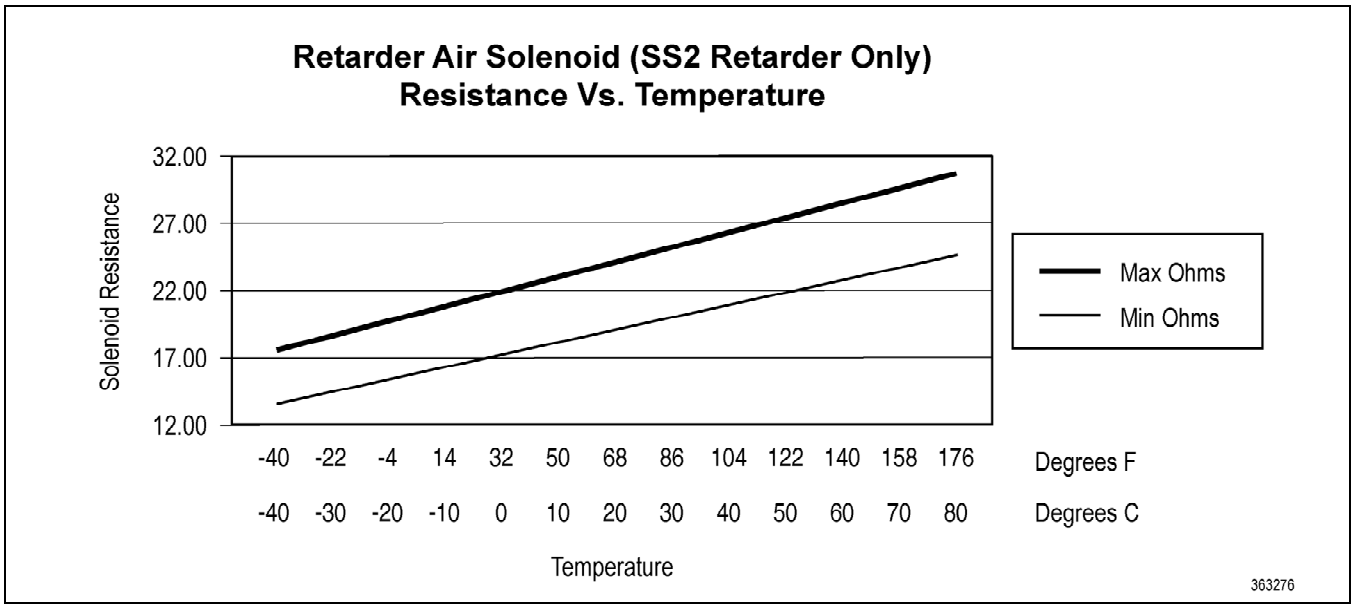

Figure 5–39. Retarder Air Solenoid—SS2 in Retarder Equipped Transmissions

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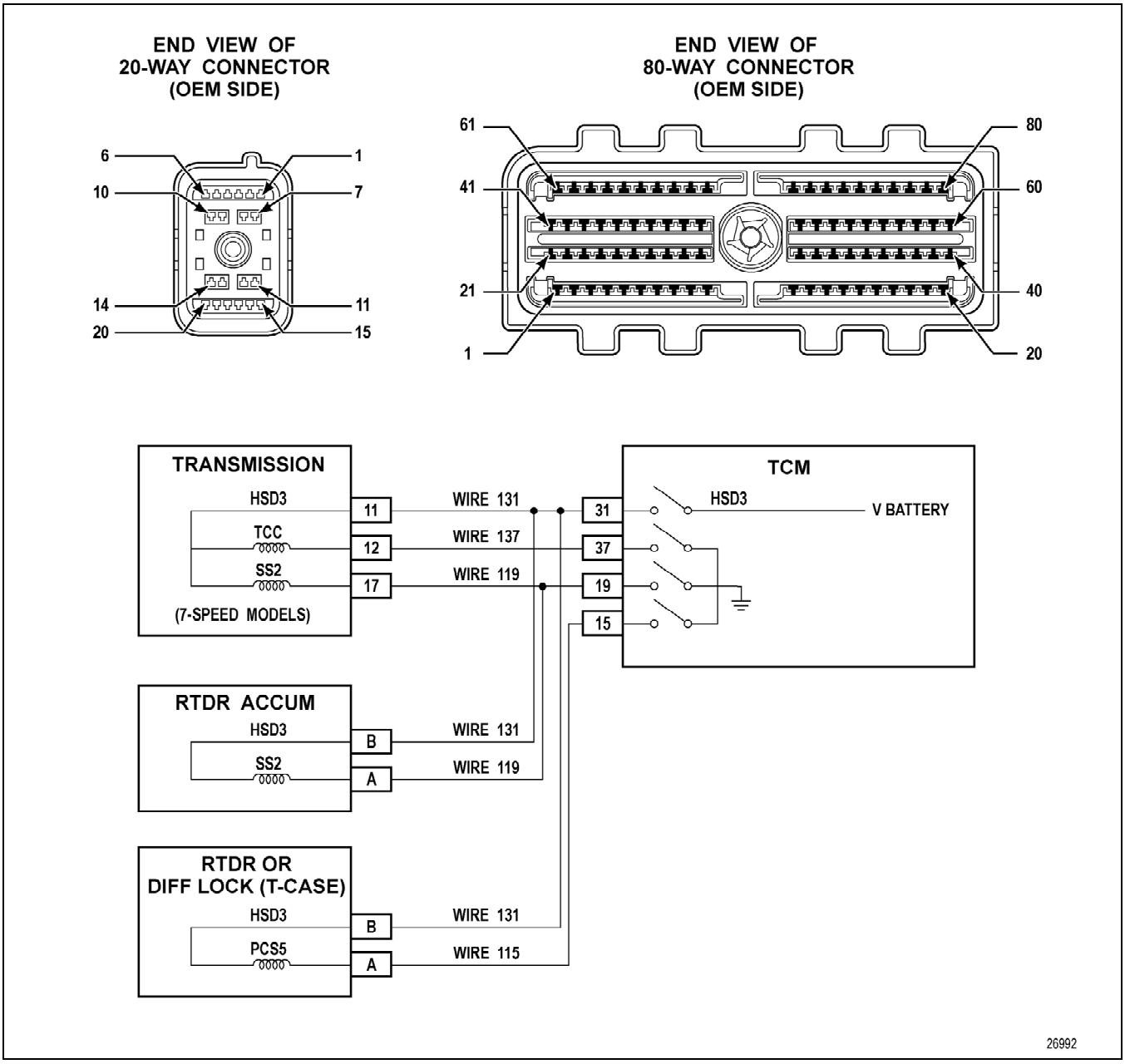
DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3)



Circuit Description

This test detects if the voltage measured at HSD is high when the circuit is expected to be off.

Action Taken When the DTC Sets

When DTC P2686 is active:

- Transmission fails to Neutral (N).
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2686 can be caused by:

- HSD3 circuit issues such as:
  - W131 shorted to another wire in chassis harness.
  - W131 (terminal 11 of 20-way) shorted to another wire in the internal transmission harness.
- TCC issues such as:
  - W137 shorted to another wire in chassis harness.
  - W137 shorted (terminal 12 of 20-way) to another wire in the internal transmission harness.
- PCS5 (7-speed Differential Lock, retarder) issues such as:
  - W115 shorted to another wire in chassis harness.
- SS2 issues such as:
  - W119 shorted to another wire in chassis harness.
  - W119 shorted (terminal 17 of 20-way) to another wire in the internal transmission harness.
- Air solenoid (SS2) issues such as:
  - W119 shorted to another wire in chassis harness.
- Defective solenoids TCC, PCS5 (retarder solenoid), SS2, air solenoid (SS2), or differential lock solenoid (PCS5).
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check W131 for short to another wire.
3. Check for retarder.
4. Check for short to another wire on retarder solenoid (PCS5) wires or air solenoid (SS2) wires.
5. Check for Differential Lock (3700 SPS) solenoid.
6. Check air solenoid (SS2) and retarder solenoid (PCS5) resistance.
7. Check TCM.
8. Check internal harness HSD3 (terminal 11) for short to another wire.
9. Check PCS5 Differential Lock wires for short to another wire.
10. Check Differential Lock solenoid resistance.
11. Check for multiple low side solenoid wires in internal harness shorted to another wire.
12. Check TCC and SS2 (7-speed) solenoid resistance.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2686 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 13*

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness. 5. Disconnect OEM 20-way connector from transmission. 6. For retarder transmissions, disconnect retarder solenoid (PCS5) and air solenoid (SS2) from chassis harness. For 3700SPS transmissions, disconnect differential lock solenoid (PCS5) at transfer case. 7. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 31 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 31 and to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 3*	*Address issue with W131. Go to Step 13 after repairs are made.*
3	Is transmission equipped with retarder?		*Go to Step 4*	*Go to Step 5*
4	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect OEM harness connectors from retarder solenoid (PCS5) and air solenoid (SS2). 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal A of retarder solenoid (PCS5) connector to all other labeled terminals shown on J-47275-1 Magnetic Overlay. 7. Repeat task 6 for terminal B of retarder solenoid (PCS5) connector. 8. Repeat tasks 6 and 7 for terminal A and B of air solenoid (SS2). Does resistance measure 20 kΩ or more from each of the solenoid connector terminals A and B wires to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Address issue with OEM harness wire that is shorted to another wire or to chassis ground for the retarder solenoid (PCS5) and/or air solenoid (SS2). Go to Step 13*
5	Is transmission equipped with a 7-speed?		*Go to Step 9*	*Go to Step 7*

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Connect air solenoid (SS2) to OEM chassis harness. 6. Measure resistance between terminals 19 and 31 at J-47275-1 Magnetic Overlay. 7. Connect retarder solenoid (PCS5) to OEM chassis harness. 8. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–40 for retarder solenoid (PCS5) and Figure 5–42 for air solenoid (SS2) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–40 for retarder solenoid (PCS5) and Figure 5–42 for air solenoid (SS2)	*Go to Step 7*	*Replace air solenoid (SS2) or retarder solenoid (PCS5) that is not within specification. Go to Step 13*
7	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2686 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 8*

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect TCC solenoid and SS2 (if equipped) from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 11 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 11 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 11*	*Repair or replace internal harness. Go to Step 13*
9	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect OEM harness connectors from PCS5 Differential Lock (Transfer case) solenoid. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal A of Differential Lock solenoid connector to all other labeled terminals shown on J-47275-1 Magnetic Overlay. 7. Repeat task 6 for terminal B of Differential Lock solenoid connector. Does resistance measure 20 kΩ or more from each of the solenoid connector terminals A and B wires to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 10*	*Address issue with OEM harness wire that is shorted to another wire or to chassis ground for the Differential Lock solenoid (PCS5). Go to Step 13*
10	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Connect PCS5 Differential Lock solenoid to OEM chassis harness. 6. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–42 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–42	*Go to Step 7*	*Replace PCS5 Differential Lock solenoid that is not within specification. Go to Step 13*

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

Step	Action	Value(s)	Yes	No
11	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave solenoids disconnected from internal harness. 3. Check resistance for J-47279-1 Magnetic Overlay terminal 12 to all other labeled terminals on J-47279-1 Magnetic Overlay. 4. Repeat task 3 for terminal 17 if equipped with 7-speed. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminals 12 and 17 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 12*	*Repair any shorted internal harness wires or replace internal harness. Go to Step 13*
12	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect TCC solenoid and SS2 (7-speed models) to internal harness connectors. 4. Measure resistance between terminals 11 and 12 at J-47279-1 Magnetic Overlay. 5. Repeat task 4 for terminals 11 and 17. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–40 and Figure 5–41 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–40 and Figure 5–41	*Go to Step 13*	*Replace solenoid that is not within specification. Go to Step 13*
13	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2686 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

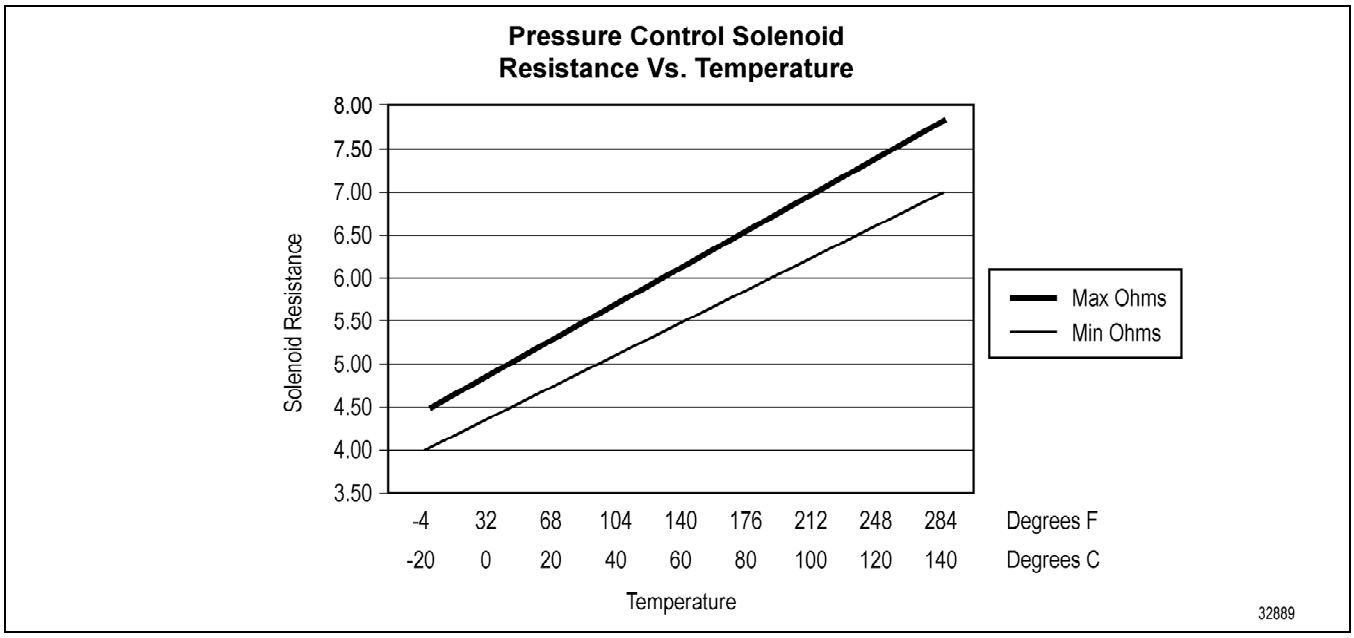

Figure 5–40. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

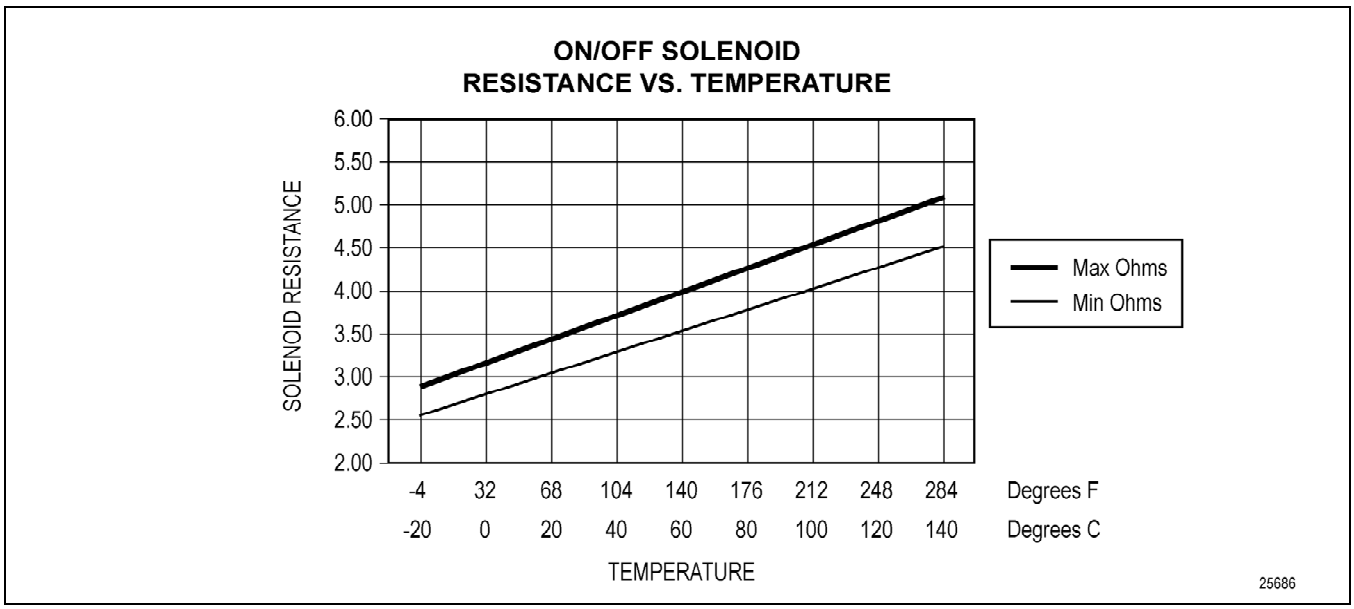

Figure 5–41. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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DTC P2686 Actuator Supply Circuit Voltage 3 High (HSD3) *(cont'd)*

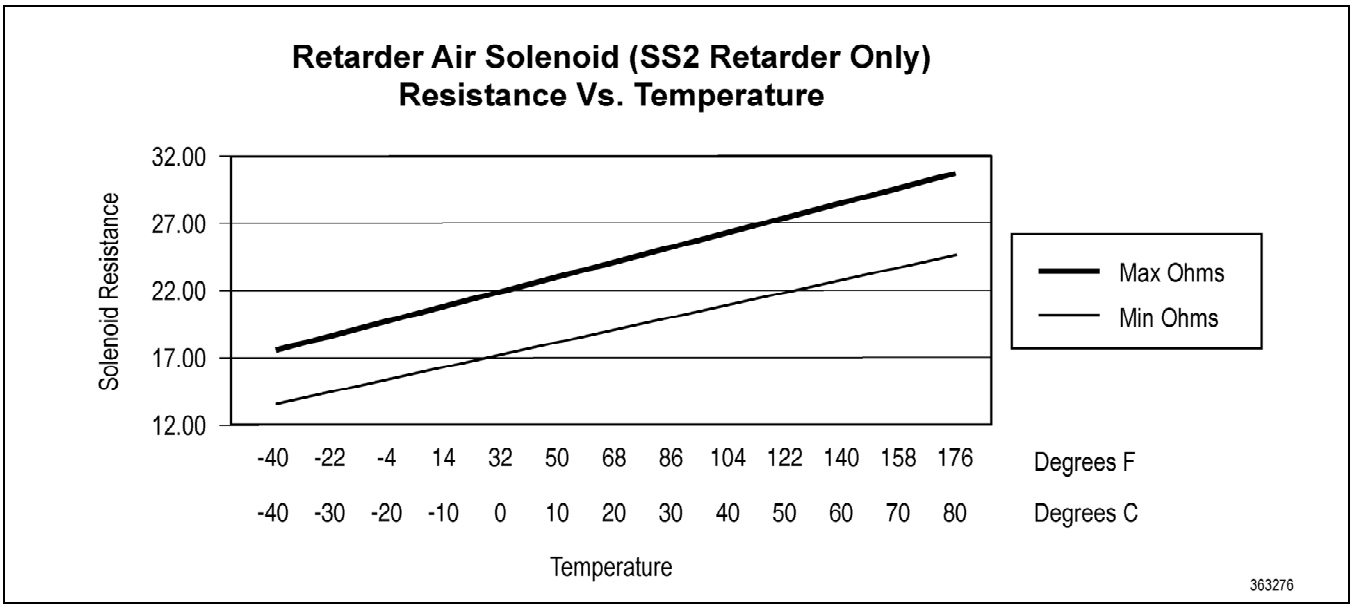

Figure 5–42. Retarder Air Solenoid—SS2 in Retarder Equipped Transmissions

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DTC P2714 Pressure Control Solenoid (PCS) 4 Stuck Off

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the on-coming clutch controlled by Pressure Control Solenoid 4 (PCS4) engages during a forward range shift. PCS4 controls C4 for 2nd and 6th range in all 3000 and 4000 transmissions.

Action Taken When the DTC Sets

When DTC P2714 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2714 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS4 controls C4. However, this code may also occur when any other clutch did not maintain engagement while C4 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P2714 Pressure Control Solenoid (PCS) 4 Stuck Off *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (HSD) DTC history.
6. Check TCM.
7. Check clutch pressures and turbine shaft speed during clutch test.
8. Verify turbine shaft speed at 0-1 rpm in clutch test.
9. Disassemble and inspect control valve module.
10. Check for DTC.
11. Disassemble and inspect transmission.
12. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 12*
3	Are there output shaft speed sensor DTCs in history or active with DTC P2714?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P2714?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any HSD or LSD solenoid?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P2714 Pressure Control Solenoid (PCS) 4 Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2714 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 12 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P2714 Pressure Control Solenoid (PCS) 4 Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 2nd range at idle. Record main pressure and apply clutch pressure for all range clutches. Check exhaust pressures in clutches commanded Off in all ranges. Record turbine shaft speed rpm in all ranges. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpmand record pressures and turbine shaft speed again. Repeat task 4 and 5 for 6th range. Record pressures in applied clutches, and turbine shaft speed. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 9*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 11*
9	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 12*	*Replace PCS4 solenoid. Go to Step 10*

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DTC P2714 Pressure Control Solenoid (PCS) 4 Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2714 return?		*Go to Step 11*	*System OK. Clear inactive DTCs and return vehicle to service.*
11	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 12*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
12	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2714 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2715 Pressure Control Solenoid (PCS) 4 Stuck On

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the off-going clutch controlled by Pressure Control Solenoid 4 (PCS4) remains engaged during a forward range shift. PCS4 controls C4 for 2nd and 6th range in all 3000 and 4000 transmissions.

Action Taken When the DTC Sets

When DTC P2715 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2715 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS4 controls C4. However, this code may also occur for any other off-going clutch issue while C4 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P2715 Pressure Control Solenoid (PCS) 4 Stuck On *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (HSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P2715?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P2715?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any HSD or LSD solenoid?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P2715 Pressure Control Solenoid (PCS) 4 Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2715 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P2715 Pressure Control Solenoid (PCS) 4 Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 2nd range at idle. Record main pressure and apply clutch pressure for all range clutches. Check exhaust pressures in clutches commanded Off in all ranges. Record turbine shaft speed rpm in all ranges. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Repeat task 4 and 5 for 6th range. Record pressures in applied clutches, and turbine shaft speed. 7. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P2715 Pressure Control Solenoid (PCS) 4 Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace all solenoids in the control valve module. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2715 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2715 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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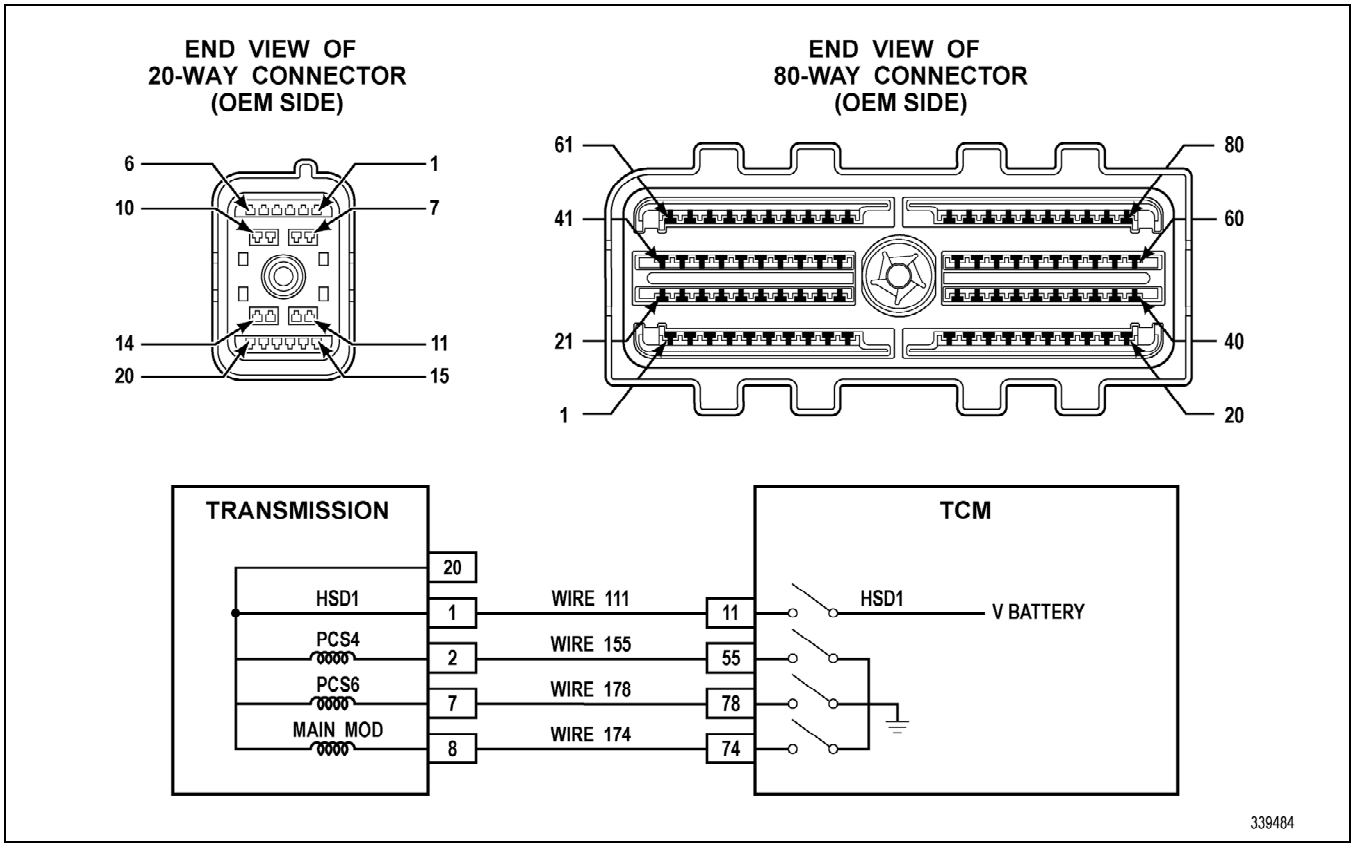
DTC P2718 Pressure Control Solenoid (PCS) 4 Control Circuit Open



Circuit Description

DTC P2718 indicates that the TCM has detected an open condition in the PCS4 electrical circuit. The open condition may exist in the high side (wire 111) or low side (wire 155).

Action Taken When the DTC Sets

When DTC P2718 is active:

- If failure occurs while in a forward range, then shifts to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2718 can be caused by:

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DTC P2718 Pressure Control Solenoid (PCS) 4 Control Circuit Open *(cont'd)*

- PCS4 issues such as:
  - W155 high resistance or an open circuit in chassis harness.
  - W155 (terminal 2 of 20-way) high resistance or an open circuit in internal transmission harness.
  - PCS4 defective.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W155 in chassis harness for open or high resistance.
4. Check TCM.
5. Check internal harness wire for PCS4 Low Side Driver (terminal 2) for high resistance or open.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P2718 Pressure Control Solenoid (PCS) 4 Control Circuit Open *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2718 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0657, P0960, or P2812 present or in history with active DTC P2718?		*Go to DTC P0657*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 1 and 2 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 11 and 55 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W155. Go to Step 7 after repairs are made.*

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DTC P2718 Pressure Control Solenoid (PCS) 4 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2718 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS4 from internal harness. 4. Install jumper wire between A and B terminals of PCS4 connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 1 and 2 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 1 to terminal 2 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS4 to internal harness connectors. 4. Measure resistance between terminals 1 and 2 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–43 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–43	*Go to Step 7*	*Replace PCS4 that is not within specification. Go to Step 7*

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DTC P2718 Pressure Control Solenoid (PCS) 4 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2718 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

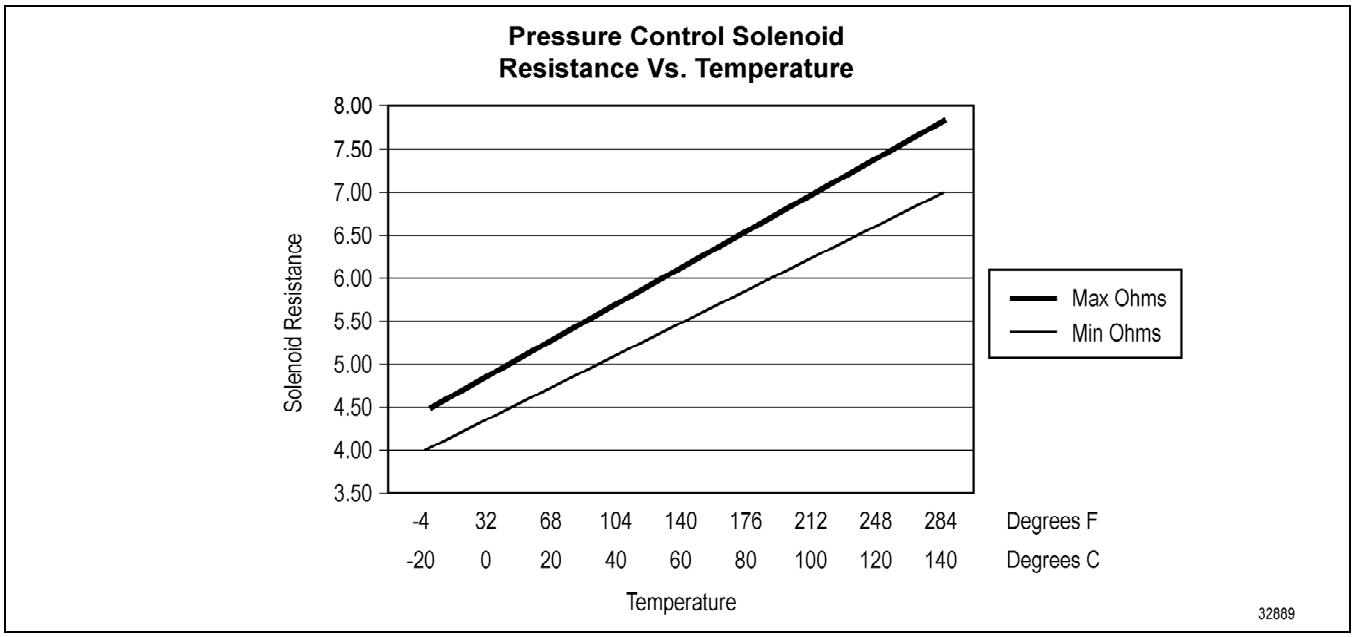

Figure 5–43. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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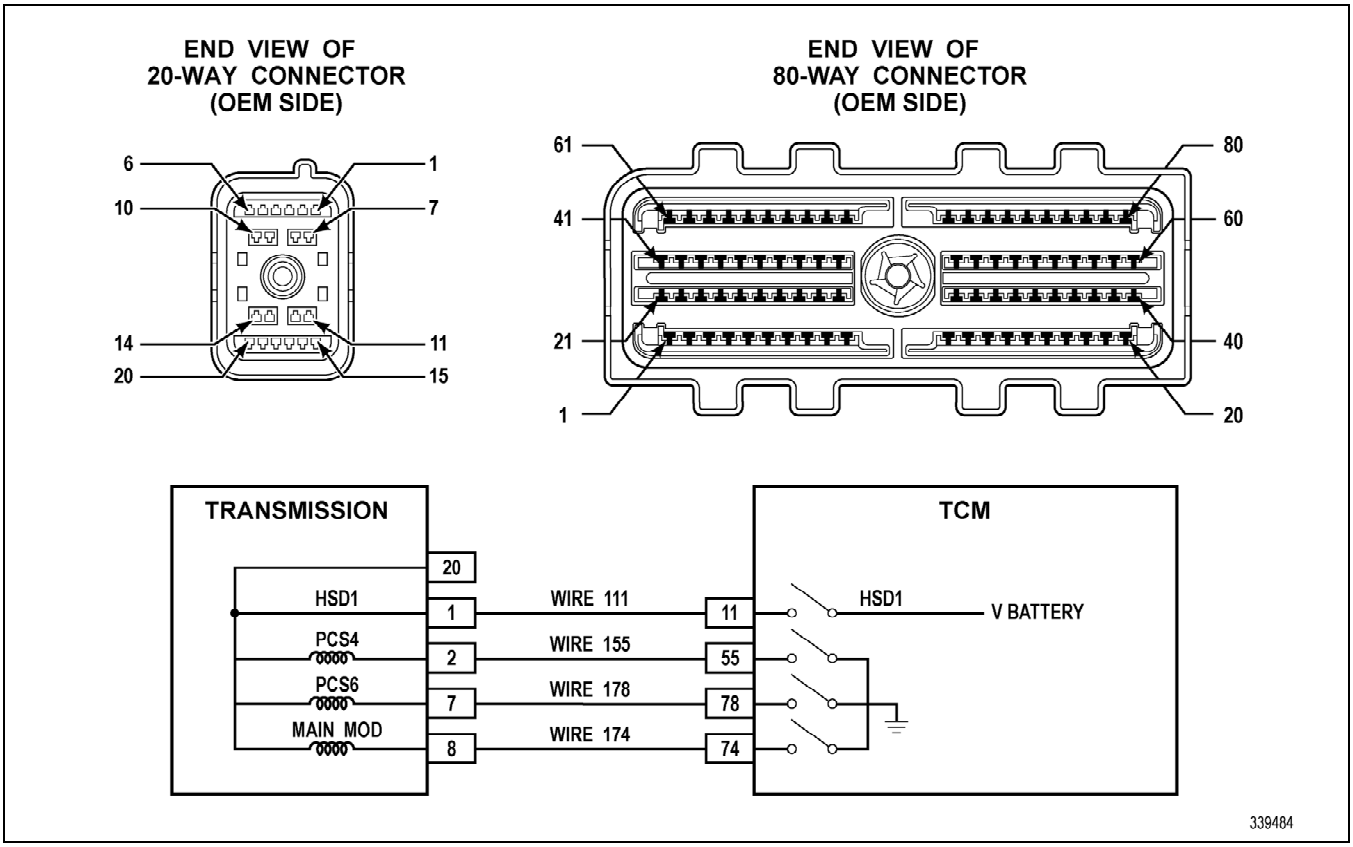
DTC P2720 Pressure Control Solenoid (PCS) 4 Control Circuit Low



Circuit Description

DTC P2720 indicates that the TCM has detected a failed low condition in the PCS4 electrical circuit. The condition may exist in the high side (wire 111) or low side (wire 155).

