DTC P0976 Shift Solenoid 2 (SS2) Control Circuit Low (contd)

Step	Action	Value(s)	Yes	No
4	NOTE: Review Section 4—Wire Test Procedures		Go to Step 5	Go to Step 6
	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			
	5 Inspect the multing of wive 110 in the chassic			
	harness between the TCM and the transmission			
	connector.			
	6. At J 47275-1 TCM Overlay, test for wire-to-wire			
	80-way connector, and shorts-to-ground between			
	Were any wire-to-wire shorts or shorts-to-ground wiring defects found?			
5	NOTE: The vehicle OEM has responsibility for all		Go to Step 11	
	external wiring narness 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?			

			-				10		6		8			~	1															9	Step
Did the DTC return?	2. Drive the vehicle under normal operating conditions.		In order to verify your repair:	Is Section 3–6 complete?	Refer to TCM diagnostic procedure, Section 3-6.	Investigate thoroughly before replacing the TCM.	NOTE: In most cases, the TCM is not at fault.	Is the replacement complete?	Replace SS2.	Is the repair complete?	Repair or replace the internal wiring harness.	Were any wire-to-wire or shorts-to-ground found?	2. Inspect the internal narness for wire-to-wire shorts or shorts-to-ground.	<i>For retarder models skip to Step 9.</i>	found?	When our right to mine should be should be seened	NOTE: The resistance value of SS2 (retarder accumulator) will be normal solenoid resistance. Refer to Solenoid Resistance chart for these values	3. Using a DVOM, test for shorts-to-ground between pin A of SS2 and chassis ground.	 1. Turn OFF the Ignition. 2. Disconnect the retarder accumulator solenoid. 	For retarder units:	4. Lest for shorts-to-ground between pin 17 and chassis ground.	A Ter feedback to mease values.	Positional solenoid resistance. Refer to Solenoid	11 will read normal solenoid resistance. The	NOTE: The resistance value between pins 17 and	between pin 17 and all other pins in the 20-way		2. Install J 4/2/9 Transmission Breakout to the transmission 20-way connector. Leave the OEM		For 7-speed transmissions:	Action
																															Value(s)
	Co to Step 1	diagnosis again.	Begin the				Go to Step 11		Go to Step 11		Go to Step 11			Go to Step 8)												transmission go to Step 9.	Retarder equipped	transmissions go to Step 7	7-speed	Yes
			System OK											Go to Step 9																Go to Step 10	No

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)





Circuit Description

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

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

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

- $\dot{\omega}$ Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275 Connect the BLACK test lead to the isolated ground pin.
- 4 Use Allison DOCTM For PC-Service Tool solenoid test function to command the solenoid ON and OFF.
- S 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

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

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

10.

This step tests for proper operation of the SS2 Low Side Driver.

	DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High	2 (SS2) Control	Circuit High	
Step	Action	Value(s)	Yes	No
_	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	 Install the Allison DOCTM For PC-Service Tool. Start the engine. 	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem. Go to Step 11
	4. Monitor ignition voltage.			
	Is the voltage within the specified values?			
	 Clear the DTC. Start the engine and test drive the vehicle. 		Go to Step 4	Go to Diagnostic Aids
	 Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). 			
	NOTE: This DTC is intended to detect a short-to- battery condition in the SS2 electrical circuit.			

Did DTC P0977 return?

6-263

					6			ა					4	Step	
Were any wire-to-wire shorts found?	NOTE: The resistance value between pins A and B of SS2 (retarder accumulator) will be normal solenoid resistance. Refer to Solenoid Resistance chart for this value.	 For retarder equipped units: 1. Turn OFF the ignition. 2. Disconnect the retarder accumulator solenoid. 3. Using a digital multimeter (DVOM), test for wire-to-wire shorts between pin A and pin B of SS2. 	NOTE: The resistance value between pins 17 and 11 will read normal solenoid resistance. The resistance value between pins 17 and 12 will be twice normal solenoid resistance. Refer to Solenoid Resistance chart for these values.	 Install J 4/2/9 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. Using a digital multimeter (DVOM), test for wire-to-wire shorts between pin 17 and all other pins in the 20-way connector. 	For 7-speed transmissions: 1. Turn OFF the ignition.	replace the vehicle wiring. Is the repair complete?	<i>acaters are not covered by Attison Transmission</i> warranty. Coordinate with the vehicle OEM to renair or	NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and	Were any wire-to-wire shorts found?	 Inspect the routing of wires 131 and 119 in the chassis harness between the TCM and the transmission connector. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 19 and all other pins in the 80-way connector. 	 Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. Disconnect the transmission 20-way connector. 	 Turn OFF the ignition. Disconnect the TCM 80-way connector. 	NOTE: Review Section 4—Wire Test Procedures before performing steps.	Action	DIC FUSA SHILL SOLENDIA 2 (332) CONTROL CITCUIT FIGH (control)
														Value(s)	52) Control Ci
				Retarder equipped transmission go to Step 9.	7-speed transmissions go to Step 7.			Go to Step 11					Go to Step 5	Yes	rcuit High (conto
					Go to Step 10								Go to Step 6	No	

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High (contd)

DTC P0977 Shift Solenoid 2 (SS2) Control Circuit High (contd)

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



6-265



DTC P0989 Retarder Pressure Sensor Failed Low

Circuit Description

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

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

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

•

Test Description

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

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

DTC P0989 Retarder Pressure Sensor Failed Low

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

Sten	Action Value(s) Vac			No
	MOTE. The unkinte OEM Las manage Killin for all	- minc(0)	· · · · · · · · · · · · · · · · · · ·	
4	external wiring harness repairs. Harness repairs external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.		uo to step o	
	Coordinate with the vehicle OEM to repair or replace the vehicle wiring.			
	Is the repair complete?			
Ui	1. Remove J 47275 TCM Breakout and reconnect the TCM and OEM 80-way connector to each other.	4.75–5.0V	Go to Step 6	Go to Step 7
	 Disconnect the retarder pressure sensor from the OEM harness, if not disconnected in Step 3 above. 			
	3. Reconnect the transmission 20-way connector and RMR connector, if installed.			
	4. Turn ON the ignition. Leave the engine OFF.			
	5. Using a DVOM, measure the voltage between pin B (5V reference wire 112) and pin A (analog return wire 158) at the OEM harness retarder			
	pressure sensor connector.			
ų	Is the voltage within the specified values? Renlace the retarder messure sensor		Co to Sten &	
c	Is the replacement complete		o daic oi oo	
7	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.		Go to Step 8	
	Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?			
8	In order to verify your repair:		Begin the	System OK
c	I. Clear the DTC.		diagnosis again.	System ON
	2. Drive the vehicle under normal operating		Go to Step 1	
	3. Using Allison DOC TM For PC–Service Tool,			
	monitor retarder pressure.			
	Did the DTC return?			





3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0990 Retarder Pressure Sensor Failed High

6-269

DTC P0990 Retarder Pressure Sensor Failed High

Circuit Description

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

- a reference voltage wire,
- retarder pressure signal wire, and

analog ground wire

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

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

Test Description

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

- 2. This step tests for active diagnostic codes.
- ŝ This step tests for wire-to-wire shorts or shorts-to-battery on wires 112 and 144, and opens in wire 158.

	Thi
	s step
	This step verifies the TCM is supplying proper 5V reference voltage.
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?			:	
Step	Action	Value(s)	Yes	No
	Was Section 35, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	 Install the Allison DOCTM For PC–Service Tool. Start the engine. Record the failure records. Clear the DTC. Attempt to duplicate same operating conditions observed in failure records. 		Go to Step 3	Go to Diagnostic Aids
	NOTE: This DTC indicates that the retarder pressure sensor signal is greater than or equal to 5V for 10 seconds. It may also indicate a short-to- battery in either the 5V reference wire 112 or retarder pressure sensor signal wire 144, or an open in analog return wire 158.			
	Did DTC P0990 return?			
:J3	 Turn OFF the ignition. Inspect the routing of the 5V reference wire 112, signal wire 144, and analog return wire 158 between the TCM and the retarder pressure sensor. 		Go to Step 4	Go to Step 5
	 Disconnect the 80-way connector from the TCM. Install the OEM-side of the 80-way connector to J 47275 TCM Breakout. Leave the TCM-side disconnected. 			
	5. Disconnect the retarder pressure sensor from the OEM wiring harness.			
	Disconnect the transmission 20-way connector and RMR connector, if installed.			
	7. Test for wire-to-wire shorts and shorts-to-battery in wires 112 and 144.			
	8. Test for an open condition in wire 158.			
	Was chafing or wire damage found?			

DTC P0990 Retarder Pressure Sensor Failed High

DTC P0990 Retarder Pre n sure Sensor Failed High (contd)

DTC P1739 Incorrect Low Gear Ratio

Refer to Low Range Hydraulic Schematic

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

Test Description

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

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

DTC P1739 Incorrect Low Gear Ratio

Step	Action Was Section 3–5, Beginning The Troubleshooting Process, performed?
	Process, performed?
 2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips).
	Is the transmission fluid level correct?
ы	1. Start the engine.
	 Record the DTC Failure Record data. Using the Allison DOCTM For PC–Service Tool, measure ignition voltage.
	Is the voltage within the specified value?
4	1. Start the engine and drive the vehicle under
	2. Using Allison DOCTM For PC-Service Tool,
	readings.
	Is speed sensor data erratic or are dropouts in signal

indicated?

