Allison Transmission®

Allison 4th Generation Controls

Troubleshooting Manual

3000 and 4000 Product Families

TS3989EN

Troubleshooting Manual

2005 DECEMBER
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TS3989EN

Allison Transmission

VOCATIONAL MODELS

3000 VOCATIONAL MODELS

3000 HS	3500 RDS		B 300(P)(R)
3000 RDS	3500 EVS		B 400(P)(R)
3000 EVS			T 200
3000 MH			T 300
3000 PTS			
3000 TRV			
3200 SP	3500 SP	3700 SP	
3200 TRV			

4000 VOCATIONAL MODELS

4000 EVS	4500 EVS	4700 EVS	4800 EVS	B 500
4000 HS	4500 HS	4700 RDS		B 500P
4000 MH	4500 RDS			B 500R
4000 RDS	4500 SP			B 500PR
4000 TRV	4500 TRV			T 425
				T 450

Allison Transmission

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FOREWORD — How to Use This Manual

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

This manual includes:

- Description of the 3000 and 4000 Product Families Allison 4TH Generation Electronic Control system.
- Description of the electronic control system components.
- Description of diagnostic codes, system responses to faults, and troubleshooting.
- Wire, terminal, and connector repair information.

Specific instructions for using many of the available or required service tools and equipment are not included in this manual. The service tool manufacturer will furnish instructions for using the tools or equipment.

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

This publication is revised periodically to include improvements, new models, special tools, and procedures. A revision is indicated by a new date on the title page and in the lower left corner of the rear cover. Check with your Allison Transmission service outlet for the currently applicable publication. Additional copies of this publication may be purchased from authorized Allison Transmission service outlets. Look in your telephone directory under the heading of Transmissions — Truck, Tractor, etc.

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

NOTE: Allison Transmission is providing for service of wiring harnesses and wiring harness components as follows:

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

St. Clair Technologies, Inc.
920 Old Glass Road
Wallaceburg, Ontario, N8A 4L8
Phone: 519-627-1673
Fax: 519-627-4227

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

IMPORTANT SAFETY NOTICE

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

Also, be sure to review and observe WARNINGS, CAUTIONS, and NOTES provided by the vehicle manufacturer and/or body builder before servicing the Allison transmission in that vehicle.

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

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

WARNINGS, CAUTIONS, AND NOTES

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

WARNING!	**Is used when an operating procedure, practice, etc., which, if not correctly followed, could result in injury or loss of life.**

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

NOTE: ***Is used when an operating procedure, practice, etc., is essential to highlight.***

TRADEMARKS USED IN THIS MANUAL

The following trademarks are the property of the companies indicated:

- Allison DOC™ is a trademark of General Motors Corporation.
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- LPS® Cleaner is a registered trademark of LPS Laboratories.
- Loctite® is a registered trademark of the Loctite Corporation.
- MagiKey® is a registered trademark of NEXIQ Technologies, Inc.
- Teflon® is a registered trademark of the DuPont Corporation.
- TranSynd™ is a trademark of Castrol Ltd.

SHIFT SELECTOR TERMS AND DISPLAY INDICATIONS

Shift selector terms and displays are represented in this manual as follows:

- Button Names — ↑, ↓, "display mode", **MODE**, etc.
- Transmission Ranges — **D** (Drive), **N** (Neutral), **R** (Reverse), **1** (First), **2** (Second), etc.
- Displays — "**o, L**"; "**o, K**", etc. (Display occurs one character at a time.)

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APPENDICES

NOTES

SECTION 1—GENERAL DESCRIPTION

1–1. TRANSMISSION

The Allison 4th Generation Controls feature closed-loop clutch control to provide superior shift quality over a wide range of operating conditions. The 3000 and 4000 Product Families transmissions configurations can be programmed to have up to six forward ranges, neutral, and one reverse range. The MD 3070, 3700 SP, HD 4070/4076, 4700 RDS, 4700/4800 EVS, 4700/4800 SP have up to seven forward ranges and one reverse.

Figure 1–1 is a block diagram of the basic system inputs and outputs.

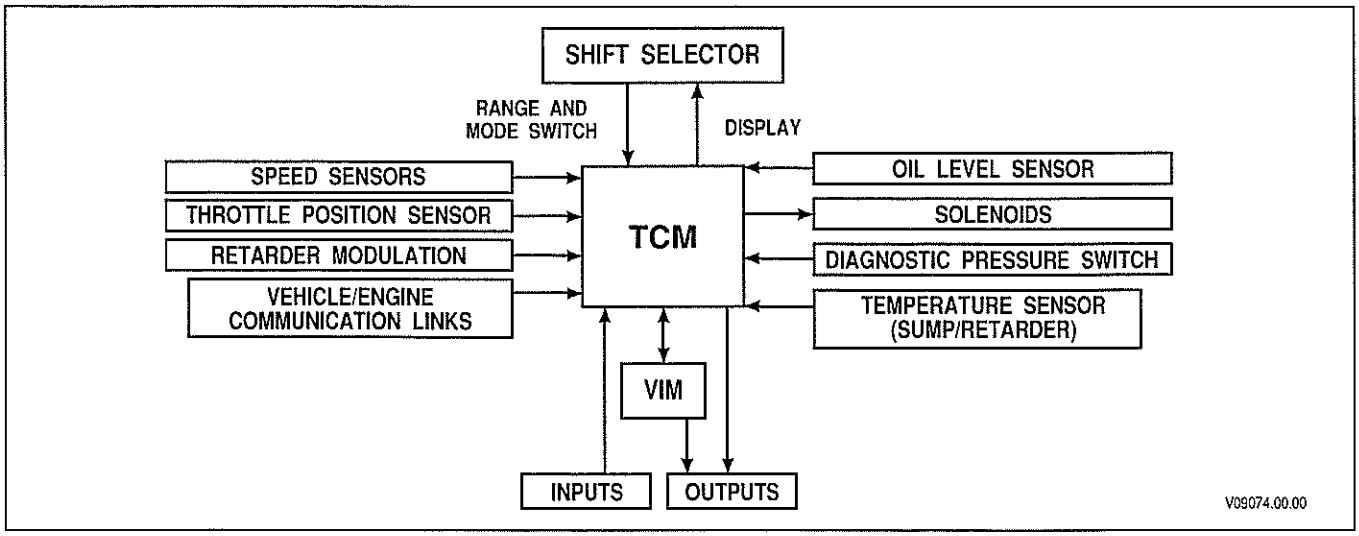


Figure 1–1. Transmission Control Module

Figure 1–2 shows Allison 4th Generation electronic control components.

Allison 4th Generation Controls consist of the following elements:

- Remote 12V or 12/24V Max Feature Sealed Transmission Control Module (TCM)
- Remote Pushbutton or Lever Shift Selector
- Optional Secondary Shift Selector
- Throttle Position Sensor (TPS) (or electronic engine throttle data or PWM signal)
- Engine, Turbine, and Output Speed Sensors
- Control Module (Electro-Hydraulic Valve Body)
- Wiring Harnesses
- Vehicle Interface Module (VIM)
- Autodetect Feature
- TransID Feature
- Optional Retarder Controls
- Optional Engine Coolant Temperature Input.

NOTE:
- ***All external harnesses are OEM supplied.***
- ***The VIM is an OEM option.***