Action Taken When the DTC Sets

When DTC P2720 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P2720 Pressure Control Solenoid (PCS) 4 Control Circuit Low *(cont'd)*

Diagnostic Aids

DTC P2721 can be caused by:

- PCS4 issues such as:
  - W155 short in chassis harness.
  - W155 (terminal 2 of 20-way) short in internal transmission harness.
  - PCS4 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W155 in chassis harness for short to another wire.
4. Check TCM.
5. Check internal harness wire for PCS4 Low Side Driver (terminal 2) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P2720 Pressure Control Solenoid (PCS) 4 Control Circuit Low *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2720 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0658, P0962, or P2814 present or in history with active DTC P2720?		*Go to DTC P0658*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 55 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 55 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W155. Go to Step 7 after repairs are made.*

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DTC P2720 Pressure Control Solenoid (PCS) 4 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2720 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS4 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 2 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 2 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS4 to internal harness connectors. 4. Measure resistance between terminals 1 and 2 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–44 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–44	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P2720 Pressure Control Solenoid (PCS) 4 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2720 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

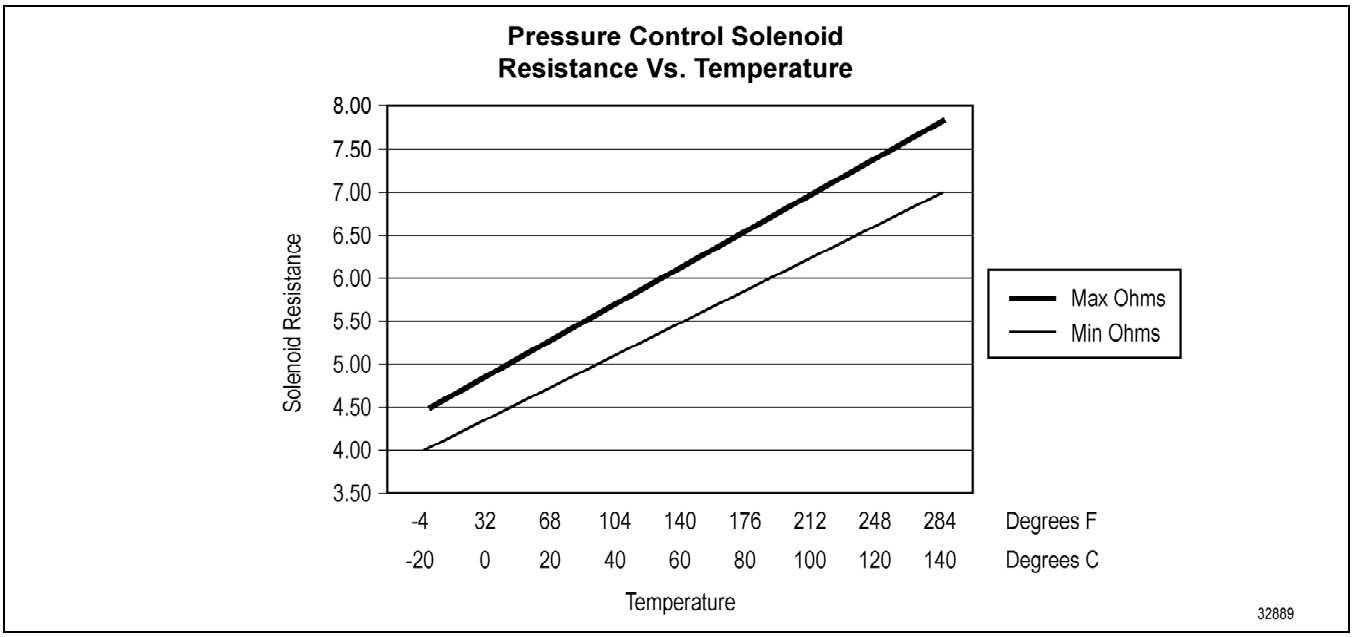

Figure 5–44. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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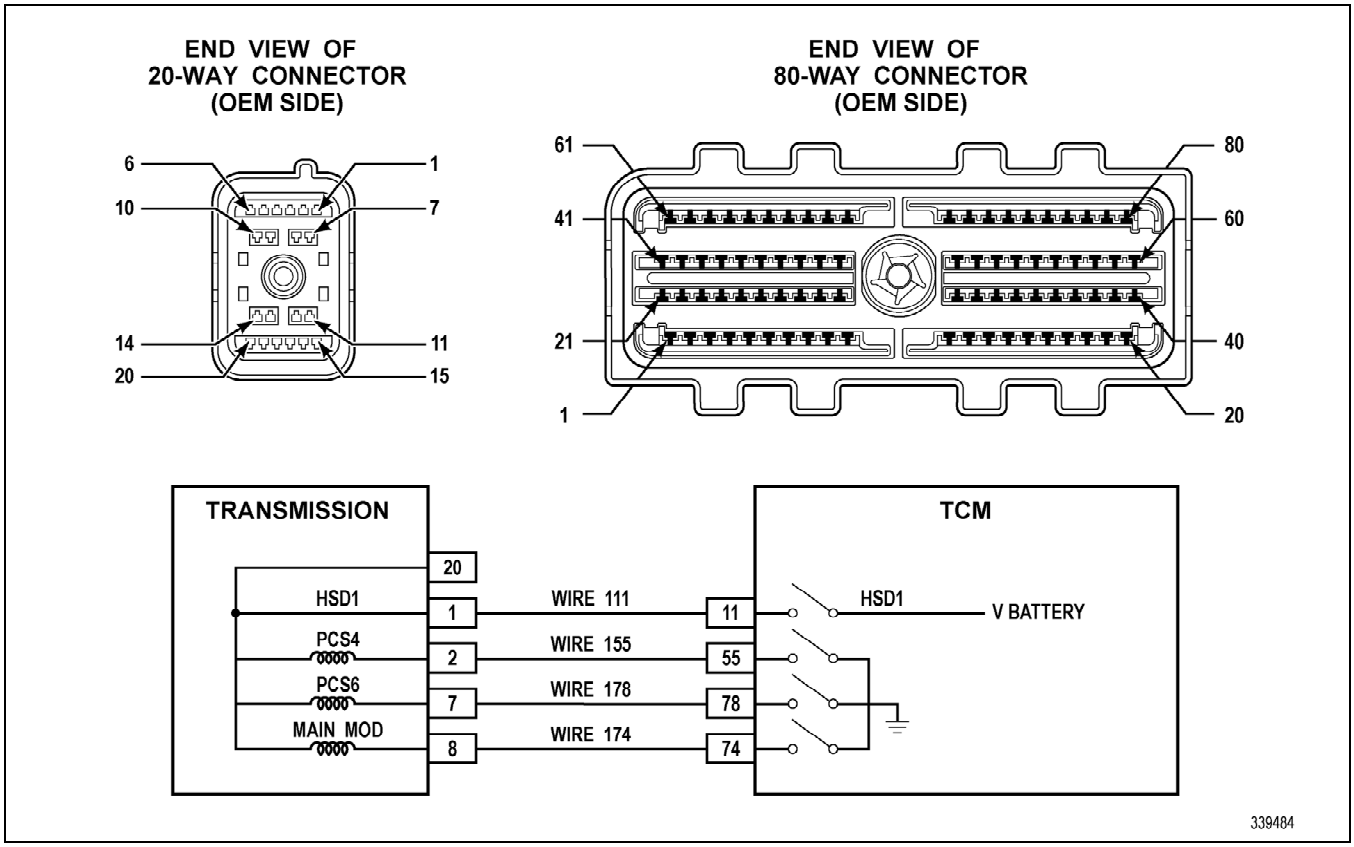
DTC P2721 Pressure Control Solenoid (PCS) 4 Control Circuit High



Circuit Description

DTC P2721 indicates that the TCM has detected a failed high condition in the PCS4 electrical circuit.

Action Taken When the DTC Sets

When DTC P2721 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2721 can be caused by:

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DTC P2721 Pressure Control Solenoid (PCS) 4 Control Circuit High *(cont'd)*

- PCS4 issues such as:
  - W155 short in chassis harness.
  - W155 (terminal 2 of 20-way) short in internal transmission harness.
  - PCS4 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W155 in chassis harness for short to another wire or chassis.
4. Check TCM.
5. Check internal harness wire for PCS4 Low Side Driver (terminal 2) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P2721 Pressure Control Solenoid (PCS) 4 Control Circuit High *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2721 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0659, P0963, or P2815 present or in history with active DTC P2721?		*Go to DTC P0659*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 55 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 55 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W155. Go to Step 7 after repairs are made.*

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DTC P2721 Pressure Control Solenoid (PCS) 4 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2721 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS4 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 2 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 2 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS4 to internal harness connectors. 4. Measure resistance between terminals 1 and 2 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–45 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–45	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P2721 Pressure Control Solenoid (PCS) 4 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2721 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

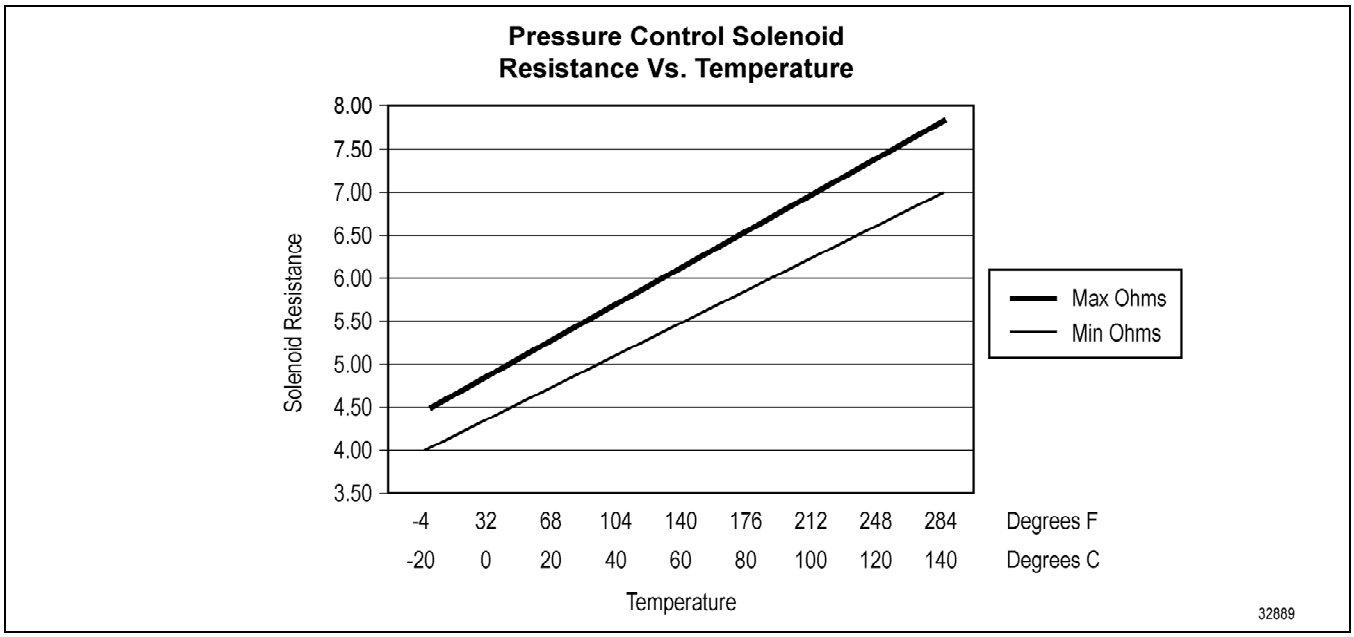

Figure 5–45. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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DTC P2723 Pressure Control Solenoid (PCS) 1 Stuck Off

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the on-coming clutch controlled by Pressure Control Solenoid 1 (PCS1) engages during a forward range shift. PCS1 controls C1 for 1st through 4th gears in all 3000 and 4000 transmissions, and the Low range in 4700/4800 transmissions. PCS1 does not control clutches for Low range in the 3700 transmission.

Action Taken When the DTC Sets

When DTC P2723 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2723 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS1 controls C1 clutch. However, this code may also occur when any on-coming clutch did not maintain engagement while C1 is commanded.

Tool Requirements:

- Allison DOC®

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DTC P2723 Pressure Control Solenoid (PCS) 1 Stuck Off *(cont'd)*

- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check clutch pressures and turbine shaft speed during clutch test.
8. Verify turbine shaft speed at 0-1 rpm.
9. Disassemble and inspect control valve module.
10. Check for DTC.
11. Disassemble and inspect transmission.
12. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 12*
3	Are there output shaft speed sensor DTCs in history or active with DTC P2714?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P2714?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P2723 Pressure Control Solenoid (PCS) 1 Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2723 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 12 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P2723 Pressure Control Solenoid (PCS) 1 Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 1st range at idle. Record main and apply pressure for C1 and C5. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C2, C3, and C4 to verify clutches are exhausted while in 1st range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed again. Repeat task 4 and 5 for 2nd, 3rd, and 4th range. Record pressures in applied clutches, and turbine shaft speed. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 9*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 11*

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DTC P2723 Pressure Control Solenoid (PCS) 1 Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
9	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 12*	*Replace all solenoids in the control valve module. Go to Step 10*
10	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2723 return?		*Go to Step 11*	*System OK. Clear inactive DTCs and return vehicle to service.*
11	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 12*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
12	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2723 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2724 Pressure Control Solenoid (PCS) 1 Stuck On

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the off-going clutch controlled by Pressure Control Solenoid 1 (PCS1) remains engaged during a forward range shift. PCS1 controls C1 for 1st through 4th gears in all 3000 and 4000 transmissions, and the Low range in 4700/4800 transmissions. PCS1 does not control clutches for Low range in the 3700 transmission.

Action Taken When the DTC Sets

When DTC P2724 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2724 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS1 controls C1. However, this code may also occur for any off-going clutch issue while C1 is commanded.

Tool Requirements:

- Allison DOC®

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DTC P2724 Pressure Control Solenoid (PCS) 1 Stuck On *(cont'd)*

- J-26417-A Pressure Gauge Set or equivalent

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine shaft speed 0-1 rpm in clutch test.
9. Check turbine shaft speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P2724?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P2724?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any HSD or LSDsolenoid with DTC P2724?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P2724 Pressure Control Solenoid (PCS) 1 Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2724 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*

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DTC P2724 Pressure Control Solenoid (PCS) 1 Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select 1st through 4th range at idle. Record main and apply pressure for C1 and C5. Record turbine shaft speed rpm. **NOTE:** Install remaining gauges in C2, C3, and C4 to verify clutches are exhausted while in 1st range. 5. Slowly increase engine speed until attaining at least 1200 to 1500 rpm and record pressures and turbine shaft speed again. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Repeat task 4 and 5 for 2nd, 3rd, and 4th range. Record pressures in applied clutches, and turbine shaft speed. 7. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*

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DTC P2724 Pressure Control Solenoid (PCS) 1 Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace all solenoids in the control valve module. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2724 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Remove the transmission. Refer to the service manual. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2724 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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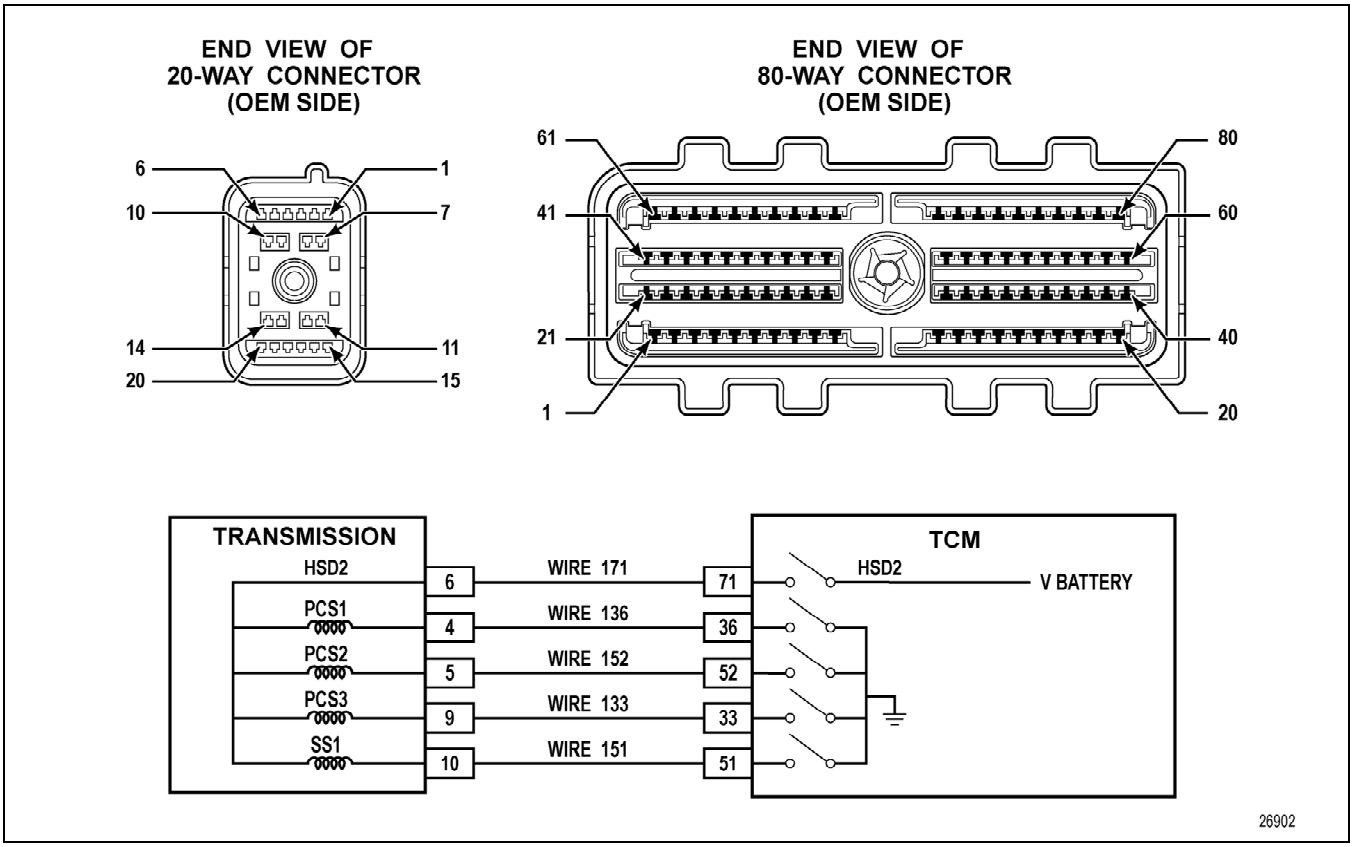
DTC P2727 Pressure Control Solenoid (PCS) 1 Control Circuit Open



Circuit Description

DTC P2727 indicates that the TCM has detected an open condition in the PCS1 electrical circuit. The open condition may exist in the high side (wire 171) or low side (wire 136).

Action Taken When the DTC Sets

When DTC P2727 is active:

- If failure occurs while in a forward range, then the transmission shifts to another forward range. If failure occurs while in Neutral (N), transmission remains in Neutral (N). If failure occurs while in Reverse (R), transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2727 can be caused by:

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DTC P2727 Pressure Control Solenoid (PCS) 1 Control Circuit Open *(cont'd)*

- PCS1 issues such as:
  - W136 high resistance or an open circuit in chassis harness.
  - W136 (terminal 4 of 20-way) high resistance or an open circuit in internal transmission harness.
  - PCS1 defective.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W136 in chassis harness for open or high resistance.
4. Check TCM.
5. Check internal harness wire for PCS1 Low Side Driver (terminal 4) for high resistance or open.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P2727 Pressure Control Solenoid (PCS) 1 Control Circuit Open *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2727 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2669, P0964, or P0968 present or in history with active DTC P2727?		*Go to DTC P2669*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 4 and 6 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 36 and 71 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W136. Go to Step 7 after repairs are made.*

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DTC P2727 Pressure Control Solenoid (PCS) 1 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2727 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS1 from internal harness. 4. Install jumper wire between A and B terminals of PCS1 connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 4 and 6 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 4 to terminal 6 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS1 to internal harness connector. 4. Measure resistance between terminals 4 and 6 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–46 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–46	*Go to Step 7*	*Replace PCS1 that is not within specification. Go to Step 7*

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DTC P2727 Pressure Control Solenoid (PCS) 1 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2727 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

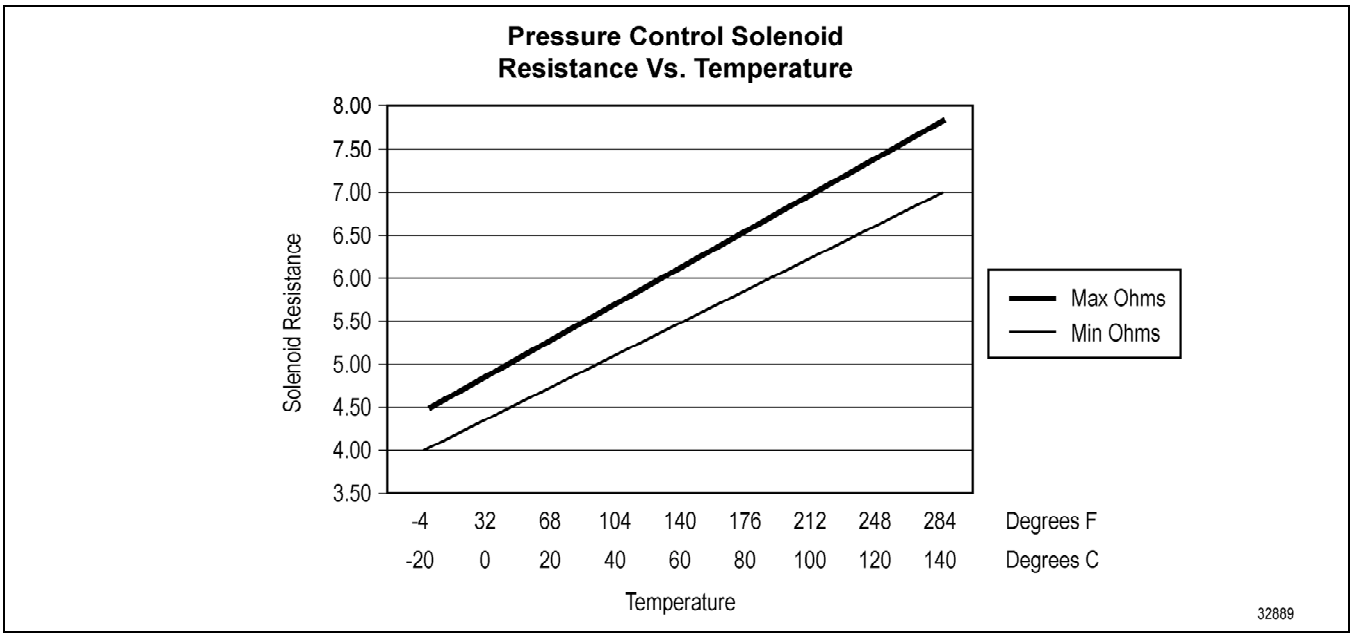

Figure 5–46. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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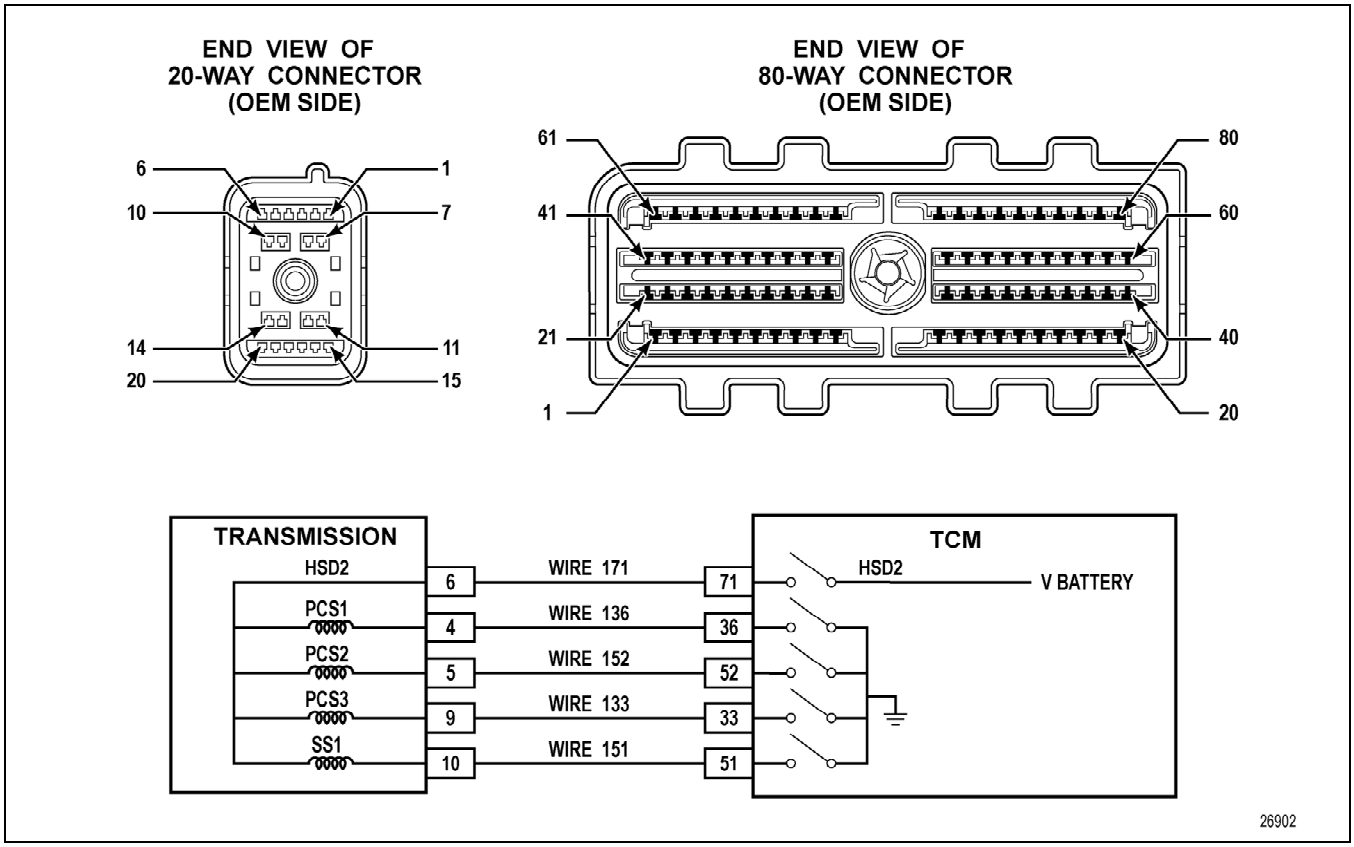
DTC P2729 Pressure Control Solenoid (PCS) 1 Control Circuit Low



Circuit Description

DTC P2729 indicates that the TCM has detected a failed low condition in the PCS1 electrical circuit. The condition may exist in the high side (wire 171) or low side (wire 136).

Action Taken When the DTC Sets

When DTC P2729 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

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DTC P2729 Pressure Control Solenoid (PCS) 1 Control Circuit Low *(cont'd)*

Diagnostic Aids

DTC P2729 can be caused by:

- PCS1 issues such as:
  - W136 shorted to another wire or ground in chassis harness.
  - W136 (terminal 4 of 20-way) shorted to another wire or ground in internal transmission harness.
  - PCS1 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information inSection 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W136 in chassis harness for short to another wire or to chassis.
4. Check TCM.
5. Check internal harness wire for PCS1 Low Side Driver (terminal 4) for short to another wire or control module.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P2729 Pressure Control Solenoid (PCS) 1 Control Circuit Low *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2729 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2670, P0966, P0970, or P0973 present or in history with active DTC P2729?		*Go to DTC P2670*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 36 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 36 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W136. Go to Step 7 after repairs are made.*

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DTC P2729 Pressure Control Solenoid (PCS) 1 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2729 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS1 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 4 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 4 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS1 to internal harness connectors. 4. Measure resistance between terminals 1 and 4 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–47 after tool resistance is subtracted from J-46708 DMM reading?	Figure 5–47	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P2729 Pressure Control Solenoid (PCS) 1 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2729 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

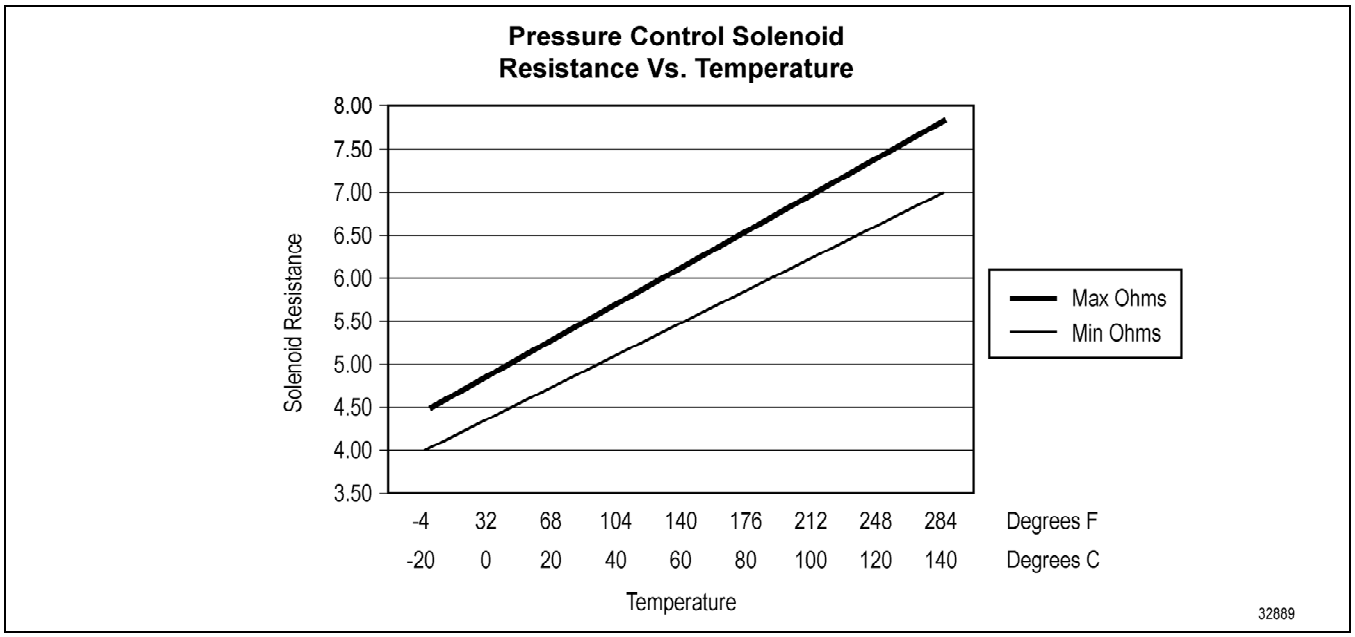

Figure 5–47. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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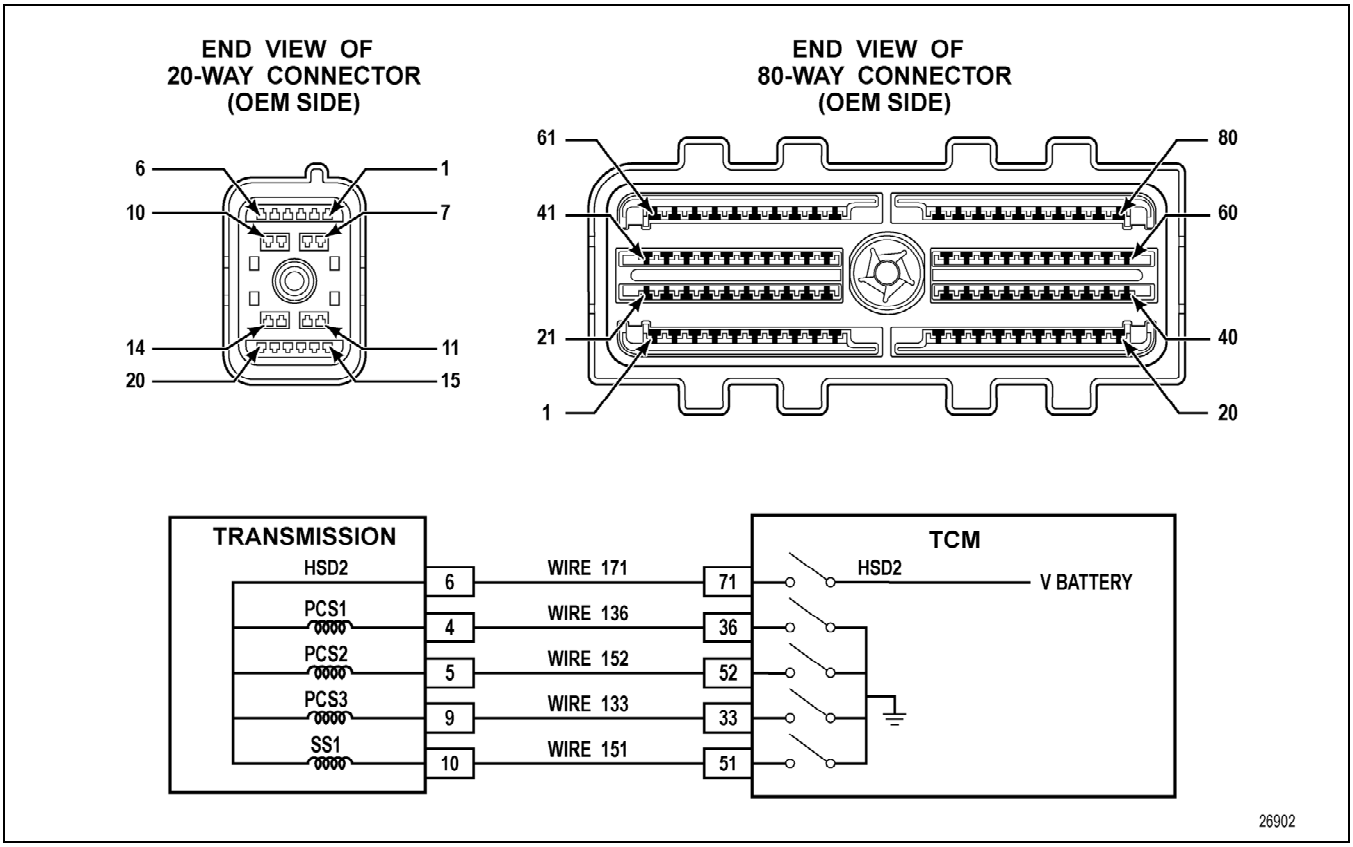
DTC P2730 Pressure Control Solenoid (PCS) 1 Control Circuit High



Circuit Description

DTC P2730 indicates that the TCM has detected a failed high condition in the PCS1 electrical circuit.