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL--ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1739 Incorrect Low Gear Ratio (contd)

			8	7	6		5 Step	et en
4. Inspect for damaged gaskets and face seals.	valves. 3. Inspect the suction filter. Ensure screen is not plugged.	 Inspect the control valve bodies for stuck or sticking solenoid regulator valves and logic latch 	1. Consult the appropriate service manual and remove the transmission hydraulic control	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?	Read and record Main, C6, C1 (4000 7-speed only) or C3 (3000 7-speed only) clutch pressures. Are the pressure readings within specified values in Appendix B?	 damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you do all of the following: Put the transmission in N (Neutral). Apply the parking brake and service brake. Chock the wheels and take any other steps necessary to prevent the vehicle from moving. Warn personnel to keep clear of the vehicle and its path. CAUTION: DO NOT conduct a stall test in Low. The torque produced in Low can damage the vehicle driveline or axle. I. Turn OFF the ignition. Install 2000 kPa (300 psi) pressure gauges in main pressure tap, and C6 (4000 7-speed only) or C1 and C6 (4000 7-speed only) pressure tap. Start the engine. With brakes applied, select D (Drive). With the engine at idle speed, select and attain the range indicated by the DTC. Turbine speed should go to zero. 	Action WARNING: To help avoid injury or property	
					Refer to Main Clutch Pressure specifications in Appendix B		Value(s)	
			Go to Step 11	Go to Step 10	Go to Step 7	Diagnostic Aids	Yes Go to	100111
			Go to Step 9	Go to Diagnostic Aids	Go to Step 8		No Go to Step б	2

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6-275

DTC P1739 Incorrect Low Gear Ratio (contd)

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		(c)20104		MO
9	Using pressure readings obtained in Step 6 above, replace the affected solenoid.		Go to Step 11	
	 Incorrect C1 (4000 7-speed only) pressure— PCS1 			
	 Incorrect C3 (3000 7-speed only) pressure— PCS3 			
	 Incorrect C6 (Both) pressure—PCS6 			
	Is the replacement complete?			
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.		Go to Step 11	
	If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual).			
	Is the replacement complete?			
1	In order to verify your repair: 1. Clear the DTC.		Begin the diagnosis again.	System OK
	 Using Allison DOCTM For PC–Service Tool, monitor engine, turbine and output speed sensor readings. 		Go to Step 1	
	3. Drive the vehicle under normal operating conditions.			
	Did the DTC return?			

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3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

6-277

DTC P1891 Throttle Position Sensor PWM Signal Low Input

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

6-279

6.	This step inspects for damage or corrosion to the TCM and engine control module connectors	e TCM and engine	control module con	inectors.
Step	Action	Value(s)	Yes	No
_	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	 Install the Allison DOCTM For PC-Service Tool. Start the engine. Record the failure records. Using Allison DOCTM For PC-Service Tool, measure ignition voltage. 	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem (refer to DTC P0882 and DTC P0883)
	Is ignition voltage within the specified value?			
ىر.	 Operate the throttle while monitoring Allison DOCTM For PC–Service Tool. Verify the throttle source is functioning correctly? Is the PWM signal OK? 		Go to Diagnostic Aids.	Go to Step 4
4	 Turn OFF the ignition. Disconnect the 80-way connector from the TCM. Install the OEM-side of the J 47275 TCM Breakout. Leave the TCM disconnected. 		Go to Step 5	Go to Step 6
տ	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.		Go to Step 10	-
	Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?			
6	Inspect the TCM and Engine Control Module (ECM) connectors and terminals for damage and/or corrosion.		Go to Step 7	Go to Step 8
Ţ	Repair and clean terminals if possible. Is the repair complete?		Go to Step 10	

This step tests for wire-to-wire shorts, shorts-to-ground, or an open on wire 144.

ယ \dot{b}

This step tests for operation of the PWM throttle sensor.

This step tests for proper ignition voltage.

4

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

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DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

DTC P1891 Throttle Position Sensor PWM Signal Low Input (contd)

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



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6-281

DTC P1892 Throttle Position Sensor PWM Signal High Input

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

6-283

This step tests for wire-to-wire shorts, shorts-to-ground, or an open on wire 144. The step inspects for damage or corrosion to the TCM and engine control module connectors DTC P1892 Throttle Position Sensor PWM Signal High Input Was Section 3-5. Beginning The Troubleshooting Process, performed? Value(s) Value(s) Carton Value(s) Carton Value(s) Ves Carton Propherence Resolution Summer Signal High Input Propherence Carton Propherence Resolution Carton Propherence Resolution Carton Propherence Resolution Propherence Resolution Propherence Resolution Resolution
an open on wire 144. engine control module VM Signal High In (s) Ves Ga to Step 2 Ga to Step 3 V TCM) Ga to Step 3 Ga to Step 5 Ga to Step 1 Ga to Step 1
wire 144. trol module (Yes <i>Go to Step 2</i> <i>Go to Step 3</i> <i>Go to Step 5</i> <i>Go to Step 10</i>

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS **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.

i5 This step tests for proper ignition voltage.

ယ This step tests for operation of the PWM throttle sensor.

DTC P1892 Throttle Position Sensor PWM Signal High Input (contd)

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





DTC P2184 Engine Coolant Temperature Sensor Circuit Low Input

Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

- A broken wire inside the insulation.

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DIAGNOSTIC TROUBLE CODES (DTC)

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

Test Description

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

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

Step	Action	Value(s)	Yes	No
	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	 Install the Allison DOCTM For PC-Service Tool. Start the engine. 	9-18V (12V TCM) 18-32V (24V TCM)	Go to Step 3	Resolve voltage problem (refer to
	 Record failure record. Using Allison DOCTM For PC–Service Tool, measure ignition voltage. 			DTC P0882 and DTC P0883)
	Is ignition voltage within the specified value?			
ون	 Clear the DTCs. Monitor the engine coolant temperature on Allison DOCTM For PC-Service Tool 	>174.11°C (345,4°F)	Go to Step 4	Go to Diagnostic Aids
	3. Drive the vehicle and observe Allison DOC TM For PC–service tool for an unrealistically high temperature condition.			
	Is the Allison DOC TM For PC–Service Tool transmission fluid temperature greater than 174.11°C (345.4°F)?			
4.	 Turn OFF the ignition. Install J 47275 TCM Breakout at the TCM. 	4.75 to 5.0V	Go to Step 7	Go to Step 5
	Disconnect the engine coolant temp sensor connector.			
	4. Turn ON the ignition.			
	5. At J 47275-1 TCM Overlay connect a DVOM and measure voltage between pins 35 and 58.			
	Is the voltage within the specified value?			

DTC P2184 Engine Coolant Temperature Sensor Circuit Low Input

DTC P2184 Engine Coolant Temperature Sensor Circuit Low Input (contd)

Action Value(s) Ves 1. Turn OFF the ignition. Converted to the converted. <
s) Ves Go to Step (Go to Step 5 Go to Step 5 Go to Step 5 Begin the diagnosis aga Go to Step 1

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DTC P2185 Engine Coolant Temperature Sensor Circuit High Input

Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

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

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

Test Description

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

- \dot{b} This step tests for proper transmission fluid level and condition.
- ω This step verifies which condition has set the DTC P2185.
- 4 This step tests for the proper 5V reference voltage at TCM.
- Ś This step tests for wiring defects in the OEM chassis harness.

DTC P2185 Engine Coolant Temperature Sensor Circuit High Input

			ł	
Step	Action	Value(s)	Yes	No
_	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	 Install the Allison DOCTM For PC–Service Tool. Start the engine. 	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem (refer to
	3. Record failure record.			DTC P0882 and
	 Using Allison DOCTM For PC–Service Tool, measure ignition voltage. 			DIC (10003)
	Is ignition voltage within the specified value?			
3	I. Clear the DTCs.	≤-42°C (-43.75°F)	Go to Step 4	Go to
	2. Monitor the engine coolant temperature on Allison DOC TM For PC–Service Tool.			Diagnostic Aids
	 Drive the vehicle and observe Allison DOCTM For PC–Service Tool for an unrealistically low temperature condition. 			
	Is the Allison DOC TM For PC–Service Tool engine coolant temperature less than or equal to -42°C (-43.75°F)?			
4	 Turn OFF the ignition. Install J 47275 TCM Breakout at the TCM. 	4.75 to 5.0V	Go to Step 7	Go to Step 5
	Disconnect the engine coolant temp sensor connector.			
	4. Turn ON the ignition.			
	5. At J 47275-1 TCM Overlay connect a DVOM and select the volts-DC scale.			
	6. Measure voltage between pin 35 and an isolated ground.			
	Is the voltage within the specified value?			

DTC P2185 Engine Coolant Temperature Sensor Circuit High Input (contid)

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

DTC P2637 Torque Management Feedback Signal (SEM)

No Schematic for this DTC

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

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

Test Description

The numbers below refer to step numbers on the diagnostic table

- 2 This step tests for presence of DTC P0614.
- ယ This step tests for proper ECM SEM torque request response.
- 4 This step tests to identify the device causing the torque request to be ignored.
- Ś This step tests for the offending device by removing it from the J1939 network
- 9
- This step tests for the presence of proper engine controller software
DTC P2637 Torque Management Feedback Signal (SEM)

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

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DTC P2637 Torque Management Feedback Signal (SEM) (contd)

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

DTC P2641 Torque Management Feedback Signal (LRTP)

No Schematic for this DTC

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

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

Test Description

The numbers below refer to step numbers on the diagnostic table

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

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Step	Action Value(s) Yes	Value(s)	Yes
	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2
2	If DTC P0614 is present, troubleshoot and resolve before going to the next step.		Go to DTC P0614 and resolve before proceeding to Step 3
ယ	 Install the Allison DOCTM For PC–Service Tool. Turn ON the ignition. Refer to LRTP torque reduction status in SEM/ LRTP AUTODETECT INFO display of Allison DOCTM For PC–Service Tool. Does Allison DOCTM For PC–Service Tool indicate the ECM response to LRTP torque reduction as INCORRECT? 	Allison DOCTM diagnostic tool indicates "correct response" or "incorrect response"	Go to Step 6
4	Use Allison DOC TM For PC–Service Tool to identify an unapproved LRTP torque reduction device. Is the unapproved device one of the following? 1. Engine? 2. Null Address (N/A) or All/Any (info not valid)?	Allison DOCTM For PC–Service Tool shows the actual device at fault	Go to Step6
۰	 If Allison DOCTM For PC-Service Tool is indicating another device such as brakes, cruise control, headway controller etc., inspect the controller for the device indicated. If possible eliminate the device by disconnecting it from the J1939 CAN backbone. <i>NOTE: It may be possible that the device causing the interruption is only triggered under certain circumstances. For example, a brake controller may only send commands under certain road conditions. Since these conditions may not be easily repeatable, replacement with a known good controller may be the only way to verify the failure.</i> If necessary to confirm the failure, test the system with a known, good controller. Was the device causing the problem replaced or repaired? 		Go to Step 7
6	 Verify that compatible engine controller software is being used. If the software is correct, turn the vehicle over to the engine manufacturer to replace the engine controller. If neither solves the problem, use an engine torque/power rating that does not require LRTP. Was the software updated or engine controller replaced? 		Go to Step 7

