DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0976 Shift Solenoid 2 (SS2) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 119 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 19 and all other pins in the 80-way connector, and shorts-to-ground between pin 19 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	

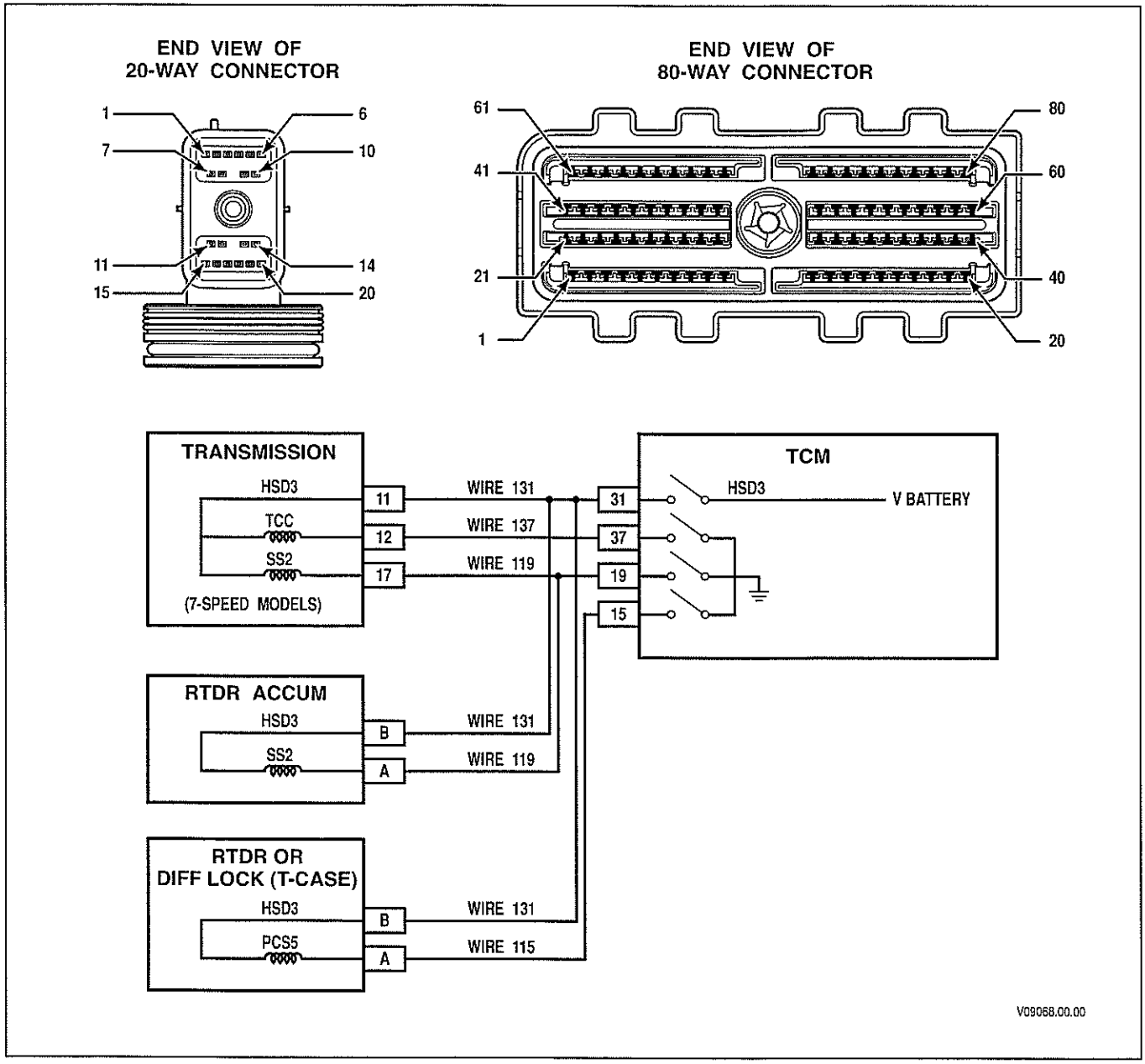
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0976 Shift Solenoid 2 (SS2) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	For 7-speed transmissions: 1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 17 and all other pins in the 20-way connector. ***NOTE: The resistance value between pins 17 and 11 will read normal solenoid resistance. The resistance value between 17 and 12 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.*** 4. Test for shorts-to-ground between pin 17 and chassis ground. For retarder units: 1. Turn OFF the ignition. 2. Disconnect the retarder accumulator solenoid. 3. Using a DVOM, test for shorts-to-ground between pin A of SS2 and chassis ground. ***NOTE: The resistance value of SS2 (retarder accumulator) will be normal solenoid resistance. Refer to Solenoid Resistance chart for these values.*** Were any wire-to-wire shorts or shorts-to-ground found?		*7-speed transmissions go to Step 7. Retarder equipped transmission go to Step 9.*	*Go to Step 10*
7	***NOTE: This step applies to 7-speed models only. For retarder models skip to Step 9.*** 1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-to-wire shorts or shorts-to-ground. Were any wire-to-wire or shorts-to-ground found?		*Go to Step 8*	*Go to Step 9*
8	Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 11*	
9	Replace SS2. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High



Circuit Description

Shift Solenoid 2 (SS2) is a normally closed (N/C) solenoid used to either activate the retarder accumulator air solenoid (retarder models) or the C6 enable solenoid (7-speed models). The TCM commands the solenoid ON to supply control main pressure to SS2. When SS2 is commanded OFF, the retarder accumulator air solenoid closes in retarder units or the C6 enable valve closes in 7-speed transmissions.

The TCM sends control current to SS2 from High Side Driver 3 (HSD3) via wire 131. HSD3 is continuously ON unless the TCM detects a fault condition. The TCM energizes SS2 by switching the solenoid's Low Side Driver (LSD) ON. Wire 119 completes the circuit between SS2 and its LSD. DTC P0977 indicates that the TCM has detected a short-to-battery condition in the low side of SS2 electrical circuit.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P0977 is set when the TCM detects a short-to-battery in the SS2 return circuit for more than 125 milliseconds.

Actions Taken When the DTC Sets

When DTC P0977 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM allows operation in second range through sixth range and in Neutral and Reverse.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P0977 indicates a short-to-battery in the electrical circuit for the SS2 solenoid.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.

DIAGNOSTIC TROUBLE CODES (DTC)

3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts between wire 119 and other wires in the OEM chassis harness.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.
10. This step tests for proper operation of the SS2 Low Side Driver.

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem. Go to Step 11*
3	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 a short-to-battery condition in the SS2 electrical circuit.*** Did DTC P0977 return?		*Go to Step 4*	*Go to Diagnostic Aids*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wires 131 and 119 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 19 and all other pins in the 80-way connector. Were any wire-to-wire shorts found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
6	For 7-speed transmissions: 1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a digital multimeter (DVOM), test for wire-to-wire shorts between pin 17 and all other pins in the 20-way connector. ***NOTE: The resistance value between pins 17 and 11 will read normal solenoid resistance. The resistance value between pins 17 and 12 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.*** For retarder equipped units: 1. Turn OFF the ignition. 2. Disconnect the retarder accumulator solenoid. 3. Using a digital multimeter (DVOM), test for wire-to-wire shorts between pin A and pin B of SS2. ***NOTE: The resistance value between pins A and B of SS2 (retarder accumulator) will be normal solenoid resistance. Refer to Solenoid Resistance chart for this value.*** Were any wire-to-wire shorts found?		*7-speed transmissions go to Step 7. Retarder equipped transmission go to Step 9.*	*Go to Step 10*

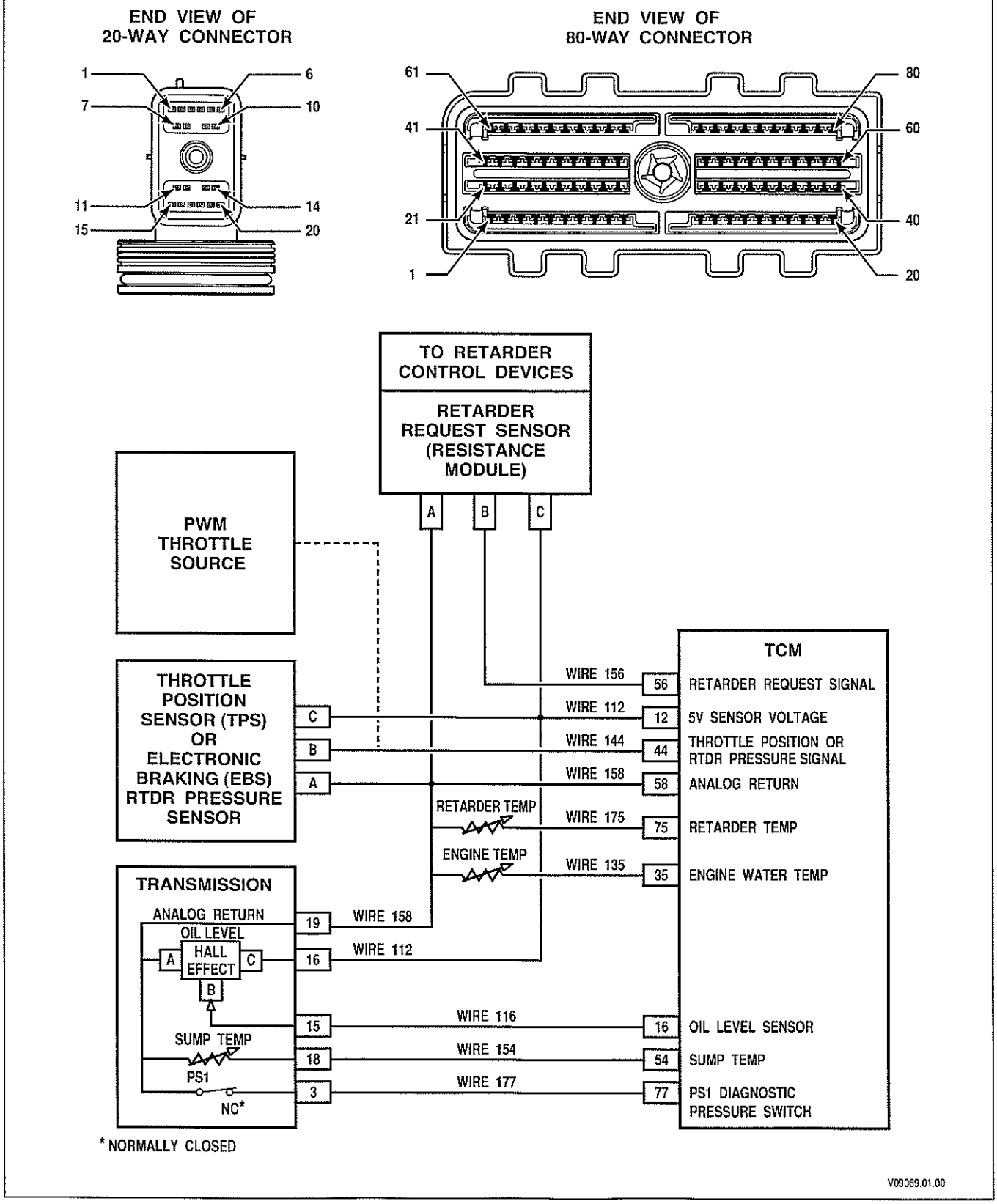
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
7	***NOTE: This step applies to 7-speed models only. Retarder models skip to Step 9.*** 1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-to-wire shorts. Were any wire-to-wire shorts found?		*Go to Step 8*	*Go to Step 9*
8	Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 11*	
9	Replace SS2. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0989 Retarder Pressure Sensor Failed Low



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0989 Retarder Pressure Sensor Failed Low

Circuit Description

The Transmission Control Module (TCM) can be calibrated to control retarder capacity in response to signals from an integral vehicle electronic braking system (EBS). However, the EBS controller requires accurate information about the state of the retarder. Because retarder capacity is proportional to retarder charge pressure, the TCM uses a pressure transducer located in the retarder cavity to measure the precise retarder capacity when the retarder is in operation. The TCM is connected to the pressure transducer by:

- a reference voltage wire,
- retarder request signal wire, and
- analog ground wire.

When the TCM commands more retardation, pressure in the retarder charge pressure circuit increases resulting in a larger voltage signal from the retarder pressure transducer.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- Electronic Braking is enabled in the TCM calibration.

Conditions for Setting the DTC

The TCM detects retarder pressure voltage signal equal to 0V for 10 seconds.

Actions Taken When the DTC Sets

When DTC P0989 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and retarder pressure sensor. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle and operate the retarder in order to experience a fault.

DIAGNOSTIC TROUBLE CODES (DTC)

- DTC P0989 can be caused by an open or short-to-ground in either the 5V reference wire 112 or retarder pressure sensor signal wire 144. The retarder pressure sensor shares a common 5V reference voltage wire 112 with the optional transmission oil level sensor (OLS) and retarder request sensor. An open or short-to-ground in the common 5V reference causes a "sensor failed low" code for the other devices as well. An open or short-to-ground on wire 144 will cause DTC P0989 only.

Test Description

This DTC requires the use of the J 47275 TCM Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for active diagnostic codes.
3. This step tests for wire-to-wire shorts, opens, or shorts-to-ground on wires 112 and 144.
6. This step verifies the TCM is supplying proper 5V reference voltage.

DTC P0989 Retarder Pressure Sensor Failed Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Clear the DTC. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the retarder pressure sensor signal is at 0V for 10 seconds. It may also indicate an open or short-to-ground in either the 5V reference wire 112 or retarder pressure sensor signal wire 144.*** Did DTC P0989 return?		*Go to Step 3*	*Go to Diagnostic Aids*
3	1. Turn OFF the ignition. 2. Inspect the routing of the 5V reference wire 112, signal wire 144, and analog return wire 158 between the TCM and the retarder pressure sensor. 3. Disconnect the 80-way connector from the TCM. 4. Install the OEM-side of the 80-way connector to J 47275 TCM Breakout. Leave the TCM disconnected. 5. Disconnect the retarder pressure sensor from the OEM wiring harness. 6. Disconnect the transmission 20-way connector and RMR connector, if installed. 7. Test for wire-to-wire shorts, opens and shorts-to-ground on wires 112 and 144. Was chafing or wire damage found?		*Go to Step 4*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

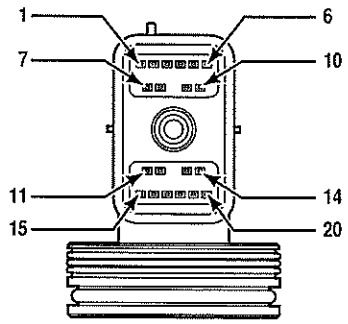
DTC P0989 Retarder Pressure Sensor Failed Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 8*	
5	1. Remove J 47275 TCM Breakout and reconnect the TCM and OEM 80-way connector to each other. 2. Disconnect the retarder pressure sensor from the OEM harness, if not disconnected in Step 3 above. 3. Reconnect the transmission 20-way connector and RMR connector, if installed. 4. Turn ON the ignition. Leave the engine OFF. 5. Using a DVOM, measure the voltage between pin B (5V reference wire 112) and pin A (analog return wire 158) at the OEM harness retarder pressure sensor connector. Is the voltage within the specified values?	4.75–5.0V	*Go to Step 6*	*Go to Step 7*
6	Replace the retarder pressure sensor. Is the replacement complete		*Go to Step 8*	
7	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 8*	
8	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using Allison DOC™ For PC–Service Tool, monitor retarder pressure. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

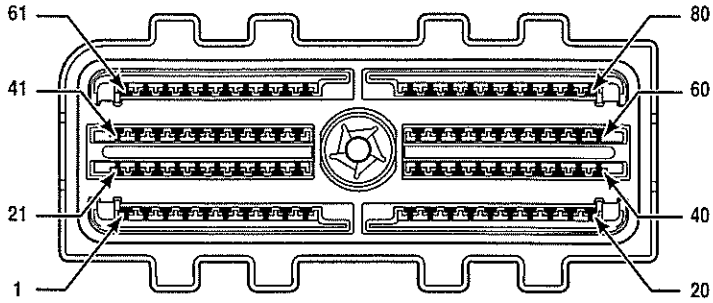
DIAGNOSTIC TROUBLE CODES (DTC)

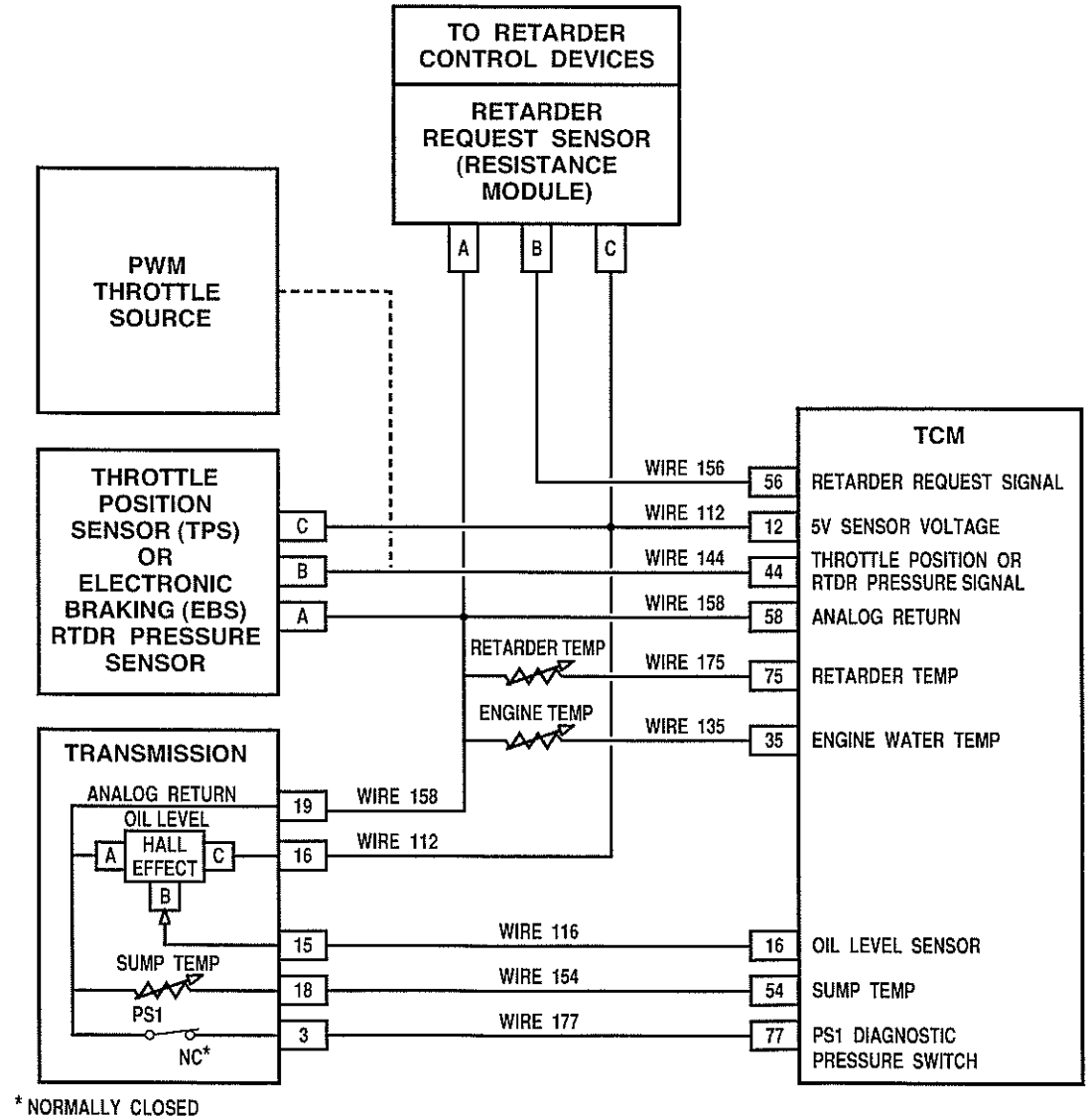
DTC P0990 Retarder Pressure Sensor Failed High

END VIEW OF 20-WAY CONNECTOR



END VIEW OF 80-WAY CONNECTOR





DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0990 Retarder Pressure Sensor Failed High

Circuit Description

The Transmission Control Module (TCM) can be calibrated to control retarder capacity in response to signals from an integral vehicle electronic braking system (EBS). However, the EBS controller requires accurate information about the state of the retarder. Because retarder capacity is proportional to retarder charge pressure, the TCM uses a pressure transducer located in the retarder cavity to measure the precise retarder capacity when the retarder is in operation. The TCM is connected to the pressure transducer by:

- a reference voltage wire,
- retarder pressure signal wire, and
- analog ground wire.