Action Taken When the DTC Sets

When DTC P2730 is active:

- If failure occurs while in a forward range, then shifts to another forward range. If failure occurs while in Neutral (N), the transmission remains in Neutral (N). If failure occurs while in Reverse (R), the transmission remains in Reverse (R) or shifts to Neutral (N). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2730 can be caused by:

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DTC P2730 Pressure Control Solenoid (PCS) 1 Control Circuit High *(cont'd)*

- PCS1 issues such as:
  - W136 shorted to another wire in chassis harness.
  - W136 (terminal 4 of 20-way) shorted to another wire in internal transmission harness.
  - PCS1 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W136 in chassis harness for short to another wire.
4. Check TCM.
5. Check internal harness wire for PCS1 Low Side Driver (terminal 4) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P2730 Pressure Control Solenoid (PCS) 1 Control Circuit High *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2730 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2671, P0967, P0971, or P0974 present or in history with active DTC P2730?		*Go to DTC P2671*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 36 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 36 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W136. Go to Step 7 after repairs are made.*

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DTC P2730 Pressure Control Solenoid (PCS) 1 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2730 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS1 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 4 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 4 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS1 to internal harness connectors. 4. Measure resistance between terminals 1 and 5 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–48 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–48	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P2730 Pressure Control Solenoid (PCS) 1 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2730 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

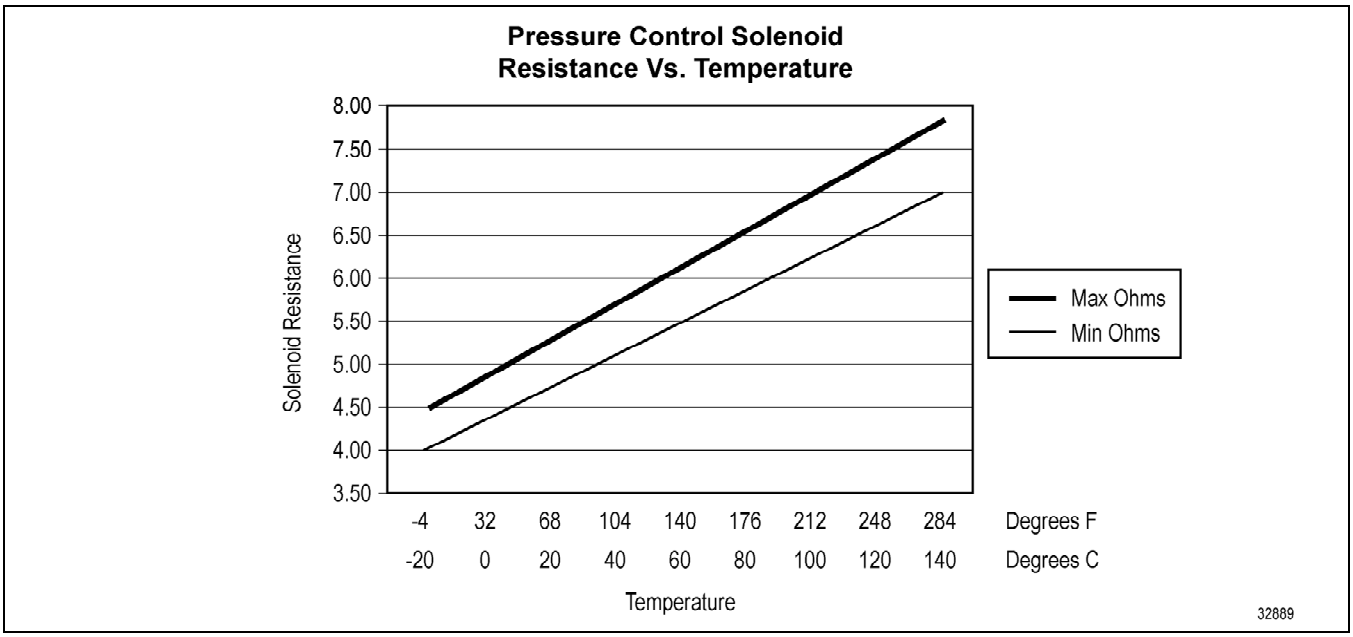

Figure 5–48. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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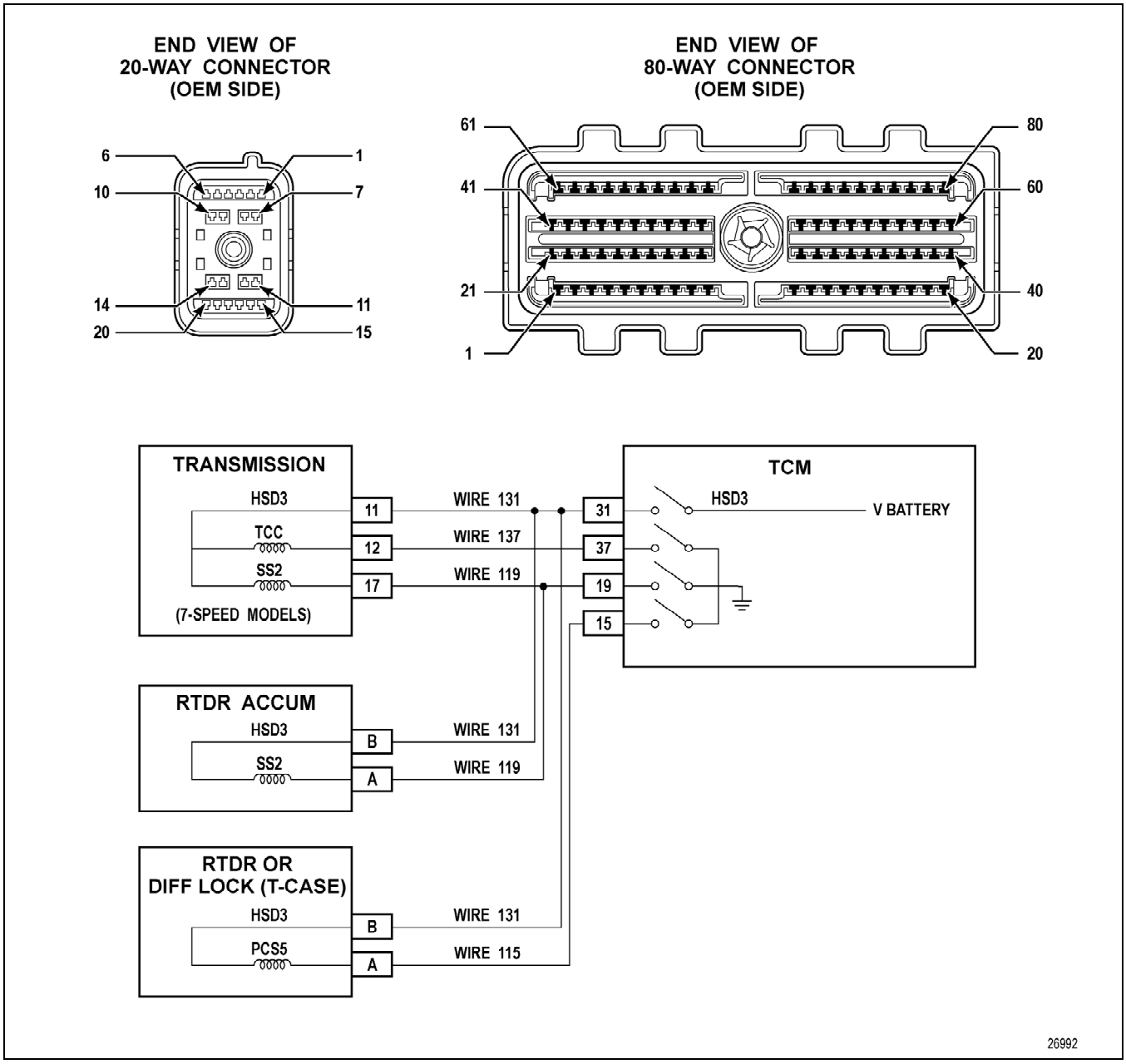
DTC P2736 Pressure Control Solenoid (PCS) 5 Control Circuit Open



Circuit Description

Pressure Control Solenoid 5 (PCS5) is a normally closed solenoid used to apply the retarder solenoid or differential lock solenoid (3700 models). DTC P2736 indicates that the TCM has detected a high resistance or open condition in the low side of the PCS5 electrical circuit.

Action Taken When the DTC Sets

When DTC P2736 is active:

- For 7-speed models, limit ranges to Reverse (R), Neutral (N) and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.

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DTC P2736 Pressure Control Solenoid (PCS) 5 Control Circuit Open *(cont'd)*

- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2736 can be caused by:

- PCS5 issues such as W115 high resistance or open circuit in the chassis harness.
- Defective PCS5.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.
3. Check W115 in chassis harness for high resistance or open.
4. Check if retarder model.
5. Check retarder solenoid (PCS5) resistance.
6. Check if 3700 model.
7. Check diff lock solenoid (PCS5) resistance.
8. Check TCM.

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DTC P2736 Pressure Control Solenoid (PCS) 5 Control Circuit Open *(cont'd)*

9. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2736 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 9*
2	Are there any active or inactive DTCs P2684, P0975, or P2761 present or in history with active DTC P2736?		*Go to DTC P2684*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect PCS5 (retarder solenoid for retarders, diff lock solenoid for 7-speed) from chassis harness. 5. Install a jumper wire between terminals A and B of the PCS5 connector. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminal 15 and 31 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address high resistance or open issue with OEM harness wire. Go to Step 9*
4	Is transmission a retarder model?		*Go to Step 5*	*Go to Step 6*

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DTC P2736 Pressure Control Solenoid (PCS) 5 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect retarder solenoid (PCS5) to OEM chassis harness. 5. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–49 for the retarder solenoid (PCS5) after tool resistance is subtracted from J-46708 DMM reading?	Figure 5–49	*Go to Step 8*	*Replace retarder solenoid (PCS5) that is not within specification. Go to Step 9*
6	Is transmission a 3700 model?		*Go to Step 7*	*Go to Step 8*
7	1. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 2. Leave J-47275-1 Magnetic Overlay installed. 3. Connect diff lock solenoid (PCS5) to OEM chassis harness. 4. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for the solenoid in Figure 5–50 after tool resistance is subtracted from J-46708 DMM reading?	Figure 5–50	*Go to Step 8*	*Replace diff lock solenoid (PCS5) that is not within specification. Go to Step 9*
8	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2736 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 9 after repairs are made.*	*If DTC active with both test TCM and original TCM, do not replace TCM. Go to Step 9*

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DTC P2736 Pressure Control Solenoid (PCS) 5 Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC®snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2736 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

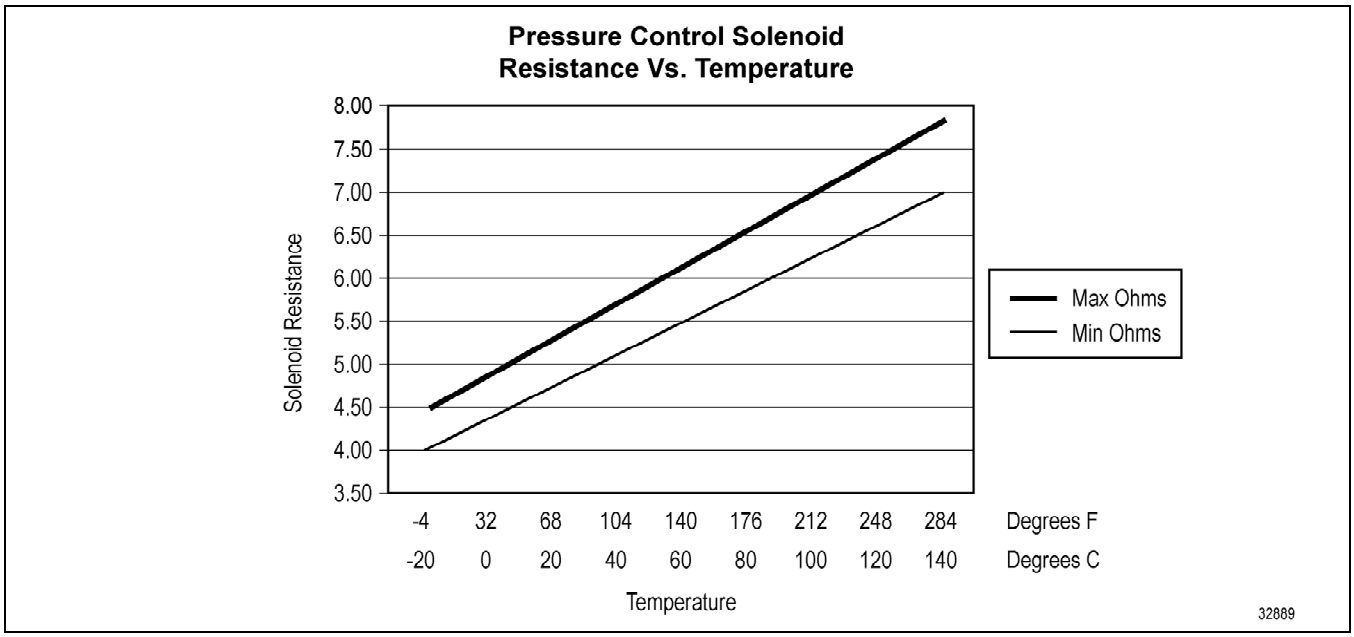

Figure 5–49. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5Retarder Only, PCS6

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DTC P2736 Pressure Control Solenoid (PCS) 5 Control Circuit Open *(cont'd)*

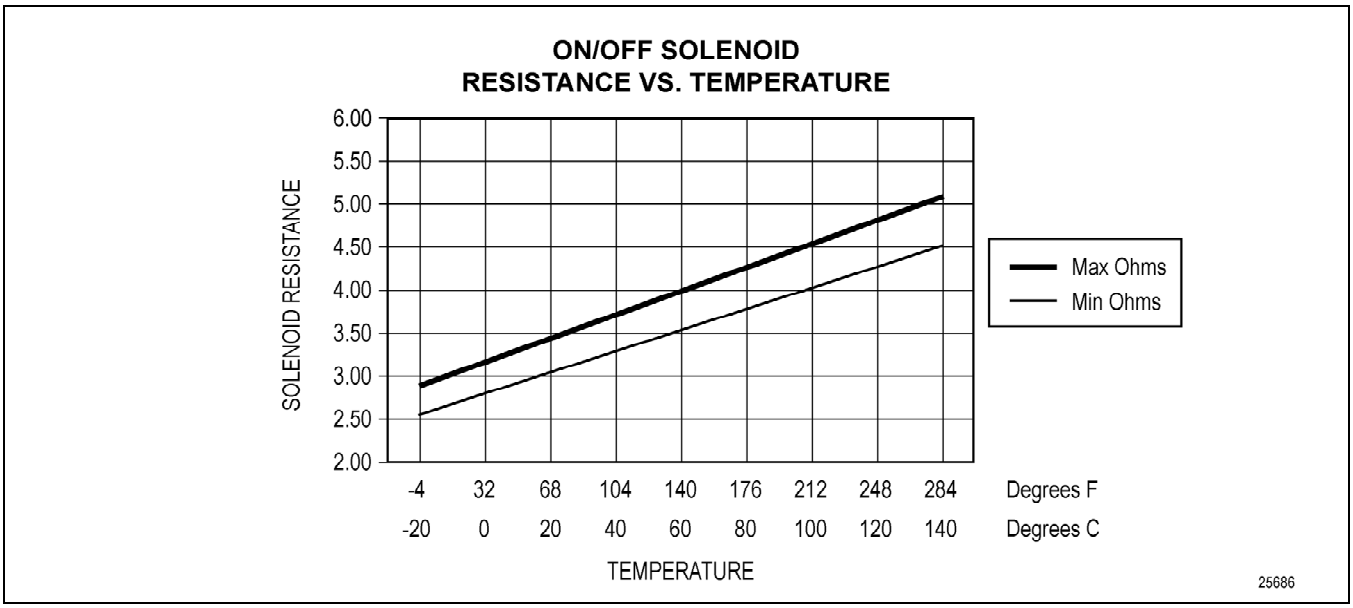

Figure 5–50. ON/OFF Solenoid–SS1, SS2(7-Speed Only), PCS5 (Differential Lock 3700 Only)

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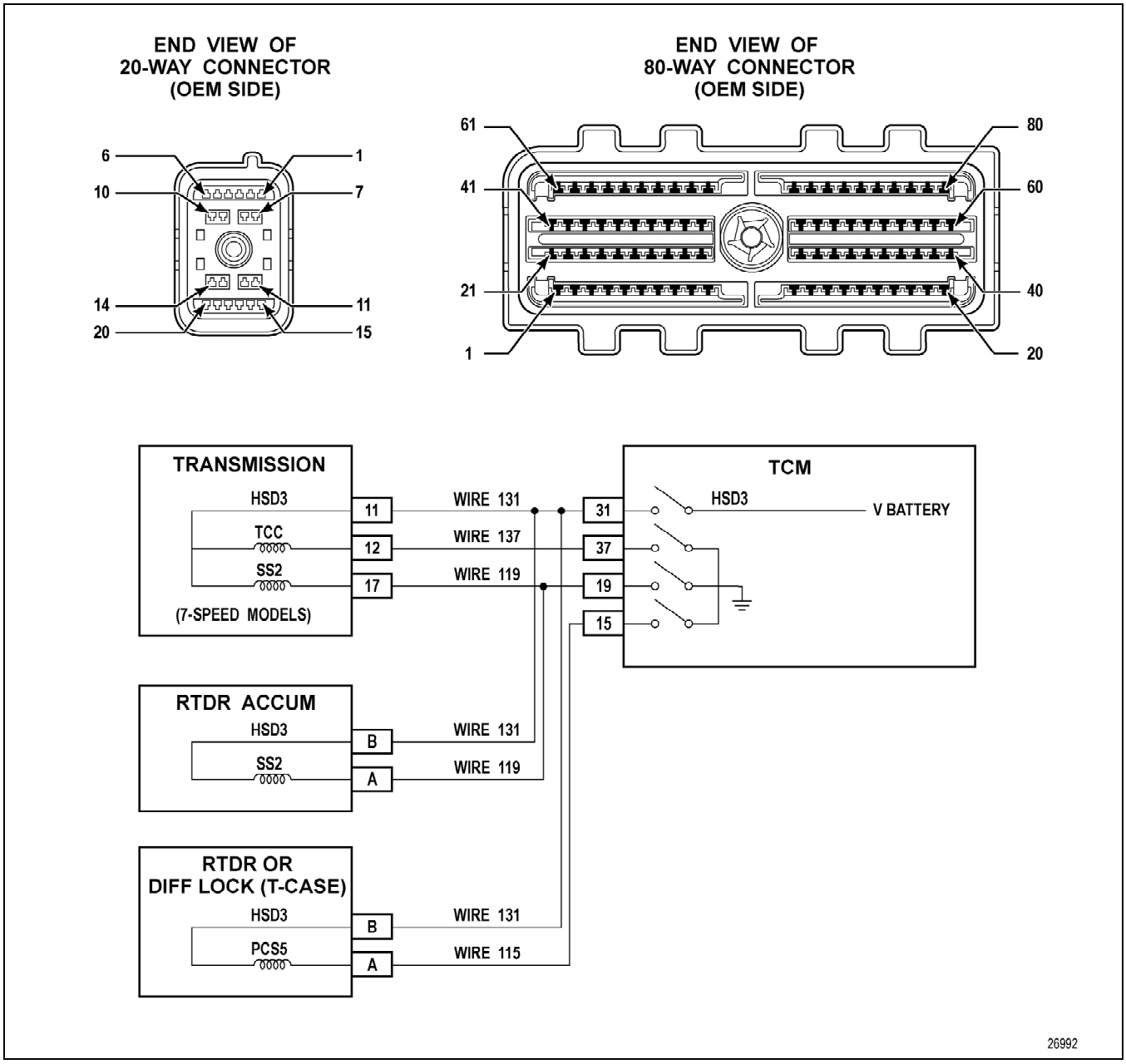
DTC P2738 Pressure Control Solenoid (PCS) 5 Control Circuit Low



Circuit Description

Pressure Control Solenoid 5 (PCS5) is a normally closed solenoid used to apply the retarder solenoid or differential lock solenoid (3700 models). DTC P2738 indicates that the TCM has detected a short-to-ground condition in the low side of the PCS5 electrical circuit.

Action Taken When the DTC Sets

When DTC P2738 is active:

- For 7-speed models, limit ranges to Reverse (R), Neutral (N) and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.

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DTC P2738 Pressure Control Solenoid (PCS) 5 Control Circuit Low *(cont'd)*

- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2738 can be caused by:

- PCS5 issues such as W115 shorted to another wire in the chassis harness or to chassis ground.
- Defective PCS5.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.
3. Check W115 in chassis harness for short to another wire or to chassis ground.
4. Check if retarder model.
5. Check retarder solenoid (PCS5) resistance.
6. Check if 3700 model.
7. Check diff lock solenoid (PCS5) resistance.
8. Check TCM.

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DTC P2738 Pressure Control Solenoid (PCS) 5 Control Circuit Low *(cont'd)*

9. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2738 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 9*
2	Are there any active or inactive DTCs P2685, P0976, or P2764 present or in history with active DTC P2738?		*Go to DTC P2685*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Using a J-46708 Digital Multimeter, measure the resistance between terminal 15 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 15 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W115. Go to Step 9 after repairs are made.*
4	Is transmission a retarder model?		*Go to Step 5*	*Go to Step 6*

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DTC P2738 Pressure Control Solenoid (PCS) 5 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect retarder solenoid (PCS5) to OEM chassis harness. 5. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–51 for the retarder solenoid (PCS5) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–51	*Go to Step 8*	*Replace retarder solenoid (PCS5) that is not within specification. Go to Step 9*
6	Is transmission a 3700 model?		*Go to Step 7*	*Go to Step 8*
7	1. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 2. Leave J-47275-1 Magnetic Overlay installed. 3. Connect diff lock solenoid (PCS5) to OEM chassis harness. 4. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for the solenoid in Figure 5–52 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–52	*Go to Step 8*	*Replace diff lock solenoid (PCS5) that is not within specification. Go to Step 9*
8	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2738 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 9 after repairs are made.*	*If DTC active with both test TCM and original TCM, do not replace TCM. Go to Step 9*

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DTC P2738 Pressure Control Solenoid (PCS) 5 Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2738 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

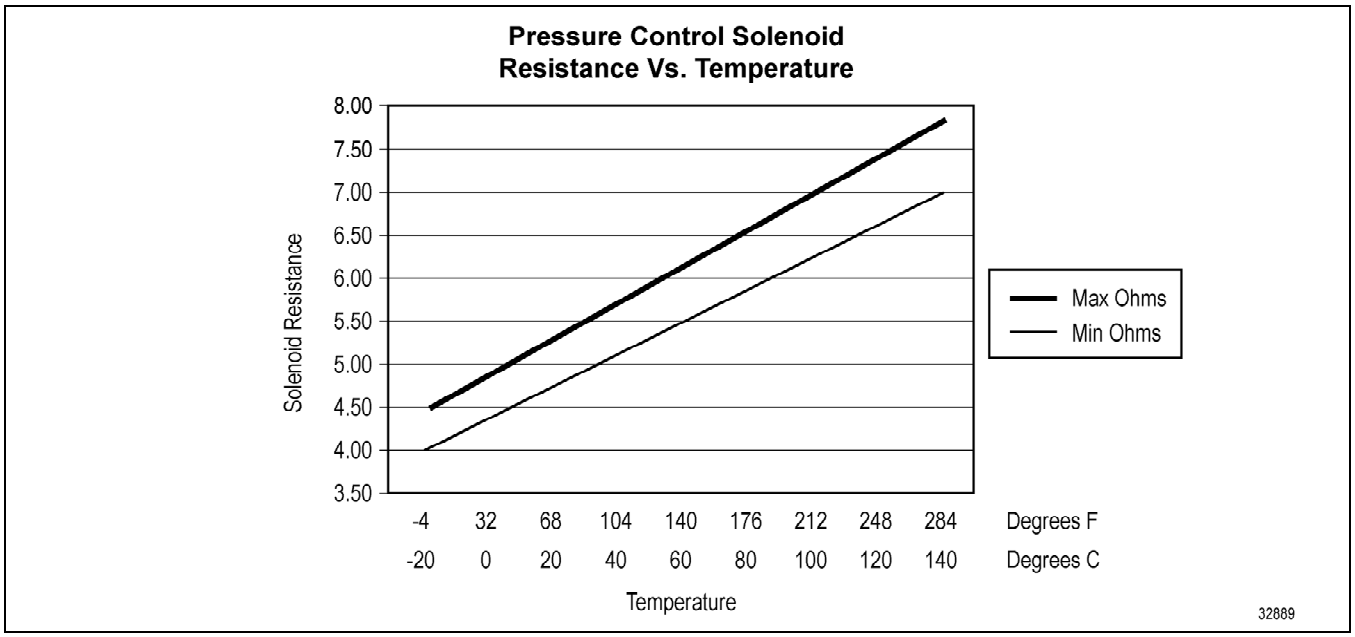

Figure 5–51. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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DTC P2738 Pressure Control Solenoid (PCS) 5 Control Circuit Low *(cont'd)*

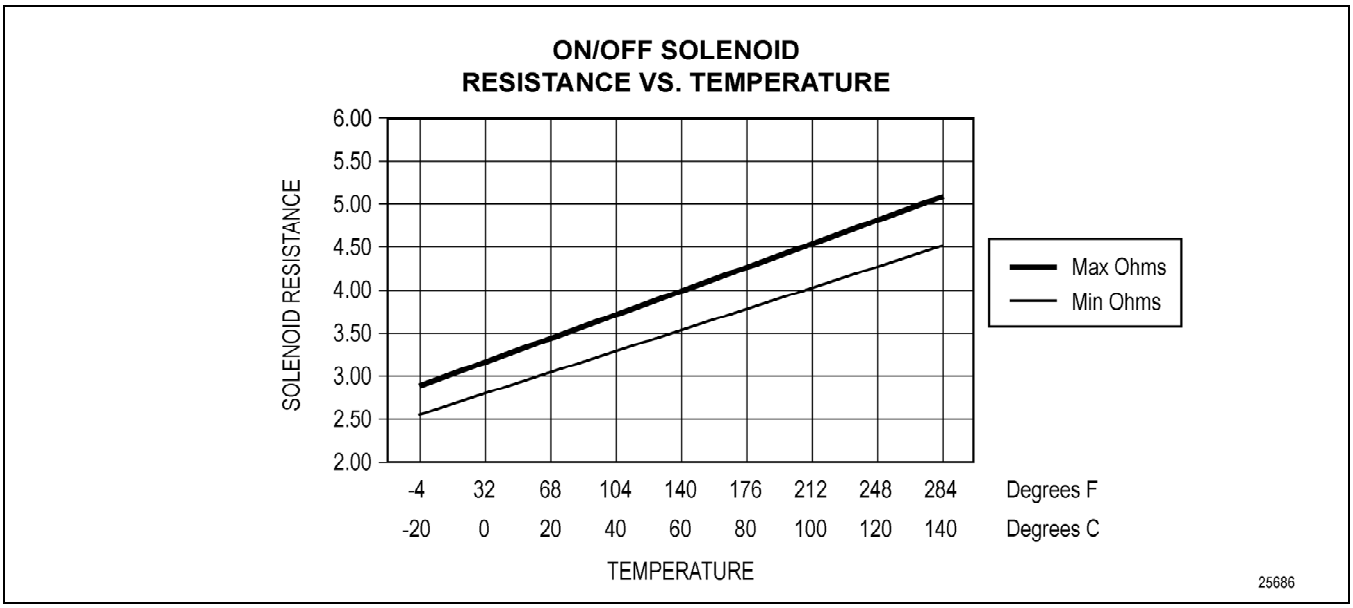

Figure 5–52. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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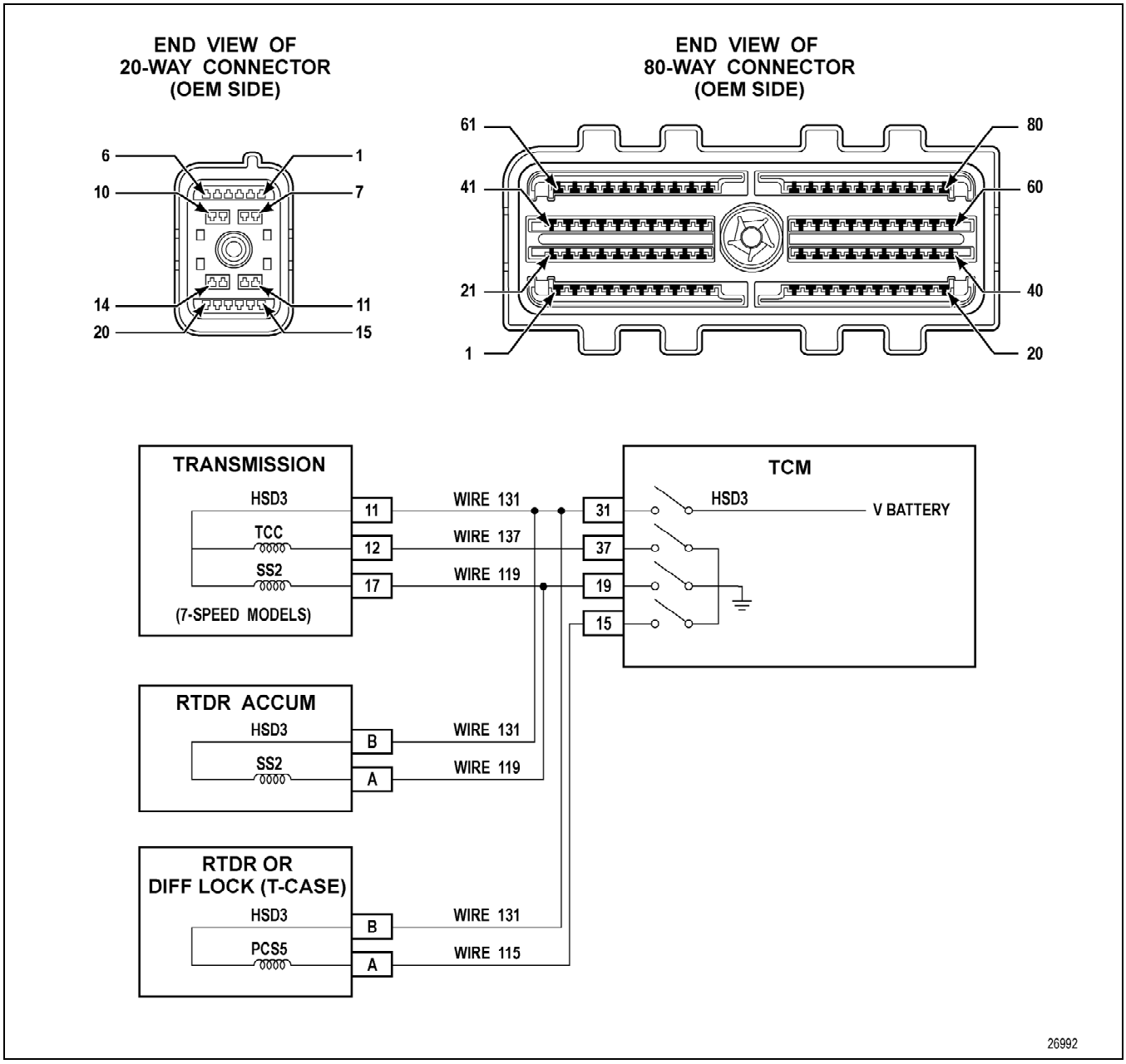
DTC P2739 Pressure Control Solenoid (PCS) 5 Control Circuit High



Circuit Description

Pressure Control Solenoid 5 (PCS5) is a normally closed solenoid used to apply the retarder solenoid or differential lock solenoid (3700 models). DTC P2739 indicates that the TCM has detected a failed high condition in the low side of the PCS5 electrical circuit.

Action Taken When the DTC Sets

When DTC P2739 is active:

- For 7-speed models, limit ranges to Reverse (R), Neutral (N) and ranges 2-6 operation.
- TCM commands retarder OFF.
- The TCM inhibits TCC engagement.

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DTC P2739 Pressure Control Solenoid (PCS) 5 Control Circuit High *(cont'd)*

- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2739 can be caused by:

- PCS5 issues such as W115 shorted to another wire in the chassis harness.
- Defective PCS5.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.
3. Check W115 in chassis harness for short to another wire.
4. Check if retarder model.
5. Check retarder solenoid (PCS5) resistance.
6. Check if 3700 model.
7. Check diff lock solenoid (PCS5) resistance.
8. Check TCM.