GENERAL DESCRIPTION

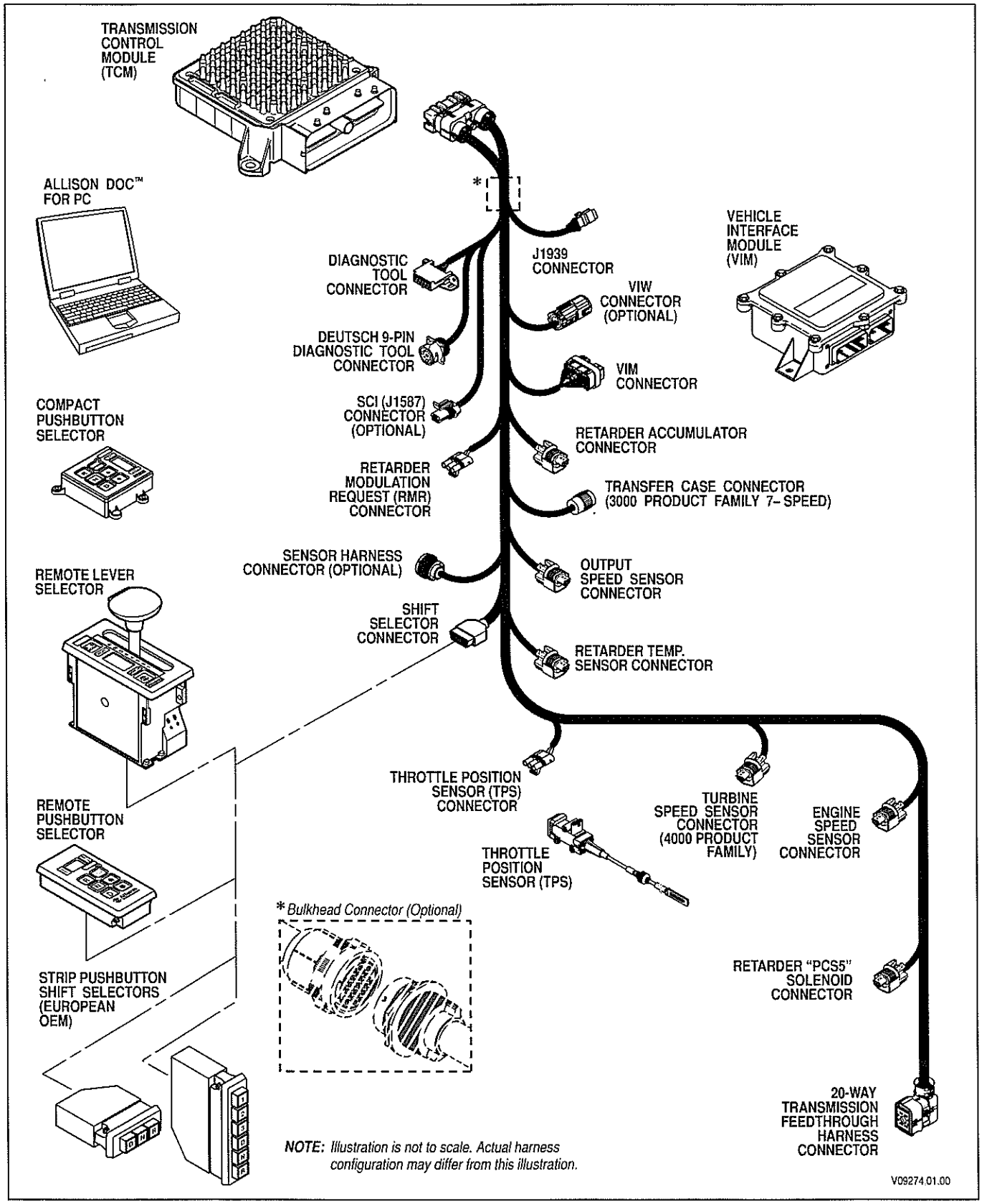


Figure 1–2. Typical Allison 4th Generation Control Components

GENERAL DESCRIPTION

1–2. TRANSMISSION CONTROL MODULE (TCM)

The electronic control of the transmission is performed by a microcomputer. The microcomputer is an independent controller and is referred to as a Transmission Control Module (TCM). TCMs are available in both 12V and 12/24V configurations to match the configuration of the vehicle electrical system.

The TCM (Figure 1–3) contains the microcomputer which is the brain of the control system. The TCM receives and processes information defining:

- Shift selector
- Throttle position
- Sump/retarder temperature
- Pressure switch state
- Engine speed
- Turbine speed
- Transmission output speed.

The TCM uses the information to:

- Control transmission solenoids
- Supply system status
- Provide diagnostic information.

Each TCM has a date code laser etched on the outer case of the TCM. This is the date when the TCM passed final testing. This date is commonly used to denote the change configuration level of the TCM. It is normal for the TCM date displayed electronically to be a few days prior to the date shown on the label.

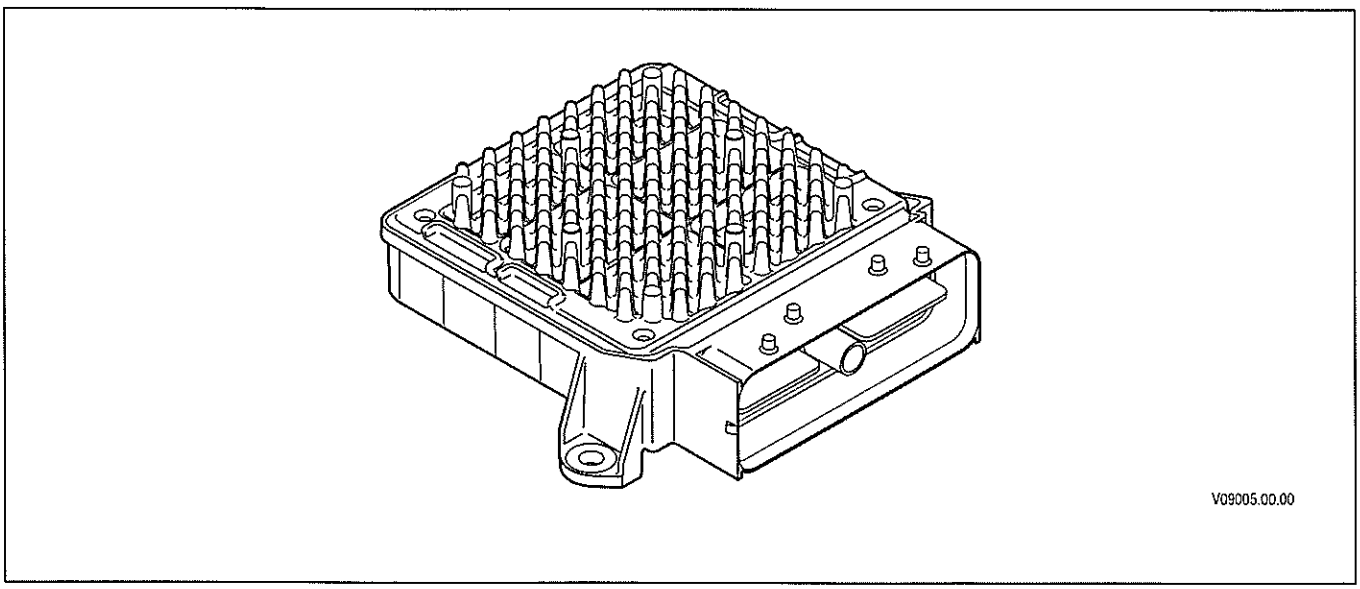


Figure 1–3. Transmission Control Module (TCM)

GENERAL DESCRIPTION

1–3. SHIFT SELECTOR

Pushbutton and lever shift selectors for the Allison 4th Generation Series are remote mounted from the TCM and communicate to the TCM via the J1939 communications data link. All shift selectors except the strip-type pushbutton have a dual digit vacuum fluorescent (VF) display and a mode indicator (LED). During normal transmission operation, illumination of the LED indicator shows that a secondary or special operating condition has been selected by pressing the **MODE** button. During diagnostic display mode, illumination of the LED indicator shows that the displayed diagnostic code is active. Display brightness is regulated by the same vehicle potentiometer that controls dash light display brightness. More information on both types of shift selectors is continued below.

A. Pushbutton Shift Selector *(Figure 1–4)*

There are three full-function pushbutton shift selectors and a strip pushbutton shift selector. Strip pushbutton shift selectors are used primarily by non-North American OEMs. A full-function shift selector has a **MODE** button and diagnostic display capability through the dual digit vacuum fluorescent (VF) display. The strip pushbutton shift selector does not have a **MODE** button, diagnostic capability, or adjustable illumination. The full-function pushbutton shift selector has six (6) pushbuttons which are **R** (Reverse), **N** (Neutral), **D** (Drive), ↓ (Down), ↑ (Up), and **MODE**. Manual forward range downshifts and upshifts are made by pressing the ↓ (Down) or ↑ (Up) arrow buttons after selecting **D** (Drive). The **N** (Neutral) button has a raised lip to aid in finding it by touch. The **MODE** button is pressed to select a secondary or special operating condition, such as ECONOMY shift schedule. Diagnostic information is obtained by pressing the ↑ (Up) and ↓ (Down) arrow buttons at the same time.

The strip pushbutton shift selector has either three or six range selection positions as shown in Figure 1–4. When a strip pushbutton shift selector is used, diagnostic information must be obtained by using the Allison DOC™ For PC–Service Tool, or a customer-furnished remote display.

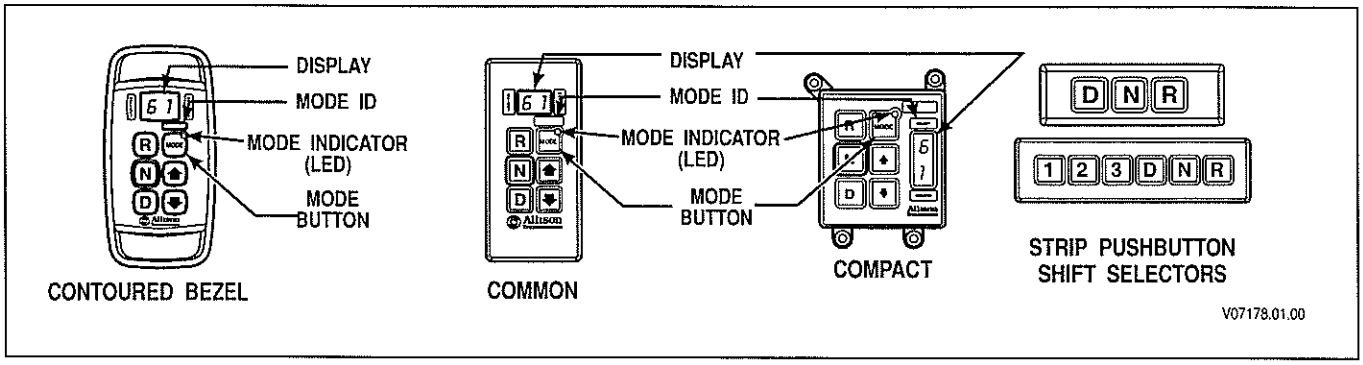


Figure 1–4. Typical Pushbutton Shift Selectors

GENERAL DESCRIPTION

B. Lever Shift Selector *(Figure 1–5)*

The lever shift selector can have as many as six forward range positions (seven for the 7-speed models), as well as **R** (Reverse) and **N** (Neutral). There is a hold override button which **must be pressed** and held in order to move between certain selector positions. The hold override button **must be pressed** when shifting between **R, N,** and **D**. The hold override button is released when the desired selector position is reached. The selector lever can be moved freely between **D** and the numbered forward ranges without pressing the hold override button. The lever selector can be chosen with the lever on the left side or on the right side and with the **R** (Reverse) position toward the front or toward the rear of the selector. Diagnostic and oil level (if sensor is present) information is obtained from the LED display by pressing the "display mode" button.