When the TCM commands more retardation, pressure in the retarder charge pressure circuit increases resulting in a larger voltage signal from the retarder pressure transducer.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- Electronic Braking is enabled in the TCM calibration.

Conditions for Setting the DTC

The TCM detects retarder pressure voltage signal greater than or equal to 5V for 10 seconds.

Actions Taken When the DTC Sets

When DTC P0990 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- Inspect the wiring for poor electrical connections at the TCM and retarder pressure sensor. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle and operate the retarder in order to experience a fault.

DIAGNOSTIC TROUBLE CODES (DTC)

- DTC P0990 can be caused by a short-to-battery in the 5V reference wire 112 or retarder pressure sensor wire 144. DTC P0990 can also be caused by an open in analog return wire 158. The retarder pressure sensor shares a common 5V reference voltage wire 112 with the optional transmission oil level sensor (OLS) and retarder request sensor. A short-to-battery in the 5V reference wire 112 or open in analog return wire 158 causes a "sensor failed high" code for these other devices as well. A short-to-battery in retarder pressure sensor signal wire 144 will produce DTC P0990 only.

Test Description

This DTC requires the use of the J 47275 TCM Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for active diagnostic codes.
3. This step tests for wire-to-wire shorts or shorts-to-battery on wires 112 and 144, and opens in wire 158.
6. This step verifies the TCM is supplying proper 5V reference voltage.

DTC P0990 Retarder Pressure Sensor Failed High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Clear the DTC. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the retarder pressure sensor signal is greater than or equal to 5V for 10 seconds. It may also indicate a short-to-battery in either the 5V reference wire 112 or retarder pressure sensor signal wire 144, or an open in analog return wire 158.*** Did DTC P0990 return?		*Go to Step 3*	*Go to Diagnostic Aids*
3	1. Turn OFF the ignition. 2. Inspect the routing of the 5V reference wire 112, signal wire 144, and analog return wire 158 between the TCM and the retarder pressure sensor. 3. Disconnect the 80-way connector from the TCM. 4. Install the OEM-side of the 80-way connector to J 47275 TCM Breakout. Leave the TCM-side disconnected. 5. Disconnect the retarder pressure sensor from the OEM wiring harness. 6. Disconnect the transmission 20-way connector and RMR connector, if installed. 7. Test for wire-to-wire shorts and shorts-to-battery in wires 112 and 144. 8. Test for an open condition in wire 158. Was chafing or wire damage found?		*Go to Step 4*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0990 Retarder Pressure Sensor Failed High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 8*	
5	1. Remove J 47275 TCM Breakout and reconnect the TCM and OEM 80-way connectors to each other. 2. Disconnect the retarder pressure sensor from the OEM harness, if not disconnected in Step 3. 3. Reconnect the transmission 20-way connector and RMR connector, if installed. 4. Turn ON the ignition. 5. Using a DVOM, measure the voltage between pin B (5V reference wire 112) and pin A (analog return wire 158) at the OEM harness retarder pressure sensor connector. Is the voltage within the specified values?	4.75–5.0V	*Go to Step 6*	*Go to Step 7*
6	Replace the retarder pressure sensor. Is the replacement complete?		*Go to Step 8*	
7	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 8*	
8	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using Allison DOC™ For PC–Service Tool, monitor retarder pressure. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1739 Incorrect Low Gear Ratio

Refer to Low Range Hydraulic Schematic

Circuit Description

The Transmission Control Module (TCM) uses input from the turbine speed and the output speed sensors to determine the current commanded steady state gear ratio. The TCM then compares the known gear ratio to the calculated gear ratio for the current range.

Conditions for Running the DTC

- Hydraulic system is pressurized.
- No shift in progress.
- Hydraulic default condition not present.
- Output speed is above 200 rpm.
- Engine initialization or shutdown is not in progress.

Conditions for Setting the DTC

DTC P1739 sets when the calculated low range ratio (steady state) differs from the known Low range ratio.

Actions Taken When the DTC Sets

When DTC P1739 is active, the following conditions will occur:

- The TCM commands second range and allows operation in second range through sixth range, and in neutral and reverse.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- You may have to clear the DTC and drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing failures mode where DTC was set.
- Incorrect ratio codes typically indicate mechanical problems with specific clutches for range indicated, i.e. C3 and C6 (3000 7-speed model) or C1 and C6 (4000 7-speed model) for Low range.
- An incorrect ratio DTC may indicate a mechanically failed clutch control solenoid. Check the DTC information for the specific solenoid.
- Output speed or turbine speed tone wheel damage may cause erratic speed sensor input allowing this code to set.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper transmission fluid level.
3. This step tests for proper ignition voltage.
4. This step tests for proper match between calibration gear ratio and actual gear ratio.
5. This step tests speed sensor readings.
6. This step tests for clutch slippage in Low range.
7. This step tests for clutch pressure to range clutches.
8. This step tests for evidence of clutch failure.

DTC P1739 Incorrect Low Gear Ratio

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Start the engine. 2. Record the DTC Failure Record data. 3. Using the Allison DOC™ For PC–Service Tool, measure ignition voltage. Is the voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 4*	*Go to General Troubleshooting Section 8*
4	1. Start the engine and drive the vehicle under normal operating conditions. 2. Using Allison DOC™ For PC–Service Tool, monitor turbine, engine, and output speed sensor readings. Is speed sensor data erratic or are dropouts in signal indicated?	Watch for erratic speed sensor signals	*Go to appropriate speed sensor DTC*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1739 Incorrect Low Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
5	**WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you do all of the following:** **• Put the 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.** **CAUTION: DO NOT conduct a stall test in Low. The torque produced in Low can damage the vehicle driveline or axle.** 1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main pressure tap, and C3 and C6 (3000 7-speed only) or C1 and C6 (4000 7-speed only) pressure taps. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select **D** (Drive). 6. With the engine at idle speed, select and attain the range indicated by the DTC. Turbine speed should go to zero. Did turbine speed remain at zero?		*Go to Diagnostic Aids*	*Go to Step 6*
6	Read and record Main, C6, C1 (4000 7-speed only) or C3 (3000 7-speed only) clutch pressures. Are the pressure readings within specified values in Appendix B?	Refer to Main Clutch Pressure specifications in Appendix B	*Go to Step 7*	*Go to Step 8*
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?		*Go to Step 10*	*Go to Diagnostic Aids*
8	1. Consult the appropriate service manual and remove the transmission hydraulic control module. 2. Inspect the control valve bodies for stuck or sticking solenoid regulator valves and logic latch valves. 3. Inspect the suction filter. Ensure screen is not plugged. 4. Inspect for damaged gaskets and face seals. Was a valve body problem found and repaired?		*Go to Step 11*	*Go to Step 9*

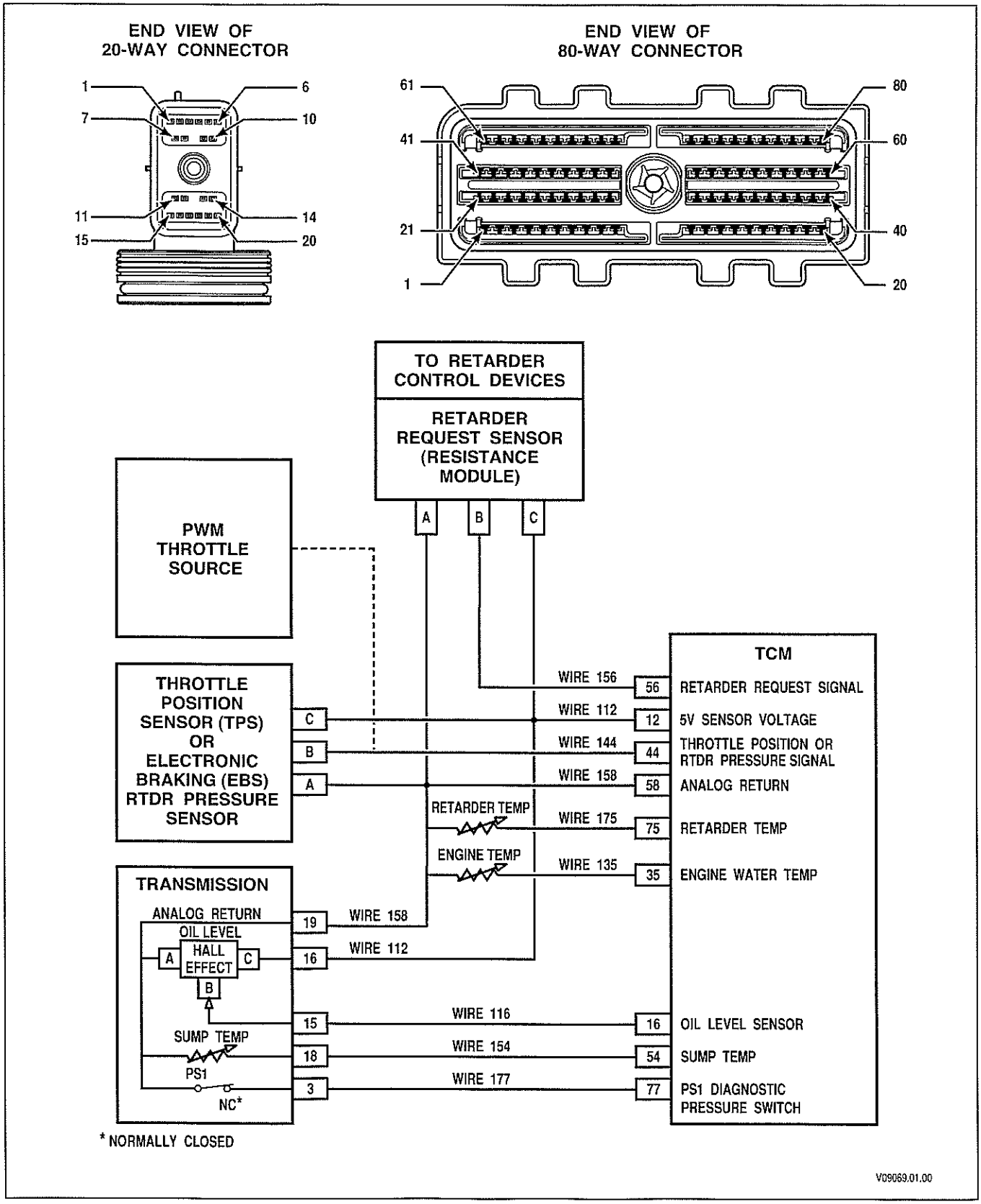
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1739 Incorrect Low Gear Ratio *(cont'd)*

Step	Action	Value(s)	Yes	No
9	Using pressure readings obtained in Step 6 above, replace the affected solenoid. • Incorrect C1 (4000 7-speed only) pressure—PCS1 • Incorrect C3 (3000 7-speed only) pressure—PCS3 • Incorrect C6 (Both) pressure—PCS6 Is the replacement complete?		*Go to Step 11*	
10	Remove the main and lube filters and inspect for clutch debris. It may also be necessary to remove the control module and inspect the suction screen for clutch debris. If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual). Is the replacement complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor engine, turbine and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1891 Throttle Position Sensor PWM Signal Low Input



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1891 Throttle Position Sensor PWM Signal Low Input

Circuit Description

The Transmission Control Module (TCM) can be calibrated to receive throttle information from a Pulse Width Modulation (PWM) signal.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- The TCM has autodetected a PWM throttle source.

Conditions for Setting the DTC

The TCM detects PWM throttle signal less than 4.9 percent for 5 seconds.

Actions Taken When the DTC Sets

When DTC P1891 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM uses default throttle values.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- The TCM detects the throttle source automatically during the initial series of engine starts. The TCM may have auto-detected the wrong throttle source type. Use the Allison DOC™ For PC–Service Tool to reset auto-detect or select the appropriate throttle source if PWM-type sensor is not being used.
- Inspect the wiring for poor electrical connections at the TCM and PWM throttle sensor. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle in order to experience a fault.
- Advanced troubleshooting—monitor frequency on pin 44 as throttle is increased from closed throttle to wide open throttle. If frequency does not vary, the signal is bad. Have the vehicle manufacturer replace the PWM device.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47275 TCM Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for proper ignition voltage.
3. This step tests for operation of the PWM throttle sensor.
4. This step tests for wire-to-wire shorts, shorts-to-ground, or an open on wire 144.
6. This step inspects for damage or corrosion to the TCM and engine control module connectors.

DTC P1891 Throttle Position Sensor PWM Signal Low Input

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Using Allison DOC™ For PC–Service Tool, measure ignition voltage. Is ignition voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem (refer to DTC P0882 and DTC P0883)*
3	1. Operate the throttle while monitoring Allison DOC™ For PC–Service Tool. 2. Verify the throttle source is functioning correctly? Is the PWM signal OK?		*Go to Diagnostic Aids.*	*Go to Step 4*
4	1. Turn OFF the ignition. 2. Disconnect the 80-way connector from the TCM. 3. Install the OEM-side of the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the PWM throttle sensor connector. 5. Using a DVOM at J 47275-1 TCM Overlay, test for opens, pin-to-pin shorts, or shorts-to-ground on wire 144. Were any wiring defects found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 10*	
6	Inspect the TCM and Engine Control Module (ECM) connectors and terminals for damage and/or corrosion. Did you find a problem?		*Go to Step 7*	*Go to Step 8*
7	Repair and clean terminals if possible. Is the repair complete?		*Go to Step 10*	

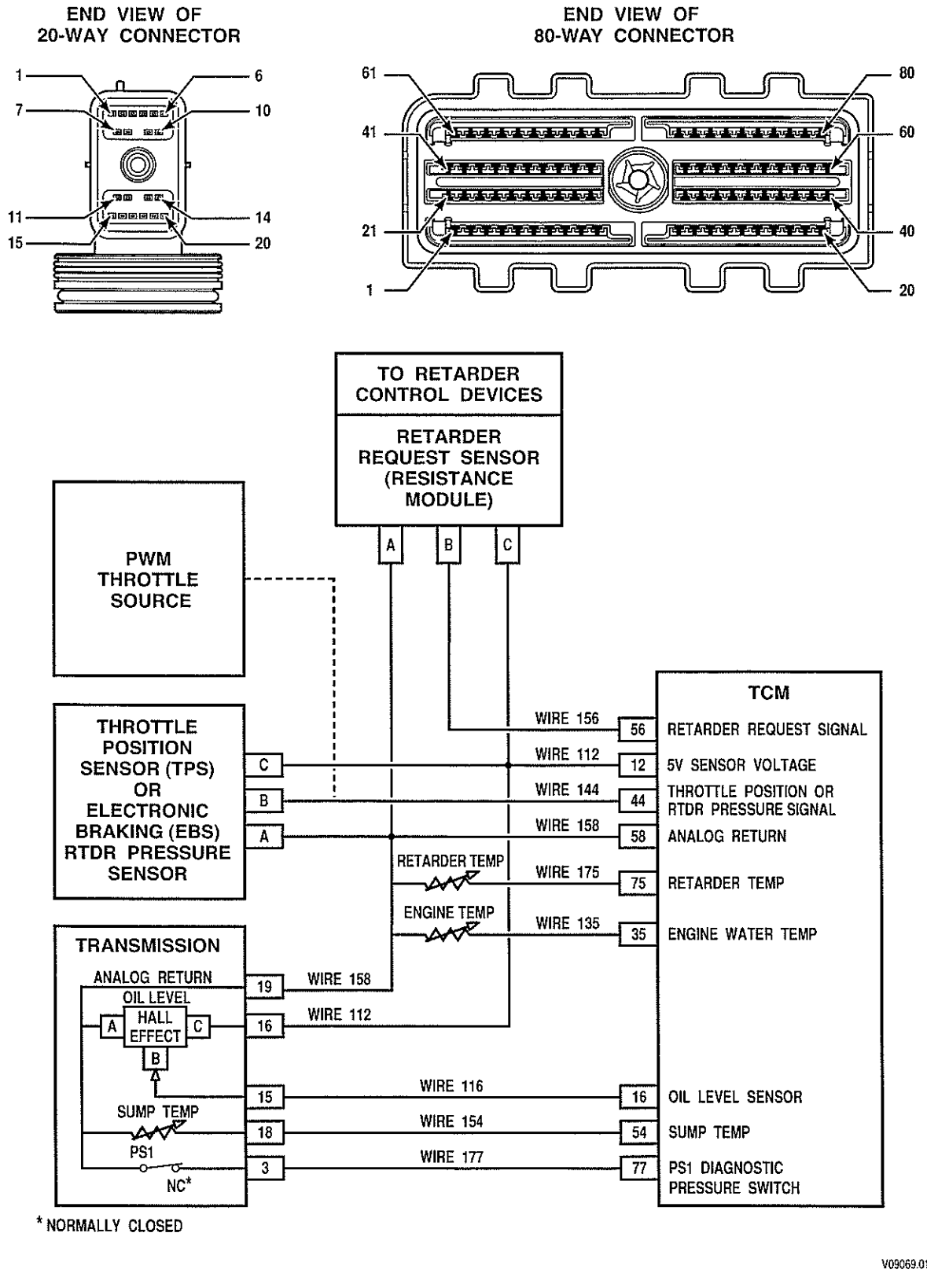
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1891 Throttle Position Sensor PWM Signal Low Input *(cont'd)*

Step	Action	Value(s)	Yes	No
8	***NOTE: The vehicle OEM has responsibility for the PWM throttle sensor. PWM throttle sensor repairs performed by Allison Transmission distributors and dealers are not covered by Allison warranty.*** Coordinate with the vehicle OEM to troubleshoot and replace the PWM throttle sensor. Did a new PWM throttle sensor correct the problem?		*Go to Step 10*	*Go to Step 9*
9	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 10*	
10	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using Allison DOC™ For PC–Service Tool, monitor throttle percentage. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1892 Throttle Position Sensor PWM Signal High Input



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1892 Throttle Position Sensor PWM Signal High Input

Circuit Description

The Transmission Control Module (TCM) can be calibrated to receive throttle information from a Pulse Width Modulation (PWM) signal.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- The TCM has autodetected a PWM throttle source.

