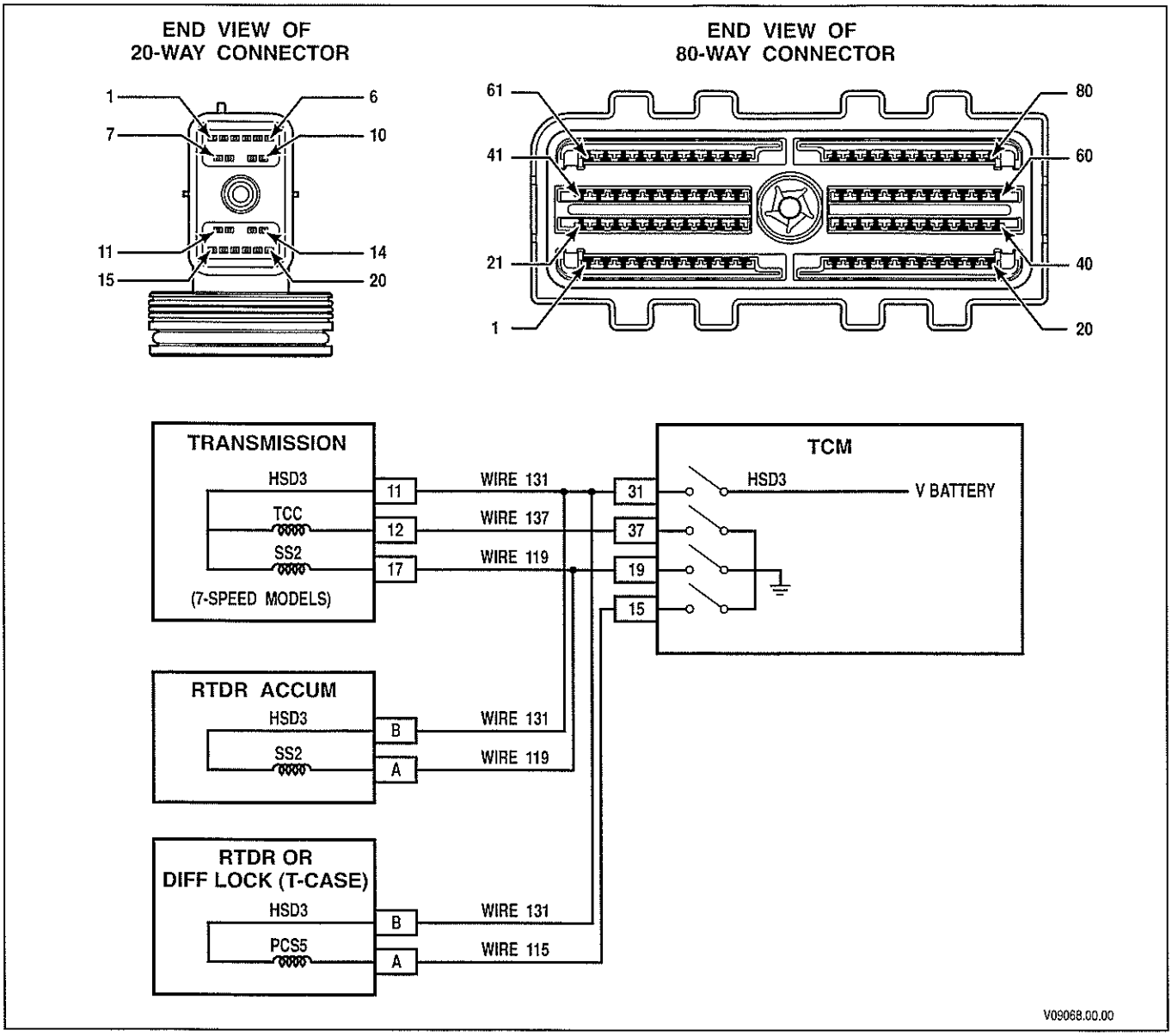
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2739 Pressure Control Solenoid 5 (PCS5) Control Circuit High



Circuit Description

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

The TCM sends control current to PCS5 from High Side Driver 3 (HSD3) via wire 131. HSD3 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to PCS5 by switching PCS5 Low Side Driver (LSD) ON and OFF. Wire 115 completes the circuit between PCS5 and its LSD. DTC P2739 indicates that the TCM has detected a short-to-battery condition in the low side of PCS5 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.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2739 Pressure Control Solenoid 5 (PCS5) Control Circuit High

Conditions for Setting the DTC

DTC P2739 is set when the TCM detects a short-to-battery in the PCS5 return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2739 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ diagnostic 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 P2739 indicates a short-to-battery in the electrical circuit for PCS5.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.
  3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
  4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
  5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47275 TCM Breakout. 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 115 and other wires in the OEM chassis harness.
6. This step tests for proper PCS5 resistance.

DTC P2739 Pressure Control Solenoid 5 (PCS5) Control Circuit High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). ***NOTE: This DTC is intended to detect a short-to-battery condition in the PCS5 electrical circuit.*** Did DTC P2739 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the retarder feedthrough or T-case connector. 5. Inspect the routing of wires 115 and 131 in the chassis harness between the TCM and the PCS5 connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 15 and all other pins in the 80-way connector. Were any wire-to-wire shorts found?		*Go to Step 5*	*Go to Step 6*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2739 Pressure Control Solenoid 5 (PCS5) Control Circuit High *(cont'd)*

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

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2740 Retarder Oil Temperature Hot

Refer to Retarder Hydraulic Schematic

Circuit Description

During retarder operation, the retarder housing is filled and pressurized with transmission fluid. This fluid acts on the vaned rotor assembly and impedes rotation of the transmission output shaft, converting a significant amount of rotational energy into heat in the process. Additionally, when the retarder is activated the retarder control valve supplies main pressure to the large autoflow valve in the retarder housing. The autoflow valve is repositioned during retarder operation to direct hot fluid in the retarder cavity to the transmission oil cooler. The retarder temperature sensor monitors fluid temperature in the retarder-housing cavity.

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).

Conditions for Setting the DTC

The TCM detects retarder oil temperature greater than 165°C (330°C) for more than 10 seconds.

Actions Taken When the DTC Sets

When DTC P2740 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

- The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.
- The TCM cancels the DTC default actions when the fault no longer exists and the DTC passes test.

Diagnostic Aids

- The Allison DOC™ For PC–Service Tool retarder oil temperature should rise steadily during retarder operation and drop to near sump temp when the retarder is deactivated.
- A stuck autoflow valve can cause overheating in retarder-equipped transmissions. Refer to Section 8 for general troubleshooting of performance complaints.
- Other possible causes include:
  - — Prolonged retarder use
  - — Low fluid level
  - — High fluid level
  - — A retarder apply system that allows the throttle and retarder to be applied simultaneously
  - — A cooler that is inadequately sized for the retarder.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper transmission fluid level and condition.
3. This step monitors the status of DTC P2740.
4. This step verifies which condition has set the DTC P2740.
5. This step tests for proper resistance value in entire circuit.
6. This step tests the resistance value of the retarder temperature sensor.
10. This step tests the condition of the vehicle cooling system.
11. This step tests for proper cooler pressure drop.
12. This step tests for deficiencies with the transmission oil cooler and cooling lines.

DTC P2740 Retarder Oil Temperature Hot

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Install a temperature gauge at the retarder outlet port. 3. Turn ON the ignition. 4. Record the failure records. 5. Clear the DTCs. 6. Drive the vehicle and monitor retarder temperature on Allison DOC™ For PC–Service Tool. Did DTC P2740 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	Compare the manual temperature reading to the Allison DOC™ For PC–Service Tool retarder temperature when the DTC is set. Does the manual temperature reading confirm the retarder oil temperature is actually hot when DTC P2740 is logged?		*Go to Step 10*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2740 Retarder Oil Temperature Hot *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect the 80-way connector from the TCM. 3. Connect J 47425 TCM Breakout to the OEM connector. Leave the TCM disconnected from J 47275 TCM Breakout. 4. Using a DVOM at J 47275-1 TCM Overlay, measure the resistance between pin 75 and 58. 5. Refer to Appendix Q and find the retarder oil temperature that corresponds to the resistance value determined in the preceding step. Does the value listed in Appendix Q match the manual retarder temperature reading?	Refer to Appendix Q	*Go to Step 9*	*Go to Step 6*
6	1. Disconnect the retarder temperature sensor connector. 2. Using a DVOM, measure resistance at retarder temp sensor pins A and B. 3. Refer to Appendix Q and find the retarder oil temperature that corresponds to the resistance value determined in the preceding step. Does the value listed in Appendix Q match the manual retarder temperature reading?	Refer to Appendix Q	*Go to Step 7*	*Go to Step 8*
7	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 14*	
8	Replace the retarder temperature sensor. Is the replacement complete?		*Go to Step 14*	
9	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 14*	

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2740 Retarder Oil Temperature Hot *(cont'd)*

Step	Action	Value(s)	Yes	No
10	1. Inspect the engine cooling system for the following conditions: • Air flow restrictions • Air flow blockage • System fluid level and condition • Debris 2. Inspect the transmission cooling system for the following conditions: • Air flow restrictions • Air flow blockage • System fluid level and condition • Damaged cooler lines and hoses Did you find and correct the condition?		*Go to Step 14*	*Go to Step 11*
11	1. Install pressure gauges in the "to" and "from" cooler lines. 2. Start the engine. 3. Subtract the "from cooler" pressure from the "to cooler" pressure to obtain pressure drop across the transmission oil cooler. 4. Verify cooler pressure drop satisfies limits of Table 6–16 (4000 Product Family) or Table 6–17 (3000 Product Family). Is cooler pressure drop within specified values?	Refer to Table 6–18 or 6–19	*Go to Diagnostic Aids*	*Go to Step 12*
12	Inspect the transmission cooling system for the following conditions: • Transmission cooler lines reversed. • Cooler lines restricted. • Improperly sized cooler fittings. • Inadequately sized cooler. Did you find any problems with the vehicle's cooling system?		*Go to Step 13*	*Go to Diagnostic Aids*
13	***NOTE: The vehicle OEM has responsibility for all vehicle cooling system repairs. Cooling system repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair the vehicle cooling system. Is the repair complete?		*Go to Step 13*	*Go to Diagnostic Aids*
14	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor retarder temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in temperature. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2740 Retarder Oil Temperature Hot

External Hydraulic Circuit Characteristics

Basic, PTO, 93°C (200°F) Sump Temperature

Table 6–16. 4000 Product Family

CONVERTER OPERATION MAXIMUM COOLER FLOW AT MINIMUM PRESSURE DROP				
	Flow		Pressure Drop	
Input rpm	L/s	GPM	kPa	psi
600	0.22	3.4	0	0
900	0.38	6.1	0	0
1200	0.55	8.7	0	0
1500	0.80	12.7	0	0
1800	1.03	16.4	0	0
2100	1.13	18.0	0	0
2300	1.20	19.0	0	0
CONVERTER OPERATION COOLER FLOW AT MAXIMUM ALLOWABLE PRESSURE DROP				
600	0.20	3.2	31.0	4.5
900	0.37	5.8	63.0	9.1
1200	0.55	8.7	108.0	15.7
1500	0.77	12.2	167.0	24.2
1800	0.92	14.5	231.0	30.9
2100	0.97	15.3	238.0	34.5
2300	1.00	15.9	250.0	36.3

Table 6–17. 3000 Product Family

CONVERTER OPERATION MAXIMUM COOLER FLOW AT MINIMUM PRESSURE DROP				
	Flow		Pressure Drop	
Input rpm	L/s	GPM	kPa	psi
600	0.10	1.6	0	0
800	0.23	3.7	0	0
1200	0.47	7.4	0	0
1400	0.61	9.7	0	0
1600	0.74	11.7	0	0
2000	0.94	14.9	0	0
2400	1.19	18.9	0	0
3200	1.28	20.3	0	0

DIAGNOSTIC TROUBLE CODES (DTC)

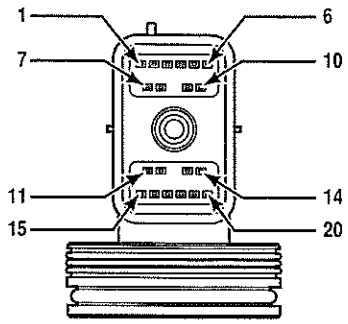
Table 6–17. 3000 Product Family *(cont'd)*

CONVERTER OPERATION MAXIMUM ALLOWABLE PRESSURE DROP				
	Flow		Pressure Drop	
Input rpm	L/s	GPM	kPa	psi
600	0.10	1.6	10.0	1.5
800	0.23	3.5	40.0	5.8
1200	0.45	7.1	159.0	23.1
1400	0.57	9.0	252.0	36.6
1600	0.67	10.6	338.0	49.0
2000	0.80	12.7	481.0	69.8
2400	0.85	13.5	549.0	79.6
3200	0.85	13.5	549.0	79.6
LOCKUP OPERATION MAXIMUM COOLER FLOW AT MINIMUM PRESSURE DROP				
600	0.10	1.6	0	0
800	0.23	3.7	0	0
1200	0.50	7.9	0	0
1400	0.63	10.0	0	0
1600	0.77	12.2	0	0
2000	0.95	15.1	0	0
2400	1.12	17.8	0	0
2800	1.22	19.3	0	0
3200	1.28	20.3	0	0
LOCKUP OPERATION MAXIMUM ALLOWABLE PRESSURE DROP				
600	0.10	1.6	5.0	0.7
800	0.23	3.7	46.0	6.7
1200	0.48	7.6	148.0	21.5
1400	0.62	9.8	247.0	35.8
1600	0.73	11.6	346.0	50.2
2000	0.90	14.3	561.0	81.4
2400	1.07	17.0	737.0	106.9
2800	1.10	17.4	770.0	111.7
3200	1.10	17.4	791.0	114.7

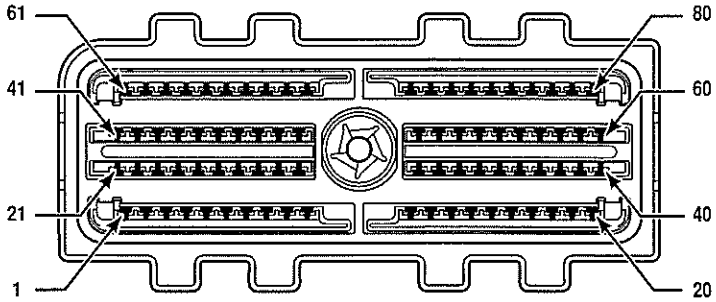
DIAGNOSTIC TROUBLE CODES (DTC)

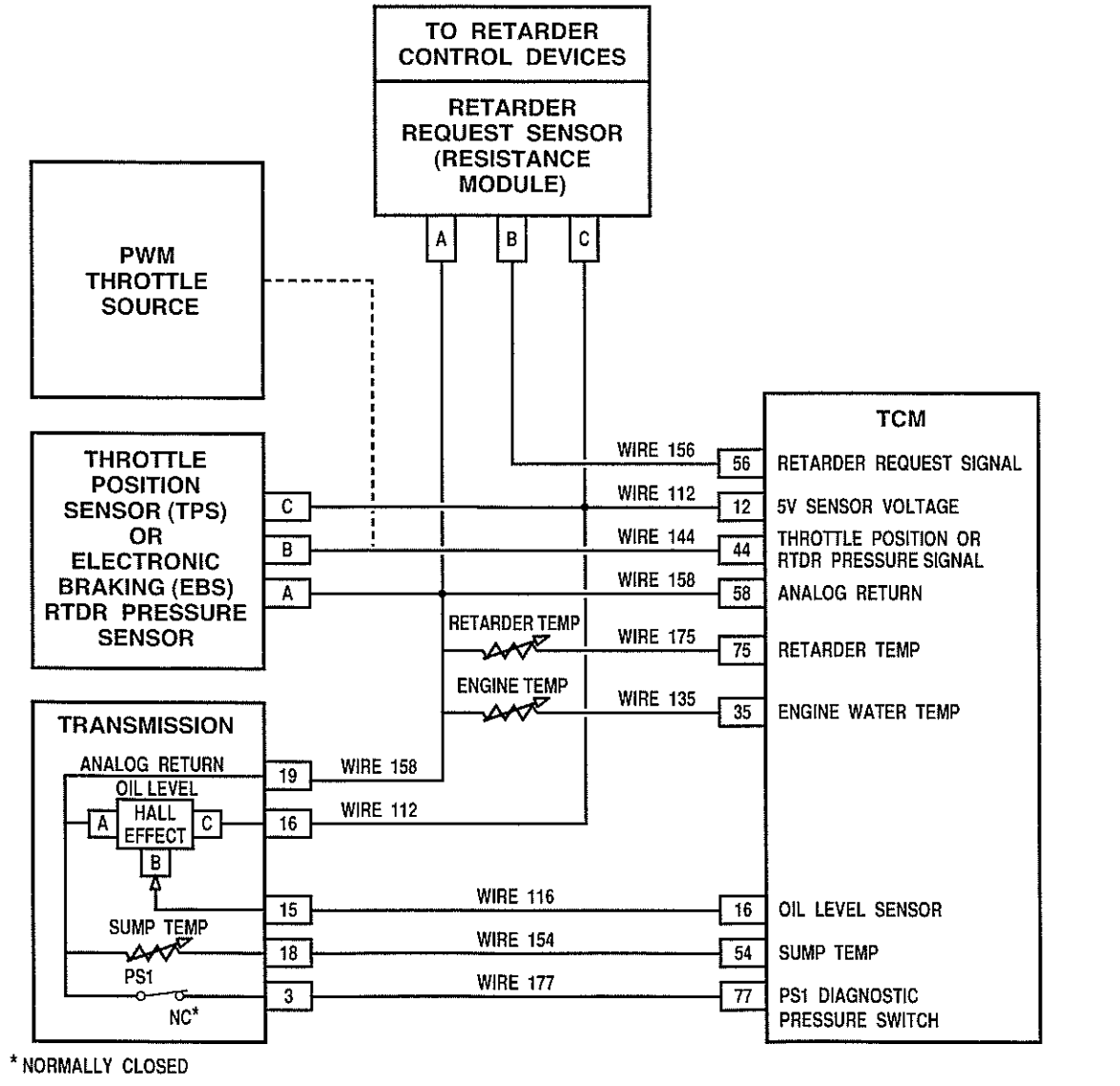
DTC P2742 Retarder Oil Temperature Sensor Circuit — Low Input

END VIEW OF 20-WAY CONNECTOR



END VIEW OF 80-WAY CONNECTOR





DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2742 Retarder Oil Temperature Sensor Circuit — Low Input

Circuit Description

A retarder oil temperature sensor monitors retarder cavity fluid temperature. The sensor consists of a thermistor that varies its resistance value based on the temperature of the fluid in the retarder housing. The Transmission Control Module (TCM) supplies a 5V reference voltage signal into a voltage-sensing network that is connected to one side of the retarder temperature sensor via wire 175. The other side of the temp sensor is connected to the TCM analog ground wire 158.

The resistance value of the retarder temperature sensor determines the voltage drop in the retarder temperature sensor circuit. As resistance changes, the voltage drop across the thermistor will also change varying the sensor input voltage on wire 175. When retarder fluid is cold the sensor resistance is high, which produces a large voltage drop across the temp sensor circuit. The TCM, therefore, detects a high sensor input voltage during cold conditions. As the retarder fluid temperature warms to normal operating temperature, the resistance decreases producing a smaller voltage drop across the temp sensor. As a result, the TCM detects a lower sensor input voltage on wire 175 during hot oil conditions. The TCM uses retarder temperature information to restrict retarder operation and reduce fluid temperature when a retarder over-heat condition is detected.