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DTC P2739 Pressure Control Solenoid (PCS) 5 Control Circuit High *(cont'd)*

9. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2739 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 9*
2	Are there any active or inactive DTCs P2686, P0977, or P2763 present or in history with active DTC P2739?		*Go to DTC P2686*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect PCS5 solenoid (retarder solenoid for retarders, diff-lock solenoid for 7-speed) from chassis harness. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminal 15 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 15 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W115. Go to Step 9 after repairs are made.*
4	Is transmission a retarder model?		*Go to Step 5*	*Go to Step 6*

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DTC P2739 Pressure Control Solenoid (PCS) 5 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Connect retarder solenoid (PCS5) to OEM chassis harness. 5. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications shown in Figure 5–53 for the retarder solenoid (PCS5) after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–53	*Go to Step 8*	*Replace retarder solenoid (PCS5) that is not within specification. Go to Step 9*
6	Is transmission a 3700 model?		*Go to Step 7*	*Go to Step 8*
7	1. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 2. Leave J-47275-1 Magnetic Overlay installed. 3. Connect diff lock solenoid (PCS5) to OEM chassis harness. 4. Measure resistance between terminals 15 and 31 at J-47275-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for the solenoid in Figure 5–54 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–54	*Go to Step 8*	*Replace diff lock solenoid (PCS5) that is not within specification. Go to Step 9*
8	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2739 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 9 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 9*

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DTC P2739 Pressure Control Solenoid (PCS) 5 Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
9	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2739 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

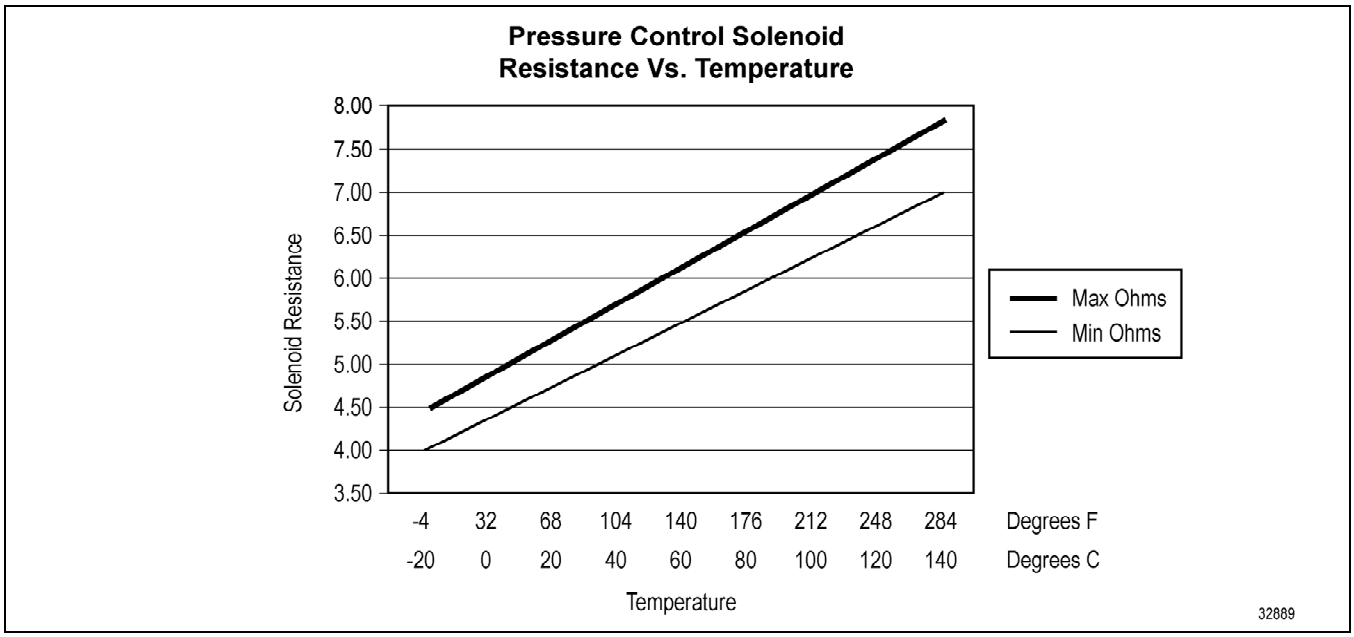

Figure 5–53. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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DTC P2739 Pressure Control Solenoid (PCS) 5 Control Circuit High *(cont'd)*

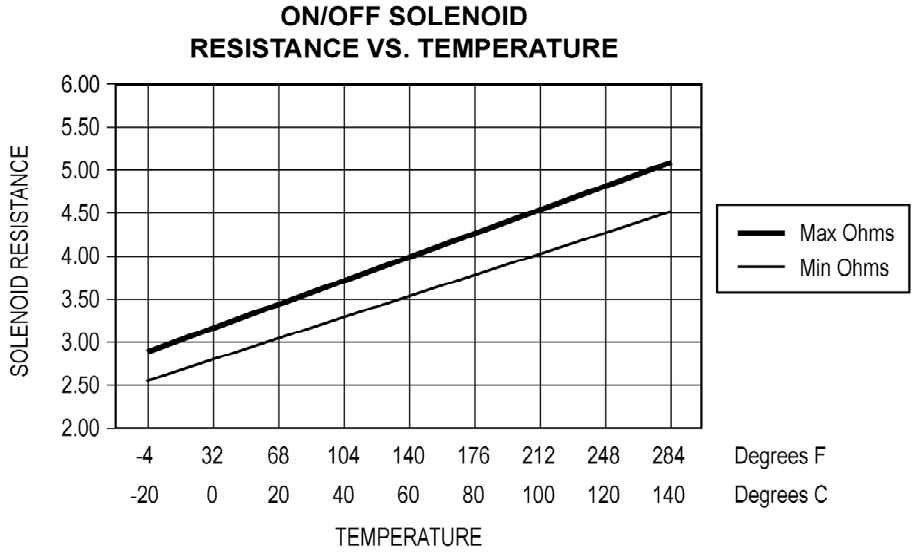

Figure 5–54. ON/OFF Solenoid–SS1, SS2 (7-Speed Only), PCS5 (Differential Lock 3700SPS Only)

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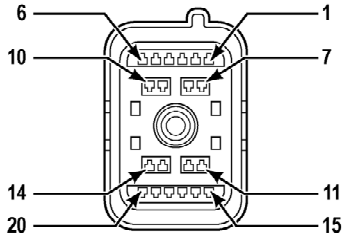
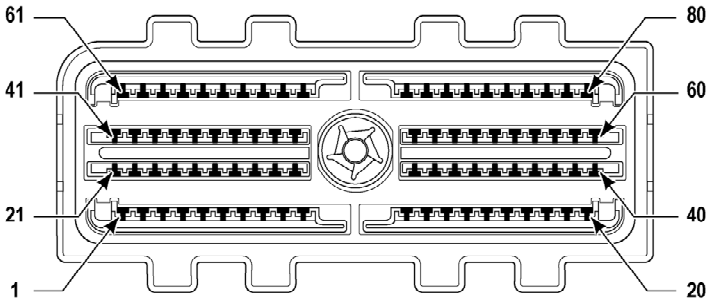
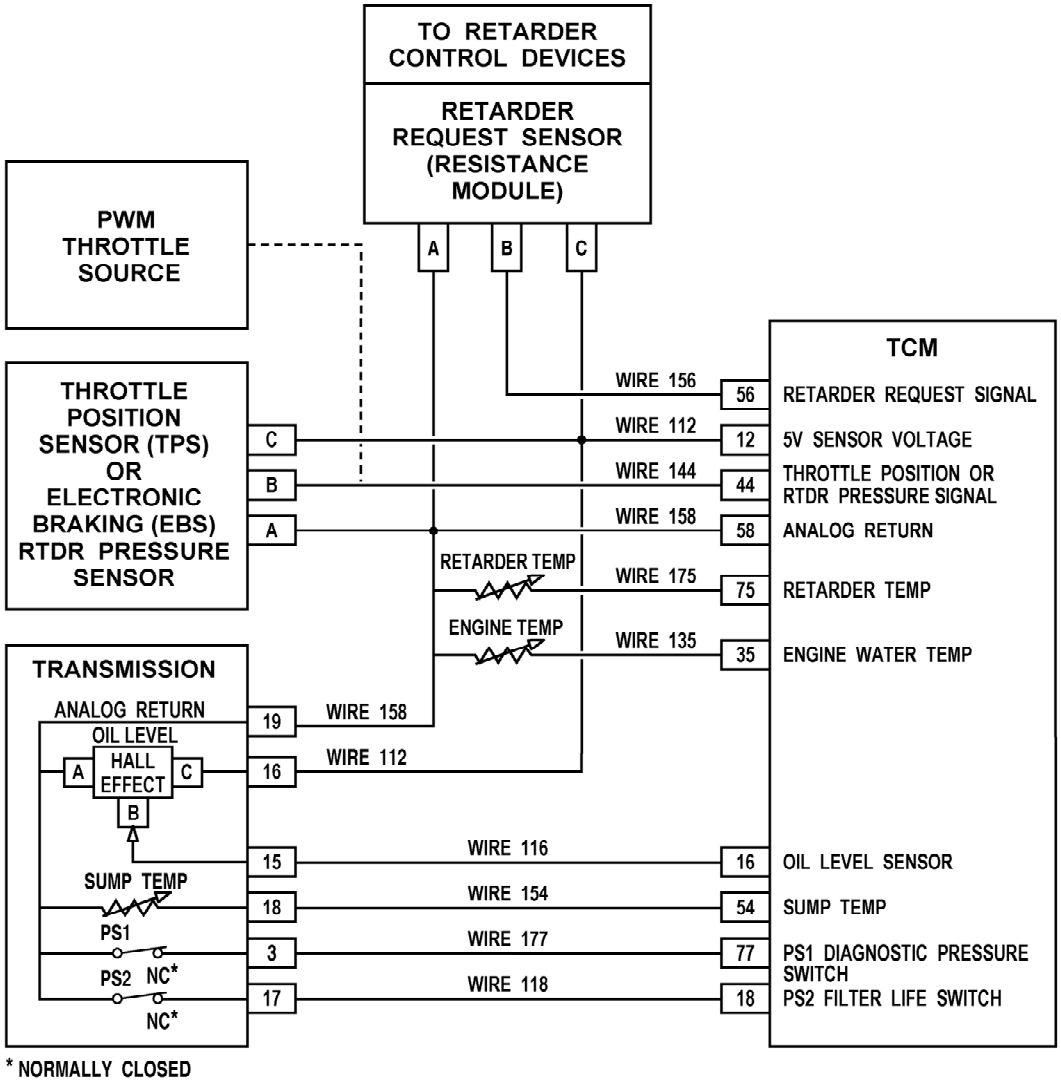
DTC P273F Retarder Oil Temperature Sensor Over Temperature Condition

END VIEW OF
20-WAY CONNECTOR
(OEM SIDE)



END VIEW OF
80-WAY CONNECTOR
(OEM SIDE)





266597

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DTC P273F Retarder Oil Temperature Sensor Over Temperature Condition *(cont'd)*

Circuit Description

A retarder Transmission Fluid Temperature (TFT) sensor monitors retarder cavity fluid temperature. This diagnostic test detects high transmission fluid temperature in the retarder cavity.

Action Taken When the DTC Sets

When DTC P273F is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- Retarder command reduced.

Conditions for Clearing the DTC/CHECK TRANS Light

The DTC goes inactive and the TCM cancels the DTC active actions when the retarder TFT sensor signals that the fluid temperature is below 166°C (331°F) for 10 seconds or more.

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

NOTE: DTC may occur in vehicles with history of DTC P2742. Follow the diagnostic steps in DTC P2742 before proceeding to the diagnostic steps for this DTC. Repairing the condition that sets DTC P2742 will likely eliminate this DTC.

DTC P273F may be caused by:

- Incorrect transmission fluid fill.
- Defective retarder TFT sensor.
- Defective TCM.
- Transmission fluid temperature in retarder reaching over 166°C (331°F) for 10 seconds.
- Inadequate or obstructed vehicle cooling system.
- Non-bypassed engine coolant thermostats that are not opening in time may cause overheat condition for transmission fluid temperature. Monitor retarder fluid temperature using Allison DOC® and review transmission overheat and retarder information in Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS.

The retarder TFT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if retarder TFT sensor resistance is increasing, decreasing, or stationary with fluctuations in fluid temperature. Normal circuit operation is indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

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DTC P273F Retarder Oil Temperature Sensor Over Temperature Condition *(cont'd)*

Using the Allison DOC®, monitor the transmission fluid temperature to verify that it rises in cycles and then stabilizes. Monitor and record snapshot fluid temperature.

Follow transmission overheat troubleshooting in7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS for problem: OVERHEATING INDICATED BY DTCs P0218, P273F OR FLUID CONDITION, and if equipped with a retarder follow problem RETARDER FEELS WEAK.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Is DTC P273F in history or active?
2. Check if DTC can be duplicated in snapshot if not currently active.
3. Check fluid level.
4. Conduct 30 minute idle in drive test.
5. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Is DTC P2742 active or shown in history?		*Go to DTC P2742*	*Go to Step 2*
2	1. Install the Allison DOC®. 2. Start the engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P273F active?		*Go to Step 3*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 5*

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DTC P273F Retarder Oil Temperature Sensor Over Temperature Condition *(cont'd)*

Step	Action	Value(s)	Yes	No
3	**NOTE:** Low or high fluid level can cause DTC P273F. 1. With the engine at idle, transmission in **N** (Neutral), and the park brake set, check the transmission fluid level using the Oil Level Sensor (OLS) if equipped or the dipstick. 2. Turn ignition OFF. 3. Add or remove fluid as necessary. 4. Start the engine and recheck fluid level. 5. Duplicate conditions from failure record. 6. Check for active DTC P273F. Is DTC P273F active?		*Go to Step 4*	*Go to Step 5*
4	**NOTE:** For complete procedures, steps, and specifications to conduct a cooling test, refer to Applications Technical Document TD157, on the Allison Extranet. Can vehicle idle in drive for 30 minutes at a stop without setting active DTC P0218?		*See Problem RETARDER FEELS WEAK in 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS. After checking for issues, go to Step 5*	*Go to DTC P0218*
5	Verify repair: 1. Clear the DTC. 2. Using Allison DOC®, record snapshot of transmission fluid temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in retarder TFT sensor. Did DTC P273F return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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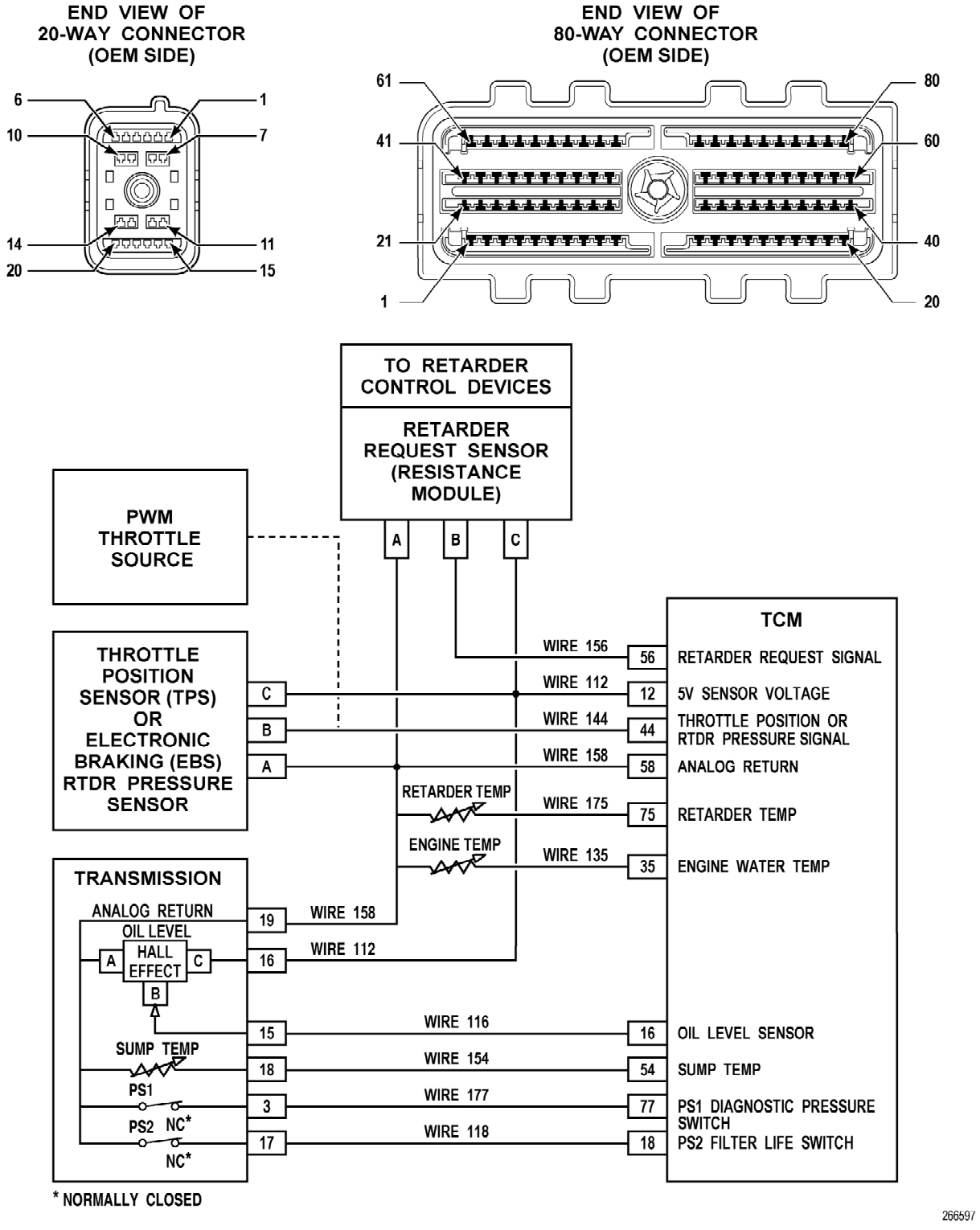
DTC P2742 Retarder Oil Temperature Sensor Circuit Low



Circuit Description

A retarder Transmission Fluid Temperature (TFT) sensor monitors retarder cavity fluid temperature. This diagnostic test determines if the retarder temperature sensor signal is in the failed low error zone.

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DTC P2742 Retarder Oil Temperature Sensor Circuit Low *(cont'd)*

Actions Taken When the DTC Sets

When DTC P2742 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM uses default retarder temperature values.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2742 may be caused by:

- Incorrect transmission fluid fill.
- W175 shorted to ground, or shorted to another wire in chassis harness.
- Broken or defective connector assemblies that cause pins to short together.
- Unlocked connectors, missing or damaged seals, missing seal plugs that allow moisture into connectors.
- Defective retarder TFT sensor.
- Defective TCM.
- Transmission fluid temperature in retarder reaching over 201°C (394°F) for 10 seconds.
- Inadequate or obstructed vehicle cooling system.
- Non-bypassed engine coolant thermostats that are not opening in time may cause overheat condition for transmission fluid temperature. Monitor retarder fluid temperature using Allison DOC® and review transmission overheat and retarder information in Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS.

The retarder TFT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under the "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if retarder TFT sensor resistance is increasing, decreasing, or stationary with fluctuations in fluid temperature. Normal circuit operation is indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

Refer to DTC P273F and DTC P0218 or Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTSas guidelines for troubleshooting vehicle cooling issues.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box

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DTC P2742 Retarder Oil Temperature Sensor Circuit Low *(cont'd)*

- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check fluid level is correct.
3. Check W175 for short to ground, or short to another wire in chassis harness.
4. Check for active DTC.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2742 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 6*

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DTC P2742 Retarder Oil Temperature Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
2	**NOTE:** Low or high fluid level can cause DTC P2742. 1. With the engine at idle, transmission in **N** (Neutral), and the park brake set, check the transmission fluid level using the OLS (if equipped) or the dipstick. 2. Turn ignition **OFF**. 3. Add or remove fluid as necessary. 4. Start engine and recheck fluid level. 5. Check for active DTC P2742. Is DTC P2742 active?		*Go to Step 3*	*Go to Step 6*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 75 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 75 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Replace Retarder TFT sensor. Go to Step 4*	*Address issue with W175. Go to Step 6 after repairs are made.*
4	Is DTC P2742 active?		*Go to Step 5*	*Go to Step 6*
5	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2742 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 6*

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DTC P2742 Retarder Oil Temperature Sensor Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 3. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2742 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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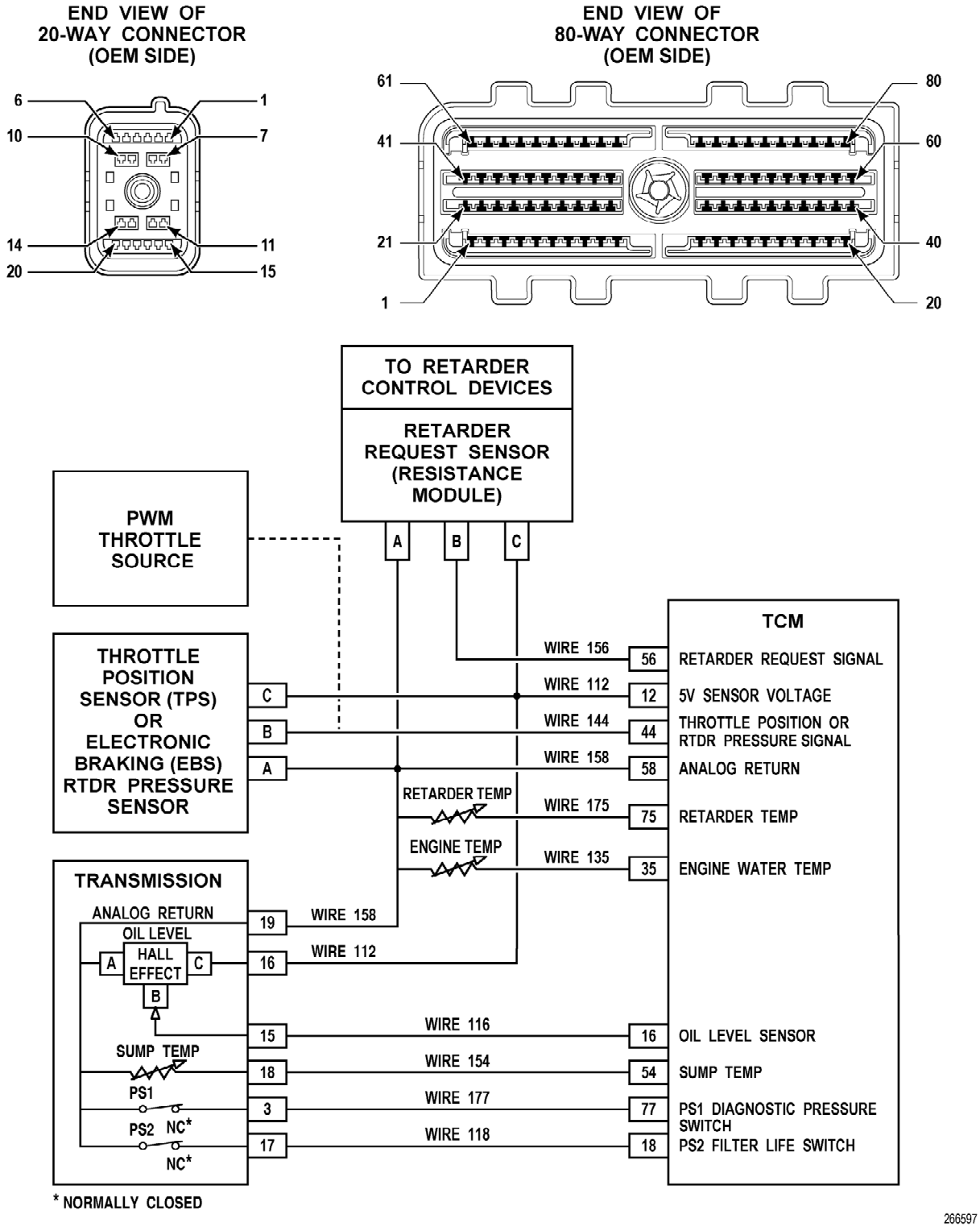
DTC P2743 Retarder Oil Temperature Sensor Circuit High



Circuit Description

A retarder Transmission Fluid Temperature (TFT) sensor monitors retarder cavity fluid temperature. This diagnostic test determines if the retarder temperature sensor signal is in the failed high error zone.

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DTC P2743 Retarder Oil Temperature Sensor Circuit High *(cont'd)*

Actions Taken When the DTC Sets

When DTC P2743 is active, the following conditions occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM uses default retarder temperature values.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

NOTE: If DTC P2743 is accompanied by DTC P0713 or P2185, check for short to battery on W135, W154 and W175. Follow DTC P0713 steps first, if in history with this DTC.

DTC P2743 may be caused by:

- Incorrect transmission fluid fill.
- W175 shorted to another wire in chassis harness.
- W175 open circuit in chassis harness.
- W158 open circuit in chassis harness.
- Broken or defective connector assemblies that cause pins to short together.
- Unlocked connectors, missing or damaged seals, missing seal plugs that allow moisture into connectors.
- Defective retarder TFT sensor.
- Defective TCM.

The retarder TFT sensor resistance is available on the Allison DOC® Data Monitor grid. Prior to 'Connect' for Allison DOC®, check the 'Troubleshoot Specific Problem' box under "Connection Options" and then check the 'Sensor, Voltage, Ohms, and Counts Data' box.

Check if retarder TFT sensor resistance is increasing, decreasing, or stationary with fluctuations in fluid temperature. Normal circuit operation is indicated if sensor resistance decreases as fluid temperature increases, and sensor resistance increases as fluid temperature decreases.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter

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DTC P2743 Retarder Oil Temperature Sensor Circuit High *(cont'd)*

- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for reference voltage with 20-way connector disconnected.
3. Check for reference voltage with 16-way bypass connector disconnected.
4. Check for open circuit in W175 or W158 in chassis harness.
5. Check W175 short to another wire in chassis harness.
6. Check TCM.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2743 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*

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DTC P2743 Retarder Oil Temperature Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Disconnect the OEM chassis harness 80-way connector from the TCM. 4. Connect OEM chassis harness to J-47275 TCM Breakout Harness 80-way harness. 5. Connect TCM side of J-47275 TCM Breakout Harness to the TCM. 6. Disconnect OEM transmission 20-way connector from transmission. 7. Connect 16-way bypass on J-47275 TCM Breakout Harness. 8. Turn ignition **ON** but do not start engine. 9. Install J-46708 Digital Multimeter and measure voltage between terminals 75 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Go to Step 4*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to TCM and OEM chassis harness. 3. Disconnect the 16-way bypass connector on J-47275 TCM Breakout Harness. 4. Leave OEM 20-way connector disconnected from transmission. 5. Leave J-46708 Digital Multimeter connected between terminals 75 (5V reference) and 58 (analog ground) at J-47275-1 Magnetic Overlay. 6. Turn ignition **ON** but do not start engine. 7. Measure voltage between terminals 75 and 58 at J-47275-1 Magnetic Overlay. Does voltage meet specification?	4.5-5.4V	*Address issue with W175 or W158. Go to Step 7 after repairs are made.*	*Go to Step 6*

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DTC P2743 Retarder Oil Temperature Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Leave J-47275 TCM Breakout Harness connected to J-39700 Universal Breakout Box. 3. Leave OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Disconnect TCM side of J-47275 TCM Breakout Harness from TCM. 5. Leave 20-way OEM transmission connector disconnected from the transmission. 6. Disconnect retarder TFT sensor from OEM harness. 7. Install a jumper wire between terminals A and B of retarder TFT sensor harness connector. 8. Using a J-46708 Digital Multimeter, measure the resistance between terminals 75 and 58 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 DMM reading?	4 Ω or less	*Go to Step 5*	*Address issue with W175, or W158. Go to Step 7 after repairs are made.*
5	1. Turn ignition **OFF**. 2. Leave chassis harness connected to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Leave OEM 20-way connector disconnected from transmission. 5. Disconnect retarder TFT sensor and engine water temp sensor if used as analog signal for transmission. 6. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 75 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. 7. Repeat task 6 using terminals 35 and 54 (if equipped). Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 75, 54, and 35 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Address issue with W175, W154, or W135. Go to Step 7 after repairs are made.*

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DTC P2743 Retarder Oil Temperature Sensor Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2743 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Replace retarder TFT sensor. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2743 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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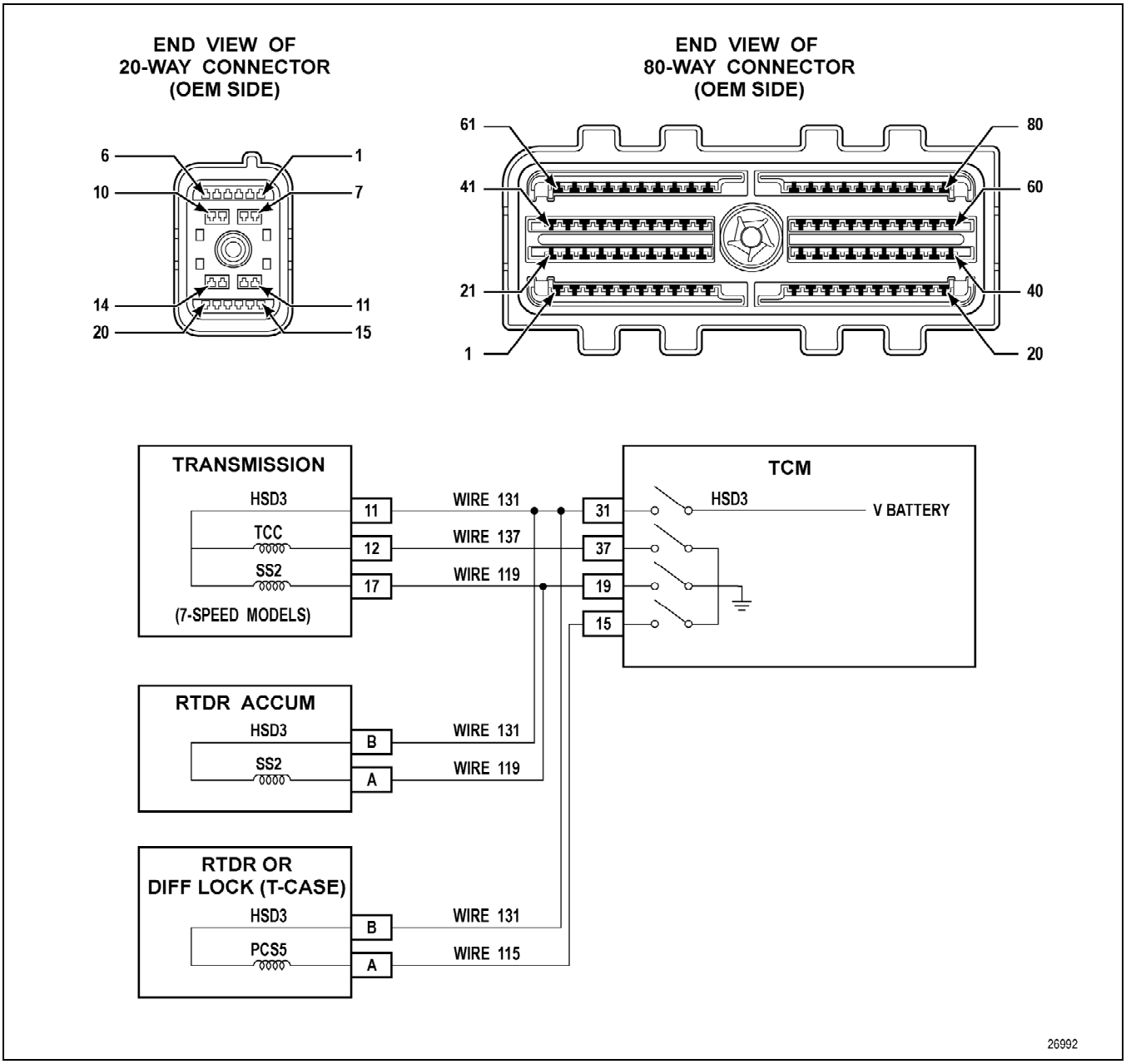
DTC P2761 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit–Open



Circuit Description

The TCC PCS is a normally closed solenoid used to apply the lockup clutch. DTC P2761 indicates that the DTC has detected a high resistance or an open condition in the low side of the TCC solenoid electrical circuit.

Action Taken When the DTC Sets

When DTC P2761 is active:

- The TCM inhibits TCC engagement.
- DTC is stored in the TCM history.

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DTC P2761 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit–Open *(cont'd)*

- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2761 can be caused by:

- TCC solenoid issues such as W137 high resistance or open circuit in the chassis harness.
- W137 (terminal 12 of 20-way) high resistance or an open circuit in internal transmission harness.
- Defective TCC solenoid.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279 Transmission Breakout Harness
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.
3. Check W137 in chassis harness for high resistance or open.
4. Check TCM.
5. Check internal harness.
6. Check TCC solenoid resistance.

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DTC P2761 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit–Open *(cont'd)*

7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2761 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2684, P0975, or P2736 present or in history with active DTC P2761?		*Go to DTC P2684*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 11 and 12 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 37 and 31 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W137. Go to Step 7 after repairs are made.*

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DTC P2761 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit–Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2761 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect TCC solenoid from internal harness. 4. Install jumper wire between A and B terminals of TCC solenoid connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 11 and 12 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 11 to terminal 12 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect TCC solenoid to internal harness connectors. 4. Measure resistance between terminals 11 and 12 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–55 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–55	*Go to Step 7*	*Replace TCC solenoid that is not within specification. Go to Step 7*

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DTC P2761 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit–Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2761 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

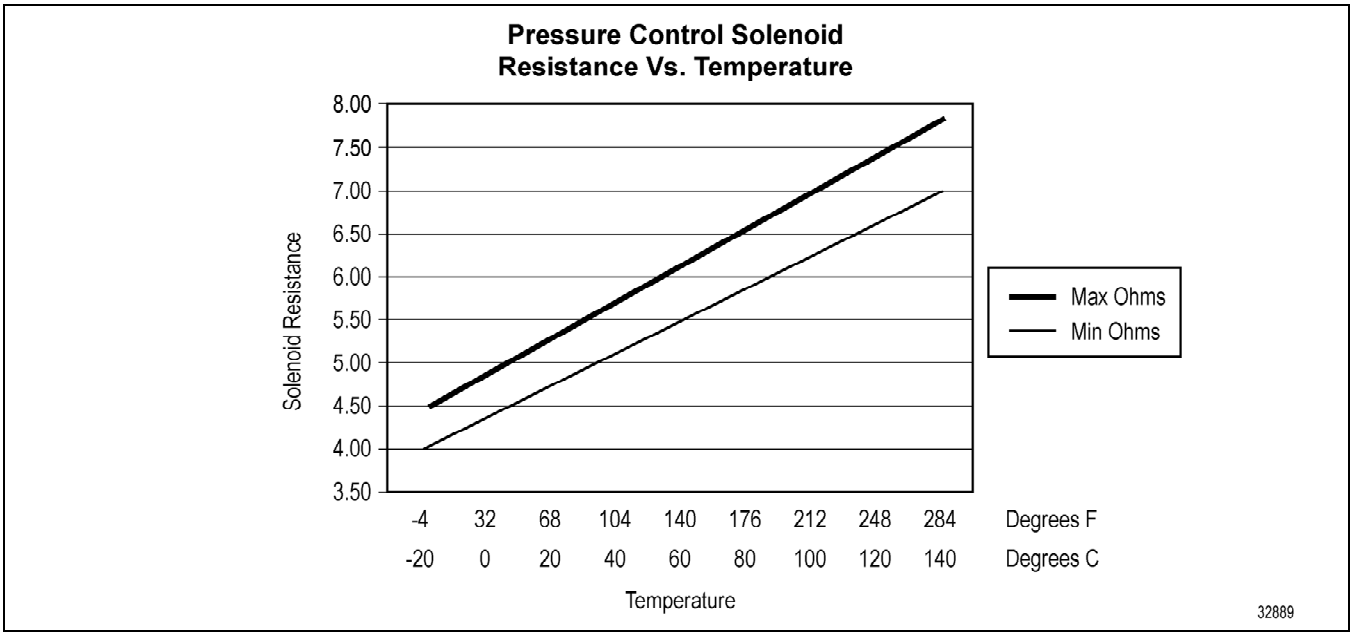

Figure 5–55. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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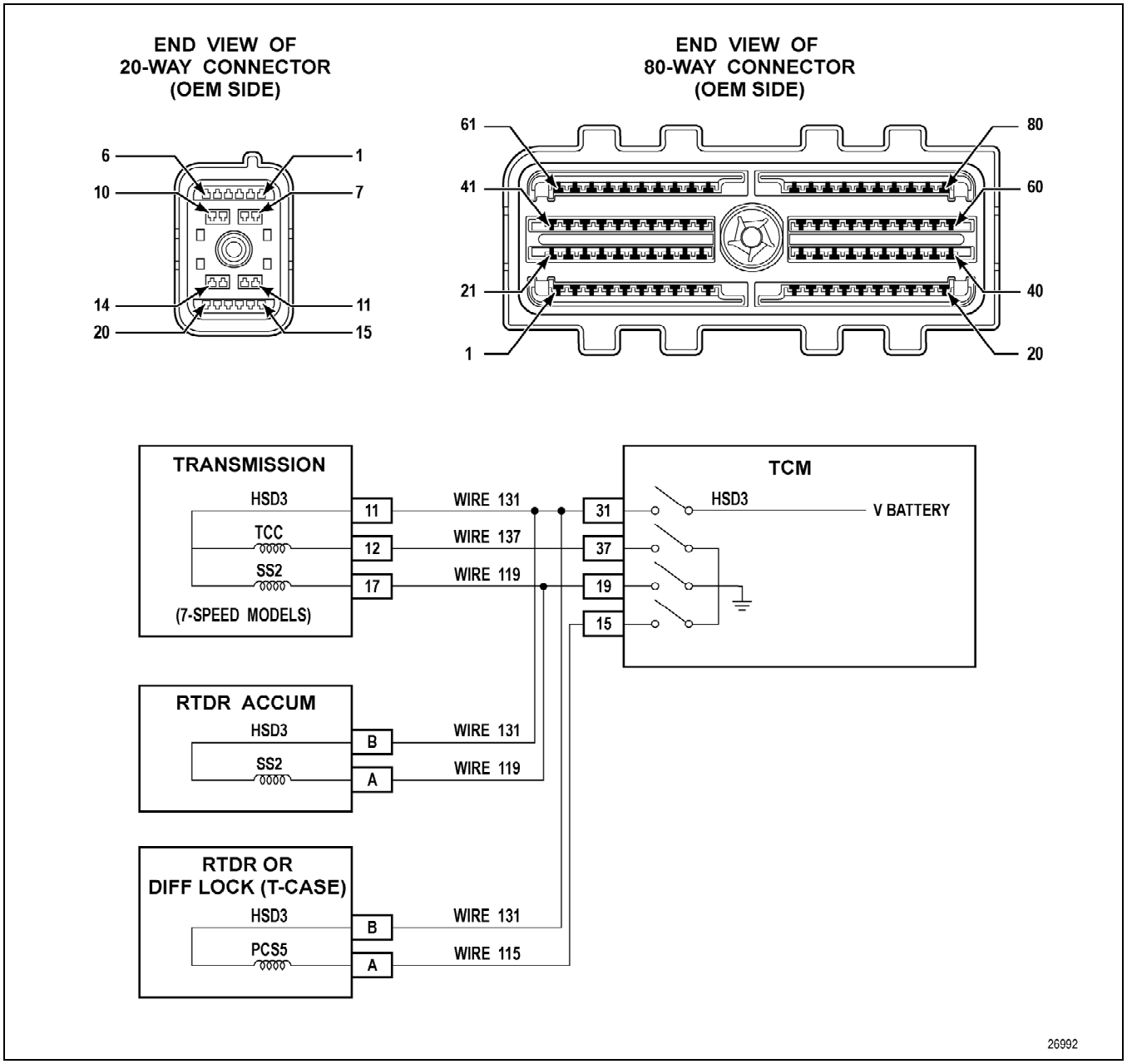
DTC P2763 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit High



Circuit Description

The TCC PCS is a normally closed solenoid used to apply the lockup clutch. DTC P2763 indicates that the DTC has detected a failed high condition in the low side of the TCC solenoid electrical circuit.

Action Taken When the DTC Sets

When DTC P2763 is active:

- The TCM inhibits TCC engagement.
- DTC is stored in the TCM history.

