

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0736 Incorrect Reverse Gear Ratio

Refer to Reverse 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 P0736 sets when the calculated reverse range ratio (steady state) differs from the known reverse range ratio.

Actions Taken When the DTC Sets

When DTC P0736 is active, the following conditions will occur:

- The TCM will lock in N (Neutral).
- 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 DOCTM 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 the failure mode where the DTC was set.
- Incorrect ratio codes typically indicate mechanical problems with specific clutches for range indicated, i.e. C3 and C5 for reverse range.
- An incorrect ratio DTC may indicate a mechanically failed clutch control solenoid. Review the DTC information for the specific solenoid.

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 Reverse.
7. This step tests for clutch pressure to range clutches.
8. This step tests for evidence of clutch failure.

DTC P0736 Incorrect Reverse 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 Check 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 values?	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 the 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 the appropriate speed sensor DTC	Go to Step 5

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0736 Incorrect Reverse Ratio (cont'd)**

Step	Action	Value(s)	Yes	No
5	<p>WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you:</p> <ul style="list-style-type: none"> • 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. <p>CAUTION: DO NOT conduct a stall test in Reverse. The torque produced in Reverse can damage the vehicle.</p> <ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main pressure tap and C3 and C5 pressure taps. 3. Start the engine. 4. Using Allison DOCTM For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select R (Reverse). 6. With the engine at idle speed, select and attain the range indicated by the DTC. Turbine speed should go to zero. <p>Did turbine speed remain at zero?</p>		Go to Diagnostic Aids	Go to Step 6
6	<p>Read and record Main, C3 and C5 clutch pressures. Are the pressure readings within specified values in Appendix B?</p>	See Main and Clutch Pressure specifications in Appendix B	Go to Step 7	Go to Step 8
7	<p>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?</p>		Go to Step 10	Go to Diagnostic Aids
8	<ol style="list-style-type: none"> 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. <p>Was a valve body problem found and repaired?</p>		Go to Step 11	Go to Step 9

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0736 Incorrect Reverse Ratio (cont'd)**

Step	Action	Value(s)	Yes	No
9	Using pressure readings obtained in Step 6, replace the affected solenoid. <ul style="list-style-type: none"> • Incorrect C3 pressure—PCS2 • Incorrect C5 pressure—PCS3 		<i>Go to Step 11</i>	
10	Is the replacement complete? 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).		<i>Go to Step 11</i>	
11	Is the replacement complete? In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOCTM For PC-Service Tool, monitor engine, turbine, and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0741 Torque Converter Clutch System Stuck Off

Refer to Hydraulic Schematic

Circuit Description

The Transmission Control Module (TCM) uses data from the engine speed sensor and the turbine speed sensor to calculate torque converter slip value. The TCM then compares this calculated slip value to a preset value in the TCM calibration.

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.
- Selected range is a forward range.
- Throttle position is above 75 percent.
- Transmission fluid temperature is between 25°C (77°F) and 130°C (266°F).
- 6 seconds or more have elapsed since torque converter clutch (TCC) was applied in a range.

Conditions for Setting the DTC

DTC P0741 sets when the TCM detects a TCC slip value greater than 150 rpm for more than 25.5 seconds, indicating TCC did not apply.

Actions Taken When the DTC Sets

When DTC P0741 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCT[™] 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

Residue or contamination may cause solenoid regulator (spool) valves to stick intermittently.

Test Description

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

2. This step tests converter slip speed.
3. This step tests if TCC is being commanded ON.
4. This step tests for hydraulic pressure in lockup clutch circuit.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0741 Torque Converter Clutch System Stuck Off**

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		<i>Go to Step 2</i>	<i>Go to Section 3–5, Beginning the Troubleshooting Process</i>
2	<ol style="list-style-type: none"> 1. Install the Allison DOCT[™] For PC–Service Tool. 2. Turn ON the ignition. leave the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. 6. Using Allison DOCT[™] For PC–Service Tool, monitor TCC slip speed when a range is attained where the TCC should be applied. <p>NOTE: This DTC sets when converter slip speed is detected above 150 rpm for 25.6 seconds or more. This indicates the TCC has not applied.</p> <p>Is the slip speed value at or above the specified value when the TCC should be applied.</p>	>150 rpm	<i>Go to Step 3</i>	<i>Go to Diagnostic Aids</i>
3	Monitor TCC solenoid state when converter slip speed is greater than 150 rpm. Is the TCC solenoid ON?		<i>Go to Step 4</i>	<i>Go to General Troubleshooting Section 8</i>
4	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauge in the lockup pressure tap. 3. Drive the vehicle under normal operating conditions. 4. Using Allison DOCT[™] For PC–Service Tool, monitor TCC slip speed. 5. Read and record lockup pressure when TCC slip speed is greater than 150 rpm. <p>Is lockup pressure reading within specified values in Appendix B?</p>	See Lockup Clutch Pressure specifications in Appendix B	<i>Go to Step 7</i>	<i>Go to Step 5</i>
5	<ol style="list-style-type: none"> 1. Consult the appropriate service manual and remove the transmission hydraulic control module. 2. Inspect the solenoid control valve body for a stuck or sticking TCC solenoid regulator valve. 3. Inspect the suction filter. Be sure screen is not plugged. 4. Inspect for damaged gaskets. <p>Was a valve body problem found and repaired?</p>		<i>Go to Step 8</i>	<i>Go to Step 6</i>
6	<p>Replace the TCC solenoid.</p> <p>Is replacement complete?</p>		<i>Go to Step 8</i>	

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0741 Torque Converter Clutch System Stuck Off (cont'd)**

Step	Action	Value(s)	Yes	No
7	<ol style="list-style-type: none"> 1. Remove the transmission (refer to the appropriate service manual). 2. Disassemble and inspect the torque converter. 3. Inspect for worn lockup clutch damper friction material, damaged seals, etc. Is the repair complete?		<i>Go to Step 8</i>	
8	In order to verify your repair: <ol style="list-style-type: none"> 1. Clear the DTC. 2. Using Allison DOCTM For PC-Service Tool, monitor converter slip speed. 3. Drive the vehicle under conditions noted in failure records. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0776 Pressure Control Solenoid 2 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 2 (PCSS2) supplies hydraulic pressure to the C3 clutch in reverse and to the C2 clutch in fourth through sixth range. The TCM sets a DTC P0776 when it detects a slip condition while PCSS2 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 P0776 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 P0776 occurs, the TCM will command the 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 DOCTM 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 PCSS2 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 PCSS2 solenoid.
 - A stuck PCSS2 regulator valve.
 - A stuck C2 logic latch valve.
- PCSS2 supplies hydraulic pressure to the C3 clutch in reverse and to the C2 clutch in fourth range through sixth range. Review the Allison DOCTM 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 DOCTTM 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 (drive/line 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 C2 and C3 clutch pressure from PCS2.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P0776 Pressure Control Solenoid 2 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 Check 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 Allison DOCT TM 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 record. <i>NOTE: This DTC indicates that the TCM has detected a slip condition and could not verify the correct oncoming ratio following a shift.</i> Did DTC P0776 return?		Go to Step 4	Go to Diagnostic Aids
4	1. Install the Allison DOCT TM For PC–Service Tool. 2. Start the engine. 3. Record the DTC failure record data. 4. Using the Allison DOCT TM 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 DOCT TM 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 the appropriate speed sensor DTC	Go to Step 6

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0776 Pressure Control Solenoid 2 Stuck Off (cont'd)**

Step	Action	Value(s)	Yes	No
6	<ol style="list-style-type: none"> Turn OFF the ignition. Install 2000 kPa (300 psi) pressure gauges in main, C2, and C3 pressure taps. Start the engine. Using Allison DOCTR[™] For PC–Service Tool, select the clutch test mode. With brakes applied, select and attain the range where the DTC occurred as indicated in the Failure Records. Read and record Main and C2 and C3 clutch pressures. <p>Are the pressure readings within specified values in Appendix B?</p>	Refer to Main and Clutch Pressure specifications in Appendix B	Go to Step 7	Go to Step 8
7	<p>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?</p>		Go to Step 10	Go to Diagnostic Aids
8	<ol style="list-style-type: none"> Consult the service manual and remove the transmission hydraulic control module. Inspect the control valve bodies for stuck or sticking solenoid regulator valves and logic latch valves. Inspect the suction filter. Be sure screen is not plugged. Inspect for damaged gaskets and face seals. <p>Was a valve body problem found and repaired?</p>		Go to Step 11	Go to Step 9
9	<p>Replace PCS2.</p> <p>Is the replacement complete?</p>		Go to Step 11	
10	<p>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.</p> <p>If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual).</p> <p>Is the replacement complete?</p>		Go to Step 11	
11	<p>In order to verify your repair:</p> <ol style="list-style-type: none"> Clear the DTC. Using Allison DOCTR[™] For PC–Service Tool, monitor engine, turbine, and output speed sensor readings. Drive the vehicle under normal operating conditions. <p>Did the DTC return?</p>		Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0777 Pressure Control Solenoid 2 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 2 (PCSS2) supplies hydraulic pressure to the C3 clutch in reverse and to the C2 clutch in fourth range through sixth range. The TCM sets a DTC P0777 when it detects a tie-up condition while PCS2 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 P0777 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 P0777 occurs, the TCM will command previous range.
- While the diagnostic response is active, the TCM ignores shift selectors 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 DOCTM 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-going clutch being controlled by PCS2 is not released or released too slowly.
Common causes include:
 - Erratic turbine and output speed sensor readings.
 - An obstruction in the C2 clutch exhaust circuit.
 - A defective PCS2 solenoid.
 - A stuck PCS2 regulator valve.
- PCS2 supplies hydraulic pressure to C3 clutch in reverse and to C2 clutch in fourth range through sixth range. Review the Allison DOCTM 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 DDC™ 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 (drive/line 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 C2 or C3 clutch pressure from PCS2.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P0777 Pressure Control Solenoid 2 Stuck On

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		<i>Go to Step 2</i>	<i>Go to Section 3–5, Beginning the Troubleshooting Process</i>
2	Perform the Fluid Check Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		<i>Go to Step 3</i>	<i>Go to Fluid Check Procedure (refer to mechanic's tips)</i>
3	1. Install the Allison DDC™ 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 P0777 return?		<i>Go to Step 4</i>	<i>Go to Diagnostic Aids</i>
4	1. Install the Allison DDC™ For PC–Service Tool. 2. Start the engine. 3. Record the DTC failure record data. 4. Using the Allison DDC™ For PC–Service Tool, measure ignition voltage. Is the voltage within the specified value?	9–18V (12V TCM) 18–32V (24V TCM)	<i>Go to Step 5</i>	<i>Go to General Troubleshooting Section 8</i>
5	1. Start the engine and drive the vehicle under normal operating conditions. 2. Using Allison DDC™ 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	<i>Go to the Appropriate Speed Sensor DTC</i>	<i>Go to Step 6</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0777 Pressure Control Solenoid 2 Stuck On (cont'd)**

Step	Action	Value(s)	Yes	No
6	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main and C2 and C3 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, C2, and C3 clutch pressures. <p>Are the pressure readings within specified values in Appendix B?</p>	Refer to Main and Clutch Pressure specifications in Appendix B	Go to Step 7	Go to Step 8
7	<p>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?</p>		Go to Step 10	Go to Diagnostic Aids
8	<ol style="list-style-type: none"> 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. <p>Was a valve body problem found and repaired?</p>		Go to Step 11	Go to Step 9
9	<p>Replace PCS2.</p> <p>Is the replacement complete?</p>		Go to Step 11	
10	<p>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.</p> <p>If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual).</p> <p>Is the replacement complete?</p>		Go to Step 11	
11	<p>In order to verify your repair:</p> <ol style="list-style-type: none"> 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. <p>Did the DTC return?</p>		<p>Begin the diagnosis again. Go to Step 1</p>	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0796 Pressure Control Solenoid 3 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 3 (PCCS3) supplies hydraulic pressure to the C5 clutch in reverse, neutral, and first; and to the C3 clutch in third and fifth. The TCM sets a DTC P0796 when it detects a slip condition while PCCS3 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 P0796 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 P0796 occurs, the TCM will command previous range.
- While the Diagnostic Response is active, the TCM will ignore 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 DOCTM 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 PCCS3 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.
 - A stuck PCCS3 regulator valve.
 - A stuck C1 or C2 logic latch valve.
- PCCS3 supplies hydraulic pressure to C5 clutch in reverse, neutral and first range; and to C3 clutch in third and fifth ranges. Review the Allison DOCTM 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 DOCTM 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 (drive/line 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 C3 and C5 clutch pressure from PCS3.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P0796 Pressure Control Solenoid 3 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 Check 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 DOCTM 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. <i>NOTE: This DTC indicates that the TCM has detected a slip condition and could not verify the correct oncoming ratio following a shift.</i> Did DTC P0796 return?		Go to Step 4	Go to Diagnostic Aids
4	1. Install the Allison DOCTM For PC–Service Tool. 2. Start the engine. 3. Record the DTC failure record data. 4. Using the Allison DOCTM 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 DOCTM 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 the appropriate speed sensor DTC	Go to Step 6

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0796 Pressure Control Solenoid 3 Stuck Off (cont'd)**

Step	Action	Value(s)	Yes	No
6	<ol style="list-style-type: none"> Turn the OFF the ignition. Install 2000 kPa (300 psi) pressure gauges in main, C3, and C5 pressure taps. Start the engine. Using Allison DOCTM For PC-Service Tool, select the clutch test mode. With brakes applied, select and attain the range where the DTC occurred as indicated in the failure records. Read and record Main, C3, and C5 clutch pressures. <p>Are the pressure readings within specified values in Appendix B?</p>	Refer to Main and Clutch Pressure specifications in Appendix B	Go to Step 7	Go to Step 8
7	<p>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.</p> <p>Are there signs of a clutch failure?</p>		Go to Step 10	Go to Diagnostic Aids
8	<ol style="list-style-type: none"> Consult the service manual and remove the transmission hydraulic control module. Inspect the control valve bodies for stuck or sticking solenoid regulator valves and logic latch valves. Inspect the suction filter. Be sure screen is not plugged. Inspect for damaged gaskets and face seals. <p>Was a valve body problem found and repaired?</p>		Go to Step 11	Go to Step 9
9	<p>Replace PCS3.</p> <p>Is the replacement complete?</p>		Go to Step 11	
10	<p>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.</p> <p>If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual).</p> <p>Is the replacement complete?</p>		Go to Step 11	
11	<p>In order to verify your repair:</p> <ol style="list-style-type: none"> Clear the DTC. Using Allison DOCTM For PC-Service Tool, monitor engine, turbine, and output speed sensor readings. Drive the vehicle under normal operating conditions. <p>Did the DTC return?</p>		Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0797 Pressure Control Solenoid 3 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 3 (PCSS3) supplies hydraulic pressure to the C5 clutch in reverse, neutral, and first; and to the C3 clutch in third and fifth ranges. The TCM sets a DTC P0797 when it detects a tie-up condition while PCSS3 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 P0797 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 P0797 occurs, the TCM will command previous range.
- While Diagnostic Response is active, the TCM will ignore 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 DOOCTM 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-going clutch being controlled by PCSS3 is not released or released too slowly.
Common causes include:
 - Erratic turbine and output speed sensor readings.
 - An obstruction in the C3 or C5 clutch exhaust circuit.
 - A defective PCSS3 solenoid.
 - A stuck PCSS3 regulator valve.
- PCSS3 supplies hydraulic pressure to C5 clutch in reverse, neutral and first range; and to C3 clutch in third and fifth ranges. Review the Allison DOOCTM 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 C3 or C5 clutch pressure from PCS3.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P0797 Pressure Control Solenoid 3 Stuck On

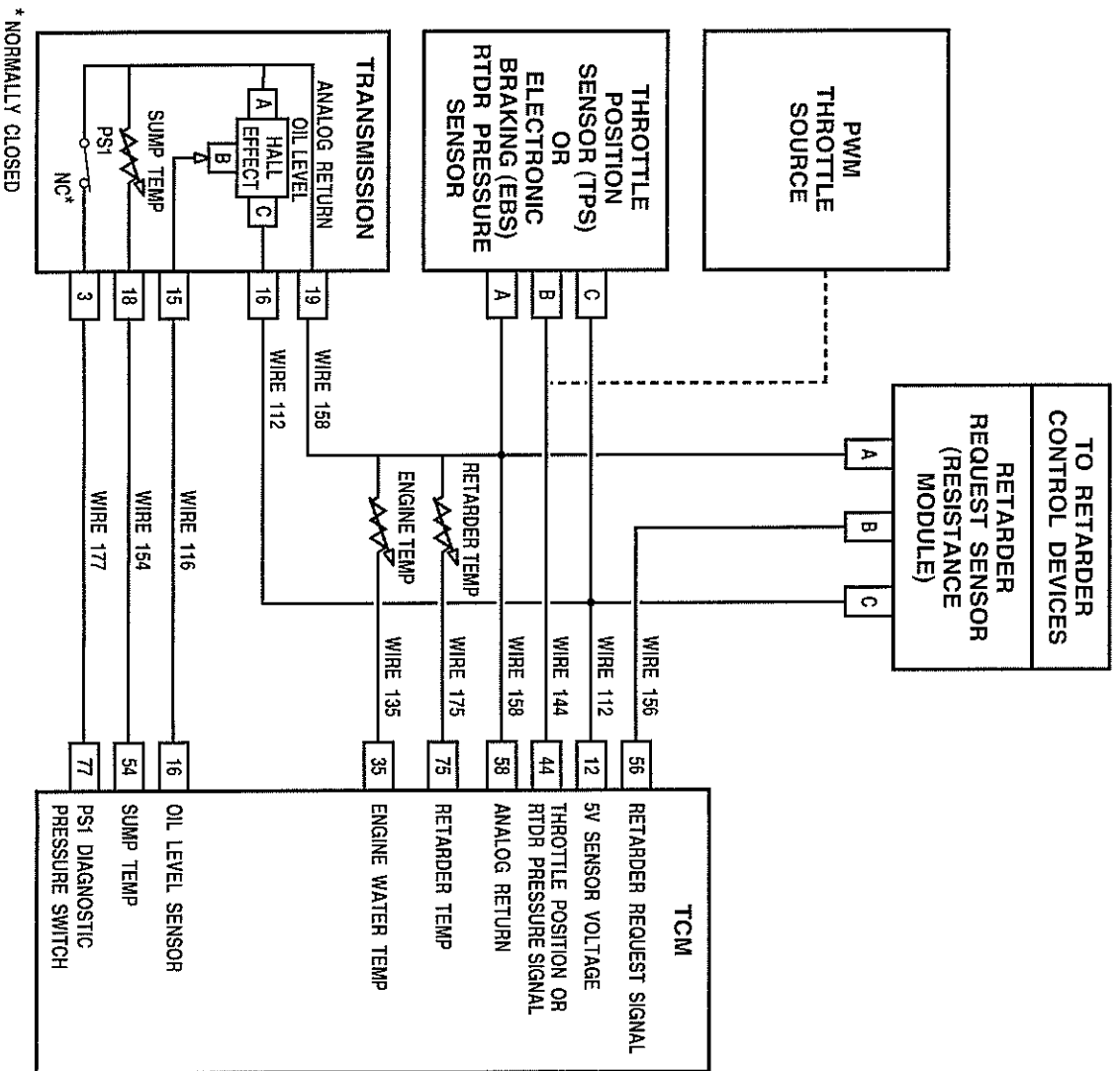
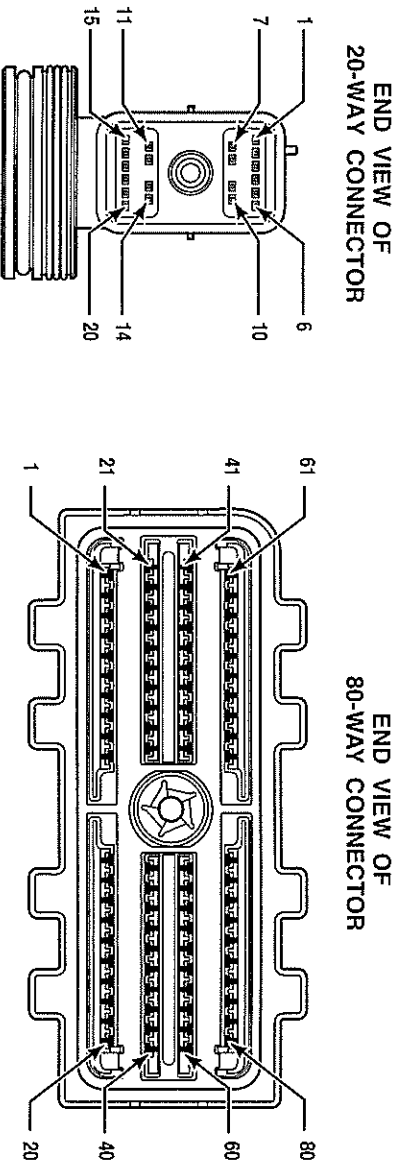
Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	Perform the Fluid Check Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		Go to Step 3	Go 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. <i>NOTE: This DTC indicates that the TCM has detected that the off-going clutch did not release (clutch tie-up) following a shift.</i> Did DTC P0797 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 the appropriate speed sensor DTC	Go to Step 6