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DIAGNOSTIC TROUBLE CODES (DTC)

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DTC P2641 Torque Management Feedback Signal—LRTP (contd)

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



Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

Test Description

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

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

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low

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

			6		S								4					. در.	Step
Were any opens, wire-to-wire shorts or shorts-to- ground found?	NOTE: The resistance value between pins 6 and 4, between pins 6 and 5, between pins 6 and 9, and between pins 6 and 10 will read normal solenoid resistance.	 Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between pin 6 and all other pins in the 20-way connector, and shorts-to-ground between pin 6 and chassis ground. 		Coordinate with the vehicle OEM to repair or replace the chassis harness. Is the repair complete?	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.	Were any wire-to-wire shorts or shorts-to-ground found?	 At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 71 and all other pins in the 80-way connector, and test for shorts-to-ground between pin 71 and chassis ground. 	5. Inspect the routing of wire 171 in the chassis harness between the TCM and the transmission connector.	4. Disconnect the OEM-side 20-way connector from the transmission.	3. Install the OEM-side of the J 47275 TCM Breakout. Leave the TCM disconnected.	 Turn OFF the ignition. Disconnect the 80-way connectors at the TCM. 	before performing steps.	Did D1C P26 /0 return? NOTE: Review Section 4—Wire Test Procedures	ground condition in the HSD2 electrical circuit.	temperature, etc.).	observed in the failure records (range attained,		1. Clear the DTC.	Action
																			Value(s)
			Go to Step 7		Go to Step 9								Go to Sten 5					Go to Step 4	Yes
			Go to Step 8										Go to Sten 6				Diagnostic Aids	Ga to	No

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL---ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low (contd)

Τ

DTC P2670 Actuator Supply Voltage 2 (HSD2) Low (contd)

cton	A ₀ +io ₂	V 22	2
' .			
Γ	1. Remove the hydraulic control module assembly.	Go to Step 9	
	2. Repair or replace the internal wiring harness.		
	Is the repair complete?		
8	NOTE: In most cases, the TCM is not at fault.	Go to Step 9	
	Refer to TCM Diagnostic Procedure, Section 3-6.		
	Is Section 3-6 complete?		
9	In order to verify your repair:	Begin the	System OK
	1. Clear the DTC.	diagnosis again.	
	2. Drive the vehicle under conditions noted in	Go to Step 1	
	failure records.		
	Did the DTC return?		



DTC P2671 Actuator Supply Voltage 2 (HSD 2) High

Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

DTC P2671 Actuator Supply Voltage 2 (HSD 2) High

Actions Taken When the DTC Sets

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

- The CHECK TRANS light illuminates
- ٠ 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

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

Diagnostic Aids

- data can be useful in reproducing the failure mode when DTC was set. determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to . This
- . 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 open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes parking brake drum, suspension components, etc. an
- . equipment for a change When diagnosing for an intermittent short or open, massage the wiring harness while watching the test

Test Description

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

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

14 th GENERATION CONTROLS	BLESHOOTING MANUAL—ALLISON 4 th GENERA	3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL—ALLISON 4 th GENERATION CONTROLS

DTC P2671 Actuator Supply Voltage 2 (HSD2) High

Step	Action Value(s) Yes	Value(s)	Yes
-	Was Section 3–5, Beginning The Troubleshooting Process, performed?		
2	 Install the Allison DOCTM For PC–Service Tool. Start the engine. 	9–18V (12V TCM) 18–32V (24V TCM)	
	 Record the failure records. Monitor ignition voltage. 		
	Is voltage within the specified values?		
3			
	 Start the engine and test drive the vehicle. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). 		
	NOTE: This DTC is intended to detect an open or short-to-battery condition in the HSD2 electrical circuit.		
4	Did D1C P26/1 return? 1 Turn OFF the ionition		
4	 Form Of Form Of Formon. Install the J 47275 TCM Breakout at the TCM 80-way connector. 		
	3. Install J 47275 TCM Breakout at the transmission 20-way connector.		
	 Turn ON the ignition, leave the engine OFF. Using Allison DOCTM For PC–Service Tool, enter Solenoid Test mode and command PCS3 ON. 		
	 Determine the voltage drop in the HSD2 circuit as follows: At 147775 1 TCM Overlage magnetic voltage 		
	 At J 47279-1 Transmission Overlay, measure 		
	 voltage between pin 6 and isolated ground. Subtract the two voltage measurements to obtain the voltage drop in the circuit. 		
	NOTE: A voltage drop of more than 0.5V indicates an excessive voltage loss in the OEM harness.		
	Did the high-side voltage drop exceed 0.5VDC?		

	10	<u>ب</u>	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		-1	0	u.	Step	
Did the DTC return?	In order to verify your repair:1. Clear the DTC.2. Drive the vehicle under conditions noted in failure records.	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?	 Remove the hydraulic control module assembly. Repair or replace the internal wiring harness. Is the repair complete? 	NOTE: The resistance value between pins 6 and 4, between pins 6 and 5, between pins 6 and 9, and between pins 6 and 10 will read normal solenoid resistance. Refer to Solenoid Resistance chart for these values. Were any wire-to-wire shorts found?	 Turn OFF the ignition. Verify the J 47279 Transmission Breakout is installed at the transmission 20-way connector and the OEM-side is disconnected. Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between pin 6 and all other pins in the 20-way connector. 	NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repair performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?	 Turn OFF the ignition. Disconnect the TCM from the J 47275 harness. Leave the OEM-side connected. Disconnect the OEM-side of the 20-way connector J 47279 Transmission Breakout. Leave the transmission-side connected. Inspect the routing of wire 171 in the chassis harness between the TCM and the transmission connector. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 71 and all other pins in the 80-way connector. Were any wire-to-wire shorts found? 		DTC P2671 Actuator Supply Voltage 2 (HSD2) High (contd)
								Value(s)	^{oltage} 2 (HSD)
	Begin the diagnosis again. Go to Step 1	Go to Step 10	Go to Step 10		Go to Step 8	Got to Step 10	Go to Step 6	Yes	2) High (cont'd)
	System OK				Go to Step 9		Go to Step 7	No	

DIAGNOSTIC TROUBLE CODES (DTC)



Engine speed greater than 200 rpm.

HSD3 is commanded ON.

than 9V and less than 32V (24V TCM).

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

Conditions for Running the DTC

or less. DTC P2685 could be caused by a short-to-ground in the high side wiring attached to HSD3 (wire 131). Driver (LSD) ON and OFF. DTC P2685 indicates the TCM has detected a supply voltage in the HSD3 circuit of 6V

retarder and 7-speed models) solenoids via wire 131. HSD3 is continuously ON during normal operation except during brief circuit tests. The TCM regulates control current to the solenoids by switching the appropriate Low Side High Side Driver 3 (HSD3) supplies battery voltage to the TCC, PCS5 (retarder and 7-speed models) and SS2 (also,



Circuit Description

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE

CODES (DTC)

DTC P2685 Actuator Supply Voltage 3 (HSD 3) Low

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- 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. You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- following conditions: Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the
- 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 parking brake drum, suspension components, etc. open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes an
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change

Test Description

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

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

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Step	Action	Value(s)	Yes
	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2
2	 Install the Allison DOCTM For PC–Service Tool. Start the engine. Record the failure records. Monitor ignition voltage. 	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 3
	Is voltage within the specified values?		
ω	 Clear the DTC. Start the engine and test drive the vehicle. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). 		Go to Step 4
	<i>NOTE: This DTC is intended to detect a short-to-</i> ground condition in the HSD3 electrical circuit. Did DTC P2685 return?		
4	 Turn OFF the ignition. Disconnect the 80-way connector at the TCM. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 		Go to Step 5
	 Disconnect the OEM 20-way connector from the transmission. For retarder transmissions, disconnect the SS2 (accumulator) and PCS5 (retarder control) 		
	 connectors. For 3000 7-speed only, disconnect the T-case electrical connector. 		
	7. Inspect the routing of wire 131 in the chassis harness between the TCM and the transmission connectors.		
	8. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 31 and all other pins in the 80-way connector, and test for shorts-to-ground between pin 31 and chaseis ground		
	Were any wire-to-wire shorts or shorts-to-ground found?		
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.		Go to Step 12
	Coordinate with the vehicle OEM to repair or replace the chassis harness. Is the repair complete?		
ľ			

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DTC P2685 Actuator Supply Voltage 3 (HSD 3) Low

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Step 6	DTC P2685 Actuator Supply Voltage 3 (HSD 3) Low (cont'd) Action Value(s) Yes 1. Turn OFF the ignition. Ga to Step 7 2. Install the transmission 20-way connector to the Ga to Step 7	Value(s)	
	 Install the transmission 20-way connector to the J 47279 Transmission Breakout. Leave the OEM-side connected. Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between pin 11 and all other pins in the 20-way connector, and shorts-to-ground between pin 11 and chassis ground. 		
	NOTE: The resistance value between pins 11 and 12, and between pins 11 and 17 (7-speed models) will read normal solenoid resistance. Were any opens, wire-to-wire shorts, or shorts-to- ground found?		
7	 Remove the hydraulic control module assembly. Repair or replace the internal wiring harness. Is the repair complete? 		
∞	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?	:	
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?		



Circuit Description

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

Conditions for Running the DTC

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

DTC P2686 Actuator Supply Voltage 3 (HSD 3) High

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- data can be useful in reproducing the failure mode when DTC was set. determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- 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.
- open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an parking brake drum, suspension components, etc.
- equipment for a change When diagnosing for an intermittent short or open, massage the wiring harness while watching the test

Test Description

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

- \mathbf{P} This step tests for the proper ignition voltage
- ιu This step tests for an active DTC
- 4 This step tests for an open in wire 131 of the OEM chassis harness.
- \mathcal{S}
- 2 This step tests for wiring defects in the transmission internal harness. This step tests for wire-to-wire short, or short-to-battery in wire 131 of the OEM chassis harness.