Conditions for Setting the DTC

The TCM detects PWM throttle signal greater than or equal to 95.1 percent for 5 seconds.

Actions Taken When the DTC Sets

When DTC P1892 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM uses default throttle values.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- The TCM detects the throttle source automatically during the initial series of engine starts. The TCM may have auto-detected the wrong throttle source type. Use the Allison DOC™ For PC–Service Tool to reset auto-detect or select the appropriate throttle source if PWM-type sensor is not being used.
- Inspect the wiring for poor electrical connections at the TCM and PWM throttle sensor. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle in order to experience a fault.
- Advanced troubleshooting—monitor frequency on pin 44 as throttle is increased from closed throttle to wide open throttle. if frequency does not vary, the signal is bad. Have the vehicle manufacturer replace the PWM device.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47275 TCM Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for proper ignition voltage.
3. This step tests for operation of the PWM throttle sensor.
4. This step tests for wire-to-wire shorts, shorts-to-ground, or an open on wire 144.
6. This step inspects for damage or corrosion to the TCM and engine control module connectors.

DTC P1892 Throttle Position Sensor PWM Signal High Input

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Using Allison DOC™ For PC–Service Tool, measure ignition voltage. Is ignition voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem (refer to DTC P0882 and DTC P0883)*
3	1. Operate the throttle while monitoring Allison DOC™ For PC–Service Tool. 2. Verify the throttle source is functioning correctly? Is the PWM signal OK?		*Go to Diagnostic Aids*	*Go to Step 4*
4	1. Turn OFF the ignition. 2. Disconnect the 80-way connector from the TCM. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the PWM throttle sensor connector. 5. Using a DVOM at J 47275-1 TCM Overlay, test for opens, pin-to-pin shorts, or shorts-to-ground on wire 144. Were any wiring defects found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 10*	
6	Inspect the TCM and Engine Control Module (ECM) connectors and terminals for damage and/or corrosion. Did you find a problem?		*Go to Step 7*	*Go to Step 8*
7	Repair and clean terminals if possible. Is the repair complete?		*Go to Step 10*	

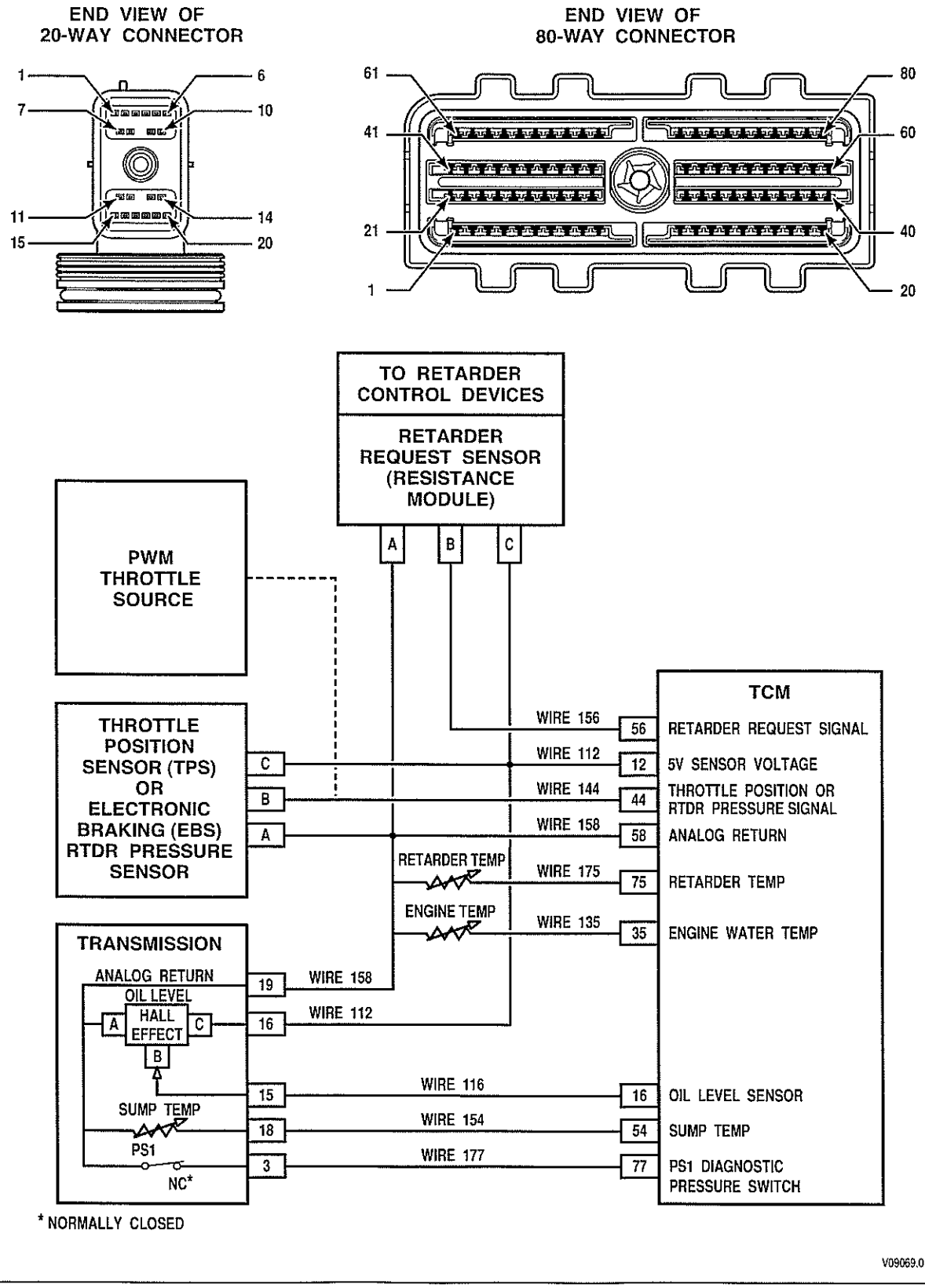
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1892 Throttle Position Sensor PWM Signal High Input *(cont'd)*

Step	Action	Value(s)	Yes	No
8	***NOTE: The vehicle OEM has responsibility for the PWM throttle sensor. PWM throttle sensor repairs performed by Allison Transmission distributors and dealers are not covered by Allison warranty.*** Coordinate with the vehicle OEM to troubleshoot and replace the PWM throttle sensor. Did a new PWM throttle sensor correct the problem?		*Go to Step 10*	*Go to Step 9*
9	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 10*	
10	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using Allison DOC™ For PC–Service Tool, monitor throttle percentage. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2184 Engine Coolant Temperature Sensor Circuit Low Input



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2184 Engine Coolant Temperature Sensor Circuit Low Input

Circuit Description

The Transmission Control Module (TCM) receives an input from an engine coolant temperature sensor. The TCM supplies a 5V reference voltage signal into a voltage-sensing network that is connected to one side of the engine coolant temp sensor via wire 135. The other side of the temp sensor is connected to the TCM analog ground wire 158.

The resistance value of the engine coolant temperature sensor determines the voltage drop in the engine coolant temp sensor circuit. As resistance changes, the voltage drop across the temp sensor circuit will also change varying the sensor input voltage on wire 135. The TCM uses engine coolant temperature information to restrict retarder operation when an engine coolant over-heat condition is detected.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- The TCM has autodetected the following:
  - — Retarder
  - — Analog engine coolant temperature sensor
  - — PWM retarder request source.
- The "Retarder reduction and preselect based on engine coolant temperature" feature is enabled in the calibration.

Conditions for Setting the DTC

The TCM detects engine coolant temperature greater than a calibrated value for more than 10 seconds.

Actions Taken When the DTC Sets

When DTC P2184 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The TCM uses default engine coolant values.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2184 may be caused by a short-to-ground on wire 135.
- Review Appendix A for diagnosing intermittent electrical conditions.
- Inspect the wiring for poor electrical connections at the TCM and engine coolant temp sensor. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.

DIAGNOSTIC TROUBLE CODES (DTC)

- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle in order to experience a fault.

Test Description

This DTC requires the use of the J 47275 TCM Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for proper ignition voltage.
3. This step verifies which condition has set the DTC P2184.
4. This step tests for the proper 5V reference voltage at TCM.
5. This step tests for wire-to-wire shorts, shorts-to-ground, or an open in wires 135 (engine coolant temp) and wire 112 (5V reference).

DTC P2184 Engine Coolant Temperature Sensor Circuit Low Input

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record failure record. 4. Using Allison DOC™ For PC–Service Tool, measure ignition voltage. Is ignition voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem (refer to DTC P0882 and DTC P0883)*
3	1. Clear the DTCs. 2. Monitor the engine coolant temperature on Allison DOC™ For PC–Service Tool. 3. Drive the vehicle and observe Allison DOC™ For PC–service tool for an unrealistically high temperature condition. Is the Allison DOC™ For PC–Service Tool transmission fluid temperature greater than 174.11°C (345.4°F)?	>174.11°C (345.4°F)	*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout at the TCM. 3. Disconnect the engine coolant temp sensor connector. 4. Turn ON the ignition. 5. At J 47275-1 TCM Overlay connect a DVOM and measure voltage between pins 35 and 58. Is the voltage within the specified value?	4.75 to 5.0V	*Go to Step 7*	*Go to Step 5*

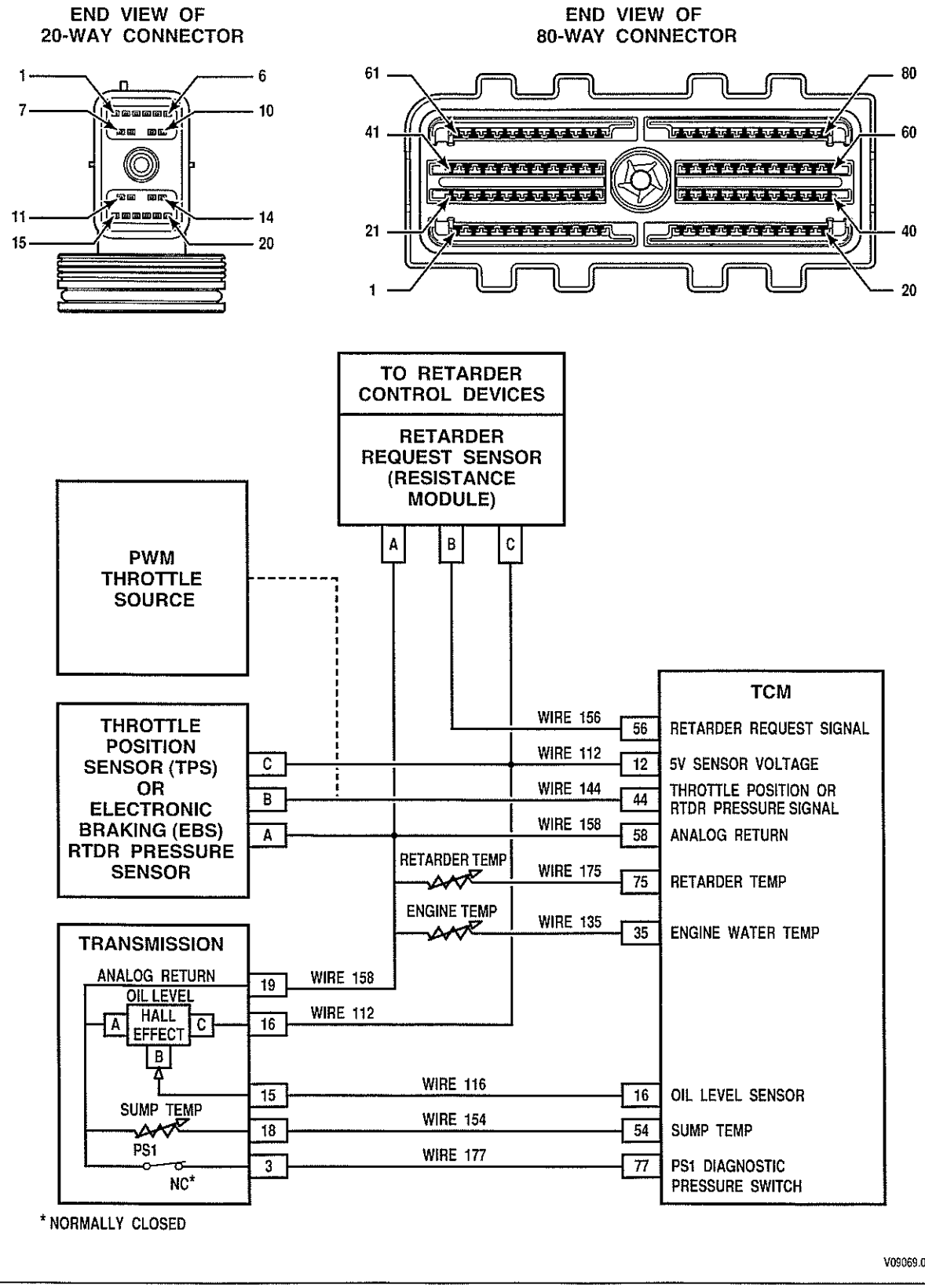
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2184 Engine Coolant Temperature Sensor Circuit Low Input *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect J 47275 TCM Breakout from the TCM. Leave the OEM-side connected. 3. Disconnect the engine coolant temp sensor connector, if not disconnected in Step 4. 4. Using a DVOM at J 47275-1 TCM Overlay, test for pin-to-pin shorts, or shorts-to-ground, at pin 35. Were any wiring defects found?		*Go to Step 6*	*Go to Step 8*
6	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 9*	
7	***NOTE: The vehicle OEM has responsibility for the engine coolant temp sensor. Engine coolant temperature sensor repairs performed by Allison Transmission distributors and dealers are not covered by Allison warranty.*** Coordinate with the vehicle OEM to troubleshoot and replace the engine coolant temp sensor. Is replacement complete?		*Go to Step 9*	
8	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 9*	
9	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor the engine coolant temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in engine coolant temperature. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2185 Engine Coolant Temperature Sensor Circuit High Input



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2185 Engine Coolant Temperature Sensor Circuit High Input

Circuit Description

The Transmission Control Module (TCM) receives an input from an engine coolant temperature sensor. The TCM supplies a 5V reference voltage signal into a voltage-sensing network that is connected to one side of the engine coolant temp sensor via wire 135. The other side of the temp sensor is connected to the TCM analog ground wire 158.

The resistance value of the engine coolant temp sensor determines the voltage drop in the engine coolant temp sensor circuit. As resistance changes, the voltage drop across the temp sensor circuit will also change varying the sensor input voltage on wire 135.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- The TCM has autodetected the following:
  - — Retarder
  - — Analog engine coolant temperature sensor
  - — PWM retarder request source.
- The "Retarder reduction and preselect based on engine coolant temperature" feature is enabled in the calibration.

Conditions for Setting the DTC

The TCM detects engine coolant temperature less than or equal to a calibrated value for more than 2.5 seconds.

Actions Taken When the DTC Sets

When DTC P2185 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The TCM uses default engine coolant values.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2185 may be caused by an open on wire 135 or 158.
- DTC P2185 may be caused by a short-to-battery on wire 135. If DTC P2185 is accompanied by a DTC P0713 and/or P2743, the problem is likely a short-to-battery on wire 154, wire 135, or wire 175.
- Review Appendix A for diagnosing intermittent electrical fault conditions.
- Inspect the wiring for poor electrical connections at the TCM and engine coolant temp sensor. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.

DIAGNOSTIC TROUBLE CODES (DTC)

- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle in order to experience a fault.

Test Description

This DTC requires the use of the J 47275 TCM Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for proper transmission fluid level and condition.
3. This step verifies which condition has set the DTC P2185.
4. This step tests for the proper 5V reference voltage at TCM.
5. This step tests for wiring defects in the OEM chassis harness.

DTC P2185 Engine Coolant Temperature Sensor Circuit High Input

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record failure record. 4. Using Allison DOC™ For PC–Service Tool, measure ignition voltage. Is ignition voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem (refer to DTC P0882 and DTC P0883)*
3	1. Clear the DTCs. 2. Monitor the engine coolant temperature on Allison DOC™ For PC–Service Tool. 3. Drive the vehicle and observe Allison DOC™ For PC–Service Tool for an unrealistically low temperature condition. Is the Allison DOC™ For PC–Service Tool engine coolant temperature less than or equal to –42°C (–43.75°F)?	≤–42°C (–43.75°F)	*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout at the TCM. 3. Disconnect the engine coolant temp sensor connector. 4. Turn ON the ignition. 5. At J 47275-1 TCM Overlay connect a DVOM and select the volts-DC scale. 6. Measure voltage between pin 35 and an isolated ground. Is the voltage within the specified value?	4.75 to 5.0V	*Go to Step 7*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2185 Engine Coolant Temperature Sensor Circuit High Input *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect the TCM from the J 47275 TCM Breakout. Leave the OEM-side connected. 3. Disconnect the engine coolant temperature sensor, if not disconnected in Step 4. 4. Disconnect the transmission 20-way connector and retarder temperature sensor. 5. Using a DVOM at J 47275-1 TCM Overlay, test for opens in wires 135 and 158. 6. Also test for wire-to-wire shorts, or shorts-to-battery on wire 135, wire 154, or wire 175. Were any wiring defects found?		*Go to Step 6*	*Go to Step 8*
6	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 9*	
7	***NOTE: The vehicle OEM has responsibility for the engine coolant temp sensor. Engine coolant temperature sensor repairs performed by Allison Transmission distributors and dealers are not covered by Allison warranty.*** Coordinate with the vehicle OEM to troubleshoot and replace the engine coolant temp sensor. Is replacement complete?		*Go to Step 9*	
8	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 9*	
9	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor the engine coolant temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in engine coolant temperature. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2637 Torque Management Feedback Signal (SEM)

No Schematic for this DTC

Circuit Description

Shift Energy Management (SEM) allows the Transmission Control Module (TCM) to request torque reduction from the engine controller. By reducing torque, shifts can be made quicker, at a more consistent output torque which reduces clutch temperatures and increases clutch life.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm but less than 7500 rpm for 5 seconds.
- SEM is enabled in the calibration.

Conditions for Setting the DTC

DTC P2637 sets when the TCM detects one of the following conditions for a minimum of four up shifts (consecutive or non-consecutive) during one drive cycle:

- Engine ECM is not responding to SEM torque reduction signal request from the TCM.
- A non-approved J1939 device is interfering with the SEM torque reduction signal request.

Actions Taken When the DTC Sets

When DTC P2637 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- SEM operation is not active.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the actual engine torque follows TCM commanded torque for 20 consecutive up-shifts in the same ignition cycle.

Diagnostic Aids

It will be necessary to drive the vehicle with heavy to moderate throttle settings for at least four up-shift cycles in order to set a DTC P2637.

When a DTC P2637 is set with a P0614, start troubleshooting with P0614 first. This combination of DTCs indicates that AUTOSELECT was active and engine software is not correct.