Conditions for Running the DTC

The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).

Conditions for Setting the DTC

The TCM detects retarder oil temperature greater than a calibrated value for more than 2.5 seconds.

*NOTE: **The TCM is detecting voltage. An unusually low input voltage implies low thermistor resistance, which corresponds to an illogically high retarder oil temperature measurement.***

Actions Taken When the DTC Sets

When DTC P2742 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC P2742 may be caused by a short-to-ground on wire 175.
- Review Appendix A for diagnosing intermittent electrical conditions.
- Inspect the wiring for poor electrical connections at the TCM and retarder temperature sensor. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.

DIAGNOSTIC TROUBLE CODES (DTC)

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

Test Description

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

2. This step tests for proper transmission fluid level and condition.
3. This step verifies which condition has set the DTC P2742.
4. This step tests for the proper 5V reference voltage at TCM.
5. This step tests for wire-to-wire shorts or shorts-to-ground on wire 175 (Retarder Oil Temp).
6. This step tests for proper system circuit resistance value.
7. This step tests the resistance value of the retarder temp sensor.

DTC P2742 Retarder Oil Temperature Sensor Circuit–Low Input

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. With the engine OFF, turn the ignition to the ON position. 3. Record the failure records. 4. Clear the DTCs. 5. Monitor the retarder temperature on Allison DOC™ For PC–Service Tool. 6. Drive the vehicle and observe Allison DOC™ For PC–Service Tool for an unrealistically high temperature condition. Is the Allison DOC™ For PC–Service Tool retarder oil temperature greater than 178°C (352°F)?	>178°C (352°F)	*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout at the TCM. 3. Disconnect the retarder temp sensor connector. 4. Turn ON the ignition. 5. At J 47275-1 TCM Overlay, connect a DVOM and measure voltage between pins 75 and 58. Is the voltage within the specified value?	4.75 to 5.0V	*Go to Step 6*	*Go to Step 5*

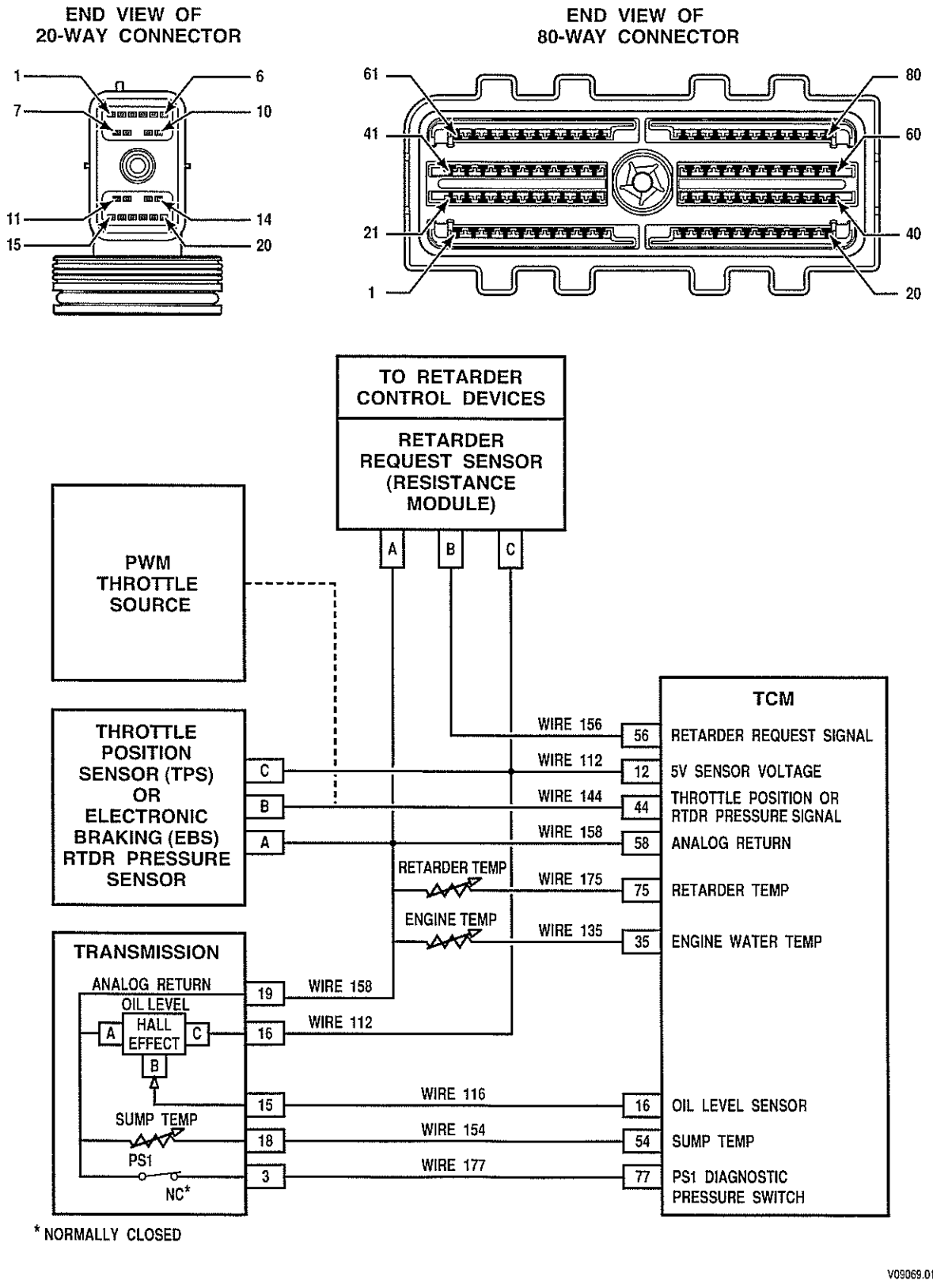
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2742 Retarder Oil Temperature Sensor Circuit–Low Input *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect the TCM from the J 47275 TCM Breakout. Leave the OEM-side connected. 3. Disconnect the retarder temp sensor connector, if not disconnected in Step 4. 4. Using a DVOM at J 47275-1 TCM Overlay, test for pin-to-pin shorts, or shorts-to-ground on wire 175. Were any wiring defects found?		*Go to Step 8*	*Go to Step 10*
6	1. Turn OFF the ignition. 2. Disconnect the TCM from the J 47275 TCM Breakout. Leave the OEM-side connected. 3. Reconnect the retarder temp sensor connector. 4. At J 47275-1 TCM Overlay connect a DVOM, measure the resistance between pin 75 and 58. Is the resistance within the specified value?	Refer to Appendix Q	*Go to Diagnostic Aids*	*Go to Step 7*
7	1. Disconnect the retarder temp sensor connector. 2. Using a DVOM, measure resistance between pins A and B of the retarder temp sensor. Is the resistance within the specified value?	Refer to Appendix Q	*Go to Step 8*	*Go to Step 9*
8	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by distributors and dealers are not covered by warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
9	Replace the retarder temperature sensor. 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. Using Allison DOC™ For PC–Service Tool, monitor retarder temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in temperature. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2743 Retarder Oil Temperature Sensor Circuit—High Input



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2743 Retarder Oil Temperature Sensor Circuit—High Input

Circuit Description

A retarder oil temperature sensor monitors retarder cavity fluid temperature. The sensor consists of a thermistor that varies its resistance value based on the temperature of the fluid in the retarder housing. The Transmission Control Module (TCM) supplies a 5V reference voltage signal into a voltage-sensing network that is connected to one side of the retarder temperature sensor via wire 175. The other side of the temperature sensor is connected to the TCM analog ground wire 158.

The resistance value of the retarder temperature sensor determines the voltage drop in the retarder temperature sensor circuit. As resistance changes, the voltage drop across the thermistor will also change varying the sensor input voltage on wire 175. When retarder fluid is cold the sensor resistance is high, which produces a large voltage drop across the temp sensor circuit. The TCM, therefore, detects a high sensor input voltage during cold conditions. As the retarder fluid temperature warms to normal operating temperature, the resistance decreases producing a smaller voltage drop across the temp sensor. As a result, the TCM detects a lower sensor input voltage on wire 175 during hot oil conditions.

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).

Conditions for Setting the DTC

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

*NOTE: **The TCM is detecting voltage. A high input voltage implies high thermistor resistance, which corresponds to an extremely cold retarder oil temperature measurement.***

Actions Taken When the DTC Sets

When DTC P2743 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

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

DIAGNOSTIC TROUBLE CODES (DTC)

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

Test Description

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

2. This step tests for proper transmission fluid level and condition.
3. This step verifies which condition has set the DTC P2743.
4. This step tests for the proper 5V reference voltage at TCM.
5. This step tests for wire-to-wire shorts, shorts-to-ground, or an open on wire 175.
6. This step tests for proper system circuit resistance value.
7. This step tests the resistance value of the internal TFT sensor.

DTC P2743 Retarder Oil Temperature Sensor Circuit—High Input

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. With the engine OFF, turn the ignition to the ON position. 3. Record the failure records. 4. Clear the DTCs. 5. Monitor the retarder temperature on Allison DOC™ For PC–Service Tool. 6. Drive the vehicle and observe Allison DOC™ For PC–Service Tool for an unrealistically low temperature condition. Is the Allison DOC™ For PC–Service Tool transmission fluid temperature less than –45°C (–49°F)?	<–45° C (–49° F)	*Go to Step 4*	*Go to Diagnostic Aids*
4	1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout at the TCM. 3. Disconnect the retarder temp sensor connector. 4. Turn ON the ignition. 5. At J 47275-1 TCM Overlay connect a DVOM and select the volts-DC scale. 6. Measure voltage between pin 75 and an isolated ground. Is the voltage within the specified value?	4.75 to 5.0V	*Go to Step 6*	*Go to Step 5*

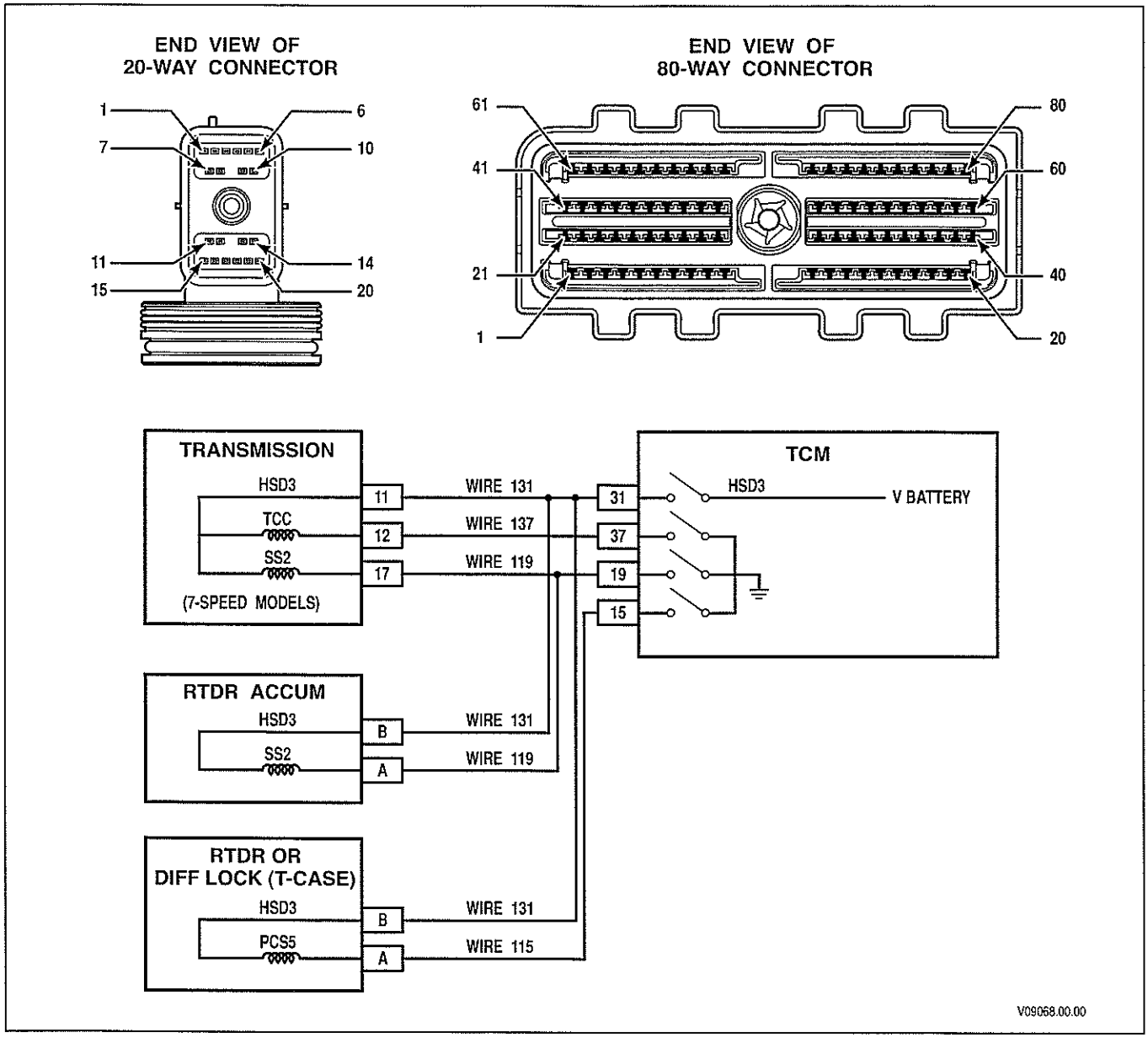
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2743 Retarder Oil Temperature Sensor Circuit—High Input *(cont'd)*

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Disconnect the TCM from the J 47275 TCM Breakout. Leave the OEM-side connected. 3. Disconnect the retarder temperature sensor, if not disconnected in Step 4. 4. Disconnect the transmission 20-way connector and engine coolant temperature sensor. 5. Using a DVOM at J 47275-1 TCM Overlay, test for opens in wire 175 and wire 112. 6. Also test for wire-to-wire shorts, or shorts-to-battery on wire 135, wire 154, or wire 175. Were any wiring defects found?		*Go to Step 8*	*Go to Step 10*
6	1. Turn OFF the ignition. 2. Disconnect the TCM from the J 47275 TCM Breakout. Leave the OEM-side connected. 3. Reconnect the transmission 20-way connector. 4. At J 47275-1 TCM Overlay connect a DVOM, measure the resistance at pin 75 and 58. Is the resistance within the specified value?	Refer to Appendix Q	*Go to Diagnostic Aids*	*Go to Step 7*
7	1. Disconnect the retarder temp sensor connector. 2. Using a DVOM, measure resistance between pins A and B of the retarder temp sensor. Is the resistance within the specified value?	Refer to Appendix Q	*Go to Step 8*	*Go to Step 9*
8	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
9	Replace the retarder temperature sensor. 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. Using Allison DOC™ For PC–Service Tool, monitor retarder temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in temperature. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2761 TCC PCS Control Circuit Open



Circuit Description

Torque Converter Clutch Pressure Control Solenoid (TCC) is a normally closed (N/C) solenoid used to apply the torque converter clutch when specific engine and turbine speed conditions are met. The TCM commands the solenoid ON to produce hydraulic pressure in the torque converter clutch apply circuit. When solenoid TCC is commanded OFF, torque converter clutch pressure is released.

The TCM sends control current to solenoid TCC from High Side Driver 3 (HSD3) via wire 131. HSD3 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to TCC by switching TCC's Low Side Driver (LSD) ON and OFF. Wire 137 completes the circuit between TCC and its LSD. DTC P2761 indicates that the TCM has detected an open condition in solenoid TCC's electrical circuit. The open condition may exist in the high side (wire 131) or low side (wire 137).

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2761 TCC PCS Control Circuit Open

Conditions for Running the DTC

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

Conditions for Setting the DTC

DTC P2761 is set when the TCM detects an open circuit on the TCC solenoid return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2761 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

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

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests the OEM harness for an excessive voltage drop caused by an open condition in either wire 131 or wire 137 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 TCC solenoid resistance.

DTC P2761 TCC PCS Control Circuit Open

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). ***NOTE: This DTC is intended to detect an open condition in the TCC solenoid electrical circuit.*** Did DTC P2761 return?		*Go to Step 4*	*Go to Diagnostic Aids*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2761 TCC PCS Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout between the OEM and TCM 80-way connectors. 3. Install J 47279 Transmission Breakout between the OEM and transmission 20-way connectors. 4. Turn ON the ignition, leave engine OFF. 5. Using Allison DOC™ For PC–Service Tool, enter Solenoid Test mode and command solenoid TCC ON. 6. Determine the voltage drop in the high side of the TCC circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 31 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 11 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 TCC circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 37 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 12 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*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	

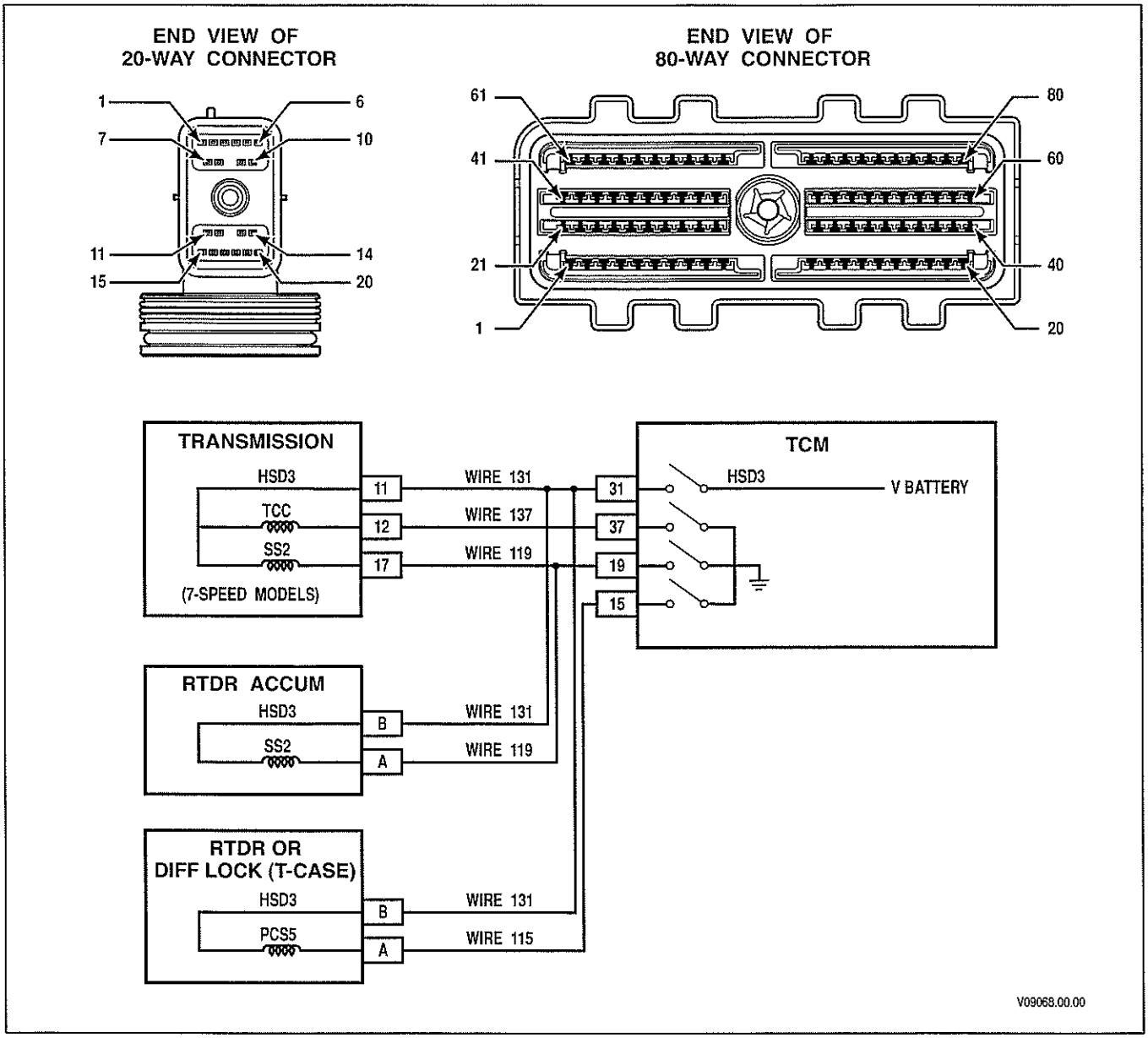
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2761 TCC PCS Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
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 11 and pin 12 in the transmission 20-way connector. Is the resistance within the specified value?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 10*	*Go to Step 7*
7	1. Remove the hydraulic control module assembly. 2. Disconnect solenoid TCC from the internal wiring harness. 3. Using a DVOM, measure solenoid TCC 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 solenoid TCC. 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. Watch for significant change in temperature. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2763 TCC PCS Control Circuit High



Circuit Description

Torque Converter Clutch Pressure Control Solenoid (TCC) is a normally closed (N/C) solenoid used to apply the torque converter clutch when specific engine and turbine speed conditions are met. The TCM commands the solenoid ON to produce hydraulic pressure in the torque converter clutch apply circuit. When solenoid TCC is commanded OFF, torque converter clutch pressure is released.