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0797 Pressure Control Solenoid 3 Stuck On (cont'd)**

Step	Action	Value(s)	Yes	No
6	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main, C3, and C5 pressure taps. 3. Start the engine. 4. Using Allison DOCTM 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, C3 and C5 clutch pressures. <p>Are the pressure readings within specified values in Appendix B?</p>	Refer to Main and Clutch Pressure specifications in Appendix B	Go to Step 7	Go to Step 8
7	<p>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?</p>		Go to Step 10	Go to Diagnostic Aids
8	<ol style="list-style-type: none"> 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. <p>Was a valve body problem found and repaired?</p>		Go to Step 11	Go to Step 9
9	<p>Replace PCS3.</p> <p>Is the replacement complete?</p>		Go to Step 11	
10	<p>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.</p> <p>If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual).</p> <p>Is the replacement complete?</p>		Go to Step 11	
11	<p>In order to verify your repair:</p> <ol style="list-style-type: none"> 1. Clear the DTC. 2. Using Allison DOCTM For PC-Service Tool, monitor engine, turbine, and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. <p>Did the DTC return?</p>		Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0842 Transmission Pressure Switch 1 Circuit Low



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DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0842 Transmission Pressure Switch 1 Circuit Low

Circuit Description

Diagnostic pressure switch 1 (PS1) is a normally closed switch. When the switch is depressurized, PS1 closes to complete a circuit between wire 177 and analog return wire 158. The Transmission Control Module (TCM) detects PS1 closed when it senses a ground on wire 177. When the switch is pressurized, PS1 opens and voltage on wire 177 goes high.

The TCM uses the signal from PS1 to confirm the following control valve functions:

- When the C5 clutch is filled as in reverse, neutral, or first range—PS1 senses PCS2 solenoid regulator valve position to verify proper C3 clutch control in these three ranges.
- When the C5 clutch is exhausted as in second through sixth ranges—PS1 monitors C1 and C2 latch valve position.

Conditions for Running the DTC

- Hydraulic system pressurized
- Initialization complete
- Transmission sump temperature greater than -15°C (5°F)

Conditions for Setting the DTC

DTC P0842 sets if the TCM detects that PS1 is EXHAUSTED when it should be PRESSURIZED. Specifically, the TCM will set a P0842 code if it senses that PS1 is EXHAUSTED during the following conditions:

- Integrity Test
 - The C5 clutch is filled and PCS2 solenoid is commanded ON, or
 - The C5 clutch is exhausted and both latch valves are stroked.
- Time Out Test
 - After a change in latch valve states that ends up with both latch valves stroked.

Actions Taken When the DTC Sets

When DTC P0842 occurs:

- The TCM will lock in range.
- While the 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 DOCTM For PC–Service Tool can be used to clear the code 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

- Unlike the WTEC IV/III C3 pressure switch, the Allison 4th Generation Pressure Switch 1 (PS1) closes when exhausted, and opens when pressurized.

DIAGNOSTIC TROUBLE CODES (DTC)

- DTC P0842 may be caused by:
 - Low transmission fluid level.
 - Defective PS1 pressure switch.
 - Stuck C1 or C2 latch valves.
 - Defective shift solenoid SS1.
 - Stuck diagnostic valve.
 - A short-to-ground in wire 177.
 - Worn or damaged charging pump.
- Compare transmission fluid level measurements when the engine is shutdown and when the engine is operating. Fluid level should drop after starting the engine. If level does not change, the transmission charging pump may have failed.
- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
 - A bent terminal
 - A backed-out terminal
 - A damage 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. It may be necessary to test for shorting-to-ground at individual wires within a harness to isolate an intermittent condition (refer to Section 4, Wire Test Procedures).
- You may have to drive the vehicle in order to experience a fault. The data obtained from failure records can be useful in reproducing failure modes when the DTC was set.

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.
3. This step verifies failure conditions.
4. This step tests the entire PS1 circuit.
5. This step tests for internal short in TCM.
6. This step tests for wiring defects in OEM harness.
9. This step tests defective internal harness.
13. This step tests for active diagnostic code.
14. This step tests for low main pressure.
15. This step tests for proper function of SS1 solenoid.
16. This step test stuck valves in the hydraulic control module.
18. This step tests for the cause of low main pressure.

DTC P0842 Transmission Pressure Switch 1 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

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0842 Transmission Pressure Switch 1 Circuit Low (cont'd)**

Step	Action	Value(s)	Yes	No
2	Perform the Fluid Check Procedure (refer to appropriate mechanic's tips). <i>NOTE: If transmission fluid was recently drained and refilled, allow the engine to run for a few minutes to prime the main pump and clutch apply circuits.</i>		<i>Go to Step 3</i>	<i>Go to Fluid Check Procedure (refer to mechanic's tips)</i>
3	Is the transmission fluid level correct? 1. Install Allison DOCT [™] For PC-Service Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record failure records. 4. Clear the DTC. 5. Start vehicle and test drive. Attempt to duplicate the same conditions observed in failure records (range attained, transmission temperature, etc.). Did DTC P0842 return?		<i>Go to Step 4</i>	<i>Go to Diagnostic Aids</i>
4	1. Turn OFF the ignition. 2. Disconnect the transmission 20-way connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe PSI status on Allison DOCT [™] For PC-Service Tool. <i>NOTE: Allison DOCT[™] For PC-Service Tool should show PSI switch status as PRESSURIZED under these test conditions.</i> Does Allison DOCT [™] For PC-Service Tool show PSI EXHAUSTED?		<i>Go to Step 5</i>	<i>Go to Step 12</i>
5	1. Turn OFF the ignition. 2. Install a 2000 kPa (300 psi) pressure gauge in main pressure tap. 3. Start the engine. 4. Read and record main pressure. Is the pressure reading within specified value in Appendix B?	Refer to Main and Clutch Pressure specifications in Appendix B	<i>Go to Step 6</i>	<i>Go to Step 10</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0842 Transmission Pressure Switch 1 Circuit Low (cont'd)**

Step	Action	Value(s)	Yes	No
6	<p>WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you:</p> <ul style="list-style-type: none"> • 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. 	Refer to Main and Clutch Pressure specifications in Appendix B	Go to Step 7	Go to Step 10
	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) gauges in C1 and C2 pressure taps. 3. Start the engine. 4. Using Allison DOCTM 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 fourth range. <p>Are both C1 and C2 pressure readings within specified values in Appendix B?</p>		Go to Step 8	Go to Step 9
7	<ol style="list-style-type: none"> 1. Verify the ignition is in the OFF position. 2. Consult appropriate transmission service manual and remove the control module from the transmission. 3. Disconnect PS1. 4. Using a DVOM, test pin 3 in the internal wiring harness for pin-to-pin shorts, and shorts-to-ground. <p>Were any pin-to-pin shorts or shorts-to-ground found?</p>			
8	<p>Replace the internal wiring harness.</p> <p>Is the replacement complete?</p>		Go to Step 17	
9	<p>Replace pressure switch PS1.</p> <p>Is the replacement complete?</p>		Go to Step 17	
10	<ol style="list-style-type: none"> 1. Verify the ignition is in the OFF position. 2. Consult appropriate transmission service manual and remove the control module from the transmission. 3. Inspect the solenoid and main valve bodies for sticking or defective diagnostic valve, PCS1 and PCS2 solenoid regulator valves, or C1 and C2 latch valves. <p>Was a defective valve found or repaired?</p>		Go to Step 17	Go to Step 11

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0842 Transmission Pressure Switch 1 Circuit Low (cont'd)**

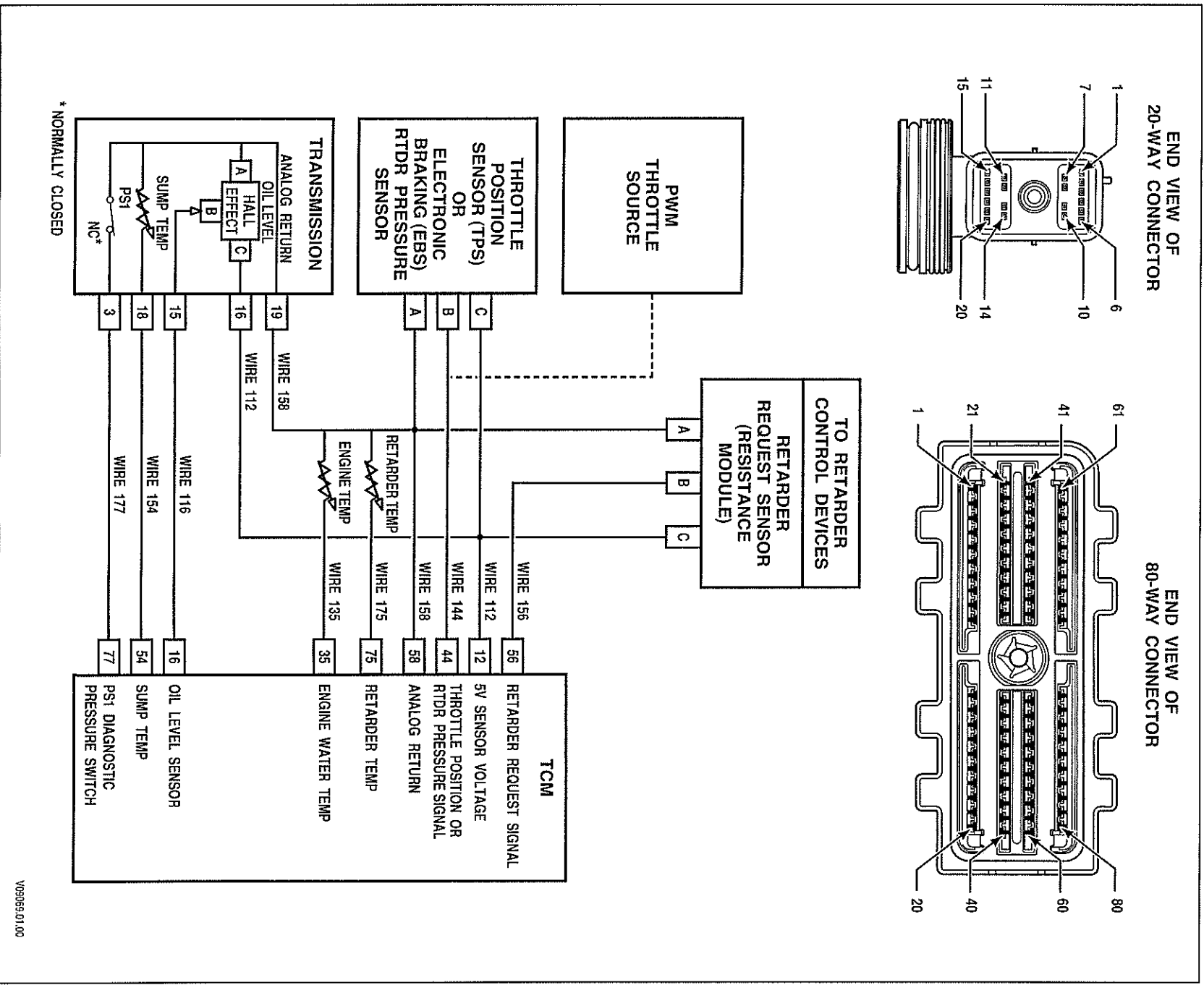
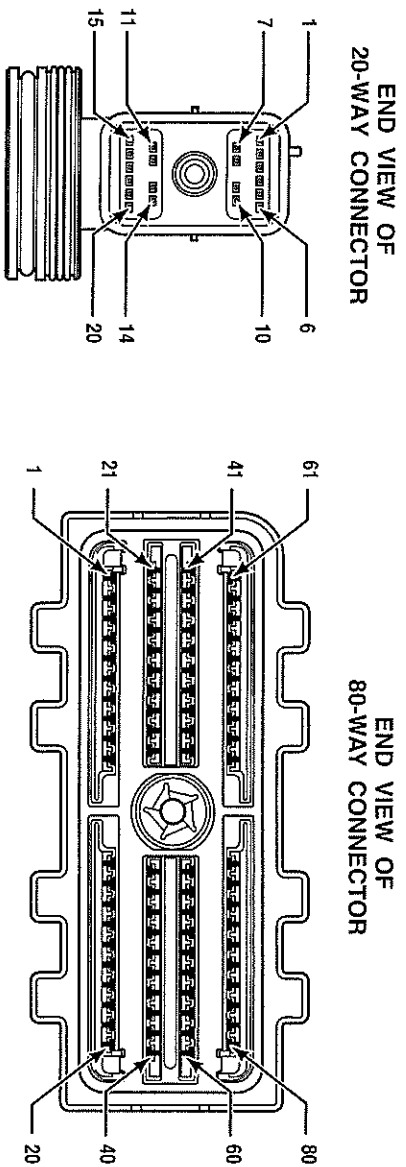
Step	Action	Value(s)	Yes	No
11	Replace the solenoid that is controlling the malfunctioning clutch (as indicated by pressure readings obtained in step 6 above). <ul style="list-style-type: none"> • C1 clutch – PCS1 solenoid • C2 clutch – PCS2 solenoid • Both C1 and C2 clutch – SS1 solenoid Is the repair complete?		<i>Go to Step 17</i>	
12	1. Turn OFF the ignition. 2. Install the J 47275 TCM Breakout at the TCM 80-way connector. 3. Disconnect the 16-pin bypass connector on J 47275 TCM Breakout. 4. Turn ON the ignition. 5. Observe PS status on Allison DOC™ For PC–Service Tool. NOTE: Allison DOC™ For PC–Service Tool should show PSI switch status as PRESSURIZED under these test conditions.		<i>Go to Step 13</i>	
13	Does Allison DOC™ For PC–Service Tool show PSI PRESSURIZED? 1. Turn OFF the ignition. 2. Inspect the routing of the PSI sense wire 177 between the TCM and the transmission 20-way connector. 3. Disconnect the TCM from J 47275 TCM Breakout. Leave the OEM-side connected. 4. Reconnect the 16-pin bypass connector on J 47275 TCM Breakout. 5. Disconnect the transmission 20-way connector. 6. Using a DVOM at J 47275-1 TCM Overlay, test for wire-to-wire shorts and shorts-to-ground at pin 177 (PS1 signal). Were short-to-ground or wire damage found?		<i>Go to Step 14</i>	<i>Go to Diagnostic Aids</i>
14	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?		<i>Go to Step 17</i>	
15	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?		<i>Go to Step 17</i>	

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0842 Transmission Pressure Switch 1 Circuit Low (cont'd)**

Step	Action	Value(s)	Yes	No
16	Investigate the cause of low main pressure. Possible causes include: <ul style="list-style-type: none"> • Collapsed main filter • Broken converter pump or PTO gear tangs • Worn main charging pump. 		Go to Step 17	
17	Is the cause of low main pressure repaired? In order to verify your repair: <ol style="list-style-type: none"> 1. Clear the DTC. 2. Use Allison DOC™ For PC-Service Tool to monitor pressure switch PSI status. 3. Drive the vehicle under conditions noted in failure records. Did the DTC P0842 return?		Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0843 Transmission Pressure Switch 1 Circuit High



Y09056.01.00

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0843 Transmission Pressure Switch 1 Circuit High

Circuit Description

The TCM uses diagnostic pressure switch Pressure Switch 1 (PS1) to confirm the following control valve function. While C5 clutch is filled as in reverse, neutral, or first range, PS1 senses Pressure Control Switch 2 (PCSS2) solenoid regulator valve position to verify C3 clutch control in these three ranges. While C5 is exhausted as in second through sixth ranges, PS1 monitors C1 and C2 latch valve positions.

PS1 is a normally closed switch. When the switch is depressurized, PS1 closes to complete a circuit between wire 177 and analog return wire 158. The TCM detects PS1 closed when it senses a ground on wire 177. When the switch is pressurized, PS1 opens and voltage on wire 177 goes high.

Conditions for Running the DTC

- Hydraulic system pressurized
- Initialization complete
- Transmission sump temperature greater than -15°C (5°F)

Conditions for Setting the DTC

DTC P0843 sets if the TCM detects that PS1 is pressurized in the following situations:

- Integrity Test
 - The C5 clutch is exhausted or PCS2 solenoid is commanded OFF, and at least one C1 and C2 latch valve is de-stroked.
- Time Out Test
 - After a change in latch valve states that starts with both latch valves stroked and ends up with at least one latch valve de-stroked.

Actions taken when the DTC Sets

When DTC P0843 occurs:

- The TCM will lock in range.
- While the diagnostic response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits torque converter clutch (TCC) engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCT™ 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. 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 only a P0843 is set, look for an intermittent open in the pressure switch circuit.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to test for shorting-to-ground at individual wires within a harness to isolate an intermittent condition (refer to Section 4, Wire Test Procedures).
- You may have to drive the vehicle in order to experience a fault. The data obtained from failure records can be useful in reproducing failure modes when the DTC was set.

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 proper transmission fluid level.
3. This step verifies failure conditions.
4. This step tests the TCM for PSI switch status.
5. This step tests for internal open in TCM.
6. This step tests for wiring defects (opens) in OEM harness.
9. This step tests for opens in the internal harness.

DTC P0843 Transmission Pressure Switch 1 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	Perform the Fluid Check 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 DOCTM For PC–Service Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record failure records. 4. Clear the DTC. 5. Start vehicle and test drive. Attempt to duplicate the same conditions observed in failure records (range attained, transmission temperature, etc.). <i>NOTE: This DTC indicates that an open circuit condition may exist in the OEM harness, internal transmission harness, or PSI diagnostic pressure switch.</i>		Go to Step 4	Go to Diagnostic Aids
	Did DTC P0843 return?			