Test Description

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

2. This step tests for presence of DTC P0614.
3. This step tests for proper ECM SEM torque request response.
4. This step tests to identify the device causing the torque request to be ignored.
5. This step tests for the offending device by removing it from the J1939 network.
6. This step tests for the presence of proper engine controller software.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2637 Torque Management Feedback Signal (SEM)

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	If DTC P0614 is present, troubleshoot and resolve before going to the next step.		*Go to DTC P0614 and resolve before proceeding to Step 3*	*Go to Step 3*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition. 3. Refer to the SEM torque reduction status in SEM/LRTP AUTODECT INFO display of Allison DOC™ For PC–Service Tool. Does Allison DOC™ For PC–Service Tool indicate the ECM response to SEM torque reduction as **INCORRECT**?	Allison DOC™ diagnostic tool indicates "correct response" or "incorrect response"	*Go to Step 6*	*Go to Step 4*
4	Use Allison DOC™ For PC–Service Tool to identify an unapproved SEM torque reduction device. Is the unapproved device one of the following? 1. Engine or transmission? 2. Null Address (N/A) or All/Any (info not valid)?	Allison DOC™ diagnostic tool shows the actual device at fault	*Go to Step 6*	*Go to Step 5*
5	1. If Allison DOC™ For PC–Service Tool is indicating another device such as brakes, cruise control, headway controller etc., inspect the controller for the device indicated. 2. If possible eliminate the device by disconnecting it from the J1939 CAN backbone. ***NOTE: It may be possible that the device causing the interruption is only triggered under certain circumstances. For example, a brake controller may only send commands under certain road conditions. Since these conditions may not be easily repeatable, replacement with a known good controller may be the only way to verify the failure.*** 3. If necessary to confirm the failure, test the system with a known good controller. Was the device causing the problem replaced or repaired?		*Go to Step 7*	
6	1. Verify that compatible engine controller software is being used. 2. If the software is correct, turn the vehicle over to the engine manufacturer to replace the engine controller. 3. If neither solves the problem, use an engine torque/power rating that does not require SEM. Was the software updated or engine controller replaced?		*Go to Step 7*	

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2637 Torque Management Feedback Signal (SEM) *(cont'd)*

Step	Action	Value(s)	Yes	No
7	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. Clear the DTC. 3. Drive the vehicle under moderate to heavy throttle setting for at least four up shift cycles. 4. Attempt to duplicate conditions when DTC was set (cruise control, headway controls, ABS, etc.). Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2641 Torque Management Feedback Signal (LRTP)

No Schematic for this DTC

Circuit Description

Lower Range Torque Protection (LRTP) protects the transmission during low vehicle speed conditions. When an engine torque rating exceeds a predetermined value, LRTP limits engine torque in lower ranges to protect the transmission from damage during a converter stall condition.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm but less than 7500 rpm for 5 seconds.
- LRTP is enabled in the calibration.

Conditions for Setting the DTC

DTC P2641 sets when the TCM detects one of the following conditions for a minimum of four up shifts (consecutive or non-consecutive) during one drive cycle:

- Engine ECM is not responding to LRTP torque reduction signal request from the TCM.
- A non-approved J1939 device is interfering with the LRTP torque reduction signal request.

Actions Taken When the DTC Sets

When DTC P2641 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- LRTP operation is not active.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

It may be necessary to drive the vehicle in order to set a DTC P2641.

When a DTC P2641 is set with a P0614, start troubleshooting with P0614 first. This combination of DTCs indicates that AUTOSELECT was still active and the engine software is not correct.

Test Description

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

2. This step tests for the presence of DTC P0614.
3. This step tests for proper ECM LRTP torque request response.
4. This step tests to identify the device causing the torque request to be ignored.
5. This step tests for the offending device by removing it from the J1939 network.
6. This step tests for the presence of proper engine controller software.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2641 Torque Management Feedback Signal—LRTP

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	If DTC P0614 is present, troubleshoot and resolve before going to the next step.		*Go to DTC P0614 and resolve before proceeding to Step 3*	*Go to Step 3*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition. 3. Refer to LRTP torque reduction status in SEM/ LRTP AUTODETECT INFO display of Allison DOC™ For PC–Service Tool. Does Allison DOC™ For PC–Service Tool indicate the ECM response to LRTP torque reduction as **INCORRECT**?	Allison DOC™ diagnostic tool indicates "correct response" or "incorrect response"	*Go to Step 6*	*Go to Step 4*
4	Use Allison DOC™ For PC–Service Tool to identify an unapproved LRTP torque reduction device. Is the unapproved device one of the following? 1. Engine? 2. Null Address (N/A) or All/Any (info not valid)?	Allison DOC™ For PC–Service Tool shows the actual device at fault	*Go to Step6*	*Go to Step 5*
5	1. If Allison DOC™ For PC–Service Tool is indicating another device such as brakes, cruise control, headway controller etc., inspect the controller for the device indicated. 2. If possible eliminate the device by disconnecting it from the J1939 CAN backbone. ***NOTE: It may be possible that the device causing the interruption is only triggered under certain circumstances. For example, a brake controller may only send commands under certain road conditions. Since these conditions may not be easily repeatable, replacement with a known good controller may be the only way to verify the failure.*** 3. If necessary to confirm the failure, test the system with a known, good controller. Was the device causing the problem replaced or repaired?		*Go to Step 7*	
6	1. Verify that compatible engine controller software is being used. 2. If the software is correct, turn the vehicle over to the engine manufacturer to replace the engine controller. 3. If neither solves the problem, use an engine torque/power rating that does not require LRTP. Was the software updated or engine controller replaced?		*Go to Step 7*	

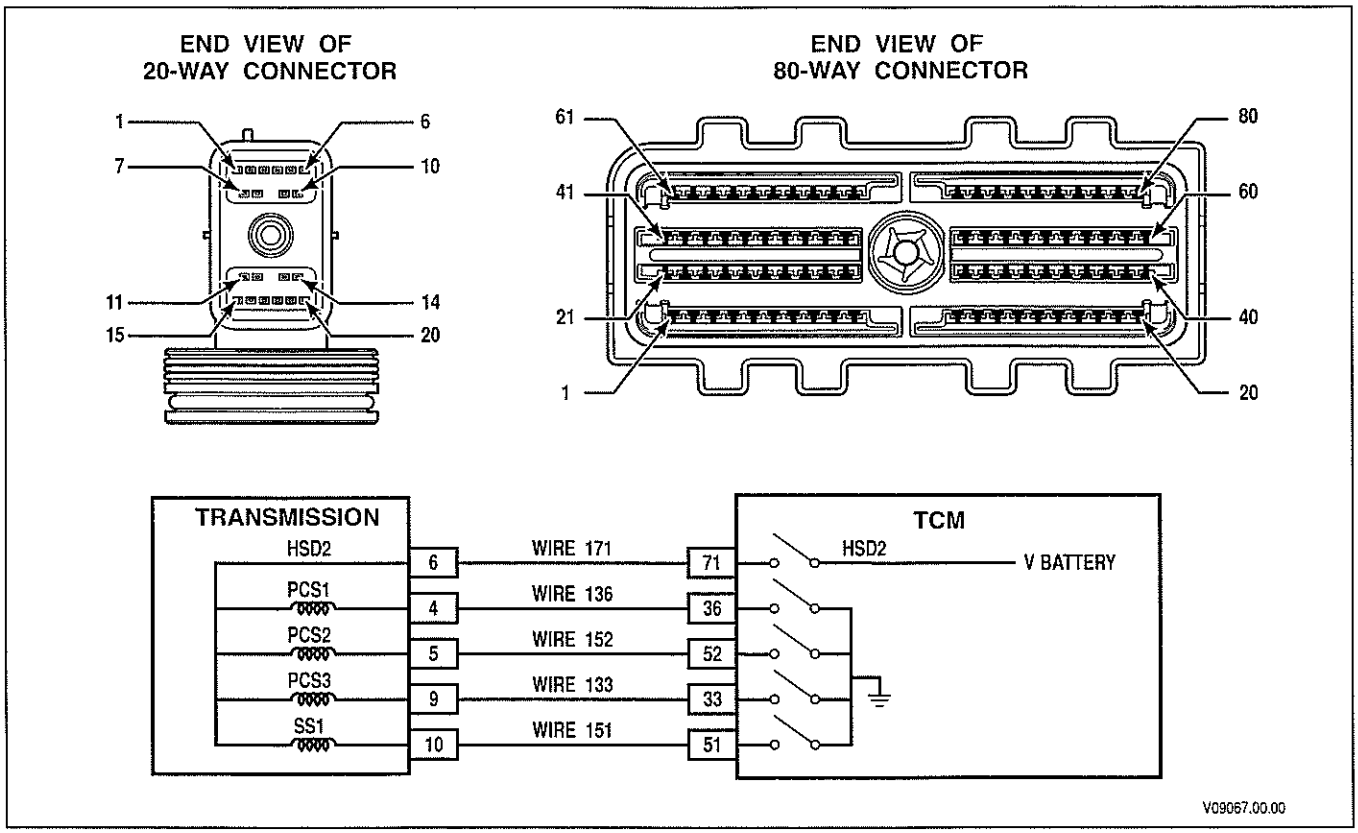
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2641 Torque Management Feedback Signal—LRTP *(cont'd)*

Step	Action	Value(s)	Yes	No
7	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. Clear the DTC. 3. Drive the vehicle. Refer to Allison DOC™ For PC–Service Tool "Test Passed" section and confirm the test was run. 4. Attempt to duplicate the conditions when the DTC was set (loads, grades, road conditions). Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low



Circuit Description

High Side Driver 2 (HSD2) supplies battery voltage to the PCS1, PCS2, PCS3, and SS1 solenoids via wire 171. HSD2 is continuously ON during normal operation except during brief circuit tests. The TCM regulates control current to the solenoids by switching the appropriate Low Side Driver (LSD) ON and OFF. DTC P2670 indicates the TCM has detected a supply voltage in the HSD2 circuit of 6V or less. DTC P2670 could be caused by a short-to-ground in the high side wiring attached to HSD2 (wire 171).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- HSD2 is commanded ON.
- Engine speed greater than 200 rpm.

Conditions for Setting the DTC

DTC P2670 is set when the TCM detects a low voltage condition (less than 6V) in three solenoids in the HSD2 circuit.

Actions Taken When the DTC Sets

When DTC P2670 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for a wire-to-wire short, or short-to-ground in the wire 171 of the OEM chassis harness.
6. This step tests for wiring defects in the transmission internal harness.

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problems*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low *(cont'd)*

Step	Action	Value(s)	Yes	No
3	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 a short-to-ground condition in the HSD2 electrical circuit.*** Did DTC P2670 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the 80-way connectors at the TCM. 3. Install the OEM-side of the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the OEM-side 20-way connector from the transmission. 5. Inspect the routing of wire 171 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 71 and all other pins in the 80-way connector, and test for shorts-to-ground between pin 71 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the chassis harness. Is the repair complete?		*Go to Step 9*	
6	1. Turn OFF the ignition. 2. Install the transmission 20-way connector to the J 47279 Transmission Breakout. Leave the OEM-side disconnected. 3. Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between pin 6 and all other pins in the 20-way connector, and shorts-to-ground between pin 6 and chassis ground. ***NOTE: The resistance value between pins 6 and 4, between pins 6 and 5, between pins 6 and 9, and between pins 6 and 10 will read normal solenoid resistance.*** Were any opens, wire-to-wire shorts or shorts-to-ground found?		*Go to Step 7*	*Go to Step 8*

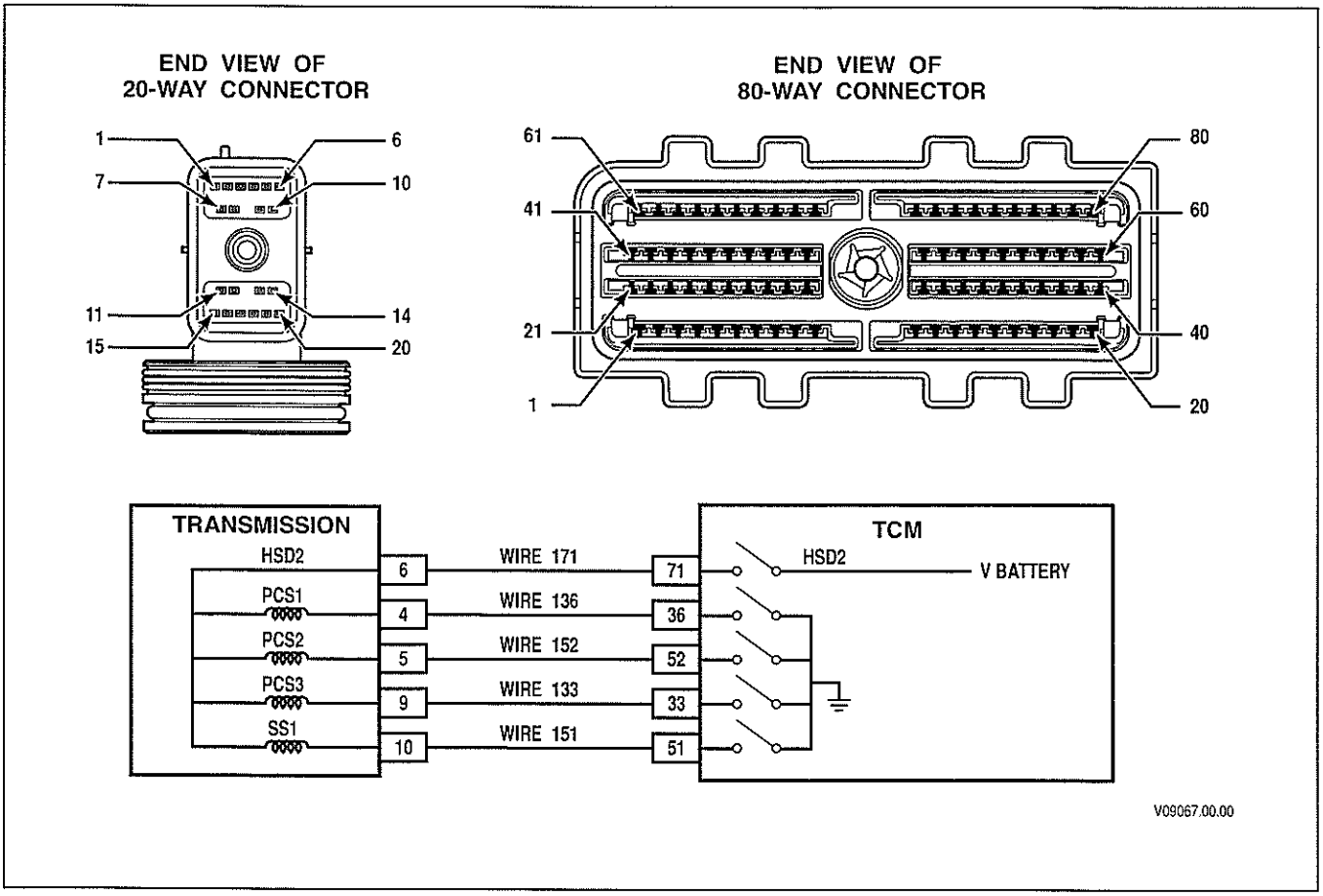
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low *(cont'd)*

Step	Action	Value(s)	Yes	No
7	1. Remove the hydraulic control module assembly. 2. Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 9*	
8	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM Diagnostic Procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 9*	
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2671 Actuator Supply Voltage 2 (HSD 2) High



Circuit Description

High Side Driver 2 (HSD2) supplies battery voltage to the PCS1, PCS2, PCS3, and SS1 solenoids via wire 171. HSD2 is continuously ON during normal operation except during brief circuit tests. The TCM regulates control current to the solenoids by switching the appropriate Low Side Driver (LSD) ON and OFF. DTC P2671 indicates the TCM has detected greater than or equal to 6V in the HSD2 circuit when HSD2 is OFF during TCM initialization. DTC P2671 could be caused by an open or short-to-battery in the high side wiring attached to HSD2 (wire 171).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- HSD2 is commanded ON.
- Engine speed greater than 200 rpm.

Conditions for Setting the DTC

DTC P2671 is set when the TCM detects a high voltage condition (> 6V) in the HSD2 circuit after two solenoids indicate a failure.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2671 Actuator Supply Voltage 2 (HSD 2) High

Actions Taken When the DTC Sets

When DTC P2671 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for an open in wire 171 of OEM chassis harness.
5. This step tests for a wire-to-wire short, or short-to-battery in the wire 171 of the OEM chassis harness.
7. This step tests for wiring defects in the transmission internal harness.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2671 Actuator Supply Voltage 2 (HSD2) High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problems*
3	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 open or short-to-battery condition in the HSD2 electrical circuit.*** Did DTC P2671 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Turn OFF the ignition. 2. Install the J 47275 TCM Breakout at the TCM 80-way connector. 3. Install J 47275 TCM Breakout at the transmission 20-way connector. 4. Turn ON the ignition, leave the engine OFF. 5. Using Allison DOC™ For PC–Service Tool, enter Solenoid Test mode and command PCS3 ON. 6. Determine the voltage drop in the HSD2 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 71 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 6 and isolated ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. ***NOTE: A voltage drop of more than 0.5V indicates an excessive voltage loss in the OEM harness.*** Did the high-side voltage drop exceed 0.5VDC?		*Go to Step 6*	*Go to Step 5*