The TCM sends control current to solenoid TCC from High Side Driver 3 (HSD3) via wire 131. HSD3 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to TCC by switching TCC's Low Side Driver (LSD) ON and OFF. Wire 137 completes the circuit between TCC and its LSD. DTC P2763 indicates that the TCM has detected a short-to-battery condition in the low side of solenoid TCC's electrical circuit.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2763 TCC PCS Control Circuit High

Conditions for Running the DTC

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

Conditions for Setting the DTC

DTC P2763 is set when the TCM detects a short-to-battery in the TCC solenoid return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2763 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC P2763 indicates a short-to-battery in the electrical circuit for the TCC solenoid.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode when DTC was set.
- Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.
- Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)—measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.

DIAGNOSTIC TROUBLE CODES (DTC)

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

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts in wire 137.
6. This step tests for the wire-to-wire shorts in the internal transmission harness.

DTC P2763 TCC PCS Control Circuit High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). ***NOTE: This DTC is intended to detect a short-to-battery condition in the TCC solenoid electrical circuit.*** Did DTC P2763 return?		*Go to Step 4*	*Go to Diagnostic Aids*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2763 TCC PCS Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 137 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 37 and all other pins in the 80-way connector, and shorts-to-ground between pin 37 and chassis ground. Were any wire-to-wire shorts found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
6	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 12 and all other pins in the 20-way connector. ***NOTE: The resistance value between pins 12 and 11 will read normal solenoid resistance. The resistance value between pins 12 and 17 (7-speed models) will be twice normal solenoid resistance. Refer to the Solenoid Resistance chart for these values.*** Were any wire-to-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-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 solenoid TCC. Is the replacement complete?		*Go to Step 11*	

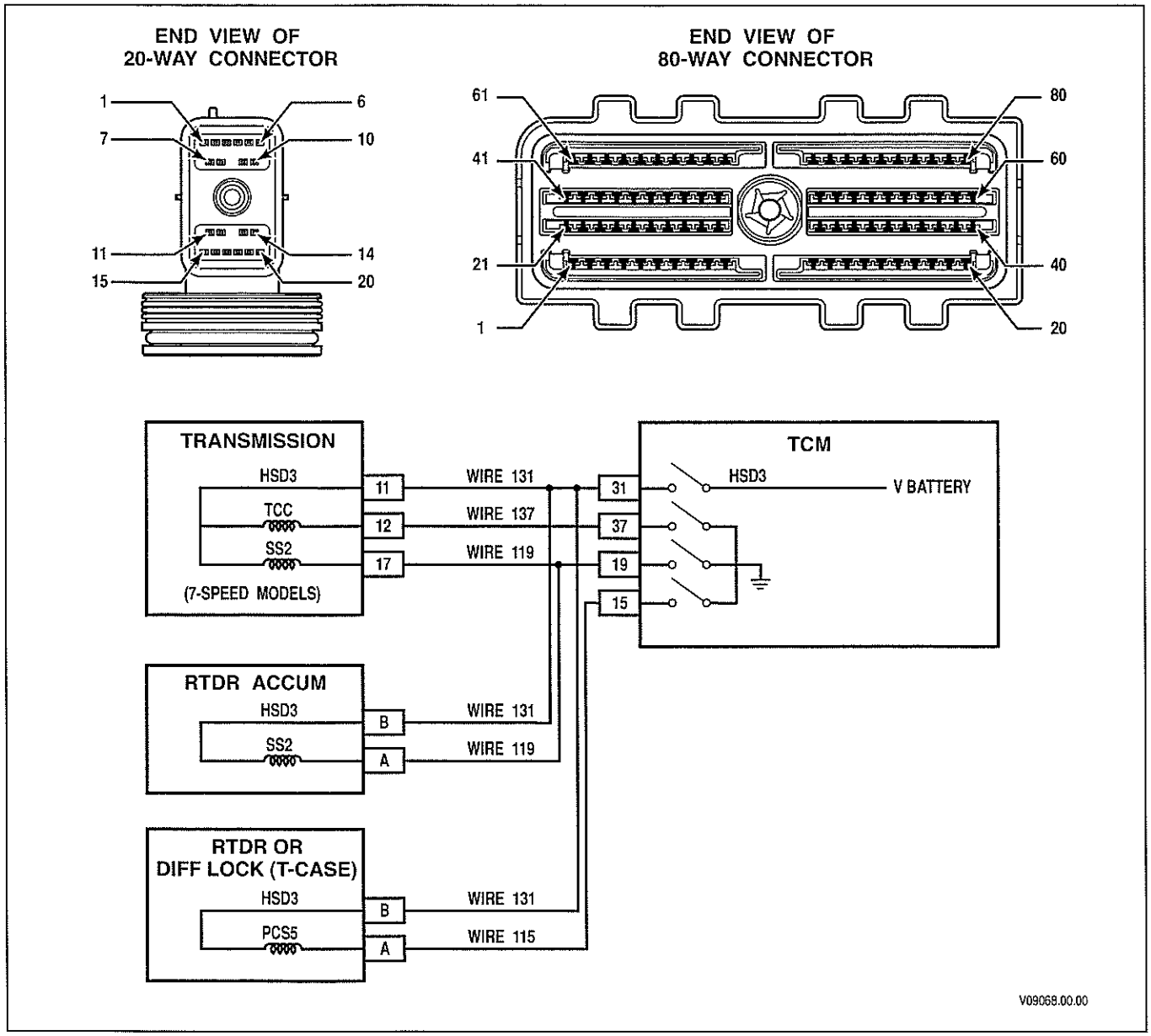
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2763 TCC PCS Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
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 P2764 TCC PCS Control Circuit Low



Circuit Description

Torque Converter Clutch Pressure Control Solenoid (TCC) is a normally closed (N/C) solenoid used to apply the torque converter clutch when specific engine and turbine speed conditions are met. The TCM commands the solenoid ON to produce hydraulic pressure in the torque converter clutch apply circuit. When solenoid TCC is commanded OFF, torque converter clutch pressure is released.

The TCM sends control current to solenoid TCC from High Side Driver 3 (HSD3) via wire 131. HSD3 is continuously ON unless the TCM detects a fault condition. The TCM regulates the amount of current to TCC by switching TCC's Low Side Driver (LSD) ON and OFF. Wire 137 completes the circuit between TCC and its LSD. DTC P2764 indicates that the TCM has detected a short-to-ground condition in the low side of solenoid TCC's electrical circuit.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2764 TCC PCS 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 P2764 is set when the TCM detects a short-to-ground in the TCC solenoid return circuit for more than 2 seconds.

Actions Taken When the DTC Sets

When DTC P2764 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC P2764 indicates a short-to-ground in the electrical circuit for the TCC 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)—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.Connect the RED test lead to the solenoid

DIAGNOSTIC TROUBLE CODES (DTC)

low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.

3. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
4. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts or a short-to-ground condition in wire 137.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.

DTC P2764 TCC PCS Control Circuit Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). ***NOTE: This DTC is intended to detect a short-to-ground condition in the TCC solenoid electrical circuit.*** Did DTC P2764 return?		*Go to Step 4*	*Go to Diagnostic Aids*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2764 TCC PCS Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 8-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 131 and wire 137 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 37 and all other pins in the 80-way connector, and shorts-to-ground between pin 37 and chassis ground. 7. Test wire 131 for an intermittent short. Refer to Diagnostic Aids, Bullet 5 for the correct procedure. Were any wire-to-wire shorts or short-to-ground found?		*Go to Step 5*	*Go to Step 6*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the 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 12 and all other pins in the 20-way connector, and shorts-to-ground between pin 12 and chassis ground. ***NOTE: The resistance value between pins 12 and 11 will read normal solenoid resistance. The resistance value between pins 12 and 17 will be twice normal solenoid resistance.*** Were any wire-to-wire shorts or shorts-to-ground found?		*Go to Step 7*	*Go to Step 10*
7	1. Remove the hydraulic control module assembly. 2. Inspect the internal harness for wire-to-wire shorts, or shorts-to-ground. Were any wire-to-wire shorts or shorts-to-ground found?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 8*	*Go to Step 9*

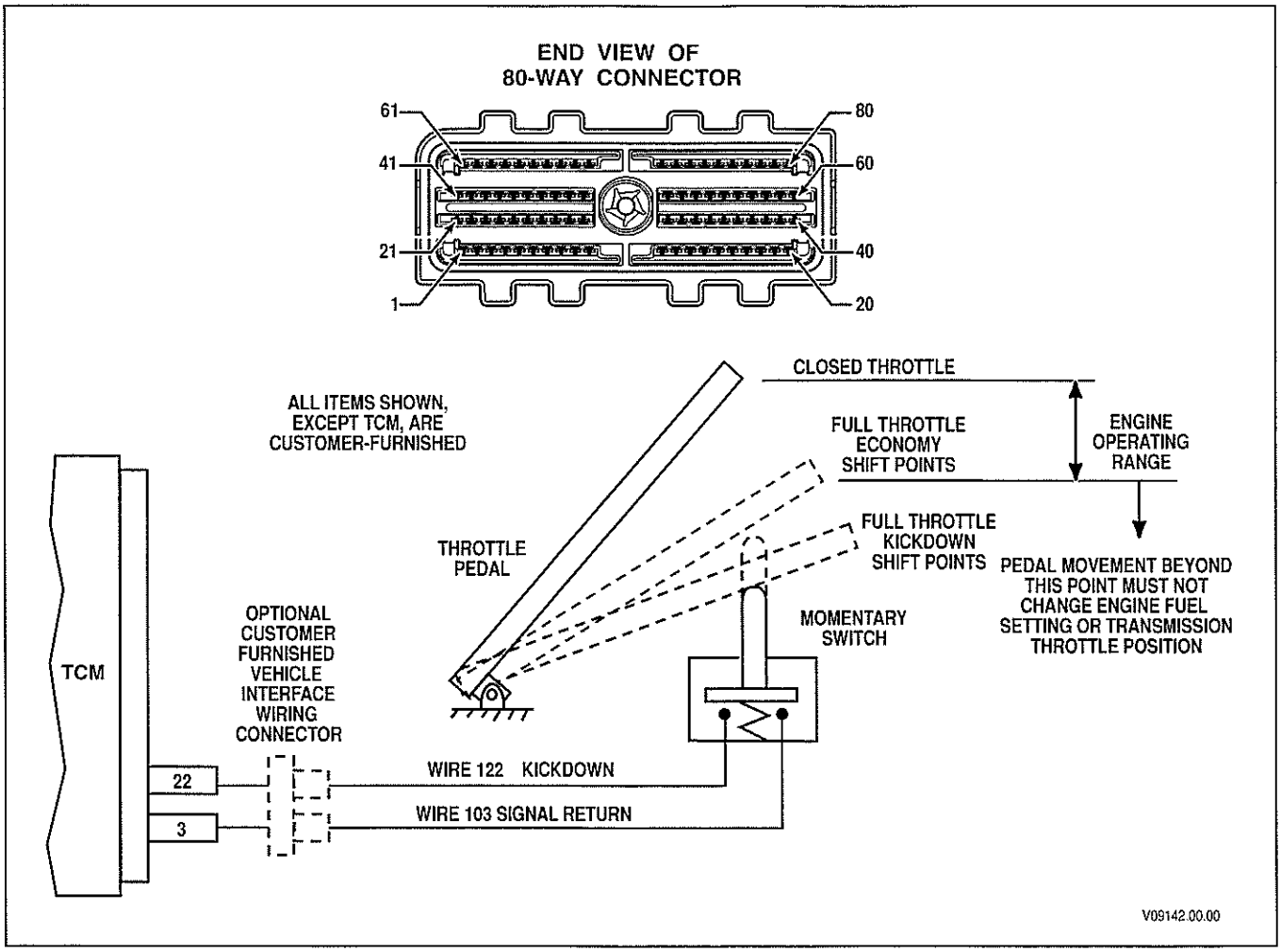
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2764 TCC PCS Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
8	Repair or replace the internal wiring harness. Is the repair complete?		*Go to Step 11*	
9	Replace solenoid TCC. 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 P278A Kickdown Input Failed ON



Circuit Description

The Transmission Control Module (TCM) can be calibrated to receive an acceleration pedal kickdown input from either an analog input wire or the digital data link. When the operator activates the kickdown feature in the Economy Mode, the TCM uses Performance shift points. A momentary, normally open switch attached to the throttle pedal typically generates the kickdown input signal. The switch provides a detente feel when full-throttle is achieved. When the operator "steps through" the detente, the kickdown function is activated.

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).
- The components are powered and engine speed is greater than 200 rpm and less than 750 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P278A sets if the TCM is calibrated to receive the kickdown input signal and both of the following conditions are met:

- Throttle percentage is less than 20 percent.
- The kickdown input signal is ON for more than 5 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P278A Kickdown Input Failed ON

Actions Taken When the DTC Sets

When DTC P278A is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- When analog input wires are used, the kickdown function is active when a switch is closed to complete the circuit between wire 122 and signal return wire 103. If a data link is used, the TCM receives "accelerator pedal kickdown input" as part of J1939 message parameters PGN 61443, Electronic Engine Controller 2 (EEC2).
- DTC P278A indicates the TCM has detected a kickdown input signal for more than 5 seconds with less than full throttle conditions. The code can be caused by:
  - — Faulty wiring
  - — Faulty connections to the accelerator pedal kickdown switch
  - — A faulty accelerator pedal kickdown switch
  - — Another controller improperly broadcasting kickdown signal on the data link when throttle conditions are not met
  - — A faulty TCM.
- Inspect the wiring for poor electrical connections at the TCM and kickdown input switch. 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.
- J1939 Kickdown status can be read on Allison DOC™ For PC–Service Tool. Monitor data link communications using Data Bus Viewer.

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.
4. This step tests for status of analog input wire 122.
5. This step determines if kickdown function activated by a data link message.
6. This step tests for shorts-to-ground in wire 122.
7. This step tests for proper kickdown switch function.
9. This step monitors received messages on the digital data link.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P278A Kickdown Input Failed 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	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Clear the DTC and drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the kickdown input signal is present for more than 5 seconds when throttle is below 20 percent.*** Did DTC P278A return?		*Go to Step 3*	*Go to Diagnostic Aids*
3	Inspect vehicle for analog kickdown input wire 122. Is analog input wire 122 present?		*Go to Step 4*	*Go to Step 9*
4	1. Turn ON the ignition. 2. Using Allison DOC™ For PC–Service Tool, observe status of Kickdown input wire 122. Does wire 122 go ON when throttle pedal is depressed and go OFF when throttle pedal is released?		*Go to Step 5*	*Go to Step 6*
5	Using Allison DOC™ For PC–Service Tool, observe status of Kickdown function? ***NOTE: If Kickdown function is ON while the Kickdown input wire 122 is OFF, the TCM is receiving a "Kickdown Input-Active" message via the data link.*** Is the Kickdown function ON when wire 122 is OFF?		*Go to Step 9*	*Go to Diagnostic Aids*
6	1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to J 47275 TCM Breakout. Leave the TCM-side disconnected. 4. Check for shorts-to-ground on wire 122. Were any shorts or wiring defects found?		*Go to Step 8*	*Go to Step 7*
7	1. Turn OFF the ignition. 2. Using a DVOM, check for continuity when switch is depressed and no continuity when switch is released. Does the switch close when depressed and open when released?		*Go to Step 9*	*Go to Step 8*

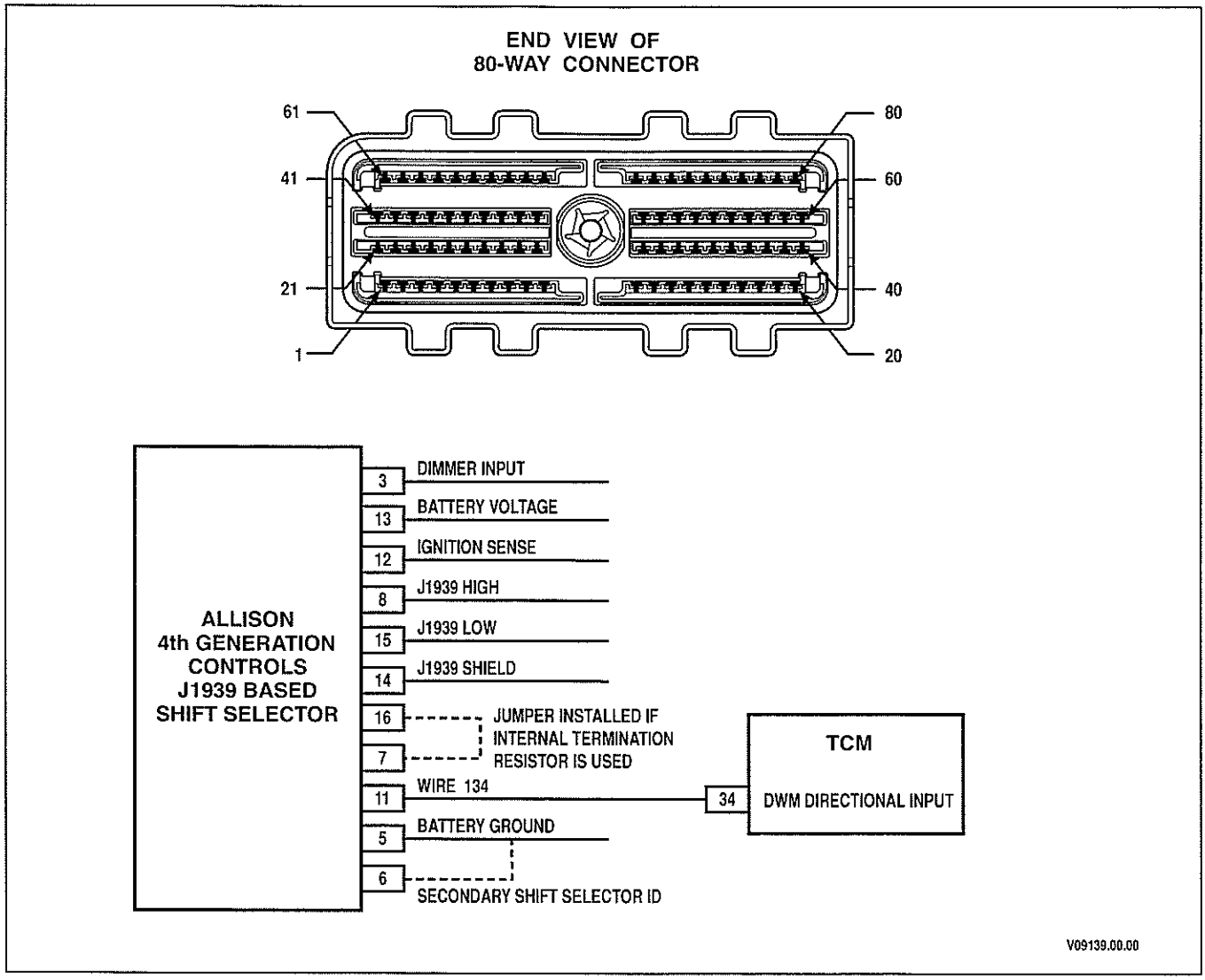
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P278A Kickdown Input Failed ON *(cont'd)*