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DTC P2686 Actuator Supply Voltage 3 (HSD3) High

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Step	Action	Value(s)	Yes	No
_	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2		9–18V (12V TCM)	Go to Step 3	Resolve voltage
	 Start the engine. Record the failure records. 	18–32V (24V TCM)		problems
	Is voltage within the specified values?			
υ	I. Clear the DTC.		Go to Step 4	Go to
				Diagnostic Aids
	 Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). 			
	NOTE: This DTC is intended to detect an open or short-to-battery condition in the HSD3 electrical			
	circuit.			
	Did DTC P2686 return?			
4	 Turn OFF the ignition. Install the J 47275 TCM Breakout at the 80-way 		Go to Step 6	Go to Step 5
	connector.			
	 Install J 4 / 2 / 9 adapter at the 20-way connector. Turn ON the ionition I eave the engine OFF 			
	Determine the voltage drop in the HSD3 circuit as follows:			
	At J 47275-1 TCM Overlay, measure voltage			
	At J 47279-1 Transmission Overlay, measure			
	ground.			
	 Subtract the two voltage measurements to obtain the voltage drop in the circuit. 			
	NOTE: A voltage drop of more than 0.5V indicates an excessive voltage loss in the OEM harness.			
	Did the high-side voltage drop exceed 0.5VDC?			

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

	÷	5		6		8							Ţ							6									ы	Step	
Did the DTC return?	 Clear the DTC. Drive the vehicle under conditions noted in failure records. 	Is Section 3–6 complete?	Refer to TCM diagnostic procedure, Section 3-6.	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.	Is the repair complete?	 Remove the hydraulic control module assembly. Repair or replace the internal wiring harness. 	Were any wire-to-wire shorts found?	<i>12, and between purs 11 and 17 (7-speed models)</i> <i>will read normal solenoid resistance.</i>	NOTE: The resistance value between pins 11 and	pin 11 and all other pins in the 20-way connector.	3. Using a DVOM at J 47279-1 Transmission Overlay, test for wire-to-wire shorts between		1. Turn OFF the ignition.	Is the repair complete?	replace the chassis harness.	Condition with the which ODM to make a	ueaters are not covered by Atlison 4 ransmission warranty	performed by Allison Transmission distributors and	external wiring harness repairs. Harness repairs	NOTE: The vehicle OEM has responsibility for all	Were any wire-to-wire shorts found?	80-way connector:	5. At J 47275-1 TCM Overlay, test for wire-to-wire	connectors.	4. Inspect the routing of wire 131 in the chassis harness between the TCM and the transmission	transmission-side connected.	connector from the 1 47279 adapter Leave the		1. Turn OFF the ignition.	Action	יום (contact) אינעמנטן Subbit Voltage אינעמנטן Contacts) אינעמנטן Contacts אינעמנטן Contacts אינעמנטן Contacts
																												 		Value(s)	voitage ง (ทรม
	diagnosis again. Go to Step 1	5		Go to Step 10		Go to Step 10							Go to Step 8							Go to Step 10									Go to Step 6	Yes	3) Hign (conta)
													Go to Step 9															,	Go to Step 7	No	

DTC P2714 Pressure Control Solenoid 4 (PCS4) Stuck Off

Refer to Hydraulic Schematic

Circuit Description

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

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

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

Actions Taken When the DTC Sets

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

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

Test Description

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

- 2. This step tests for proper transmission fluid level.
- 3. This step tests for active diagnostic codes.
- 4. This step tests ignition voltage.
- 5. This step tests speed sensor readings.
- 6. This step tests for C4 clutch pressure from PCS4.
- 7. This step tests for evidence of clutch failure.

 ∞

This step tests for stuck or sticking valves and damaged valve body gaskets.

DTC P2714 Pressure Control Solenoid 4 (PCS4) Stuck Off

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o le p	ACUOLI	(s)anipy	Ies	NO
_	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	Perform the Fluid Checking Procedure (refer to the appropriate mechanic's tips).		Go to Step 3	Go to Fluid Check Procedure
	Is the transmission fluid level correct?			(refer to mechanic's tips)
ير:	 Install the Allison DOCTM For PC-Service Tool. Turn ON the ignition, leave engine OFF. Record the failure records. Clear the DTC. 		Go to Step 4	Go to Diagnostic Aids
	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.			
4	Did DTC P2714 return?	0 19V/ (19V/ TCM)	Co to Cton t	Co to Connel
4	 Install the Allison DOCTM For PC-Service Tool. Start the engine. Record the DTC Failure Record data. Using the Allison DOCTM For PC-Service Tool, measure ignition voltage. 	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 5	Go to General Troubleshooting Section 8
У	 Is the voltage within the specified value? Start the engine and drive the vehicle under normal operating conditions. Using Allison DOCTM For PC–Service Tool, 	Watch for erratic speed sensor signals	Go to appropriate speed sensor DTC	Go to Step 6
	readings using the strip chart display. Is speed sensor data erratic or are dropouts in signal indicated?			

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL---ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

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

?				
Step	Action	Value(s)	Yes	No
6		Refer to Main and	Go to Step 7	Go to Step 8
	 Install 2000 kPa (300 psi) pressure gauges in Main and C4 pressure taps. 	Clutch Pressure specification in		
	3. Start the engine.	Appendix B		
	 Using Allison DOCTM For PC–Service Tool, select the clutch test mode. 			
	 With brakes applied, select and attain the range where the DTC occurred as indicated in the failure records. 			
	6. Read and record Main and C4 clutch pressures.			
	Are the pressure readings within specified values in Appendix B?			
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.		Go to Step 10	Go to Diagnostic Aids
	Are there signs of a clutch failure?			
8	1. Consult the service manual and remove the transmission hydraulic control module.		Go to Step 11	Go to Step 9
	 Inspect the control valve bodies for stuck or sticking solenoid regulator valves. 			
	 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?			
9	Replace PCS4.		Go to Step 11	
	Is the replacement complete?			
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.		Go to Step 11	
	If debris is found, remove the transmission for overhaul or replacement (refer to the appropriate service manual).			
:	Is the replacement complete?			
Ξ	 In order to verify your repair: Clear the DTC. Using Allison DOCTM For PC–Service Tool, monitor engine, turbine and output speed sensor 		Begin the diagnosis again. Go to Step 1	System OK
	3. Drive the vehicle under normal operating conditions.			
	Did the DTC return?			

DTC P2715 Pressure Control Solenoid 4 (PCS4) Stuck On

Refer to Hydraulic Schematic

Circuit Description

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

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

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

Actions Taken When the DTC Sets

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

6-318

Sten	DTC P2715 Pressure Control Solenoid 4 (PCS4) Stuck On	Value(s)	CS4) Stuck	Ôn
Step	Action	Value(s)		Yes
-	Was Section 3-5, Beginning The Troubleshooting Process, performed?		0	Go to Step 2
2	Perform the Fluid Checking Procedure (refer to appropriate mechanic's tips).			Go to Step 3
	Is the transmission fluid level correct?			
3	Install the Allison DOCTM For PC-Service Tool.			Go to Step 4
	 Turn ON the ignition, leave engine OFF. Record the failure records. Clear the DTC. 			
	 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.			
4	1. Install the Allison DOC TM For PC–Service	9-18V (12V TCM)		Go to Step 5
	2. Start the engine.	18-32V (24V ICM)		
	 Record the DTC Failure Record data. Using the Allison DOCT^M For PC–Service 			
ı	Is the voltage within the specified value?			
Ś	 Start the engine and drive the vehicle under normal operating conditions. 	Watch for erratic speed sensor		Go to appropriate speed sensor DTC
	2. Using Allison DOC TM For PCService Tool, monitor turbine, engine, and output speed sensor readings using the strip chart display.	signals		
	Is speed sensor data erratic or are dropouts in signal indicated?			

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL—ALLISON 4th GENERATION CONTROLS **DIAGNOSTIC TROUBLE CODES (DTC)**

Test Description

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

- $\dot{\mathbf{b}}$ This step tests for proper transmission fluid level.
- ω This step tests for active diagnostic codes.
- 4 This step tests ignition voltage.
- 5 This step tests speed sensor readings.
- 6 This step tests for C4 clutch pressure from PCS4.
- 7 This step tests for evidence of clutch failure.
- This step tests for stuck or sticking valves and damaged valve body gaskets.

 ∞

DTC P9715 P ure Control Solenoid 4 (PCS4) Stuck On (control)

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





Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

Test Description

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

- 2. This step tests for the proper ignition voltage.
- 3. This step tests for an active DTC
- 4 This step tests the OEM harness for an excessive voltage drop caused by an open condition in either
- wire 111 or wire 155 of the OEM chassis harness.
- 6 -1 This step tests for the proper PCS4 resistance This step tests for an open condition in the transmission internal harness

6-323

danc	Acuoi	value(s)	Ieo	
	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2 2. 2. 3. 4. Is	 Install the Allison DOCTM For PC–Service Tool. Start the engine. Record the failure records. Monitor ignition voltage. Is the voltage within the specified values? 	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem
3 2.1. D co	 Clear the DTC. Start the engine and test drive the vehicle. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). NOTE: This DTC is intended to detect an open condition in the PCS4 electrical circuit. Did DTC P2718 return? 		Co to Step 4	Go to Diagnostic Aids
4 S S 2	 NOTE: Kenew Section 4—Wire Test Procedures before performing steps. 1. Turn OFF the ignition. 2. Install J 47275 TCM Breakout between the OEM external wiring harness and TCM 80-way connectors. 3. Install J 47279 Transmission Breakout between the OEM external wiring harness and transmission 20-way connectors. 4. Turn ON the ignition, leave engine OFF. 5. Using Allison DOCTM For PC–Service Tool, enter Solenoid Test mode and command PCS4 ON. 6. Determine the voltage drop in the high side of the PCS4 circuit as follows: At J 47275-1 TCM Overlay, measure voltage between pin 1 and an isolated ground. At J 47275-1 TCM Overlay, measure voltage between pin 1 and an isolated ground. Subtract the two voltage measurements to obtain the voltage drop in the circuit. 7. Determine the voltage drop in the low side of the PCS4 circuit as follows: At J 47275-1 TCM Overlay, measure voltage between pin 1 and an isolated ground. Subtract the two voltage measurements to obtain the voltage drop in the circuit. 7. Determine the voltage drop in the low side of the PCS4 circuit as follows: At J 47279-1 Transmission Overlay, measure voltage between pin 55 and an isolated ground. At J 47279-1 Transmission Overlay, measure voltage between pin 2 and an isolated ground. At J 47279-1 Transmission Overlay, measure voltage between pin 2 and an isolated ground. At J 47279-1 Transmission Overlay, measure voltage between pin 2 and an isolated ground. MOTE: A voltage drop of more than 0.5V across either victor voltage loss in the OEM harness. 		Co to Step S	Co to Step o