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DTC P2763 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit High *(cont'd)*

- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2763 can be caused by:

- TCC solenoid circuit issues such as:
  - W137 shorted to another wire in chassis harness.
  - W137 (terminal 12 of 20-way) shorted to another wire in internal transmission harness.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.
3. Check W137 in chassis harness for short to another wire.
4. Check TCM.
5. Check internal harness.
6. Check TCC solenoid resistance.

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DTC P2763 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit High *(cont'd)*

7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2763 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2686, P0977, or P2739 present or in history with active DTC P2763?		*Go to DTC P2686*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminal 37 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 37 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W137. Go to Step 7 after repairs are made.*

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DTC P2763 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2763 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If TCM is active with both test TCM and original TCM, do not replace TCM. Go to Step 5*
5	1. Remove control module from transmission. Refer to service manual. 2. Connect J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Install J-47279-1 Magnetic Overlay. 4. Disconnect TCC solenoid. 5. Using a J-46708 Digital Multimeter, measure the resistance between terminals 12 and every other labeled terminal shown on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 12 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect TCC to internal harness connectors. 4. Measure resistance between terminals 11 and 12 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–56 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–56	*Go to Step 7*	*Replace TCC solenoid that is not within specification. Go to Step 7*

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DTC P2763 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2763 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

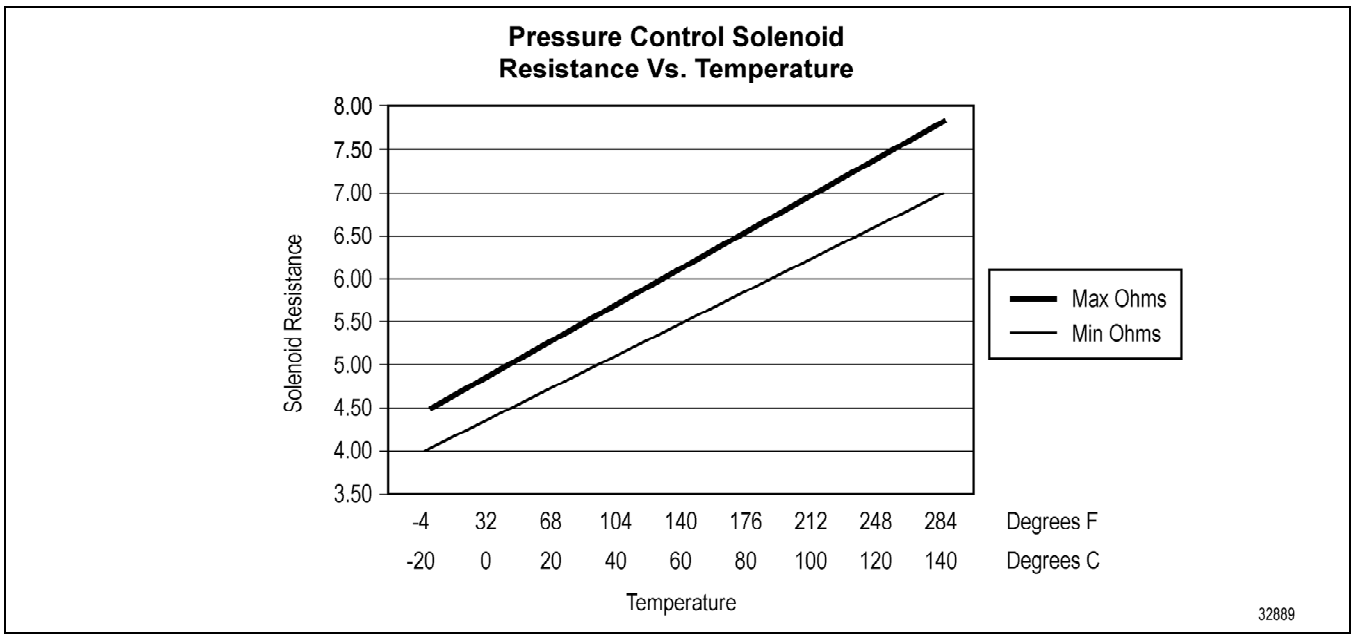

Figure 5–56. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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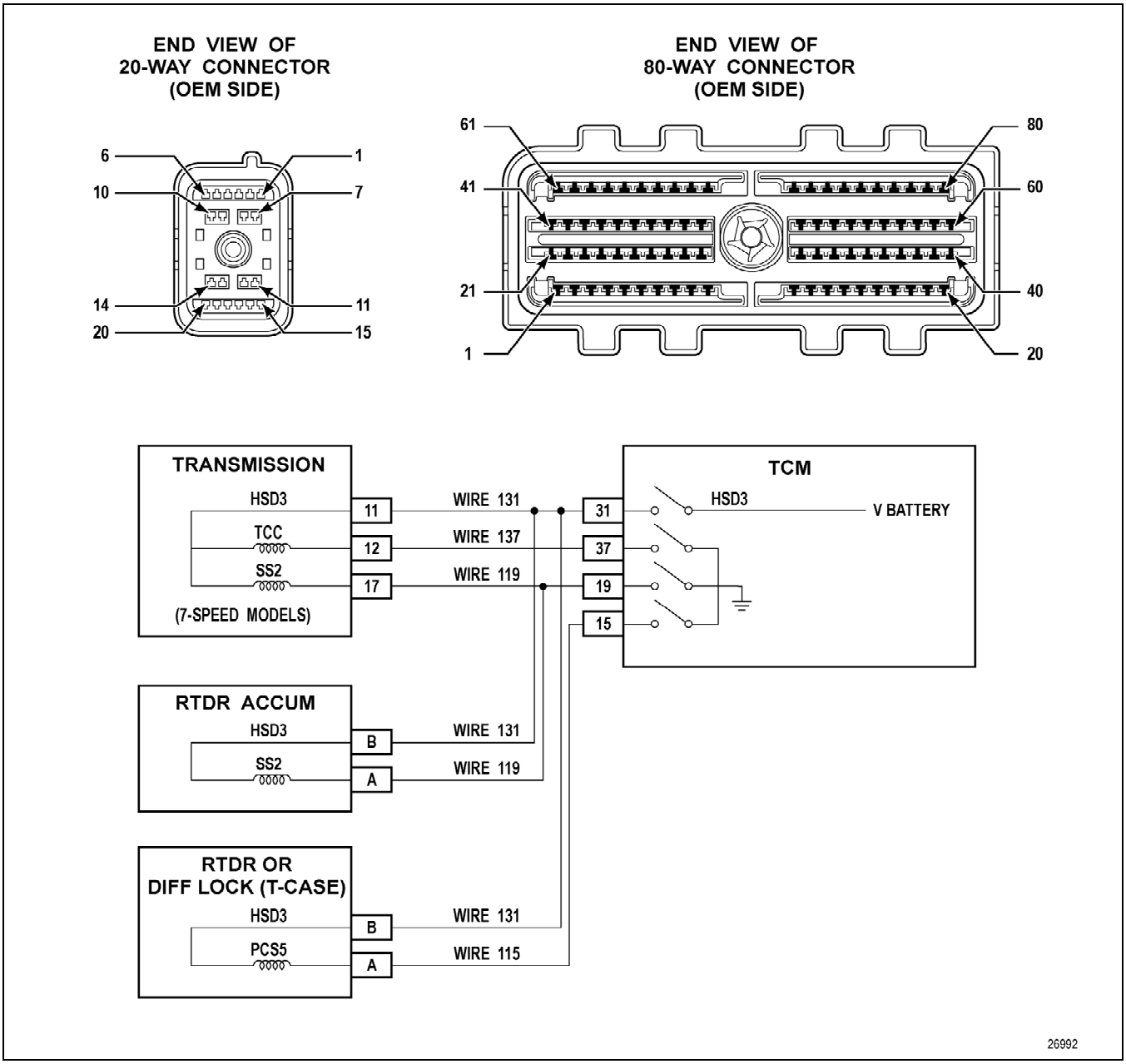
DTC P2764 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit Low



Circuit Description

The TCC PCS is a normally closed solenoid used to apply the lockup clutch. DTC P2764 indicates that the DTC has detected a failed low condition in the low side of the TCC solenoid electrical circuit.

Action Taken When the DTC Sets

When DTC P2764 is active:

- The TCM inhibits TCC engagement.
- DTC is stored in the TCM history.

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DTC P2764 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit Low *(cont'd)*

- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2764 can be caused by:

- TCC solenoid circuit issues such as:
  - W137 shorted to another wire or to chassis ground in chassis harness.
  - W137 (terminal 12 of 20-way) shorted to another wire in internal transmission harness or to the control valve module.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related codes.
3. Check W137 in chassis harness for short to another wire or to chassis ground.
4. Check TCM.
5. Check internal harness.

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DTC P2764 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit Low *(cont'd)*

6. Check TCC solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2764 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P2685, P0976, or P2738 present or in history with active DTC P2764?		*Go to DTC P2685*	*Go to Step 3*

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DTC P2764 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Using a J-46708 Digital Multimeter, measure the resistance between terminal 37 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does circuit resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 37 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and to chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W137. Go to Step 7 after repairs are made.*
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2764 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If TCM is active with both test TCM and original TCM, do not replace TCM. Go to Step 5*
5	1. Remove control module from transmission. Refer to service manual. 2. Connect J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 3. Install J-47279-1 Magnetic Overlay. 4. Disconnect TCC solenoid. 5. Using a J-46708 Digital Multimeter, measure the resistance between terminals 12 and every other labeled terminal shown on J-47279-1 Magnetic Overlay and to the control valve module. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 12 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and to the control valve module?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*

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DTC P2764 Torque Converter Clutch (TCC) Pressure Control Solenoid (PCS) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect TCC to internal harness connectors. 4. Measure resistance between terminals 11 and 12 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–57 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–57	*Go to Step 7*	*Replace TCC solenoid that is not within specification. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2764 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

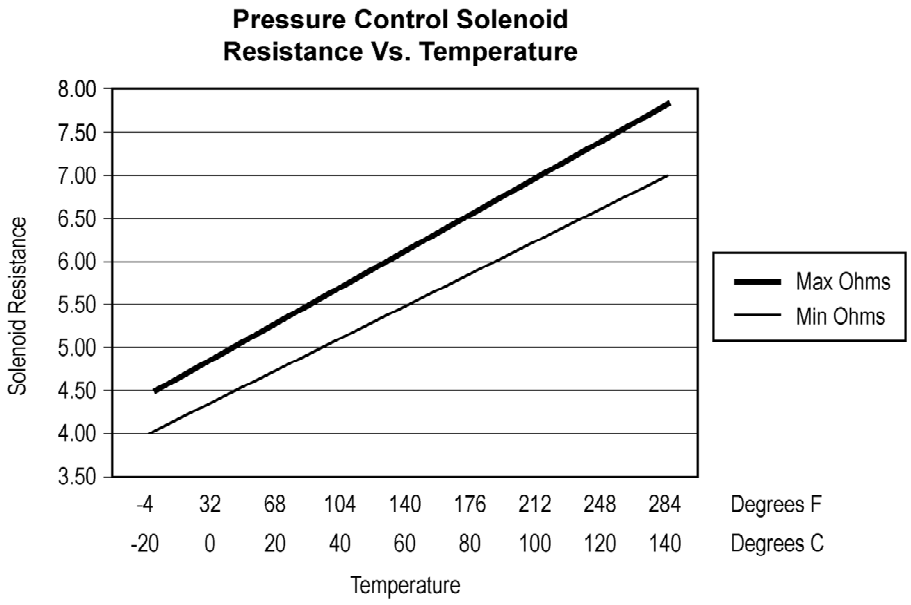

Figure 5–57. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1–PCS4, PCS5 Retarder Only, PCS6

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DTC P2789 Transmission Clutch Life Expired (Clutch Adaptive Learning at Limit)

NO SCHEMATIC FOR THIS DTC

DTC Description

The Transmission Health Monitor (TM) is part of the Allison Control System Prognostics package.

If the free running clearance of any clutch exceeds its maximum value, then the **TRANS SERVICE** indicator (wrench icon on Allison shift selector) illuminates informing the operator that there is a need for service. The wrench icon (and **TRANS SERVICE** indicator, if separate) stays illuminated during vehicle operation until clutch system service is performed and the TM function can reset itself with the new predicted values. Allison DOC® may also be used to reset the TM function in the Action Request screen.

If the TM function is not reset within several ignition cycles of illuminating the **TRANS SERVICE** indicator, then a **CHECK TRANS** indicator illuminates indicating P2789. The TM automatically resets itself if the function detects that the values for remaining clutch life or predicted free running clearance are back within specification.

Action Taken When the DTC Sets

- The TCM illuminates the **CHECK TRANS** light.
- The DTC is stored in the TCM history.

Conditions for Clearing the DTC/CHECK TRANS Light

- This DTC goes inactive when percent clutch life remaining is predicted to be more than 16%.
- Use the Allison DOC® to Reset Transmission Health Indicator by specific clutch(es) through the Action Request screen. The DTC may also be cleared from TCM history using Allison DOC®.

Diagnostic Aids

Refer to Section 2. ALLISON 5TH GENERATION CONTROL SYSTEM OPERATION andSection 4. PROGNOSTICS PACKAGE AND FEATURES for important information about Oil Life Monitor (OM), Filter Life Monitor (FM), and Transmission Health Monitor (TM). These sections discuss prognostics principles of operation, feature requirements, type of maintenance alerts, reports, and processes to reset features or change fluid type using both Allison DOC® or an Allison supplied shift selector.

Other factors besides clutch wear may cause this DTC such as:

- OEM solenoid wiring issue, e.g., high resistance wires, poor pin crimps, expanded terminal, poor power and grounds.
- Defective solenoid.
- Sticking valve.
- Worn valve body.
- Weak trim springs.
- Low main pressure.
- Low control main pressure.
- Leak to sump of exhaust backfill.
- Leaking piston seal.

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DTC P2789 Transmission Clutch Life Expired (Clutch Adaptive Learning at Limit) *(cont'd)*

- Defective TCM.

NOTE: When transmission clutches are replaced, always select "Reset Adaptive Shift Parameters" and "Reset Prognostics Information" on the Allison DOC®. This will allow access to "Reset Transmission Health Monitor" and "Reset Oil Life Monitor" from the "Action Requests" menu. Refer to Section 3. FLUID CHECK PROCEDURES, Section 4. PROGNOSTICS PACKAGE AND FEATURES, Appendix C. FIRST STEPS AND TIPS FOR TROUBLESHOOTING, and the Universal Allison DOC® Technician's Library for additional information.

NOTE: Do not base transmission removal solely because this DTC is active or that a Trans Health report comes back red on a clutch. Instead, perform an inspection and function check of the transmission in chassis, if possible, e.g., clutch tests, pressure checks, and stall check to look for slipping clutch, etc. If the transmission function checks, such as fluid filter check, fluid condition check, shift quality check, and clutch pressure check are all normal, then do not remove the transmission from the vehicle. Instead, continue to monitor the transmission for issues and look for other causes for the high fill volumes mentioned in Diagnostic Aids for this DTC.

NOTE: Refer to 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS for indicator lamp issues. Allison DOC® action requests and lamp tests may be used to check functionality of **SERVICE TRANS** indicator (wrench icon).

Tool Requirements

- Allison DOC®

DTC Test Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC P2789.
2. Check for multiple DTCs related to P2789.
3. Identify clutch that is 'Not OK'.
4. Check for worn clutch symptoms.
5. Check TCM.
6. If DTC is still active, review diagnostic aids, Section 3. FLUID CHECK PROCEDURES, Section 4. PROGNOSTICS PACKAGE AND FEATURES, Appendix C. FIRST STEPS AND TIPS FOR TROUBLESHOOTING, and the Universal Allison DOC® Technician's Library.

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DTC P2789 Transmission Clutch Life Expired (Clutch Adaptive Learning at Limit) *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2789 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 6*
2	Are there other codes active or in history with P2789 such as solenoid codes, pressure switch 1 codes, ratio codes, etc.?		*Go to Active DTC*	*Go to Step 3*
3	Using Allison DOC®, click on the Prognostic tab to see any clutches detected with less than 6% remaining clutch life. They will be displayed as “Not OK”. Are there clutches displaying “Not OK”?	OK/Not OK	*Run Prognostics Report and Trans Health Report. Go to Step 4*	*Go to Step 5*
4	1. Is there visual evidence or transmission troubleshooting data that suggests clutch wear exceeds service guidelines such as: • Debris, odor, or discoloration in the transmission fluid? • Debris plugging the main filter (or suction filter if control module has been removed)? • Measured clutch pressures that do not meet minimum service specifications? • Turbine speed indicated during clutch test (using Allison DOC®) for some or all ranges during stall condition of torque converter? **NOTE:** Always check with vehicle manufacturer prior to stalling vehicle in low ranges. Do not stall test in **R** (Reverse). Is there visual evidence or transmission data indicating excessive clutch wear or pressure measurements are not within service limits?		*Repair transmission condition causing DTC, e.g., worn clutches, sticky valve, worn valve body, worn trim springs, low main pressure, low control main pressure, defective solenoid, etc. Refer to Diagnostic Aids. Go to Step 6*	*Go to Step 5*

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DTC P2789 Transmission Clutch Life Expired (Clutch Adaptive Learning at Limit) *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Remove, disassemble, and inspect control module parts. Repair any component that does not meet specification. Replace solenoid controlling clutch that is reported "Not OK". Go to Step 6*
6	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC P2789 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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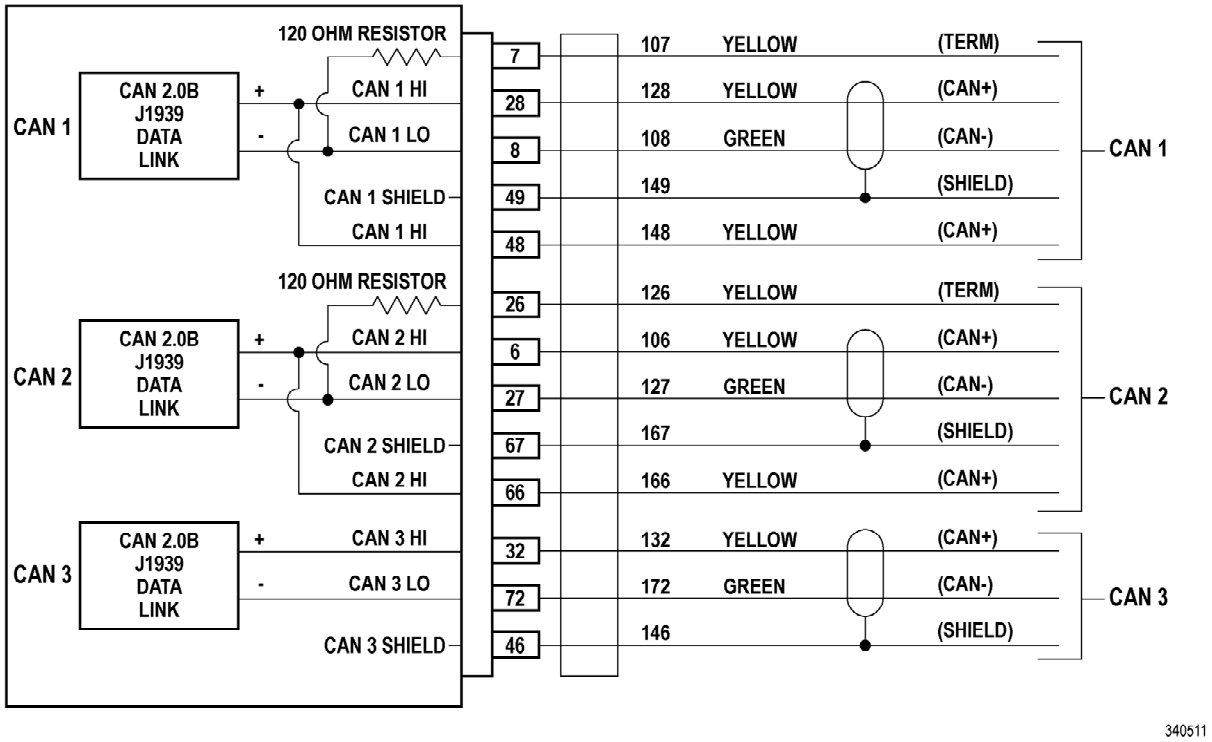
DTC P2793 Gear Shift Direction Circuit



Circuit Description

Allison 5th Generation Controls shift selectors communicate with the TCM by exchanging standardized digital messages over the SAE J1939 Controller Area Network (CAN). The shift selectors are also equipped with a single wire backup to the SAE J1939 CAN datalink. Allison 5th Generation shift selectors transmit directional information (Forward, Neutral, and Reverse) on wire 134 to the TCM. This diagnostic test determines if the signal on W134 is invalid.

Action Taken When the DTC Sets

When DTC P2793 is active, the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.
- The TCM ignores PWM signal from shift selector.
- If CAN signal is also lost, the TCM locks in last valid direction.

Conditions for Clearing the DTC/CHECK TRANS Light

Allison DOC® may be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Tool Requirements

- Allison DOC®
- J-47275 TCM Breakout Harness
- J-39700 Universal Breakout Box

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DTC P2793 Gear Shift Direction Circuit *(cont'd)*

- J-46708 Digital Multimeter
- J-47275-1 Magnetic Overlay

Diagnostic Aids

This DTC may be caused by:

- Short to power or short to another wire in W134.
- High resistance or open in W134.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors, unlocked pins, causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for shift selector.
- Defective TCM.
- Defective shift selector.
- The PWM signal characteristics are shown in Table 5–19.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Table 5–19. PWM Signal Characteristics

	Primary Shift Selector 977 Hz 10 Hz (when active)	Secondary Shift Selector 871 Hz 10 Hz (when active)
Description	Duty Cycle (Percent)	
Unknown	15% ± 2%	15% ± 2%
Park	30% ± 2%	30% ± 2%
Reverse	45% ± 2%	45% ± 2%
Neutral	60% ± 2%	60% ± 2%
Forward	75% ± 2%	75% ± 2%
Error	90% ± 2%	90% ± 2%

DTC Troubleshooting Test Descriptions

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for shorts to ground or to another wire in W134.
3. Check for high resistance or open circuits in W134.
4. Check TCM.
5. Check shift selector.

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DTC P2793 Gear Shift Direction Circuit *(cont'd)*

6. If DTC is still active, review diagnostic aids, and applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2793 active?		*Go to Step 2*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 6*
2	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way connected to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect selector harness connector from selector. 6. Using J-46708 Digital Multimeter, measure the resistance from the terminal 34 on J-47275-1 Magnetic Overlay to all other labeled terminals on J-47275-1 Magnetic Overlay and to chassis ground. Does circuit resistance measure 20 kΩ or more from terminal 34 to all other terminals and chassis ground?	20 kΩ or more	*Go to Step 3*	*Resolve wiring issue with W134. Go to Step 6*

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DTC P2793 Gear Shift Direction Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
3	1. Turn ignition **OFF**. 2. Remove J-47275 TCM Breakout Harness and J-39700 Universal Breakout Box. 3. Leave TCM disconnected from chassis harness. 4. Leave selector harness disconnected from selector. 5. Using a J-46708 Digital Multimeter, and matching terminals that can be inserted in OEM selector and TCM harness connectors, measure the resistance between terminals 11 of the selector to terminal 34 of the TCM. Does circuit resistance measure 2 Ω or less?	2 Ω or less	*Go to Step 4*	*Address issue with W134. Go to Step 6 after repairs are made.*
4	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 6 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Install test shift selector and connect OEM harnesses to selector 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active DTCs. 6. If DTCs are not active with test shift selector installed, then turn ignition **OFF** and reinstall original shift selector. 7. Restart engine and check again for active DTCs. Is DTC active with the original shift selector and inactive with a test shift selector?		*Replace shift selector. Go to Step 6*	*If DTC is active with both test shift selector and original shift selector, then reinstall the original shift selector. Review Diagnostic Aids. Go to Step 1*

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DTC P2793 Gear Shift Direction Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Acquire new Allison DOC® snapshot while operating vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2793 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2808 Pressure Control Solenoid (PCS6) Stuck Off

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the on-coming clutch controlled by Pressure Control Solenoid 6 (PCS6) engages during a forward range shift. PCS6 controls the C6 for Low range in 3700/4700/4800 transmission models. PCS6 controls C6 for Reverse 2 in the 4700/4800 model.

Action Taken When the DTC Sets

When DTC P2808 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2808 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS6 controls the C6. However, this code may also occur when any other clutch did not maintain engagement while C6 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P2808 Pressure Control Solenoid (PCS6) Stuck Off *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output shaft speed sensor codes.
4. Check for turbine shaft speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check clutch pressures and turbine shaft speed during clutch test.
8. Verify turbine shaft speed at 0-1 rpm.
9. Disassemble and inspect control valve module.
10. Check for DTC.
11. Disassemble and inspect transmission.
12. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Remove transmission. Refer to service manual. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 12*
3	Are there output shaft speed sensor DTCs in history or active with DTC P2808?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P2808?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P2808 Pressure Control Solenoid (PCS6) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2808 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 12 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and Low range at idle. Record main pressure and apply clutch pressure for all range clutches. Check exhaust pressures in clutches commanded Off in all ranges. Record turbine speed rpm in all ranges. 5. Select Reverse 2 and record main pressure, C6 pressure, and turbine shaft speed at idle. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 9*

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DTC P2808 Pressure Control Solenoid (PCS6) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 11*
9	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 12*	*Replace PCS6, SS1, and SS2 solenoid. Go to Step 10*
10	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2808 return?		*Go to Step 11*	*System OK. Clear inactive DTCs and return vehicle to service.*
11	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 12*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
12	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2808 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2809 Pressure Control Solenoid (PCS6) Stuck On

REFER TO Appendix M. HYDRAULIC SCHEMATICS

Circuit Description

This DTC test determines if the off-going clutch controlled by Pressure Control Solenoid 6 (PCS6) remains engaged during a forward range shift. PCS6 controls C6 for Low gear in 3700/4700/4800 transmission models. PCS6 controls C6 for Reverse 2 in the 4700/4800 model.

Action Taken When the DTC Sets

When DTC P2809 is active, the following conditions will occur:

- If DTC goes active while making a forward range shift (e.g., 1-2), the transmission returns to the previous range. If DTC goes active during a shift to reverse or neutral, the transmission shifts to neutral. Once shifting is complete, the attained range is locked in range.
- While diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in the TCM history.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC P2809 may be caused by:

- Output shaft speed sensor signal circuit issues.
- Turbine shaft speed sensor signal circuit issues.
- Low clutch pressures, main pressure, or control main pressure.
- Control module issues like stuck/sticky valves, mechanically defective solenoids, broken springs, damaged valve bores, plugged suction filter, damaged gaskets, excessive leaks to exhaust, etc.
- Internal transmission damage.
- Issue with TCM.
- A high resistance circuit in Shift Solenoid 1 (SS1) low side solenoid wire (W151) may cause this code. There may be a P0973 in history with this code. SS1 strokes the C2 latch valve when energized. A high resistance connection may not fully energize the SS1 in order to stroke the C2 latch valve. Check for expanded terminals, broken/loose connectors, loose pin crimps, or damaged W151 in chassis harness. Check condition of wire harness in control valve module and the SS1 resistance if needed.
- PCS6 controls the C6. However, this code may also occur for any off-going clutch issue while C6 is commanded.

Tool Requirements:

- Allison DOC®
- J-26417-A Pressure Gauge Set or equivalent

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DTC P2809 Pressure Control Solenoid (PCS6) Stuck On *(cont'd)*

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check condition of fluid and filters.
2. Check for correct transmission fluid level.
3. Check for output speed sensor codes.
4. Check for turbine speed sensor codes.
5. Check for solenoid High Side Driver (HSD) or Low Side Driver (LSD) DTC history.
6. Check TCM.
7. Check all clutch pressures.
8. Check turbine speed 0-1 rpm in clutch test.
9. Check turbine speed and engine speed in **N** (Neutral).
10. Disassemble and inspect control valve module.
11. Check for DTC.
12. Disassemble and inspect transmission.
13. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

Step	Action	Value(s)	Yes	No
1	Check condition of fluid and filters. Does fluid or filters indicate that the transmission requires overhaul; e.g., fluid is extremely discolored or odorous, excessive metal in fluid, or filters full of clutch or metallic debris?		*Refer to service manual. Remove transmission. Repair or replace transmission*	*Go to Step 2*
2	Check fluid level using dipstick and Oil Level Sensor (OLS). Is transmission fluid level correct?		*Go to Step 3*	*Correct fluid level with approved fluid. Go to Step 13*
3	Are there output shaft speed sensor DTCs in history or active with DTC P2809?		*Go to DTC P0721 or DTC P0722*	*Go to Step 4*
4	Are there turbine shaft speed sensor DTCs in history or active with DTC P2809?		*Go to DTC P0716 or DTC P0717*	*Go to Step 5*
5	Are there active or inactive DTCs for any solenoid HSD or LSD with DTC P2809?		*Go to solenoid HSD or LSD DTC*	*Go to Step 6*

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DTC P2809 Pressure Control Solenoid (PCS6) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine and test drive vehicle. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2809 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 13 after repairs are made.*	*If DTC is active with both test TCM and original TCM, do not replace TCM. Go to Step 7*
7	**WARNING:** To avoid injury or property damage caused by sudden or unexpected vehicle movement, do not start a clutch test until you: • Put transmission in **N** (Neutral) • Apply the parking brake and service brake • Chock the wheels and take any other steps necessary to prevent the vehicle from moving • Warn personnel to keep clear of the vehicle and its path 1. Install J-26417-A Pressure Gauge Set or equivalent. 2. Apply brakes. 3. Start the engine. 4. Using Allison DOC®, select the clutch test mode and select Low range at idle. Record main pressure and apply clutch pressure for all range clutches. Check exhaust pressures in clutches commanded Off in all ranges. Record turbine speed rpm in all ranges. 5. Select Reverse 2 and record main pressure, C6 pressure, and turbine shaft speed at idle. **NOTE:** It is normal to see turbine shaft speed jump up initially, but should settle down within 1-2 seconds to 0-1 rpm. 6. Compare acquired pressures to specifications listed in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS. Do all pressures meet specifications including all clutches that are commanded OFF?	Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS	*Go to Step 8*	*Go to Step 10*

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DTC P2809 Pressure Control Solenoid (PCS6) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
8	**NOTE:** It is normal to see turbine shaft speed increase briefly, but should settle down to 0-1 rpm within 2 seconds during clutch test. Did turbine shaft speed remain 0-1 rpm for the stall conditions listed in the previous step?		*Go to Step 9*	*Go to Step 10*
9	1. Leave Allison DOC® connected. 2. Start engine. 3. Record turbine shaft speed and engine speed in **N** (Neutral) at idle. Is turbine shaft speed less than engine speed by 100 rpm or more in **N** (Neutral)?		*Go to Step 12*	*Go to Step 10*
10	Disassemble, inspect, and correct any issues causing hydraulic circuit issues within the control valve module, such as stuck valves, plugged suction filter, debris, broken springs, etc. Were there any control valve module issues to correct that were causing hydraulic circuit issues?		*Repair issues found in control valve module. Go to Step 13*	*Replace PCS6, SS1, and SS2 solenoids. Go to Step 11*
11	1. Install control valve module. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2809 return?		*Go to Step 12*	*System OK. Clear inactive DTCs and return vehicle to service.*
12	1. Refer to the service manual and remove the transmission. 2. Disassemble and inspect all modules and assemblies. 3. Check for wear, damage, or defects in all modules. 4. Repair or replace parts that do not meet service specification. Refer to the service manual and technician guides. Was a transmission issue causing this DTC?		*Go to Step 13*	*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*
13	1. Install or reconnect all OEM and transmission components and connectors, if needed. 2. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2809 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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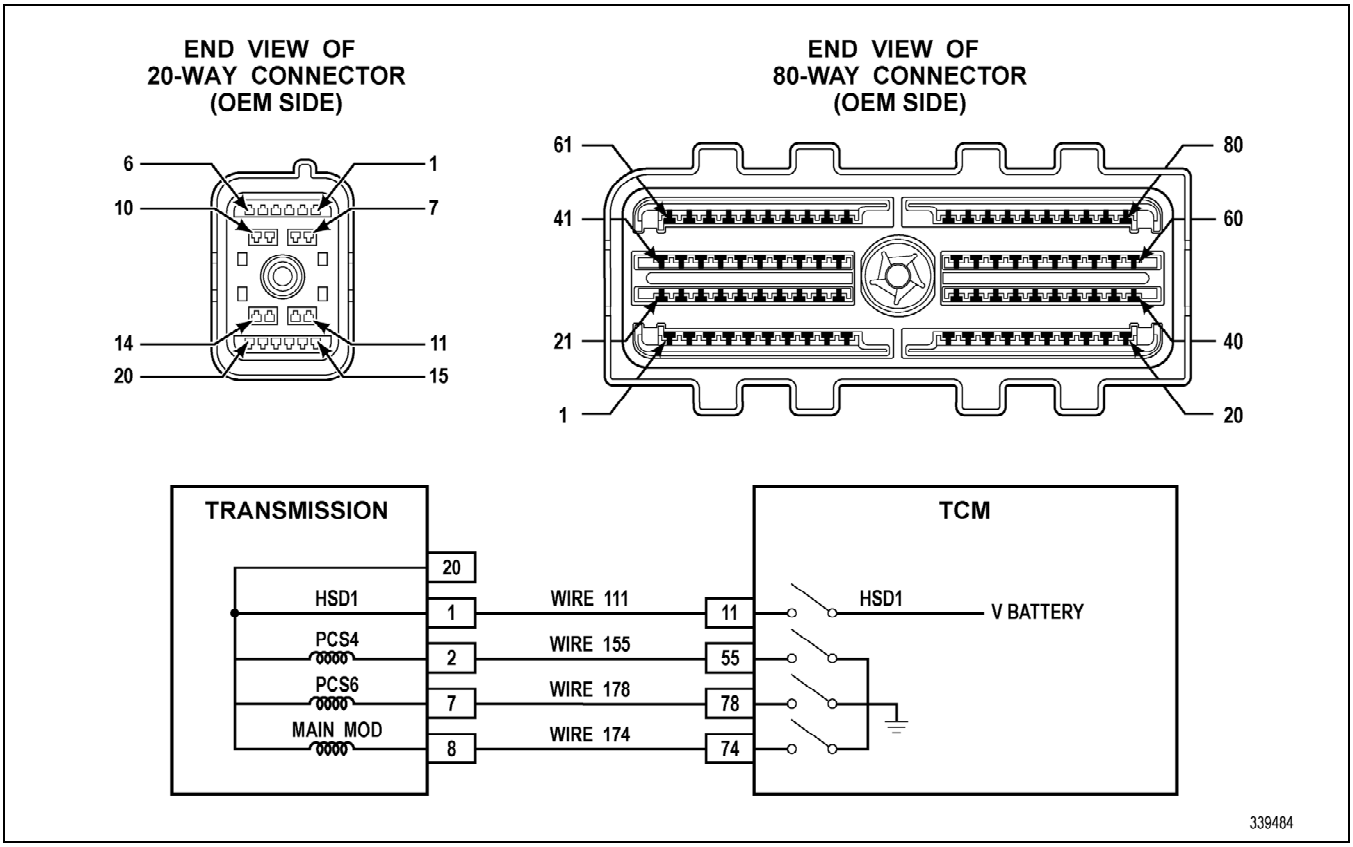
DTC P2812 Pressure Control Solenoid (PCS6) Control Circuit Open



Circuit Description

Pressure Control Solenoid 6 (PCS6) is a normally closed solenoid used to apply C6 in Low (L) range (7-speed models only). The Transmission Control Module (TCM) commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS6 is commanded OFF, the clutch pressure is released. DTC P2812 indicates that the TCM has detected an open condition in the PCS6 electrical circuit. The open condition may exist in the high side (wire 111) or low side (wire 178).