Step	Action	Value(s)	Yes	No
8	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
9	1. Turn ON the ignition. 2. Reconnect the 80-way connector, if removed in Step 5. 3. Install Allison DOC™ For PC–Service Tool. 4. Turn ON the ignition. 5. Using Allison DOC™ For PC–Service Tool Data Bus Viewer, observe status of AP Kickdown Switch. Consult Allison DOC™ For PC–Service Tool User's Guide for instructions on using Data Bus Viewer. On Data Bus Viewer, does AP Kickdown Switch show ON when throttle pedal is depressed and OFF when throttle pedal is released?		*Go to Diagnostic Aids*	*Go to Step 10*
10	***NOTE: Allison Transmission is not responsible for data link messages that originate in other controllers. Repairs not associated with the transmission controller are not covered by Allison Transmission warranty.*** Coordinate with the vehicle or engine OEM to correct the cause of the inconsistent kickdown switch status message. Is the repair complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Use Allison DOC™ For PC–Service Tool to monitor retarder request percentage. 3. Drive the vehicle under conditions noted in the failure records. 4. Confirm with the service tool in the test passed section that the diagnostic test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2793 Gear Shift Direction Circuit



Circuit Description

Allison 4th Generation Controls shift selectors communicate with the transmission control module (TCM) by exchanging standardized digital messages over the SAE J1939 controller area network (CAN). The shift selectors are also equipped with a single wire backup to the J1939 CAN data link. Allison 4th Generation shift selectors transmit directional information (Forward, Neutral, and Reverse) in the form of an analog pulse-width modulated (PWM) signal via wire 134 to the TCM. The shift selector switches an internal driver ON and OFF to vary the duty cycle of the voltage on wire 134. When the driver in the shift selector is ON, the voltage on wire 134 is pulled to ground. When the driver is OFF, the driver's output is open and the voltage on wire 134 is high. Since duty cycle is measured when voltage is high, the driver's OFF-time determines the duty cycle. For example, if wire 134 duty cycle is 15 percent, the shift selector driver is ON (pulled low) 85 percent of the time and OFF (open) 15 percent of the time.

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).

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2793 Gear Shift Direction Circuit

Conditions for Setting the DTC

DTC P2793 sets when the TCM has received invalid data from the shift selector.

Actions Taken When the DTC Sets

When DTC P2793 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM ignores PWM signal from shift selector.
- If CAN is also lost, the TCM will lock in last valid direction.

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 P2793 is usually caused by an intermittent electrical defect in wire 134. Common causes include:
  - — An intermittent open in wire 134 between the shift selector and the TCM.
  - — An intermittent short-to-battery or short-to-ground in wire 134.
  - — A poor connection at the shift selector or the TCM.
  - — A defective shift selector.
- Inspect PWM signal wire 134 for poor electrical connections at the shift selector(s). 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.
- The PWM signal characteristics are shown in Table 6–18. When the vehicle is equipped with a primary and secondary shift selector, the TCM receives a PWM signal from the active shift selector only.

Table 6–18. PWM Signal Characteristics

	Primary Shift Selector 977 Hz 10 Hz (when active)	Secondary Shift Selector 871 Hz 10 Hz (when active)
Description	Duty Cycle (Percent)	
Unknown	15% ± 2%	15% ± 2%
Park	30% ± 2%	30% ± 2%
Reverse	45% ± 2%	45% ± 2%
Neutral	60% ± 2%	60% ± 2%
Forward	75% ± 2%	75% ± 2%
Error	90% ± 2%	90% ± 2%

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for wiring defects between the TCM and the active shift selector.

DTC P2793 Gear Shift Direction Circuit

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. Turn OFF the ignition. 2. Disconnect the 80-way connector at the TCM. 3. Connect the OEM 80-way connector to J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the shift selector(s). 5. Inspect wire 134 between the TCM and shift selector(s) for defects. 6. At J 47275-1 TCM Overlay, test pin 34 for wire-to-wire shorts, and shorts-to-ground, and opens between the TCM and shift selector. Massage the harness while making the wiring checks. Were any wiring defects found?		*Go to Step 4*	*Go to Step 3*
3	1. Verify ignition is OFF. 2. Reconnect the TCM and OEM 80-way connectors. 3. Disconnect the shift selector (s), if not disconnected in Step 2 above. 4. Using a digital multimeter (DVOM), test for continuity between pin 5 in the OEM shift selector connector and battery ground. Is there a clean ground to the shift selector?		*Go to Step 5*	*Go to Step 4*
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 8*	
5	***NOTE: If the vehicle has a primary and secondary shift selector, both must be disconnected to properly perform this step.*** 1. Disconnect the shift selector(s). 2. Turn ON the ignition. Leave the engine OFF. 3. Using a DVOM set on VDC, measure the voltage on pin 11 in the OEM shift selector connector. Is voltage within specified values?	4.5–5.0V	*Go to Step 7*	*Go to Step 6*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2793 Gear Shift Direction Circuit *(cont'd)*

Step	Action	Value(s)	Yes	No
6	Replace the affected shift selector. Is the replacement complete?		*Go to Step 8*	
7	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 8*	
8	In order to verify your repair: 1. Clear the DTC. 2. Refer to Allison DOC™ For PC–Service Tool "Test Passed" section and confirm the test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2808 Pressure Control Solenoid 6 (PCS6) 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 6 (PCS6) supplies hydraulic pressure to the C6 clutch in Low range for 7-speed models. The TCM sets a DTC P2808 when it detects a slip condition while PCS6 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 P2808 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 P2808 occurs, the TCM commands previous range.
- While Diagnostic Response is active, the TCM ignores shift selector input.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- This DTC indicates that the oncoming clutch controlled by PCS6 is not applied or applied too slowly. Common causes include:
  - — Erratic turbine or output speed signals.
  - — A leak or obstruction in the C6 clutch apply circuit.
  - — A defective solenoid.
  - — A stuck PCS6 regulator valve.
- PCS6 supplies hydraulic pressure to C6 clutch in Low range for 7-speed models. Check the Allison DOC™ For PC–Service Tool failure record data for previous or current range information when the DTC was set to determine which clutch circuit is suspect.

DIAGNOSTIC TROUBLE CODES (DTC)

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

Test Description

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

2. This step tests for proper transmission fluid level.
3. This step tests for active diagnostic codes.
4. This step tests ignition voltage.
5. This step tests speed sensor readings.
6. This step tests for C6 clutch pressure from PCS6.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P2808 Pressure Control Solenoid 6 (PCS6) Stuck Off

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition, leave engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the TCM has detected a slip condition and could not verify the correct oncoming ratio following a shift.*** Did DTC P2808 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 P2808 Pressure Control Solenoid 6 (PCS6) Stuck Off *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main and C6 pressure taps. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select and attain the range where the DTC occurred as indicated in the Failure Records. 6. Read and record Main and C6 clutch pressures. Are the pressure readings within specified values in Appendix B?	Refer to Main and Clutch Pressure specifications in Appendix B	*Go to Step 7*	*Go to Step 8*
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?		*Go to Step 10*	*Go to Diagnostic Aids*
8	1. Consult the appropriate service manual and remove the transmission hydraulic control module. 2. Inspect the control valve body for stuck or sticking solenoid regulator valves. 3. Inspect the suction filter. Ensure screen is not plugged. 4. Inspect for damaged gaskets and face seals. Was a valve body problem found and repaired?		*Go to Step 11*	*Go to Step 9*
9	Replace PCS6. Is the replacement complete?		*Go to Step 11*	
10	Remove the main and lube filters and inspect for clutch debris. It may also be necessary to remove the control module and inspect the suction screen for clutch debris. If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual). Is the replacement complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor engine, turbine and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2809 Pressure Control Solenoid 6 (PCS6) 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 6 (PCS6) supplies hydraulic pressure to the C6 clutch in Low range for 7-speed models. The TCM sets a DTC P2809 when it detects a tie-up condition while PCS6 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 P2809 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 P2809 occurs, the TCM will command previous range.
- While Diagnostic Response is active, the TCM ignores shift selector inputs.
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- This DTC indicates that the off-coming clutch controlled by PCS6 is not released or released too slowly. Common causes include:
  - — Erratic turbine and output speed sensor readings.
  - — An obstruction in the C6 clutch exhaust circuit.
  - — A defective PCS6 solenoid.
  - — A stuck PCS6 regulator valve.
- PCS6 supplies hydraulic pressure to C6 clutch in Low range for 7-speed models. Check the Allison DOC™ For PC–Service Tool failure record data for previous or current range information when the DTC was set to determine which clutch circuit is suspect.

DIAGNOSTIC TROUBLE CODES (DTC)

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

Test Description

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

2. This step tests for proper transmission fluid level.
3. This step tests for active diagnostic codes.
4. This step tests ignition voltage.
5. This step tests speed sensor readings.
6. This step tests for C6 clutch pressure from PCS6.
7. This step tests for evidence of clutch failure.
8. This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P2809 Pressure Control Solenoid 6 (PCS6) Stuck On

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips). Is the transmission fluid level correct?		*Go to Step 3*	*Go to Fluid Check Procedure (refer to mechanic's tips)*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition, leave engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the TCM has detected that the off-going clutch did not release (clutch tie-up) following a shift.*** Did DTC P2809 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*

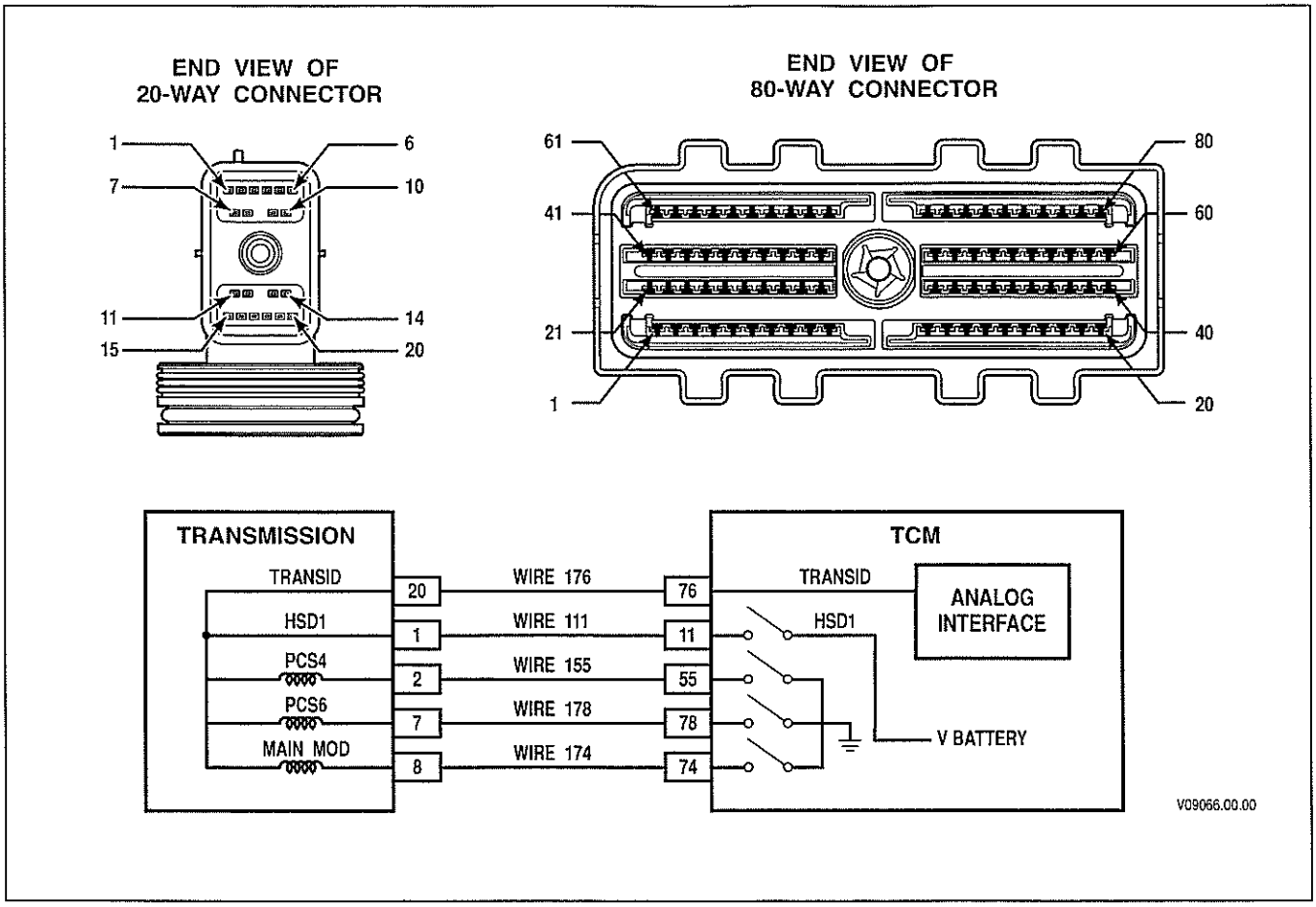
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2809 Pressure Control Solenoid 6 (PCS6) Stuck On *(cont'd)*

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition. 2. Install 2000 kPa (300 psi) pressure gauges in main and C6 pressure taps. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, select the clutch test mode. 5. With brakes applied, select and attain the range where the DTC occurred as indicated in the failure records. 6. Read and record Main and C6 clutch pressures. Are the pressure readings within specified values in Appendix B?	Refer to Main and Clutch Pressure specifications in Appendix B	*Go to Step 7*	*Go to Step 8*
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?		*Go to Step 10*	*Go to Diagnostic Aids*
8	1. Consult the service manual and remove the transmission hydraulic control module. 2. Inspect the control valve body for stuck or sticking solenoid regulator valves. 3. Inspect the suction filter. Be sure screen is not plugged. 4. Inspect for damaged gaskets and face seals. Was a valve body problem found and repaired?		*Go to Step 11*	*Go to Step 9*
9	Replace PCS6. Is the replacement complete?		*Go to Step 11*	
10	Remove the main and lube filters and inspect for clutch debris. It may also be necessary to remove the control module and inspect the suction screen for clutch debris. If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual). Is the replacement complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor engine, turbine and output speed sensor readings. 3. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2812 Pressure Control Solenoid 6 (PCS6) Control Circuit Open



Circuit Description

Pressure Control Solenoid 6 (PCS6) is a normally closed (N/C) solenoid used to apply the C6 clutch in low range (7-speed models only). The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS6 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCS6 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 PCS6 by switching PCS6 Low Side Driver (LSD) ON and OFF. Wire 178 completes the circuit between PCS6 and its LSD. DTC P2812 indicates that the TCM has detected an open condition in PCS6 electrical circuit. The open condition may exist in the high side (wire 111) or low side (wire 178).

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 P2812 is set when the TCM detects an open circuit on the PCS6 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2812 Pressure Control Solenoid 6 (PCS6) Control Circuit Open

Actions Taken When the DTC Sets

When DTC P2812 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC P2812 indicates an open in the electrical circuit for the PCS6 solenoid. In addition to PCS6, High Side Driver HSD1 also supplies power to the Main Mod and PCS4 solenoids. If DTC P2812 is accompanied by DTC P0960 (Main Mod solenoid open circuit) and/or DTC P2718 (PCS4 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 178 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 PCS6 resistance.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2812 Pressure Control Solenoid 6 (PCS6) Control Circuit Open

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). ***NOTE: This DTC is intended to detect an open condition in the PCS6 electrical circuit.*** Did DTC P2812 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout between the OEM and TCM 80-way connectors. 3. Install J 47279 Transmission Breakout between the OEM and transmission 20-way connectors. 4. Turn ignition ON, leave engine OFF. 5. Using Allison DOC™ For PC–Service Tool, enter Solenoid Test mode and command PCS6 ON. 6. Determine the voltage drop in the high side of the PCS6 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 11 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 1 and 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 PCS6 circuit as follows: • At J 47275-1 TCM Overlay, measure voltage between pin 78 and an isolated ground. • At J 47279-1 Transmission Overlay, measure voltage between pin 7 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*