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0843 Transmission Pressure Switch 1 Circuit High (cont'd)**

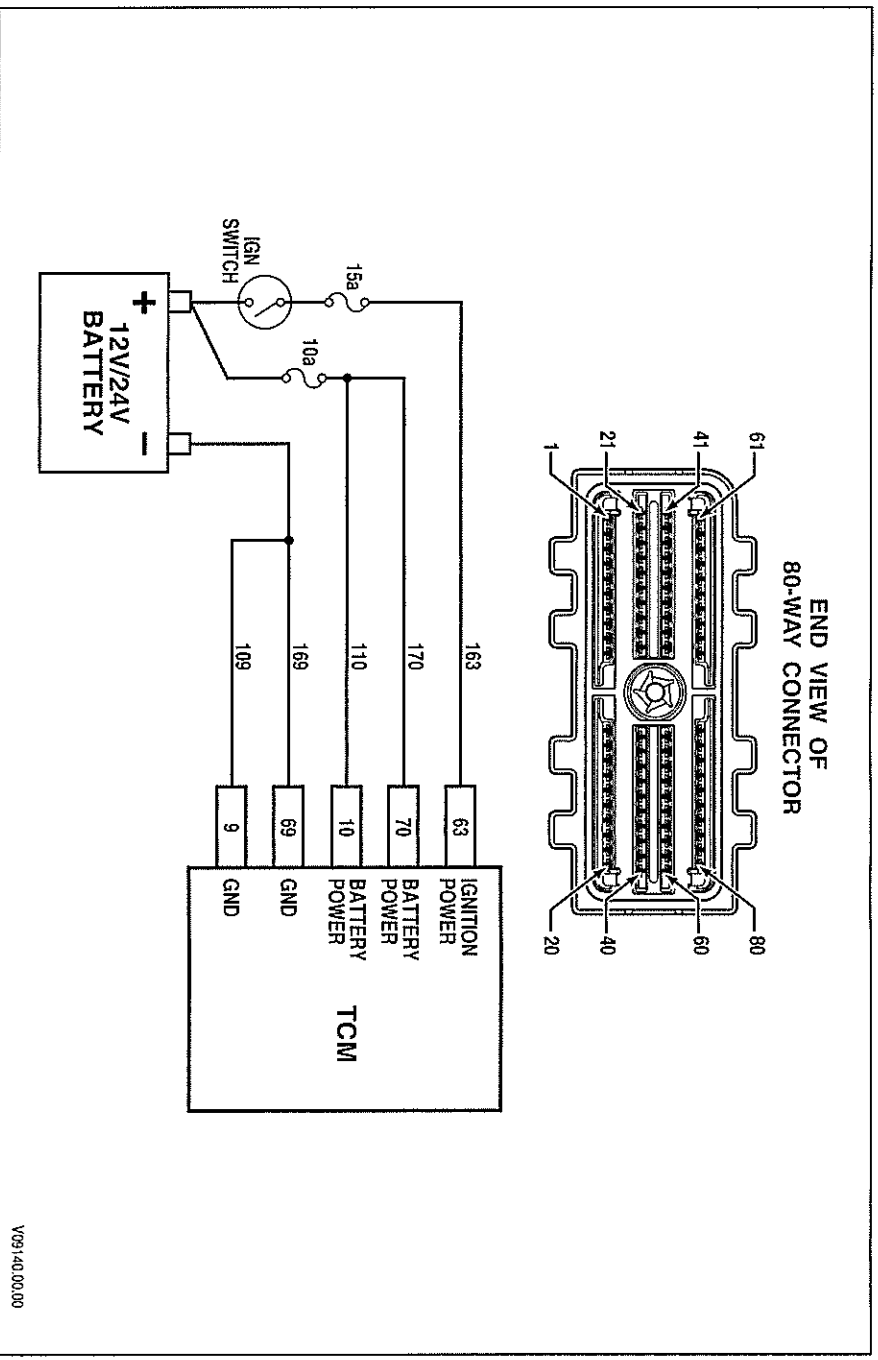
Step	Action	Value(s)	Yes	No
4	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the transmission 20-way connector. 3. Connect the OEM-side of the 20-way connector to the J 47279 Transmission Breakout. Leave the transmission-side disconnected. 4. At J 47279-1 Transmission Overlay, install a jumper between pin 3 and a known good ground. 5. Turn ON the ignition, with the engine OFF. 6. Observe PSI status on Allison DOCTM For PC-Service Tool. 		<i>Go to Step 5</i>	<i>Go to Step 9</i>
5	<p>Does Allison DOCTM For PC-Service Tool show PSI PRESSURIZED?</p> <ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Install the J 47275 TCM Breakout at the TCM 80-way connector. 3. Disconnect the 16-pin bypass connector on J 47275 TCM Breakout. 4. At J 47275-1 TCM Overlay, install a jumper between pin 77 and ground (pin 9 or pin 69). 5. Turn ON the ignition. Leave the engine OFF. <p>Does Allison DOCTM For PC-Service Tool show PSI PRESSURIZED?</p>		<i>Go to Step 8</i>	<i>Go to Step 6</i>
6	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Inspect the routing of the PSI sense wire 177 between the TCM and transmission 20-way connector. 3. Disconnect the TCM from J 47275 TCM Breakout. Leave the OEM-side connected. 4. Reconnect the 16-pin bypass connector on J 47275 TCM Breakout. 5. Disconnect the transmission 20-way connector. 6. Test for opens on wire 177. <p>Were opens or wire damage found?</p>		<i>Go to Step 7</i>	<i>Go to Diagnostic Aids</i>
7	<p>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.</p> <p>Coordinate with the vehicle OEM to repair or replace the vehicle wiring.</p> <p>Is the repair complete?</p>		<i>Go to Step 12</i>	
8	<p>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</p> <p>Refer to TCM diagnostic procedure, Section 3-6. Is Section 3-6 complete?</p>		<i>Go to Step 12</i>	

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0843 Transmission Pressure Switch 1 Circuit High (cont'd)**

Step	Action	Value(s)	Yes	No
9	<ol style="list-style-type: none"> Consult appropriate transmission service manual and remove the control module from the transmission. Disconnect PSI. Using a DVOM, test for continuity across pressure switch PSI. Is there continuity across pressure switch PSI?		Go to Step 10	Go to Step 11
10	Replace the internal wiring harness. Is the replacement complete?		Go to Step 12	
11	Replace the pressure switch PSI. Is the replacement complete?		Go to Step 12	
12	In order to verify your repair: <ol style="list-style-type: none"> Clear the DTC. Using Allison DOC™ For PC-Service Tool, monitor pressure switch PSI status. Drive the vehicle under normal operating conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0880 TCM Power Input Signal



Circuit Description

The Transmission Control Module (TCM) requires a switched ignition voltage input and a direct battery voltage input. This switched ignition signal originates from the ignition switch or an ignition relay to supply voltage to pin 63 in the 80-way connector at the TCM. Battery direct voltage is supplied to pins 10 and 70 at the 80-way connector.

Conditions for Running the DTC

This test is continuously enabled.

Conditions for Setting the DTC

DTC P0880 sets during the next ignition cycle if battery power is lost before the power down process is complete and the engine is running.

Actions Taken When the DTC Sets

When DTC P0880 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The TCM loses adaptive information for the drive cycle.
- The TCM reverts to previous adaptive settings.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0880 TCM Power Input Signal

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 P0880 may set if battery disconnects are opened before switching OFF ignition.
- You may have to drive the vehicle in order to experience a fault.
- Inspect the wiring for poor electrical connections at the TCM. 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.

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 battery voltage.
3. This step tests for proper charging system operation.
4. This step tests for proper system voltage.
5. This step tests for proper ignition voltage.

DTC P0880 TCM Power Input Signal

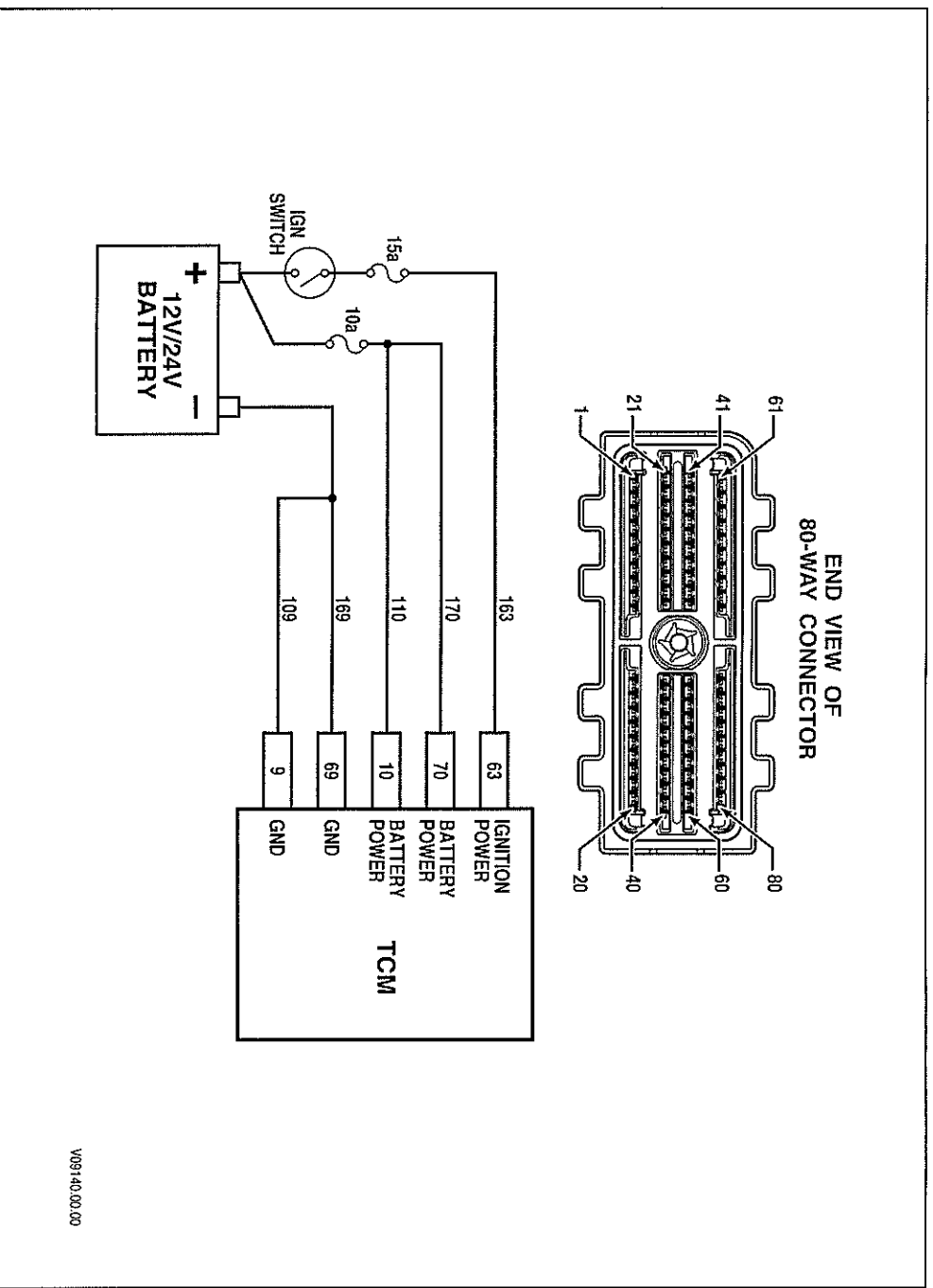
Step	Action	Value(s)	Yes	No
1	Was Section 3-5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3-5, Beginning the Troubleshooting Process
2	<ol style="list-style-type: none"> 1. Install the Allison DOC™ For PC-Service Tool. 2. Turn the ignition to the RUN position with the engine OFF. 3. Record the DTC failure records. 4. Using a digital multimeter (DVOM), measure and record voltage at the battery terminals. Is voltage greater than specified value?	10.5V (12V TCM) 22V (24V TCM)	Go to Step 3	Resolve battery problem. Go to Step 7
3	Start the engine and warm to normal operating temperature. Is the Alternator/Check Engine Lamp ON?		Repair charging system	Go to Step 4

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0880 TCM Power Input Signal (cont'd)**

Step	Action	Value(s)	Yes	No
4	<ol style="list-style-type: none"> Increase engine speed to 1000–1500 rpm. Using Allison DOCTM For PC–Service Tool, monitor system voltage. Is the voltage within the specified values?	13–15V (12V TCM) 25–30V (24V TCM)	Go to Step 5	Repair charging system
5	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the 80-way connector from the TCM and install J 47275 TCM Breakout between the OEM and TCM connectors. Using a DVOM, measure voltage between 80-way connector pins 9 and 10 with ignition OFF. Turn ON the ignition, leave engine OFF. Using a DVOM, measure voltage between 80-way connector pins 9 and 63 with ignition ON. Subtract the voltage reading obtained in Step 5 from the voltage reading obtained in Step 3. Is the difference between Step 3 voltage and Step 5 voltage greater than the specified value?	0.5V	Go to Step 6	Go to Diagnostic Aids
6	<p>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.</p> Repair the vehicle wiring harness. Is the repair complete?		Go to Step 7	
7	In order to verify your repair: <ol style="list-style-type: none"> Clear the DTC. Start the engine and warm to normal operating temperature. Using Allison DOCTM For PC–Service Tool, monitor system voltage. System voltage should be 9–18V. Did the DTC return?		Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0881 TCM Power Input Signal Performance



Circuit Description

The Transmission Control Module (TCM) requires a switched ignition voltage input and a direct battery voltage input. This switched ignition voltage signal originates from the ignition switch or an ignition relay to supply voltage to pin 63 in the 80-way connector at the TCM. Battery voltage is supplied to pins 10 and 70 at the 80-way connector.

Conditions for Running the DTC

Engine speed is greater than 500 rpm for at least 1.5 seconds.

Conditions for Setting the DTC

DTC P0881 sets under the following conditions:

- The TCM detects direct battery voltage below 5.5V. When battery voltage drops below 5.5V for 10 samples, a fault pending is reported. DTC P0881 is set if voltage remains below 5.5V for 20 samples.
- The TCM detects a large variation in direct battery voltage. When battery voltage varies by 4.0V or more for 10 samples, a fault pending is reported. DTC P0881 is set if ignition or battery voltage varies by 4.0V or more for 20 samples.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0881 TCM Power Input Signal Performance

Actions Taken When the DTC Sets

When DTC P0881 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCTM 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.
- This DTC indicates a variation in direct battery voltage.
 - Battery voltage problems may be due to loose or corroded battery cables, a bad connection at the battery direct feed terminal (10 or 70), or an internal TCM failure due to a burnt trace.
 - A vehicle charging system failure may cause this DTC under certain circumstances.
- This code may indicate that an internal voltage problem has occurred inside the TCM. The use of a substitute TCM would be a good way to diagnose this problem.
- A defective vehicle battery may induce this DTC.
 - Inspect the wiring for poor electrical connections at the TCM. 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.

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 an active DTC.
3. This step tests for proper direct battery input voltage.
4. This step tests for shorts or open conditions at direct battery input circuit.

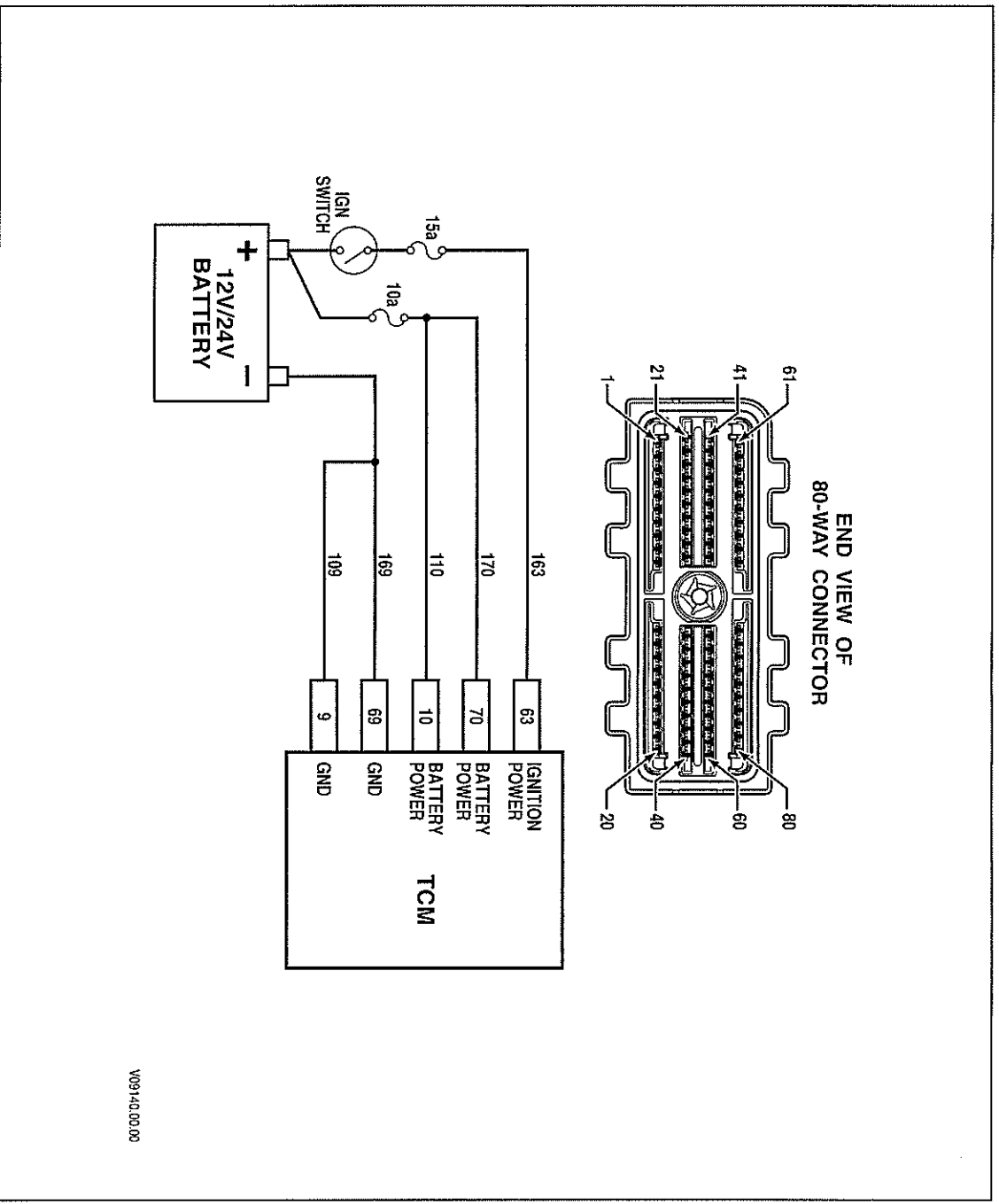
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0881 TCM Power Input Signal Performance

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	<ol style="list-style-type: none"> 1. Install the Allison DOCTM 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. <p><i>NOTE: This DTC indicates that a voltage variation exists in the battery input circuit. This variation is measured for min. and max. voltage values. This DTC sets if the voltage variation is present for a pre-determined number of samples.</i></p> Did DTC P0881 return?		Go to Step 3	Go to Diagnostic Aids
3	<ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the 80-way connector at the TCM. 3. Install J 47275 TCM Breakout between the OEM and TCM 80-way connectors. 4. Using a digital multimeter (DVOM), sequentially measure voltage at 80-way connector pins 9 and 10, then between pins 69 and 70. Is the voltage within the specified values?	11.5–12.5V	Repair charging system	Go to Step 4
4	<p><i>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.</i></p> Inspect battery direct circuits 110 and 170 for one of the following conditions: <ul style="list-style-type: none"> • Intermittent open or short at battery direct power and ground circuits 109, 110, 169, and 170. • Loose or corroded connections at battery or connection points. • Defective battery. Was one of these conditions discovered and repaired?		Go to Step 5	
5	In order to verify your repair: <ol style="list-style-type: none"> 1. Clear the DTC. 2. Start the engine and warm to normal operating temperature. 3. Using Allison DOCTM For PC–Service Tool, monitor system voltage. System voltage should be 9–18V. Did the DTC return?		Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0882 TCM Power Input Signal Low



Circuit Description

The Transmission Control Module (TCM) receives power directly from the battery. Wires 110 and 170 supply direct battery power to pins 10 and 70 respectively at the TCM.

Conditions for Running the DTC

Engine has been running for more than 10 seconds and engine speed is greater than 450 rpm.