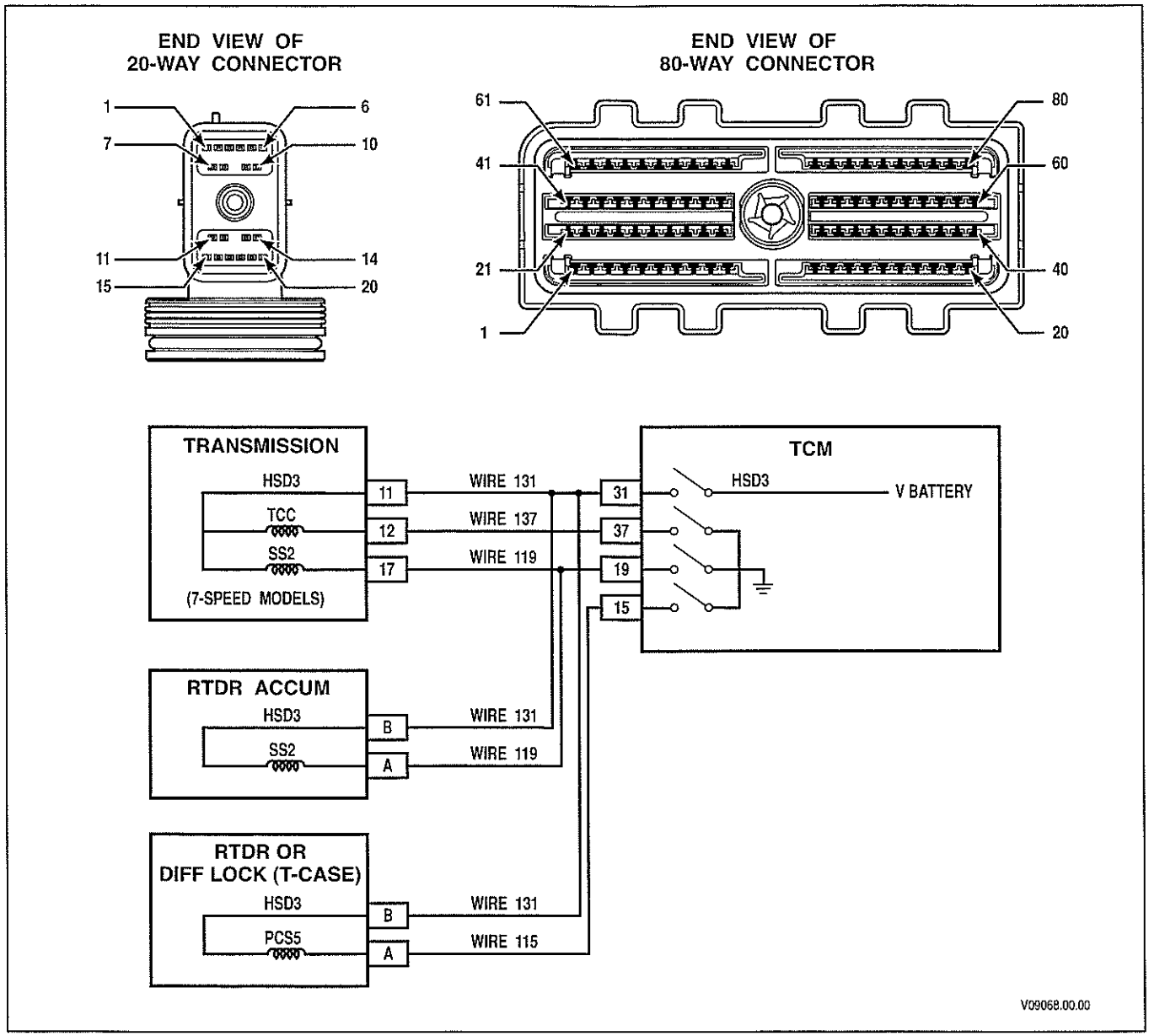
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2671 Actuator Supply Voltage 2 (HSD2) High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect the TCM from the J 47275 harness. Leave the OEM-side connected. 3. Disconnect the OEM-side of the 20-way connector J 47279 Transmission Breakout. Leave the transmission-side connected. 4. Inspect the routing of wire 171 in the chassis harness between the TCM and the transmission connector. 5. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 71 and all other pins in the 80-way connector. Were any wire-to-wire shorts found?		*Go to Step 6*	*Go to Step 7*
6	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repair performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Got to Step 10*	
7	1. Turn OFF the ignition. 2. Verify the J 47279 Transmission Breakout is installed at the transmission 20-way connector and the OEM-side is disconnected. 3. Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between pin 6 and all other pins in the 20-way connector. ***NOTE: The resistance value between pins 6 and 4, between pins 6 and 5, between pins 6 and 9, and between pins 6 and 10 will read normal solenoid resistance. Refer to Solenoid Resistance chart for these values.*** Were any wire-to-wire shorts found?		*Go to Step 8*	*Go to Step 9*
8	1. Remove the hydraulic control module assembly. 2. Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 10*	
9	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 10*	
10	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2685 Actuator Supply Voltage 3 (HSD3) Low



Circuit Description

High Side Driver 3 (HSD3) supplies battery voltage to the TCC, PCS5 (retarder and 7-speed models) and SS2 (also, retarder and 7-speed models) solenoids via wire 131. HSD3 is continuously ON during normal operation except during brief circuit tests. The TCM regulates control current to the solenoids by switching the appropriate Low Side Driver (LSD) ON and OFF. DTC P2685 indicates the TCM has detected a supply voltage in the HSD3 circuit of 6V or less. DTC P2685 could be caused by a short-to-ground in the high side wiring attached to HSD3 (wire 131).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- HSD3 is commanded ON.
- Engine speed greater than 200 rpm.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2685 Actuator Supply Voltage 3 (HSD 3) Low

Conditions for Setting the DTC

DTC P2685 is set when the TCM detects a low voltage condition (less than 6V) in two solenoids in the HSD3 circuit.

Actions Taken When the DTC Sets

When DTC P2685 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for a wire-to-wire short, or short-to-ground in the wire 131 of the OEM chassis harness.
6. This step tests for wiring defects in the transmission internal harness.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2685 Actuator Supply Voltage 3 (HSD 3) Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problems*
3	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 a short-to-ground condition in the HSD3 electrical circuit.*** Did DTC P2685 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Turn OFF the ignition. 2. Disconnect the 80-way connector at the TCM. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the OEM 20-way connector from the transmission. 5. For retarder transmissions, disconnect the SS2 (accumulator) and PCS5 (retarder control) connectors. 6. For 3000 7-speed only, disconnect the T-case electrical connector. 7. Inspect the routing of wire 131 in the chassis harness between the TCM and the transmission connectors. 8. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 31 and all other pins in the 80-way connector, and test for shorts-to-ground between pin 31 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the chassis harness. Is the repair complete?		*Go to Step 12*	

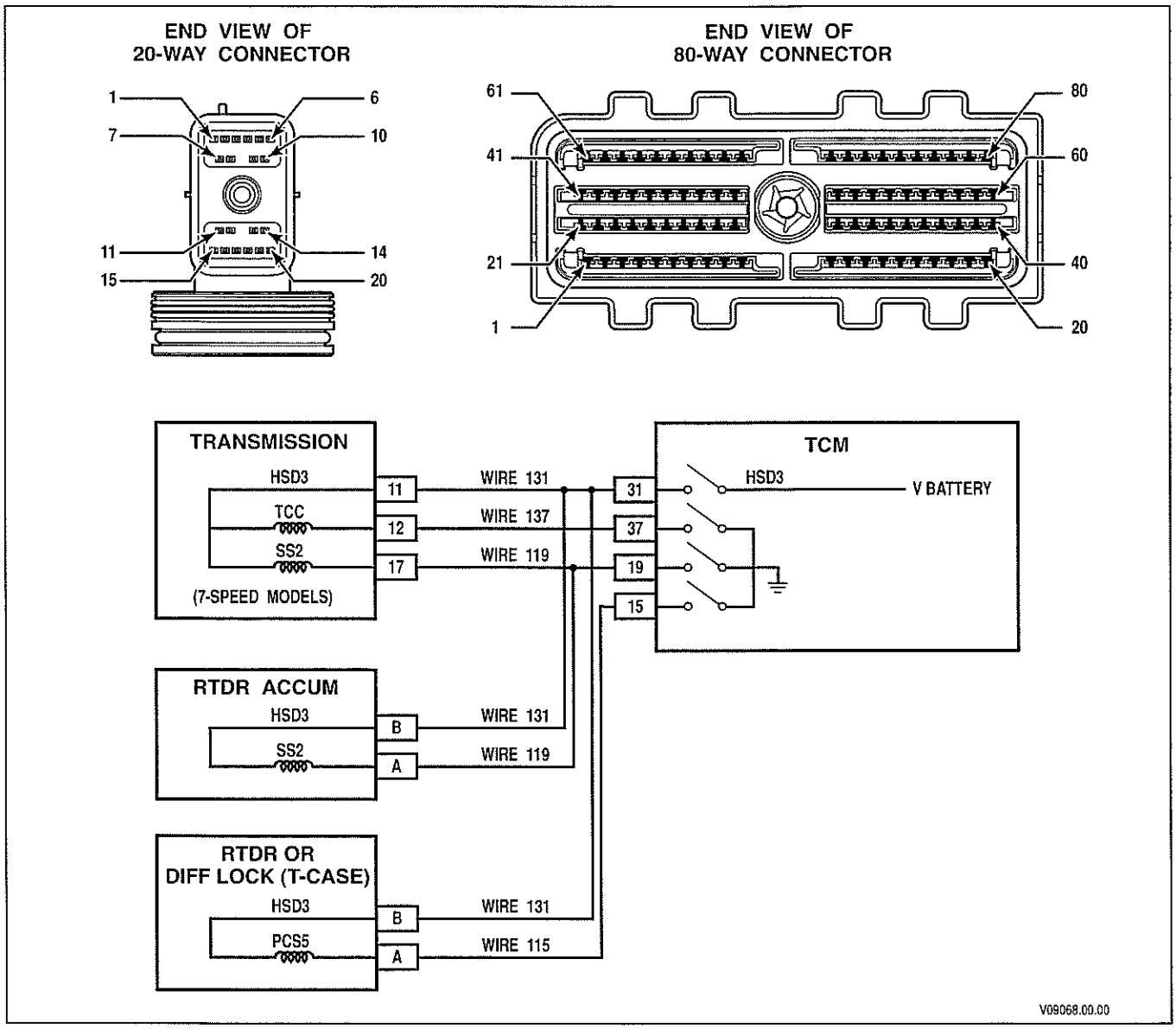
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2685 Actuator Supply Voltage 3 (HSD 3) Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install the transmission 20-way connector to the J 47279 Transmission Breakout. Leave the OEM-side connected. 3. Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between pin 11 and all other pins in the 20-way connector, and shorts-to-ground between pin 11 and chassis ground. ***NOTE: The resistance value between pins 11 and 12, and between pins 11 and 17 (7-speed models) will read normal solenoid resistance.*** Were any opens, wire-to-wire shorts, or shorts-to-ground found?		*Go to Step 7*	*Go to Step 8*
7	1. Remove the hydraulic control module assembly. 2. Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 9*	
8	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 9*	
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2686 Actuator Supply Voltage 3 (HSD 3) High



Circuit Description

High Side Driver 3 (HSD3) supplies battery voltage to the TCC, PCS5 (retarder and 7-speed models) and SS2 (also, retarder and 7-speed models) solenoids via wire 131. HSD3 is continuously ON during normal operation except during brief circuit tests. The TCM regulates control current to the solenoids by switching the appropriate Low Side Driver (LSD) ON and OFF. DTC P2686 indicates the TCM has detected greater than or equal to 6V in the HSD3 circuit when HSD3 is OFF during TCM initialization. DTC P2686 could be caused by an open or short-to-battery in the high side wiring attached to HSD3 (wire 131).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- HSD3 is commanded ON.
- Engine speed greater than 200 rpm.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2686 Actuator Supply Voltage 3 (HSD 3) High

Conditions for Setting the DTC

DTC P2686 is set when the TCM detects a high voltage condition (> 6V) in the HSD3 circuit after two solenoids indicate a failure.

Actions Taken When the DTC Sets

When DTC P2686 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for an open in wire 131 of the OEM chassis harness.
5. This step tests for wire-to-wire short, or short-to-battery in wire 131 of the OEM chassis harness.
7. This step tests for wiring defects in the transmission internal harness.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2686 Actuator Supply Voltage 3 (HSD3) High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problems*
3	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 open or short-to-battery condition in the HSD3 electrical circuit.*** Did DTC P2686 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Turn OFF the ignition. 2. Install the J 47275 TCM Breakout at the 80-way connector. 3. Install J 47279 adapter at the 20-way connector. 4. Turn ON the ignition. Leave the engine OFF. 5. Using Allison DOC™ For PC–Service Tool, enter Solenoid Test mode and command the TCC solenoid ON. 6. Determine the voltage drop in the HSD3 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 31 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage drop between pin 11 and an isolated ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. ***NOTE: A voltage drop of more than 0.5V indicates an excessive voltage loss in the OEM harness.*** Did the high-side voltage drop exceed 0.5VDC?		*Go to Step 6*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2686 Actuator Supply Voltage 3 (HSD3) High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect the TCM from the J 47275 TCM Breakout. Leave the OEM-side connected. 3. Disconnect the OEM-side of the 20-way connector from the J 47279 adapter. Leave the transmission-side connected. 4. Inspect the routing of wire 131 in the chassis harness between the TCM and the transmission connectors. 5. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 31 and all other pins in the 80-way connector. Were any wire-to-wire shorts found?		*Go to Step 6*	*Go to Step 7*
6	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the chassis harness. Is the repair complete?		*Go to Step 10*	
7	1. Turn OFF the ignition. 2. Verify the J 47279 Transmission Breakout is installed at the transmission 20-way connector and the OEM-side is disconnected. 3. Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between pin 11 and all other pins in the 20-way connector. ***NOTE: The resistance value between pins 11 and 12, and between pins 11 and 17 (7-speed models) will read normal solenoid resistance.*** Were any wire-to-wire shorts found?		*Go to Step 8*	*Go to Step 9*
8	1. Remove the hydraulic control module assembly. 2. Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 10*	
9	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 10*	
10	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2714 Pressure Control Solenoid 4 (PCS4) Stuck Off

Refer to Hydraulic Schematic

Circuit Description

The Transmission Control Module (TCM) uses input from the turbine speed and the output speed sensors to detect if a clutch is slipping. Pressure Control Solenoid 4 (PCS4) supplies hydraulic pressure to the C4 clutch in second and sixth ranges. The TCM sets a DTC P2714 when it detects a slip condition while PCS4 is supplying hydraulic pressure to the oncoming clutch.

Conditions for Running the DTC

- Hydraulic system is pressurized.
- Output speed greater than or equal to 125 rpm.
- Turbine speed greater than or equal to 60 rpm.
- Cold Mode operation not required.

Conditions for Setting the DTC

DTC P2714 sets when the TCM detects an incorrect oncoming ratio (range-to-range) for an accumulated number of occurrences.

Actions Taken When the DTC Sets

- When DTC P2714 occurs, the TCM will command previous range.
- While Diagnostic Response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- This DTC indicates the oncoming clutch being controlled by PCS4 is not applied or applied too slowly. Common causes include:
  - — Erratic turbine or output speed signals.
  - — A leak or obstruction in the C4 clutch apply circuit.
  - — A defective solenoid.
  - — A stuck PCS4 regulator valve.
- PCS4 supplies hydraulic pressure to C4 clutch in second and sixth ranges. Check the Allison DOC™ For PC–Service Tool failure record data for previous or current range information when the DTC was set to determine which clutch circuit is suspect.

DIAGNOSTIC TROUBLE CODES (DTC)

- If the condition is intermittent, connect Allison DOC™ For PC–Service Tool and observe the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
  - — Intermittent wiring connection
  - — Excessive vibration (driveline or engine torsionals)
  - — Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).

Test Description

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

2. This step tests for proper transmission fluid level.
3. This step tests for active diagnostic codes.
4. This step tests ignition voltage.
5. This step tests speed sensor readings.
6. This step tests for C4 clutch pressure from PCS4.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P2714 Pressure Control Solenoid 4 (PCS4) Stuck Off

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to the appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition, leave engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the TCM has detected a slip condition and could not verify the correct oncoming ratio following a shift.*** Did DTC P2714 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Allison DOC™ For PC–Service Tool, measure ignition voltage. Is the voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 5*	*Go to General Troubleshooting Section 8*
5	1. Start the engine and drive the vehicle under normal operating conditions. 2. Using Allison DOC™ For PC–Service Tool, monitor turbine, engine, and output speed sensor readings using the strip chart display. Is speed sensor data erratic or are dropouts in signal indicated?	Watch for erratic speed sensor signals	*Go to appropriate speed sensor DTC*	*Go to Step 6*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2714 Pressure Control Solenoid 4 (PCS4) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in Main and C4 pressure taps. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select and attain the range where the DTC occurred as indicated in the failure records. 6. Read and record Main and C4 clutch pressures. Are the pressure readings within specified values in Appendix B?	Refer to Main and Clutch Pressure specification in Appendix B	*Go to Step 7*	*Go to Step 8*
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?		*Go to Step 10*	*Go to Diagnostic Aids*
8	1. Consult the service manual and remove the transmission hydraulic control module. 2. Inspect the control valve bodies for stuck or sticking solenoid regulator valves. 3. Inspect the suction filter. Be sure screen is not plugged. 4. Inspect for damaged gaskets and face seals. Was a valve body problem found and repaired?		*Go to Step 11*	*Go to Step 9*
9	Replace PCS4. Is the replacement complete?		*Go to Step 11*	
10	Remove the main and lube filters and inspect for clutch debris. It may also be necessary to remove the control module and inspect the suction screen for clutch debris. If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual). Is the replacement complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor engine, turbine and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2715 Pressure Control Solenoid 4 (PCS4) Stuck On

Refer to Hydraulic Schematic

Circuit Description

The Transmission Control Module (TCM) uses information from the turbine and output speed sensors to detect if a clutch is in a tie-up condition or if three clutches are applied. Pressure Control Solenoid 4 (PCS4) supplies hydraulic pressure to the C4 clutch in second and sixth ranges. The TCM sets a DTC P2715 when it detects a tie-up condition while PCS4 is supplying hydraulic pressure to the off-going clutch.

Conditions for Running the DTC

- Hydraulic system is pressurized.
- Output speed greater than or equal to 200 rpm.
- Turbine speed greater than or equal to 200 rpm.
- Cold Mode operation not required.

Conditions for Setting the DTC

DTC P2715 sets when the transmission is shifting from range to range and the off-going range (ratio) remains engaged even though the off-going clutch is commanded OFF.

Actions Taken When the DTC Sets

- When DTC P2715 occurs, the TCM will command previous range.
- While Diagnostic Response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- This DTC indicates the off-coming clutch being controlled by PCS4 is not released or released too slowly. Common causes include:
  - — Erratic turbine and output speed sensor readings.
  - — An obstruction in the C4 clutch exhaust circuit.
  - — A defective PCS4 solenoid.
  - — A stuck PCS4 regulator valve.
- PCS4 supplies hydraulic pressure to C4 clutch in second and sixth ranges. Check the Allison DOC™ For PC–Service Tool failure record data for previous or current range information when the DTC was set to determine which clutch circuit is suspect.
- If the condition is intermittent, connect Allison DOC™ For PC–Service Tool and observe the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
  - — Intermittent wiring connection
  - — Excessive vibration (driveline or engine torsionals)
  - — Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper transmission fluid level.
3. This step tests for active diagnostic codes.
4. This step tests ignition voltage.
5. This step tests speed sensor readings.
6. This step tests for C4 clutch pressure from PCS4.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P2715 Pressure Control Solenoid 4 (PCS4) Stuck On

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	Install the Allison DOC™ For PC–Service Tool. 1. Turn ON the ignition, leave engine OFF. 2. Record the failure records. 3. Clear the DTC. 4. Drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the TCM has detected that the off-going clutch did not release (clutch tie-up), following a shift.*** Did DTC P2715 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Allison DOC™ For PC–Service Tool, measure ignition voltage. Is the voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 5*	*Go to General Troubleshooting Section 8*
5	1. Start the engine and drive the vehicle under normal operating conditions. 2. Using Allison DOC™ For PC–Service Tool, monitor turbine, engine, and output speed sensor readings using the strip chart display. Is speed sensor data erratic or are dropouts in signal indicated?	Watch for erratic speed sensor signals	*Go to appropriate speed sensor DTC*	*Go to Step 6*