Conditions for Running the DTC

- TCM initialized normally and engine speed above 200 rpm.

Conditions for Setting the DTC

- This DTC sets when the TCM detects PCS6 low side driver has been detected in a failed open state.

Action Taken When the DTC Sets

When DTC P2812 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in **N** (Neutral), the transmission remains in **N** (Neutral). If failure occurs while in **R** (Reverse), transmission remains in **R** (Reverse) or shifts to **N** (Neutral). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

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DTC P2812 Pressure Control Solenoid (PCS6) Control Circuit Open *(cont'd)*

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2812 can be caused by:

- PCS6 issues such as:
  - W178 open circuit in chassis harness.
  - W178 (terminal 7 of 20-way) open circuit in internal transmission harness.
  - PCS6 defective.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W178 in chassis harness for open or high resistance.
4. Check TCM.
5. Check internal harness wire for PCS6 Low Side Driver (terminal 7) for high resistance or open.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P2812 Pressure Control Solenoid (PCS6) Control Circuit Open *(cont'd)*

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2812 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0657, P2718, or P0960 present or in history with active DTC P2812?		*Go to DTC P0657*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect J-47275 TCM Breakout Harness to J-39700 Universal Breakout Box. 3. Connect OEM chassis harness 80-way to J-47275 TCM Breakout Harness OEM side. 4. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 5. Disconnect 20-way OEM transmission connector from the transmission. 6. Install a jumper wire between terminal 1 and 7 of the OEM 20-way transmission connector. 7. Using a J-46708 Digital Multimeter, measure the resistance between terminals 11 and 78 at J-47275-1 Magnetic Overlay. Does circuit resistance measure 4 Ω or less after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 4*	*Address issue with W178. Go to Step 7 after repairs are made.*

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DTC P2812 Pressure Control Solenoid (PCS6) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2812 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS6 from internal harness. 4. Install jumper wire between A and B terminals of PCS6 connector on internal harness. 5. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 6. Install J-47279-1 Magnetic Overlay. 7. Check resistance between terminal 1 and 7 of J-47279-1 Magnetic Overlay. Does resistance measure 4 Ω or less from J-47279-1 Magnetic Overlay terminal 1 to terminal 7 on J-47279-1 Magnetic Overlay after tool resistance is subtracted from J-46708 Digital Multimeter reading?	4 Ω or less	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS6 to internal harness connectors. 4. Measure resistance between terminals 1 and 7 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–58 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–58	*Go to Step 7*	*Replace PCS6 that is not within specification. Go to Step 7*

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DTC P2812 Pressure Control Solenoid (PCS6) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2812 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

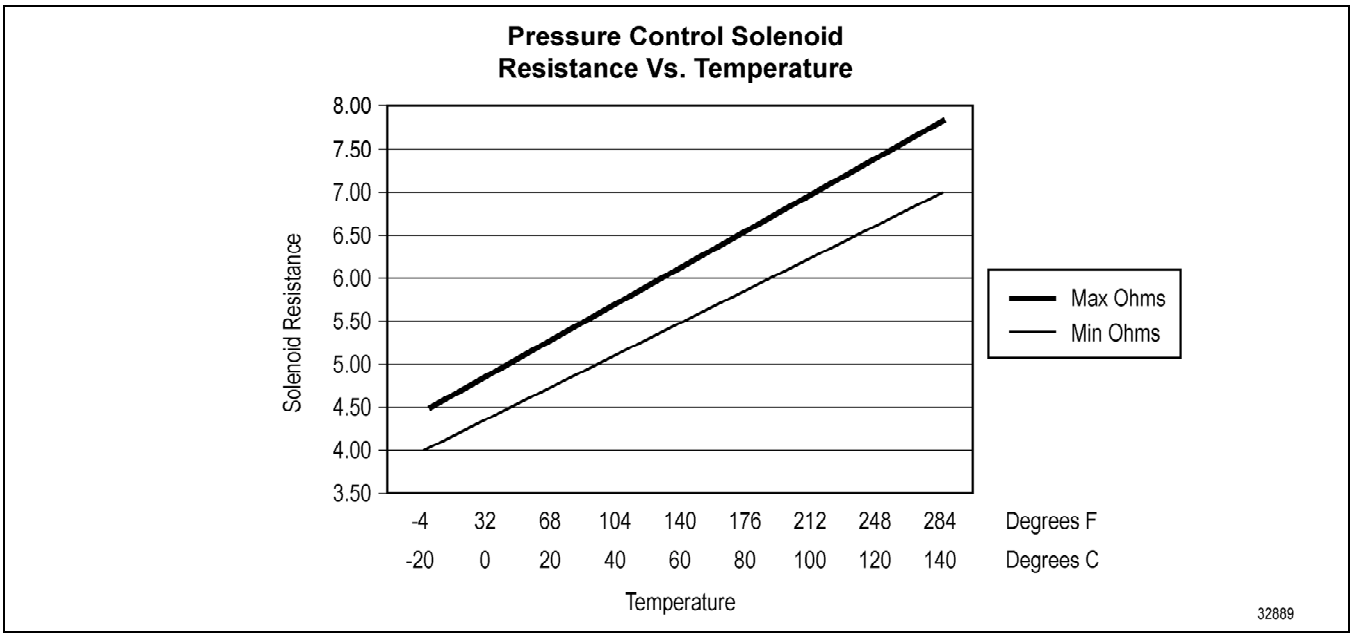

Figure 5–58. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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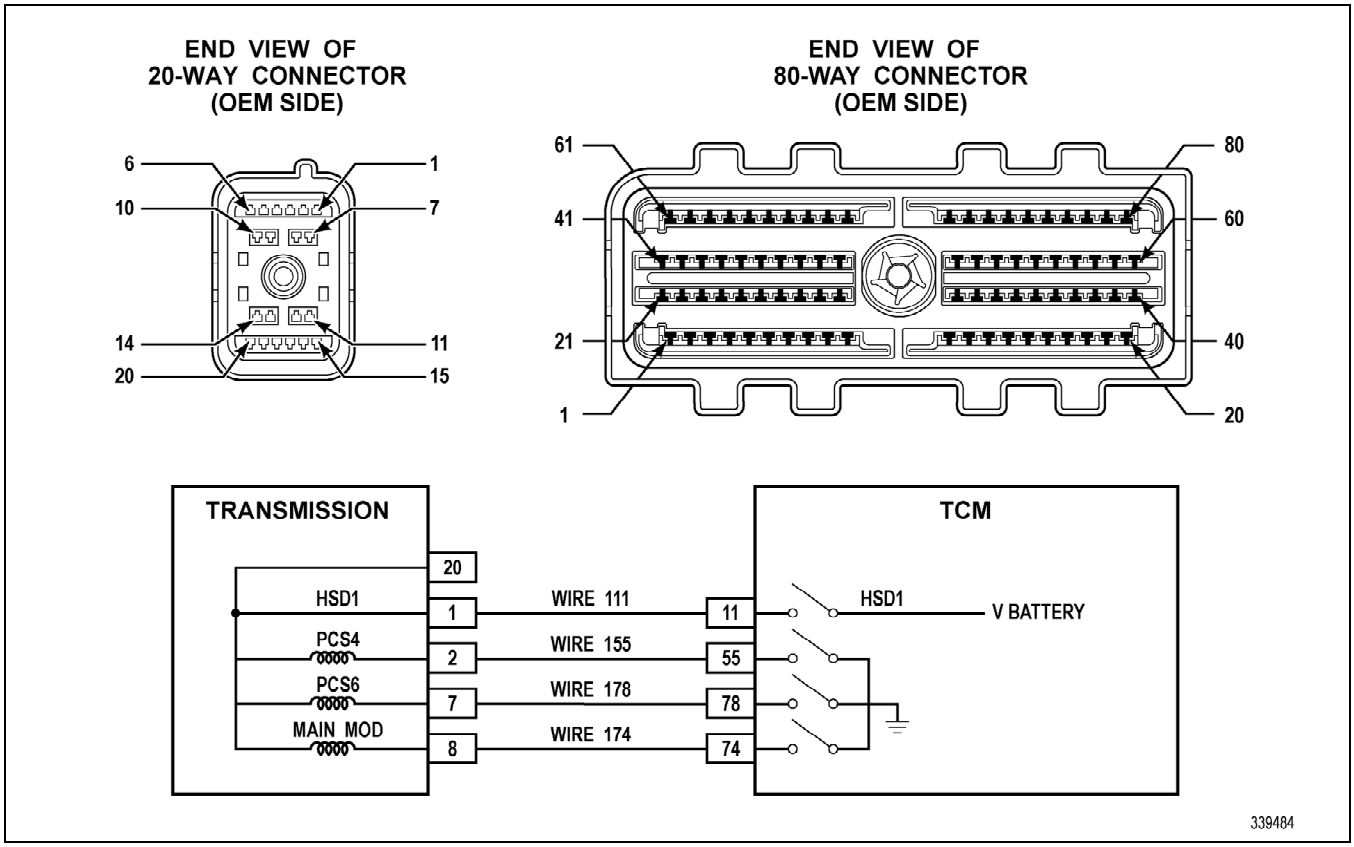
DTC P2814 Pressure Control Solenoid (PCS6) Control Circuit Low



Circuit Description

Pressure Control Solenoid 6 (PCS6) is a normally closed solenoid used to apply C6 in Low (L) range (7-speed models only). DTC P2814 indicates that the TCM has detected a failed low condition in the PCS6 electrical circuit. The condition may exist in the high side (wire 111) or low side (wire 178).

Action Taken When the DTC Sets

When DTC P2814 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in **N** (Neutral), the transmission remains in **N** (Neutral). If failure occurs while in **R** (Reverse), transmission remains in **R** (Reverse) or shifts to **N** (Neutral). Once range is attained, transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2814 can be caused by:

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DTC P2814 Pressure Control Solenoid (PCS6) Control Circuit Low *(cont'd)*

- PCS6 issues such as:
  - W178 shorted to another wire or ground in chassis harness.
  - W178 (terminal 7 of 20-way) shorted to another wire or ground in internal transmission harness.
  - PCS6 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W178 in chassis harness for short to another wire or to chassis.
4. Check TCM.
5. Check internal harness wire for PCS6 Low Side Driver (terminal 7) for short to another wire or control module.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

NOTE: The J-39700 Universal Breakout Box, adapter harnesses, jumpers, and the J-46708 Digital Multimeter leads add a few ohms of resistance to a circuit. Refer to Appendix E. TROUBLESHOOTING TRANSMISSION AND VEHICLE CIRCUITS for the procedure to determine the tool resistance that is added to a test circuit.

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DTC P2814 Pressure Control Solenoid (PCS6) Control Circuit Low *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder-provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2814 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0658, P2720, or P0962 present or in history with active DTC P2814?		*Go to DTC P0658*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 78 and every other labeled terminal shown on J-47275-1 Magnetic Overlay and to chassis ground. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 78 to all other labeled terminal locations on J-47275-1 Magnetic Overlay and chassis ground?	20 kΩ or more	*Go to Step 4*	*Address issue with W178. Go to Step 7 after repairs are made.*

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DTC P2814 Pressure Control Solenoid (PCS6) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2814 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS6 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 7 to all other labeled terminals on J-47279-1 Magnetic Overlay and to the control module assembly. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 7 to all other labeled terminal locations on J-47279-1 Magnetic Overlay and the control module assembly?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS6 to internal harness connectors. 4. Measure resistance between terminals 1 and 7 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–59 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–59	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*

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DTC P2814 Pressure Control Solenoid (PCS6) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2814 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

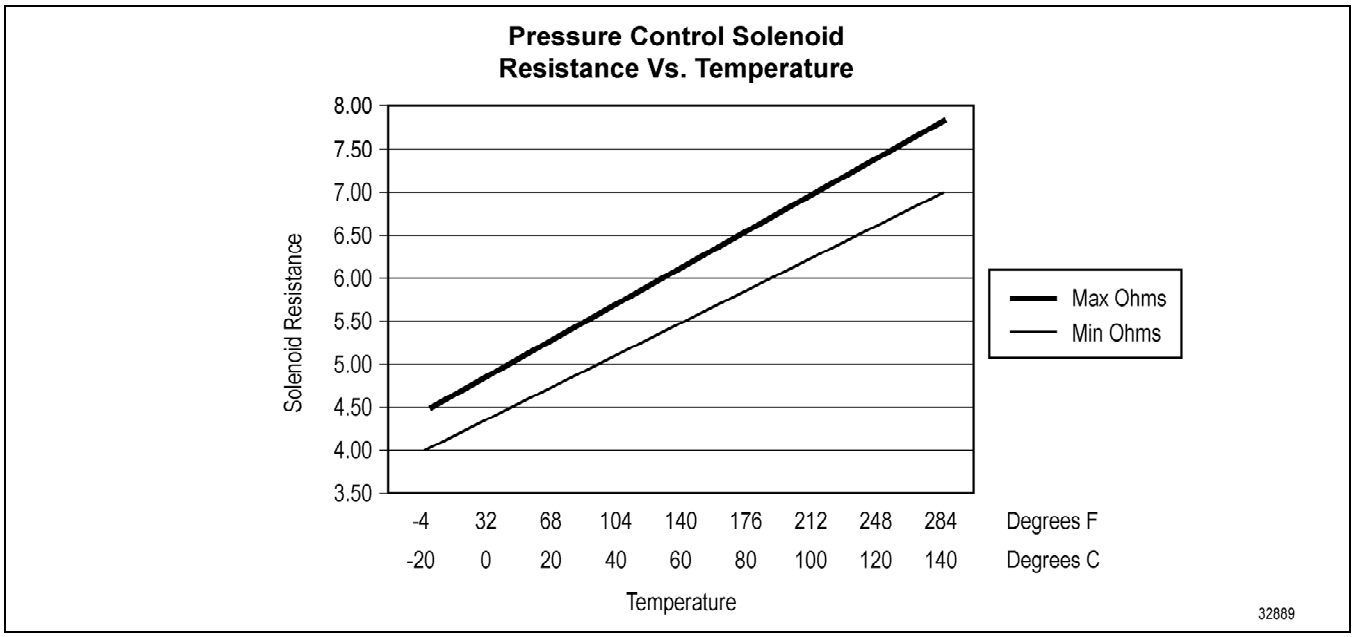

Figure 5–59. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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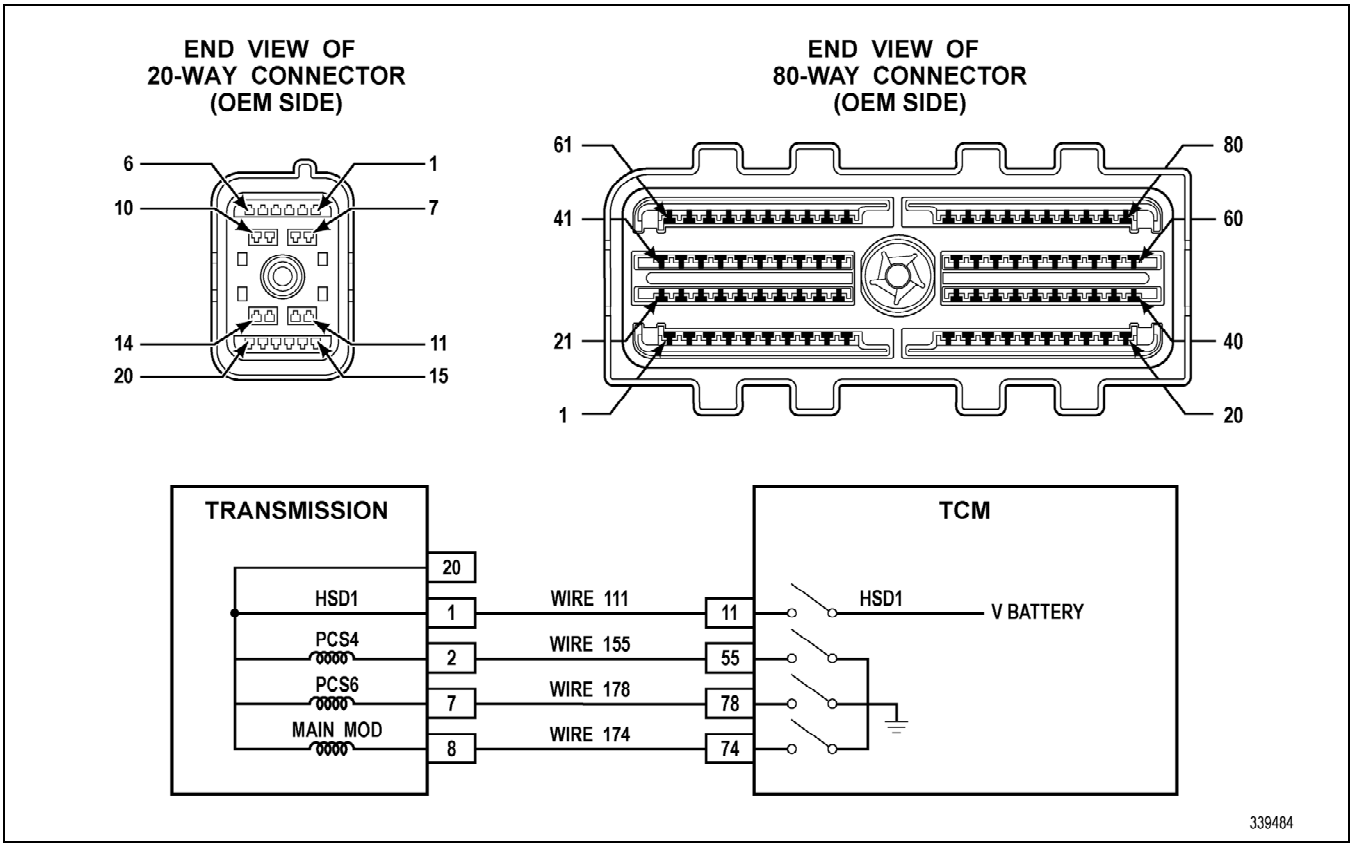
DTC P2815 Pressure Control Solenoid (PCS6) Control Circuit High



Circuit Description

Pressure Control Solenoid 6 (PCS6) is a normally closed solenoid used to apply C6 in Low (L) range (7-speed models only). DTC P2815 indicates that the TCM has detected a failed high condition in the PCS6 electrical circuit.

Conditions for Running the DTC

- TCM initialized normally and engine speed above 200 rpm.

Conditions for Setting the DTC

- This DTC sets when the TCM detects PCS6 low side driver has been detected in a failed high state.

Action Taken When the DTC Sets

When DTC P2815 is active:

- If failure occurs while in a forward range, then shift to another forward range. If failure occurs while in **N** (Neutral), the transmission remains in **N** (Neutral). If failure occurs while in **R** (Reverse), the transmission remains in **R** (Reverse) or shifts to **N** (Neutral). Once range is attained, the transmission will be locked in range. There is no response to shift selector requests.
- DTC is stored in the TCM history.
- The TCM inhibits Torque Converter Clutch (TCC) engagement.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

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DTC P2815 Pressure Control Solenoid (PCS6) Control Circuit High *(cont'd)*

Conditions for Clearing the DTC

Use Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

DTC P2815 can be caused by:

- PCS6 issues such as:
  - W178 shorted to another wire in chassis harness.
  - W178 (terminal 7 of 20-way) shorted to another wire in internal transmission harness.
  - PCS6 defective.
- Broken or defective connector assemblies allowing pushed back pins to short together.
- Unlocked connectors, missing seal plugs allowing moisture in connectors.
- Defective TCM.

Review applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS and the Appendices to find additional circuit specifications, system and connector diagrams, and troubleshooting tips.

Tool Requirements:

- Allison DOC®
- J-39700 Universal Breakout Box
- J-47275 TCM Breakout Harness
- J-47279 Transmission Breakout Harness
- J-46708 Digital Multimeter
- J-39197-A Jumper Wire Kit
- J-47275-1 Magnetic Overlay
- J-47279-1 Magnetic Overlay

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check for related DTCs.
3. Check W178 in chassis harness for short to another wire.
4. Check TCM.
5. Check internal harness wire for PCS6 Low Side Driver (terminal 7) for short to another wire.
6. Check solenoid resistance.
7. If DTC is still active, review diagnostic aids, applicable information in Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and related Appendices.

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DTC P2815 Pressure Control Solenoid (PCS6) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC P2815 active?		*Go to Step 2*	*Troubleshoot any other active DTCs if present. If no other DTCs are active, go to Step 7*
2	Are there any active or inactive DTCs P0659, P2721, or P0963 present or in history with active DTC P2815?		*Go to DTC P0659*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Connect chassis harness to J-47275 TCM Breakout Harness. 3. Leave TCM side of J-47275 TCM Breakout Harness disconnected from TCM. 4. Disconnect OEM 20-way connector disconnected from transmission. 5. With ignition **OFF** and using J-46708 Digital Multimeter, measure resistance between terminal 78 and every other labeled terminal shown on J-47275-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47275-1 Magnetic Overlay terminal 78 to all other labeled terminal locations on J-47275-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 4*	*Address issue with W178. Go to Step 7 after repairs are made.*
4	1. Turn ignition **OFF**. 2. Install the test TCM and tighten the bolt in the TCM 80-way connector on J-47275 TCM Breakout Harness to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC®, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and reinstall original TCM. 7. Restart engine and check again for active DTCs. Is DTC P2815 active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 7 after repairs are made.*	*If DTC active with both the test TCM and the original TCM, do not replace TCM. Go to Step 5*

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DTC P2815 Pressure Control Solenoid (PCS6) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Remove control valve module from transmission. Refer to service manual. 3. Disconnect PCS6 from internal harness. 4. Install J-47279 Transmission Breakout Harness to J-39700 Universal Breakout Box and to the control valve module transmission 20-way connector. 5. Install J-47279-1 Magnetic Overlay. 6. Check resistance for J-47279-1 Magnetic Overlay terminal 7 to all other labeled terminals on J-47279-1 Magnetic Overlay. Does resistance measure 20 kΩ or more from J-47279-1 Magnetic Overlay terminal 7 to all other labeled terminal locations on J-47279-1 Magnetic Overlay?	20 kΩ or more	*Go to Step 6*	*Repair or replace internal harness. Go to Step 7*
6	1. Leave J-47279 Transmission Breakout Harness connected to J-39700 Universal Breakout Box and to the control valve module transmission 20-way. 2. Leave J-47279-1 Magnetic Overlay installed. 3. Connect PCS6 to internal harness connectors. 4. Measure resistance between terminals 1 and 7 at J-47279-1 Magnetic Overlay. Does solenoid circuit resistance measure within specifications for solenoids in Figure 5–60 after tool resistance is subtracted from J-46708 Digital Multimeter reading?	Figure 5–60	*Go to Step 7*	*Replace solenoid that is not within specification. Go to Step 7*
7	1. Remove J-39700 Universal Breakout Box, and all related harness adapters and jumpers from vehicle, if installed. 2. Install or reconnect all OEM and transmission components and connectors, if needed. **NOTE:** TCM 80-way connector bolt and transmission 20-way connector bolt must be tightened to 2.0-3.2 N·m (18-28 lb in). 3. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records from Step 1. Did DTC P2815 return?		*Review Diagnostic Aids for this DTC. Begin the diagnosis again. Go to Step 1*	*System OK. Clear inactive DTCs and return vehicle to service.*

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DTC P2815 Pressure Control Solenoid (PCS6) Control Circuit High *(cont'd)*

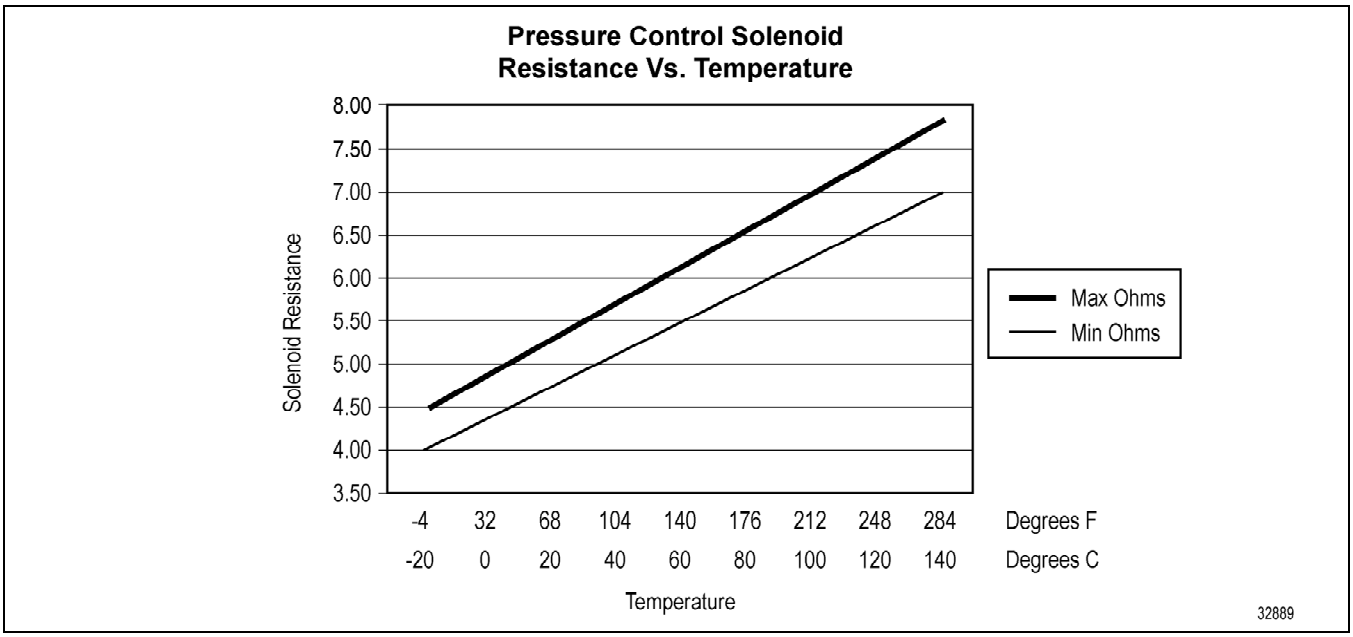

Figure 5–60. Variable Bleed Pressure Control Solenoids—Main Mod, TCC, PCS1-PCS4, PCS5 Retarder Only, PCS6

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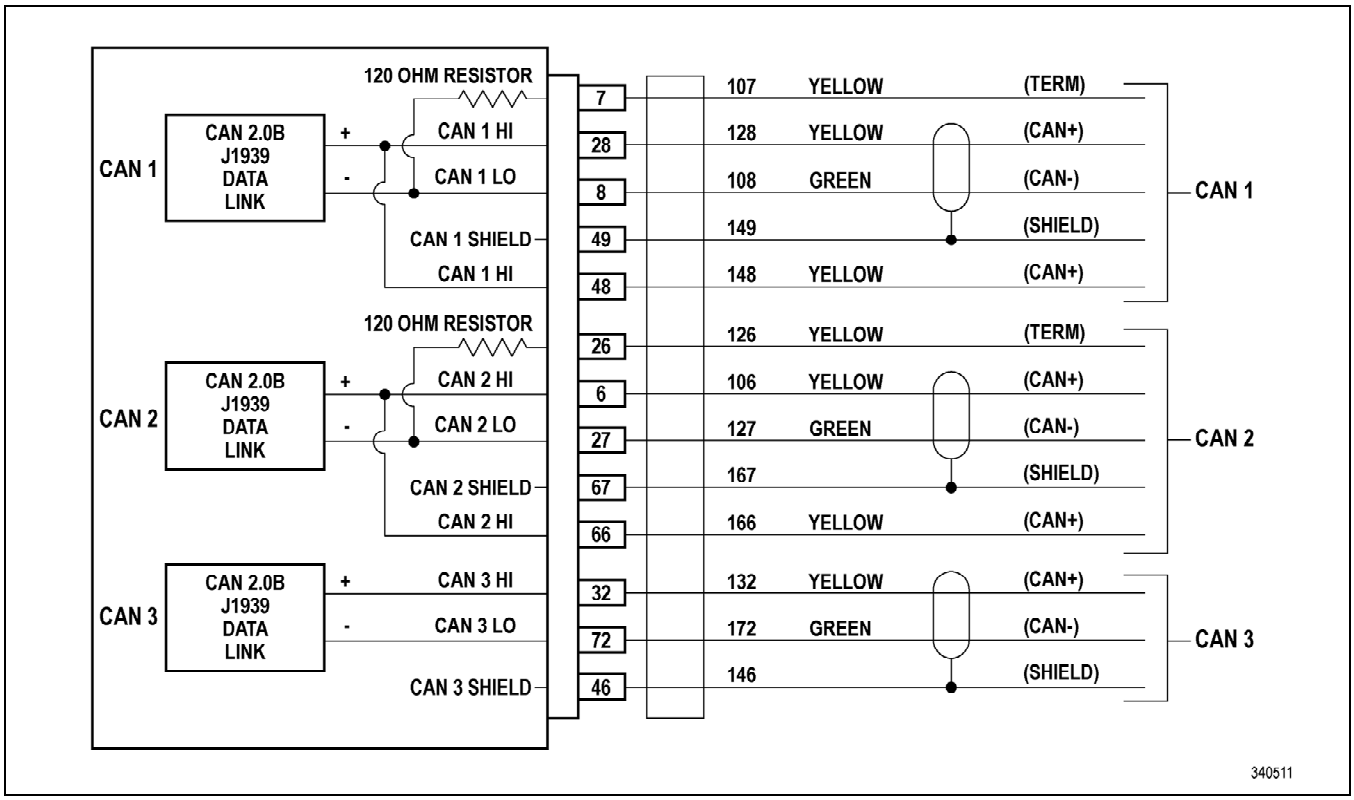
DTC U0073 CAN Communication Bus 1 Off



Circuit Description

This DTC sets when the TCM detects no communication on the CAN1 backbone harness for a period of time.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- SEM operation is not active, if applicable.
- Default values are substituted for missing data, e.g., engine throttle percentage, engine torque, engine coolant temperature.
- SAE J1939 Shift Selector input on CAN1 is lost.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The DTC automatically clears the DTC from the DTC history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- DTC U0073 indicates that a CAN1 bus hardware error has occurred.

  This code may be caused by:

  – Miswired or defective OEM controllers, OEM components, or OEM circuits attached to CAN1.

  – Defective TCM.

  – Defective shift selector.

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DTC U0073 CAN Communication Bus 1 Off *(cont'd)*

- An active DTC U0073 may prevent the Allison DOC® from communicating with the TCM. The J-47276 TCM Reflash Harness may be used to confirm that the TCM is operational. Connect the J-47276 TCM Reflash Harness to the TCM and leave the OEM harness disconnected. Provide input power from the J-42455-A Load Box.
- CAN1 and CAN2 devices must not be interconnected because they are not compatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN1 High and CAN1 Low terminals. Resistance across CAN1 High and CAN1 Low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

Tool Requirements:

- Allison DOC®
- J-47949 GMLAN Cable
- J-47276 TCM Reflash Harness
- J-42455-A Load Box

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.
2. Tests for communication with the TCM via the J-47276 TCM Reflash Harness and J-47949 GMLAN Cable.
3. Check TCM.
4. Check shift selector.
5. Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS—SHIFT SELECTOR ISSUES, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

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DTC U0073 CAN Communication Bus 1 Off *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 5*	*Go to Step 2*
2	1. Turn ignition **OFF**. 2. Disconnect the 80-way connector at the TCM. 3. Install J-47276 TCM Reflash Harness and the J-47949 GMLAM Cable to the TCM. Leave the OEM-side 80-way connector disconnected. 4. Provide power to the TCM from the J-42455-A Load Box. 5. Connect Allison DOC® to the Type 1 SAE J1939 (9-pin) connector, in the J-47276 TCM Reflash Harness. Is Allison DOC® communicating with the TCM?		*Review information in the Allison DOC® Technician's Library. Correct OEM component or selector issue causing DTC. Go to Step 4 for selector check if needed.*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 5 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Go to Step 4 after repair.*
4	1. Turn ignition **OFF**. 2. Install test shift selector. 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test shift selector installed, then turn ignition **OFF** and reinstall original shift selector. 7. Restart engine and check again for active DTCs. Is DTC active with the original selector and inactive with a test selector?		*Install new shift selector. Go to Step 5 after repair*	*If DTC is active with both test shift selector and original shift selector, then reinstall the original shift selector. Go to Step 5 after repair*

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DTC U0073 CAN Communication Bus 1 Off *(cont'd)*

Step	Action	Value(s)	Yes	No
5	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0073 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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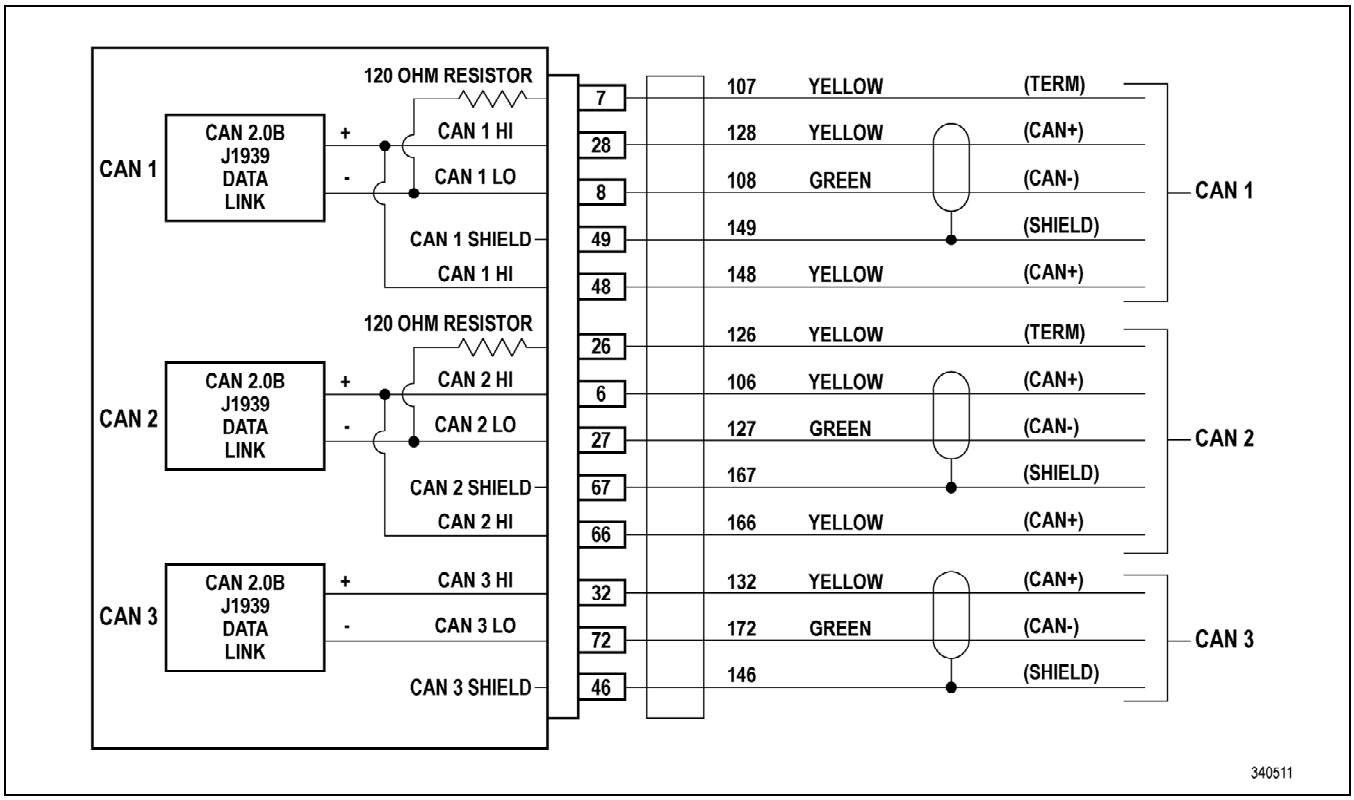
DTC U0074 CAN Communication Bus 2 Off



Circuit Description

DTC U0074 sets when the TCM detects no communication on the CAN 2 backbone harness for a period of time.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- SEM operation is not active, if applicable.
- Default values are substituted for missing data, e.g., engine throttle percentage, engine torque, engine coolant temperature.
- SAE J1939 Shift Selector input on CAN2 is lost (W134 directional signal failure).
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The DTC automatically clears the DTC from the DTC history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- DTC U0074 indicates that a CAN2 bus hardware error has occurred.