Conditions for Setting the DTC

DTC P0882 sets under the following condition:

- The TCM detects battery voltage below 8V at 0°C (32°F) for six times. The voltage threshold is temperature dependent varying from 5V at -60°C (-75°F) to 9V at 20°C (68°F).

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0882 TCM Power Input Signal Low

Actions Taken When the DTC Sets

When DTC P0882 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 determine the range attained.
- TCM inhibits TCC engagement.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCTM 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

- A defective vehicle battery may allow this DTC to set. Test the vehicle battery to verify proper voltage and load capacity.
- A defective vehicle charging system may cause this DTC.
- Intermittent faults may exist in vehicle components such as a poor connection at the battery posts. Such faults would cause this DTC to set and not remain active.
- Inspect the wiring for poor electrical connections at the TCM. 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.

Test Description

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

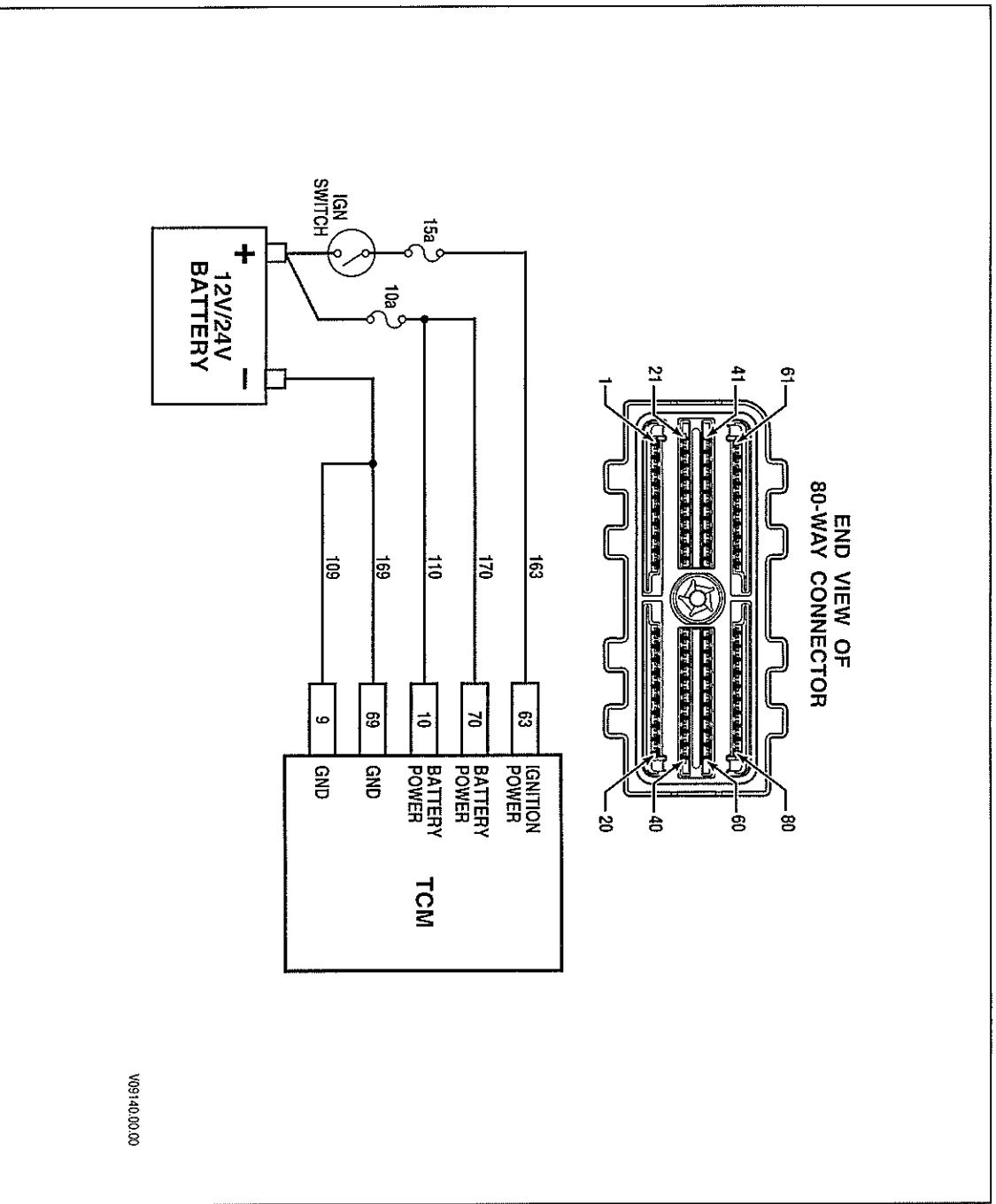
2. This step tests for proper battery voltage.
3. This step tests for an active DTC.
4. This step tests vehicle battery per OEM guidelines.
5. This step tests vehicle charging system per OEM guidelines.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0882 TCM Power Input Signal 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	<ol style="list-style-type: none"> 1. Install the Allison DOCTM For PC–Service Tool. 2. Turn ON the ignition, leave engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Observe the battery voltage value on Allison DOCTM For PC–Service Tool. <p><i>NOTE: This DTC sets when battery voltage drops below a predetermined level that is temperature dependent for a pre-determined number of detections.</i></p>	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 4	Go to Step 3
	Is the battery voltage below specified value?			
3	<ol style="list-style-type: none"> 1. Start the vehicle, if possible. 2. If the DTC is not active, drive the vehicle. Attempt to duplicate the same operating conditions observed in the failure records. 		Go to Step 4	Go to Diagnostic Aids
	Did the DTC return?			
4	Test the vehicle battery per OEM instructions. This should include a voltage test and a load test. Does test indicate the battery is good?	Refer to OEM for correct battery specifications	Go to Step 5	Replace vehicle battery. Go to Step 6
5	Test the vehicle charging system per the OEM recommended testing procedure. Is the charging system operating properly?	Refer to OEM for correct charging system specifications	Go to Diagnostic Aids	Repair the charging system. Go to Step 6
6	In order to verify your repair: <ol style="list-style-type: none"> 1. Clear the DTC. 2. Start the engine and warm to normal operating temperature. 		Begin the diagnosis again. Go to Step 1	System OK
	Did the DTC return?			

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0883 TCM Power Input Signal High



Circuit Description

The Transmission Control Module (TCM) receives power directly from the battery. Wires 110 and 170 supply direct battery power to pins 10 and 70 respectively at the TCM.

Conditions for Running the DTC

Engine has been running for more than 10 seconds and engine speed is greater than 450 rpm.

Conditions for Setting the DTC

DTC P0883 sets under the following conditions:

- 12V TCM—The TCM detects an ignition voltage greater than or equal to 16V for 6 out of 10 samples.
- 24V TCM—The TCM detects an ignition voltage greater than or equal to 32V for 6 out of 10 samples.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0883 TCM Power Input Signal High

Actions Taken When the DTC Sets

When DTC P0883 is active, the following conditions will occur:

- The **CHECK TRANS** light does not illuminate.
- 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

- A defective vehicle charging system that is overcharging may cause this DTC.
- Intermittent faults may exist in vehicle components such as a poor connection at the battery posts. Such faults would cause this DTC to set and not remain active.
- Inspect the wiring for poor electrical connections at the TCM. 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.
- DTC P0883 may set if an A41 or A42 TCM is installed in a 24V electrical system.

Test Description

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

2. This step tests for proper battery voltage.
3. This step tests for an active DTC.
4. This step tests vehicle charging system per OEM guidelines.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0883 TCM Power Input Signal 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 TM For PC–Service Tool. 2. Turn ON the ignition, leave engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Observe the battery voltage value on Allison DOC TM For PC–Service Tool. <i>NOTE: This DTC sets when battery voltage is detected at or above a predetermined level for a pre-determined number of samples.</i>	Refer to Conditions for Setting DTC	Go to Step 4	Go to Step 3
3	Is the battery voltage at or above specified value? 1. Start the vehicle, if possible. 2. If the DTC is not active, drive the vehicle. Attempt to duplicate the same operating conditions observed in the failure records. Did the DTC return?		Go to Step 4	Go to Diagnostic Aids
4	Test the vehicle charging system per the OEM recommended testing procedure. Is the charging system operating properly?	Refer to OEM for correct charging system specifications	Go to Diagnostic Aids	Repair the charging system. Go to Step 5
5	In order to verify your repair: 1. Clear the DTC. 2. Start the engine and warm to normal operating temperature. Did the DTC return?		Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0894 Transmission Component Slipping

Refer to First Range Hydraulic Schematic

Circuit Description

The Transmission Control Module (TCM) uses input from the turbine speed and the output speed sensors to verify the transmission has attained first range when the operator selects **D** (Drive). If the TCM does not detect turbine speed pull down following the shift into **D** (Drive), the TCM sets a Code P0894.

Conditions for Running the DTC

- Hydraulic system is pressurized.
- Hydraulic default condition not present.
- Engine initialization or shutdown is not in progress.

Conditions for Setting the DTC

DTC P0894 sets when first range is selected and turbine speed remains above a calibrated value.

Actions Taken When the DTC Sets

When DTC P0894 is active, the following conditions will occur:

- The TCM commands first 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 torque converter clutch (TCC) engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCTM For PC-Service Tool can be used to clear the code 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.
- DTC P0894 may be caused by the following:
 - Improper transmission fluid level
 - Stuck solenoid regulator valve
 - Stuck C1 or C2 latch valve
 - Defective pressure control or shift solenoid
 - Mechanical problem with the C1 or C5 clutch
- If this code is accompanied by a P0842, troubleshoot and correct the cause of the P0842 first.

DIAGNOSTIC TROUBLE CODES (DTC)**Test Description**

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

2. This step tests for presence of code P0842.
3. This step tests for improper transmission fluid level.
4. This step tests for active diagnostic codes.
5. This step tests for low main pressure.
6. This step tests for proper clutch pressures in first range.
7. This step tests for signs of a clutch failure.

DTC P0894 Transmission Component Slipping

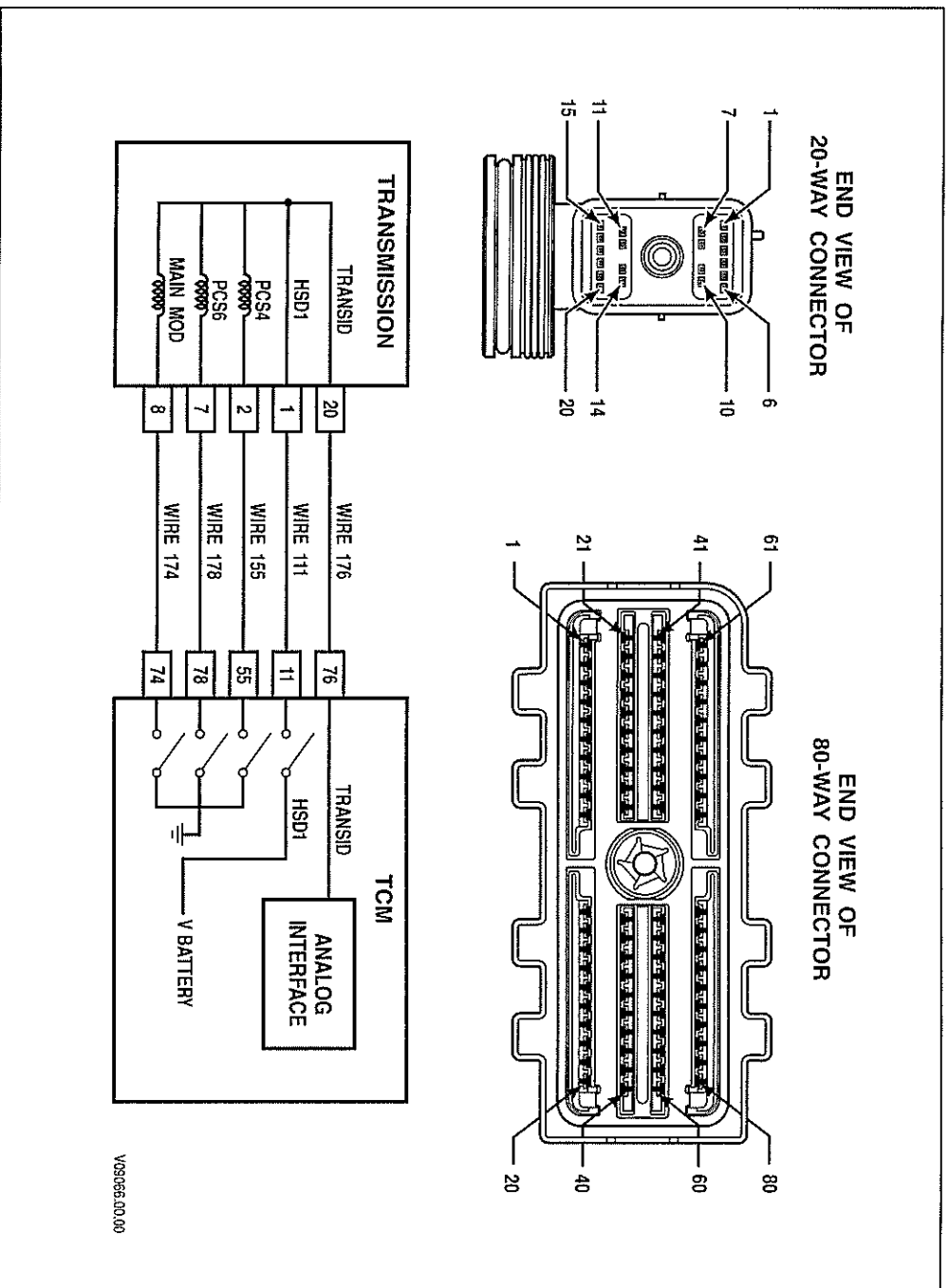
Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	If DTC P0842 is present, troubleshoot and resolve before going to the next step. Is a DTC P0842 present?		Go to DTC P0842 and resolve before proceeding to Step 3	Go to Step 3
3	Perform the Fluid Check Procedure (refer to mechanic's tips). Is the transmission fluid level correct?		Go to Step 4	Go to Fluid Check Procedure (refer to mechanic's tips)
4	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record DTC failure record data. 4. Clear the DTC. 5. Drive the vehicle under normal operating conditions. Did DTC P0894 return?		Go to Step 5	Go to Diagnostic Aids
5	1. Turn OFF the ignition. 2. Install a 2000 kPa (300 psi) pressure gauge in the main pressure tap. 3. Start the engine. 4. Read and record main pressure. Is the pressure reading within the specified value in Appendix B?	See Main and Clutch Pressure specifications in Appendix B	Go to Step 6	Go to Step 10
6	1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main, C1 and C5 pressure taps. 3. Start the engine. 4. Select Drive and shift the transmission into first range. 5. Read and record Main, C1, and C5 clutch pressures. Are the pressure readings within specified values in Appendix B?	See Main and Clutch Pressure specifications in Appendix B	Go to Step 7	Go to Step 8

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0894 Transmission Component Slipping**

Step	Action	Value(s)	Yes	No
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?		<i>Go to Step 11</i>	<i>Go to Diagnostic Aids</i>
8	<ol style="list-style-type: none"> Consult the appropriate service manual and remove the transmission hydraulic control module. Inspect the control valve bodies for stuck or sticking solenoid regulator valves and logic latch valves. Inspect the suction filter. Be sure screen is not plugged. Inspect for damaged gaskets and face seals. Was a valve body problem found and repaired?		<i>Go to Step 12</i>	<i>Go to Step 9</i>
9	Using pressure readings obtained in Step 6 above, replace the affected solenoid. <ul style="list-style-type: none"> Incorrect C1 pressure—PCSI Incorrect C5 pressure—PCS3 Is the replacement complete?		<i>Go to Step 12</i>	
10	Investigate the cause of low main pressure. Possible causes include: <ul style="list-style-type: none"> Collapsed main filter Broken converter pump or PTO gear tangs Worn main charging pump Is the cause of low main pressure repaired?		<i>Go to Step 12</i>	
11	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?		<i>Go to Step 12</i>	
	In order to verify your repair: <ol style="list-style-type: none"> Clear the DTC. Drive the vehicle under normal operating conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0960 Pressure Control Solenoid Main Mod Control Circuit Open



Circuit Description

Pressure control solenoid Main Mod solenoid is a normally closed (N/C) solenoid used to modulate the transmission main pressure schedule. The TCM commands the solenoid ON when specific transmission and engine conditions are met. When the Main Mod solenoid is commanded ON, pressure is routed to the main regulator valve lowering the main pressure schedule.

The TCM sends control current to the Main Mod solenoid 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 the Main Mod solenoid by switching the Main Mod solenoid's Low Side Driver ON and OFF. Wire 174 completes the circuit between the Main Mod solenoid and its Low Side Driver (LSD). DTC P0960 indicates that the TCM has detected an open condition in the Main Mod solenoid electrical circuit. The open condition may exist in the high side (wire 111) or low side (wire 174).

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.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0960 Pressure Control Solenoid Main Mod Control Circuit Open

Conditions for Setting the DTC

DTC P0960 is set when the TCM detects an open circuit on the Main Mod solenoid return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P0960 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCTM 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 P0960 indicates an open in the electrical circuit for the Main Mod solenoid. In addition to the Main Mod solenoid, HSD1 also supplies power to Pressure Control Solenoids 4 (PCS4) and PCS6. If DTC P0960 is accompanied by DTC P2718 (PCS4 open circuit) and/or DTC 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 174 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 the Main Mod solenoid resistance.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0960 Pressure Control Solenoid Main Mod Control Circuit Open**

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		<i>Go to Step 2</i>	<i>Go to Section 3–5, Beginning the Troubleshooting Process</i>
2	<ol style="list-style-type: none"> 1. Install the Allison DOCTM 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)	<i>Go to Step 3</i>	<i>Resolve voltage problem. Go to Step 11</i>
3	<ol style="list-style-type: none"> 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 Main Mod solenoid electrical circuit.		<i>Go to Step 4</i>	<i>Go to Diagnostic Aids</i>
	Did DTC P0960 return?			