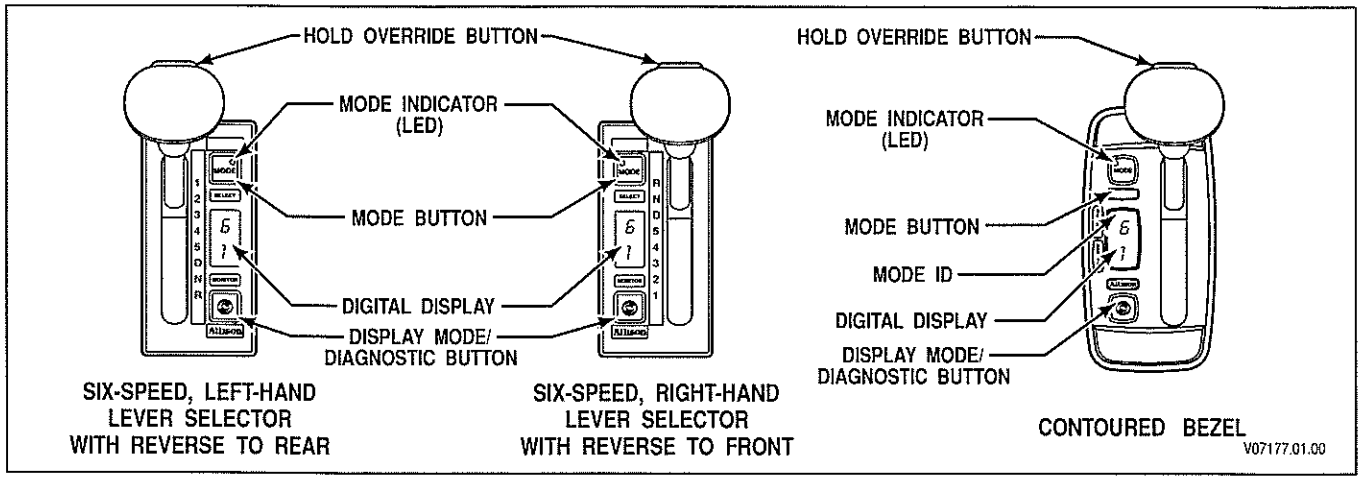


Figure 1–5. Typical Lever Shift Selector

1–4. THROTTLE POSITION SENSOR *(Figure 1–6)*

The Throttle Position Sensor (TPS) can be mounted to the engine, chassis, or transmission. The TPS contains a pull actuation cable and a potentiometer. One end of the cable is attached to the engine fuel lever and the other, inside a protective housing, to the TPS potentiometer. Output voltage from the TPS is directed to the TCM through the external harness. The voltage signal indicates the throttle position and, in combination with other input data, determines shift timing.

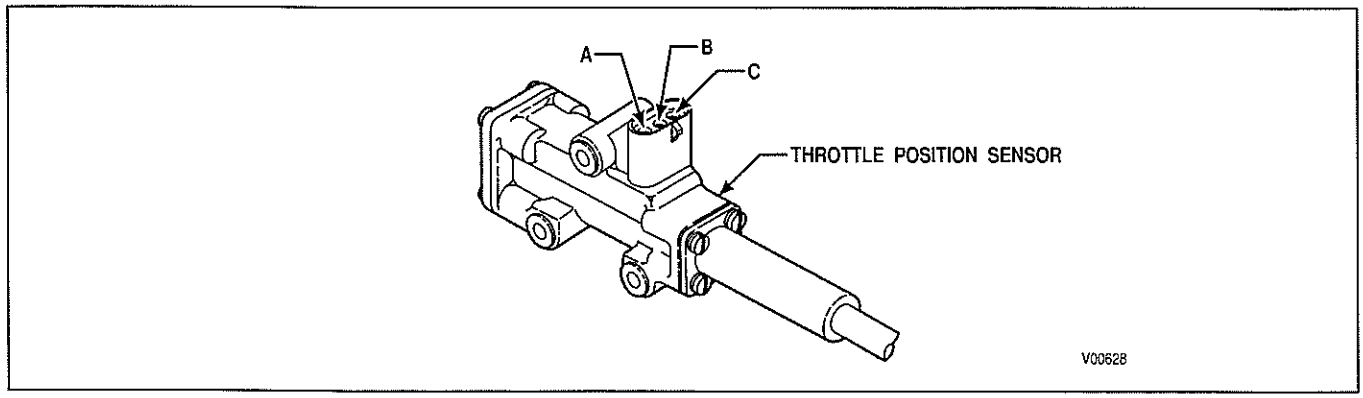


Figure 1–6. Throttle Position Sensor (Without Mounting Brackets)

GENERAL DESCRIPTION

1–5. SPEED SENSORS *(Figure 1–7)*

Three speed sensors—engine speed, turbine speed, and output speed—provide information to the TCM. The engine speed signal is generated by ribs on the shell of the torque converter pump. The turbine speed signal is generated by the rotating-clutch housing spline contours. The output speed signal is generated by a toothed member attached to the output shaft (except for the 3000 Product Family 7-speed models, where the toothed member is the transfer case idler gear). The speed ratios between the various speed sensors allow the TCM to determine if the transmission is in the selected range. Speed sensor information is also used to control the timing of clutch apply pressures, resulting in the smoothest shifts possible. Hydraulic problems are detected by comparing the speed sensor information for the current range to that range's speed sensor information stored in the TCM memory.

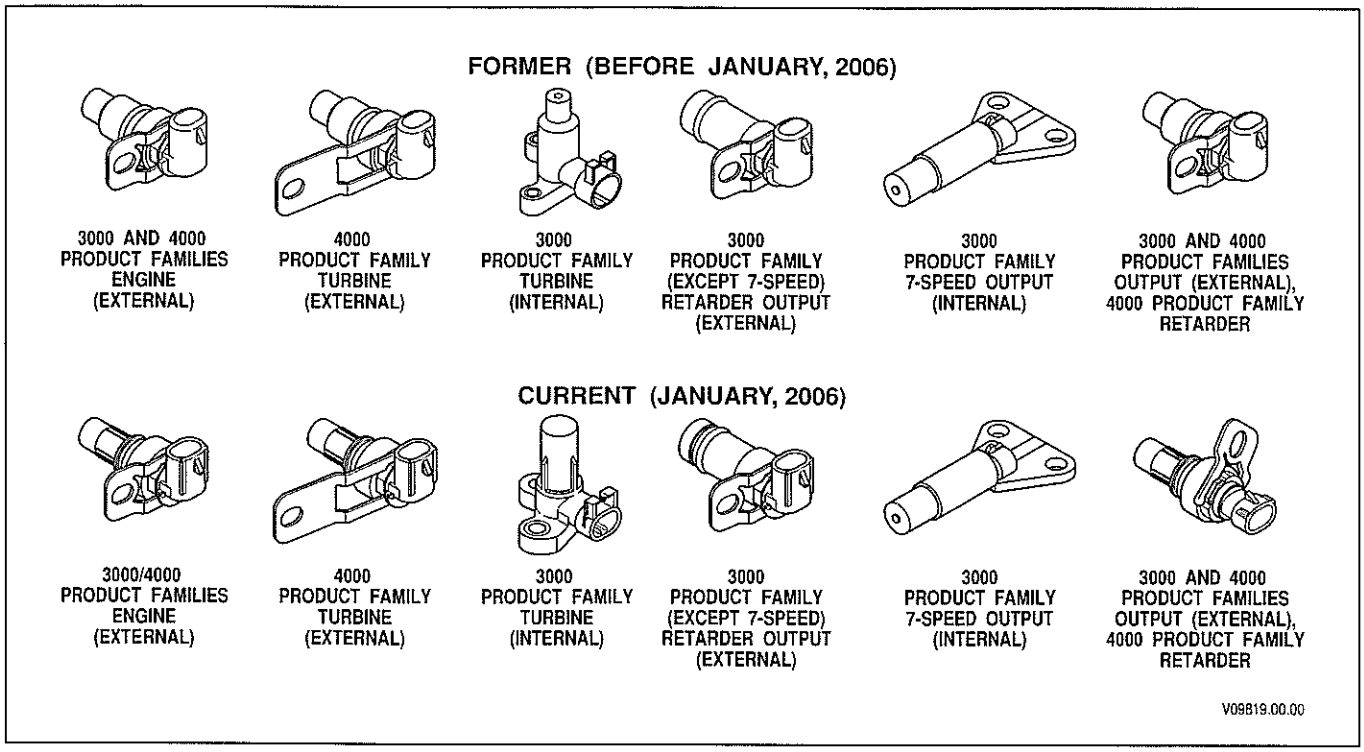
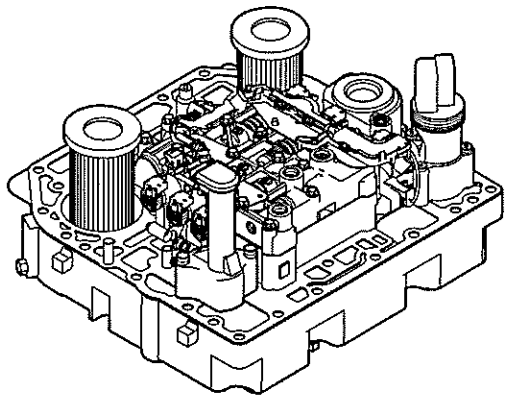