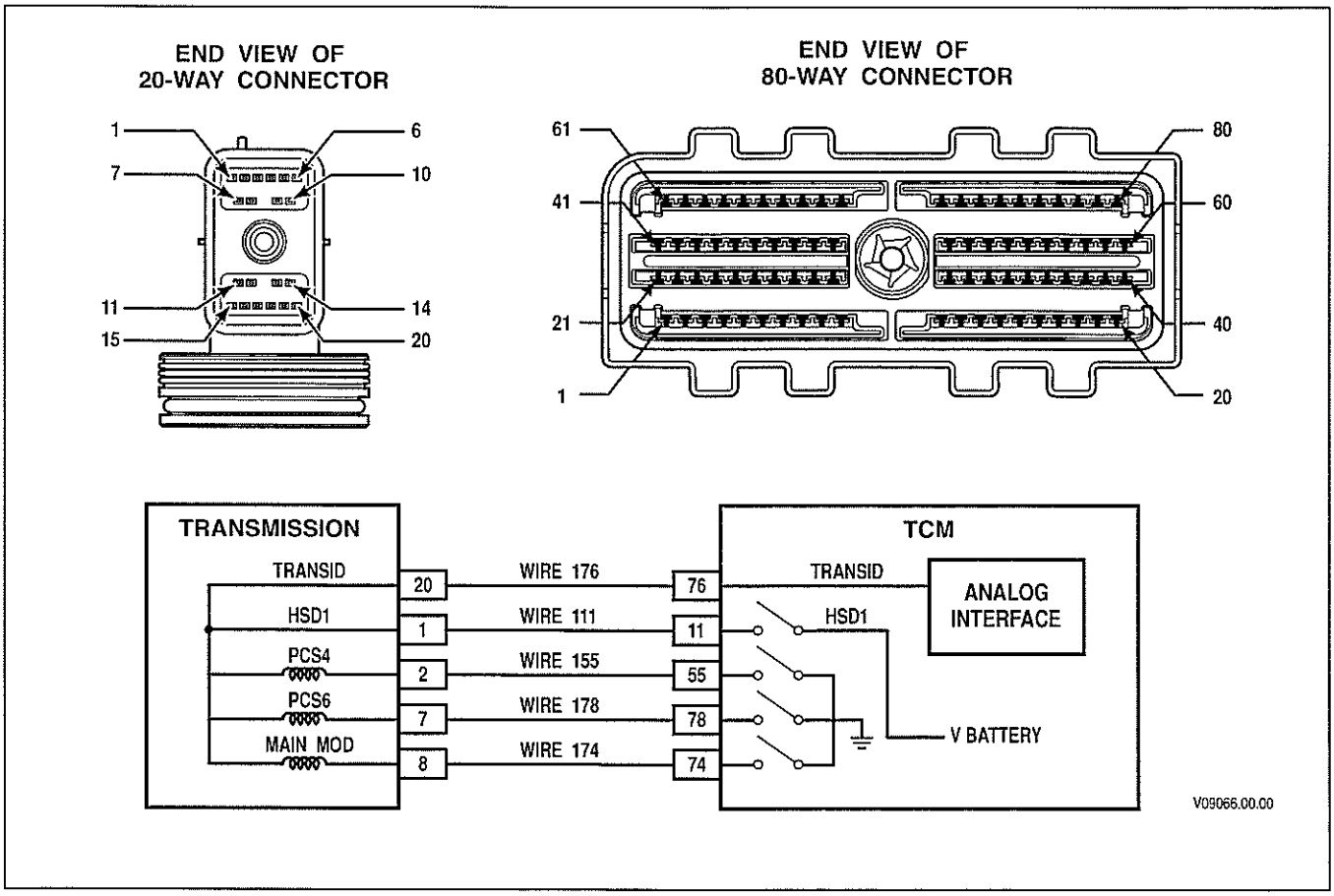
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2812 Pressure Control Solenoid 6 (PCS6) Control Circuit Open *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
6	1. Turn OFF the ignition. 2. Disconnect the OEM 20-way connector from J 47279 Transmission Breakout. Leave the transmission 20-way connector connected to the breakout. 3. Using a digital multimeter (DVOM), measure the resistance between pin 1 and pin 7 of the transmission 20-way connector. Is the resistance within the specified value?	Refer to Solenoid Resistance Chart (Appendix K)	*Go to Step 10*	*Go to Step 7*
7	1. Remove the hydraulic control module assembly. 2. Disconnect PCS6 from the internal wiring harness. 3. Using a DVOM, measure PCS6 resistance. 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 PCS6. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2814 Pressure Control Solenoid 6 (PCS6) Control Circuit Low



Circuit Description

Pressure Control Solenoid 6 (PCS6) is a normally closed (N/C) solenoid used to apply the C6 clutch in low range (7-speed models only). The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS6 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCS6 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 PCS6 by switching PCS6 Low Side Driver (LSD) ON and OFF. Wire 178 completes the circuit between PCS6 and its LSD. DTC P2814 indicates that the TCM has detected a short-to-ground condition in the low side of PCS6 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 P2814 is set when the TCM detects a short-to-ground in the PCS6 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2814 Pressure Control Solenoid 6 (PCS6) Control Circuit Low

Actions Taken When the DTC Sets

When DTC P2814 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC P2814 indicates a short-to-ground in the electrical circuit for the PCS6 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)—Measure solenoid LSD functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.
  3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
  4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
  5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts or a short-to-ground condition in wire 178.
6. This step tests for the wire-to-wire shorts or a short-to-ground in the internal transmission harness.

DTC P2814 Pressure Control Solenoid 6 (PCS6) Control Circuit Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). ***NOTE: This DTC is intended to detect short-to-ground condition in the PCS6 electrical circuit.*** Did DTC P2814 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 178 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 78 and all other pins in the 80-way connector, and shorts-to-ground between pin 78 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found?		*Go to Step 5*	*Go to Step 6*

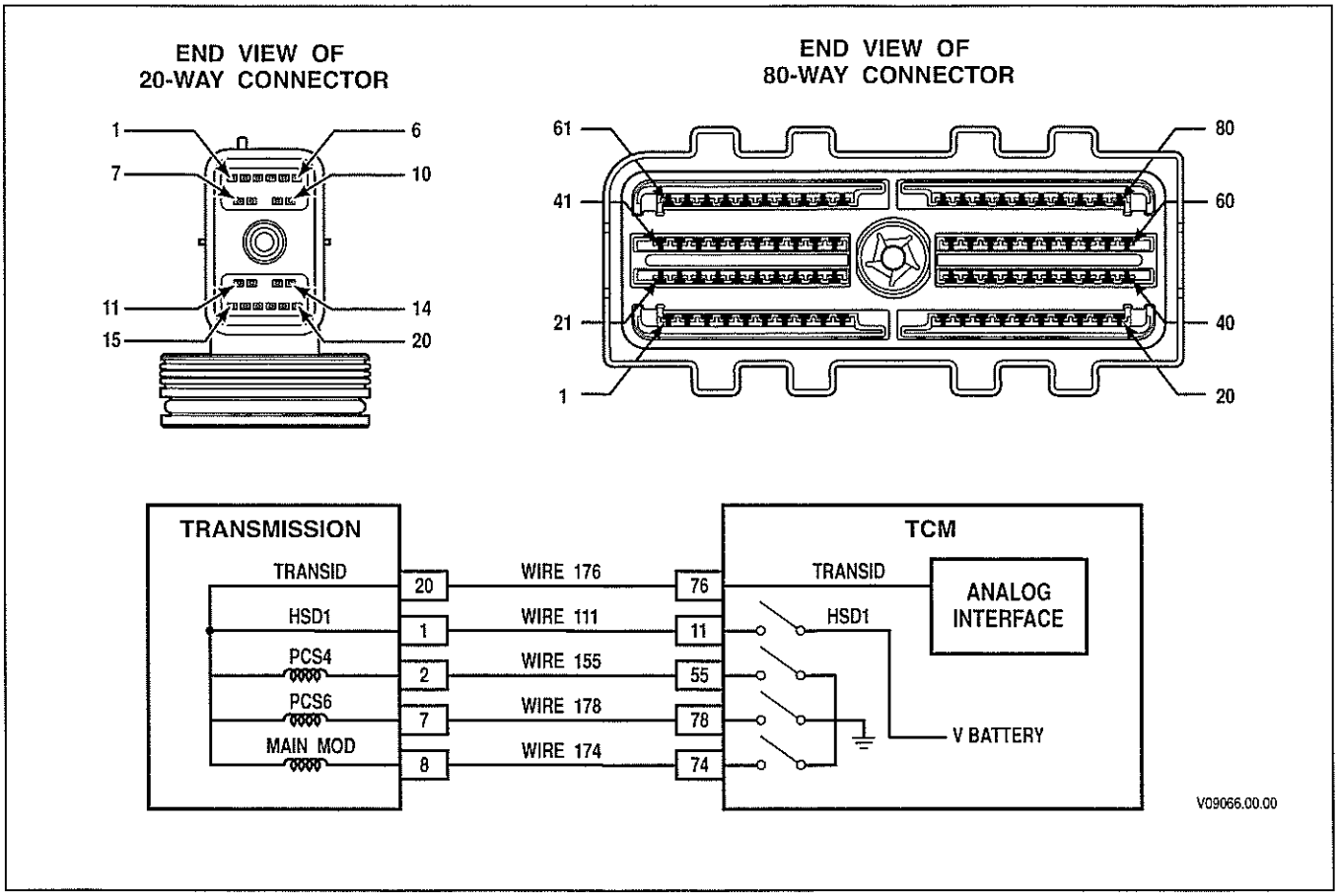
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2814 Pressure Control Solenoid 6 (PCS6) Control Circuit Low *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
6	1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 7 and all other pins in the 20-way connector, and shorts-to-ground between pin 2 and chassis ground. ***NOTE: The resistance value between pins 7 and 1, and between pins 7 and 20 will read normal solenoid resistance. The resistance value between pins 7 and 2, and between 7 and 8 will be twice normal solenoid resistance. Refer to the Solenoid Resistance chart for these values.*** Were any wire-to-wire shorts, or shorts-to-ground found?		*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 PCS6. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2815 Pressure Control Solenoid 6 (PCS6) Control Circuit High



Circuit Description

Pressure Control Solenoid 6 (PCS6) is a normally closed (N/C) solenoid used to apply the C6 clutch in low range (7-speed models only). The TCM commands the solenoid ON to produce hydraulic pressure in the clutch apply circuit. When PCS6 is commanded OFF, the clutch pressure is released.

The TCM sends control current to PCS6 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 PCS6 by switching PCS6 Low Side Driver (LSD) ON and OFF. Wire 178 completes the circuit between PCS6 and its LSD. DTC P2815 indicates that the TCM has detected a short-to-battery condition in the low side of PCS6 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 P2815 is set when the TCM detects a short-to-battery in the PCS6 return circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2815 Pressure Control Solenoid 6 (PCS6) Control Circuit High

Actions Taken When the DTC Sets

When DTC P2815 is active, the following conditions will occur:

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

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC P2815 indicates a short-to-battery in the electrical circuit for the PCS6 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)—Measure solenoid Low Side Driver functionality as follows:
  1. Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
  2. Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the VOLTS-DC scale and depressing the HERTZ button once.
  3. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
  4. Use Allison DOC™ For PC–Service Tool solenoid test function to command the solenoid ON and OFF.
  5. Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should read 0 hertz when the driver is commanded OFF.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests for wire-to-wire shorts between wire 178 and other wires in the OEM chassis harness.
6. This step tests for the wire-to-wire shorts in the transmission internal harness.

DTC P2815 Pressure Control Solenoid 6 (PCS6) Control Circuit High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Monitor ignition voltage. Is the voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 3*	*Resolve voltage problem*
3	1. Clear the DTC. 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). ***NOTE: This DTC is intended to detect short-to-battery condition in the PCS6 electrical circuit.*** Did DTC P2815 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wires 111 and 178 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 78 and all other pins in the 80-way connector. Were any wire-to-wire shorts found?		*Go to Step 5*	*Go to Step 6*

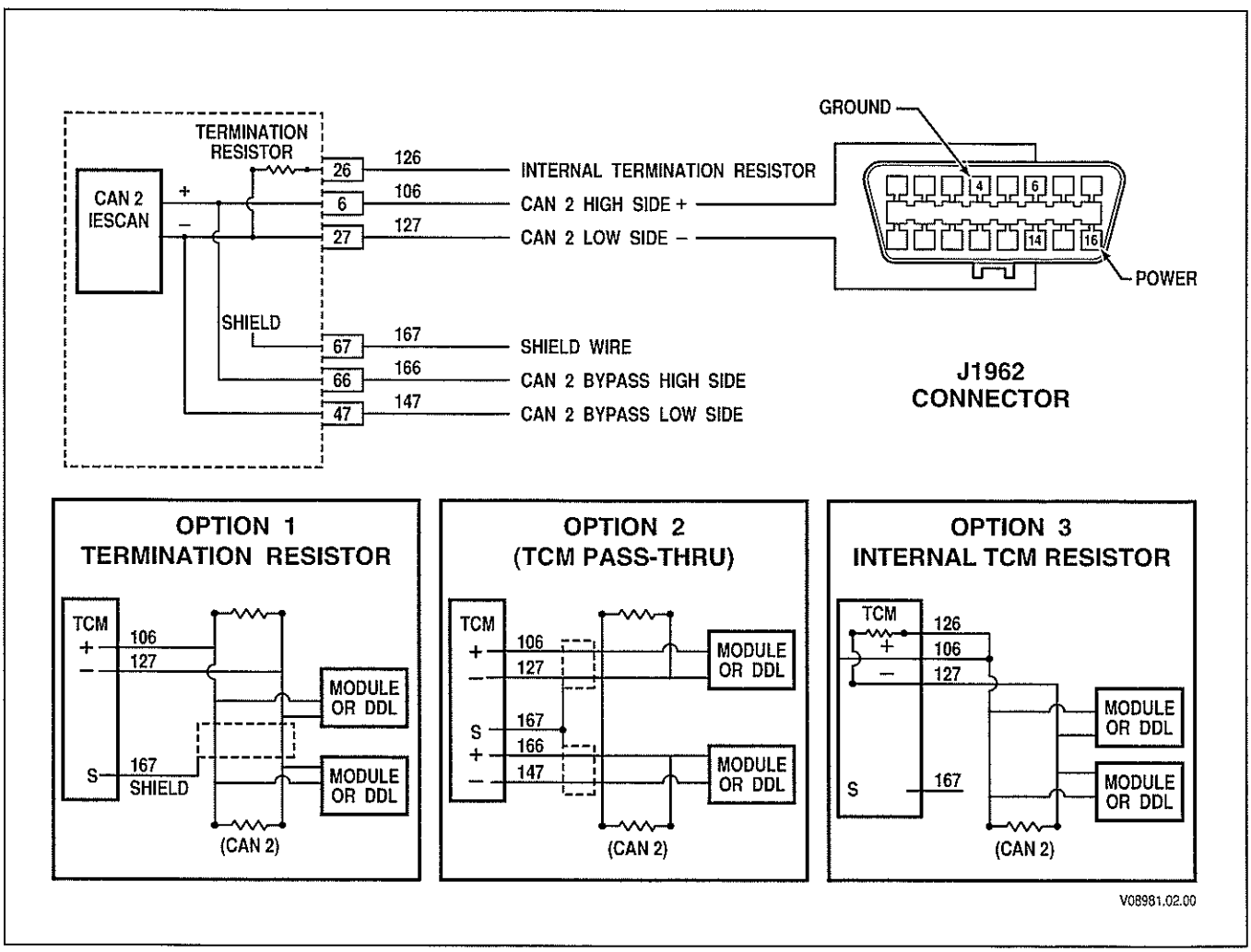
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2815 Pressure Control Solenoid 6 (PCS6) Control Circuit High *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the 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 7 and all other pins in the 20-way connector. ***NOTE: The resistance value between pins 7 and 1, and between pins 7 and 20 will read normal solenoid resistance. The resistance value between pins 7 and 2, and between 7 and 8 will be twice normal solenoid resistance. Refer to the Solenoid Resistance chart for these values.*** Were any wire-to-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-to-wire shorts. Were any wire-to-wire shorts found?	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 PCS6. Is the replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0001 Hi Speed CAN Bus Reset Counter Overrun (IESCAN)



Circuit Description

Beginnings in MY07, the Allison 4th Generation Controls transmission control module (TCM) is capable of communicating with some Mercedes engines via the IESCAN. The TCM uses the high-speed Controller Area Network 2 (CAN2) chip to exchange standardized messages with the engine controller and other vehicle systems. The IESCAN physical network consists of a two-wire twisted pair, two 120 Ohm resistors and, in most cases, a third shield wire. A 120 Ohm termination resistor is located at each end of the network. Vehicle OEMs may choose to install external termination resistors or use internal termination resistors built into many IESCAN electronic modules.

Conditions for Running the DTC

- Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC U0001 sets when the TCM detects no communication on the CAN2 backbone for 3 seconds or more.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0001 Hi Speed CAN Bus Reset Counter Overrun (IESCAN)

Actions Taken When the DTC Sets

When DTC U0001 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- SEM operation is not active, if applicable.
- The TCM defaults to the most recent adaptive shift values and uses default throttle percentage.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC U0001 indicates that a CAN bus hardware error has occurred. This may indicate a short-to-power or short-to-ground exists in the CAN bus wiring harness.
- Vehicle manufactures may use the following pin pairs for the J2284 CAN2 high and low wires:
  - — Pins 6 and 7
  - — Pins 66 and 47
  - — Both pins 6 and 27, and pins 66 and 47 in a "pass-through" setup.

  As a result, vehicle manufactures can wire the TCM into the CAN2 backbone in three different ways:
  - — The TCM may be on its own stub as in traditional CAN backbones.
  - — The TCM may be wired in a "pass-through" configuration such that the CAN high and low wires are connected to two separate pin pairs in the TCM 80-way connector. Data link messages pass-through but can still be viewed by the TCM.
  - — The TCM may represent one end of the backbone. Typically, the internal resistor in the TCM will be used in this setup.
- Often an active U0001 will prevent the Allison DOC™ For PC–Service Tool from communicating with the TCM. The J 47276 "T" Breakout and TCM Reflashing Harness may be used to confirm the TCM is operational. Connect the T-harness to the TCM and leave the OEM harness disconnected. Provide input power from the PCCS load box.
- Inspect the J2284 CAN wires 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.
- You may have to drive the vehicle in order to experience a fault.
- For proper J2284 data link communications, it is necessary to have two 120 Ohm resistors installed in parallel at the J2284 CAN backbone.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47276 "T" Breakout and TCM Reflashing Harness. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for communication with the TCM via the vehicle diagnostic connector.
3. This step tests for communication with the TCM via the T-harness.
4. This step inspects for wiring defects in the CAN backbone.