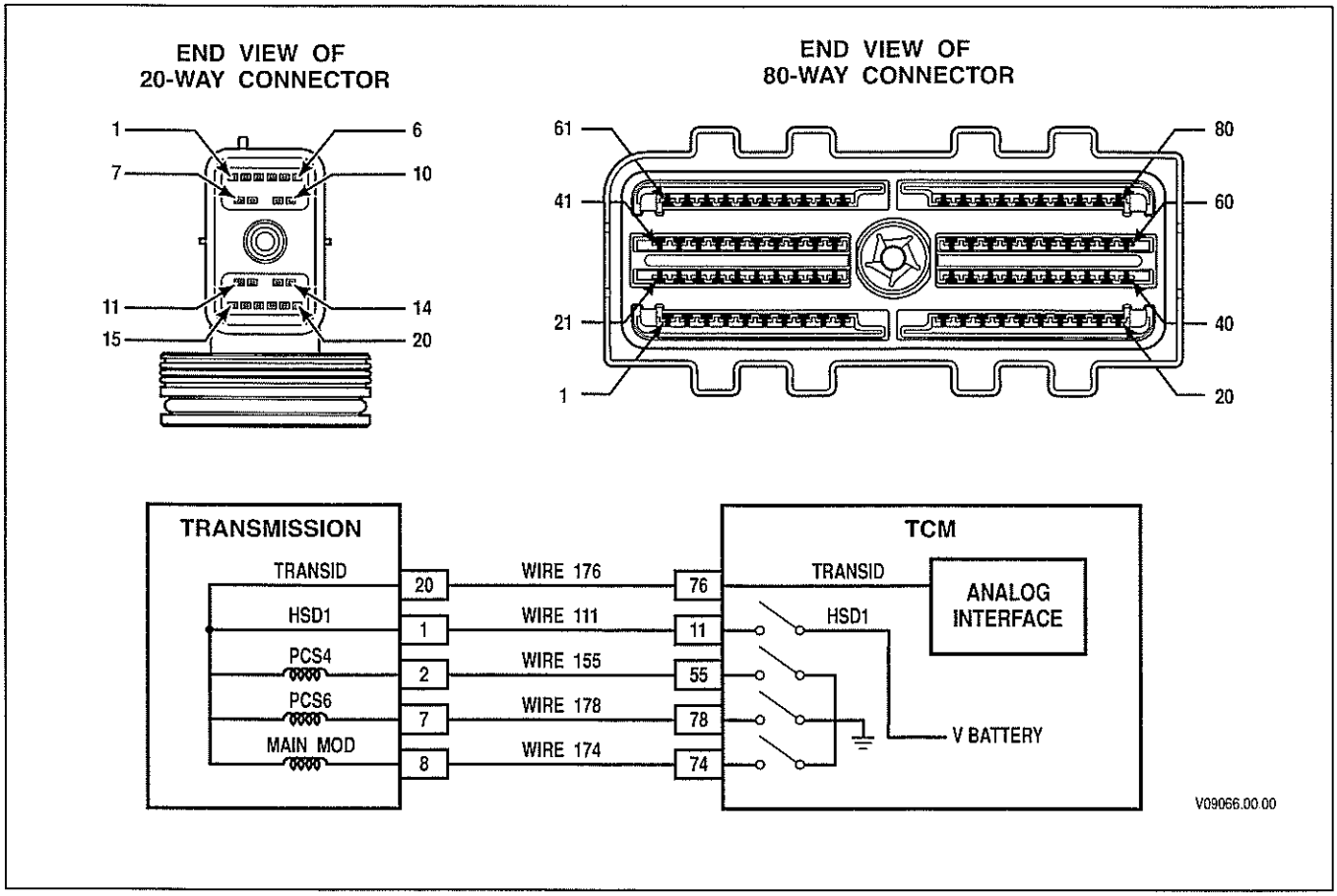
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2715 Pressure Control Solenoid 4 (PCS4) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in Main and C4 pressure taps. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select and attain the range where the DTC occurred as indicated in the failure records. 6. Read and record Main and C4 clutch pressures. Are the pressure readings within specified values in Appendix B?	Refer to Main and Clutch Pressure specification in Appendix B	*Go to Step 7*	*Go to Step 8*
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?		*Go to Step 10*	*Go to Diagnostic Aids*
8	1. Consult the service manual and remove the transmission hydraulic control module. 2. Inspect the control valve bodies for stuck or sticking solenoid regulator valves. 3. Inspect the suction filter. Be sure screen is not plugged. 4. Inspect for damaged gaskets and face seals. Was a valve body problem found and repaired?		*Go to Step 11*	*Go to Step 9*
9	Replace PCS4. Is the replacement complete?		*Go to Step 11*	
10	Remove the main and lube filters and inspect for clutch debris. It may also be necessary to remove the control module and inspect the suction screen for clutch debris. If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual). Is the replacement complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor engine, turbine, and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2718 Pressure Control Solenoid 4 (PCS4) Control Circuit Open



Circuit Description

Pressure Control Solenoid 4 (PCS4) is a normally closed (N/C) solenoid used to apply the C4 clutch in second and sixth ranges. The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS4 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCS4 from High Side Driver 1 (HSD1) via wire 111. HSD1 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS4 by switching PCS4 Low Side Driver (LSD) ON and OFF. Wire 155 completes the circuit between PCS4 and its LSD. DTC P2718 indicates that the TCM has detected an open condition in PCS4 electrical circuit. The open condition may exist in the high side (wire 111) or low side (wire 155).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2718 is set when the TCM detects an open circuit on the PCS4 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2718 Pressure Control Solenoid 4 (PCS4) Control Circuit Open

Actions Taken When the DTC Sets

When DTC P2718 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2718 indicates an open in the electrical circuit for the PCS4. In addition to PCS4, HSD1 also supplies power to Main Mod and PCS6. If DTC P2718 is accompanied by DTC P0960 (Main Mod open circuit) and/or P2812 (PCS6 open circuit), the open is most likely in the high side of the circuit.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests the OEM harness for an excessive voltage drop caused by an open condition in either wire 111 or wire 155 of the OEM chassis harness.
6. This step tests for an open condition in the transmission internal harness.
7. This step tests for the proper PCS4 resistance.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2718 Pressure Control Solenoid 4 (PCS4) Control Circuit Open

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	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 open condition in the PCS4 electrical circuit.*** Did DTC P2718 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout between the OEM external wiring harness and TCM 80-way connectors. 3. Install J 47279 Transmission Breakout between the OEM external wiring harness and transmission 20-way connectors. 4. Turn ON the ignition, leave engine OFF. 5. Using Allison DOC™ For PC–Service Tool, enter Solenoid Test mode and command PCS4 ON. 6. Determine the voltage drop in the high side of the PCS4 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 11 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 1 and an isolated ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. 7. Determine the voltage drop in the low side of the PCS4 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 55 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 2 and an isolated ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. ***NOTE: A voltage drop of more than 0.5V across either circuit indicates an excessive voltage loss in the OEM harness.*** Did either high-side or low-side voltage drop exceed 0.5VDC?		*Go to Step 5*	*Go to Step 6*

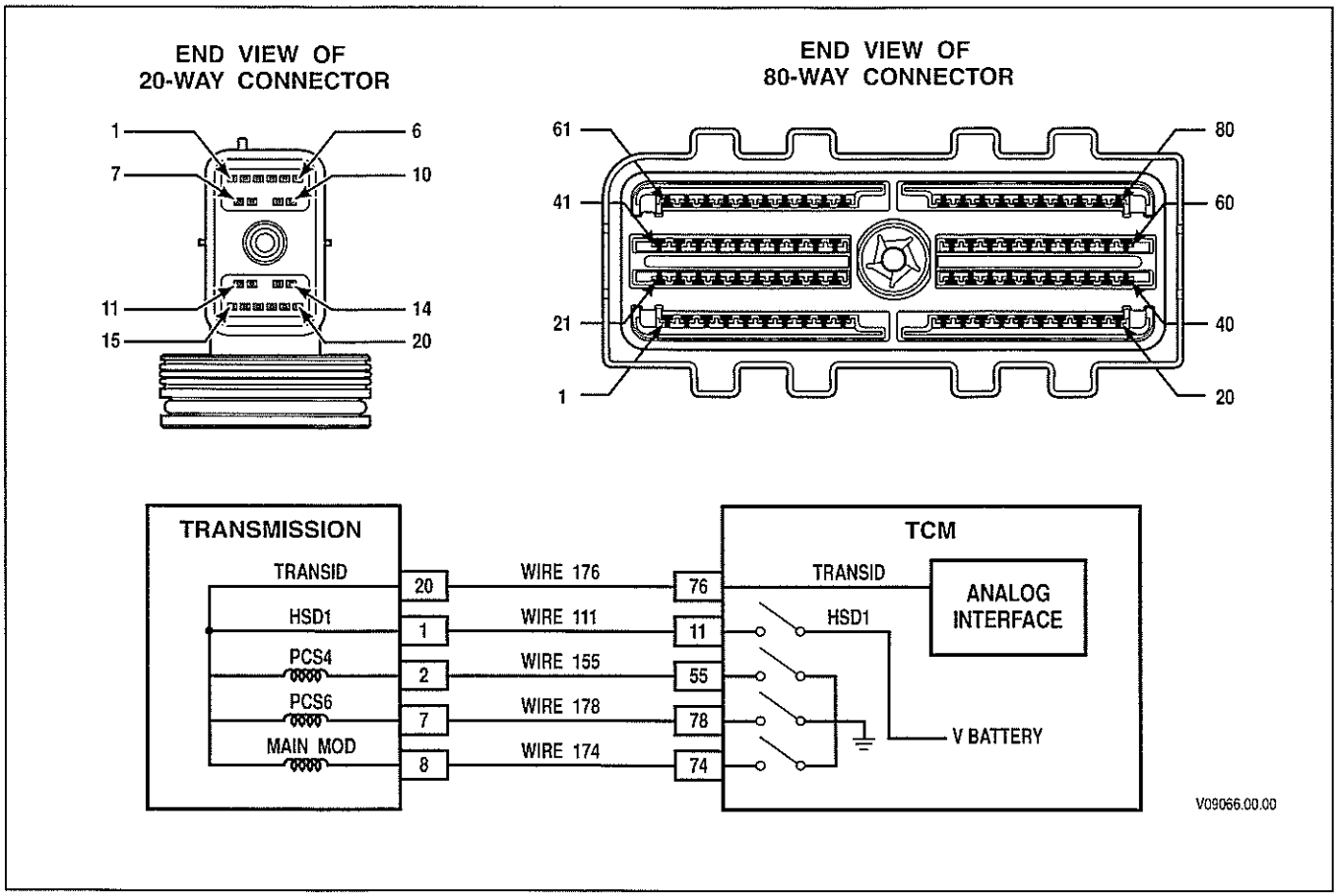
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2718 Pressure Control Solenoid 4 (PCS4) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
6	1. Turn OFF the ignition. 2. Disconnect the OEM 20-way connector from J 47279 Transmission Breakout. Leave the transmission 20-way connector connected to the breakout. 3. Using a digital multimeter (DVOM), measure the resistance between pin 1 and pin 2 of the transmission 20-way connector. Is the resistance within the specified value?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 10*	*Go to Step 7*
7	1. Remove the hydraulic control module assembly. 2. Disconnect PCS4 from the internal wiring harness. 3. Using a DVOM, measure PCS4 resistance at pins A and B. Is resistance within the specified values?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 8*	*Go to Step 9*
8	Replace the internal wiring harness. Is the replacement complete?		*Go to Step 11*	
9	Replace PCS4. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2720 Pressure Control Solenoid 4 (PCS4) Control Circuit Low



Circuit Description

Pressure Control Solenoid 4 (PCS4) is a normally closed (N/C) solenoid used to apply the C4 clutch in second and sixth ranges. The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS4 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCS4 from High Side Driver 1 (HSD1) via wire 111. HSD1 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS4 by switching PCS4 Low Side Driver (LSD) ON and OFF. Wire 155 completes the circuit between PCS4 and its LSD. DTC P2720 indicates that the TCM has detected a short-to-ground condition in the low side of PCS4 electrical circuit.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2720 is set when the TCM detects a short-to-ground in the PCS4 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2720 Pressure Control Solenoid 4 (PCS4) Control Circuit Low

Actions Taken When the DTC Sets

When DTC P2720 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2720 indicates a short-to-ground in the electrical circuit for PCS4.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.
  3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
  4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
  5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47279—3000 and 4000 Product Families Transmission Breakout Harness. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts or a short-to-ground condition in wire 155.
6. This step tests for the wire-to-wire shorts or a short-to-ground in the internal transmission harness.

DTC P2720 Pressure Control Solenoid 4 (PCS4) Control Circuit Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	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 a short-to-ground condition in the PCS4 electrical circuit.*** Did DTC P2720 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 harness. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 155 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 55 and all other pins in the 80-way connector, and shorts-to-ground between pin 55 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found?		*Go to Step 5*	*Go to Step 6*

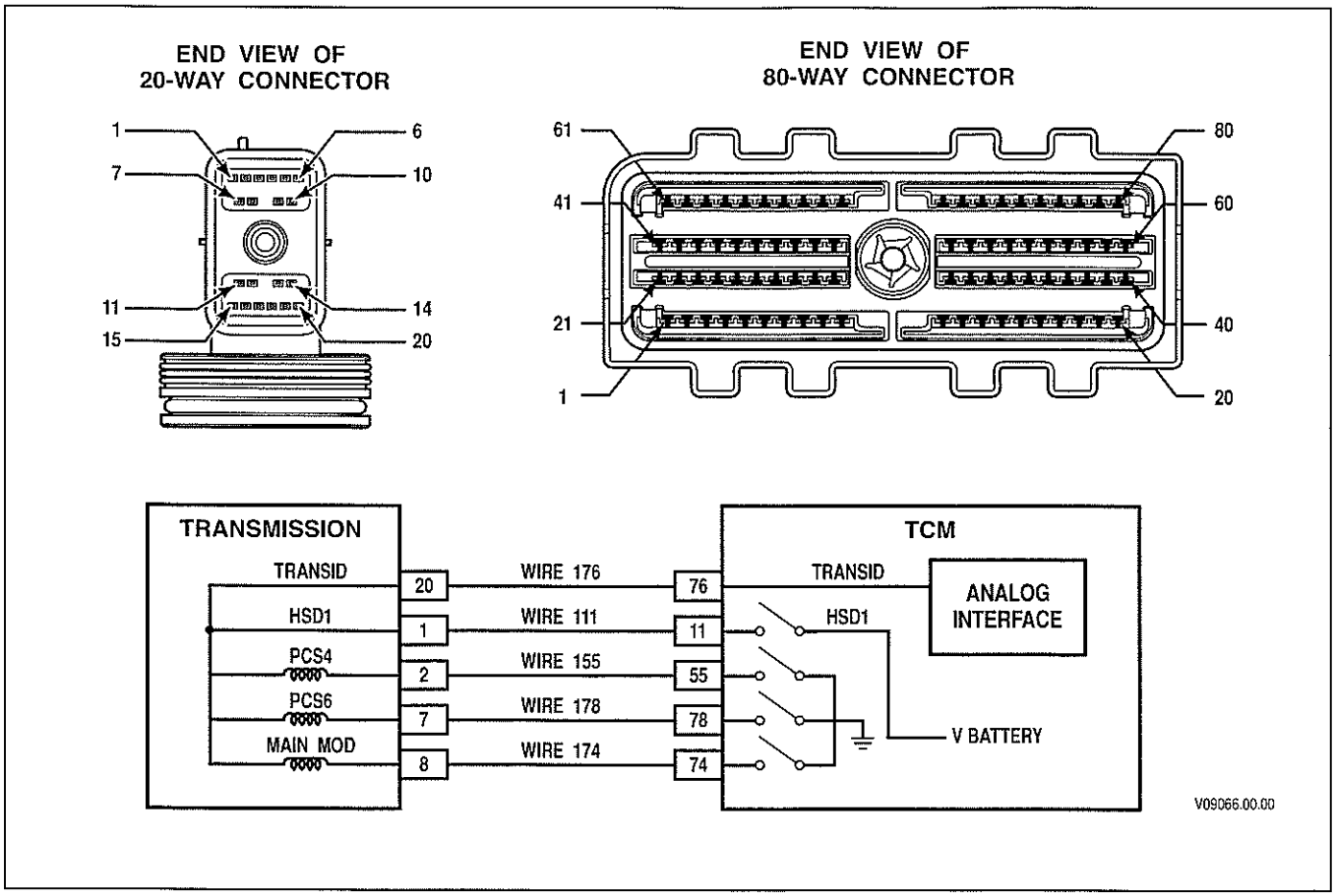
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2720 Pressure Control Solenoid 4 (PCS4) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
6	1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 2 and all other pins in the 20-way connector, and shorts-to-ground between pin 2 and chassis ground. ***NOTE: The resistance value between pins 2 and 1, and between pins 2 and 20 will read normal solenoid resistance. The resistance value between pins 2 and 7 (7-speed models), and between pins 2 and 8 will be twice normal solenoid resistance. Refer to the Solenoid Resistance chart for these values.*** Were any wire-to-wire shorts or shorts -to-ground found?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 7*	*Go to Step 10*
7	1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-to-wire shorts or shorts-to-ground. 3. Were wire-to-wire shorts or shorts-to-ground found?		*Go to Step 8*	*Go to Step 9*
8	Replace the internal wiring harness. Is the replacement complete?		*Go to Step 11*	
9	Replace PCS4. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2721 Pressure Control Solenoid 4 (PCS4) Control Circuit High



Circuit Description

Pressure Control Solenoid 4 (PCS4) is a normally closed (N/C) solenoid used to apply the C4 clutch in second and sixth ranges. The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS4 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCS4 from High Side Driver 1 (HSD1) via wire 111. HSD1 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS4 by switching PCS4 Low Side Driver (LSD) ON and OFF. Wire 155 completes the circuit between PCS4 and its LSD. DTC P2721 indicates that the TCM has detected a short-to-battery condition in the low side of PCS4 electrical circuit.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2721 is set when the TCM detects a short-to-battery in the PCS4 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2721 Pressure Control Solenoid 4 (PCS4) Control Circuit High

Actions Taken When the DTC Sets

When DTC P2721 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2721 indicates a short-to-battery in the electrical circuit for the PCS4 solenoid.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.
  3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
  4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
  5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts between wire 155 and other wires in the OEM chassis harness.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.

DTC P2721 Pressure Control Solenoid 4 (PCS4) Control Circuit High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is voltage within specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	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 a short-to-battery condition in the PCS4 electrical circuit.*** Did DTC P2721 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM-side disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 111 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 55 and all other pins in the 80-way connector. Were any wire-to-wire shorts found?		*Go to Step 5*	*Go to Step 6*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2721 Pressure Control Solenoid 4 (PCS4) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the chassis harness. Is the repair complete?		*Go to Step 11*	
6	1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 2 and all other pins in the 20-way connector. ***NOTE: The resistance value between pins 2 and 1, and between pins 2 and 20 will read normal solenoid resistance. The resistance value between pins 2 and 7 (7-speed models), and between pins 2 and 8 will be twice normal solenoid resistance. Refer to the Solenoid Resistance chart for these values.*** Were any wire-to-wire shorts found?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 7*	*Go to Step 10*
7	1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-to-wire shorts. Were any wire-to-wire shorts found?		*Go to Step 8*	*Go to Step 9*
8	Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 11*	
9	Replace PCS4. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2723 Pressure Control Solenoid 1 (PCS1) Stuck Off
Refer to Hydraulic Schematic

Circuit Description

The Transmission Control Module (TCM) uses input from the turbine speed and the output speed sensors to detect if a clutch is slipping. Pressure Control Solenoid 1 (PCS1) supplies hydraulic pressure to the C1 clutch in first range through fourth range. The TCM sets a DTC P2723 when it detects a slip condition while PCS1 is supplying hydraulic pressure to the oncoming clutch.

Conditions for Running the DTC

- Hydraulic system is pressurized.
- Output speed greater than or equal to 125 rpm.
- Turbine speed greater than or equal to 60 rpm.
- Cold Mode operation not required.

Conditions for Setting the DTC

DTC P2723 sets when the TCM detects an incorrect oncoming ratio (range-to-range) for an accumulated number of occurrences.