Figure 1–7. Speed Sensors

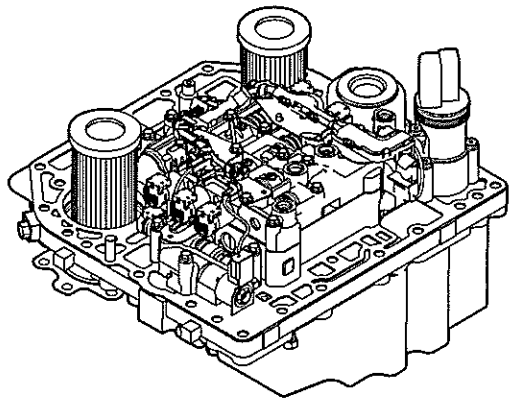
GENERAL DESCRIPTION

1–6. CONTROL MODULE *(Figure 1–8)*

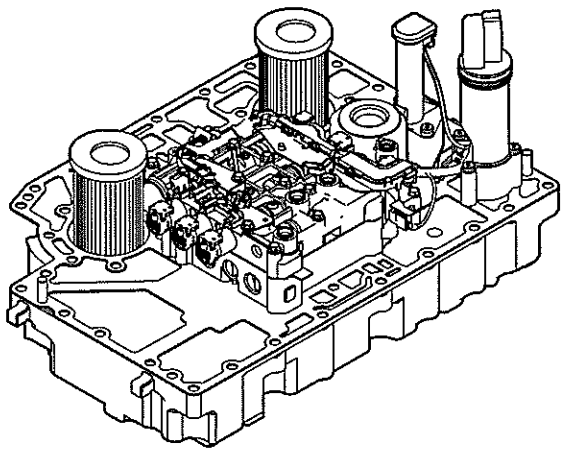
The Allison 4th Generation Series transmission control module contains a main body assembly and solenoid valve body assembly, which are mounted to an aluminum channel plate. The TCM issues commands to various solenoids in the two valve bodies to govern fluid flow to the clutches (including torque converter clutch). The solenoids produce an output pressure that is proportional to current from the TCM. Hence, the solenoids are referred to as pressure control solenoids (PCS).



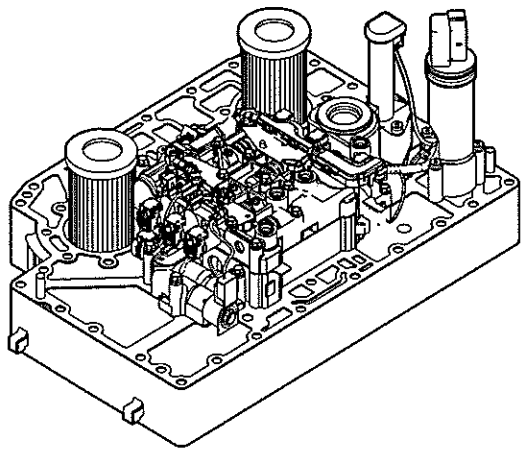
6-SPEED 3000 PRODUCT FAMILY CONTROL MODULE



7-SPEED 3000 PRODUCT FAMILY CONTROL MODULE



6-SPEED 4000 PRODUCT FAMILY CONTROL MODULE



7-SPEED 4000 PRODUCT FAMILY CONTROL MODULE

V09276.00.00

Figure 1–8. Allison 4th Generation Control Modules

GENERAL DESCRIPTION

The main valve body assembly contains the following:

- Main pressure regulator valve
- Control main regulator valve
- Converter flow valve
- Lube regulator valve
- Converter regulator valve
- Exhaust backfill valve
- Two latching logic valves
- On/Off solenoid SS1.

The solenoid valve body assembly contains the following:

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

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

The Allison 4th Generation controls system includes a main modulation solenoid. Modulated main pressure results in improved cooler flow and reduced pump losses when throttle position and output speed is low. The Allison 4th Generation Controls TCM commands the main mod solenoid ON when all of the following conditions are simultaneously met:

- Sump temperature is greater than 30°C (86°F) and less than 150°C (302°F) [greater than –5°C (23°F) and less than 225°C (437°F) for 4700 and 4800 model transmissions].
- Engine speed less than 1200 rpm in all ranges except neutral. There are no restrictions on engine speed in neutral.
- Throttle percentage less than 15 percent in reverse, low (7-speed), first, or second range. Main mod may be commanded ON in neutral at any throttle position.
- Output speed is less than 250 rpm in neutral, reverse, low (7-speed), first, or second range.
- The PTO input to the TCM indicates the PTO is OFF.
- Shift not in progress.

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

A temperature sensor (thermistor) is located in the internal wiring harness. Changes in sump fluid temperature are indicated by changes in sensor resistance, which changes the signal sent to the TCM. Refer to the chart in Appendix Q.

The oil level sensor (OLS) is a float type device mounted on the control module channel plate. The OLS senses transmission fluid level by electronically measuring the buoyancy forces on the float. The sensor operates on 5VDC supplied by the TCM. The oil level sensor is available on any 3000 and 4000 Product Families transmissions except the 3000 7-speed transmissions.

GENERAL DESCRIPTION

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

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

The turbine speed sensor is also mounted on the control module for the 3000 Product Family transmissions. The turbine speed sensor is directed at the rotating-clutch housing. The turbine speed sensor on the 4000 Product Family transmission is located on the outside of the main housing.

1–7. WIRING HARNESSES

A. External Wiring Harness *(Figure 1–9)*

The TCM uses a single 80-way connector, which is used to receive input from the following:

Transmission	TPS	Diagnostic tool connector
Engine	Vehicle interface module (VIM)	Retarder
Turbine	Retarder control module	Retarder temperature sensor
Output speed sensor	Shift selector	Accumulator

Many harnesses will include a bulkhead fitting to separate cab and chassis components. Also, many different styles and materials for harnesses are likely to be encountered.

NOTE: Allison Transmission is providing for service of wiring harnesses and wiring harness components as follows:

- ***Repair parts for the internal wiring harness and for wiring harness components attached to the shift selector will be available through the Allison Transmission Parts Distribution Center (PDC). Use the P/N from your appropriate parts catalog or from Appendix E in this manual. Allison Transmission is responsible for warranty on these parts.***
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Fax: 519-627-4227

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

- ***SCTI is the source for external harness repair parts.***

GENERAL DESCRIPTION

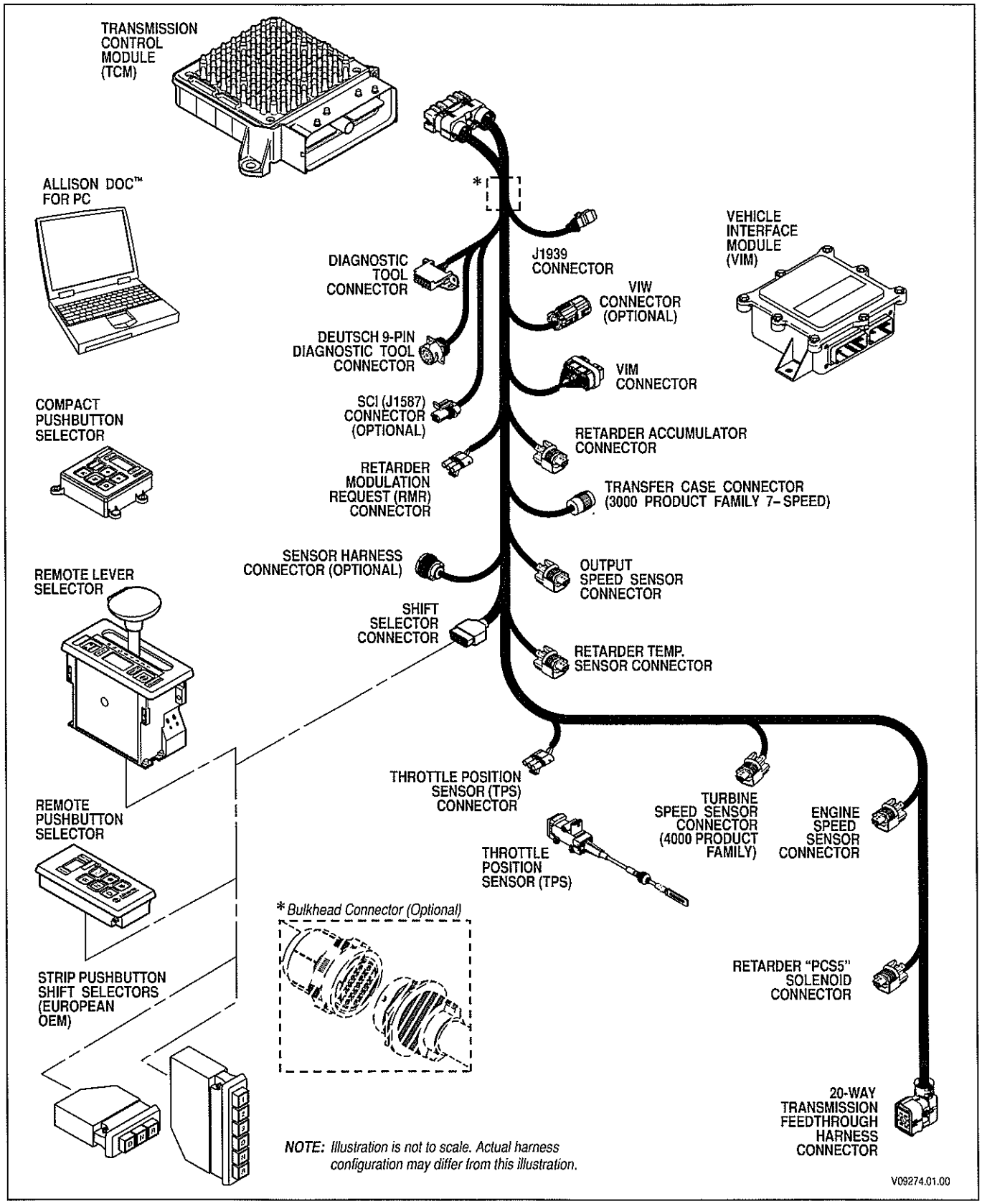


Figure 1–9. Typical 4th Generation Electronic Controls External Wiring Harnesses

GENERAL DESCRIPTION

B. Internal Wiring Harness *(Figure 1–10)*

The internal wiring harness provides connection between the following:

- External harness
- Pressure control and shift solenoids
- Oil level sensor
- Diagnostic pressure switch
- Temperature sensor
- Turbine speed sensor.