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0960 Pressure Control Solenoid Main Mod Control Circuit Open (cont'd)**

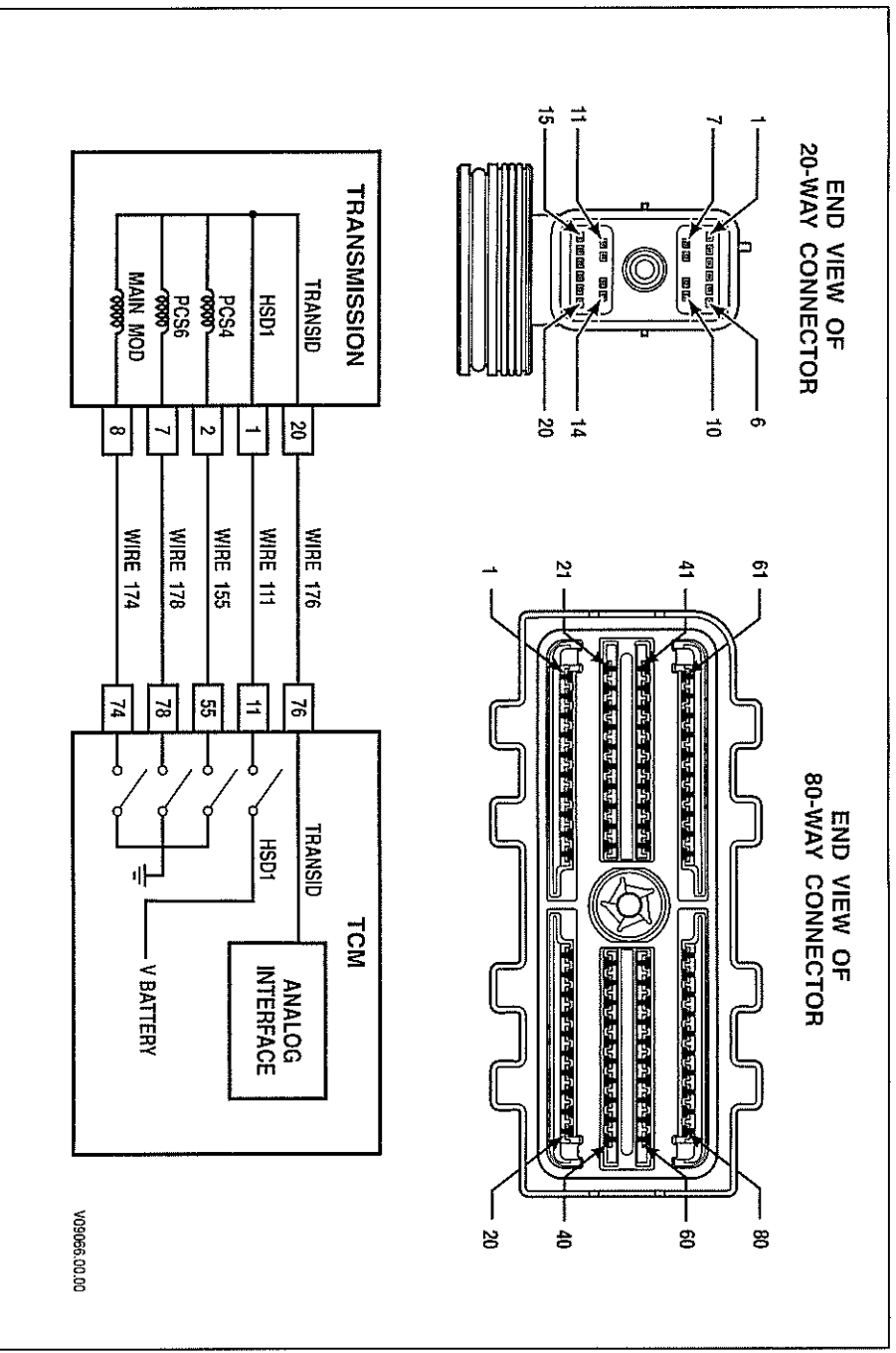
Step	Action	Value(s)	Yes	No
4	<p>NOTE: Review Section 4—Wire Test Procedures before performing steps.</p> <ol style="list-style-type: none"> Turn OFF the ignition. Install J 47275 TCM Breakout between the OEM and TCM 80-way connectors. Install J 47279 Transmission Breakout between the OEM and transmission 20-way connectors. Turn ON the ignition, leave engine OFF. Using Allison DOC™ For PC—Service Tool, enter Solenoid Test mode and command the Main Mod solenoid ON. Determine the voltage drop in the high side of the Main Mod solenoid circuit as follows: <ul style="list-style-type: none"> 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 isolated ground. Subtract the two voltage measurements to obtain the voltage drop in the circuit. Determine the voltage drop in the low side of the Main Mod solenoid circuit as follows: <ul style="list-style-type: none"> At J 47275-1 TCM Overlay, measure voltage between pin 74 and an isolated ground. At J 47279 Transmission Breakout, measure voltage between pin 8 and ground. Subtract the two voltage measurements to obtain the voltage drop in the circuit. <p>NOTE: A voltage drop of more than 0.5V across either circuit indicates an excessive voltage loss in the OEM harness.</p> <p>Did either high-side or low-side voltage drop exceed 0.5VDC?</p>		Go to Step 5	Go to Step 6
5	<p>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.</p> <p>Coordinate with the vehicle OEM to repair or replace the vehicle wiring.</p> <p>Is the repair complete?</p>		Go to Step 11	
6	<ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the OEM 20-way connector from J 47279 Transmission Breakout. Leave the transmission 20-way connector connected to the breakout. Using a digital multimeter (DVOM), measure the resistance between pin 1 and pin 8 of the transmission 20-way connector. <p>Is the resistance within the specified value?</p>	Refer to Solenoid Resistance Chart (Appendix K)	Go to Step 10	Go to Step 7

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0960 Pressure Control Solenoid Main Mod Control Circuit Open (cont'd)**

Step	Action	Value(s)	Yes	No
7	<ol style="list-style-type: none"> Remove the hydraulic control module assembly. Disconnect the Main Mod solenoid from the internal wiring harness. Using a DVOM, measure the Main Mod solenoid 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 the Main Mod solenoid. 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: <ol style="list-style-type: none"> Clear the DTC. Drive the vehicle under normal operating conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0962 Pressure Control Solenoid Main Mod Control Circuit Low



Circuit Description

Main Mod solenoid is a normally closed (N/C) solenoid used to modulate the transmission main pressure schedule. The TCM commands the solenoid ON when specific transmission and engine conditions are met. When the Main Mod solenoid is commanded ON, pressure is routed to the main regulator valve lowering the main pressure schedule.

The TCM sends control current to the Main Mod solenoid 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 the Main Mod solenoid by switching the Main Mod solenoid's Low Side Driver (LSD) ON and OFF. Wire 174 completes the circuit between the Main Mod solenoid and its LSD. DTC P0962 indicates that the TCM has detected a short-to-ground condition in the low side of the Main Mod solenoid 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 P0962 is set when the TCM detects a short-to-ground in the Main Mod solenoid return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0962 Pressure Control Solenoid Main Mod Control Circuit Low

Actions Taken When the DTC Sets

When DTC P0962 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 determine the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCTM 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 P0962 indicates a short-to-ground in the electrical circuit for the Main Mod 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 DOCTM 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. 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 174.
6. This step tests for wire-to-wire shorts or a short-to-ground in the internal transmission harness.

DTC P0962 Pressure Control Solenoid Main Mod Control Circuit Low

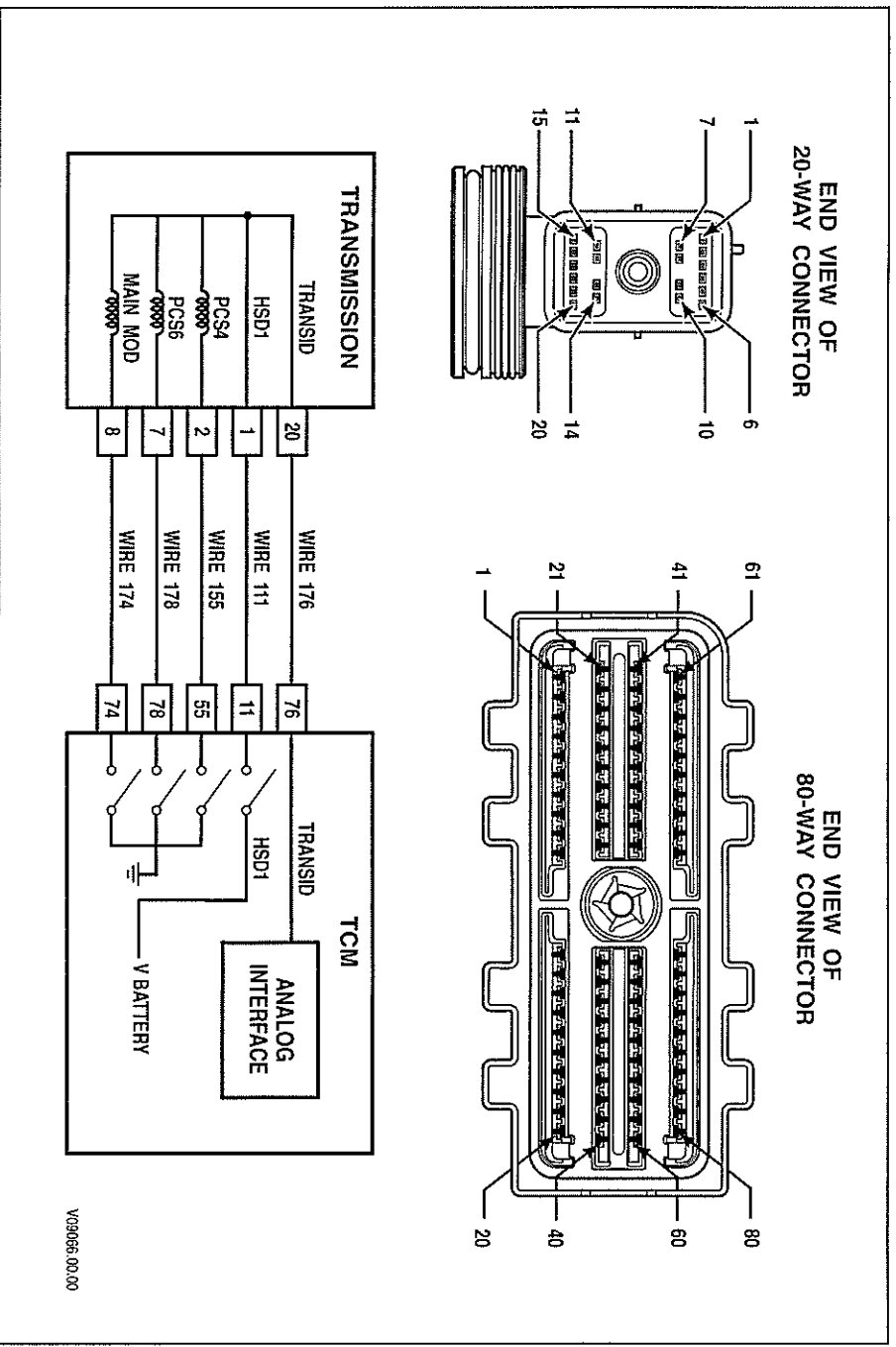
Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	<ol style="list-style-type: none"> 1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 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	<ol style="list-style-type: none"> 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.). <p>NOTE: This DTC is intended to detect a short-to-ground condition in the Main Mod solenoid electrical circuit.</p> Did DTC P0962 return?		Go to Step 4	Go to Diagnostic Aids
4	<p>NOTE: Review Section 4—Wire Test Procedures before performing steps.</p> <ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connectors. 3. Install the OEM-side 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 174 in the chassis harness between the TCM and transmission connector. 6. At J 47275–1 TCM Overlay, test for wire-to-wire shorts between pin 74 and all other pins in the 80-way connector, and shorts-to-ground between pin 74 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 P0962 Pressure Control Solenoid Main Mod Control Circuit Low (cont'd)**

Step	Action	Value(s)	Yes	No
5	<i>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.</i> 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 DVOM, test for wire-to-wire shorts between pin 8 and all other pins in the 20-way connector; and shorts-to-ground between pin 8 and chassis ground. <i>NOTE: The resistance value between pins 8 and 1, and between pins 8 and 20 will read normal solenoid resistance. The resistance value between pins 8 and 2, and between 8 and 7 (7-speed models) will be twice normal solenoid resistance.</i> 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	Replace the internal wiring harness. Is the replacement complete?		Go to Step 11	
9	Replace the Main Mod solenoid. Is the replacement complete?		Go to Step 11	
10	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> 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 P0963 Pressure Control Solenoid Main Mod Control Circuit High



Circuit Description

Main Modulation Solenoid (Main Mod) is a normally closed (N/C) solenoid used to modulate the transmission main pressure schedule. The TCM commands the solenoid ON when specific transmission and engine conditions are met. When the Main Mod solenoid is commanded ON, pressure is routed to the main regulator valve lowering the main pressure schedule.

The TCM sends control current to the Main Mod solenoid 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 the Main Mod solenoid by switching the Main Mod solenoid's Low Side Driver (LSD) ON and OFF. Wire 174 completes the circuit between the Main Mod solenoid and its LSD. DTC P0963 indicates that the TCM has detected a short-to-battery condition in the low side of the Main Mod solenoid's 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 P0963 is set when the TCM detects a short-to-battery in the Main Mod solenoid return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0963 Pressure Control Solenoid Main Mod Control Circuit High

Actions Taken When the DTC Sets

When DTC P0963 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCTM 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 P0963 indicates a short-to-battery in the electrical circuit for the Main Mod 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 DOCTM 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 174 and other wires in the OEM chassis harness.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.

DTC P0963 Pressure Control Solenoid Main Mod Control Circuit High

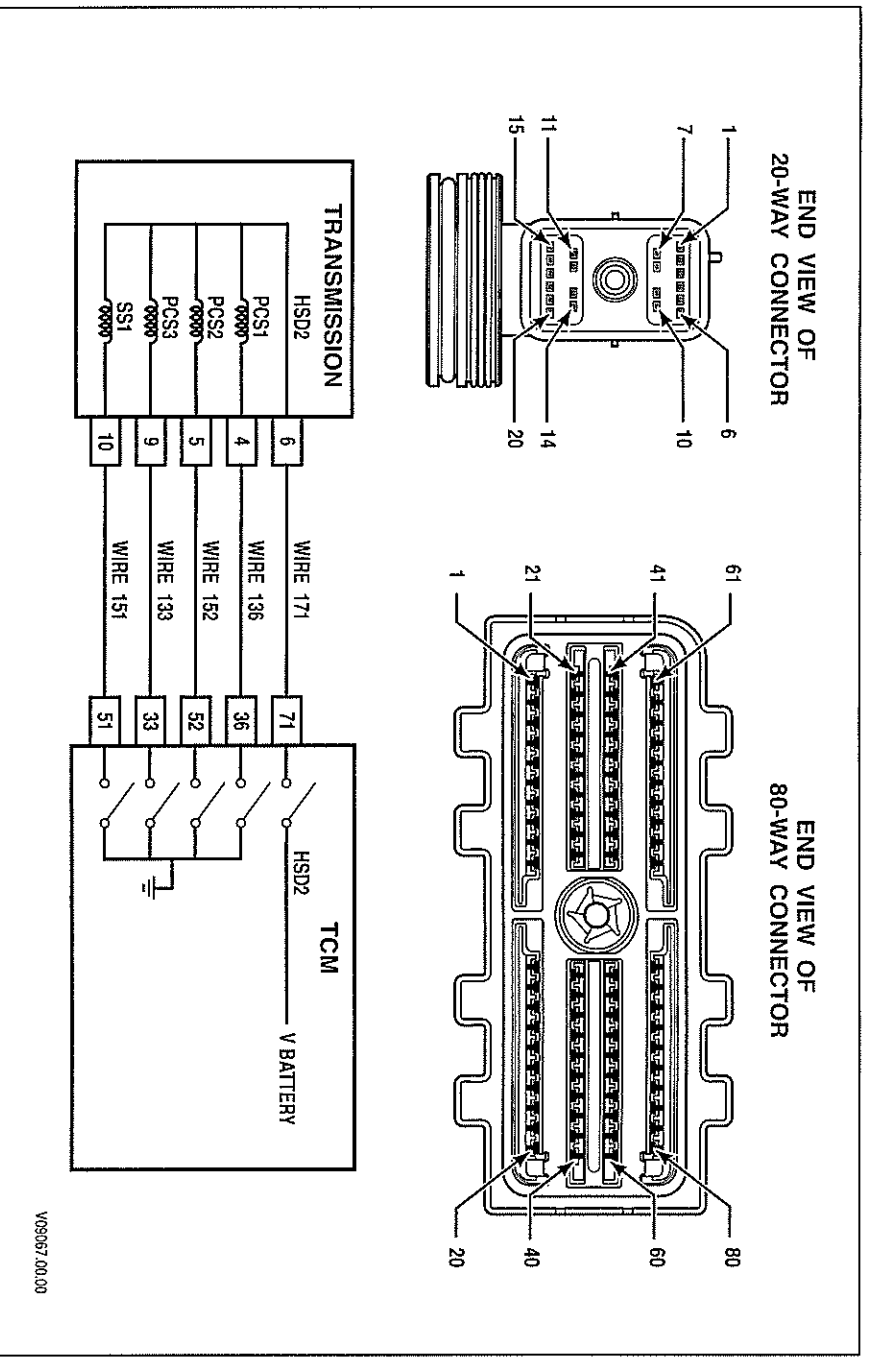
Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	<ol style="list-style-type: none"> 1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 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	<ol style="list-style-type: none"> 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.). <p>NOTE: This DTC is intended to detect a short-to-battery condition in the Main Mod solenoid electrical circuit.</p> Did DTC P0963 return?		Go to Step 4	Go to Diagnostic Aids
4	<p>NOTE: Review Section 4—Wire Test Procedures before performing steps.</p> <ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Disconnect the 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 111 and 174 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 74 and all other pins in the 80-way connector, and shorts-to-ground between pin 74 and chassis ground. Were any wire-to-wire shorts found?		Go to Step 5	Go to Step 6

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0963 Pressure Control Solenoid Main Mod Control Circuit High (cont'd)**

Step	Action	Value(s)	Yes	No
5	<i>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.</i> 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-10-wire shorts between pin 8 and all other pins in the 20-way connector. <i>NOTE: The resistance value between pins 8 and 1, and between pins 8 and 20 will read normal solenoid resistance. The resistance value between pins 8 and 2, and between 8 and 7 (7-speed models) will be twice normal solenoid resistance.</i> Were any wire-10-wire shorts found?		Go to Step 7	Go to Step 10
7	1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-10-wire shorts. Were any wire-10-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 the Main Mod solenoid. Is the replacement complete?		Go to Step 11	
10	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> 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 P0964 Pressure Control Solenoid 2 (PCS2) Control Circuit Open



Circuit Description

Pressure Control Solenoid 2 (PCS2) is a normally open (N/O) solenoid used to apply the C2 clutch in fourth through sixth range, and the C3 clutch in Reverse. The TCM commands the solenoid OFF to produce hydraulic pressure in the clutch apply circuit. When PCS2 is commanded ON, the C2 clutch is released.

The TCM sends control current to PCS2 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 PCS2 by switching PCS2 Low Side Driver (LSD) ON and OFF. Wire 152 completes the circuit between PCS2 and its LSD. DTC P0964 indicates that the TCM has detected an open condition in PCS2 electrical circuit. The open condition may exist in the high side (wire 171) or low side (wire 152).