DTC P2718 Pressure Control Solenoid 4 (PCS4) Control Circuit Open **DIAGNOSTIC TROUBLE CODES (DTC)** 3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

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

11 In ordu 1. Cle 2. Dri fail Did th	10 NOTE Invest Refer Is Sect	9 Replac Is the	8 Replac	3. Usi A a Is resi		Is the	3. Usi resi tran	o 1. 1ur 2. Dis J 47 tran bre:		5 NOTE: T external v performed dealers au warranty.	σ	-
In order to verify your repair:1. Clear the DTC.2. Drive the vehicle under conditions noted in failure records.Did the DTC return?	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?	Replace PCS4. Is the replacement complete?	Replace the internal wiring harness. Is the replacement complete?	 Using a DVUM, measure PCS4 resistance at pins A and B. Is resistance within the specified values? 	Remove the hydraulic control module assembly. Disconnect PCS4 from the internal wiring harness.	Is the resistance within the specified value?	Using a digital multimeter (DVOM), measure the resistance between pin 1 and pin 2 of the transmission 20-way connector.	 Jurn OFF the Ignition. Disconnect the OEM 20-way connector from J 47279 Transmission Breakout. Leave the transmission 20-way connector connected to the breakout. 	Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?	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.	Action	
					Refer to Solenoid Resistance Chart (Appendix K)			Keter to Solenoid Resistance Chart (Appendix K)			Value(s)	
Begin the diagnosis again. Go to Step 1	Go to Step 11	Go to Step 11	Go to Step 11		Go to Step 8			Go to Step 10		Go to Step 11	Yes	
System OK					Go to Step 9			Go to Step 7			No	





Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- DTC P2720 indicates a short-to-ground in the electrical circuit for PCS4
- . data can be useful in reproducing the failure mode when DTC was set. determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- . following conditions: Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the
- A bent terminal
- A backed-out terminal
- A damaged terminal
- Poor terminal tension
- A chafed wire
- A broken wire inside the insulation.
- open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to parking brake drum, suspension components, etc. an
- ٠ equipment for a change. When diagnosing for an intermittent short or open, massage the wiring harness while watching the test
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)---measure solenoid LSD functionality as follows:

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- -Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
- \mathbf{P} VOLTS-DC scale and depressing the HERTZ button once Set up a frequency-capable digital multimeter, e.g. Fluke 87, to monitor frequency by selecting the
- ယ nect the BLACK test lead to the isolated ground pin. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Con-
- 4 Use Allison DOCTM For PC-Service Tool solenoid test function to command the solenoid ON and OFF
- $\mathcal{O}_{\mathcal{I}}$ read 0 hertz when the driver is commanded OFF Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL—ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

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

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Step	Action	Value(s)	Yes	No
—	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 DOCTM For PC-Service Tool.	9-18V (12V TCM)	Go to Step 3	Resolve voltage
	2. Start the engine.	18-32V (24V TCM)		problem
	3. Record the failure records.			
	4. Monitor ignition voltage.			
	Is the voltage within the specified values?			
3	1. Clear the DTC.		Go to Step 4	Go to
	2. Start the engine and test drive the vehicle.			Diagnostic Aids
	 Attempt to duplicate the same conditions observed in the failure records (range attained, 			
	temperature, etc.).			
	NOTE: This DTC is intended to detect a short-to- ground condition in the PCS4 electrical circuit.			
	Did DTC P2720 return?			
4	NOTE: Review Section 4—Wire Test Procedures before performing steps.		Go to Step 5	Go to Step 6
	1. Turn OFF the ignition.			,
	2. Disconnect the TCM 80-way connector.			
	3. Install the OEM-side of the 80-way connector to the J 47275 harness. Leave the TCM			
	4. Disconnect the transmission 20-way connector			
	5. Inspect the routing of wire 155 in the chassis			
	harness between the TCM and the transmission connector.			
	6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 55 and all other pins in the			
	80-way connector, and shorts-to-ground between pin 55 and chassis ground.			
	Were any wire-to-wire shorts or shorts-to-ground wiring defects found?			

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

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





Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

DTC P2721 is set when the TCM detects a short-to-battery in the PCS4 return circuit for more than 2 seconds.
DTC P2721 Pressure Control Solenoid 4 (PCS4) Control Circuit High

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- ٠ DTC P2721 indicates a short-to-battery in the electrical circuit for the PCS4 solenoid
- ٠ data can be useful in reproducing the failure mode when DTC was set. determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- following conditions: Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the
- A bent terminal
- A backed-out terminal
- A damaged terminal
- Poor terminal tension
- A chafed wire
- A broken wire inside the insulation.
- open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to parking brake drum, suspension components, etc. an
- equipment for a change. When diagnosing for an intermittent short or open, massage the wiring harness while watching the test
- LSD functionality as follows: Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)---measure solenoid

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- ._____ 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.
- $\dot{\omega}$ Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Connect the BLACK test lead to the isolated ground pin.
- 4 Use Allison DOCTM For PC-Service Tool solenoid test function to command the solenoid ON and OFF
- Ś Frequency should read in the KILOHERTZ range when the driver is commanded ON. Frequency should

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

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

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

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

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

	=			10		6	ø		7		ە م	Sten
Did the DTC return?	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions.	Is Section 36 complete?	Refer to TCM diagnostic procedure, Section 3-6.	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.	Is the replacement complete?	Replace PCS4.	Repair or replace the internal wiring harness. Is the repair complete?	Were any wire-to-wire shorts found?	 Remove the hydraulic control module assembly. Inspect the internal harness for wire-to-wire shorts. 	Were any wire-to-wire shorts found?	Action NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Coordinate with the vehicle OEM to repair or replace the chassis harness. Is the repair complete? 1. Turn OFF the ignition. 2. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 3. Using a DVOM, test for wire-to-wire shorts between pin 2 and all other pins in the 20-way connector. NOTE: The resistance value between pins 2 and 1, and between pins 2 and 20 will read normal solenoid resistance. The resistance value between pins 2 and 7 (7-speed models), and between pins 2 and 8 will be twice normal solenoid resistance. Refer to the Solenoid Resistance chart for these values.	Action Value(s) Vac N
											Value(S) Refer to Solenoid Resistance Chart (Appendix K)	Value/el
	Begin the diagnosis again. Go to Step 1			Go to Step 11		Go to Step 11	Go to Step 11		Go to Step 8		Yes Go to Step 11 Go to Step 7	Vac
	System OK								Go to Step 9		Go to Step 10	No

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

Circuit Description

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

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

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

Actions Taken When the DTC Sets

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

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- Excessive vibration (driveline or engine torsionals)
- Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL—ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

- \mathbf{b} This step tests for proper transmission fluid level.
- ယ This step tests for active diagnostic codes.
- 4 This step tests ignition voltage.
- $\dot{\mathbf{v}}$ This step tests speed sensor readings.
- 6 This step tests for C1 clutch pressure from PCS1.
- $\overline{}$
- ∞ This step tests for stuck or sticking valves and damaged valve body gaskets. This step tests for evidence of clutch failure.

DTC P2723 Pressure Control Solenoid 1 (PCS1) Stuck Off

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

6-335

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

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DTC P2724 Pressure Control Solenoid 1 (PCS1) Stuck On

Refer to Hydraulic Schematic

Circuit Description

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

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

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

Actions Taken When the DTC Sets

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

6-337

ActionValueWas Section 3-5, Beginning The Troubleshooting Process, performed?ValuePerform the Fluid Checking Procedure (refer to appropriate mechanic's tips).perform the Fluid Checking Procedure (refer to appropriate mechanic's tips).Is the transmission fluid level correct?1. Install the Allison DOCTM For PC-Service Tool.2. Turn ON the ignition, leave engine OFF.3. Record the failure records.4. Clear the DTC.5. Drive the vehicle. Attempt to duplicate same operating conditions observed in failure records.NOTE: This DTC indicates that the TCM has detected that the off-going clutch did not release (clutch tie-up) following a shift.Did DTC P2724 return?1. Install the Allison DOCTM For PC-Service Tool.9–18V (12)2. Start the engine.18–32V (24)3. Record the DTC Failure Record data.18–32V (24)4. Using the Allison DOCTM For PC-Service Tool, measure ignition voltage.9–18V (12)	Value(s) 9-18V (12V TCM) 18-32V (24V TCM)
	sp Cc

If the condition is intermittent, connect Allison DOCTM diagnostic tool and observe the speed sensor indicated DIAGNOSTIC TROUBLE CODES (DTC) 3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

- 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.

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

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DTC P2724 Pressure Control Solenoid 1 (PCS1) Stuck On

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

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





Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

Test Description

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

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

6-341	

Step	Action	Value(s)	Yes	No
	Was Section 3-5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
N	 Install the Allison DOCTM For PC–Service Tool. Start the engine. Record the failure records. Monitor ignition voltage. Is the voltage within the specified values? 	9–18V (12V TCM) 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem
: در:	 Clear the DTC. Start the engine and test drive the vehicle. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). NOTE: This DTC is intended to detect an open condition in the PCSI electrical circuit. 		Go to Step 4	Go to Diagnostic Aids
4	Did DTC P2/2/ return? NOTE: Review Section 4—Wire Test Procedures		Go to Step 5	Go to Step 6
	 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 DOCTM For PC-Service Tool, enter Solenoid Test mode and command PCS1 ON. 6. Determine the voltage drop in the high side of the PCS1 circuit as follows: At J 47275-1 TCM Overlay, measure voltage between pin 71 and an isolated ground. At J 47279-1 Transmission Overlay, measure voltage between pin 6 and isolated ground. Subtract the two voltage drop in the circuit. 7. Determine the voltage drop in the low side of the PCS1 circuit as follows: At J 47275-1 TCM Overlay, measure voltage between pin 6 and isolated ground. Subtract the two voltage measurements to obtain the voltage drop in the circuit. 7. Determine the voltage drop in the low side of the PCS1 circuit as follows: At J 47279-1 Transmission Overlay, measure voltage between pin 36 and an isolated ground. At J 47279-1 Transmission Overlay, measure voltage between pin 4 and isolated ground. At J 47279-1 Transmission Overlay, measure voltage between pin 4 and isolated ground. At J 47279-1 Transmission Overlay, measure voltage between pin 4 and isolated ground. Subtract the two voltage measurements to obtain the voltage drop in the circuit. MOTE: 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	Co to Step 6