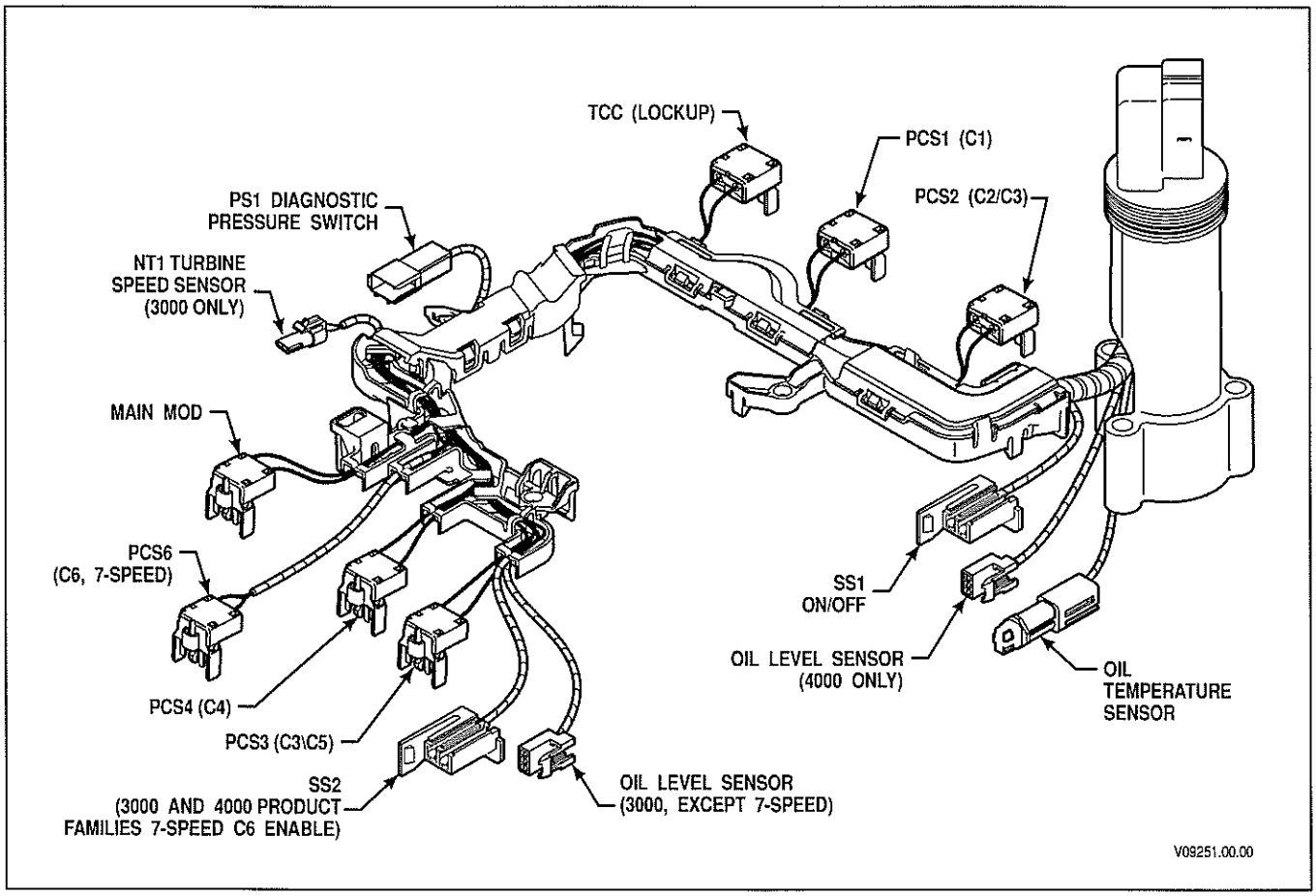


Figure 1–10. Allison 4th Generation Internal Wiring Harness

GENERAL DESCRIPTION

1–8. VEHICLE INTERFACE MODULE *(Figure 1–11)*

The vehicle interface module (VIM) provides relays, fuses, and connection points for interface with the output side of the vehicle electrical system. VIMs are available for both 12V and 24V electrical systems. The VIM for 12V systems uses all 12V relays. The VIM for 24V systems has all 24V relays. Refer to the appropriate parts catalog for the transmission assembly number that you are servicing for detailed parts information. Refer to Pages D–15 and D–16 for VIM wire number and terminal information.

Some OEMs may provide their own equivalent for the VIM which performs the same functions as the VIM shown in Figure 1–11.

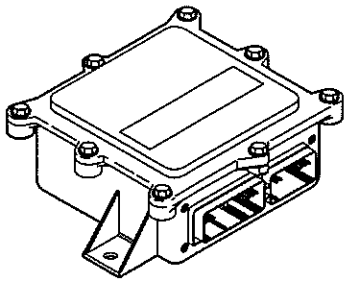


Figure 1–11. Vehicle Interface Module (VIM)

1–9. AUTODETECT FEATURE

Autodetect is active on the first 25 engine starts and, in the case of throttle source detection logic, may continue past 25 ignition cycles until a valid source is determined (details follow in A through D below). Autodetect takes place within the first 30 seconds of each engine start monitored. Autodetect searches for the presence of the following transmission components or data inputs in the priority listed:

Retarder	Present, Not Present
Oil Lever Sensor (OLS)	Present, Not Present
Throttle	TPS, J1587, J1939
Engine Coolant Temperature	Sensor, J1939, J1587

Even after autodetect has been completed, it can be reset to monitor an additional group of engine starts. Reset may be necessary if a device known to be present is not detected or if an autodetectable component or sensor was added after the initial vehicle build. Reset is accomplished by using Allison DOC™ For PC–Service Tool. To use the Allison DOC™ For PC–Service Tool, select "RESET AUTODETECT" to search for all four devices. Select "RESET AUTODETECT RETARDER" to search for a retarder only. Selecting "RESET ADAPTIVE SHIFT PARAMETERS" **will not reset** autodetect logic.

The Allison DOC™ For PC–Service Tool can also be used to override autodetect and manually enter the component or sensor to be recognized by the TCM by changing appropriate "customer modifiable constants" (CMC). The four items above are the only CMCs that are autodetectable. Other CMCs can be changed at any time and are not related to autodetect. Consult the Allison DOC™ User's Guide, GN3433EN, for, detailed instructions related to Allison 4th Generation Controls CMC. Additional details for each of the four autodetectable features are given below.

GENERAL DESCRIPTION

A. Retarder

Autodetect searches for the presence of pressure control solenoid 5 (PCS5) to the retarder during the first 35 engine ignition cycles. Retarder autodetect will countdown for a maximum of 35 ignition cycles while recording detections of a retarder. A retarder will be identified as present and the retarder autodetect logic will stop once it is detected for three consecutive ignition cycles. If the ignition cycle counter completes the 35 cycles before there are three consecutive detections of a retarder, the software will log that there is no retarder and the retarder autodetect logic will stop. If the autodetect logic is not satisfied during the first 35 engine starts, the retarder is not detected and will not function on subsequent engine starts.

WARNING: **If a retarder is present but is not detected by autodetect, the retarder will not function. Be sure to check for proper functioning immediately after the 35th engine start. If the retarder is not functioning, check PCS5 solenoid for an open, short-to-ground, or short-to-battery condition. Use the Allison DOC™ For PC–Service Tool to reset retarder autodetect or to manually select the presence of the retarder after the PCS5 circuit is repaired.**

B. Oil Level Sensor (OLS)

NOTE: ***If an OLS is known to be present, but has not been detected, a possible cause is that the transmission fluid level is too low. Check the fluid level before beginning the OLS troubleshooting.***

Oil level sensor autodetect will countdown for a maximum of 25 engine starts while recording detections of an OLS. The TCM monitors the OLS input voltage on wire 116. OLS input voltage **must exceed** a predetermined level for the TCM to record a detection. Additionally, OLS detection **must occur** within 12.5 seconds on any given engine start. An OLS will be identified as present and the OLS autodetect logic will stop once it is detected during any single engine start.

If the engine start counter completes 25 cycles before TCM records one detection of an OLS, the software will log that there is no OLS present and the OLS autodetect logic will stop. Then the TCM concludes that no OLS is present.

No OLS diagnostics take place until the OLS is detected. Frequently check for the presence of oil level diagnostics if the transmission is known to contain an OLS. If an OLS is known to be present, but has not been detected, troubleshooting the OLS circuit is required. After the OLS circuit is repaired, reset autodetect or manually select the OLS function using the Allison DOC™ For PC–Service Tool.

C. Throttle Source

Throttle autodetect will increment a counter for a throttle source on each engine start during which the possible throttle source is detected. When the counter for any of the sources indicates five consecutive detections, the software will set a "confidence flag" to indicate that this is an available throttle source. Multiple throttle sources can be detected on a single engine start and multiple confidence flags can be set. There is no limit to the number of engine starts for autodetection of the throttle source until a confidence flag is set for a source. Once a confidence flag is set for any one of the sources, a counter begins to countdown for 15 additional engine starts. During the entire autodetect period, the software will use the highest priority source as the throttle source if multiple sources are detected before any confidence flags are set. Once a confidence flag is set, that source is

used as the source for the throttle signal. When the countdown period is complete, the software will use the highest priority throttle source having a confidence flag set and the autodetect logic will stop.