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 P0964 is set when the TCM detects an open circuit on the PCS2 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0964 Pressure Control Solenoid 2 (PCS2) Control Circuit Open

Actions Taken When the DTC Sets

When DTC P0964 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 DOCTM 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 P0964 indicates an open in the electrical circuit for the PCS2 solenoid. In addition to PCS2, HSD2 also supplies power to solenoids PCS1, PCS3, and SS1. If DTC P0964 is accompanied by DTC P2727 (PCS1 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 open condition in either wire 171 or wire 152 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 PCS2 resistance.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0964 Pressure Control Solenoid 2 (PCS2) 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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 PCS2 electrical circuit. Did DTC P0964 return?		Go to Step 4	Go to Diagnostic Aids
4	NOTE: Review Section 4—Wire Test Procedures before performing steps. <ol style="list-style-type: none"> 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 PCS2 ON. 6. Determine the voltage drop in the high side of the PCS2 circuit as follows: <ul style="list-style-type: none"> • 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 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 PCS2 circuit as follows: <ul style="list-style-type: none"> • At J 47275-1 TCM Overlay, measure voltage between pin 52 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 5 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

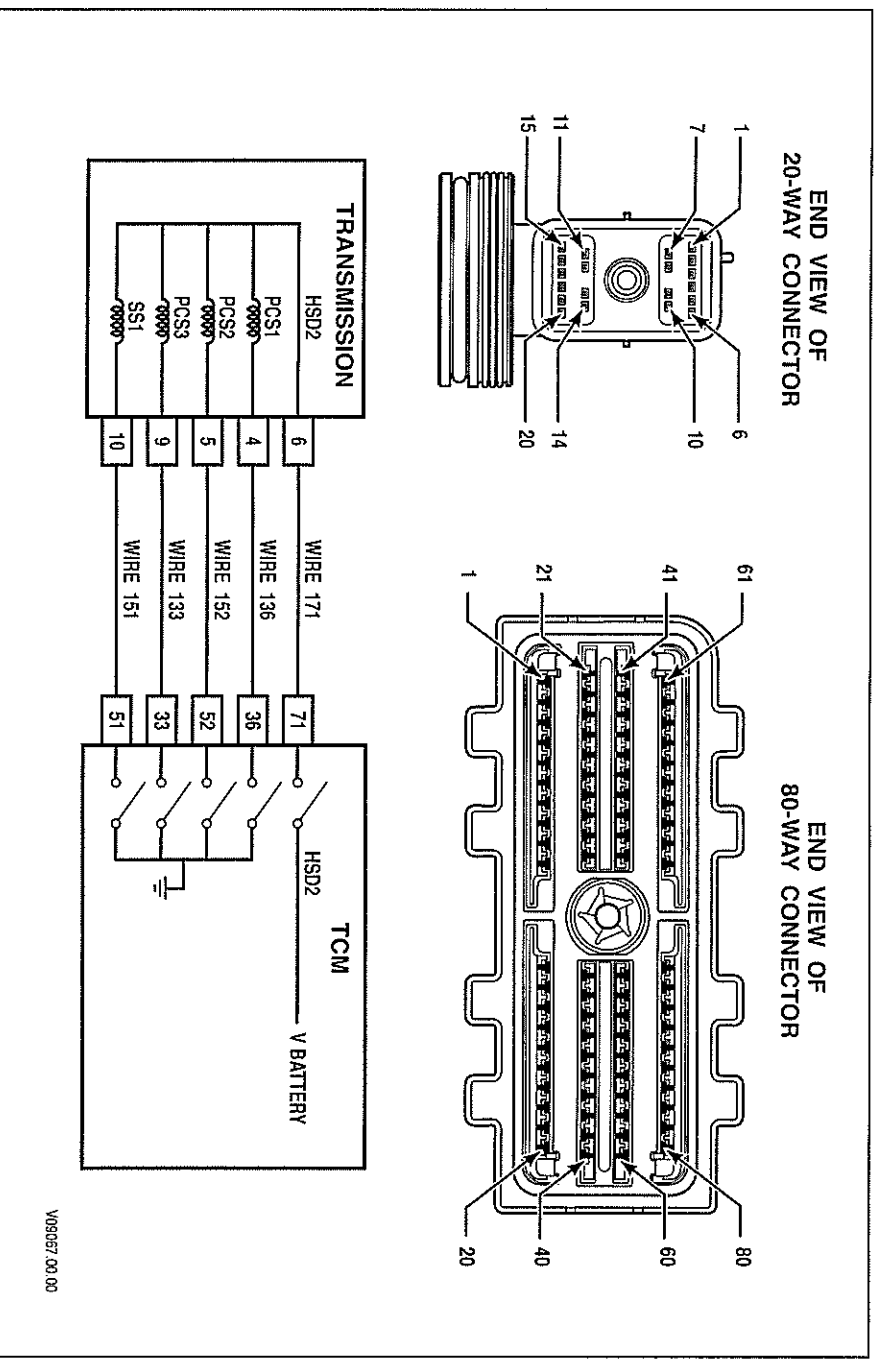
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0964 Pressure Control Solenoid 2 (PCS2) Control Circuit Open (*cont'd*)

Step	Action	Value(s)	Yes	No
5	NOTE: <i>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.</i> Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		<i>Go to Step 11</i>	
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 5 and pin 6 of the transmission 20-way connector. Is the resistance within the specified value?	Refer to Solenoid Resistance Chart (Appendix K)	<i>Go to Step 10</i>	<i>Go to Step 7</i>
7	1. Remove the hydraulic control module assembly. 2. Disconnect PCS2 from the internal wiring harness. 3. Using a DVOM, measure PCS2 resistance at pins A and B. Is resistance within the specified values?	Refer to Solenoid Resistance Chart (Appendix K)	<i>Go to Step 8</i>	<i>Go to Step 9</i>
8	Replace the internal wiring harness. Is the replacement complete?		<i>Go to Step 11</i>	
9	Replace PCS2. Is the replacement complete?		<i>Go to Step 11</i>	
10	NOTE: <i>In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		<i>Go to Step 11</i>	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0966 Pressure Control Solenoid 2 (PCS2) Control Circuit Low



Circuit Description

Pressure Control Solenoid 2 (PCS2) is a normally open (N/O) solenoid used to apply the C2 clutch in fourth through sixth range and the C3 clutch in reverse. The TCM commands the solenoid OFF to produce hydraulic pressure in the clutch apply circuit. When PCS2 is commanded ON, the C2 clutch is released.

The TCM sends control current to PCS2 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 PCS2 by switching PCS2 Low Side Driver (LSD) ON and OFF. Wire 152 completes the circuit between PCS2 and its LSD. DTC P0966 indicates that the TCM has detected a short-to-ground condition in the low side of PCS2 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 P0966 is set when the TCM detects a short-to-ground in the PCS2 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0966 Pressure Control Solenoid 2 (PCS2) Control Circuit Low

Actions Taken When the DTC Sets

When DTC P0966 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 DOCTM 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 P0966 indicates a short-to-ground in the electrical circuit for the PCS2 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 DOCTM 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.

- This step tests for the proper ignition voltage.
- This step tests for an active DTC.
- This step tests for wire-to-wire shorts or a short-to-ground condition in wire 152.
- This step tests for the wire-to-wire shorts or a short-to-ground in the internal transmission harness.

DTC P0966 Pressure Control Solenoid 2 (PCCS2) 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	<ol style="list-style-type: none"> Install the Allison DOC™ For PC–Service Tool. Start the engine. Record the failure records. 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	<ol style="list-style-type: none"> Clear the DTC. Start the engine and test drive the vehicle. 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 PCCS2 electrical circuit. Did DTC P0966 return?		Go to Step 4	Go to Diagnostic Aids
4	NOTE: Review Section 4—Wire Test Procedures before performing steps. <ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the TCM 80-way connector. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. Disconnect the transmission 20-way connector. Inspect the routing of wire 152 in the chassis harness between the TCM and transmission connector. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 52 and all other pins in the 80-way connector, and short-to-ground between pin 52 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found?		Go to Step 5	Go to Step 6

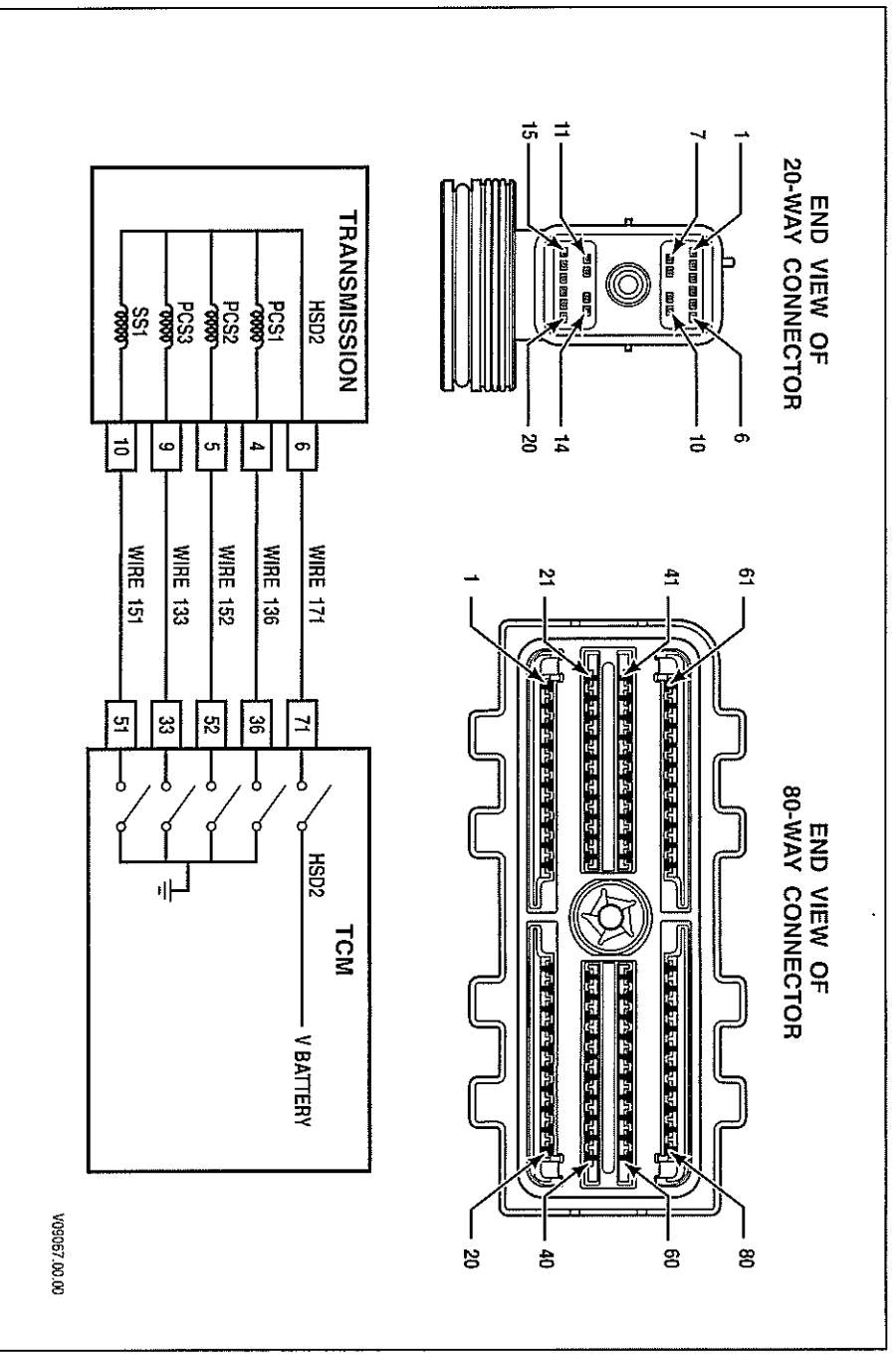
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0966 Pressure Control Solenoid 2 (PCSS2) Control Circuit Low (*cont'd*)

Step	Action	Value(s)	Yes	No
5	<i>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.</i> 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 transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 5 and pin 6 of the 20-way connector, or shorts-to-ground between pin 5 and chassis ground. <i>NOTE: The resistance value between pins 5 and 6 will read normal solenoid resistance. The resistance between pins 5 and 4, between 5 and 9, and between pins 5 and 10 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.</i> 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 PCSS2. Is the replacement complete?		Go to Step 11	
10	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> 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 P0967 Pressure Control Solenoid 2 (PCS2) Control Circuit High



Circuit Description

Pressure Control Solenoid 2 (PCS2) is a normally open (N/O) solenoid used to apply the C2 clutch in fourth through sixth range and the C3 clutch in reverse. The TCM commands the solenoid OFF to produce hydraulic pressure in the clutch apply circuit. When PCS2 is commanded ON, the C2 clutch is released.

The TCM sends control current to PCS2 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 PCS2 by switching PCS2 Low Side Driver (LSD) ON and OFF. Wire 152 completes the circuit between PCS2 and its LSD. DTC P0967 indicates that the TCM has detected a short-to-battery condition in the low side of PCS2 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 P0967 is set when the TCM detects a short-to-battery in the PCS2 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0967 Pressure Control Solenoid 2 (PCS2) Control Circuit High

Actions Taken When the DTC Sets

When DTC P0967 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 DOCTM 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 P0967 indicates a short-to-battery in the electrical circuit for the PCS2 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 DOCTM 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.

- This step tests for the proper ignition voltage.
- This step tests for an active DTC.
- This step tests for wire-to-wire shorts between wire 152 and other wires in the OEM chassis harness.
- This step tests for the wire-to-wire shorts in the transmission internal harness.

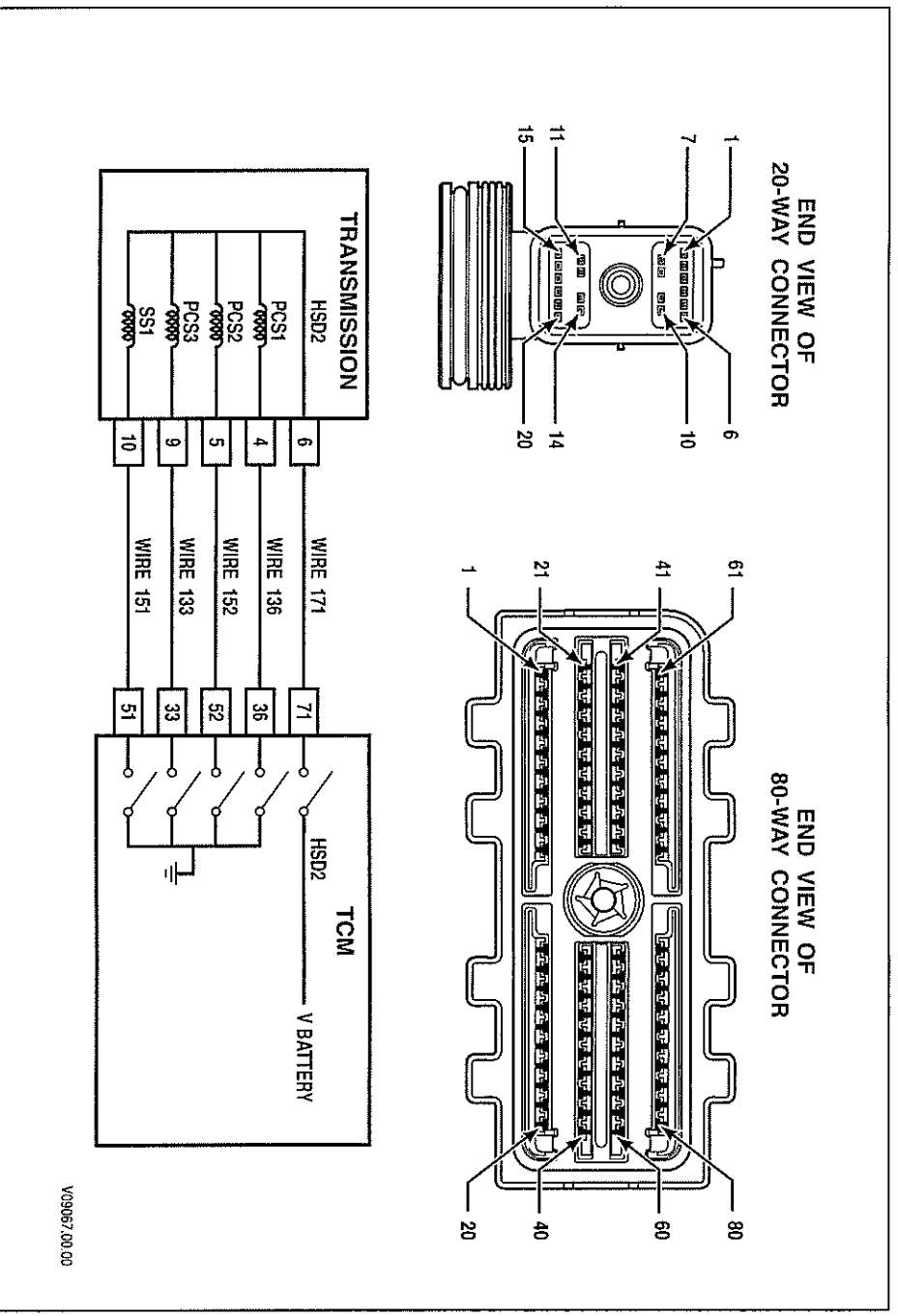
DTC P0967 Pressure Control Solenoid 2 (PCSS2) Control Circuit High

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	<ol style="list-style-type: none"> Install the Allison DOC™ For PC–Service Tool. Start the engine. Record the failure records. 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	<ol style="list-style-type: none"> Clear the DTC. Start the engine and test drive the vehicle. 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 PCSS2 electrical circuit. Did DTC P0966 return?		Go to Step 4	Go to Diagnostic Aids
4	NOTE: Review Section 4—Wire Test Procedures before performing steps. <ol style="list-style-type: none"> Turn OFF the ignition. Disconnect the TCM 80-way connector. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. Disconnect the transmission 20-way connector. Inspect the routing of wires 171 and 152 in the chassis harness between the TCM and transmission connector. At J 47275–1 TCM Overlay, test for wire-to-wire shorts between pin 52 and all other pins in the 80-way connector, and short-to-ground between pin 52 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 P0967 Pressure Control Solenoid 2 (PCSS2) Control Circuit High (cont'd)

Step	Action	Value(s)	Yes	No
5	<i>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.</i> 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 transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 5 and all other pins in the 20-way connector. <i>NOTE: The resistance value between pins 5 and 6 will read normal solenoid resistance. The resistance between pins 5 and 4, between 5 and 9, and between pins 5 and 10 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.</i> Were any wire-to-wire shorts found?			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 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 PCSS2. Is the replacement complete?		Go to Step 11	
10	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> 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 P0968 Pressure Control Solenoid 3 (PCCS3) Control Circuit Open****Circuit Description**

Pressure Control Solenoid 3 (PCCS3) is a normally closed (N/C) solenoid used to apply the C5 clutch in reverse, neutral and first and to apply the C3 clutch in third and fifth ranges. The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCCS3 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCCS3 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 PCCS3 by switching PCCS3 Low Side Driver (LSD) ON and OFF. Wire 133 completes the circuit between PCCS3 and its LSD. DTC P0968 indicates that the TCM has detected an open condition in PCCS3 electrical circuit. The open condition may exist in the high side (wire 171) or low side (wire 133).