DTC U0001 Hi Speed CAN Bus Reset Counter Overrun (IESCAN)

	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. Connect Allison DOC™ For PC–Service Tool to the vehicle's diagnostic tool connector. 2. Turn ON the ignition. Leave the engine OFF. Is the Allison DOC™ For PC–Service Tool communicating with the TCM?		*Go to Diagnostic Aids*	*Go to Step 3*
3	***NOTE: Review Section 4—Wire Test Procedures before performing steps.*** 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install J 47276 "T" Breakout to the TCM. Leave the OEM-side disconnected. 4. Provide power to the TCM from the J 47455-A PCCS load box. 5. Connect Allison DOC™ For PC–Service Tool to the 16-pin J1962 connector in the T-harness. Is Allison DOC™ For PC–Service Tool communicating with the TCM?		*Go to Step 4*	*Go to Step 6*
4	1. Turn OFF the ignition. 2. Inspect the CAN2 high, CAN2 low, and CAN2 shield wires at the engine and transmission controllers for possible wire-to-wire shorts, shorts-to-ground, or shorts-to-battery. ***NOTE: Vehicle manufactures may used the following pin pairs for CAN high and CAN low.*** • ***Pins 6 and 27*** • ***Pins 66 and 47, or both pairs 6 and 27 and 66 and 47 in a "pass-through" setup.*** Were any wiring defects found?		*Go to Step 5*	*Go to Diagnostic Aids*

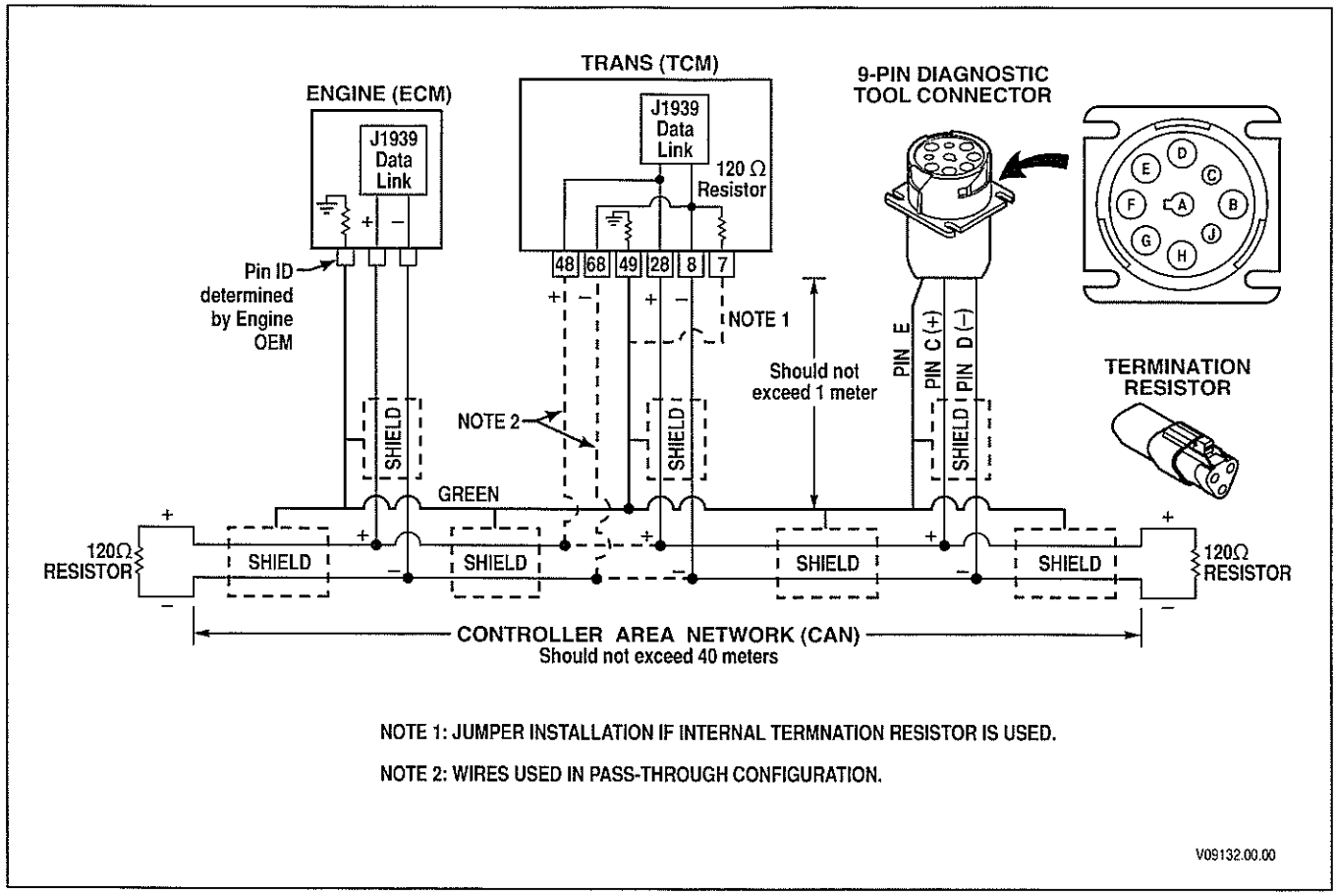
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0001 Hi Speed CAN Bus Reset Counter Overrun (IESCAN) *(cont'd)*

	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 7*	
6	***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 7*	
7	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. If communication is established with the TCM, use Allison DOC™ For PC–Service Tool to clear the DTC. 3. Confirm the TCM can communicate with the engine. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0010 CAN Bus Reset Counter Overrun



Circuit Description

In Allison 4th Generation Controls, the preferred digital data link is the SAE J1939 Controller Area Network (CAN). The TCM communicates with the engine control module and other controllers by exchanging standardized digital messages over the SAE J1939 CAN. The physical network consists of a two-wire twisted pair, two 120 Ohm termination resistors and, in most cases, a third shield wire. A 120 Ohm termination resistor is located at each end of the network. Vehicle OEMs may chose to install external termination resistors or use internal termination resistors built into many J1939 electronic modules.

Conditions for Running the DTC

- Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC U0010 sets when the TCM detects no communication on the CAN backbone for 3 seconds or more.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0010 CAN Bus Reset Counter Overrun

Actions Taken When the DTC Sets

When DTC U0010 active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- SEM operation is not active, if applicable.
- The TCM defaults to the most recent adaptive shifts values and uses default throttle percentage.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC U0010 indicates that a CAN bus hardware error has occurred. This may indicate a short-to-power or short-to-ground exists in the CAN bus wiring harness.
- Vehicle manufacturers may use the following pin pairs for the J1939 CAN high and CAN low wires:
  - — Pins 8 and 28
  - — Pins 48 and 68
  - — Both Pins 8 and 28, and Pins 48 and 68 in a "pass-through" setup
- As a result, vehicle manufacturers can wire the TCM into the CAN backbone in three different ways.
  - — The TCM may be on its own stub as in traditional CAN backbones.
  - — The TCM may be wired in a "pass-through" configuration such that the CAN high and low wires are connected to two separate pin pairs in the TCM 80-way connector. Data link messages pass-through but can still be viewed by the TCM.
  - — The TCM may represent one end of the backbone. Typically, the internal resistor in the TCM will be used in this setup.
- Often an active U0010 will prevent the Allison DOC™ For PC–Service Tool from communicating with the TCM. The J 47276 "T" Breakout and TCM Reflashing Harness may be used to confirm that the TCM is operational. Connect the T-harness to the TCM and leave the OEM harness disconnected. Provide input power from the PCCS load box.
- Inspect the J1939 CAN wires 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.
- You may have to drive the vehicle in order to experience a fault.
- For proper J1939 data link communications, it is necessary to have two 120 Ohm resistors installed in parallel at the J1939 CAN backbone.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47276 "T" Breakout and TCM Reflashing Harness. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for communication with the TCM via the vehicle diagnostic tool connector.
3. This step tests for communication with the TCM via the T-harness.
4. This step inspects for wiring defects in the CAN backbone.

DTC U0010 CAN Bus Reset Counter Overrun

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. Connect Allison DOC™ For PC–Service Tool to the vehicle's diagnostic tool connector. 2. Turn ON the ignition. Leave the engine OFF. Is Allison DOC™ For PC–Service Tool communicating with the TCM?		*Go to Diagnostic Aids*	*Go to Step 3*
3	1. Turn OFF the ignition. 2. Disconnect the 80-way connector at the TCM. 3. Install J 47276 "T" Breakout to the TCM. Leave the OEM-side 80-way connector disconnected. 4. Provide power to the TCM from the J 42455-A PCCS load box. 5. Connect Allison DOC™ For PC–Service Tool to the 9-pin connector in the T-harness. Is Allison DOC™ For PC–Service Tool communicating with the TCM?		*Go to Step 4*	*Go to Step 6*
4	1. Turn OFF the ignition. 2. Inspect the CAN1 high, CAN1 low, and CAN1 Shield wires at the engine and transmission controllers for possible wire-to-wire shorts, shorts-to-ground, or shorts-to-battery. ***NOTE: Vehicle manufacturers may use the following pin pairs for CAN high and CAN low:*** • ***Pins 8 and 28*** • ***Pins 48 and 68, or*** • ***Both pairs (8 and 28), and (48 and 68) in a "pass-through" setup.*** Were any wiring defects found?		*Go to Step 5*	*Go to Diagnostic Aids*
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the CAN wiring. Is the repair complete?		*Go to Step 7*	

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0010 CAN Bus Reset Counter Overrun *(cont'd)*

Step	Action	Value(s)	Yes	No
6	***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 7*	
7	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. If communication is established with the TCM, use Allison DOC™ For PC–Service Tool to clear the DTC. 3. Confirm the TCM can communicate with the engine. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0100 Lost Communication with ECM/PCM (J1587)

REFER TO ELECTRICAL SCHEMATIC IN APPENDIX J

Circuit Description

In Allison 4th Generation Controls, the TCM is capable of communicating with the engine control module and other controllers by exchanging standardized digital messages over the following data links:

- SAE J1939 Controller Area Network (CAN)
- SAE J1708/J1587 Serial Communications Interface
- SAE J2284 High Speed CAN for use in IESCAN applications

The TCM sets a DTC U0100 when it stops receiving certain information (throttle position, coolant temperature, or torque) from the engine controller via the J1587 serial communications interface.

Conditions for Running the DTC

- Ignition voltage is stable for a calibration time.
- Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0100 sets when the TCM detects that no engine torque or throttle messages have being received from the engine controller over the J1708/J1587 data link for 2 seconds or more.

Actions Taken when the DTC Sets

When DTC U0100 active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM defaults to the most recent adaptive shifts values and uses default throttle percentage.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the 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

- The following condition points to an open in one of the serial communication interface wires at the Engine Control Module:
  - — U0100 is active, and
  - — Allison DOC™ can view raw J1708/J1587 data from the TCM on data bus viewer when plugged into the 9-pin connector.
- Inspect the J1939 CAN wires 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 diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- You may have to drive the vehicle in order to experience a fault.

Test Description

2. This step tests for communications between the TCM and engine controller on the J1708/J1587 data link.
3. This step tests for communications between the TCM and engine controller using the J 47276 T-harness.
4. This step tests the J1708/J1587 serial communication interface wiring for open conditions or terminal damage.

DTC U0100 Lost Communication with ECM/PCM (J1587)

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. Connect Allison DOC™ For PC–Service Tool to the vehicle's diagnostic tool connector. 2. Turn ON the ignition. Leave the engine OFF. 3. Monitor Allison DOC™ For PC–Service Tool Data Bus Viewer. Can Allison DOC™ For PC–Service Tool read J1708/J1587 information from the TCM on Data Bus Viewer?		*Go to Step 4*	*Go to Step 3*
3	1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the TCM-side of the 80-way connector to the J 47276 "T" Breakout. Leave the OEM-side disconnected. 4. Provide power to the TCM from the J 42455-A PCCS load box. 5. Connect Allison DOC™ For PC–Service Tool to the 9-pin connector in the T-harness. Can Allison DOC™ For PC–Service Tool read J1708/J1587 information from the TCM on Data Bus Viewer?		*Go to Step 4*	*Go to Step 7*
4	1. Turn OFF the ignition. 2. Inspect the J1708/J1587 SCI wires at the TCM and engine controller for possible open conditions or terminal damage. Look for: • Connector not locked at module. • Terminal not locked in back shell. • Chafing of insulation. • Terminal damage or signs of corrosion. Were any wiring defects found?		*Go to Step 5*	*Go to Step 6*

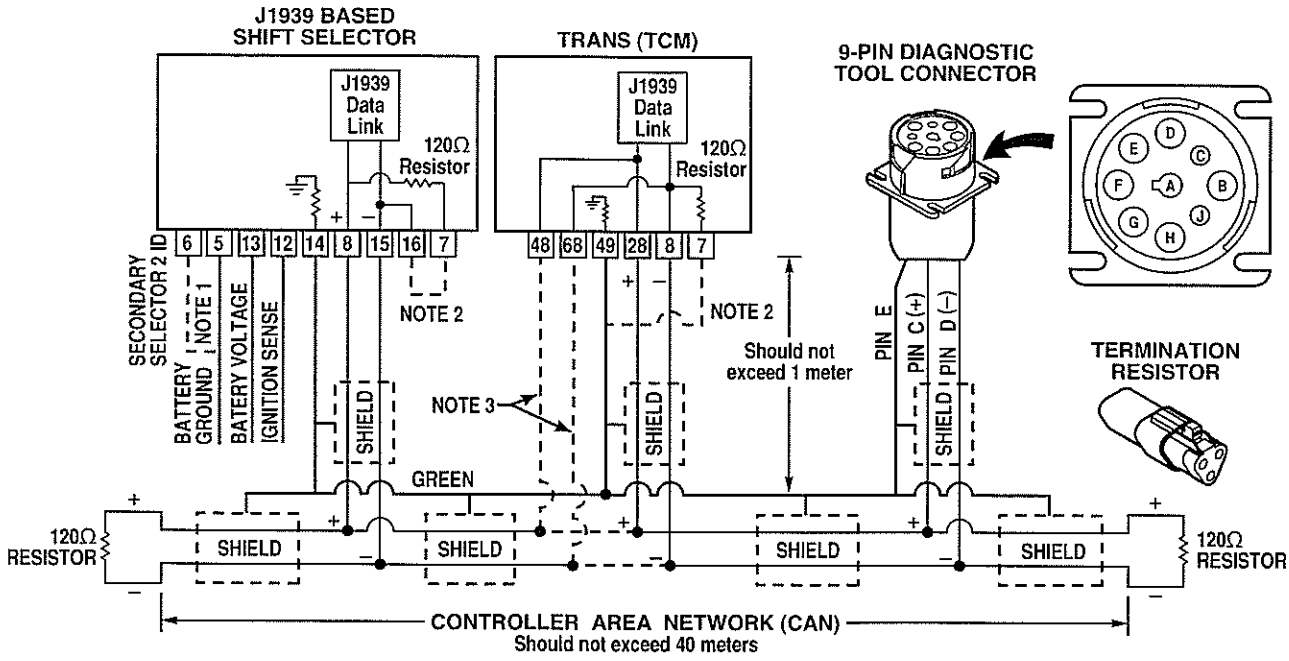
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0100 Lost Communication with ECM/PCM (J1587) *(cont'd)*

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 8*	
6	Return the vehicle to the OEM for inspection of the following: 1. The engine ECM is properly set to communicate with an Allison TCM. 2. Proper pin location at the engine ECM. 3. Proper operation of the ECM. Is the repair complete?		*Go to Step 8*	
7	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 8*	
8	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. If communication is established with the TCM, use Allison DOC™ For PC–Service Tool to clear the DTC. 3. Confirm the TCM can communicate with the engine. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0103 Lost Communication With Gear Shift Module (Shift Selector) 1



Circuit Description

Allison 4th Generation Controls shift selectors communicate with the transmission control module (TCM) by exchanging standardized digital messages over the SAE J1939 Controller Area Network (CAN). The physical network consists of a two-wire twisted pair, two 120 Ohm termination resistors and, in most cases, a third shield wire. A 120 Ohm termination resistor is located at each end of the network to maintain good J1939 signal quality. Vehicle OEMs may chose to configure the network to take advantage of 120 Ohm resistors built in to Allison 4th Generation Controls TCMs and shift selectors.

Conditions for Running the DTC

Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0103 sets when the TCM has not received a state of health (SOH) message from the primary shift selector for 2 or more seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0103 Lost Communication With Gear Shift Module (Shift Selector) 1

Actions Taken When the DTC Sets

When DTC U0103 active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The active shift selector will freeze the displays for 1.5 seconds, go blank for 10.5 seconds, then display cat-eyes, i.e. -\-, -\-.
- Direction change shifts, i.e., forward to Reverse, etc., are allowed based on PWM signal from Allison shift selectors.

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

- Vehicle manufacturers can configure the controller area network to use a built-in termination resistor in Allison shift selectors by installing a jumper between pins 7 and 18 at the primary shift selector connector. OEMs are required to clearly indicate where internal termination resistors have been used.
- DTC U0103 can be caused by the following conditions:
  - — An intermittent open between the shift selector and the connector node.
  - — A poor connection at the shift selector or the connector node.
  - — An intermittent open in the connector node.
  - — An open power or ground circuit to the shift selector.
  - — A defective shift selector.
- Inspect the J1939 CAN wires for poor electrical connections at the primary shift selector. 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.

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 power inputs to the primary shift selector.
3. This step tests for wiring defects between the primary shift selector and the connection to the J1939 backbone.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0103 Lost Communication With Gear Shift Module (Shift Selector) 1

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	Test the following primary shift selector circuits for an open or short-to-ground: 1. The battery power supply including fuses, if applicable. 2. The ignition sense circuit. 3. The ground return circuit. ***NOTE: DTC U0103 indicates the TCM did not detect a state of health message from the primary shift selector for 2 or more seconds. This may indicate an open in shift selector wiring or a defective shift selector.*** Did you find and correct the condition?		*Go to Step 6*	*Go to Step 3*
3	1. Turn OFF the ignition. 2. Disconnect the 80-way connector at the TCM and install J 47275 TCM Breakout. 3. Disconnect the shift selector(s). 4. Inspect the CAN backbone between the TCM and shift selector(s) for defects. 5. At J 47275-1 TCM Overlay, test for wire-to-wire shorts, and shorts-to-ground, and opens between shift selector at pins 8 (CAN Lo1), 28 (CAN Hi1), 48 (CAN Hi2), and 68 (CAN Lo2), if used. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts and opens between shift selector at pin 49 (CAN shield). ***NOTE: If the TCM internal resistor is used, the vehicle OEM will connect the wire 107 and wire 128 together in the external harness.*** 7. If TCM internal termination resistor is used, test for opens, wire-to-wire shorts, and shorts-to-ground at pin 7 (internal resistor). Were any wiring defects found?		*Go to Step 4*	*Go to Step 5*
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 6*	

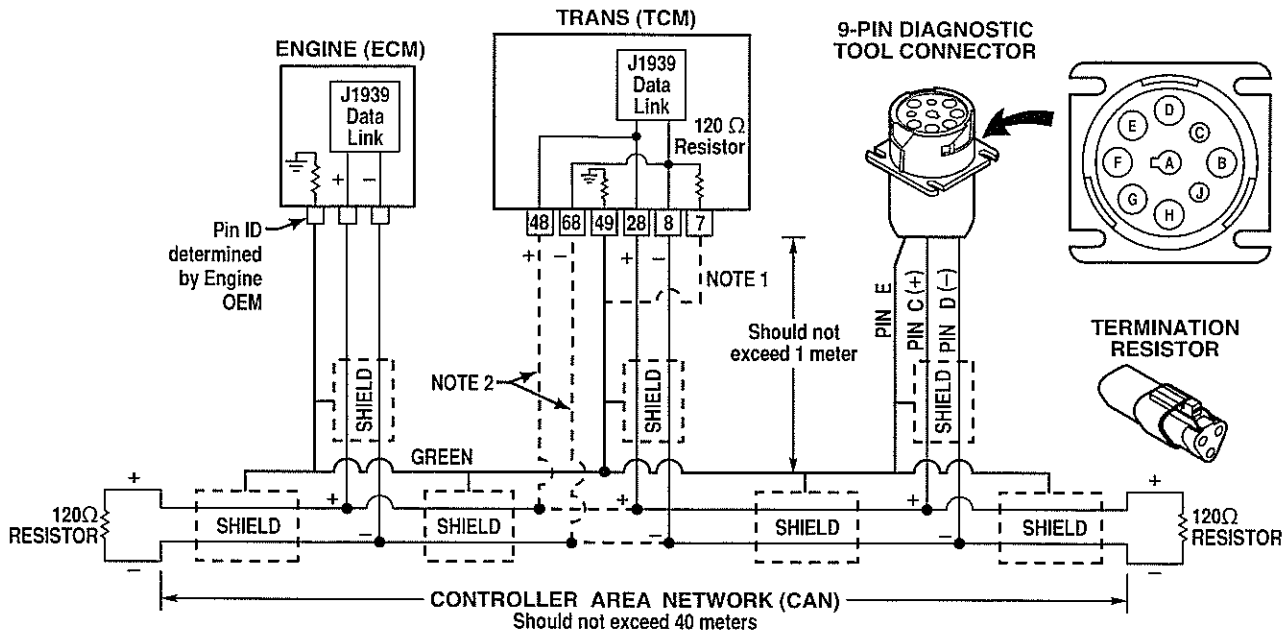
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0103 Lost Communication With Gear Shift Module (Shift Selector) 1 *(cont'd)*

Step	Action	Value(s)	Yes	No
5	Replace the primary shift selector. Is the replacement complete?		*Go to Step 6*	
6	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. Clear the DTC. 3. Verify the TCM responds to shift selector commands. 4. Refer to Allison DOC™ For PC–Service Tool "Test Passed" section and confirm the test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0115 Lost Communication With ECM



Circuit Description

- In Allison 4th Generation Controls, the TCM is capable of communicating with the engine control module and other controllers by exchanging standardized digital messages over the following data links:
  - — SAE J1939 Controller Area Network (CAN)
  - — SAE J1708/J1587 Serial Communication Interface
  - — SAE J2284 High Speed CAN for use in IESCAN applications.
- The TCM sets a DTC U0115 when it stops receiving certain information (throttle position, coolant temperature, or torque) from the engine controller via the J1939 CAN.