  This code may be caused by:

  – Miswired or defective OEM controllers, OEM components, or OEM circuits attached to CAN2.

  – Defective TCM.

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DTC U0074 CAN Communication Bus 2 Off *(cont'd)*

  - Defective shift selector.

- An active DTC U0074 may prevent the Allison DOC® from communicating with the TCM. The J-47276 TCM Reflash Harness may be used to confirm that the TCM is operational. Connect the J-47276 TCM Reflash Harness to the TCM and leave the OEM harness disconnected. Provide input power from the J-42455-A Load Box.
- CAN1 and CAN2 devices must not be interconnected because they are not compatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN2 High and CAN2 Low terminals. Resistance across CAN2 High and CAN2 Low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

Tool Requirements:

- Allison DOC®
- J-47949 GMLAN Cable
- J-47276 TCM Reflash Harness
- J-42455-A Load Box

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the diagnostic connector.
2. Tests for communication with the TCM via the J-47276 TCM Reflash Harness and J-47949 GMLAN Cable.
3. Check TCM.
4. Check shift selector.
5. Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS—SHIFT SELECTOR ISSUES, and other related Appendices.

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DTC U0074 CAN Communication Bus 2 Off *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN2 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 5*	*Go to Step 2*
2	1. Turn ignition **OFF**. 2. Disconnect the 80-way connector at the TCM. 3. Install J-47276 TCM Reflash Harness and the J-47949 GMLAM Cable to the TCM. Leave the OEM-side 80-way connector disconnected. 4. Provide power to the TCM from the J-42455-A Load Box. 5. Connect Allison DOC® to the Type 1 SAE J1939 (9-pin) connector, in the J-47276 TCM Reflash Harness. Is Allison DOC® communicating with the TCM?		*Review information in the Allison DOC® Technician's Library. Correct OEM component or selector issue causing DTC. Go to Step 4 for selector check if needed.*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 5 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Go to Step 4 after repair.*

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DTC U0074 CAN Communication Bus 2 Off *(cont'd)*

Step	Action	Value(s)	Yes	No
4	1. Turn ignition **OFF**. 2. Install test shift selector. 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test shift selector installed, then turn ignition **OFF** and reinstall original shift selector. 7. Restart engine and check again for active DTCs. Is DTC active with the original selector and inactive with a test selector?		*Install new shift selector. Go to Step 5 after repair*	*If DTC is active with both test shift selector and original shift selector, then reinstall the original shift selector. Go to Step 5 after repair*
5	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0074 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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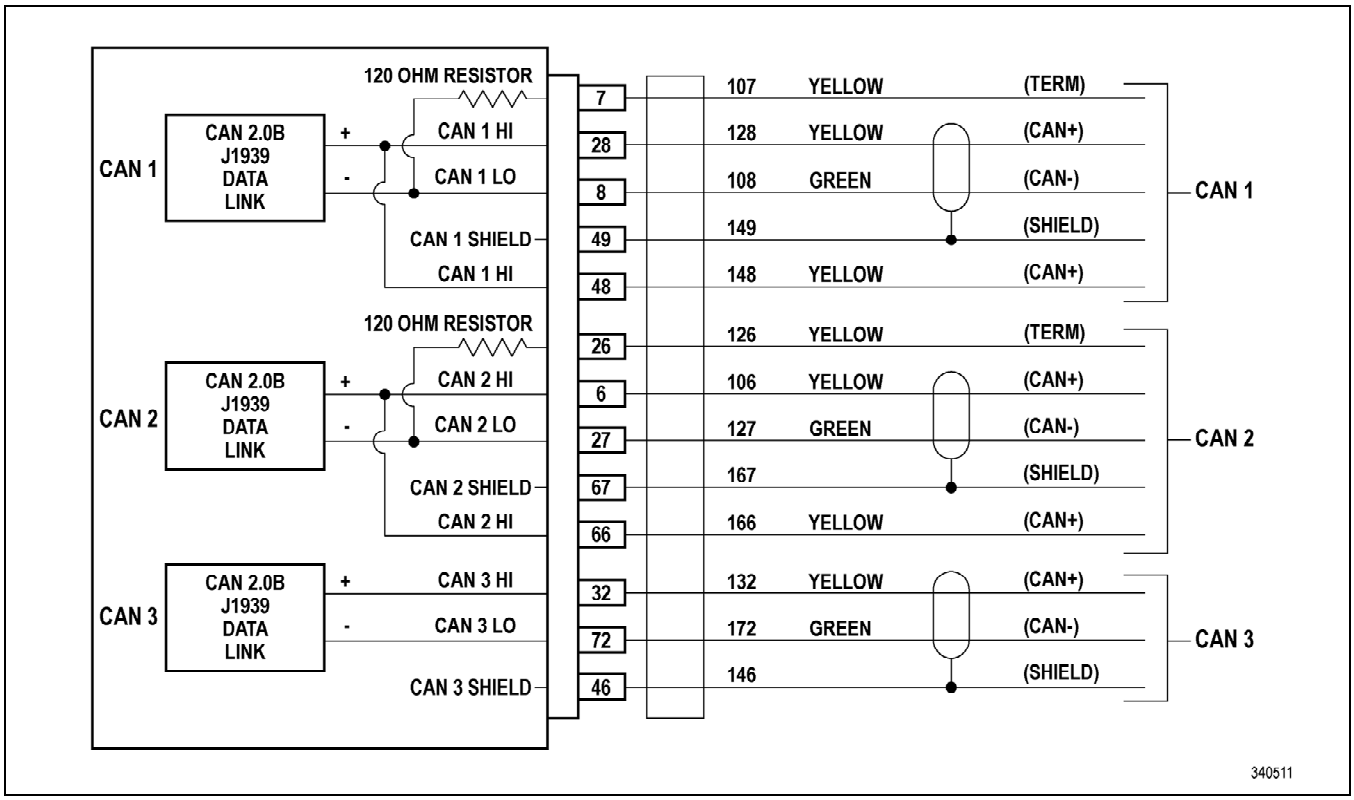
DTC U0100 Lost Communications with ECM A



Circuit Description

This test detects the loss of certain messages from the CAN Bus.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- Default values are substituted for missing data, e.g., engine throttle percentage, engine torque, engine coolant temperature.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The DTC automatically clears the DTC from the DTC history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- DTC U0100 indicates that a CAN1 bus hardware error has occurred.

  This code may be caused by:

  – Miswired or defective OEM controllers, OEM components, or OEM circuits attached to CAN1.

  – Defective TCM.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.
- An active DTC U0100 may prevent the Allison DOC® from communicating with the TCM. The J-47276 TCM Reflash Harness may be used to confirm that the TCM is operational. Connect the TCM Reflash

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DTC U0100 Lost Communications with ECM A *(cont'd)*

Harness to the TCM and leave the OEM harness disconnected. Provide input power from the J-42455-A Load Box.

- CAN1 and CAN2 devices must not be interconnected because they are not compatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN1 High and CAN1 Low terminals. Resistance across CAN1 High and CAN1 Low should measure 60 Ω when wired correctly.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS—SHIFT SELECTOR ISSUES, and other related Appendices.

Tool Requirements:

- Allison DOC®
- J-47949 GMLAN Cable
- J-47276 TCM Reflash Harness
- J-42455-A Load Box

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.
2. Tests for communication with the TCM via the J-47276 TCM Reflash Harness and J-47949 GMLAN Cable.
3. Check TCM.
4. Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, Section 7. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS—SHIFT SELECTOR ISSUES, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

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DTC U0100 Lost Communications with ECM A *(cont'd)*

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 4*	*Go to Step 2*
2	1. Turn ignition **OFF**. 2. Disconnect the 80-way connector at the TCM. 3. Install J-47276 TCM Reflash Harness and the J-47949 GMLAM Cable to the TCM. Leave the OEM-side 80-way connector disconnected. 4. Provide power to the TCM from the J-42455-A Load Box. 5. Connect Allison DOC® to the Type 1 SAE J1939 (9-pin) connector, in the J-47276 TCM Reflash Harness. Is Allison DOC® communicating with the TCM?		*Review information in the Universal Allison DOC® Technician's Library. Correct OEM component.*	*Go to Step 3*
3	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 7. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 4 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1*
4	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0100 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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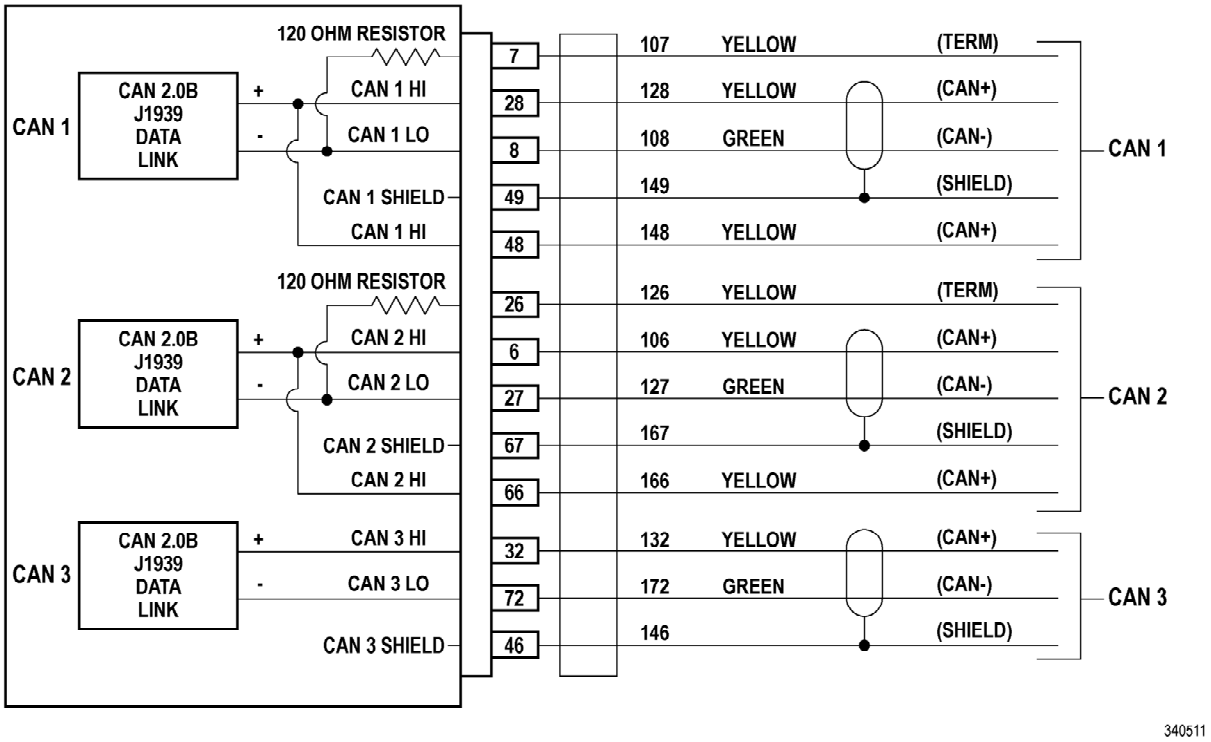
DTC U0103 Lost Communication With Gear Shift Module 1



Circuit Description

This diagnostic test monitors whether communication exists between the TCM and the primary shift selector.

Action Taken When the DTC Sets

When DTC U0103 is active, the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.
- The TCM upshifts and downshifts according to the PWM signal (W134) from shift selector.
- If the shift selector has lost communications with the TCM, the TCM commands the last valid selected gear, and any pre-select capability is disabled.
- When this DTC is active, the shift selector freezes the current display for about 1.5 seconds followed by 10.5 seconds of a blank display. If the shift selector still has power, then dual cat-eye symbols ( ) appear in both displays to notify the operator that range monitor and range select data is unavailable to the shift selector.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- DTC U0103 indicates a missing datalink message for the shift selector SOH message.

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DTC U0103 Lost Communication With Gear Shift Module 1 *(cont'd)*

This DTC may be caused by:

- Miswired or mis-pinned shift selector harness.
- Loss of ignition or battery power to primary shift selector.
- Miswired or defective OEM controllers, OEM components, or OEM circuits attached to the datalink.
- Electrical noise.
- Bus-loading.
- Short to power or short to another wire in datalink wiring.
- High resistance or open in datalink wiring.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors, unlocked pins, causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for shift selector.
- Defective TCM.
- Defective shift selector.

- Vehicle manufacturers may wire shift selectors to either CAN1 or CAN2. Refer to wiring schematic at beginning of this DTC.
- An active DTC U0103 may prevent the Allison DOC® from communicating with the TCM. The J-47276 TCM Reflash Harness may be used to confirm that the TCM is operational. Connect the TCM Reflash Harness to the TCM and leave the OEM harness disconnected. Provide input power from the J-42455-A Load Box.
- CAN1 and CAN2 devices must not be interconnected because they are incompatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN high and CAN low terminals. Resistance across CAN high and CAN low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®
- J-46708 Digital Multimeter

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.

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DTC U0103 Lost Communication With Gear Shift Module 1 *(cont'd)*

2. Check for active code.
3. Check for history of DTC U0073.
4. Check for cat-eye symbols ( ).
5. Check shift selector power, ground, ignition sense for shorts wire to wire and ground.
6. Check shift selector power, ground, ignition sense for high resistance or opens.
7. Check CAN high and CAN low wires for shorts wire to wire and shorts to ground.
8. Check CAN high and CAN low wires for high resistance and opens.
9. Check TCM.
10. Check shift selector.
11. Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 2*	*Go to DTC U0073 for shift selectors on CAN1 or DTC U0074 for shift selectors on CAN2.*
2	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC U0103 active?		*Go to Step 3*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 11*
3	Is DTC U0073 or U0074 active or in history with DTC U0103?		*Go to DTC U0073 or DTC U0074*	*Go to Step 4*
4	Do cat-eye symbols ( ) display in shift selector display after approximately 12 seconds?		*Go to Step 7*	*Go to Step 5*

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DTC U0103 Lost Communication With Gear Shift Module 1 *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Disconnect all shift selector harness connectors from shift selectors. 3. Disconnect 80-way connector from TCM. 4. Disconnect the shift selector wires from all termination points for all primary and secondary shift selector wires. 5. Using J-46708 Digital Multimeter, measure the resistance between OEM shift selector ignition power wire at shift selector terminal 12, the OEM shift selector battery power wire at terminal 13, and OEM shift selector battery ground wire at terminal 5 to all other shift selector harness wires and to each other. Does circuit resistance measure 20 kΩ or more for each OEM shift selector harness wire to all other shift selector wires and to chassis ground?	20 kΩ or more	*Go to Step 6*	*Resolve OEM shift selector wiring issue. Go to Step 11*
6	1. Turn ignition **OFF**. 2. Leave shift selector harness disconnected from shift selector. 3. Leave all OEM termination points for shift selector wires disconnected from their OEM source. 4. Check for high resistance or open through shift selector ignition power wire in shift selector terminal 12, shift selector battery power wire at terminal 13, and shift selector battery ground wire at terminal 5. Does circuit resistance measure 2 Ω or less through each of the wires in OEM shift selector harness that terminate at shift selector terminals 12, 13, and 5?	2 Ω or less	*Go to Step 7*	*Resolve shift selector wiring issue. Go to Step 11*

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DTC U0103 Lost Communication With Gear Shift Module 1 *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Leave ignition **OFF**. 2. Leave all OEM shift selector connectors disconnected. 3. Leave OEM TCM 80-way connector disconnected. 4. Locate where SAE J1939 CAN high and CAN low wires terminate in vehicle and disconnect from datalink. 5. Disconnect both external 120 Ω termination resistors or unplug the datalink connector from any controller responsible for an internal 120 Ω datalink termination point. 6. Check for shorts wire to wire and to chassis ground in SAE J1939 shift selector wires for CAN high to shift selector terminal 8 and CAN low to shift selector terminal 15. **NOTE:** A properly terminated datalink (e.g., both ends terminated with 120 Ω resistors) should measure 60 Ω with ignition **OFF**. If it measures 120 Ω, one termination resistor is missing and could cause this code. 7. For shift selectors on CAN1, repeat task 6 for wires to TCM terminals 28 (CAN1 High), 8 (CAN1 Low). For shift selectors on CAN2, repeat task 6 for wires to TCM terminals 6 (CAN2 High), 27 (CAN2 Low). Do shift selector and TCM datalink wires for CAN high and CAN low measure more than 20 kΩ to all other wires in shift selector harness and to chassis ground?	20 kΩ or more	*Go to Step 8*	*Resolve datalink wiring issue with CAN High or CAN Low. Go to Step 11*

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DTC U0103 Lost Communication With Gear Shift Module 1 *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Leave ignition **OFF**. 2. Leave all OEM shift selector connectors disconnected. 3. Leave OEM TCM 80-way connector disconnected. 4. Leave SAE J1939 CAN high and CAN low wires disconnected from backbone if possible. 5. Leave both 120 Ω termination resistors disconnected. 6. Check for high resistance or opens in SAE J1939 shift selector wires. **NOTE:** A properly terminated datalink (e.g., both ends terminated with 120 Ω resistors) should measure 60 Ω with ignition **OFF**. If it measures 120 Ω, one termination resistor is missing and could cause this code. 7. For shift selectors on CAN1, check for high resistance or opens in SAE J1939 wires from TCM terminals 28 (CAN1 High), 8 (CAN1 Low). For shift selectors on CAN2, check for high resistance or opens in SAE J1939 wires from TCM terminals 6 (CAN2 High), 27 (CAN2 Low). Do shift selector datalink and TCM wires for CAN high and CAN low measure less than 2 Ω through each wire?	2 Ω or less	*Go to Step 9*	*Resolve datalink wiring issue with CAN High or CAN Low wire. Go to Step 11*
9	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 3. Start engine. 4. Using Allison DOC® and the snapshot feature, check for active codes. 5. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 6. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 11 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Go to Step 10*

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DTC U0103 Lost Communication With Gear Shift Module 1 *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Install test shift selector. 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test shift selector installed, then turn ignition **OFF** and reinstall original shift selector. 7. Restart engine and check again for active DTCs. Is DTC active with the original shift selector and inactive with a test shift selector?		*Install new shift selector. Go to Step 11 after repair*	*If DTC is active with both test shift selector and original shift selector, then reinstall the original shift selector. Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1*
11	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0103 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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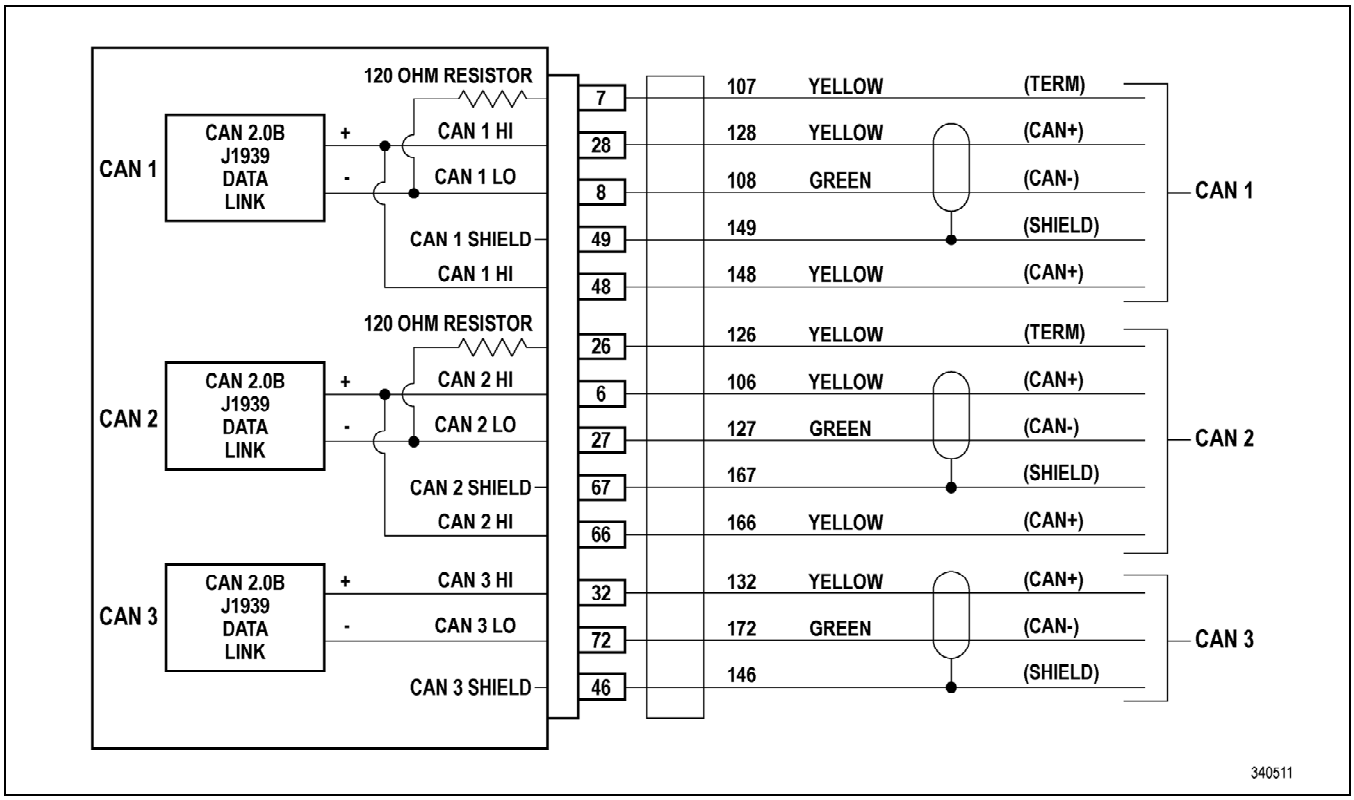
DTC U0291 Lost Communication With Gear Shift Module 2



Circuit Description

This diagnostic test monitors whether communication exists between the TCM and the secondary shift selector.

Action Taken When the DTC Sets

When DTC U0291 is active, the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.
- The TCM upshifts and downshifts according to the PWM signal (W134) from shift selector.
- If the shift selector has lost communications with the TCM, the TCM commands the last valid selected gear, and any pre-select capability is disabled.
- When this DTC is active, the shift selector freezes the current display for about 1.5 seconds followed by 10.5 seconds of a blank display. If the shift selector still has power, then dual cat-eye symbols ( ) appear in both displays to notify the operator that range monitor and range select data is unavailable to the shift selector.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- DTC U0291 indicates a missing datalink message for the shift selector SOH message.

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DTC U0291 Lost Communication With Gear Shift Module 2 *(cont'd)*

This DTC may be caused by:

- Miswired or mis-pinned shift selector harness.
- Loss of ignition or battery power to secondary shift selector.
- Miswired or defective OEM controllers, OEM components, or OEM circuits attached to the datalink.
- Electrical noise.
- Bus-loading.
- Short to power or short to another wire in datalink wiring.
- High resistance or open in datalink wiring.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors, unlocked pins, causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for shift selector.
- Defective TCM.
- Defective shift selector.

- Vehicle manufacturers may wire shift selectors to either CAN1 or CAN2. Refer to the wiring schematic at the beginning of this DTC.
- An active DTC U0291 may prevent the Allison DOC® from communicating with the TCM. The J-47276 TCM Reflash Harness may be used to confirm that the TCM is operational. Connect the J-47276 TCM Reflash Harness to the TCM and leave the OEM harness disconnected. Provide input power from the J-42455-A Load Box.
- CAN1 and CAN2 devices must not be interconnected because they are incompatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN high and CAN low terminals. Resistance across CAN high and CAN low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®
- J-46708 Digital Multimeter

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.

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DTC U0291 Lost Communication With Gear Shift Module 2 *(cont'd)*

2. Check for active code.
3. Check for history of DTC U0073.
4. Check for cat-eye symbols ( ).
5. Check shift selector power, ground, ignition sense for shorts wire to wire and shorts to ground.
6. Check shift selector power, ground, ignition sense for high resistance or opens.
7. Check CAN high and CAN low wires for shorts wire to wire and shorts to ground.
8. Check CAN high and CAN low wires for high resistance or opens.
9. Check TCM.
10. Check shift selector.
11. Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 2*	*Go to DTC U0073 for shift selectors on CAN1 or DTC U0074 for shift selectors on CAN2.*
2	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC U0291 active?		*Go to Step 3*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 11*
3	Is DTC U0073 or U0074 active or in history with DTC U0291?		*Go to DTC U0073 or DTC U0074*	*Go to Step 4*
4	Do cat-eye symbols ( ) display in shift selector windows after approximately 12 seconds?		*Go to Step 7*	*Go to Step 5*

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DTC U0291 Lost Communication With Gear Shift Module 2 *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn ignition **OFF**. 2. Disconnect all shift selector harness connectors from shift selectors. 3. Disconnect 80-way connector from TCM. 4. Disconnect the shift selector wires from all termination points for all primary and secondary shift selector wires. 5. Using J-46708 Digital Multimeter, measure the resistance between OEM shift selector ignition power wire at shift selector terminal 12, the OEM shift selector battery power wire at terminal 13, and OEM shift selector battery ground wire at terminal 5 to all other shift selector harness wires and to each other. Does circuit resistance measure 20 kΩ or more for each OEM shift selector harness wire to all other shift selector wires and to chassis ground?	20 kΩ or more	*Go to Step 6*	*Resolve OEM shift selector wiring issue. Go to Step 11*
6	1. Turn ignition **OFF**. 2. Leave shift selector harness disconnected from shift selector. 3. Leave all OEM termination points for shift selector wires disconnected from their OEM source. 4. Check for high resistance or open through shift selector ignition power wire in shift selector terminal 12, shift selector battery power wire at terminal 13, and shift selector battery ground wire at terminal 5. Does circuit resistance measure 2 Ω or less through each of the wires in OEM shift selector harness that terminate at shift selector terminals 12, 13, and 5?	2 Ω or less	*Go to Step 7*	*Resolve shift selector wiring issue. Go to Step 11*

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DTC U0291 Lost Communication With Gear Shift Module 2 *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Leave ignition **OFF**. 2. Leave all OEM shift selector connectors disconnected. 3. Leave OEM TCM 80-way connector disconnected. 4. Locate where SAE J1939 CAN high and CAN low wires terminate in vehicle and disconnect from datalink. 5. Disconnect both external 120 Ω termination resistors or unplug the datalink connector from any controller responsible for an internal 120 Ω datalink termination point. 6. Check for shorts wire to wire and to chassis ground in SAE J1939 shift selector wires for CAN high to selector terminal 8 and CAN low to selector terminal 15. **NOTE:** A properly terminated datalink (e.g., both ends terminated with 120 Ω resistors) should measure 60 Ω with ignition **OFF**. If it measures 120 Ω, one termination resistor is missing and could cause this code. 7. For shift selectors on CAN1, repeat task 6 for wires to TCM terminals 28 (CAN1 High), 8 (CAN1 Low). For shift selectors on CAN2, repeat task 6 for wires to TCM terminals 6 (CAN2 High), 27 (CAN2 Low). Do shift selector and TCM datalink wires for CAN high and CAN low measure more than 20 kΩ to all other wires in shift selector harness and to chassis ground?	20 kΩ or more	*Go to Step 8*	*Resolve datalink wiring issue with CAN High or CAN Low. Go to Step 11*

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DTC U0291 Lost Communication With Gear Shift Module 2 *(cont'd)*

Step	Action	Value(s)	Yes	No
8	1. Leave ignition **OFF**. 2. Leave all OEM shift selector connectors disconnected. 3. Leave OEM TCM 80-way connector disconnected. 4. Leave SAE J1939 CAN high and CAN low wires disconnected from backbone if possible. 5. Leave both 120 Ω termination resistors disconnected. 6. Check for high resistance or opens in SAE J1939 shift selector wires. **NOTE:** A properly terminated datalink (e.g., both ends terminated with 120 Ω resistors) should measure 60 Ω with ignition **OFF**. If it measures 120 Ω, one termination resistor is missing and could cause this code. 7. For shift selectors on CAN1, check for high resistance or opens in SAE J1939 wires from TCM terminals 28 (CAN1 High), 8 (CAN1 Low). For shift selectors on CAN2, check for high resistance or opens in SAE J1939 wires from TCM terminals 6 (CAN2 High), 27 (CAN2 Low). Do shift selector datalink and TCM wires for CAN high and CAN low measure less than 2 Ω through each wire?	2 Ω or less	*Go to Step 9*	*Resolve datalink wiring issue with CAN High or CAN Low wire. Go to Step 11*
9	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 3. Start engine. 4. Using Allison DOC® and the snapshot feature, check for active codes. 5. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 6. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 11 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Go to Step 10*

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DTC U0291 Lost Communication With Gear Shift Module 2 *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Turn ignition **OFF**. 2. Install test shift selector. 3. Install or reconnect all OEM and transmission components and connectors. 4. Start engine. 5. Using Allison DOC® and the snapshot feature, check for active codes. 6. If codes are not active with test shift selector installed, then turn ignition **OFF** and reinstall original shift selector. 7. Restart engine and check again for active DTCs. Is DTC active with the original shift selector and inactive with a test shift selector?		*Install new shift selector. Go to Step 11 after repair*	*If DTC is active with both test shift selector and original shift selector, then reinstall the original shift selector. Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1*
11	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0291 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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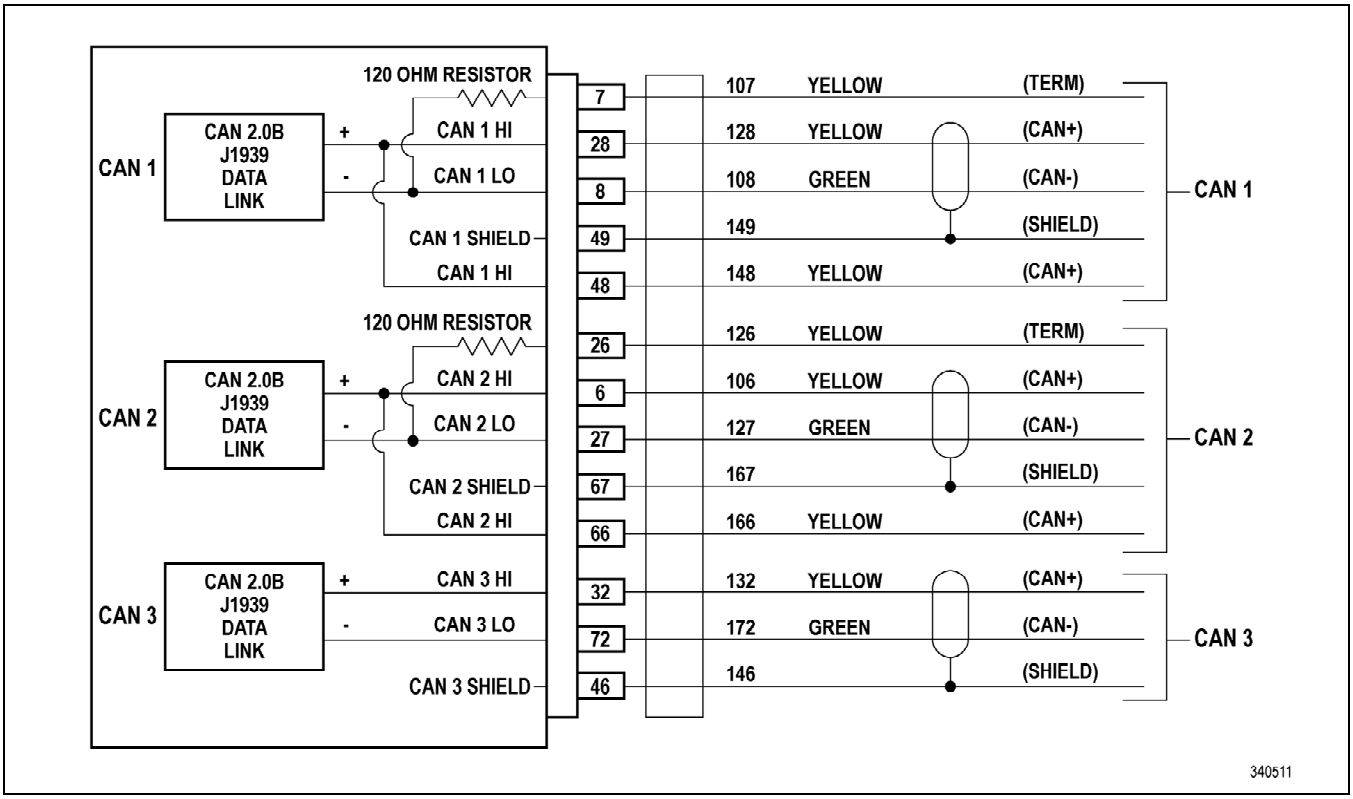
DTC U0304 Gear Shift Module 1 Incompatible



Circuit Description

This test checks if the primary SAE J1939 shift selector is incompatible with the TCM software.

Action Taken When the DTC Sets

When DTC U0304 is active for invalid ID, the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- DTC U0304 indicates a missing or invalid ID message from the shift selector.

  When this DTC is active, possible causes for invalid selector ID include:

  – Insufficient battery capacity usually caused by excessive cranking, poor battery cabling, defective batteries, etc. Battery voltage dips below 7 to 8 volts occurring just after an initialized TCM makes the ID request is a common cause for this DTC. Generally this can happen during engine cranking above 200 rpm. The selector powers down but the TCM does not. The TCM will make one ID request per engine start cycle; if that request is missed by the selector (due to loss or low battery capacity) this DTC sets. Use the min-max feature on a digital voltmeter to capture the minimum voltage during cranking to the selector and to the TCM. Inspect battery capacity or battery charging issues if low battery voltages are intermittently occurring. Check that TCM and selector are

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DTC U0304 Gear Shift Module 1 Incompatible *(cont'd)*

referenced to the same ground points. Poor grounds or different ground levels to the TCM relative to the shift selector may cause this DTC.

- Miswired or mis-pinned shift selector harness.
- Loss of ignition or battery power to primary shift selector.
- Miswired or defective OEM controllers, OEM components, or OEM circuits attached to the datalink.
- Electrical noise.
- Bus-loading.
- Short to power or short to another wire in datalink wiring.
- High resistance or open in datalink wiring.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors, unlocked pins, causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for shift selector.
- Defective TCM.
- Defective shift selector.

- Vehicle manufacturers may wire shift selectors to either CAN1 or CAN2. Refer to wiring schematic at beginning of this DTC.
- CAN1 and CAN2 devices must not be interconnected because they are incompatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN1 High and CAN1 Low terminals. Resistance across CAN1 High and CAN1 Low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.
2. Check for active code.
3. Check for history of DTC U0073 or U0074.
4. Check for cat-eye symbols ( ).