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 P0968 is set when the TCM detects an open circuit on the PCCS3 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0968 Pressure Control Solenoid 3 (PCSS3) Control Circuit Open

Actions Taken When the DTC Sets

When DTC P0968 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 DOCTM 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 P0968 indicates an open in the electrical circuit for the PCSS3 solenoid. In addition to PCSS3, HSD2 also supplies power to solenoids PCS1, PCS2, and SS1. If DTC P0968 is accompanied by DTC P2727 (PCS1 open circuit) and/or DTC P0964 (PCSS2 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 133 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 PCSS3 resistance.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0968 Pressure Control Solenoid 3 (PCSS3) 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	<ol style="list-style-type: none"> 1. Install the Allison DOCTM 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	<ol style="list-style-type: none"> 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 PCSS3 electrical circuit. Did DTC P0968 return?		Go to Step 4	Go to Diagnostic Aids
4	NOTE: Review Section 4—Wire Test Procedures before performing steps. <ol style="list-style-type: none"> 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 ignition ON, leave engine OFF. 5. Using Allison DOCTM For PC–Service Tool, enter Solenoid Test mode and command PCSS3 ON. 6. Determine the voltage drop in the high side of the PCSS3 circuit as follows: <ul style="list-style-type: none"> • 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 PCSS3 circuit as follows: <ul style="list-style-type: none"> • At J 47275–1 TCM Overlay, measure voltage between pin 33 and an isolated ground. • At J 47279–1 Transmission Overlay, measure voltage between pin 9 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

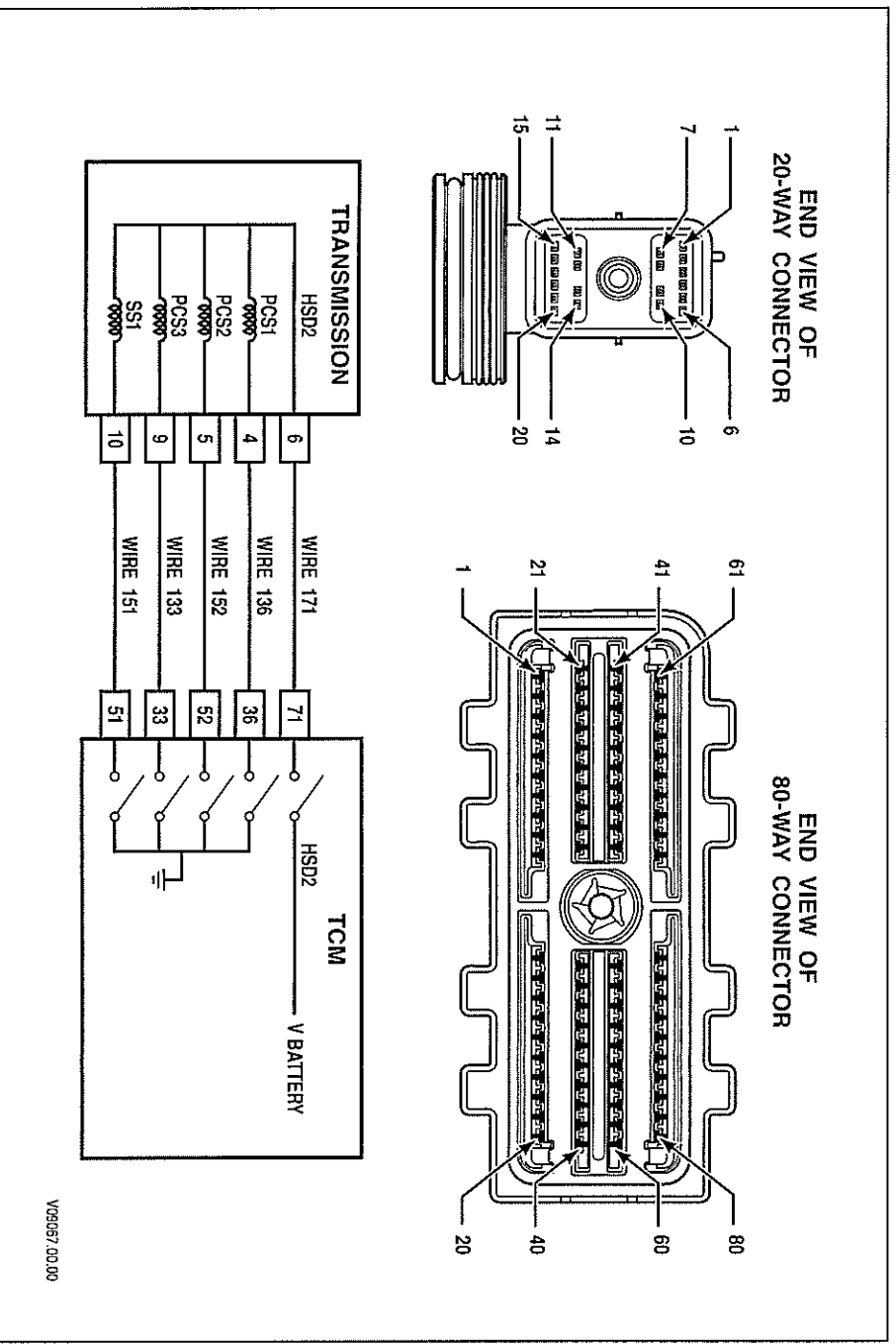
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0968 Pressure Control Solenoid 3 (PCS3) Control Circuit Open (*cont'd*)

Step	Action	Value(s)	Yes	No
5	NOTE: <i>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.</i> Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		<i>Go to Step 11</i>	
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 DVOM, measure the resistance between pin 6 and pin 9 of the transmission 20-way connector: Is the resistance within the specified value?	Refer to Solenoid Resistance Chart (Appendix K)	<i>Go to Step 10</i>	<i>Go to Step 7</i>
7	1. Remove the hydraulic control module assembly. 2. Disconnect PCS3 from the internal wiring harness. 3. Using a DVOM, measure PCS3 resistance at pins A and B. Is resistance within the specified values?	Refer to Solenoid Resistance Chart (Appendix K)	<i>Go to Step 8</i>	<i>Go to Step 9</i>
8	Replace the internal wiring harness. Is the replacement complete?		<i>Go to Step 11</i>	
9	Replace PCS3. Is the replacement complete?		<i>Go to Step 11</i>	
10	NOTE: <i>In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		<i>Go to Step 11</i>	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. Did the DTC return?		<i>Begin the diagnosis again. Go to Step 1</i>	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0970 Pressure Control Solenoid 3 (PCSS3) Control Circuit Low



Circuit Description

Pressure Control Solenoid 3 (PCSS3) is a normally closed (N/C) solenoid used to apply the C5 clutch in reverse, neutral and first; and to apply the C3 clutch in third and fifth ranges. The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCSS3 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCSS3 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 PCSS3 by switching PCSS Low Side Driver (LSD) ON and OFF. Wire 133 completes the circuit between PCSS3 and its LSD. DTC P0970 indicates that the TCM has detected a short-to-ground condition in the low side of PCS 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 P0970 is set when the TCM detects a short-to-ground in the PCSS3 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0970 Pressure Control Solenoid 3 (PCS3) Control Circuit Low

Actions Taken When the DTC Sets

When DTC P0970 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 DOCTM 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 P0970 indicates a short-to-ground in the electrical circuit for the PCS3 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 DOCTM 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 or a short-to-ground condition in wire 133.
6. This step tests for the wire-to-wire shorts or a short-to-ground in the internal transmission harness.

DTC P0970 Pressure Control Solenoid 3 (PCS3) 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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.). <p><i>NOTE: This DTC is intended to detect a short-to-ground condition in the PCS3 electrical circuit.</i></p> Did DTC P0970 return?		Go to Step 4	Go to Diagnostic Aids
4	<p><i>NOTE: Review Section 4—Wire Test Procedures before performing steps.</i></p> <ol style="list-style-type: none"> 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 133 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 33 and all other pins in the 80-way connector, and shorts-to-ground between pin 33 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground found?		Go to Step 5	Go to Step 6

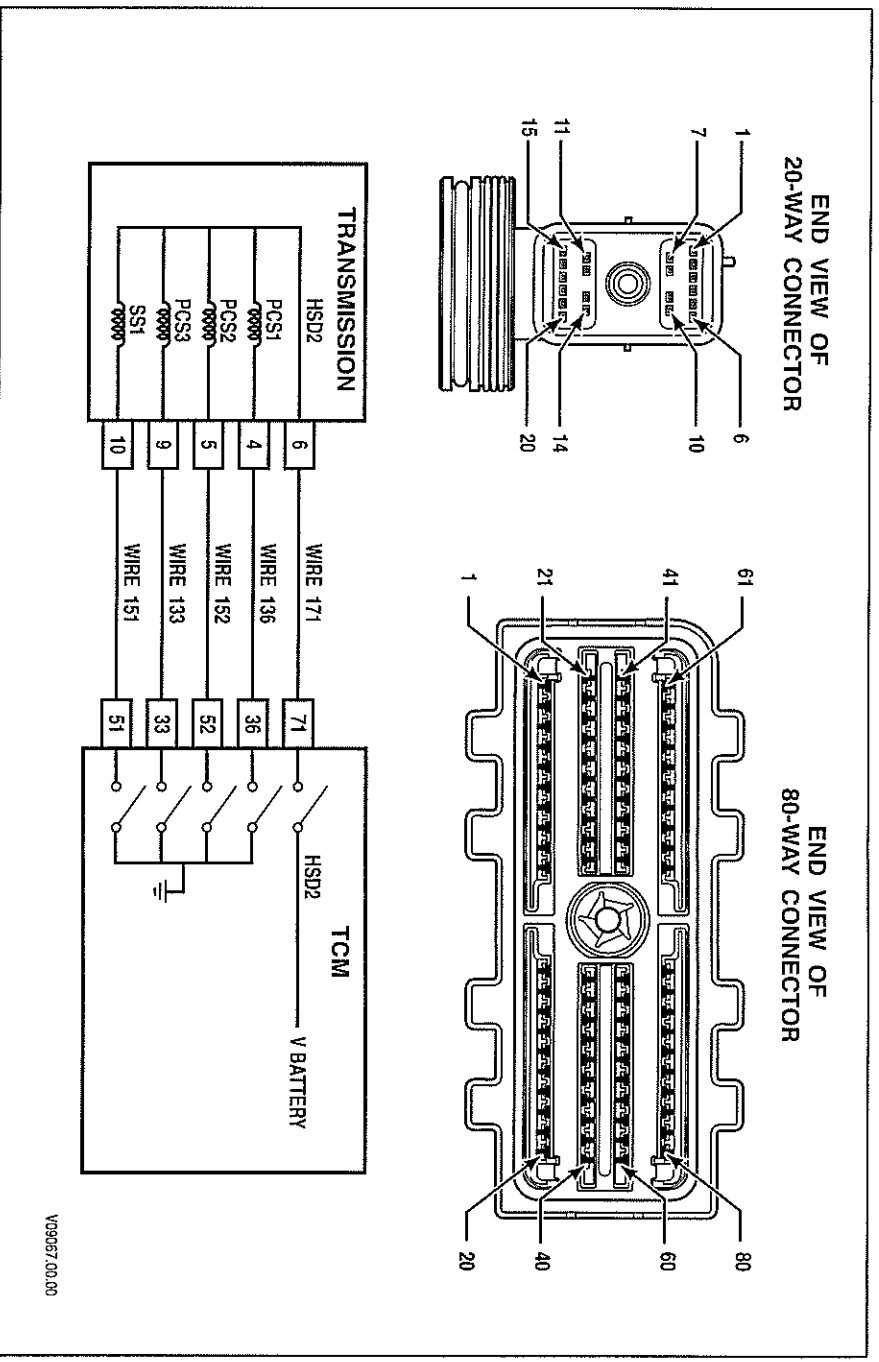
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0970 Pressure Control Solenoid 3 (PCSS3) Control Circuit Low (cont'd)

Step	Action	Value(s)	Yes	No
5	NOTE: <i>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.</i> 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 9 and all other pins in the 20-way connector, and shorts-to-ground between pin 9 and chassis ground. NOTE: <i>The resistance value between pins 9 and 6 will read normal solenoid resistance. The resistance value between pins 9 and 4, between pins 9 and 5, and between pins 9 and 10 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.</i> Were wire-to-wire 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 wire-to-wire 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 PCSS3. Is the replacement complete?		Go to Step 11	
10	NOTE: <i>In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> 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 P0971 Pressure Control Solenoid 3 (PCCS3) Control Circuit High



Circuit Description

Pressure Control Solenoid 3 (PCCS3) is a normally closed (N/C) solenoid used to apply the C5 clutch in reverse, neutral and first and to apply the C3 clutch in third and fifth ranges. The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS3 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCS3 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 PCS3 by switching PCS3 Low Side Driver (LSD) ON and OFF. Wire 133 completes the circuit between PCS3 and its LSD. DTC P0971 indicates that the TCM has detected a short-to-battery condition in the low side of PCS 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 P0971 is set when the TCM detects a short-to-battery in the PCS3 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0971 Pressure Control Solenoid 3 (PCS3) Control Circuit High

Actions Taken When the DTC Sets

When DTC P0971 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 larch valves determines the range attained.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCT™ 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 P0971 indicates a short-to-battery in the electrical circuit for the PCS3 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 DOCT™ 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 133 and other wires in the OEM chassis harness.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.

DTC P0971 Pressure Control Solenoid 3 (PCS3) Control Circuit High

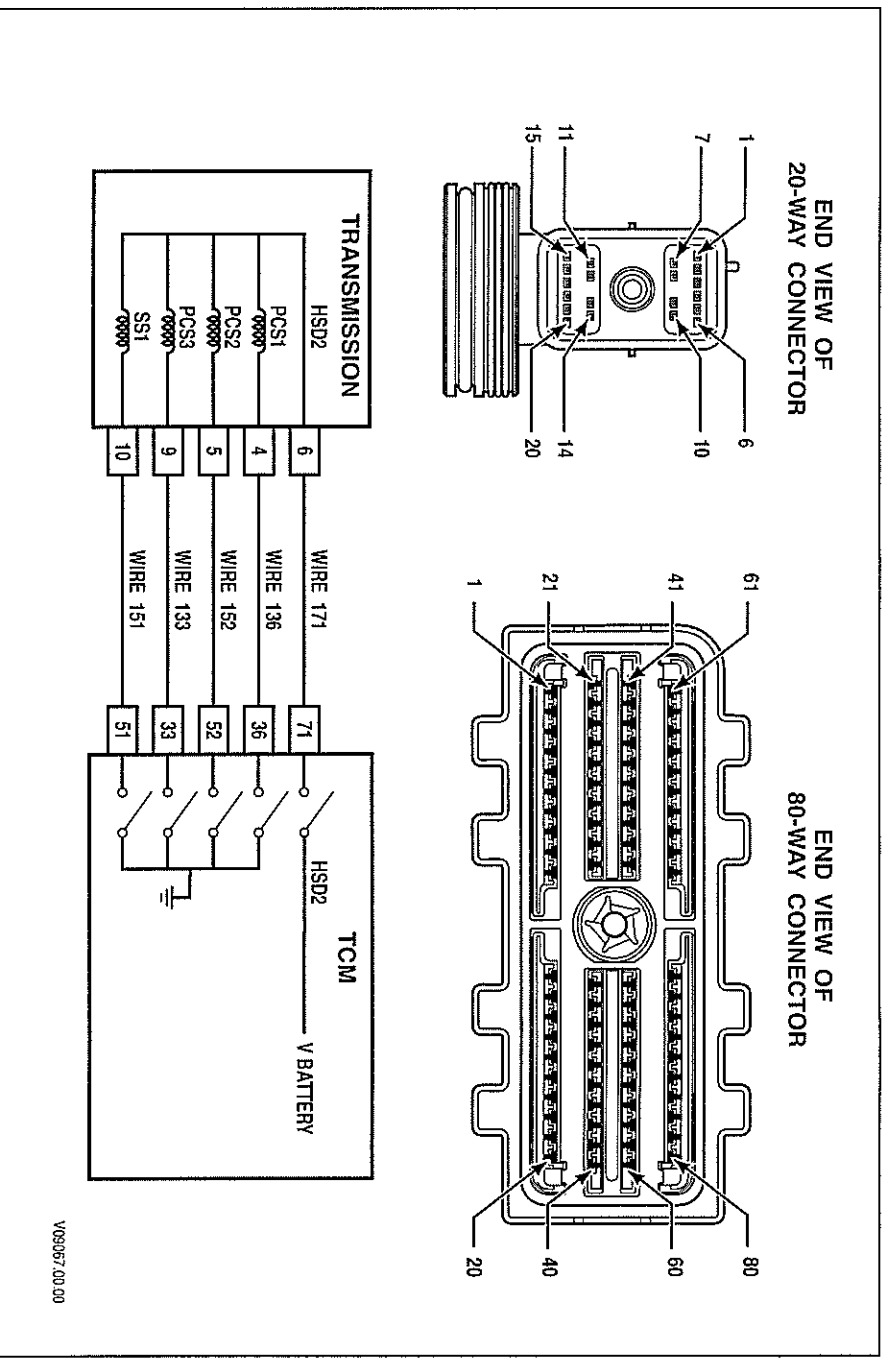
Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	<ol style="list-style-type: none"> 1. Install the Allison DOC™ For PC-Service Tool. 2. Start the engine. 3. Record the failure records. 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	<ol style="list-style-type: none"> 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.). <p>NOTE: This DTC is intended to detect short-to-battery condition in the PCS3 electrical circuit.</p> Did DTC P0971 return?		Go to Step 4	Go to Diagnostic Aids
4	<p>NOTE: Review Section 4—Wire Test Procedures before performing steps.</p> <ol style="list-style-type: none"> 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 177 and 133 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 33 and all other pins in the 80-way connector, and shorts-to-ground between pin 33 and chassis ground. Were any wire-to-wire shorts found?		Go to Step 5	Go to Step 6

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0971 Pressure Control Solenoid 3 (PCS3) Control Circuit High (cont'd)**

Step	Action	Value(s)	Yes	No
5	<i>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.</i> 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 9 and all other pins in the 20-way connector. <i>NOTE: The resistance value between pins 9 and 6 will read normal solenoid resistance. The resistance value between pins 9 and 4, between pins 9 and 5, and between pins 9 and 10 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.</i> Were 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 wire-to-wire shorts 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 or repair PCS3. Is the replacement complete?		Go to Step 11	
10	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> 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 P0973 Shift Solenoid 1 (SS1) Control Circuit Low



Circuit Description

Shift Solenoid 1 (SS1) is a normally closed (N/C) solenoid used to properly position the C1 and C2 latch valves in forward ranges. The TCM commands the solenoid ON to supply control main pressure to the C1 and C2 latch valves. When solenoid SS1 is commanded OFF, control main pressure is relieved from the C1 and C2 latch valves.

The TCM sends control current to solenoid SS1 from High Side Driver 2 (HSD2) via wire 171. HSD2 is continuously ON unless the TCM detects a fault condition. The TCM energizes SS1 by switching the solenoid's Low Side Driver (LSD) ON. Wire 151 completes the circuit between SS1 and its LSD. DTC P0973 indicates that the TCM has detected a short-to-ground or open circuit condition in the low side of SS1 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 P0973 is set when the TCM detects a short-to-ground or open condition in the SS1 return circuit for more than 125 milliseconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0973 Shift Solenoid 1 (SS1) Control Circuit Low

Actions Taken When the DTC Sets

When DTC P0973 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 DOCTM 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 P0973 indicates a short-to-ground or an open condition in the electrical circuit for the SS1 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 DOCTM 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. **NOTE: A 1000 hertz test pulse may be present in the SSI circuit.**

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 the OEM harness for an excessive voltage drop caused by an open condition in either wire 171 or wire 151 of the OEM chassis harness.
5. This step tests for wire-to-wire shorts or a short-to-ground condition in wire 151.
7. This step tests for wire-to-wire shorts or a short-to-ground or an open in the internal transmission harness.