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3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

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

	22		10 N	9 F	8 I	ſ			7	I	ىپ		6	I		z	0	6	v 5	Step
Did the DTC return?	 In order to verify your repair: Clear the DTC. Drive the vehicle under conditions noted in failure records. 	Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.	Replace PCS1. Is the replacement complete?	Replace the internal wiring harness. Is the replacement complete?	Is resistance within the specified values?	 Using a DVOM, measure PCS1 resistance at pins A and B. 	 Example the hydrautic control mouth assembly. Disconnect PCS1 from the internal wiring harness. 	Remove the hydraulic control module accembly	Is the resistance within the specified value?		J 47279 Transmission Breakout. Leave the transmission 20-way connector connected to breakout.	 Turn OFF the ignition. Disconnect the OEM 20-way connector from 	Is the repair complete?	Coordinate with the vehicle OEM to repair or replace the vehicle wiring.	warranty.	performed by Allison Transmission distributors and dealers are not covered by Allison Transmission	external wiring harness repairs. Harness repairs	NOTE: The vehicle OEM has responsibility for all	Action
								Resistance Chart (Appendix K)	Defer to Colenoid			(Appendix K)	Refer to Solenoid Resistance Chart							Value(s)
	Begin the diagnosis again. Go to Step 1		Go to Step 11	Go to Step 11	Go to Step 11			o dare or o	Co to Ston &				Go to Step 10						Go to Step 11	Yes
	System UK							Go to step y	Co to Cim 0				Go to Step 7							No



Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

- When DTC P2729 is active, the following conditions will occur:
- The CHECK TRANS light illuminates
- DTC is stored in TCM history.
- determines the range attained Hydraulic default (SOL OFF) is commanded. The shift selector position and hydraulic state of latch valves

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- ٠ DTC P2729 indicates a short-to-ground in the electrical circuit for PCS1.
- . 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. You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- following conditions: Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the
- A bent terminal
- A backed-out terminal
- A damaged terminal
- Poor terminal tension
- A chafed wire
- A broken wire inside the insulation.
- open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to parking brake drum, suspension components, etc. an
- . equipment for a change. When diagnosing for an intermittent short or open, massage the wiring harness while watching the test
- LSD functionality as follows: Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)-measure solenoid

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

Test Description

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

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

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL—ALLISON 4 th GENERATION CONTROLS	3000 AND 4000 PRODUCT FAM

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

Action Yaus Section 3-5: Beginning The Troubleshooting Process, performed? Cor to Step 2 1. Install the Allison DOCTN For PC-Service Tool. 9-18V (12V TCM) Go to Step 2 2. Start the engine. 1. Install the Allison DOCTN For PC-Service Tool. 9-18V (12V TCM) Go to Step 3 3. Record the failure records. 1. Process. 1. Process. 1. Process. 1. Process. 4. Monior ignition voltage. 1. Clear the UTC. Go to Step 4 1. Clear the DTC. Go to Step 4 2. Start the engine and test drive the vehicle. 3. Attempt to duplicate the same conditions observed in the EDSI electrical circuit. Go to Step 4 1. Clear the DTC. Go to Step 4 1. Clear the DTC is intended to detect short-to- ground condition in the PCSI electrical circuit. DID TC P229 reum? Go to Step 5 1. Turn OFF the ignition. 1. Turn OFF the ignition. Co to Step 5 1. Turn OFF the ignition 20-way connector. 3. Install the OLE-side of the 80-way connector. Go to Step 5 1. Disconnect the TCM Breakout. Leave the TCM disconnected. Go to Step 5 For Step 5 For Step 5 1. Issee the routing of wire 136 in the chassis connector. So and all other priss in the chassis portice. Go to Step 11 Go to St					
Wite Section 3-5. Beginning The Troubleshooting Process, performed? Go to Step 2 1. Install the Alison DOC TM For PC-Service Tool. 9-18V (12V TCM) Go to Step 3 2. Start the engine and the dilure records. 18-32V (24V TCM) Go to Step 4 3. Record the failure records. 18-32V (24V TCM) Go to Step 4 2. Start the engine and test drive the vehicle. 18-32V (24V TCM) Go to Step 4 3. Altempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). Go to Step 4 1 2. Start the engine and test drive the vehicle. 1 Go to Step 4 1 3. Altempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). Go to Step 5 Go to Step 5 Did DTC 1729 return? Did DTC 1729 return? Go to Step 5 Did OTC 1720 return? Did Store Section 4Wire Test Procedures Go to Step 5 1. Turn OFF the ignition. 1 Go to Step 5 1. Turn OFF the ignition. Co to Step 5 Go to Step 5 1. Start the evoluting of twite 156 in the Chassis harness between the TCM and the transmission Go to Step 5 2. Store the trouting of twite 156 in the chassis harness between the TCM and the transmission Go to Step 11 3. Attempt each other wire 156 in the chassis performed by Allison Transmission fastributors and dealers are nof covered by Allison Transmission in th	Step	Action	Value(s)	Yes	No
1. Install the Allison DOCT ^{IN} For PC-Service Tool. 9-18V (12V TCM) Go to Step 3 1 2. Start the engine. 18-32V (24V TCM) Go to Step 3 1 3. Record the failure records. 18-32V (24V TCM) Go to Step 3 1 4. Monitor ignition voltage. 18-32V (24V TCM) Go to Step 4 1 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.). Go to Step 4 1 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.). Go to Step 4 1 2. Start the engine and test drive the vehicle. 3. Intended to detect short-to-ground condition in the PCSI electrical circuit. Did DTC P2729 return? Go to Step 5 6 1. Turn OFF: the ignition. 1. Turn OFF the ignition. Go to Step 5 <		Was Section 3-5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
4. Monitor ignition voltage. is the voltage within the specified values? Go to Step 4 I. Clear the DTC. 1. Start the engine and test drive the vehicle. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). For the same conditions observed in the failure records (range attained, temperature, etc.). NOTE: This DTC is intended to detect stort-to-ground condition in the PCSI electrical circuit. Did DTC P2729 return? Co to Step 4 L NOTE: Review Section 4—Wire Test Procedures before performing steps. In the PCSI electrical circuit. Did DTC P2729 return? Co to Step 5 1. Turn OFF the ignition. Disconnect the TCM 80-way connector: Go to Step 5 Scionnector. 3. Install the OEM-side of the 80-way connector: Scionnector. Scionnector. Scionnector. 4. Disconnect the transmission 20-way connector: Scionnector. Scionnector. Scionnector. 5. Inspect the transmission 20-way connector. Scionnector. Scionnector. Scionnector. Scionnector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the slow sequence of the transmission dots or shorts-to-ground between pin 36 and all other pins in the slow sectors. Go to Step 11 externed wiring defects found? Go to Step 11 Sci to Step 11 Sci to Step 11 <	2		9–18V (12V TCM) 18–32V (24V TCM)		Resolve voltage problem.
1. Clear the Voltage within the specified values? Go to Step 4 L 1. Clear the DTC. Go to Step 4 L 2. Start the engine and test drive the vehicle. Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). Go to Step 4 L NOTE: This DTC is intended to detect short-to-ground condition in the PCSI electrical circuit. Did DTC P2729 return? Go to Step 5 L NOTE: Review Section 4—Wire Test Procedures before performing steps. I. Turn OFF the ignition. Some connector. Some connector. 2. Disconnect the TCM 80-way connector. Disconnect the TCM 80-way connector. Some connector. Some connector. 4. Disconnect the transmission 20-way connector. Some connector. Some connector. Some connector. 5. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. Some connector. Some connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts or shorts-to-ground between pin 36 and chassis ground. Go to Step 11 Go to Step 11 80-way connector. Go to Step 11 Go to Step 11 Go to Step 11 Step 11 90-way connector. Go to Step 11 Go to Step 11 Go to Step 11 Step 11 Step 11 91		 Record the failure records. Monitor ignition voltage. 			
1. Clear into LDC. Co to Step 4 L 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.). Co to Step 4 L 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 PCSI electrical circuit. Did DTC P2729 return? Co to Step 5 NOTE: Review Section 4—Wire Test Procedures before performing steps. I. Turn OFF the ignition. Co to Step 5 Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector. 3. Install the OEM-side of the 80-way connector. 5. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts or shorts-to-ground between pin 36 and all other pins in the 80-way connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts or shorts-to-ground between pin 36 and all other pins in the 80-way connector. 6. At J 47275-1 TCM And the transmission connector and chassis ground. Go to Step 11 For the pin for the failed to the failed t)	Is the voltage within the specified values?			
 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 PCSJ electrical circuit. Did DTC P2729 return? NOTE: Review Section 4—Wire Test Procedures before performing seps. 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector. 5. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission 20-way connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground wiring defects found? Were any wire-to-wire shorts-to-ground wiring hearness repairs. Harness repairs and dedeers are not covered by Allison Transmission adstributors and dealers are not covered by Allison Transmission is shorts explice with the vehicle OEM to repair or replace the vehicle witing. 	در؛			Go to Step 4	Go to Diagnostic Aids
NOTE: This DTC is intended to detect short-to- ground condition in the PCSI electrical circuit. Did DTC P2729 return? NOTE: Review Section 4—Wire Text 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. 5. Inspect the routing of vire 136 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground between pin 36 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground writing defects found? NOTE: The vehicle OEM has responsibility for all external writing harness repairs. Harness repairs performed by Allison Transmission warranty. Coordinate with the vehicle OEM to repair or replace the vehicle writing. Is the repair complete?					
Did DTC P2729 return? Go to Step 5 NOTE: Review Section 4Wire Test Procedures before performing steps. Go to Step 5 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector. 10 4. Disconnect the transmission 20-way connector. 11 5. Inspect the routing of wire 166 in the chassis harness between the TCM and the transmission connector. 11 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector. 11 7. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector. 11 80-way connector. 11 11 80-way connector. 11 11 80-way connector. 11 11 80-way connector. 11 11 90 TE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission warranty. Go to Step 11 00 replace the vehicle OEM to repair or replace the vehicle wiring. 51 15 the repair complete? 11		NOTE: This DTC is intended to detect short-to- ground condition in the PCS1 electrical circuit.			
NOTE: Review Section 4—Wire Test Procedures Go to Step 5 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. 3. Install the OEM-side of the 80-way connector. 6. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. 5. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground wiring defects found? Were any wire-to-wire shorts or shorts-to-ground wiring defects found? Go to Step 11 external withing harness repairs. Harness repairs on dealers are not covered by Allison Transmission warranty. Go to Step 11 Coordinate with the vehicle OEM to repair or replace the wehicle wiring. Is the repair complete?		Did DTC P2729 return?			
 Turn OFF the ignition. Disconnect the TCM 80-way connector. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. Disconnect the transmission 20-way connector. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground between pin 36 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found? NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission warranty. Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete? 	4			Go to Step 5	Go to Step 6
 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground between pin 36 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found? 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 replace the vehicle wiring. Is the repair complete? 		1. Turn OFF the ignition.			
 4. Disconnecture. 4. Disconnect the transmission 20-way connector. 5. Inspect the routing of wire 136 in the chassis harness between the TCM and the transmission connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground between pin 36 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found? 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 repair or replace the vehicle wiring. Is the repair complete? 		 Disconnect the TCM 80-way connector. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM 			
 connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector, and shorts-to-ground between pin 36 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground wiring defects found? 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 varranty. Coordinate with the vehicle OEM to repair or replace the vehicle wiring. 					
Were any wire-to-wire shorts or shorts-to-ground wiring defects found? 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?					
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?		Were any wire-to-wire shorts or shorts-to-ground wiring defects found?			
Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?	UI	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.		Go to Step 11	
		Coordinate with the vehicle OEM to repair or replace the vehicle wiring.			