D. Engine Coolant Temperature

Engine coolant temperature sensor autodetect will countdown for a total of 25 engine starts while recording detections of engine coolant temperature sources. A "confidence flag" will be set once a source is detected for five consecutive engine starts. Multiple sources detected before a confidence flag is set or multiple confidence flags will result in the highest priority source being used as the engine coolant temperature source. Multiple sources can be detected on a single engine start cycle.

1–10. TRANSID (TID)

The TransID feature enables the TCM to recognize various transmission hardware configurations and select an appropriate software calibration. However, if a matching calibration does not exist in memory, the TCM registers a diagnostic code. Furthermore, TID only works when the controller and transmission have the same generation controls. Thus, TID will not allow an Allison 4th Generation TCM to recognize a transmission with WTEC III controls, nor will TID allow a WTEC III ECU to recognize a transmission with Allison 4th Generation Controls.

The TCM senses the transmission configuration using TID wire 176. In initial versions of Allison 4th Generation Controls, wire 176 is connected to high side driver 1 (HSD1), wire 111, in the internal wiring harness. HSD1 supplies power to PCS6 and MAIN MOD solenoids. This wiring configuration is designated TID A.

Whenever a TID level change is to be made, the new TID level calibration will be added to the PROM Calibration Configurator System (PCCS) before the change (s) is (are) made in production to the transmissions. All TCMs programmed and sold after that date will be loaded with the new TID calibration. These TCMs will contain calibrations for the new level transmission and all previous TID levels and will automatically load the correct calibration for the transmission based on the TID signal sensed by Autodetect during the first 25 engine starts.

SECTION 2—DEFINITIONS AND ABBREVIATIONS

2–1. CHECK TRANS LIGHT

When the TCM detects a serious fault, the **CHECK TRANS** light (usually located on the vehicle instrument panel) illuminates and action is automatically taken to protect operator, vehicle, and the transmission. A diagnostic trouble code (DTC) will nearly always be registered when the **CHECK TRANS** light is on; however, not all diagnostic codes will turn on the **CHECK TRANS** light. Codes related to the **CHECK TRANS** light are detailed in the diagnostic trouble code chart (refer to Section 6).

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

Each time the engine is started, the **CHECK TRANS** light illuminates briefly and then goes off. This momentary lighting shows the light circuit is working properly. If the light does not come on during engine start, request service immediately.

2–2. ALLISON TRANSMISSION DIAGNOSTIC TOOL

Allison DOC™ (Diagnostic Optimized Connection) For PC–Service Tool is a PC-based diagnostic tool for use with 3000 and 4000 Product Families transmissions. The Allison DOC™ For PC–Service Tool is a full-feature diagnostic software application supporting the Allison 4th Generation Control System. When installed on the user's own PC, it will allow the technician to acquire data from the transmission's control system and through the use of embedded troubleshooting manuals, conduct systematic troubleshooting of transmission complaints.

Basic Features

Allison DOC™ For PC–Service Tool uses a Windows style graphical user interface (GUI) and includes:

- User selected views of multiple transmission parameters
- Active and historical diagnostic trouble codes (DTCs)
- Graphical instrument panel view of transmission parameters
- Strip chart function
- User configurable Snapshot function
- User configurable Print function
- Code driven links to embedded Allison 4th Generation Control System Troubleshooting Manuals
- Reprogramming capability (available after satisfying Allison Transmission training certification requirements)
- Demo Mode which allows the user to practice the program without being connected to a vehicle
- New animated screen by screen help support (found in Help, Video-based training materials, Allison DOC™ For PC–Service Tool Training Videos)
- Application Configuration—This menu function serves as the platform for three different features:
  (1) General tab, which allows the user to select language (English only at this time), and unit of measure.
  (2) TCM Reprogramming tab, used to enable the reprogramming capability of the Allison DOC™ For PC–Service Tool.
  (3) Update Application tab, will access a web URL that will contain minor updates for the diagnostic tool to support changes in the various transmission control systems.
- Data Bus Viewer allows the user to capture (see and save) the raw data transmitted on the various vehicle data buses supported by Allison DOC™ For PC–Service Tool (J1939, and J1850)

DEFINITIONS AND ABBREVIATIONS

- Printed user's manual and laminated Job Aid Card
- Adobe® Acrobat® 5.0 bundled on the CD for reading the Troubleshooting Manual
- Microsoft® Media Player® 6.4 and 7.0 bundled on the CD for displaying various and updated training videos (available from the application Help menu).

PC Platform Definition

Allison DOC™ For PC–Service Tool has been tested with and is known to operate on PCs with the following configurations*:

- Operating System: Microsoft® Windows® XP Professional, and Windows® 2000 (SP4 or later)
- CPU: Pentium® III, 800MHz, or Pentium® 4, 2.0 GHz (Recommended)
- RAM: 128MB RAM, or 256MB RAM or greater (Recommended)
- Internet connection capability (Internet Explorer 5.0 or greater)
- Hard Drive: 20GB ATA, or 40GB ULTRA ATA/66 or greater (Recommended)
- One USB port V1.1, or USB 2.0 (Recommended) [1]
- CD-ROM: 16x, or 48x Max. Speed or greater (Recommended).

**NOTE:*

1. ***The Allison DOC™ For PC–Service Tool will not function correctly on PCs not meeting the above listed definition and will not be supported.***
2. ***PCCS does not support Windows® NT® or ME® when recalibrating 3000 and 4000 Product Families transmissions.***
3. ***PCCS is a separate, stand-alone software application.***
4. ***For the latest requirements, please refer to www.allisontransmission.com***

NOTE: ***Additional information available in Appendix N.***

1. A serial port (COM1) is required to support the legacy CEC1 controller and for J1850 communications. More information will be provided in future SILs.

DEFINITIONS AND ABBREVIATIONS

2–3. ABBREVIATIONS

A/N	Assembly Number
ABS	Anti-lock Brake System—OEM-provided means to detect and prevent wheel stoppage to enhance vehicle handling. Retarder and engine brakes will not apply when ABS is active.
Amp	Unit of electrical current
API	Application Program Interface
AT	Allison Transmission
C1...C6	Clutch 1....Clutch 6
CAN	Controller Area Network—A network for all SAE J1939 communications in a vehicle (engine, transmission, ABS, etc.)
CIN	Calibration Identification Number
CMC	Customer Modified Constant
CPA	Connector Position Assurance
CT	Closed Throttle
DMM	Digital Multimeter
DNA	Does Not Adapt—Adaptive shift control is disabled
DNS	DO NOT SHIFT—Refers to the DO NOT SHIFT diagnostic response during which the CHECK TRANS light is illuminated and the transmission will not shift and will not respond to the Shift Selector
DOC	Diagnostic Optimized Connection
DPA	Dearborn Protocol Adapter
DTC	Diagnostic Trouble Code
DVOM	Digital Volt/Ohmmeter
ECM	Engine Control Module
EMI	ElectroMagnetic Interference
FBO	Feature Based Ordering
FCC	Federal Communications Commission
GPI	General Purpose Input—Input signal to the TCM to request a special operating mode or condition
GPO	General Purpose Output—Output signal from the TCM to control vehicle components (such as PTOs, backup lights, etc.) or allow a special operating mode or condition
GUI	Graphical User Interface
HSD	High Side Driver
J1587	Engine/transmission serial data communications link
J1939	High-speed vehicle serial data communications link
LED	Light-Emitting Diode—Electronic device used for illumination
LRTP	Low Range Torque Protection

DEFINITIONS AND ABBREVIATIONS

2–3. ABBREVIATIONS *(cont'd)*

LSD	Low Side Driver
MB	Mega Byte
NNC	Neutral No Clutches—Neutral commanded with no clutches applied
NVL	Neutral Very Low—The TCM has sensed turbine speed below 150 rpm when output speed is below 100 rpm and engine speed is above 400 rpm when N (Neutral) was selected. This is usually caused by a dragging C1 or C3 clutch or a failed turbine speed sensor. NVL is attained by turning D solenoid "ON" (in addition to E solenoid) and the C4 and C5 clutches are applied to lock the transmission output.
OEM	Original Equipment Manufacturer—Maker of vehicle or equipment
Ohm	Unit of electrical resistance
OL	Over Limit or Oil Level—For Over Limit see "∞". Indicates Oil Level is being displayed on a shift selector
OLS	Oil Level Sensor—Electronic device (optional) on control module for indicating transmission fluid level
PC	Personal Computer
PCCS	PROM Calibration Configurator System
PCS	Pressure Control Solenoid
PLR	Primary Lock Reinforcement (Connector)
P/N	Part Number
PROM	Programmable Read Only Memory
PSS	Primary Shift Selector—Main shift selector in a two-selector control system.
PTO	Power Takeoff
PWM	Pulse Width Modulation
RELS	Reduced Engine Load at Stop
RFI	Radio Frequency Interference
RMR	Retarder Modulation Request—Signal from a retarder control device
RPR	Return to Previous Range—Diagnostic response in which the transmission is commanded to return to previously commanded range
SCI	Serial Communication Interface—Used to transmit data and messages between the diagnostic tool and the TCM and other systems such as electronically-controlled engines.
SCTI	St. Clair Technologies, Inc.
SEM	Shift Energy Management
S/N	Serial Number
SOH	State Of Health
SOL OFF	All SOLenoids OFF
SPI	Serial Peripheral Interface—The means of communication between the microprocessor and the interface circuits

DEFINITIONS AND ABBREVIATIONS

2–3. ABBREVIATIONS *(cont'd)*

SS	Shift Solenoid
SSS	Secondary Shift Selector—Alternate shift selector in a two-selector control system
TCC	Torque Converter Clutch
TCM	Transmission Control Module
TFT	Transmission Fluid Temperature
TID	TransID—A feature which allows the TCM to know the transmission configuration and provide the corresponding calibration required
TPA	Terminal Position Assurance
TPS	Throttle Position Sensor—Potentiometer for signaling the position of the engine fuel control lever
V	Version—Abbreviation used in describing TCM software levels
VDC	Volts Direct Current (DC)
VF	Vacuum Fluorescent
VIM	Vehicle Interface Module—A watertight box containing relays and fuses—interfaces the transmission electronic control system with components on the vehicle
VIW	Vehicle Interface Wiring—Interfaces TCM programmed input and output functions with the vehicle wiring
Volt	Unit of electrical force
WOT	Wide Open Throttle
∞	Infinity—Condition of a circuit with higher resistance than can be measured, effectively an open circuit

DEFINITIONS AND ABBREVIATIONS

NOTES

SECTION 3—BASIC KNOWLEDGE

3–1. BASIC KNOWLEDGE REQUIRED

To service Allison 4th Generation Controls, the technician must understand basic electrical concepts. Most troubleshooting checks consist of checking resistance, continuity, and checking for shorts between wires and to ground. Technicians need to know how to use a digital volt/ohmmeter (DVOM) to make resistance and continuity checks. The technician should be able to use jumper wires and breakout harnesses and connectors. Technicians unsure of making the required checks should ask questions of experienced personnel or find instruction.