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DTC U0304 Gear Shift Module 1 Incompatible *(cont'd)*

5. Verify that primary shift selector is an approved OEM selector or Allison Transmission, Inc. 5th Generation controls shift selector.
6. Check for battery power DTCs, such as P0880, and also for battery power and ground issues on the vehicle.
7. Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 2*	*Go to DTC U0073 or DTC U0074*
2	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC U0304 active?		*Go to Step 3*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 7*
3	Is DTC U0073 or U0074 active or in history with DTC U0304?		*Go to DTC U0073 or DTC U0074*	*Go to Step 4*
4	Do cat-eye symbols ( ) display in shift selector windows after approximately 12 seconds?		*Go to DTC U0103 or DTC U0291*	*Go to Step 5*
5	**NOTE:** Parallel (wire) Data Link (PDL) selectors, e.g., non-SAE J1939 set as primary require special calibrations to ensure this DTC is not enabled. Is primary shift selector an approved OEM selector or ATI genuine shift selector?		*Go to Step 6*	*Install an approved ATI shift selector. Go to Step 7*
6	Is there a history of battery power DTCs, such as P0880, or is the DTC more common after engine cranking or during incidents that include other battery related symptoms, such as engine will not start, alternator charging issues, etc.?		*Correct issue with batteries, battery cabling, or defective batteries. Go to Step 7*	*Go to DTC U0103 or DTC U0291*

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DTC U0304 Gear Shift Module 1 Incompatible *(cont'd)*

Step	Action	Value(s)	Yes	No
7	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0304 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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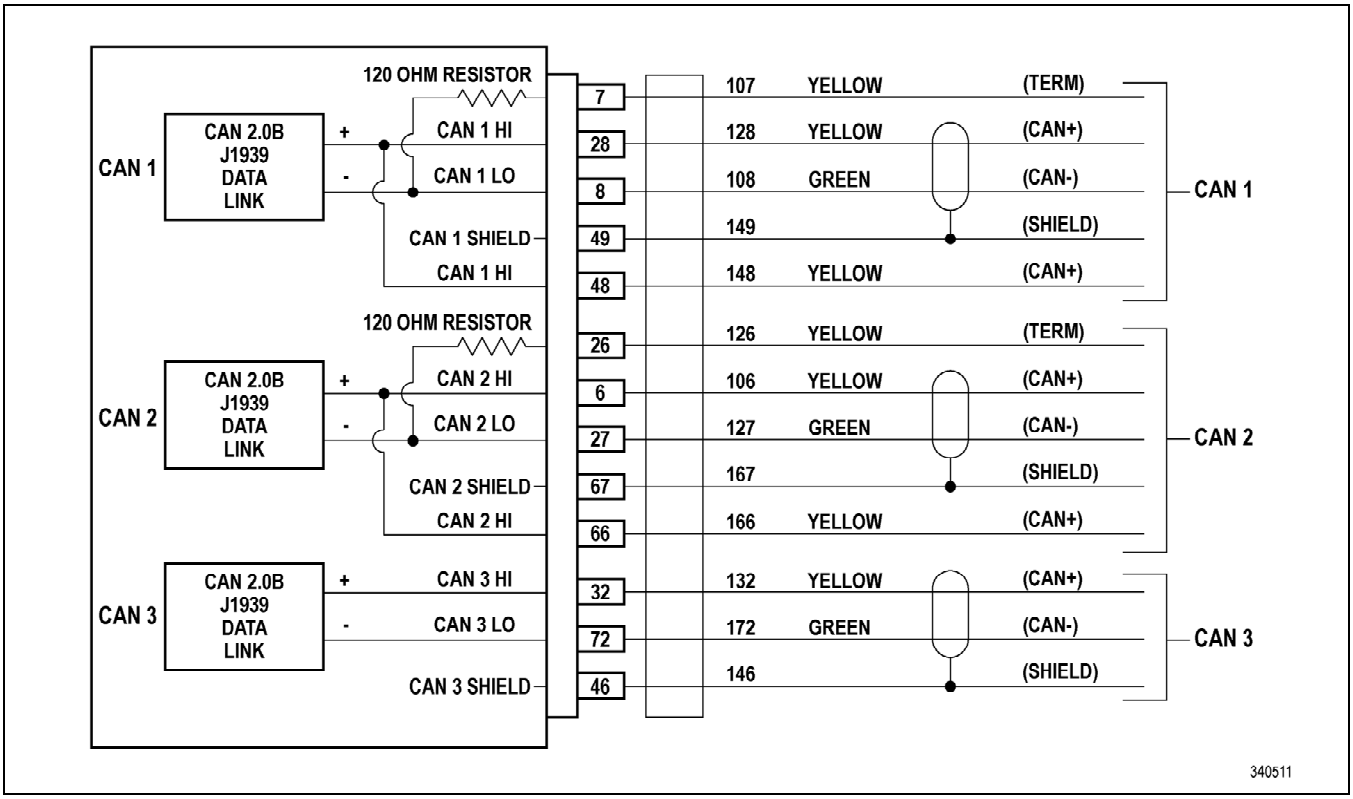
DTC U0333 Gear Shift Module 2 Incompatible



Circuit Description

This test checks if the secondary SAE J1939 shift selector is incompatible with the TCM software.

Action Taken When the DTC Sets

When DTC U0333 is active for invalid ID, the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- DTC U0333 indicates a missing or invalid ID message from the shift selector.

  When this DTC is active, possible causes for invalid selector ID include:

  – Insufficient battery capacity usually caused by excessive cranking, poor battery cabling, defective batteries, etc. A battery voltage dip below 7 to 8 volts occurring just after an initialized TCM makes the ID request a common cause for this DTC. Generally this can happen during engine cranking above 200 rpm. The selector powers down but the TCM does not. The TCM will make one ID request per engine start cycle; if that request is missed by the selector (due to loss or low battery capacity) this DTC sets. Use the min-max feature on a digital voltmeter to capture the minimum voltage during cranking to the selector and to the TCM. Inspect battery capacity or battery charging issues if low battery voltages are intermittently occurring. Check that TCM and

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DTC U0333 Gear Shift Module 2 Incompatible *(cont'd)*

selector are referenced to the same ground points. Poor grounds or different ground levels to the TCM relative to the shift selector may cause this DTC.

- Miswired or mis-pinned shift selector harness.
- Loss of ignition or battery power to secondary shift selector.
- Miswired or defective OEM controllers, OEM components, or OEM circuits attached to the datalink.
- Electrical noise.
- Bus-loading.
- Short to power or short to another wire in datalink wiring.
- High resistance or open in datalink wiring.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors, unlocked pins, causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for shift selector.
- Defective TCM.
- Defective shift selector.

- Vehicle manufacturers may wire shift selectors to either CAN1 or CAN2. Refer to wiring schematic at beginning of this DTC.
- CAN1 and CAN2 devices must not be interconnected because they are incompatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN1 High and CAN1 Low terminals. Resistance across CAN1 High and CAN1 Low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.
2. Check for active code.
3. Check for history of DTC U0073 or U0074.
4. Check for cat-eye symbols ( ).

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DTC U0333 Gear Shift Module 2 Incompatible *(cont'd)*

5. Verify that secondary shift selector is an approved OEM selector or Allison Transmission, Inc. 5th Generation controls shift selector.
6. Check for battery power DTCs, such as P0880, and also for battery power and ground issues on the vehicle.
7. If DTC is still active, review applicable information in the Universal Allison DOC® Technician's Library, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 2*	*Go to DTC U0073 or DTC U0074*
2	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC U0333 active?		*Go to Step 3*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 7*
3	Is DTC U0073 or U0074 active or in history with DTC U0333?		*Go to DTC U0073 or DTC U0074*	*Go to Step 4*
4	Do cat-eye symbols ( ) display in shift selector windows after approximately 12 seconds?		*Go to DTC U0103 or DTC U0291*	*Go to Step 5*
5	**NOTE:** Parallel (wire) Data Link (PDL) selectors, e.g., non-SAE J1939 set as secondary require special calibrations to ensure this DTC is not enabled. Is secondary shift selector an approved OEM selector or ATI genuine shift selector?		*Go to Step 6*	*Install an approved ATI shift selector. Go to Step 7*

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DTC U0333 Gear Shift Module 2 Incompatible *(cont'd)*

Step	Action	Value(s)	Yes	No
6	Is there a history of battery power DTCs, such as P0880, or is the DTC more common after engine cranking or during incidents that include other battery related symptoms, such as engine will not start, alternator charging issues, etc.?		*Correct issue with batteries, battery cabling, or defective batteries. Go to Step 7*	*Go to DTC U0103 or DTC U0291*
7	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0333 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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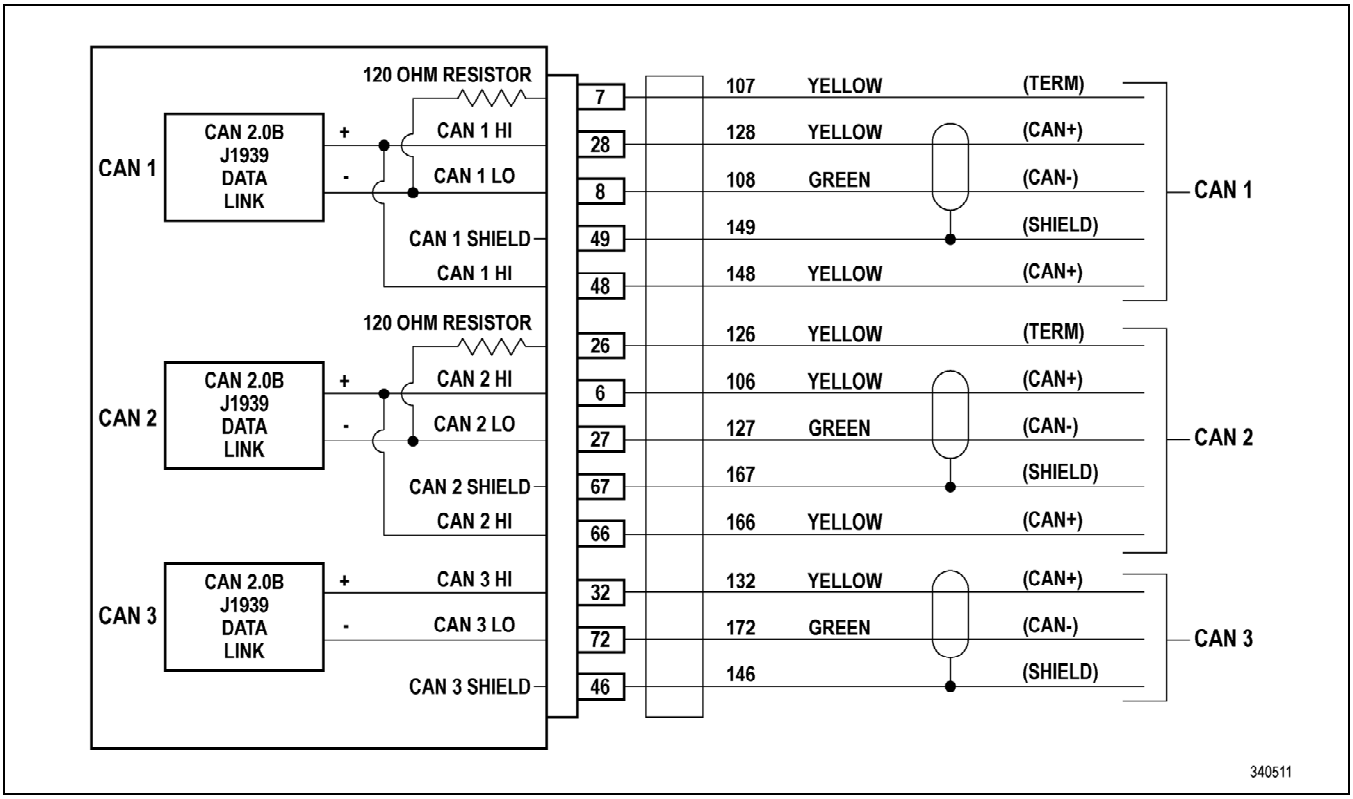
DTC U0400 Invalid Communication Link Data Received (J1939 Brake Switch)



Circuit Description

In Allison 5th Generation Controls, the preferred digital datalink is the SAE J1939 Controller Area Network (CAN). The TCM communicates with the engine control module and other controllers by exchanging standardized digital messages over SAE J1939. The physical network consists of a two-wire twisted pair, two 120 Ω termination resistors and, in most cases, a third shield wire. A 120 Ω termination resistor is located at each end of the network. Vehicle OEMs may choose to install external termination resistors or use internal termination resistors built into many SAE J1939 electronic modules, including the TCM and shift selector. Refer to the Allison DOC® Technician's Library for additional information.

Conditions for Running the DTC

- Vocation usage is Fire Service, Crash/Rescue/Military, or Special Military with Direction Change Enable (DCE) or Auxiliary Function Range Inhibit (AFRI) using Service Brake Status (SBS) via a communication link.
- TCM initializes normally and engine speed is above 200 rpm for more than 5 seconds.
- TCM calibrated to receive SAE J1939 Brake Signal message, also known as Service Brake Switch (SBS) Status from communication datalink.

Conditions for Setting the DTC

SAE J1939 SBS message indicates "Error", "Not Available" or missing for a time.

Action Taken When the DTC Sets

- The TCM illuminates the **CHECK TRANS** light.

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DTC U0400 Invalid Communication Link Data Received (J1939 Brake Switch) *(cont'd)*

- DTC is stored in TCM history.

NOTE: There is no range inhibit when this DTC is active.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

NOTE: DTC U0400 signifies SAE J1939 SBS message indicating "Error", "Not Available" or missing for a time.

This DTC may be caused by:

- Source Address (SA) set by calibration or autodetected by calibration is not sending the service brake status message or is incorrect SA.
- OEM controller hardware or software issue with body, engine, or brake systems controller (e.g., ABS/ATC/ASR, etc.).
- OEM SAE J1939 datalink integrity issues such as:
  - wiring shorted to ground.
  - wiring open circuit or high resistance.
  - shielding problems.
  - termination resistors missing, defective, or unplugged.
  - electrical noise issues.
  - bus loading issues.
- Defective TCM.

When reviewing Data Bus Viewer logs, determine which SA brake switch status message is being received by the TCM. SAE J1939 EBC1 and CCVS Brake Switch messages may be received from several source addresses. The TCM may be set by calibration to receive the service brake message from either EBC1 or CCVS or through the autodetect process which locks on the most preferred SA, even if the message sent by that controller is 'error'. EBC1 Brake switch messages have preference over CCVS during the SA autodetect process. Using Allison DOC® Action Requests, Reset Autodetect SAE J1939 SA information to reset the SA autodetect process.

SBS message status must be monitored using the Data Bus Viewer. The "Brake Pedal Depressed" status is displayed when the service brake is applied. The "Brake Pedal Released" is displayed when the brake is not applied. Verify EBC1 Brake Switch status is shown as "Not Available" before assuming brake switch is being received by the TCM from a CCVS SA.

Not all Allison input functions incorporating Service Brake Status may substitute a SAE J1939-based input for the analog input. The functions that do not allow an SBS datalink message (see table) must use an analog

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DTC U0400 Invalid Communication Link Data Received (J1939 Brake Switch) *(cont'd)*

input for SBS. Refer to the Allison DOC® Technician's Library for additional information. Features and/or ranges may be inhibited when a valid SBS state is not detected by the TCM.

Allison Input Function	SBS Datalink Message Allowed?
E Auxiliary Function Range Inhibit - Single Input (AFRI)	Yes
AA Service Brake Status	Yes
CA Brake Based Auto-Neutral For PTO (BBAN)	Yes
W Direction Change Enable	Yes
Z Retarder Enable (see Driveline Retarder Control)	Yes
AK Automatic Neutral - Dual Input with Service Brake Status	Yes
AL Shift Selector Transition/Secondary Shift Schedule	No
CN Auto-Neutral Dual Input with Automatic Return to Range Reduced Engine Load at Stop (RELS)	Yes
Neutral at Stop Premium	Yes

Review applicable information in the Allison DOC® Technician's Library, the latest version of Allison Tech Data on the Allison extranet and other related Appendices.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Check for active DTC.
2. Check SA for "Brake Signal" parameter and valid status.
3. Check for history of communication DTCs.
4. Check for multiple unrelated codes.
5. Check for active DTC P0703.
6. Check for loss of Brake Switch status in Data Bus Viewer log by road test if necessary.
7. Check TCM.
8. Review applicable information in the Allison DOC® Technician's Library, the latest version of Allison Tech Data on the Allison extranet and other related Appendices.

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DTC U0400 Invalid Communication Link Data Received (J1939 Brake Switch) *(cont'd)*

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Install the Allison DOC®. 2. Start engine. 3. Record snapshot using Allison DOC® showing active or inactive code(s). 4. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC U0400 active?		*Go to Step 2*	*Troubleshoot any other active codes, if present. If no DTCs are active, then go to Step 8.*
2	1. Reconnect Allison DOC® to the vehicle's diagnostic tool connector if needed. 2. Start engine. 3. Select "Data Bus Viewer". 4. Press and release the service brake several times while logging the SAE J1939 parameter data in a data bus viewer log. 5. Review the log file for a functioning brake switch parameter that shows the "Brake Pedal Depressed" when the service brake is pressed and "Brake Pedal Released" when the service brake is released. **NOTE:** The proper SA (controller) responsible for broadcasting the "Brake Switch" parameter must be determined prior to log file review. See Diagnostic Aids. Is the SA correct for the "Brake Signal" parameter with valid status?	Check for status by slowly pressing and releasing the service brake in **N** (Neutral); watch for changes in SAE J1939 engine parameter values.	*Go to Step 7*	*Recalibrate TCM with correct source for SAE J1939 Service Brake Status, e.g., CCVS or EBC1; or, reset Autodetect SAE J19339 SA Information if calibration is enabled to autodetect service brake status message source. Go to Step 3*
3	Is DTC U0073 or U0074 active with DTC U0400?		*Go to DTC U0073 or DTC U0074*	*Go to Step 4*
4	Are there other active or inactive codes that are not related to communication DTCs active with DTC U0400?		*Go to Step 7*	*Go to Step 5*
5	Is DTC P0703 active with DTC U0400?		*Go to DTC P0703*	*Go to Step 6*

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DTC U0400 Invalid Communication Link Data Received (J1939 Brake Switch) *(cont'd)*

Step	Action	Value(s)	Yes	No
6	**NOTE:** This step may require a short test drive if condition was not duplicated with vehicle stationary, e.g., DTC active only with vehicle vibration, wire strain, etc. to duplicate the issue. Does Brake Switch status display "Not Available" or is "Error" in the data bus viewer log file acquired from previous step?		*Correct OEM condition causing loss of Brake Signal on datalink. See Diagnostic Aids aids for possible causes. Go to Step 8*	*Go to Step 7*
7	1. Turn ignition **OFF**. 2. Install test TCM and torque bolt in TCM to 2.0-3.2 N·m (18-28 lb in). 3. Start engine. 4. Using Allison DOC® and the snapshot feature, check for active codes. 5. If codes are not active with test TCM installed, then turn ignition **OFF** and re-install original TCM. 6. Restart engine and check again for active DTCs. Is DTC active with the original TCM and inactive with a test TCM?		*Install a new TCM. Go to Step 8 after repair*	*If DTC is active with both test TCM and original TCM, then reinstall the original TCM. Review Diagnostic Aids. Go to Step 1*
8	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0400 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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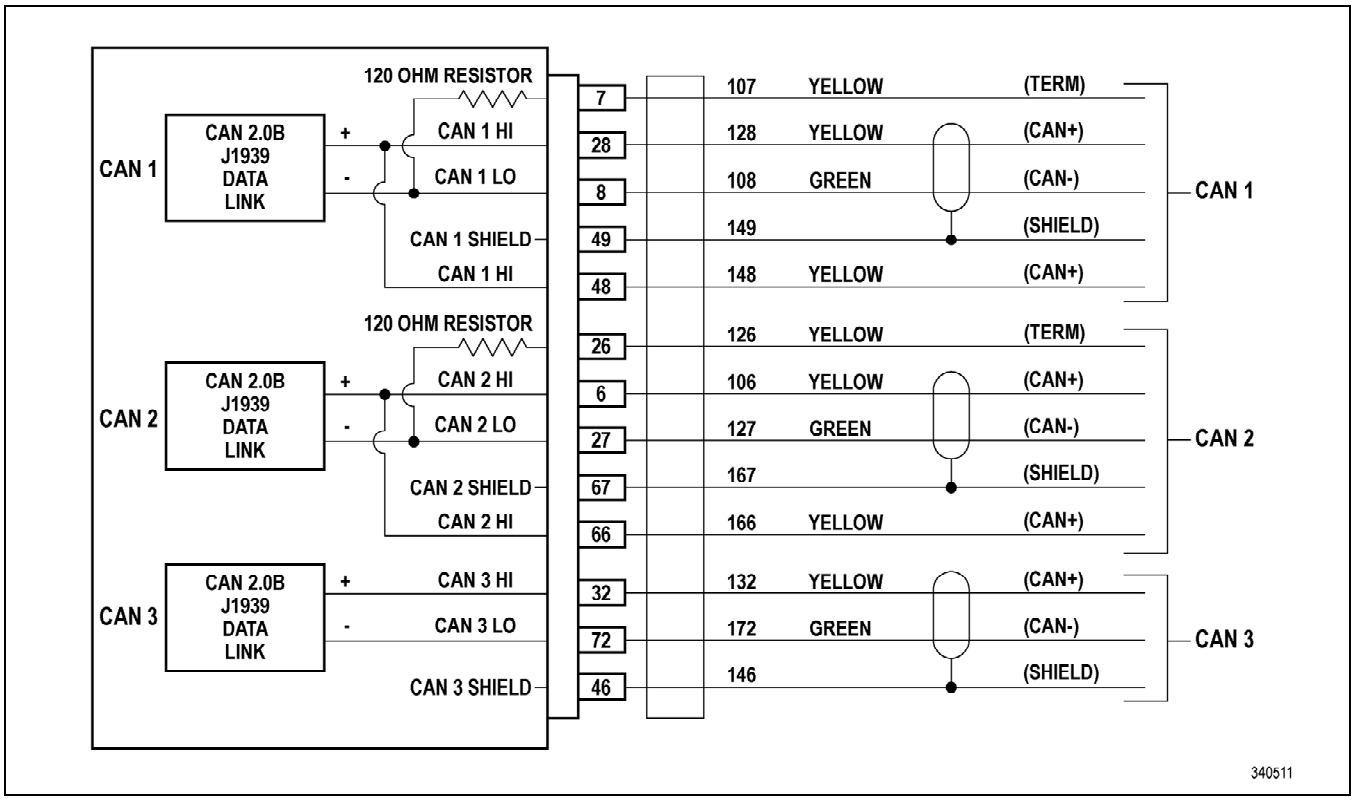
DTC U0404 Gear Shift Module 1 Invalid Data



Circuit Description

This test monitors the integrity of data from the SAE J1939 primary shift selector. Communications messages are received, but data is unusable.

Action Taken When the DTC Sets

When DTC U0404 is active when the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.
- While shift selector data is invalid, the TCM maintains last valid selected gear, and pre-select capability is disabled. The Pulse Width Modulation (PWM) circuit is used to select direction.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC U0404 indicates invalid data is received from the primary shift selector and may be caused by:

- Insufficient battery capacity usually caused by excessive cranking, poor battery cabling, defective batteries, etc. A battery voltage dip below 7 to 8 volts while the TCM continues to check for valid shift selector messages is a common cause for this DTC. Generally this can happen during engine cranking above 200 rpm. The selector powers down but the TCM does not. Use the min-max feature on a digital voltmeter to capture the minimum voltage during cranking to the selector and to TCM. Inspect battery

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DTC U0404 Gear Shift Module 1 Invalid Data *(cont'd)*

capacity or battery charging issues if low battery voltages are intermittently occurring. Check that TCM and selector are referenced to the same ground points. Poor grounds or different ground levels to the TCM relative to the shift selector may cause this DTC.

- Miswired or mis-pinned shift selector harness.
- Loss of ignition or battery power to primary shift selector.
- Miswired or defective OEM controllers, OEM components, or OEM circuits attached to the datalink.
- Electrical noise.
- Bus-loading.
- Short to power or short to another wire in datalink wiring.
- High resistance or open in datalink wiring.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors or unlocked pins causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for shift selector.
- Defective TCM.
- Defective shift selector.
- Vehicle manufacturers may wire shift selectors to either CAN1 or CAN2. Refer to wiring schematic at beginning of this DTC.
- CAN1 and CAN2 devices must not be interconnected because they are incompatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN1 High and CAN1 Low terminals. Resistance across CAN1 High and CAN1 Low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.
2. Check for active code.
3. Check for history of DTC U0073 or U0074.
4. Check for cat-eye symbols ( ).

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DTC U0404 Gear Shift Module 1 Invalid Data *(cont'd)*

5. Verify that primary shift selector is an approved OEM selector or Allison Transmission, Inc. genuine shift selector.
6. Check for battery power DTCs, such as P0880, and also for battery power and ground issues on the vehicle.
7. If DTC is still active, review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 2*	*Go to DTC U0073 or DTC U0074*
2	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC U0404 active?		*Go to Step 3*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 7*
3	Is DTC U0073 or U0074 active or in history with DTC U0404?		*Go to DTC U0073 or DTC U0074*	*Go to Step 4*
4	Do cat-eye symbols ( ) display in shift selector windows after approximately 12 seconds?		*Go to DTC U0304*	*Go to Step 5*
5	**NOTE:** Parallel (wire) Data Link (PDL) selectors, e.g., non-SAE J1939 strip style selectors set as the primary require special calibrations to ensure this DTC is not enabled. Is primary shift selector an approved OEM selector or Allison Transmission, Inc. 5th Generation controls shift selector?		*Go to Step 6*	*Install an approved shift selector. Go to Step 7*

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DTC U0404 Gear Shift Module 1 Invalid Data *(cont'd)*

Step	Action	Value(s)	Yes	No
6	Is there a history of battery power DTCs, such as P0880, or is the DTC more common after engine cranking or during incidents that include other battery related symptoms, such as engine will not start, alternator charging issues, etc.?		*Correct issue with batteries, battery cabling, or defective batteries. Go to Step 7*	*Go to DTC U0304 or DTC U0103*
7	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0404 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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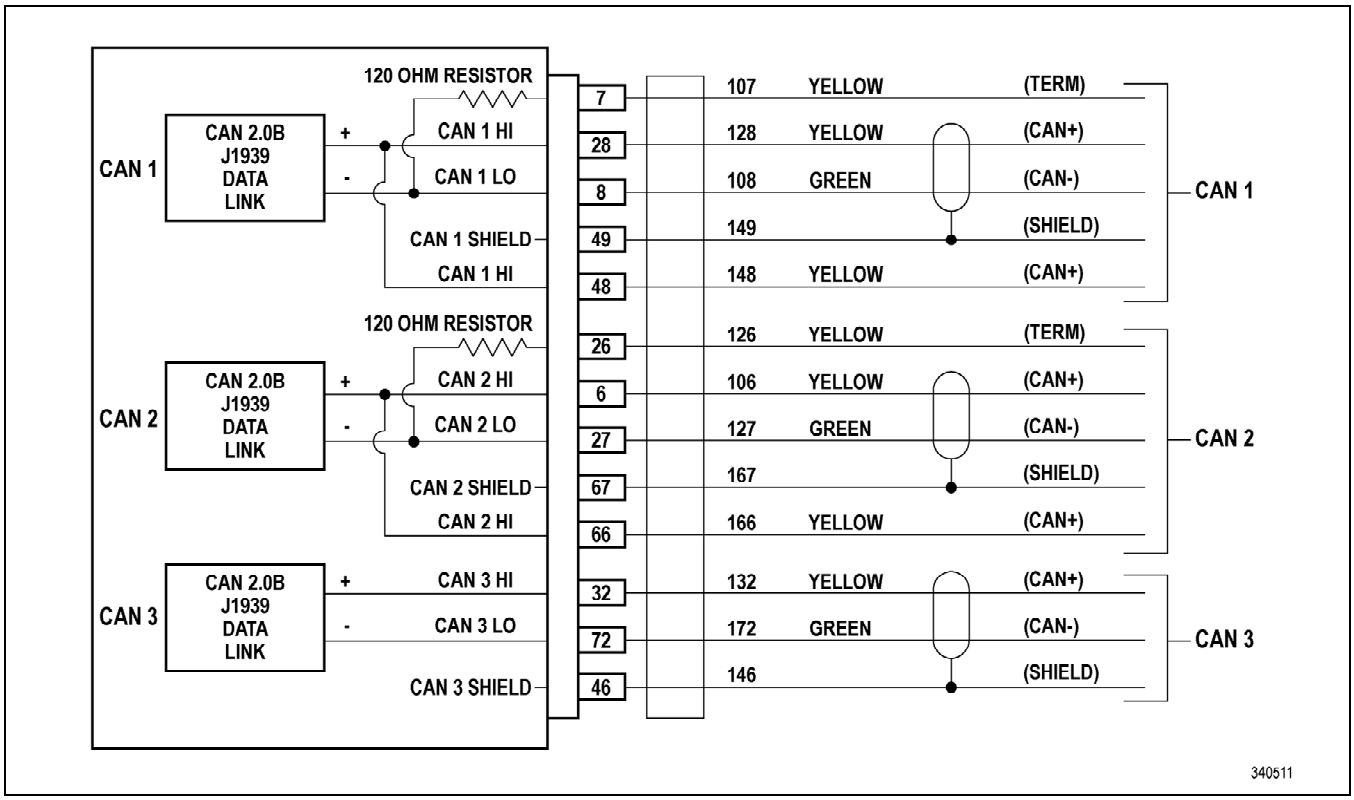
DTC U0592 Gear Shift Module 2 Invalid Data



Circuit Description

This test monitors the integrity of data from the SAE J1939 secondary shift selector. Communications messages are received, but data is unusable.

Action Taken When the DTC Sets

When DTC U0592 is active when the following conditions occur:

- The DTC is stored in the TCM history.
- The TCM illuminates the **CHECK TRANS** light.
- While shift selector data is invalid, the TCM maintains last valid selected gear, and pre-select capability is disabled. The Pulse Width Modulation (PWM) circuit is used to select direction.

Conditions for Clearing the DTC/CHECK TRANS Light

Use the Allison DOC® to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

DTC U0592 indicates invalid data is received from the secondary shift selector and may be caused by:

- Insufficient battery capacity usually caused by excessive cranking, poor battery cabling, defective batteries, etc. A battery voltage dip below 7 to 8 volts while the TCM continues to check for valid shift selector messages is a common cause for this DTC. Generally this can happen during engine cranking above 200 rpm. The selector powers down but the TCM does not. Use the min-max feature on a digital voltmeter to capture the minimum voltage during cranking to the selector and to TCM. Inspect battery

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DTC U0592 Gear Shift Module 2 Invalid Data *(cont'd)*

capacity or battery charging issues if low battery voltages are intermittently occurring. Check that TCM and selector are referenced to the same ground points. Poor grounds or different ground levels to the TCM relative to the shift selector may cause this DTC.

- Miswired or mis-pinned shift selector harness.
- Loss of ignition or battery power to secondary shift selector.
- Miswired or defective OEM controllers, OEM components, or OEM circuits attached to the datalink.
- Electrical noise.
- Bus-loading.
- Short to power or short to another wire in datalink wiring.
- High resistance or open in datalink wiring.
- Poor vehicle grounds.
- Unlocked connectors, expanded terminals, poor pin crimps or unlocked pins causing high resistance or open circuit.
- Unlocked connectors or unlocked pins causing shorts in connectors.
- TCM ground is at different voltage potential than the ground of the OEM voltage source responsible for shift selector.
- Defective TCM.
- Defective shift selector.
- Vehicle manufacturers may wire shift selectors to either CAN1 or CAN2. Refer to wiring schematic at beginning of this DTC.
- CAN1 and CAN2 devices must not be interconnected because they are incompatible with each other. CAN1 operates at 250 kbps data rate and CAN2 operates at 500 kbps data rate.
- For proper datalink communications, it is necessary to have two 120 Ω resistors installed in parallel across the CAN1 High and CAN1 Low terminals. Resistance across CAN1 High and CAN1 Low should measure 60 Ω when wired correctly.
- Allison DOC® Data Bus Viewer may be selected from the File Menu to monitor or log SAE J1939 datalink messages.

Review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, and other related Appendices.

Tool Requirements:

- Allison DOC®

DTC Troubleshooting Step Description

Each item number description in this list correlates to the identical number shown in the DTC table "Step" column and is meant to briefly describe the "Action" column procedures for a particular step in the table. The DTC troubleshooting step descriptions examine the following:

1. Tests for communication with the TCM via the CAN1 9-pin SAE vehicle diagnostic connector.
2. Check for active code.
3. Check for history of DTC U0073 or U0074.
4. Check for cat-eye symbols ( ).

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DTC U0592 Gear Shift Module 2 Invalid Data *(cont'd)*

5. Verify that secondary shift selector is an approved OEM selector or Allison Transmission, Inc. genuine shift selector.
6. Check for battery power DTCs, such as P0880, and also for battery power and ground issues on the vehicle.
7. If DTC is still active, review applicable information in the Universal Allison DOC® Technician's Library, Section 6. CONTROL SYSTEM AND TRANSMISSION SPECIFICATIONS, 7–1. GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS–SHIFT SELECTOR ISSUES, and other related Appendices.

NOTE: The Allison Transmission warranty, or the extended coverage for parts and labor, does not cover the repair or replacement of OEM or bodybuilder provided components or any external wire harnesses not provided by Allison Transmission, Inc.

Before repairing or replacing these components or circuits that caused a transmission issue, always contact the vehicle OEM call center and/or the vehicle OEM or bodybuilder service representative to verify the warranty coverage and proper payment arrangements, arrange an alternate sublet or repair plan (if needed), and get troubleshooting assistance for the repair (such as vehicle schematics, DTC trees, parts assistance, etc.).

Step	Action	Value(s)	Yes	No
1	1. Connect Allison DOC® to the vehicle's CAN1 diagnostic tool connector. 2. Turn ignition **ON**. Is Allison DOC® communicating with the TCM?		*Go to Step 2*	*Go to DTC U0073 or DTC U0074*
2	1. Start engine. 2. Record snapshot using Allison DOC® showing active or inactive code(s). 3. Review failure records report from snapshot to determine conditions when DTC occurs. Is DTC U0592 active?		*Go to Step 3*	*Troubleshoot any other active DTCs, if present. If no other DTCs are active, go to Step 7*
3	Is DTC U0073 or U0074 active or in history with DTC U0592?		*Go to DTC U0073 or DTC U0074*	*Go to Step 4*
4	Do cat-eye symbols ( ) display in shift selector windows after approximately 12 seconds?		*Go to DTC U0333*	*Go to Step 5*
5	**NOTE:** Parallel (wire) Data Link (PDL) selectors, e.g., non-SAE J1939 strip style selectors set as the secondary require special calibrations to ensure this DTC is not enabled. Is secondary shift selector an approved OEM selector or Allison Transmission, Inc. 5th Generation controls shift selector?		*Go to Step 6*	*Install an approved ATI compatible shift selector. Go to Step 7*

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DTC U0592 Gear Shift Module 2 Invalid Data *(cont'd)*

Step	Action	Value(s)	Yes	No
6	Is there a history of battery power DTCs, such as P0880, or is the DTC more common after engine cranking or during incidents that include other battery related symptoms, such as engine will not start, alternator charging issues, etc.?		*Correct issue with batteries, battery cabling, or defective batteries. Go to Step 7*	*Go to DTC U0333 or DTC U0291*
7	To verify the repair: 1. Turn ignition **OFF**. 2. Install or reconnect all OEM and transmission components and connectors, if needed. 3. Use Allison DOC® to clear inactive DTCs from history. 4. Acquire new Allison DOC® snapshot while driving vehicle under same conditions, if possible, noted in failure records. Did DTC U0592 return?		*Review Diagnostic Aids for this DTC, then begin diagnosis again at Step 1.*	*System OK. Clear inactive DTCs and return vehicle to service.*

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