Conditions for Running the DTC

- Ignition voltage is stable for a calibration time.
- Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0115 sets when the TCM detects that no engine torque or throttle messages have been received from the engine controller over the J1939 for 2 seconds or more.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0115 Lost Communication With ECM

Actions Taken When the DTC Sets

When DTC U0115 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM defaults to the most recent adaptive shifts values and uses default throttle percentage.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the DTC from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- Often an active U0115 will prevent the Allison DOC™ For PC–Service Tool from communicating with the TCM. The J 47276 "T" Breakout and TCM Reflashing Harness may be used to confirm that the TCM is operational. The T-harness is only useful to confirm that the TCM is able to communicate with Allison DOC™ diagnostic tool.
- Vehicles that use SEM/LRTP may set a DTC U0115 when engine performance complaints are present. This may include injector concerns that could cause an engine to default to a "fail safe" mode. Some engine manufacturers may interrupt engine torque messaging, which will result in a DTC U0115. Inspect the engine side for possible engine diagnostic codes that may indicate that this condition is present and correct before performing further troubleshooting on DTC U0115.
- The following condition points to an open in one of the CAN wires at the Engine Control Module:
  - — U0115 is active, and
  - — Allison DOC™ For PC–Service Tool can communicate with the TCM when plugged into the 9-pin connector.
- This DTC can be caused if engine ECM parameters are improperly set.
- Inspect the J1939 CAN wires 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.
- You may have to drive the vehicle in order to experience a fault.
- For proper J1939 data link communications, it is necessary to have two 120 Ohm resistors installed in parallel at the J1939 CAN backbone.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

This DTC requires the use of the J 47276 "T" Breakout and TCM Reflashing Harness. The numbers below refer to step numbers on the diagnostic table.

2. This step tests for communications between the TCM and engine controller on the vehicle data link.
3. This step tests for communications between the TCM and the engine controller using the J 47276 "T" Breakout.
4. This step tests the J1939 CAN1 wiring for open conditions or terminal damage.
5. This step tests the J1939 CAN1 wiring for proper termination resistance value.

DTC U0115 Lost Communication With ECM/PCM (CAN)

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. Connect Allison DOC™ For PC–Service Tool to the vehicle's diagnostic tool connector. 2. Turn ON the ignition. Leave the engine OFF. Is Allison DOC™ For PC–Service Tool communicating with the TCM?		*Go to Step 4*	*Go to Step 3*
3	1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the TCM-side of the 80-way connector to the J 47276 "T" Breakout and TCM Reflashing Harness. Leave the OEM-side disconnected. 4. Provide power to the TCM from the J 42455 at PCCS load box. 5. Connect Allison DOC™ For PC–Service Tool to the 9-pin connector on the J 47276 "T" Breakout and TCM Reflashing Harness. Is Allison DOC™ For PC–Service Tool communicating with the TCM?		*Go to Step 4*	*Go to Step 9*
4	1. Turn OFF the ignition. 2. Inspect the CAN1 high, CAN1 low, and CAN1 Shield wires at the engine and transmission controllers for possible open conditions or terminal damage. Look for the following: • Connector stub not locked at module • Terminal not locked in back shell • Chafing of insulation • Terminal damage or signs of corrosion. Were any wiring defects found?		*Go to Step 7*	*Go to Step 5*
5	Using a DVOM, measure resistance between pins C and D at the vehicle 9-pin diagnostic connector. Did the resistance match the specified value?	60 Ohms	*Go to Step 8*	*Go to Step 6*

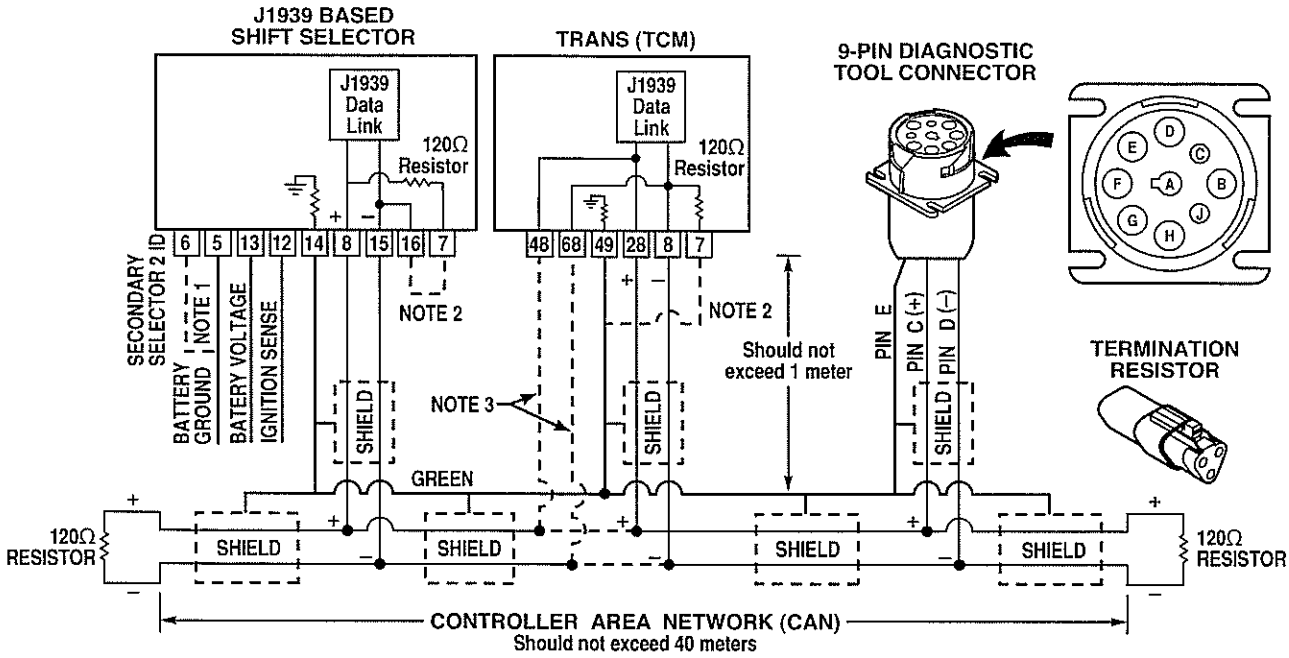
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0115 Lost Communication With ECM/PCM (CAN) *(cont'd)*

Step	Action	Value(s)	Yes	No
6	***NOTE: A resistance reading other than 60 Ohms indicates that a termination resistor is missing or a resistor with an improper value is installed. There should be two 120 Ohms resistors wired in parallel in the Controller Area Network.*** Return the vehicle to the OEM for repair. Is the repair complete?		*Go to Step 10*	
7	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 10*	
8	Return the vehicle to the OEM for inspection of the following: 1. The engine ECM is properly set to communicate with the Allison TCM. 2. Proper pin location at the engine ECM. 3. Proper operation of the ECM. Is the repair complete?		*Go to Step 10*	
9	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 10*	
10	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. If communication is established with the TCM, use Allison DOC™ For PC–Service Tool to clear the DTC. 3. Confirm the TCM can communicate with the engine. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0291 Lost Communication With Gear Shift Module (Shift Selector) 2



Circuit Description

Allison 4th Generation Controls shift selectors communicate with the transmission control module (TCM) by exchanging standardized digital messages over the SAE J1939 Controller Area Network (CAN). The physical network consists of a two-wire twisted pair, two 120 Ohm termination resistors and, in most cases, a third shield wire. A 120 Ohm termination resistor is located at each end of the network to maintain good J1939 signal quality. Vehicle OEMs may chose to configure the network to take advantage of 120 Ohm resistors built in to Allison 4th Generation Controls TCMs and shift selectors.

Conditions for Running the DTC

Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0115 sets when the TCM has not received a state of health (SOH) message from the secondary shift selector for 2 or more seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0291 Lost Communication With Gear Shift Module (Shift Selector) 2

Actions Taken When the DTC Sets

When DTC U0291 active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The active shift selector will freeze the displays for 1.5 seconds, go blank for 10.5 seconds, then display cat-eyes, i.e. -\-, -\-.
- Direction change shifts i.e. forward to Reverse, etc are allowed based on PWM signal from Allison shift selectors.

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

- Vehicle manufacturers can configure the controller area network to use a built-in termination resistor in the Allison shift selectors by installing a jumper between pins 7 and 18 at the secondary shift selector connector. OEMs are required to clearly indicate where internal termination resistors have been used.
- DTC U0291 can be caused by the following conditions:
  - — An intermittent open between the shift selector and the connector node.
  - — A poor connection at the shift selector or the connector node.
  - — An intermittent open in the connector node.
  - — An open power or ground circuit to the shift selector.
  - — A defective shift selector.
- Inspect the J1939 CAN wires for poor electrical connections at the secondary shift selector. 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.

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 power inputs to the secondary shift selector.
3. This step tests for wiring defects between the secondary shift selector and the connection to the J1939 backbone.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0291 Lost Communication With Gear Shift Module (Shift Selector) 2

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	Test the following secondary shift selector circuits for an open or short-to-ground: 1. The battery power supply including fuses, if applicable. 2. The ignition sense circuit. 3. The ground return circuit. ***NOTE: DTC U0291 indicates the TCM did not detect a state of health message from the secondary shift selector for 2 or more seconds. This may indicate an open in shift selector wiring or a defective shift selector.*** Did you find and correct the condition?		*Go to Step 6*	*Go to Step 3*
3	1. Turn OFF the ignition. 2. Disconnect the 80-way connector at the TCM and install J 47275 TCM Breakout. 3. Disconnect the shift selector(s). 4. Inspect the CAN backbone between the TCM and shift selector(s) for defects. 5. At J 47275-1 TCM Overlay, test for wire-to-wire shorts, and shorts-to-ground, and opens between shift selector at pins 8 (CAN Lo1), 28 (CAN Hi1), 48 (CAN Hi2), and 68 (CAN Lo2), if used. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts and opens between shift selector at pin 49 (CAN shield). ***NOTE: If the TCM internal resistor is used, the vehicle OEM will connect wire 107 and wire 128 together in the external harness.*** 7. If TCM internal termination resistor is used, test for opens, wire-to-wire shorts, and shorts-to-ground at pin 7 (internal resistor). Were any wiring defects found?		*Go to Step 4*	*Go to Step 5*
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 6*	

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0291 Lost Communication With Gear Shift Module (Shift Selector) 2 *(cont'd)*

Step	Action	Value(s)	Yes	No
5	Replace the secondary shift selector. Is the replacement complete?		*Go to Step 6*	
6	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. Clear the DTC. 3. Verify the TCM responds to shift selector commands. 4. Refer to Allison DOC™ For PC–Service Tool "Test Passed" section and confirm the test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0304 Incompatible Gear Shift Module 1 (Shift Selector) ID

No Schematic for this DTC

Circuit Description

In Allison 4th Generation Controls, the TCM communicates with the shift selector over the J1939 controller area network. Allison J1939 shift selectors broadcast proprietary messages to the TCM related to range selection and other operating modes. The TCM sets a DTC U0304 when the primary shift selector is not an Allison shift selector or on the approved list of shift selectors.

*NOTE: **The presence of DTC U0304 indicates the primary shift selector is not on the approved list of shift selectors. Contact the Allison Transmission Applications Engineering (1-800-252-5283) to obtain approval to use the shift selector.***

Conditions for Running the DTC

- Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- This test is run during the entire ignition cycle.

Conditions for Setting the DTC

DTC U0304 sets when the primary shift selector is not an Allison J1939-based shift selector, or on the approved list of OEM-provided shift selectors.

Actions Taken when the DTC Sets

When DTC U0304 active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM ignores shift selector inputs.
- TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the 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 TROUBLE CODES (DTC)

DTC U0333 Incompatible Gear Shift Module 2 (Shift Selector) ID

No Schematic for this DTC

Circuit Description

In Allison 4th Generation Controls, the TCM communicates with the shift selector over the J1939 controller area network. Allison J1939 shift selectors broadcast proprietary messages to the TCM related to range selection and other operating modes. The TCM sets a DTC U0304 when the primary shift selector is not an Allison shift selector or on the approved list of shift selectors.

*NOTE: **The presence of DTC U0304 indicates the primary shift selector is not on the approved list of shift selectors. Contact the Allison Transmission Applications Engineering (1-800-252-5283) to obtain approval to use the shift selector.***

Conditions for Running the DTC

- Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- This test is run during the entire ignition cycle.

Conditions for Setting the DTC

DTC U0304 sets when the primary shift selector is not an Allison J1939-based shift selector, or on the approved list of OEM-provided shift selectors.

Actions Taken when the DTC Sets

When DTC U0304 active, the following conditions will occur:

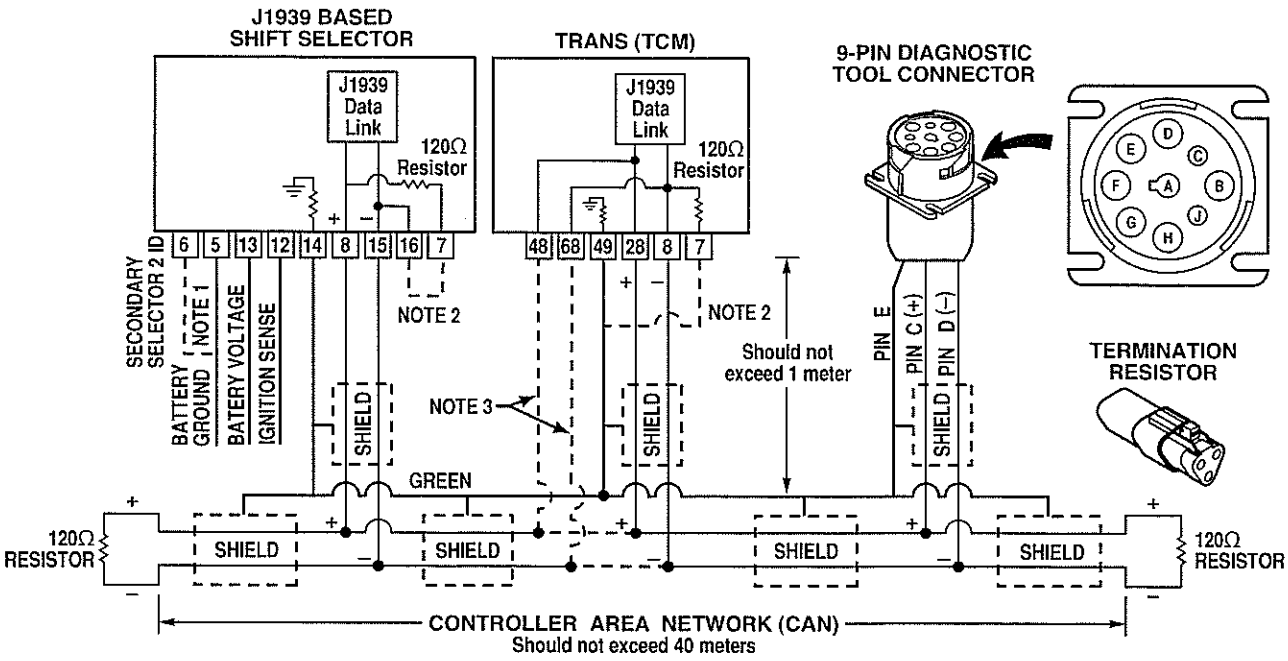
- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM ignores shift selector inputs.
- TCM freezes shift adapts (DNA).

Conditions for clearing the DTC/CHECK TRANS Light

The Allison DOC™ For PC–Service Tool can be used to clear the 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 TROUBLE CODES (DTC)

DTC U0404 Invalid Data Received From Gear Shift Module (Shift Selector) 1



Circuit Description

Allison 4th Generation Controls shift selectors communicate with the transmission control module (TCM) by exchanging standardized digital messages over the SAE J1939 Controller Area Network (CAN). The TCM sets a DTC U0404 when it receives invalid data from the primary shift selector.

Conditions for Running the DTC

Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0404 sets when the TCM detects invalid data from the shift selector.

Actions Taken When the DTC Sets

When DTC U0404 active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The active shift selector will freeze the displays for 1.5 seconds, go blank for 10.5 seconds, then display cat-eyes, i.e. -\-, -\-.
- Direction change shifts, i.e., forward to Reverse etc., are allowed based on PWM signal from Allison shift selectors.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0404 Invalid Data Received From Gear Shift Module (Shift Selector) 1

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 U0404 is typically caused by a defective primary shift selector.

Test Description

The number below refers to step numbers on the diagnostic table.

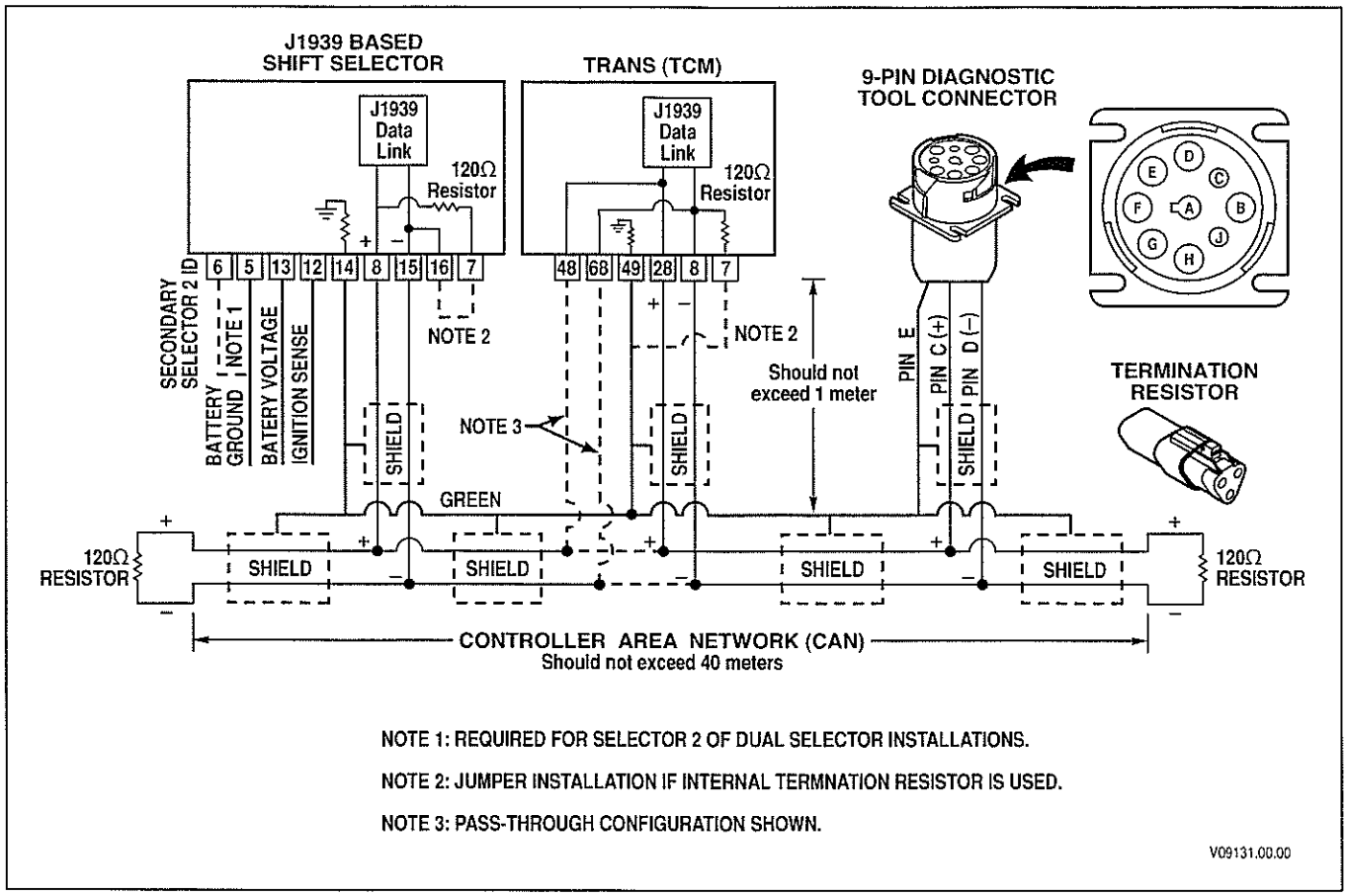
2. This step tests for proper power inputs to the primary shift selector.