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

Step	Action	Value(s)	Yes	No
6	1. Turn OFF the ignition.		Go to Step 7	Go to Step 10
	 Instail J 4/2/9 Fransmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. Using a DVOM, test for wire-to-wire shorts between pin 4 and all other pins in the 20-way connector, and shorts-to-ground between pin 4 and chassis ground. 			
	<i>NOTE: The resistance value between pins 8 and 6</i> <i>will read normal solenoid resistance. The resistance</i> <i>value between pins 4 and 5, and between 4 and 9</i> <i>will be twice normal solenoid resistance.</i>			
	Were any wire-to-wire shorts, or shorts-to-ground found?			
7	 Remove the hydraulic control module assembly. Inspect the internal harness for wire-to-wire shorts, or shorts-to-ground. 		Go to Step 8	Go to Step 9
	Were any wire-to-wire shorts, or shorts-to-ground found?			
8	Repair or replace the internal wiring harness. Is the repair complete?		Go to Step 11	
6	Replace PCS I. 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.		Go to Step 12	
	Refer to TCM diagnostic procedure, Section 3-6. Is Section 3-6 complete?			
=	In order to verify your repair:		Begin the	System OK
	 Clear the DTC. Drive the vehicle under conditions noted in failure records. 		diagnosis again. Go to Step 1	
	Did the DTC return?			



Circuit Description

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- ٠ DTC P2730 indicates a short-to-battery in the electrical circuit for PCS1.
- ٠ data can be useful in reproducing the failure mode when DTC was set. determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- following conditions: Inspect the wiring for poor electrical connections at the TCM and transmission connector. Look for the
- A bent terminal
- A backed-out terminal
- A damaged terminal
- Poor terminal tension
- A chafed wire
- A broken wire inside the insulation.
- parking brake drum, suspension components, etc. open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an
- ٠ equipment for a change. When diagnosing for an intermittent short or open, massage the wiring harness while watching the test
- Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)-measure solenoid LSD functionality as follows:

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- -Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness.
- \mathbf{P} 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.
- ယ nect the BLACK test lead to the isolated ground pin. Connect the RED test lead to the solenoid low side pin at TCM breakout harness adapter J 47275. Con-
- 4 Use Allison DOCTM For PC-Service Tool solenoid test function to command the solenoid ON and OFF
- S 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

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

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

6

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL—ALLISON 4 th GENERATION CONTROLS

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

Step	Action	Value(s)	Yes	No
-	Was Section 3–5, Beginning The Troubleshooting		Go to Step 2	Go to Section 3-5.
				Troubleshooting Process
2	1. Install the Allison DOCTM For PC-Service Tool.	9-18V (12V TCM)	Go to Step 3	Resolve voltage
	2. Start the engine.	18-32V (24V TCM)		problem.
	3. Record the failure records.			
	4. Monitor ignition voltage.			
	Is the voltage within the specified values?			
υ.	I. Clear the DTC.		Go to Step 4	Go to
	2. Start the engine and test drive the vehicle.			Diagnostic Aids
	3. Attempt to duplicate the same conditions			
	temperature, etc.).			
	NOTE: This DTC is intended to detect short-to- battery condition in the PCS1 electrical circuit.			
	Did DTC P2730 return?			
4	NOTE: Review Section 4—Wire Test Procedures		Go to Step 5	Go to Step 6
	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			
	4. Disconnect the transmission 20-way connector.			
	5. Inspect the routing of wire 171 in the chassis harness between the TCM and the transmission			
	 At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 36 and all other pins in the 80-way connector 			
	Were any wire-to-wire shorts found?			
ა	NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs		Go to Step 11	
	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.			
-				

DTC P9730 P e Control Solenoid 1 (PCS1) Cont ol Circuit Hiah (nntid)

Step	Action	Value(s)	Yes	
6	 Turn OFF the ignition. Install J 47279 Transmission Breakout to the transmission 20-way connector. Leave the OEM harness disconnected. 		Go to Step 7	Go to Step 10
	3. Using a DVOM, test for wire-to-wire shorts between pin 4 and all other pins in the 20-way connector, and shorts-to-ground between pin 4 and chassis ground.			
	<i>NOTE: The resistance value between pins 4 and 6 will read normal solenoid resistance. The resistance value between pins 4 and 5, between 4 and 9, and between 4 and 10 will be twice normal solenoid resistance.</i>			
	Were any wire-to-wire shorts, or shorts-to-ground found?			
7	 Remove the hydraulic control module assembly. Inspect the internal harness for wire-to-wire shorts. 	Refer to Solenoid Resistance Chart (Appendix K)	Go to Step 8	Go to Step 9
	Were any wire-to-wire shorts, or shorts-to-ground found?			
8	Repair or replace the internal wiring harness.		Go to Step 11	
9	Replace PCS1.		Go to Step 11	
	Is the replacement complete?			
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.		Go to Step 11	
	Refer to TCM diagnostic procedure, Section 3-6.			
	Is Section 3-6 complete?			
11	In order to verify your repair:		Begin the diagnosis again.	System OK
	2. Drive the vehicle under conditions noted in		Go to Step 1	
	failure records.			
	Did the DTC return?			

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

(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. Pressure Control Solenoid 5 (PCS5) is a normally closed (N/C) solenoid used to apply the retarder solenoid











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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- P2761, the open is most likely in the high side of the circuit. power to solenoids torque converter clutch (TCC) and SS2. If DTC P2736 is accompanied by DTC P0975 and DTC P2736 indicates an open in the electrical circuit for PCS5. In addition to PCS5, HSD3 also supplies
- 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. You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- ٠ 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.
- ٠ Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an parking brake drum, suspension components, etc open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes
- ٠ equipment for a change When diagnosing for an intermittent short or open, massage the wiring harness while watching the test

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL---ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

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

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

Step	Action	Value(s)	Yes	No
	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	on DOC TM For PC-Service Tool.	9–18V (12V TCM)	Go to Step 3	Resolve voltage
	 Start the engine. Record the failure records. 	18–32V (24V TCM)		problem
	4. Monitor ignition voltage.			
	Is the voltage within the specified values?			
ũ	1. Clear the DTC.		Go to Step 4	Go to
	2. Start the engine and test drive the vehicle.			Diagnostic Aids
	 Attempt to duplicate the same conditions observed in the failure records (range attained, temperature, etc.). 			
	NOTE: This DTC is intended to detect an open condition in PCS5 electrical circuit.			
	Did DTC P2736 return?			

3000 AND 4000 PRODUCT FAMILIES TROUBLESHOOTING MANUAL-ALLISON 4th GENERATION CONTROLS

DIAGNOSTIC TROUBLE CODES (DTC)

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

							~										+		Step
Did either high-side or low-side voltage drop exceed 0.5VDC?	<i>NOTE: A voltage drop of more than 0.5V across either circuit indicates an excessive voltage loss in the OEM harness.</i>	 Measure voltage between T-case-B and isolated ground (3000 7-speed only). Subtract the two voltage measurements to obtain the voltage drop in the circuit. 	 Back probe pin B of the T-case 6-way Cannon connector using jumper wire kit J39197 or equivalent. 	 At J 47279-1 Transmission Overlay, measure voltage between RTDR FEED THRU-A and isolated ground (retarder units), OR 	 At J 47275-1 TCM Overlay, measure voltage between pin 15 and an isolated ground. To measure PCS5 low-side voltage: 	7. Determine the voltage drop in the low side of the PCS5 circuit as follows:	 Measure voltage between T-case-B and isolated ground (3000 7-speed only). Subtract the two voltage measurements to obtain the voltage drop in the circuit. 	 Back probe pin B of the T-case 6-way Cannon connector using jumper wire kit J39197 or equivalent. 	 At J 47279-1 Transmission Overlay, measure voltage between RTDR FEED THRU-B and isolated ground (retarder units), OR 	between pin 31 and an isolated ground.To measure PCS5 high-side voltage:	At J 47275-1 TCM Overlay, measure voltage	6. Determine the voltage drop in the high side of the PCS5 circuit as follows:	5. Using Allison DOC TM For PC–Service Tool, enter Solenoid Test mode and command PCS5 ON.	3. Install J 47279 Transmission Breakout between the OEM and transmission 20-way connectors.	and TCM 80-way connectors.	1. Turn OFF the ignition.	before performing steps.		Action
																		vaiue(s)	Value(s)
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DTC P2736 Pressure Control Solenoid 5 (PCS5) Control Circuit Open (contd)

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



hydraulic pressure in the control circuit. When PCS5 is commanded OFF, the control circuit is deactivated 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

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

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

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

Actions Taken When the DTC Sets

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

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

- DTC P2738 indicates a short-to-ground in the electrical circuit for PCS5
- data can be useful in reproducing the failure mode when DTC was set. determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to
- 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.
- parking brake drum, suspension components, etc. open or short circuit condition. Moving parts on the vehicle could be contacting the harness; this includes Inspect OEM wiring harness routing, look for possible contact points where chafing could occur leading to an
- equipment for a change. When diagnosing for an intermittent short or open, massage the wiring harness while watching the test
- LSD functionality as follows: Advanced Troubleshooting (requires a frequency-capable digital multimeter, if available)---measure solenoid
- . Install TCM breakout harness adapter J 47275 between the 80-way connectors of the TCM and OEM harness
- \mathbf{b} 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

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

Test Description

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

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

6

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

Step	Action Value(s) Ves	Value(s)	Yes	NO
	Was Section 3–5, Beginning The Troubleshooting Process, performed?		Go to Step 2	Go to Section 3–5, Beginning the Troubleshooting Process
2	n DOC TM For PC–Service Tool.	9–18V (12V TCM)	Go to Step 3	Resolve voltage
	 Start the engine. Record the failure records. 	18–32V (24V TCM)		problem
	4. Monitor ignition voltage.			
	Is the voltage within the specified values?			
J.	I. Clear the DTC.		Go to Step 4	Go to
	 Start the engine and test drive the vehicle. Attempt to duplicate the same conditions observed in the failure records (range attained, 			Diagnostic Aids
	NOTE: This DTC is intended to detect a short-to- ground condition in the PCS5 electrical circuit.			