Actions Taken When the DTC Sets

- When DTC P2723 occurs, the TCM will command previous range.
- While Diagnostic Response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- This DTC indicates the oncoming clutch being controlled by PCS1 is not applied or applied too slowly. Common causes include:
  - — Erratic turbine or output speed signals.
  - — A leak or obstruction in a specific clutch apply circuit.
  - — A defective solenoid. PCS1 and SS1 each receive commands from the TCM during a shift to Drive. A failure of either solenoid or related hydraulic circuit can cause a DTC P2723.
  - — A stuck PCS1 regulator valve.
  - — A stuck C1 logic latch valve.
- PCS1 supplies hydraulic pressure to C1 clutch in first range through fourth ranges. Check the Allison DOC™ For PC–Service Tool failure record data for previous or current range information when the DTC was set to determine which clutch circuit is suspect.
- If the condition is intermittent, connect Allison DOC™ For PC–Service Tool and observe the speed sensor indicated by the DTC. If the signal is erratic, investigate and eliminate the following:
  - — Intermittent wiring connection
  - — Excessive vibration (driveline or engine torsionals)
  - — Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper transmission fluid level.
3. This step tests for active diagnostic codes.
4. This step tests ignition voltage.
5. This step tests speed sensor readings.
6. This step tests for C1 clutch pressure from PCS1.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P2723 Pressure Control Solenoid 1 (PCS1) Stuck Off

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition, leave engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the TCM has detected a slip condition and could not verify the correct oncoming ratio following a shift.*** Did DTC P2723 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Allison DOC™ For PC–Service Tool, measure ignition voltage. Is the voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 5*	*Go to General Troubleshooting (Section 7)*
5	1. Start the engine and drive the vehicle under normal operating conditions. 2. Using Allison DOC™ For PC–Service Tool, monitor turbine, engine, and output speed sensor readings using the strip chart display. Is speed sensor data erratic or are dropouts in signal indicated?	Watch for erratic speed sensor signals	*Go to appropriate speed sensor DTC*	*Go to Step 6*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2723 Pressure Control Solenoid 1 (PCS1) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main and C1 pressure taps. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select and attain the range where the DTC occurred as indicated in the Failure Records. 6. Read and record Main and C1 clutch pressures. Are the pressure readings within specified values in Appendix B?	Refer to Main and Clutch Pressure specifications in Appendix B	*Go to Step 7*	*Go to Step 8*
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?		*Go to Step 10*	*Go to Diagnostic Aids*
8	1. Consult the service manual and remove the transmission hydraulic control module. 2. Inspect the control valve bodies for stuck or sticking solenoid regulator valves and logic latch valves. 3. Inspect the suction filter. Be sure screen is not plugged. 4. Inspect for damaged gaskets and face seals. 5. Be sure the C1 latch valve is not sticking. The valve should drop freely into its bore. Was a valve body problem found and repaired?		*Go to Step 11*	*Go to Step 9*
9	Consult Allison DOC™ For PC–Service Tool failure record data. Replace PCS1 and/or SS1 based on the following: • DTC P2723 logged during neutral-to-drive and/or reverse-to-drive shifts only—replace both PCS1 and SS1. • DTC P2723 logged during fifth-to-fourth range shifts—replace PCS1 only. Is the replacement complete?		*Go to Step 11*	
10	Remove the main and lube filters and inspect for clutch debris. It may also be necessary to remove the control module and inspect the suction screen for clutch debris. If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual). Is the replacement complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor engine, turbine, and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2724 Pressure Control Solenoid 1 (PCS1) Stuck On

Refer to Hydraulic Schematic

Circuit Description

The Transmission Control Module (TCM) uses information from the turbine and output speed sensors to detect if a clutch is in a tie-up condition or if three clutches are applied. Pressure Control Solenoid 1 (PCS1) supplies hydraulic pressure to the C1 clutch in first through fourth ranges. The TCM sets a DTC P2724 when it detects a tie-up condition while PCS1 is supplying hydraulic pressure to the off-going clutch.

Conditions for Running the DTC

- Hydraulic system is pressurized.
- Output speed greater than or equal to 200 rpm.
- Turbine speed greater than or equal to 200 rpm.
- Cold Mode operation not required.

Conditions for Setting the DTC

DTC P2724 sets when the transmission is shifting from range to range and the off-going range (ratio) remains engaged even though the off-going clutch is commanded OFF.

Actions Taken When the DTC Sets

- When DTC P2724 occurs, the TCM will command previous range.
- While Diagnostic Response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- This DTC indicates the off-coming clutch being controlled by PCS1 is not released or released too slowly. Common causes include:
  - — An obstruction in the C1 clutch exhaust circuit.
  - — A defective PCS1 solenoid.
  - — A stuck PCS1 regulator valve.
- PCS1 supplies hydraulic pressure to C1 clutch in first range through fourth ranges. Check the Allison DOC™ For PC–Service Tool failure record data for previous or current range information when the DTC was set to determine which clutch circuit is suspect.
- PCS1 and PCS2 are "normally high" solenoids. PCS1 and PCS2 supply full hydraulic pressure when their coils are de-energized, and no output pressure when receiving maximum current from the TCM.

DIAGNOSTIC TROUBLE CODES (DTC)

- If the condition is intermittent, connect Allison DOC™ diagnostic tool and observe the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
  - — Intermittent wiring connection
  - — Excessive vibration (driveline or engine torsionals)
  - — Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).

Test Description

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

2. This step tests for proper transmission fluid level.
3. This step tests for active diagnostic codes.
4. This step tests ignition voltage.
5. This step tests speed sensor readings.
6. This step tests for C1 clutch pressure from PCS1.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P2724 Pressure Control Solenoid 1 (PCS1) Stuck On

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition, leave engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the TCM has detected that the off-going clutch did not release (clutch tie-up) following a shift.*** Did DTC P2724 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Allison DOC™ For PC–Service Tool, measure ignition voltage. Is the voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 5*	*Go to General Troubleshooting (Section 7)*
5	1. Start the engine and drive the vehicle under normal operating conditions. 2. Using Allison DOC™ For PC–Service Tool, monitor turbine, engine, and output speed sensor readings using the strip chart display. Is speed sensor data erratic or are dropouts in signal indicated?	Watch for erratic speed sensor signals	*Go to appropriate speed sensor DTC*	*Go to Step 6*

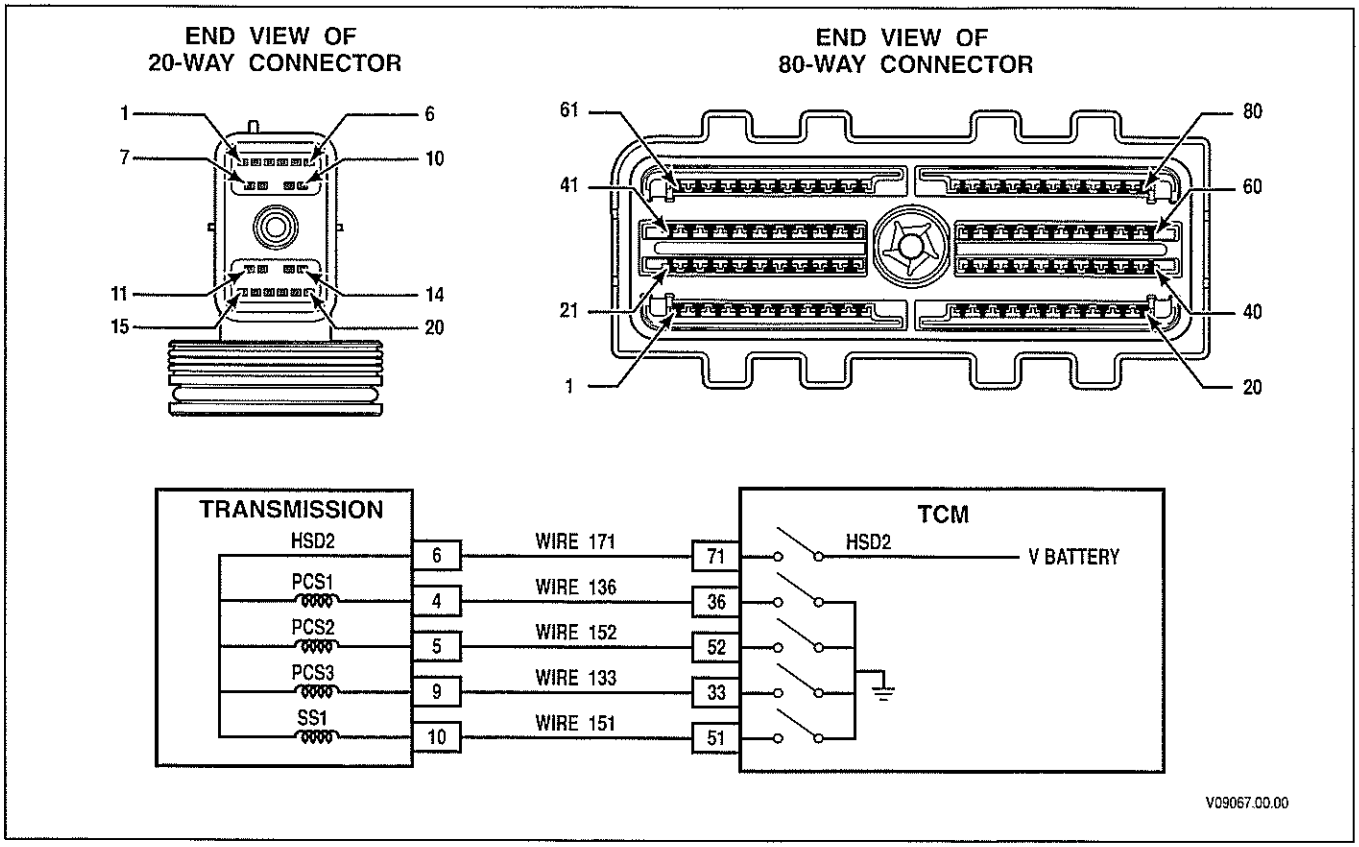
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2724 Pressure Control Solenoid 1 (PCS1) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main and C1 pressure taps. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select and attain the range where the DTC occurred as indicated in the failure records. 6. Read and record Main and C1 clutch pressures. Are the pressure readings within specified values in Appendix B?	Refer to Main and Clutch Pressure specifications in Appendix B	*Go to Step 7*	*Go to Step 8*
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?		*Go to Step 10*	*Go to Diagnostic Aids*
8	1. Consult the service manual and remove the transmission hydraulic control module. 2. Inspect the control valve bodies for stuck or sticking solenoid regulator valves and logic latch valves. 3. Inspect the suction filter. Be sure screen is not plugged. 4. Inspect for damaged gaskets and face seals. Was a valve body problem found and repaired?		*Go to Step 11*	*Go to Step 9*
9	Replace PCS1. Is the replacement complete?		*Go to Step 11*	
10	Remove the main and lube filters and inspect for clutch debris. It may also be necessary to remove the control module and inspect the suction screen for clutch debris. If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual). Is the replacement complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor engine, turbine, and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2727 Pressure Control Solenoid 1 (PCS1) Control Circuit Open



Circuit Description

Pressure Control Solenoid 1 (PCS1) is a normally open (N/O) solenoid used to apply the C1 clutch in first through fourth range. The TCM commands the solenoid OFF to produce hydraulic pressure in the clutch apply circuit. When PCS1 is commanded ON, the C1 clutch is released.

The TCM sends control current to PCS1 from High Side Driver 2 (HSD2) via wire 171. HSD2 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS1 by switching PCS1 Low Side Driver (LSD) ON and OFF. Wire 136 completes the circuit between PCS1 and its LSD. DTC P2727 indicates that the TCM has detected an open condition in PCS1 electrical circuit. The open condition may exist in the high side (wire 171) or low side (wire 136).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2727 is set when the TCM detects an open circuit on the PCS1 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2727 Pressure Control Solenoid 1 (PCS1) Control Circuit Open

Actions Taken When the DTC Sets

When DTC P2727 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2727 indicates an open in the electrical circuit for PCS1. In addition to PCS1, HSD2 also supplies power to PCS2, PCS3, and SS1. If DTC P2727 is accompanied by DTC P0964 (PCS2 open circuit) and/or DTC P0968 (PCS3 open circuit), the open is most likely in the high side of the circuit.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests the OEM harness for an excessive voltage drop caused by an open condition in either wire 171 or wire 136 of the OEM chassis harness.
6. This step tests for an open condition in the transmission internal harness.
7. This step tests for the proper PCS1 resistance.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2727 Pressure Control Solenoid 1 (PCS1) Control Circuit Open

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	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 open condition in the PCS1 electrical circuit.*** Did DTC P2727 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout between the OEM and TCM 80-way connectors. 3. Install J 47279 Transmission Breakout between the OEM and transmission 20-way connectors. 4. Turn ON the ignition, leave engine OFF. 5. Using Allison DOC™ For PC–Service Tool, enter Solenoid Test mode and command PCS1 ON. 6. Determine the voltage drop in the high side of the PCS1 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 71 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 6 and isolated ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. 7. Determine the voltage drop in the low side of the PCS1 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 36 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 4 and isolated ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. ***NOTE: A voltage drop of more than 0.5V across either circuit indicates an excessive voltage loss in the OEM harness.*** Did either high-side or low-side voltage drop exceed 0.5VDC?		*Go to Step 5*	*Go to Step 6*

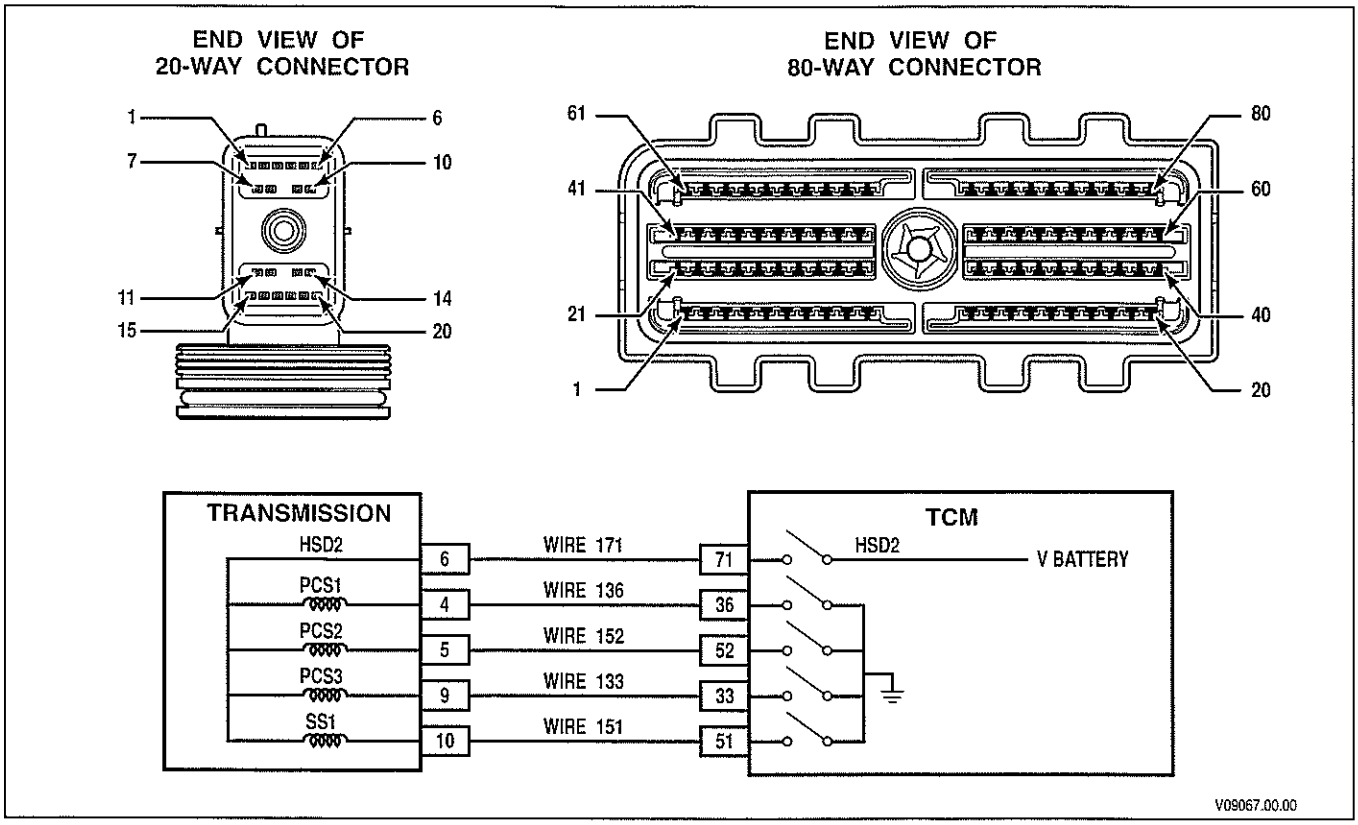
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2727 Pressure Control Solenoid 1 (PCS1) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
6	1. Turn OFF the ignition. 2. Disconnect the OEM 20-way connector from J 47279 Transmission Breakout. Leave the transmission 20-way connector connected to breakout. 3. Using a digital multimeter (DVOM), measure the resistance between pin 4 and pin 6 of the transmission 20-way connector. Is the resistance within the specified value?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 10*	*Go to Step 7*
7	1. Remove the hydraulic control module assembly. 2. Disconnect PCS1 from the internal wiring harness. 3. Using a DVOM, measure PCS1 resistance at pins A and B. Is resistance within the specified values?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 8*	*Go to Step 9*
8	Replace the internal wiring harness. Is the replacement complete?		*Go to Step 11*	
9	Replace PCS1. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2729 Pressure Control Solenoid 1 (PCS1) Control Circuit Low



Circuit Description

Pressure Control Solenoid 1 (PCS1) is a normally open (N/O) solenoid used to apply the C1 clutch in first through fourth range. The TCM commands the solenoid OFF to produce hydraulic pressure in the clutch apply circuit. When PCS1 is commanded ON, the C1 clutch is released.