The technician should also have the mechanical aptitude required to connect pressure gauges or transducers to identified pressure ports used in the troubleshooting process. Pressure tap locations and pressure values are shown in Appendix B—Checking Clutch Pressures.

Input power, ground, neutral start circuitry, etc., can cause problems with electronic controls or vehicle functioning and may not generate a diagnostic code. A working knowledge of the Allison 4th Generation Controls vehicle installation is necessary in troubleshooting installation-related problems.

Refer to Section 8 for information concerning performance complaints (non-code) troubleshooting. A complete wiring schematic is shown in Appendix J. Refer to the Allison 4th Generation Controls and General Information Sales Tech Data Book for information concerning electronic controls installation and the Installation Checklist. Reliable transmission operation and performance depend upon a correctly installed transmission. Review the Installation Checklist in the 3000 and 4000 Product Families transmissions Tech Data Books for proper installation.

*NOTE: **Allison Transmission is providing for service of wiring harnesses and wiring harness components as follows:***

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

St. Clair Technologies, Inc.
920 Old Glass Road
Wallaceburg, Ontario, Canada N8A 4L8
Phone: 519-627-1673
Fax: 519-627-4227

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

3–2. USING THE TROUBLESHOOTING MANUAL

Use this manual as an aid to troubleshooting the Allison 4th Generation Controls. Every possible problem and its solution cannot be encompassed by any manual. However, this manual does provide a starting point from which most problems can be resolved.

Once a problem solution is discovered in the manual do not look further for other solutions. It is necessary to determine *why* a problem occurred. The root cause of a problem as well as the symptom **must be** corrected to be sure of trouble-free operation. For example, taping a wire that has been rubbing on a frame rail will not correct the problem unless the rubbing contact is eliminated.

BASIC KNOWLEDGE

3–3. SYSTEM OVERVIEW

Allison 4th Generation Control functions are controlled by the TCM. The TCM reads the following to determine when to command a shift:

- Shift selector range selection
- Output speed
- Throttle position.

In order to control the oncoming and off-going clutches during a shift, the TCM monitors:

- Turbine speed
- Output speed
- Throttle position.

When the TCM detects an electrical fault, it logs a diagnostic code indicating the faulty circuit and may alter the transmission operation to prevent or reduce damage.

When the TCM detects a non-electrical problem while trying to make a shift, the TCM may try that shift a second or third time before setting a diagnostic code. Once that shift has been retried, and a fault is still detected, the TCM sets a diagnostic code and holds the transmission in a fail-to-range mode of operation.

3–4. IMPORTANT INFORMATION IN THE TROUBLESHOOTING PROCESS

A. Before Beginning Troubleshooting

Before beginning the troubleshooting process, read and understand the following:

- Allison Transmission recommended wire numbers (i.e. 158) all use a "1" for the first digit and the pin-out information at the TCM for the second and third digits.
- Shut off the engine and ignition before any harness connectors are disconnected or connected.
- Remember to do the following when checking for shorts and opens:
  - — Minimize movement of wiring harnesses when looking for shorts. Shorts involve wire-to-wire or wire-to-ground contacts and moving the harnesses may eliminate the problem.
  - — Wiggle connectors, harnesses, and splices when looking for opens. This simulates vehicle movements which occur during actual operation.
- When disconnecting a harness connector, be sure the pulling force is applied to the connector itself and **not the wires** extending from the connector.
- Resistance checks involving wiring between the TCM connector and other components adds about one Ohm of resistance to the component resistance shown.
- Inspect all connector terminals for damage. Terminals may have been bent or lost the necessary tension to maintain firm contact.
- Clean dirty terminals or connectors with isopropyl alcohol and a cotton swab, or a good quality, non-residue, non-lubricating, cleaning solvent such as LPS Electro Contact Cleaner® or LPS NoFlash Electro Contact Cleaner®.

BASIC KNOWLEDGE

CAUTION:

The cleaning solvent must not be:

- **Chlorine based**
- **Contain petroleum distillates**
- **Conduct electricity.**

The cleaning solvent should evaporate quickly to prevent the possibility of condensation within the connectors. Always blow or shake any excess cleaner from the connector before assembling it to its mating connector or hardware. Cleaner trapped in the connector can affect the connector seal. Refer to SIL 17-TR-94, latest revision, for detailed information on the recommended cleaners.

CAUTION: **Care should be taken when welding on a vehicle equipped with electronic controls. Refer to Appendix G, Paragraph 1–1.**

- Diagnostic codes displayed after system power is turned on with a harness connector disconnected, can be ignored and cleared from memory. Refer to Section 6, Diagnostic Codes, for the code clearing procedure.

NOTE: Turn off the vehicle HIGH IDLE switch, if present, before shifting from N (Neutral) to D (Drive). D (Drive) or R (Reverse) will not be attained unless the shift is made with the engine at idle. Also, be aware of other interlocks that would prevent attaining D (Drive) or R (Reverse). Examples are "wheelchair lift not stored" and "service brakes not applied" (service brake interlock present).

B. Cold Weather Starts

All Highway Series transmissions are programmed to restrict full operation until specific fluid temperatures are reached. Refer to the Table 3–1 for temperature restrictions.

Table 3–1. Minimum Fluid Operating Temperatures

Sump Fluid Temperature	CHECK TRANS Light	Operation
–32°C to –7°C (–25°F to 19°F)	OFF	Neutral, Reverse, Second
–7°C (19°F)	OFF	Full operation in all ranges

NOTE: When sump temperature is below 10°C (50°F) and transmission fluid is C4 (not DEXRON® or TranSynd™), follow these procedures when making directional shift changes:

- *To shift from forward to reverse, select N (Neutral) and then R (Reverse).*
- *To shift from reverse to forward, select N (Neutral) and then D (Drive) or other forward range.*

Failure to follow these procedures may cause illumination of the CHECK TRANS light and the transmission will be restricted to N (Neutral).

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

BASIC KNOWLEDGE

C. High Fluid Temperature

The transmission is considered to be overheated when any of the temperatures in Table 3–2 are exceeded:.

Table 3–2. Overheated Transmission Fluid Temperatures

Location of Fluid	Temperature
Sump fluid	121°C (250°F)
Fluid to cooler	149°C (300°F)
Retarder out fluid	165°C (330°F)

If the transmission overheats during normal operation, measure the fluid level in the transmission. Refer to the Transmission Fluid Check procedure in the appropriate transmission mechanic's tips manual.

CAUTION: **The engine should never be operated for more than ten (10) seconds at full throttle with the transmission in range and the output stalled. Prolonged operation of this type will cause the transmission fluid temperature to become excessively high and will cause severe overheat damage to the transmission.**

If the engine temperature gauge indicates a high temperature, the transmission is probably overheated. Stop the vehicle and inspect the cooling system. If it appears to functioning p[roperly, run the engine at 1200–1500 rpm with the transmission in **N** (Neutral). This should reduce the transmission and engine temperature to normal operating levels in two to three minutes. If temperatures do not decrease, reduce the engine rpm.

If the engine temperature indicates a high temperature, an engine or radiator problem is indicated. If high temperature in either the engine or transmission persists, stop the engine and have the overheating condition investigated by maintenance personnel.

3–5. BEGINNING THE TROUBLESHOOTING PROCESS

*NOTE: **Whenever a transmission is overhauled, exchanged, or has undergone internal repairs, the TCM MUST BE RESET TO FACTORY VALUES by selecting "Reset To Unadapted Shifts" (all), and "Reset Autodetect Information" in Allison DOC™ For PC–Service Tool.***

1. Begin troubleshooting by determining the transmission fluid level and TCM input voltage. Remember that some problems may be temperature related. Do troubleshooting at the temperature level where the problem occurs. Check diagnostic codes by:
   - Using the shift selector display (see Paragraph 6–2 for code reading).
   - Using the Allison DOC™ For PC–Service Tool.
2. When a problem exists but a diagnostic code is not indicated, refer to the Performance Complaint Section (Section 8) for a listing of various electrical and hydraulic problems, their causes, and remedies.

3. If a diagnostic code is found in the TCM memory, record all available code information and clear the active indicator. Refer to Section 6.

4. Test drive the vehicle to confirm a diagnostic code or performance complaint.

   - If the code reappears, refer to the Diagnostic Code section (Section 6) and the appropriate code chart. The Diagnostic Code section lists diagnostic codes and their description. Locate the appropriate troubleshooting chart and follow the instructions.
   - If the code does not reappear, it may be an intermittent problem. Use the Allison DOC™ For PC–Service Tool and the code display procedure described in Section 6. The code display procedure will indicate the number of times the diagnostic code has occurred. Refer to the troubleshooting chart for the possible cause(s) of the problem.
   - Appendix A deals with the identification of potential circuit problems. Refer to Appendix A if a circuit problem is suspected.