Did DTC P2738 return?

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

Step		1. Turn 2. Disc 3. Insta	3. Insta the J discc 4. Disc conn	5. Inspe harn conn	6. At J short 80-w pin 1	Were at wiring (5 NOTE: externa	perforn dealers warran	<i>perforn</i> <i>dealers</i> <i>warran</i> Coordin replace Is the re	<i>perform</i> <i>dealers</i> <i>warran</i> Coordin replace Is the re 6 1. Turn				
Action Value(s) Yes N	Review Section 4—Wire Test Procedures performing steps.	OFF the ignition. onnect the TCM 80-way connector. If the OEM-side of the 80-way connector to	II the OEM-side of the 80-way connector to 47275 TCM Breakout. Leave the TCM onnected. onnect the retarder feedthrough or T-case ector.	ect the routing of wire 115 in the chassis ess between the TCM and the PCS5 ector.	47275-1 TCM Overlay, test for wire-to-wire ts between pin 15 and all other pins in the vay connector, and shorts-to-ground between 5 and chassis ground.	ry wire-to-wire shorts or shorts-to-ground defects found?	The vehicle OEM has responsibility for all	l wiring harness repairs. Harness repairs ned by Allison Transmission distributors and are not covered by Allison Transmission ty.	<i>t wiring harness repairs. Harness repairs and are not covered by Allison Transmission distributors and ty.</i> ty. the with the vehicle OEM to repair or the vehicle wiring.	 wiring harness repairs. Harness repairs need by Allison Transmission distributors and are not covered by Allison Transmission ty. ty. the with the vehicle OEM to repair or the vehicle wiring. pair complete? OFF the ignition. 	 wiring harness repairs. Harness repairs red by Allison Transmission distributors and are not covered by Allison Transmission ty. are with the vehicle OEM to repair or the vehicle wiring. ppair complete? OFF the ignition. g a DVOM, test for shorts-to-ground g a DVOM, test for shorts-to-ground eet or and chassis ground. ny shorts-to-ground found? 	 <i>wiring harness repairs. Harness repairs are not covered by Allison Transmission distributors and are not covered by Allison Transmission distributors and ty.</i> <i>inate with the vehicle OEM to repair or the vehicle wiring.</i> <i>ipair complete?</i> OFF the ignition. <i>g</i> a DVOM, test for shorts-to-ground een pin A of retarder feed through or T-case lector and chassis ground. <i>iy shorts-to-ground found?</i> <i>ove the retarder valve body (retarder units) case (3000 7-speed only).</i> <i>ace PCS5.</i> <i>placement complete?</i> <i>In most cases, the TCM is not at fault.</i> <i>pafe thoroughly before replacing the TCM.</i> <i>or 3-6 complete?</i> <i>r to verify your repair:</i> 	 <i>wiring harness repairs. Harness repairs red by Allison Transmission distributors and are not covered by Allison Transmission distributors and are not covered by Allison Transmission distributors and the vehicle wiring.</i> <i>pair complete?</i> OFF the ignition. g a DVOM, test for shorts-to-ground een pin A of retarder feed through or T-case lector and chassis ground. <i>ny shorts-to-ground found?</i> <i>ove the retarder valve body (retarder units) case (3000 7-speed only).</i> <i>ace PCS5.</i> <i>placement complete?</i> <i>In most cases, the TCM is not at fault.</i> <i>po TCM diagnostic procedure, Section 3–6.</i> <i>on 3–6 complete?</i> <i>r to verify your repair:</i> <i>r the DTC.</i> 	 <i>wiring harness repairs. Harness repairs are not covered by Allison Transmission distributors and are not covered by Allison Transmission distributors and are not covered by Allison Transmission ty.</i> <i>ty.</i> <i>ty.</i> <i>the vehicle OEM to repair or the vehicle wiring.</i> <i>pair complete?</i> <i>OFF the ignition.</i> <i>g a DVOM, test for shorts-to-ground een pin A of retarder for shorts-to-ground een pin A of retarder det through or T-case eetor and chassis ground.</i> <i>ny shorts-to-ground found?</i> <i>ove the retarder valve body (retarder units) case (3000 7-speed only).</i> <i>ace PCS5.</i> <i>splacement complete?</i> <i>In most cases, the TCM is not at fault.</i> <i>pate thoroughly before replacing the TCM.</i> <i>o</i> TCM diagnostic procedure, Section 3–6. <i>o</i> on 3–6 complete?! <i>r</i> to verify your repair: <i>r</i> the DTC. <i>e</i> the vehicle under conditions noted in records.
Value(s)														
Yes	Go to Step 5						Go to Step 9			Go to Step 7	Go to Step 7	Go to Step 7 Go to Step 9 Go to Step 9 Begin the	Go to Step 7 Go to Step 9 Go to Step 9 Go to Step 9 diagnosis again. Go to Step 1	Go to Step 7 Go to Step 9 Go to Step 9 Begin the diagnosis again. Go to Step 1
No	Go to Step 6									Go to Step 8	Go to Step 8	Go to Step 8 System OK	Go to Step 8 System OK	Go to Step 8 System OK
NOTE: Review Section 4—Wire Test Procedures Go to Step 5 before performing steps. 1. Turn OFF the ignition. 2. 1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. 3. Install the OEM-side of the 80-way connector. 3. Install the OEM-side of the 80-way connector. 4. 4. Disconnect the retarder feedthrough or T-case connector. 4. Disconnect the retarder feedthrough or T-case connector. 5. 5. Inspect the routing of wire 115 in the chassis harness between the TCM and the PCSS connector. 6. A. I 47275-TCM Overlay, test for wire-to-wire shorts between pin 15 and all other pins in the 80-way connector. 6. A. I 47275-TCM Overlay, test for wire-to-ground wiring defects found? Go to Step 9 9 80-way connector. 6. A. I 47275-The vehicle OEM has responsibility for all external wiring defects found? Go to Step 9 9 80-way connector. Go to Step 9 9	1. Turn OFF the ignition. 2. Disconnect the TCM 80-way connector. 3. Install the OEM-side of the 80-way connector to the 147275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the retarder feedbhrough or T-case connector. 5. Inspect the routing of wire 115 in the chassis harness between the TCM and the PCS5 connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 15 and all other pins in the 80-way connector. and shorts-to-ground between pin 15 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground dealers are not covered by Allison Transmission distributors and dealers are not covered by Allison Transmission distributors and dealers are not covered by Allison Transmission distributors and between pin 4 Allison Transmission distributors and between pin 4 Allison Transmission distributors and between pin 4 Allison Transmission distributors and between pin complete? 1. Turn OFF the ignition. Go to Step 9 2. Using a DVOM, uest for shorts-to-ground between pin 4 of retarder feed through or T-case connector and chasis ground. Go to Step 7 2. Using a DVOM, uest for shorts-to-ground between pin 4 of retarder feed through or T-case connector and chasis (3000 7-speed only). Go to Step 9 2. Renove the retarder valve body (retarder units) Co to Step 9 2. Replace PCSS. Go to Step 9	the J 47275 TCM Breakout. Leave the TCM disconnected. 4. Disconnect the retarder feedthrough or T-case connector. 5. Inspect the routing of wire 115 in the chassis harness between the TCM and the PCS5 connector. 6. A1 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 15 and all other pins in the 80-way connector, and shorts-to-ground between pin 15 and chassis ground. Were any wire-to-wire shorts or shorts-to-ground between pin 15 and elects found? NOTE: The vehicle OEM has responsibility for all external wiring defects found? Norrary. Coordinate with the vehicle OEM to repair or replace the vehicle wiring. 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At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 15 and all other pins in the 80-way connector. and shorts-to-ground between pin 15 and chassis ground. Wring defects found? NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs of warranty. Coordinate with the vehicle OEM to repair or replace the vehicle wring. 1. Turn OFF the ignition. 2. Using a TVOM, test for shorts-to-ground between pin A of retarder feed through or T-case connector and chassis ground. Were any shorts-to-ground iound? 1. Remove the retarder valve body (tetarder units) 2. Replace PCSS. 2. Replace PCSS. 3. Is the repaic complete? 3. In a const of consel only. 2. Replace PCSS. 3. Is the repaic on speed only. 3. Replace PCSS. 4. Remove the retarder valve body (tetarder units) 5. Replace PCSS.</td><td>the J 47275 TCM Breakout. Leave the TCM 4. Disconnected. 4. Disconnection: 5. 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In order to verify your repair: 1. Clear the DTC. 2. Drive the problem of the production product in the product</td><td>Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete? In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records.</td></tr<></td></t<>	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 relative feedthrough or T-case connector. 5. Inspect the routing of wire 115 in the chassis harness between the TCM and the PCS5 connector. 6. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between the TCM and the PCS5 connector. 7. At J 47275-1 TCM Overlay, test for wire-to-wire shorts between pin 15 and all other pins in the 80-way connector. and shorts-to-ground between pin 15 and chassis ground. Wring defects found? 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