DTC U0404 Invalid Data Received From Gear Shift Module (Shift Selector) 1

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	Test the following primary shift selector circuits for an open or short-to-ground: 1. The battery power supply including fuses, if applicable. 2. The ignition sense circuit. 3. The ground return circuit. ***NOTE: DTC U0404 indicates the TCM did not detect valid data from the primary shift selector. This may indicate an open in shift selector wiring or a defective shift selector.*** Did you find and correct the condition?		*Go to Step 4*	*Go to Step 3*
3	Replace the primary shift selector. Is the replacement complete?		*Go to Step 4*	
4	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. Clear the DTC. 3. Verify the TCM responds to shift selector commands. 4. Refer to Allison DOC™ For PC–Service Tool "Test Passed" section and confirm the test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0592 Invalid Data Received From Gear Shift Module (Shift Selector) 2



Circuit Description

Allison 4th Generation Controls shift selectors communicate with the transmission control module (TCM) by exchanging standardized digital messages over the SAE J1939 Controller Area Network (CAN). The TCM sets a DTC U0592 when it receives invalid data from the secondary shift selector.

Conditions for Running the DTC

Ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0592 sets when the TCM has detects invalid data from the shift selector.

Actions Taken When the DTC Sets

When DTC U0592 active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The active shift selector will freeze the displays for 1.5 seconds, go blank for 10.5 seconds, then display cat-eyes, i.e. -\-, -\-.
- Direction change shifts, i.e., forward to Reverse etc., are allowed based on PWM signal from Allison shift selectors.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0592 Invalid Data Received From Gear Shift Module (Shift Selector) 2

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 U0592 is typically caused by a defective secondary shift selector.

Test Description

The number below refers to step numbers on the diagnostic table.

2. This step tests for proper power inputs to the secondary shift selector.

DTC U0592 Invalid Data Received From Gear Shift Module (Shift Selector) 2

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	Test the following secondary shift selector circuits for an open or short-to-ground: 1. The battery power supply including fuses, if applicable. 2. The ignition sense circuit. 3. The ground return circuit. ***NOTE: DTC U0592 indicates the TCM did not detect valid data from the secondary shift selector. This may indicate an open in shift selector wiring or a defective shift selector.*** Did you find and correct the condition?		*Go to Step 4*	*Go to Step 3*
3	Replace the secondary shift selector. Is the replacement complete?		*Go to Step 4*	
4	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. Clear the DTC. 3. Verify the TCM responds to shift selector commands. 4. Refer to Allison DOC™ For PC–Service Tool "Test Passed" section and confirm the test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

NOTES

SECTION 7—INPUT AND OUTPUT FUNCTIONS

7–1. INPUT FUNCTIONS

Input functions are signals sent into the TCM that prompt the TCM to take action. Input functions are activated and deactivated by switched ignition power or ground (wire 103) to the TCM (wired through the VIW), or through the **MODE** button on the shift selector. The following input functions can be activated using the **MODE** button:

- Secondary Shift Schedule
- D1 Selection (available with pushbutton selector only)
- PTO Enable
- Auto 2–1 Preselect for 7-Speeds

The wiring schematic in Appendix J illustrates installation requirements for input functions and designates specific wire numbers in the transmission control system to be used for the activation of these input functions. Appendix J should be used for reference only. The vehicle manufacturer determines which input functions are programmed, which wires are used, and whether voltage input was positive or ground. Wiring schematics for input and output functions are shown in Appendix P. Use Allison DOC™ For PC–Service Tool to determine which wire was programmed for a particular input function and the wiring schematic can be consulted to find out if input to the TCM is + or – voltage. Refer to Allison publication GN3433EN, User Guide for Allison DOC™ For PC–Service Tool, for further information regarding special input functions and other inhibits.

*NOTE: **The wiring schematic in Appendix J shows the intended use of the control features specified. These features have only been validated in the configuration shown. ANY USE OF THESE FEATURES WHICH DIFFERS FROM WHAT IS SHOWN IS NOT THE RESPONSIBILITY OF ALLISON TRANSMISSION.***

CAUTION:	**NEVER use chassis ground as an INPUT FUNCTION ground. Chassis ground can carry voltage potential of 1 or 2 volts above battery ground. This non-approved input will "confuse" the TCM and cause erroneous input results. Be sure to use wire 103 which is signal ground.**

Activating an input function can inhibit transmission operation in the same manner as a diagnostic code. Use the Allison DOC™ For PC–Service Tool to verify an active input function or a diagnostic code inhibit. Refer to Allison publication GN3433EN, User Guide for Allison DOC™ For PC–Service Tool, for further information regarding special input functions and other inhibits. For more detailed information on input functions, refer to the Allison Tech Data Book 4th Generation Controls and General Information.

The maximum number of input and output functions which may be used in any installation depends upon the transmission model and its features. Refer to Table 7–1.

Table 7–1. Input/Output Function Availability

Transmission Model	Auxiliary Transmission Controls Functions	Number Of Input Functions	Number Of Output Functions
6-Speed and 4000 7-Speed Transmissions	Retarder	12 + Mode Button	8
3000 7-Speed Transmissions	Transfer Case	12 + Mode Button	8

INPUT AND OUTPUT FUNCTIONS

The following input functions inhibit direction change shifts (forward to reverse or reverse to forward):

- Auxiliary Function Range Inhibit (standard)
- Auxiliary Function Range Inhibit (special)
- Quick to Neutral, Pump Option
- Automatic Neutral for PTO
- Automatic Neutral at Stop
- Reverse Enable
- Automatic Neutral for Refuse Packers
- Automatic Neutral for Refuse Packers with Service Brake Input
- Direction Change Enable

The following input functions lock the transmission in fourth range:

- Fire Truck Pump Mode
- Fourth Lockup Pump Mode

The following input functions preselect a lower range:

- Engine Brake and Preselect Request (standard)
- Engine Brake and Preselect Request (special)

The following input functions inhibit upshifts:

- D1 Selection
- Auxiliary Hold

The following input functions inhibit lockup shifts:

- Manual Lockup
- Anti-lock Brake Response

The following input function inhibits range and lockup shifts at high horsepower:

- Shift Enable/Shift in Process (Oil Field Application)

The following functions are general restrictions to normal operation:

- High Input Speed causes neutral to range inhibit
- Medium Cold Oil causes operation confined to **R** (Reverse), **N** (Neutral), and **2**nd-range start
- Hot Oil restricts operation to **4**th-range maximum (except emergency applications)
- Two Speed Axle Enable permits change only at low output speed and throttle
- Special Pattern Logic monitors **N** or **D** or **N** to **R** shifts; if engine throttle or output speed is too high, the transmission remains in **N**.
- Wheel Lock disengages the lockup clutch and inhibits forward range downshifts and shifts to reverse
- Anti-lock Brake Response deactivates the retarder and disengages the lockup clutch
- High Throttle during **N** (Neutral) to any range shift causes a revised clutch pressure apply rate and turns off shift adaptive
- Power loss to the TCM restricts operation to certain ranges. Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of logic values determine the range attained.

The following input function limits operation to **1**st-range and **N** (Neutral):

- Refuse Vehicle Step Switch

INPUT AND OUTPUT FUNCTIONS

7–2. OUTPUT FUNCTIONS

Output functions are signals sent out by the TCM that activate or control devices or mechanisms. These control devices or mechanisms are controlled by relays or direct connection signals from the TCM.

Many input and output functions are closely related. For example, the PTO Enable option (input function) also includes PTO Output wiring information. When searching for output function information, be sure to review any related input function information references.

The wiring schematics in Appendix J and Appendix P illustrate installation requirements for output functions as well as input functions and designate specific wire numbers in the transmission control system to be used for the activation of these output functions. The wiring schematics in Appendix J should be used for reference only. Ask the vehicle manufacturer which specific output functions are programmed and which wires are used. Output function polarity is not significant when an Allison-supplied VIM is used. The Allison DOC™ For PC–Service Tool can also be utilized to determine which wire was programmed for a particular output function. For more detailed information on output functions, refer to Allison Tech Data, Allison 4th Generation Controls 3000 and 4000 Product Families on the Allison Transmission Extranet. The schematics in Appendix P are from Allison Tech Data.

INPUT AND OUTPUT FUNCTIONS

NOTES

SECTION 8—GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

IMPORTANT:

Determine the following before beginning specific troubleshooting, removing the transmission, or removing attached components.

- Are there active diagnostic codes?
- Is the lever shift selector lever in N (Neutral) to allow starting the engine?
- Is the battery properly connected and charged?
- Is isolated battery properly connected (if used)?
- Is the fluid level correct?
- Is voltage to the TCM correct?
- Is the engine properly tuned?
- Is fuel flow to the engine correct?
- Are wheel chocks in place?
- Is air flow to the cooler and radiator unrestricted?
- Is the driveline properly connected?
- Are there signs of fluid leakage under the vehicle? What is the origination point?
- Are hydraulic connections correctly made and not leaking?
- Is vehicle acceleration from a stop changed?
- Are electrical connections correctly made?
- Are there any other obvious vehicle or transmission problems?
- Are clutch pressures within specified limits?

Use the various sections of this manual to isolate the listed problems. The following charts address specific vehicle complaints. Some complaints involve diagnostic codes, so all troubleshooting should involve determining if the system has set any diagnostic codes.

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 8–1. Troubleshooting Performance Complaints

Problem	Probable Cause	Suggested Remedy
SHIFT SELECTOR DISPLAYS "CATEYE" AND VEHICLE IS NOT OPERABLE	No communication between the TCM and a remote shift selector	Refer to code U0103 or U0291 in Troubleshooting Procedure
SHIFT SELECTOR DISPLAY IS BLANK	VIM fuse is blown	Replace VIM fuse
	Fuse blown in OEM substitute	Replace VIM fuse
	Failed CAN (J1939) Data Link	Should change to "cateye" (-\-) within 12 seconds (see Code U0103 or U0291)
SHIFT SELECTOR NOT LIGHTED AT NIGHT (WHEN HEADLIGHTS ARE ON)	OEM input wire at pin 3 of shift selector connector not connected or improperly connected	Find wire at pin 3 and connect it or install it, if necessary
VEHICLE WILL NOT START (ENGINE WILL NOT CRANK)	Lever shift selector not in **N** (Neutral)	Select **N** (Neutral) and restart
	Dead battery	Recharge battery
	Disconnected battery	Reconnect battery
	Faulty starter circuit	Repair vehicle starter circuit
	Faulty neutral start relay	Replace neutral start relay
	Faulty wiring in neutral start circuit	Repair wiring
	Calibration programmed to J 1939 neutral start message (neutral start relay not used)	Troubleshoot J1939 wiring (CAN link)
	Voltage to TCM too low	Measure battery and charging system voltage
	Faulty ignition wire (163)	Repair wire 163
	Faulty lever shift selector	Replace lever shift selector
	Lack of battery voltage on Circuit 141 from TCM when in neutral	Repair Circuit 141 or replace TCM
All display segments of display lighted	Shift selector in initialization (approximately 2 seconds)	None, normal
	Faulty TCM	Replace the TCM

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 8–1. Troubleshooting Performance Complaints *(cont'd)*

Problem	Probable Cause	Suggested Remedy
CHECK TRANS LIGHT WILL NOT GO OUT AT START-UP		
A. Vehicle Drives Normally	Faulty **CHECK TRANS** light, relay, or circuit	Replace relay or repair circuit
	An LED rather than a lamp is installed for the **CHECK TRANS** light and the LED is partially lighted from leakage current	Install a lamp rather than an LED for the **CHECK TRANS** light
B. Vehicle Does Not Drive	Engine does not start	Repair engine starting system
	Faulty harness	Repair harness (Section 4 and Appendix E)
	Faulty interface wiring to vehicle electrical system	Repair wiring (Appendix E)
	Faulty TCM	Replace the TCM
CHECK TRANS LIGHT FLASHES INTERMITTENTLY	Intermittent power to TCM	Test input power to the TCM and correct if necessary
	Loose wiring to **CHECK TRANS** light	Repair wiring
	Faulty or incorrect ground wire attachment	Repair ground circuit
	Intermittent opening in Circuit 129	Repair Circuit 129
NO **CHECK TRANS** LIGHT AT IGNITION	Faulty light bulb or socket	Replace light bulb or socket
	Incorrect wiring to and from **CHECK TRANS** light bulb	Repair wiring (Appendix E)
	Faulty wiring harness	Inspect wiring between TCM and **CHECK TRANS** light, and repair where necessary (Appendix E)
	Circuit 129 open	Repair Circuit 129
	Vehicle wired for J1939 **CHECK TRANS** light but calibration doesn't support that message	Reprogram with correct calibration
	Faulty TCM	Replace TCM

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 8–1. Troubleshooting Performance Complaints *(cont'd)*

Problem	Probable Cause	Suggested Remedy
TCM WILL NOT TURN OFF WHEN IGNITION SWITCH OFF	Faulty ignition switch	Replace ignition switch
	Externally-generated speed sensor signal(s)—refer to Appendix L for detailed inspection	Find source of false speed sensor signal(s) and correct problem
TRANSMISSION WILL NOT SHIFT TO FORWARD OR REVERSE (STAYS IN NEUTRAL)	Engine rpm too high*	Reduce engine rpm. Also, it may be necessary to reselect **N** (Neutral) and then **D** (Drive) or **R** (Reverse).
	Low fluid level	Add fluid to proper level. Refer to appropriate transmission mechanic's tips for proper dipstick calibration.
	Throttle position sensor or linkage is not functioning properly*	Refer to throttle position sensor for correct set-up (Appendix F)
	Voltage to TCM too low*	Test vehicle battery and charging system
	Shift selector is not functioning properly	Replace shift selector
	Disconnected or dirty connectors	Perform connector checkout (Appendix E)
	Faulty wiring harnesses	Repair harness (Appendix E)
	Speed sensor(s) not functioning properly*	Repair or replace speed sensor(s) or circuitry. Refer to appropriate transmission service manual and Appendix E.
	Faulty TCM	Replace the TCM
	Input function wire open and "auxiliary function range inhibit", or "direction change enable" in the calibration*	Test input function programming with Allison DOC™ For PC–Service Tool. Correct wiring or switch problem which does not allow input function wire to be grounded.
	"Auxiliary Function Range Inhibit-Standard" or "direction change enable"—hooked up to brake pressure*	Apply brakes with high force

* Flashing digital display on shifter.

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 8–1. Troubleshooting Performance Complaints *(cont'd)*

Problem	Probable Cause	Suggested Remedy
TRANSMISSION WILL NOT STAY IN FORWARD OR REVERSE	Auto-neutral or quick-to-neutral circuit (input function) faulty	Repair quick-to-neutral circuit
	Leaking at solenoid assembly	Rebuild solenoid assembly. Refer to appropriate transmission service manual.
	Faulty solenoid—leaking	Replace solenoid. Refer to appropriate transmission service manual.
TRANSMISSION WILL NOT MAKE A SPECIFIC SHIFT	Low engine power	Correct engine problem. Refer to engine service manual.
	Incorrect fluid level	Correct fluid level. Refer to appropriate transmission mechanic's tips for proper dipstick calibration.
	Extreme fluid temperature	Inspect cooling system and fluid level
	Faulty speed sensor/circuit	Repair circuit or replace speed sensor(s) (refer to codes P0716, P0721, or P0726)
	Faulty temperature sensor/circuit	Test for temperature reading which inhibits shifts
	Incorrect calibration	Install proper calibration
	Faulty shift selector	Replace shift selector
	Hydraulic problem	Refer to Range Clutch Troubleshooting section
	Faulty TCM	Replace TCM
TRANSMISSION LOCKUP CLUTCH WILL NOT ENGAGE	ABS fault active	Correct ABS fault

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 8–1. Troubleshooting Performance Complaints *(cont'd)*

Problem	Probable Cause	Suggested Remedy
TRANSMISSION DOES NOT SHIFT PROPERLY (ROUGH SHIFTS, SHIFTS OCCURRING AT TOO LOW OR TOO HIGH SPEED)	Engine idle speed too fast (neutral to range shift)	Adjust engine idle speed. Refer to vehicle service manual.
	Faulty throttle sensor/circuit	Refer to throttle sensor section for installation and operation information (refer to Appendix F)
	TCM input voltage low	Test power, ground, charging system, and battery function
	Incorrect shift calibration for vehicle	Install correct calibration
	Instrument panel tachometer incorrect	Repair or replace tachometer
	Incorrectly calibrated electronic speedometer	Calibrate electronic speedometer
	Faulty speed sensor/circuit	Repair circuit or replace speed sensor (refer to codes P0716, P0721, or P0726)
	Loose speed sensor	Tighten speed sensor retaining bracket bolt
	Incorrect fluid level	Correct fluid level. Refer to appropriate mechanic's tips for proper dipstick calibration.
	Crossed wires in harness	Inspect for crossed wires and correct
	Intermittent problems	Inspect wiring harnesses and connectors (Appendix E)
	Loose or damaged speed gear	Replace output bearing nut sensor retainer
	Logic latch valve sticking	Overhaul valve body assembly. Refer to appropriate transmission service manual.
	Sticking solenoid regulator valve	Overhaul valve body assembly Refer to appropriate transmission service manual.
	Incorrect calibration	Install correct calibration

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 8–1. Troubleshooting Performance Complaints *(cont'd)*

Problem	Probable Cause	Suggested Remedy
CRUISE CONTROL COMPLAINTS		
A. Cruise Control Shift Cycles	Performance shift schedule is being used	Switch to economy shift schedule
	Incorrect droop settings	Modify engine droop settings to provide a larger speed variation before reaction occurs (CAT engines should be set on "soft cruise". Cummins engines droop settings should be +2 mph and –3 mph.)
RETARDER PERFORMANCE COMPLAINTS		
A. Retarder Does Not Apply	Retarder enable input not activated	Turn on retarder enable switch (if present)
	Retarder enable switch not working	Replace retarder enable switch (if present)
	ABS input is active (if vehicle is equipped with ABS)	None—this is normal. If ABS is active, retarder will not apply.
	Retarder Request below 10.2 percent	Use Allison DOC™ For PC–Service Tool to determine retarder request voltage signaled by each RMR device present. Replace RMR device, based on test results.
	Closed throttle not sensed	Use Allison DOC™ For PC–Service Tool to check throttle signal. Throttle must be below 9.8 percent before retarder will apply. Adjust or replace TPS. **Exception**: If TPS has failed and Service Brake Status input is sensed by TCM, the retarder will still be applied.
	Active code inhibiting retarder	Correct cause for setting these codes: P2685, P2686, P2736, P2738, P2739, C1312, or C1313
	Transmission output speed below 350 rpm (3000 Product Family) 450 rpm (4000 Product Family)	Raise output speed to above 350 rpm (3000 Product Family) 450 rpm (4000 Product Family)
	Transmission not in a forward range	Shift to a forward range