The TCM sends control current to PCS1 from High Side Driver 2 (HSD2) via wire 171. HSD2 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS1 by switching PCS1 Low Side Driver (LSD) ON and OFF. Wire 136 completes the circuit between PCS1 and its LSD. DTC P2729 indicates that the TCM has detected a short-to-ground condition in the low side of PCS1 electrical circuit.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2729 is set when the TCM detects a short-to-ground in the PCS1 return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2729 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2729 Pressure Control Solenoid 1 (PCS1) Control Circuit Low

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2729 indicates a short-to-ground in the electrical circuit for PCS1.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.
  3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
  4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
  5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts or a short-to-ground condition in wire 136.
6. This step tests for the wire-to-wire shorts or a short-to-ground in the internal transmission harness.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2729 Pressure Control Solenoid 1 (PCS1) Control Circuit Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem.*
3	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 short-to-ground condition in the PCS1 electrical circuit.*** Did DTC P2729 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground between pin 36 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	

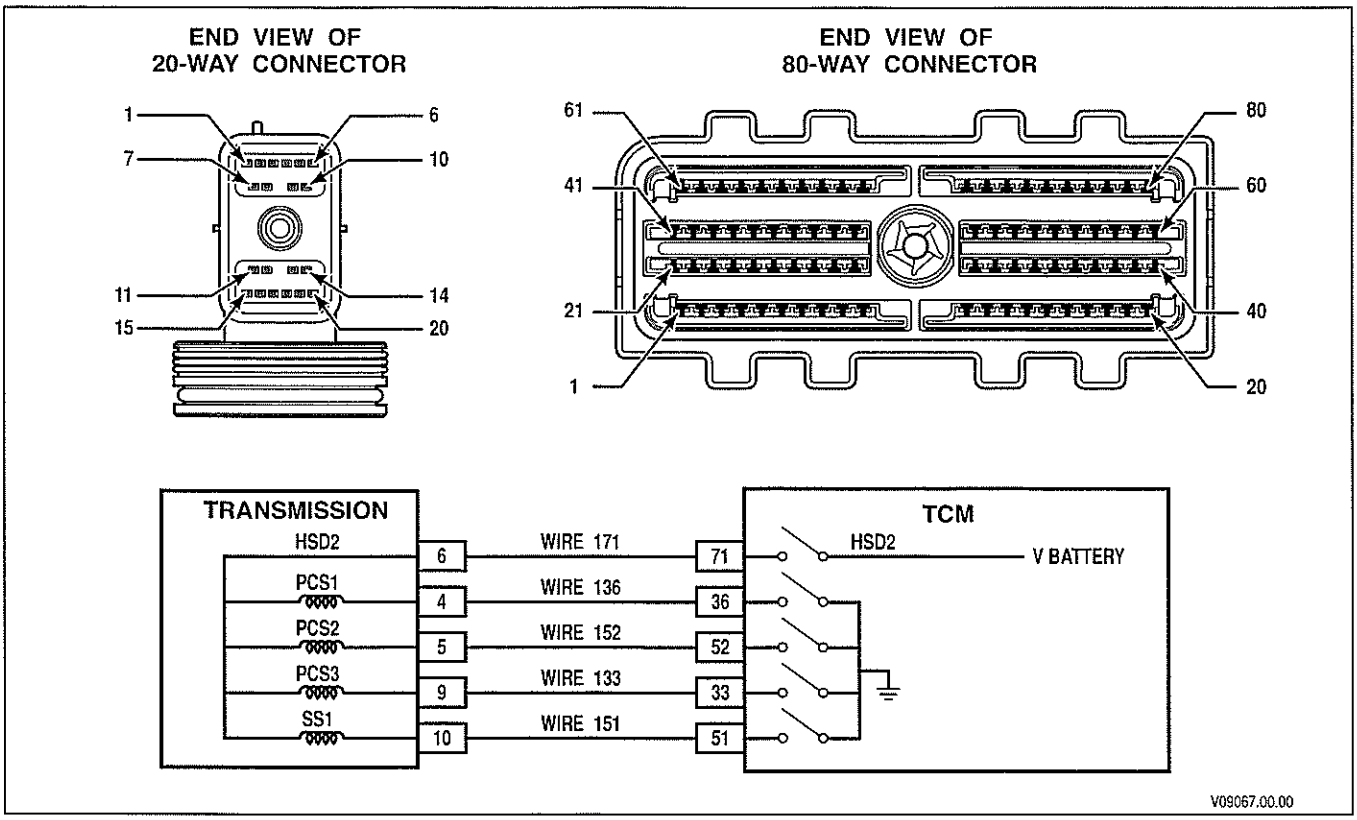
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2729 Pressure Control Solenoid 1 (PCS1) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 4 and all other pins in the 20-way connector, and shorts-to-ground between pin 4 and chassis ground. ***NOTE: The resistance value between pins 8 and 6 will read normal solenoid resistance. The resistance value between pins 4 and 5, and between 4 and 9 will be twice normal solenoid resistance.*** Were any wire-to-wire shorts, or shorts-to-ground found?		*Go to Step 7*	*Go to Step 10*
7	1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-to-wire shorts, or shorts-to-ground. Were any wire-to-wire shorts, or shorts-to-ground found?		*Go to Step 8*	*Go to Step 9*
8	Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 11*	
9	Replace PCS1. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 12*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2730 Pressure Control Solenoid 1 (PCS1) Control Circuit High



Circuit Description

Pressure Control Solenoid 1 (PCS1) is a normally open (N/O) solenoid used to apply the C1 clutch in first through fourth range. The TCM commands the solenoid OFF to produce hydraulic pressure in the clutch apply circuit. When PCS1 is commanded ON, the C1 clutch is released.

The TCM sends control current to PCS1 from High Side Driver 2 (HSD2) via wire 171. HSD2 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS1 by switching PCS1 Low Side Driver (LSD) ON and OFF. Wire 136 completes the circuit between PCS1 and its LSD. DTC P2730 indicates that the TCM has detected a short-to-battery condition in the low side of PCS1 electrical circuit.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2730 is set when the TCM detects a short-to-battery in the PCS1 return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2730 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves determines the range attained.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2730 Pressure Control Solenoid 1 (PCS1) Control Circuit High

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2730 indicates a short-to-battery in the electrical circuit for PCS1.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.
  3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
  4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
  5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts between wire 136 and other wires in the OEM chassis harness.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2730 Pressure Control Solenoid 1 (PCS1) Control Circuit High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem.*
3	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 short-to-battery condition in the PCS1 electrical circuit.*** Did DTC P2730 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 171 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector. Were any wire-to-wire shorts found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	

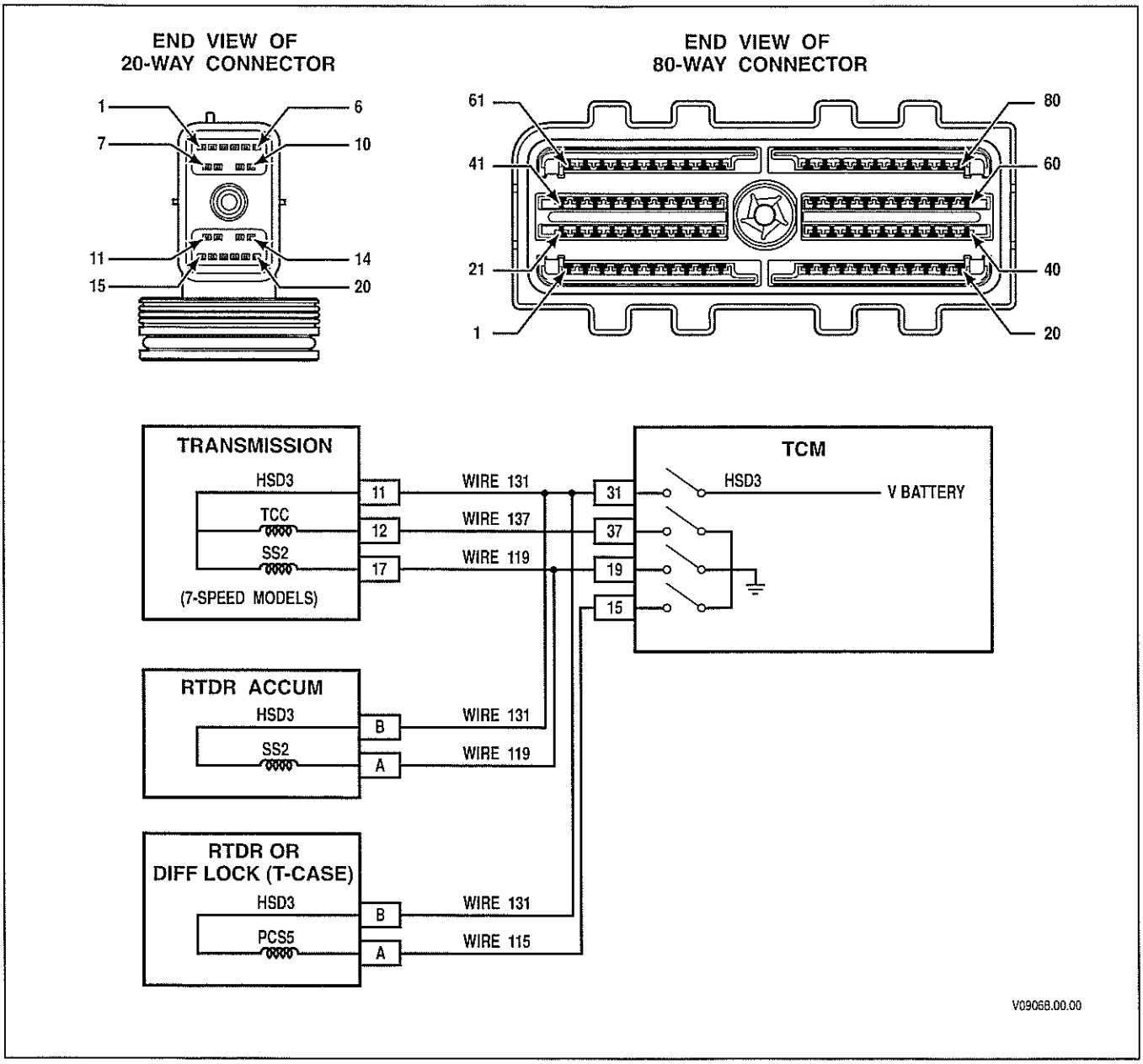
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2730 Pressure Control Solenoid 1 (PCS1) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 4 and all other pins in the 20-way connector, and shorts-to-ground between pin 4 and chassis ground. ***NOTE: The resistance value between pins 4 and 6 will read normal solenoid resistance. The resistance value between pins 4 and 5, between 4 and 9, and between 4 and 10 will be twice normal solenoid resistance.*** Were any wire-to-wire shorts, or shorts-to-ground found?		*Go to Step 7*	*Go to Step 10*
7	1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-to-wire shorts. Were any wire-to-wire shorts, or shorts-to-ground found?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 8*	*Go to Step 9*
8	Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 11*	
9	Replace PCS1. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2736 Pressure Control Solenoid 5 (PCS5) Control Circuit Open



Circuit Description

Pressure Control Solenoid 5 (PCS5) is a normally closed (N/C) solenoid used to apply the retarder solenoid (retarder units) or differential lock solenoid (3000 7-speed only). The TCM commands the solenoid ON to produce hydraulic pressure in the control circuit. When PCS5 is commanded OFF, the control circuit is deactivated.

The TCM sends control current to PCS5 from High Side Driver 3 (HSD3) via wire 131. HSD3 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS5 by switching PCS5 Low Side Driver (LSD) ON and OFF. Wire 115 completes the circuit between PCS5 and its LSD. DTC P2736 indicates that the TCM has detected an open condition in PCS5 electrical circuit. The open condition may exist in the high side (wire 131) or low side (wire 115).

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2736 Pressure Control Solenoid 5 (PCS5) Control Circuit Open

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2736 is set when the TCM detects an open circuit on the PCS5 return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2736 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits retarder operation.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2736 indicates an open in the electrical circuit for PCS5. In addition to PCS5, HSD3 also supplies power to solenoids torque converter clutch (TCC) and SS2. If DTC P2736 is accompanied by DTC P0975 and P2761, the open is most likely in the high side of the circuit.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47275 TCM Breakout and J 47279 Transmission Breakout. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests the OEM harness for an excessive voltage caused by an open condition in either wire 131 or wire 115 of the OEM chassis harness.
6. This step tests for the proper PCS5 resistance.

DTC P2736 Pressure Control Solenoid 5 (PCS5) Control Circuit Open

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	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 open condition in PCS5 electrical circuit.*** Did DTC P2736 return?		*Go to Step 4*	*Go to Diagnostic Aids*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2736 Pressure Control Solenoid 5 (PCS5) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout between the OEM and TCM 80-way connectors. 3. Install J 47279 Transmission Breakout between the OEM and transmission 20-way connectors. 4. Turn ON the ignition. Leave engine OFF. 5. Using Allison DOC™ For PC–Service Tool, enter Solenoid Test mode and command PCS5 ON. 6. Determine the voltage drop in the high side of the PCS5 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 31 and an isolated ground. • To measure PCS5 high-side voltage: — At J 47279-1 Transmission Overlay, measure voltage between RTDR FEED THRU-B and isolated ground (retarder units), **OR** — Back probe pin B of the T-case 6-way Cannon connector using jumper wire kit J39197 or equivalent. — Measure voltage between T-case-B and isolated ground (3000 7-speed only). • Subtract the two voltage measurements to obtain the voltage drop in the circuit. 7. Determine the voltage drop in the low side of the PCS5 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 15 and an isolated ground. • To measure PCS5 low-side voltage: — At J 47279-1 Transmission Overlay, measure voltage between RTDR FEED THRU-A and isolated ground (retarder units), **OR** — Back probe pin B of the T-case 6-way Cannon connector using jumper wire kit J39197 or equivalent. — Measure voltage between T-case-B and isolated ground (3000 7-speed only). • Subtract the two voltage measurements to obtain the voltage drop in the circuit. ***NOTE: A voltage drop of more than 0.5V across either circuit indicates an excessive voltage loss in the OEM harness.*** Did either high-side or low-side voltage drop exceed 0.5VDC?		*Go to Step 5*	*Go to Step 6*

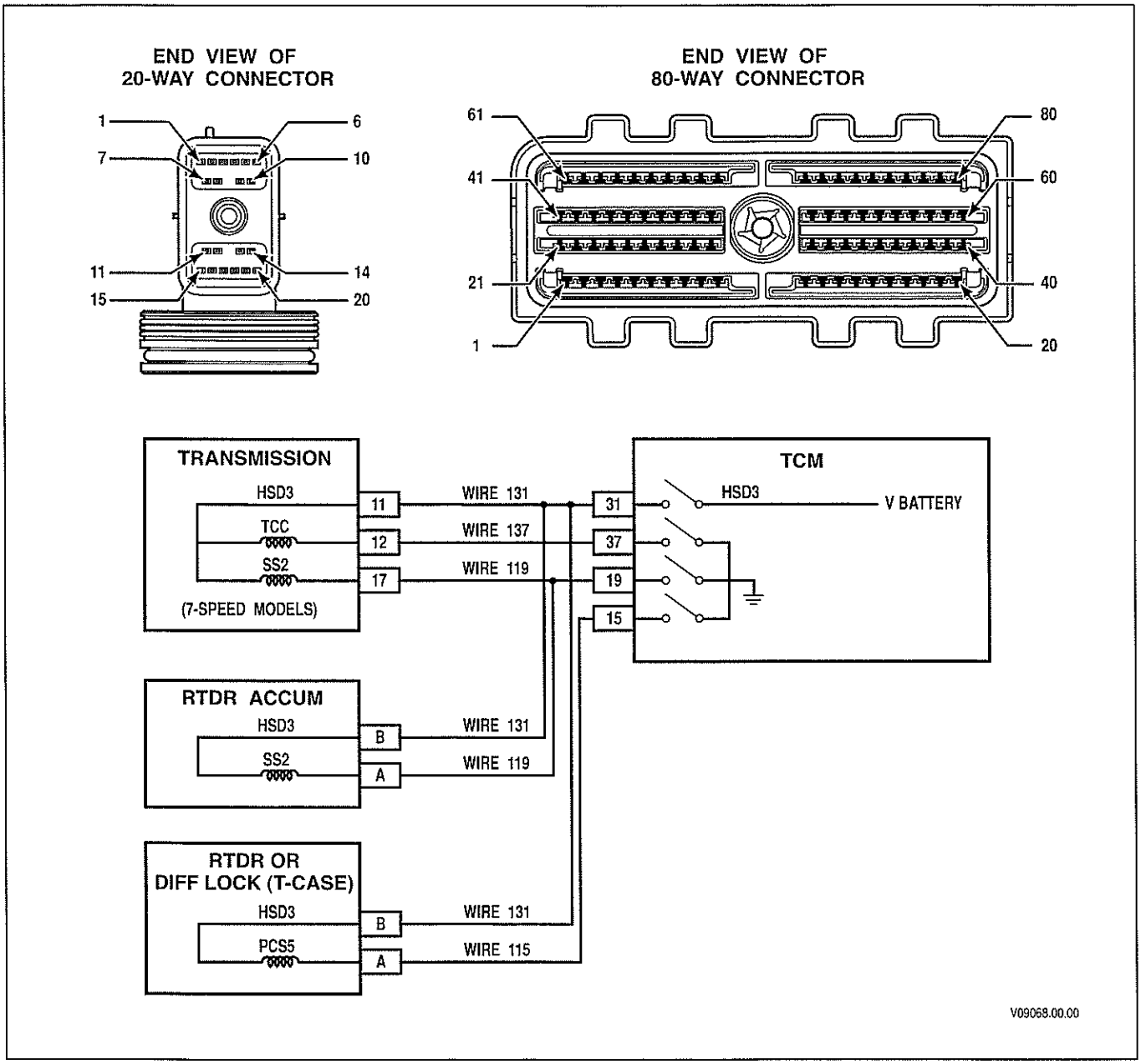
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2736 Pressure Control Solenoid 5 (PCS5) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 9*	
6	1. Turn OFF the ignition. 2. Disconnect the OEM PCS5 connector from J 47279 Transmission Breakout. 3. Using a DVOM, measure the resistance between pins A and B of the RTDR FEED THRU connector (retarder units) or T-case connector (3000 7-speed only). Is the resistance within the specified value?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 8*	*Go to Step 7*
7	1. Remove the retarder valve body (retarder units) or T-case (3000 7-speed only). 2. Replace PCS5. Is the replacement complete?		*Go to Step 9*	
8	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 9*	
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2738 Pressure Control Solenoid 5 (PCS5) Control Circuit Low



Circuit Description

Pressure Control Solenoid 5 (PCS5) is a normally closed (N/C) solenoid used to apply the retarder solenoid (retarder units) or differential lock solenoid (3000 7-speed only). The TCM commands the solenoid ON to produce hydraulic pressure in the control circuit. When PCS5 is commanded OFF, the control circuit is deactivated.

The TCM sends control current to PCS5 from High Side Driver 3 (HSD3) via wire 131. HSD3 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS5 by switching PCS5 Low Side Driver (LSD) ON and OFF. Wire 115 completes the circuit between PCS5 and its LSD. DTC P2738 indicates that the TCM has detected a short-to-ground condition in the low side of PCS5 electrical circuit.

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Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P2738 is set when the TCM detects a short-to-ground in the PCS5 return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2738 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM allows operation in second through sixth range, and in Neutral and Reverse.
- The TCM inhibits retarder and TCC operation.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can 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 failure.

Diagnostic Aids

- DTC P2738 indicates a short-to-ground in the electrical circuit for PCS5.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.

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3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
4. Use Allison DOC™ For PC–Service Tool.
5. solenoid test function to command the solenoid ON and OFF.
6. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts or a short-to-ground condition in wire 115.
6. This step tests for short-to-ground in the internal solenoid circuit.

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Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	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 a short-to-ground condition in the PCS5 electrical circuit.*** Did DTC P2738 return?		*Go to Step 4*	*Go to Diagnostic Aids*

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DTC P2738 Pressure Control Solenoid 5 (PCS5) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the retarder feedthrough or T-case connector. 5. Inspect the routing of wire 115 in the chassis harness between the TCM and the PCS5 connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 15 and all other pins in the 80-way connector, and shorts-to-ground between pin 15 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 9*	
6	1. Turn OFF the ignition. 2. Using a DVOM, test for shorts-to-ground between pin A of retarder feed through or T-case connector and chassis ground. Were any shorts-to-ground found?		*Go to Step 7*	*Go to Step 8*
7	1. Remove the retarder valve body (retarder units) or T-case (3000 7-speed only). 2. Replace PCS5. Is the replacement complete?		*Go to Step 9*	
8	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 9*	
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*