DTC P0973 Shift Solenoid 1 (SS1) Control Circuit Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		<i>Go to Step 2</i>	<i>Go to Section 3–5, Beginning the Troubleshooting Process</i>
2	<ol style="list-style-type: none"> 1. Install the Allison DOCr™ 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)	<i>Go to Step 3</i>	Resolve voltage problem. <i>Go to Step 11</i>
3	<ol style="list-style-type: none"> 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.). <p>NOTE: This DTC is intended to detect a short-to-ground or open condition in the SSI electrical circuit.</p> Did DTC P0973 return?		<i>Go to Step 4</i>	<i>Go to Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0973 Shift Solenoid 1 (SS1) Control Circuit Low (*cont'd*)

Step	Action	Value(s)	Yes	No
4	<p>NOTE: Review Section 4—Wire Test Procedures before performing steps.</p> <ol style="list-style-type: none"> 1. Turn ignition OFF. 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 ignition ON, leave engine OFF. 5. Using Allison DOCTM For PC—Service Tool enter Solenoid Test mode and command solenoid SS1 ON. 6. Determine the voltage drop in the high side of the SS1 circuit as follows: <ul style="list-style-type: none"> • 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 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 SS1 circuit as follows: <ul style="list-style-type: none"> • At J 47275-1 TCM Overlay, measure voltage between pin 51 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 10 and ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. <p>NOTE: A voltage drop of more than 0.5V across either circuit indicates an excessive voltage loss in the OEM harness.</p> <p>Did either high-side or low-side voltage drop exceed 0.5 VDC?</p>		Go to Step 6	Go to Step 5
5	<p>NOTE: Review Section 4—Wire Test Procedures before performing steps.</p> <ol style="list-style-type: none"> 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 151 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 51 and all other pins in the 80-way connector. <p>Were any wire-to-wire shorts or shorts-to-ground found?</p>		Go to Step 6	Go to Step 7

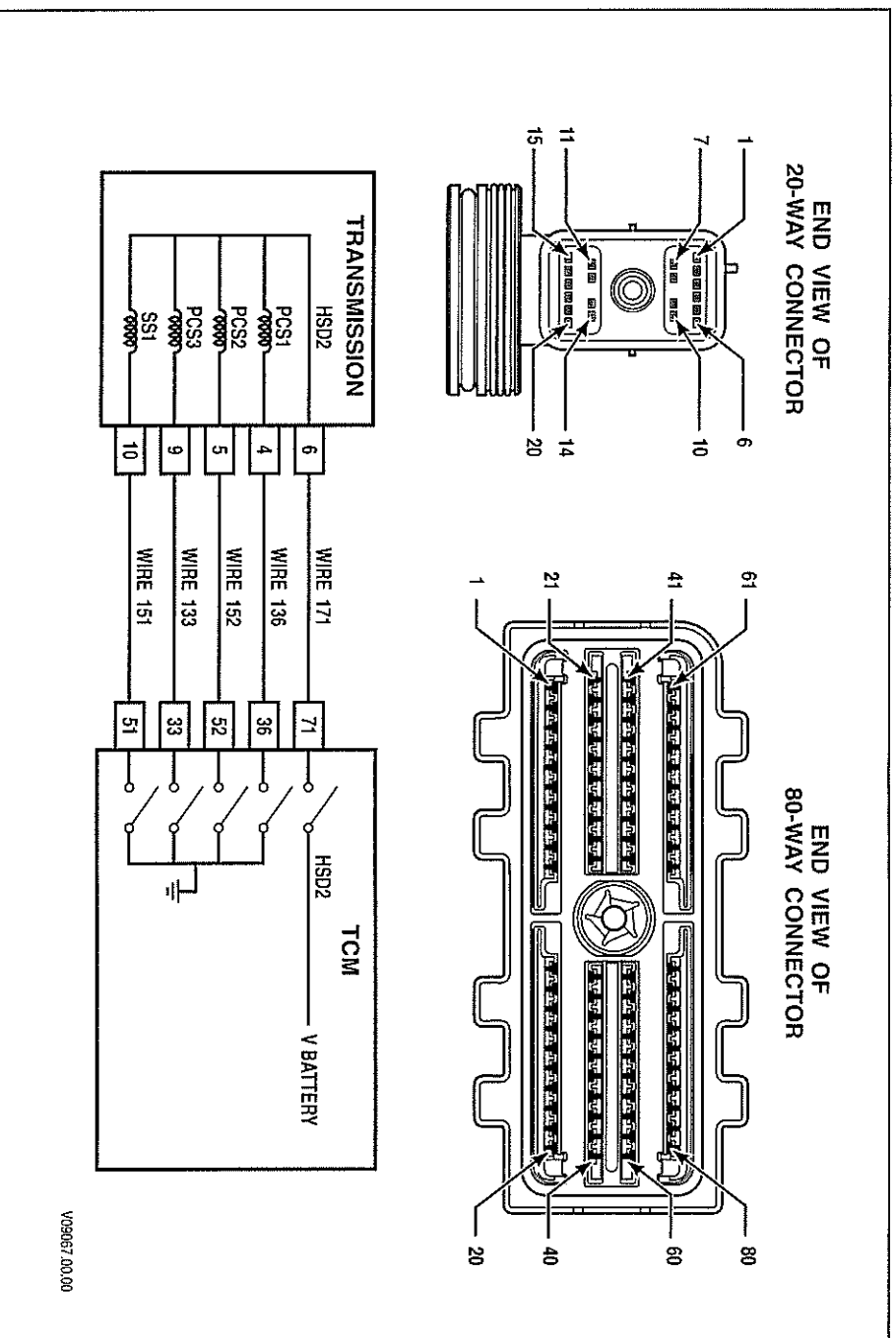
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0973 Shift Solenoid 1 (SS1) Control Circuit Low (cont'd)

Step	Action	Value(s)	Yes	No
6	<i>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.</i> Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		Go to Step 12	
7	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 10 and all other pins in the 20-way connector. 4. Test for an open between pins 6 and 10. <i>NOTE: The resistance value between pins 10 and 6 will read normal solenoid resistance. The resistance value between pins 10 and 4, between pins 10 and 5, and between pins 10 and 9 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.</i> Were any wiring defects found?	Refer to Solenoid Resistance Chart (Appendix K)	Go to Step 8	Go to Step 11
8	1. Remove the hydraulic control module assembly. 2. Disconnect SS1 from the internal harness. 3. Inspect the internal harness for wire-to-wire shorts. Were any wiring defects found?		Go to Step 8	Go to Step 10
9	Replace the internal wiring harness. Is the replacement complete?		Go to Step 12	
10	Replace SS1. Is the replacement complete?		Go to Step 12	
11	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		Go to Step 12	
12	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 P0974 Shift Solenoid 1 (SS1) Control Circuit High



Circuit Description

Shift Solenoid 1 (SS1) is a normally closed (N/C) solenoid used to properly position the C1 and C2 logic latch valves in forward ranges. The TCM commands the solenoid ON to supply control main pressure to the C1 and C2 logic latch valves. When SS1 is commanded OFF, control main pressure is relieved from the C1 and C2 latch valves.

The TCM sends control current to SS1 from High Side Driver 2 (HSD2) via wire 171. HSD2 is continuously ON unless the TCM detects a fault condition. The TCM energizes SS1 by switching the solenoid's Low Side Driver (LSD) ON. Wire 151 completes the circuit between SS1 and its LSD. DTC P0974 indicates that the TCM has detected a short-to-battery condition in the low side of SS1 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 P0974 is set when the TCM detects a short-to-battery in the SS1 return circuit for more than 125 milliseconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0974 Shift Solenoid 1 (SS1) Control Circuit High

Actions Taken When the DTC Sets

When DTC P0974 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 DOCTM 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 P0974 indicates a short-to-battery in the electrical circuit for the SS1 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 DOCTM 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. **Note: A 1000 hertz test pulse may be present in the SS1 solenoid circuit.**

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 151 and other wires in the OEM chassis harness.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.

DTC P0974 Shift Solenoid 1 (SS1) Control Circuit High

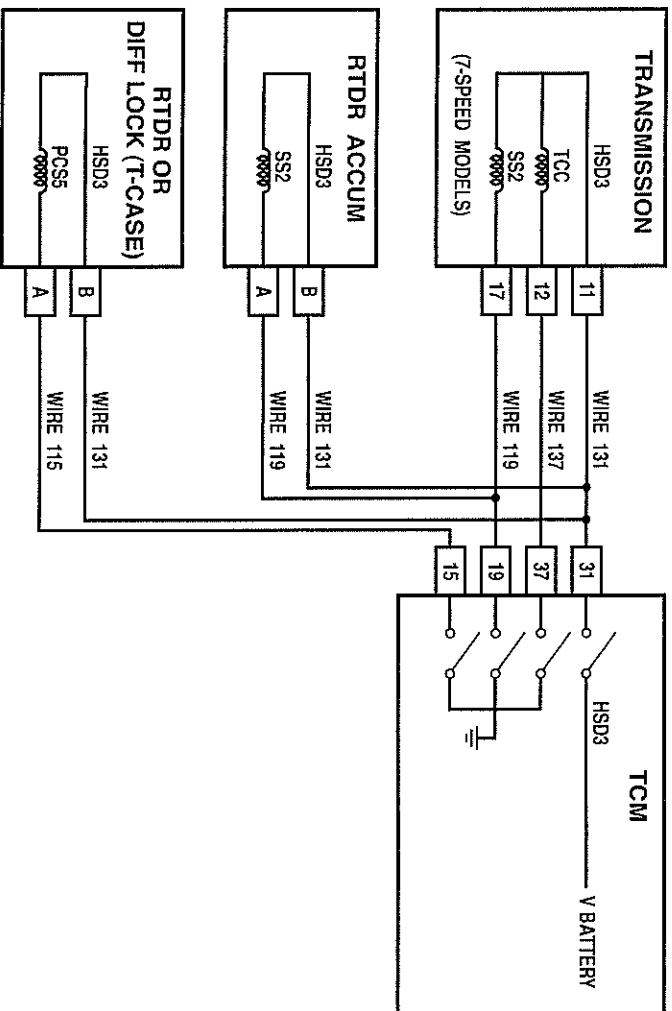
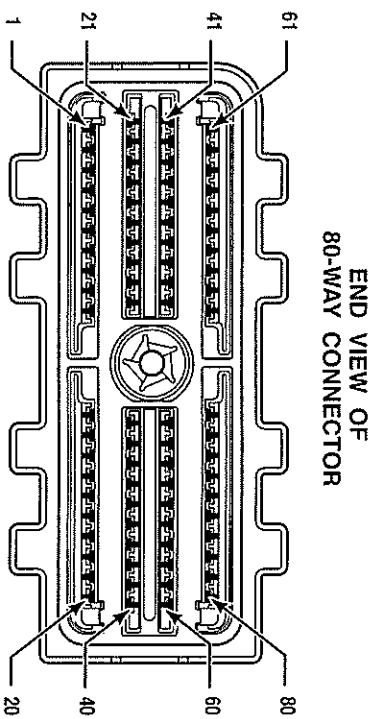
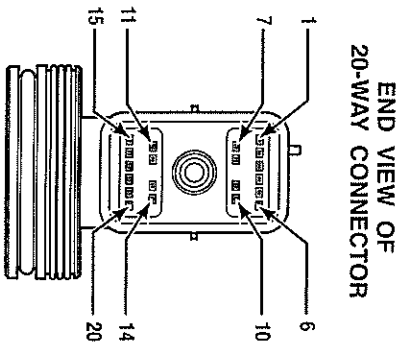
Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	<ol style="list-style-type: none"> 1. Install the Allison DOCTR[™] For PC–Service Tool. 2. Start the engine. 3. Record the failure 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	<ol style="list-style-type: none"> 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 SSI electrical circuit.		Go to Step 4	Go to Diagnostic Aids
4	Did DTC P0974 return? NOTE: Review Section 4—Wire Test Procedures before performing steps. <ol style="list-style-type: none"> 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 and wire 151 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 51 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 P0974 Shift Solenoid 1 (SS1) Control Circuit High (cont'd)**

Step	Action	Value(s)	Yes	No
5	<i>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.</i> 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 DVOM, test for wire-to-wire shorts between pin 10 and all other pins in the 20-way connector. <i>NOTE: The resistance value between pins 10 and 6 will read normal solenoid resistance. The resistance value between pins 10 and 4, between pins 10 and 5, and between pins 10 and 9 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.</i> 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 SS1. Is the replacement complete?		Go to Step 11	
10	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.</i> 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 P0975 Shift Solenoid 2 (SS2) Control Circuit Open



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DIAGNOSTIC TROUBLE CODES (DTC)

Circuit Description

- Shift Solenoid 2 (SS2) is a normally closed (N/C) solenoid used to either activate:
 - The retarder accumulator air solenoid (retarder models)
 - 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 P0975 indicates that the TCM has detected an open condition in SS2 electrical circuit. The open condition may exist in the high side (wire 131) or low side (wire 119).

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 P0975 is set when the TCM detects an open circuit on the SS2 return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

- When DTC P0975 is active, the following will occur:
 - The **CHECK TRANS** light illuminates.
 - DTC is stored in TCM history.
 - For 7-speed transmissions, the TCM allows operation in second range through sixth range, and neutral and reverse.
 - For retarder equipped transmissions, the retarder accumulator is disabled.

Conditions for Clearing the DTC/CHECK TRANS light

The Allison DOCTM 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 P0975 indicates an open in the electrical circuit for the SS2 solenoid. In addition to SS2, HSD3 also supplies power to solenoids TCC and PCS5. If DTC P0975 is accompanied by DTC P2736 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.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0975 Shift Solenoid 2 (SS2) Control Circuit Open

- 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.

- This step tests for the proper ignition voltage.
- This step tests for an active DTC.
- This step tests the OEM harness for an excessive voltage drop caused by an open condition in either wire 131 or wire 115 of the OEM chassis harness.
- This step tests for an open condition in the transmission internal harness or retarder accumulator solenoid harness.
- This step tests for the proper SS2 resistance (7-speed models only).

DTC P0975 Shift Solenoid 2 (SS2) 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	<ol style="list-style-type: none"> Install the Allison DOCT™ For PC–Service Tool. Start the engine. Record the failure records. 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	<ol style="list-style-type: none"> Clear the DTC. Start the engine and test drive the vehicle. 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 SS2 electrical circuit. Did DTC P0975 return?		Go to Step 4	Go to Diagnostic Aids

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0975 Shift Solenoid 2 (SS2) Control Circuit Open (cont'd)**

Step	Action	Value(s)	Yes	No
4	<p>NOTE: Review Section 4—Wire Test Procedures before performing steps.</p> <ol style="list-style-type: none"> 1. Turn OFF the ignition. 2. Install the J 47275 TCM Breakout between the OEM and TCM 80-way connector. 3. Install J 47279 Transmission Breakout between the OEM and transmission 20-way connectors, and OEM and retarder accumulator solenoid connector, if applicable. 4. Turn ON the ignition, leave engine OFF. 5. Using Allison DOC™ For PC—Service Tool, enter Solenoid Test mode and command SS2 ON. 6. Determine the voltage drop in the high side of the SS2 circuit as follows: <ul style="list-style-type: none"> • At J 47275-1 TCM Overlay, measure voltage between pin 31 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 11 (7-speed) or pin RTDR ACCUM-B (retarder) 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 SS2 circuit as follows: <ul style="list-style-type: none"> • At J 47275-1 TCM Overlay, measure voltage between pin 19 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 17 (7-speed) or pin RTDR ACCUM-A (retarder) and an isolated ground. • Subtract the two voltage measurements to obtain the voltage drop in the circuit. <p>NOTE: A voltage drop of more than 0.5V across either circuit indicates an excessive voltage loss in the OEM harness.</p> <p>Did either high-side or low-side voltage drop exceed 0.5VDC?</p>		Go to Step 5	Go to Step 6
5	<p>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.</p> <p>Coordinate with the vehicle OEM to repair or replace the vehicle wiring.</p> <p>Is the repair complete?</p>		Go to Step 11	

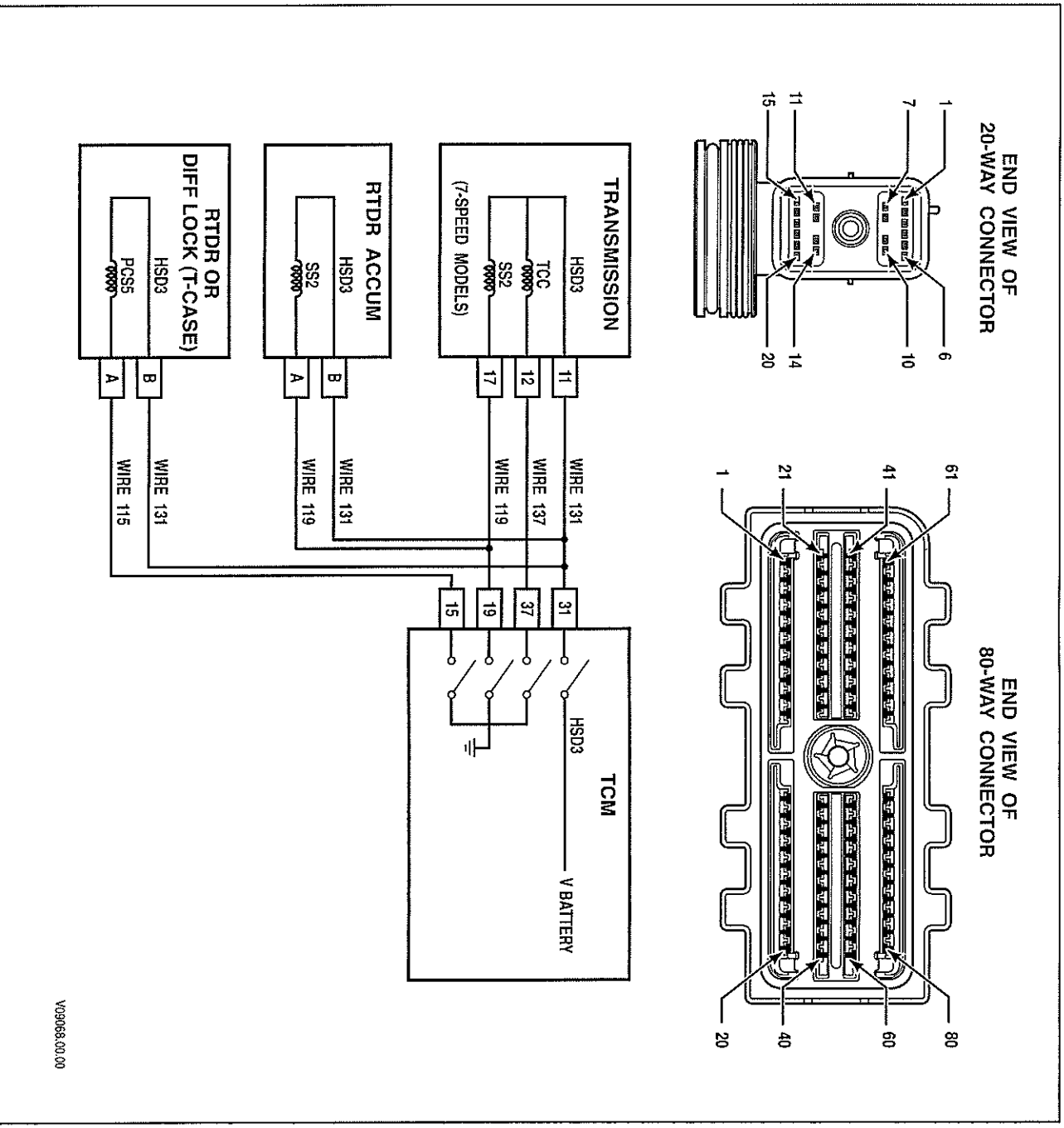
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0975 Shift Solenoid 2 (SS2) Control Circuit Open (*cont'd*)

Step	Action	Value(s)	Yes	No
6	For 7-speed transmissions: 1. Turn OFF the ignition. 2. Disconnect the OEM 20-way connector from J 47279 Transmission Breakout. Leave the transmission-side connected. 3. Using a DVOM, measure the resistance between pin 11 and pin 17 of the transmission 20-way connector. For retarder units: 1. Disconnect the retarder accumulator SS2 connector. 2. Using a DVOM, measure the resistance between pins A and B of the retarder accumulator solenoid.	Refer to Solenoid Resistance Chart (Appendix K)	Go to Step 10	7-speed transmissions, go to Step 7. Retarder equipped transmissions, go to Step 9.
7	NOTE: This step applies to 7-speed models only. For retarder models, go to Step 9. 1. Remove the hydraulic control module assembly. 2. Remove C6 Enable SS2. 3. Using a DVOM, measure resistance of SS2 between pins A and B. Is the resistance within the specified value?	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 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 P0976 Shift Solenoid 2 (SS2) Control Circuit Low



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 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 P0976 indicates that the TCM has detected a short-to-ground condition in the low side of SS2 electrical circuit.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0976 Shift Solenoid 2 (SS2) Control Circuit Low

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 P0976 is set when the TCM detects a short-to-ground in the SS2 return circuit for more than 125 milliseconds.

Actions Taken When the DTC Sets

When DTC P0976 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.
- The TCM inhibits TCC operation.

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOCTM 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 P0976 indicates a short-to-ground 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.

DIAGNOSTIC TROUBLE CODES (DTC)

- Advanced Troubleshooting (requires a frequency-capable digital multimeter; if available)—measure solenoid LSD functionality as follows:
 - Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
 - 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.
 - 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.
 - Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
 - 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.

- This step tests for the proper ignition voltage.
- This step tests for an active DTC.
- This step tests for wire-to-wire shorts or a short-to-ground condition in wire 119.
- This step tests for the wire-to-wire shorts or a short-to-ground in the internal transmission harness.

DTC P0976 Shift Solenoid 2 (SS2) 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	<ol style="list-style-type: none"> Install the Allison DOC™ For PC–Service Tool. Start the engine. Record the failure records. 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	<ol style="list-style-type: none"> Clear the DTC. Start the engine and test drive the vehicle. 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 SS2 electrical circuit. Did DTC P0976 return?		Go to Step 4	Go to Diagnostic Aids