5. If difficulties arise, you have unanswered questions, or if you are unable to quickly identify the root cause during troubleshooting, please contact the Technical Assistance Center (TAC):

   Technical Assistance Center
   PO Box 894, Mail Code 462-470-PF9
   Indianapolis, IN 46206-0894
   Phone: 1-800-252-5283

NOTE: ***Information concerning specific items is contained in the appendices located in the back of this manual. The appendices are referred to throughout the manual.***

3–6. TCM DIAGNOSTIC PROCEDURE

- Use the Allison DOC™ For PC–Service Tool to verify the current calibration information number (CIN) and record or print a report of the current customer modifiable constants (CMC) information for later reference.
- Remove the 80-way connector from the suspect TCM; inspect the connector for damaged or bent pins.
- Replace the TCM with a known, good TCM from a similar vehicle.

NOTE: ***If using a TCM from another vehicle is unavoidable, the TCM MUST BE set to factory values and the vehicle MUST BE driven carefully to adapt the shifts to the test vehicle. Refer to SIL 16-WT-96 for the correct procedure. Be sure to reset the Adaptive Shift parameters and Autodetect information when it is installed in the original vehicle.***

- If the replacement TCM corrects the original complaint, reinstall the original TCM to verify that the complaint returns. If the complaint is confirmed. install a new TCM.
- If the complaint does not return, leave the original TCM installed. Disconnecting and reconnecting the TCM can often correct faulty wiring harness connections that may have been present.
- Clear any diagnostic codes that may be present and test drive the vehicle to confirm the repair.

NOTE: ***All Allison 4th Generation Controls TCMs are designed to be isolated from the vehicle chassis ground. Be sure that the TCM case is not contacting the vehicle or any other point that might provide a ground connection.***

BASIC KNOWLEDGE

3–7. RESETTING OF TCM PARAMETERS TO SUPPORT ENGINE UPDATE

Shift Energy Management (SEM) Autoselect feature may be used on certain transmissions. Autoselect is deactivated following the first 20 engine starts where engine and transmission communication are present. If during the first 20 starts the TCM recognizes an engine to be on its list of certified engines, it will lock to the SEM active state. If the engine is not supported, the TCM will lock to a non-SEM state.

*NOTE: **Most engine upgrades are same type/rating; under normal circumstances there should be no reason to reset the TCM Autoselect.***

However, there may be a small chance that transmission performance, shift quality, or codes may result from the use of different models within the same engine family or when a recalibration of engine software has taken place. If a vehicle receives upgraded engine hardware or software it may become necessary to reactivate the Autoselect feature to redetect the engine current SEM status.

*NOTE: **Once TCM Autoselect locks, the only way to reactivate is to perform a reset procedure (refer to Paragraph 3–8).***

3–8. RESETTING TCM AUTOSELECT

Verify a new engine rating by checking the engine data tag. The engine **must be** compatible with the transmission rating. If engine rating **is not** compatible, the vehicle **must be** returned to the OEM for engine recalibration. If the rating is correct for the transmission, perform the following steps.

Allison DOC™ for PC–Service Tool is used to reset Autoselect function as follows:

- Display the Action Request menu.
- On the drop down menu, select Reset SEM Autodetect.
- Click on the **OK** button.

The TCM is now reset to Autoselect and will start looking for supporting engine software. Drive the vehicle; confirm DTCs have not returned.

*NOTE: **Transmission shifts will now be in the unadaptive (base) state, so it will be necessary to drive the vehicle to allow shift to converge.***

SECTION 4—WIRE TEST PROCEDURES

4–1. TESTING FOR OPENS, SHORTS BETWEEN WIRES, AND SHORTS-TO-GROUND

(Use Digital Volt/Ohmmeter J 34520-A and Jumper Wire Set J 39197)

NOTE: Please refer to Paragraph 3–5 to begin the troubleshooting process.

1. Make sure all connectors are tightly connected and re-test the circuit.
2. Disconnect and inspect all connectors.

CAUTION:

Observe the following assembly precautions when mating TCM 80-way Cam-Assist connectors (used in GM truck applications):

- **Bring the connector to the TCM "squared up", not at an angle.**
- **Keep hands away from the handle, squarely press the connector onto the TCM until the cam lever handle moves of its own accord approximately ¾ inch.**
- **Gently complete mating the connector to the TCM by moving the cam lever handle to the locked position.**
- **Slide the CPA into the secondary lock.**

Failure to do so could cause damage to the internal latching mechanism.

3. Thoroughly clean corroded or dirty terminals. If dirty or corroded terminals are the probable cause of the problems, reconnect the clean connectors and operate the vehicle normally. If the problem recurs, proceed with Step (4).

CAUTION:

The cleaning solvent must not be:

- **Chlorine based**
- **Contain petroleum distillates**
- **Conduct electricity.**

The cleaning solvent should evaporate quickly to prevent the possibility of condensation within the connectors. Always blow or shake any excess cleaner from the connector before assembling it to its mating connector or hardware. Cleaner trapped in the connector can affect the connector seal. Refer to SIL 17-TR-94, latest revision, for detailed information on the recommended cleaners.

4. Review the Allison 4th Generation Controls wire numbering system described in Paragraph 3–4.
5. If all connectors are clean and connected correctly, determine which wires in the chassis harness are indicated by the diagnostic code. For example, Code P0960, indicates an open in the pressure control solenoid circuit, wires 111 and 174.
   a. Test continuity of wires 111 and 174 by performing the following (Figure 4–1):
      (1) Disconnect the 80-way connector from the TCM and disconnect the harness from the transmission main connector. At one end of the harness, using jumper wire kit J 39197, connect wires 111 and 174 to each other, being careful not to distort the terminals. Jumpering the wires together creates a circuit between wires 111 and 174.

CAUTION:

Do not insert test probes larger than 0.81 mm into the TCM 80-way and transmission 20-way connectors. Use the gray-colored 150 Series Metripack Flexible Male Connector probe contained in Jumper Wire Kit J 39197 when testing the TCM and transmission mating connectors. Failure to do so may distort the socket terminals inside the connectors and cause them to lose the necessary tension to maintain firm contact.

WIRE TEST PROCEDURES

(2) On the opposite end of the harness, test the continuity of the jumpered pair. No continuity in a jumpered pair circuit (infinite resistance reading) indicates an open in the wire being tested. Locate and repair the damaged portion of the wire.

b. If the continuity test is good (0–2 Ohms resistance), remove the jumpers. Check the harness for shorts between wires and shorts-to-ground by performing the following (Figure 4–2):

(1) At the TCM end of the harness, touch one probe of a DVOM to one wire of the circuit being tested and touch the other probe to each terminal in the same connector, then touch the probe to chassis ground and to the transmission main housing. Do this for both wires in the circuit being tested.

(1) If at any time the DVOM shows zero to low resistance, or the meter's continuity beeper sounds, there is a short between the two points being probed—wire-to-wire or wire-to-ground. Isolate and repair the short.

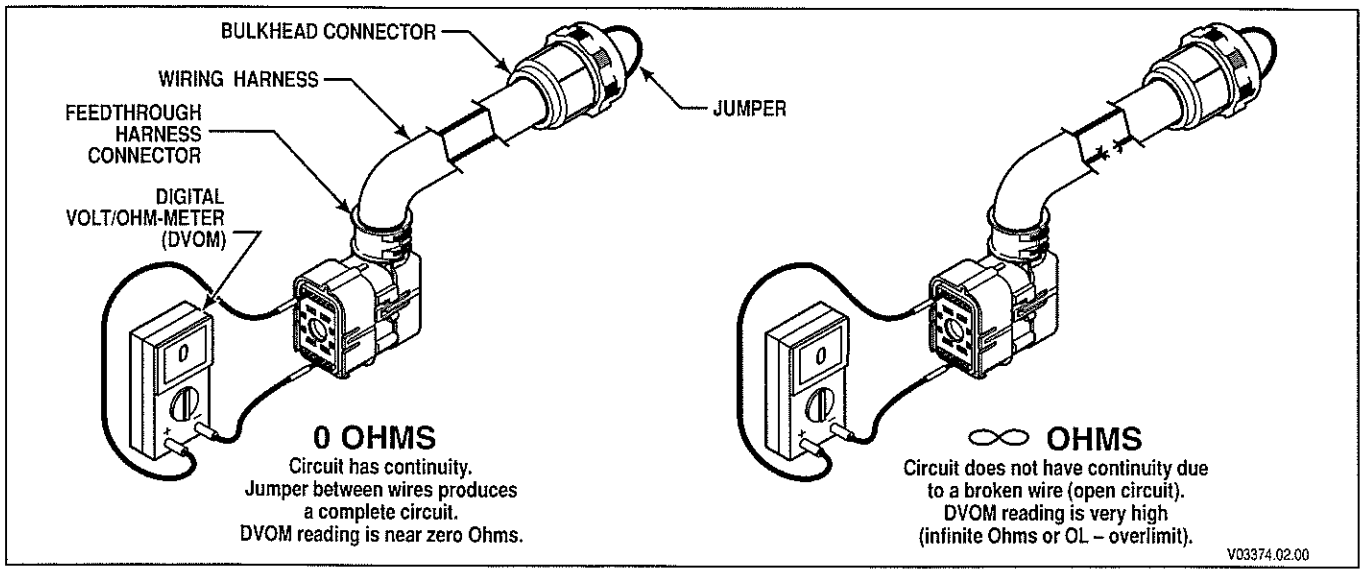


Figure 4–1. Open Circuit

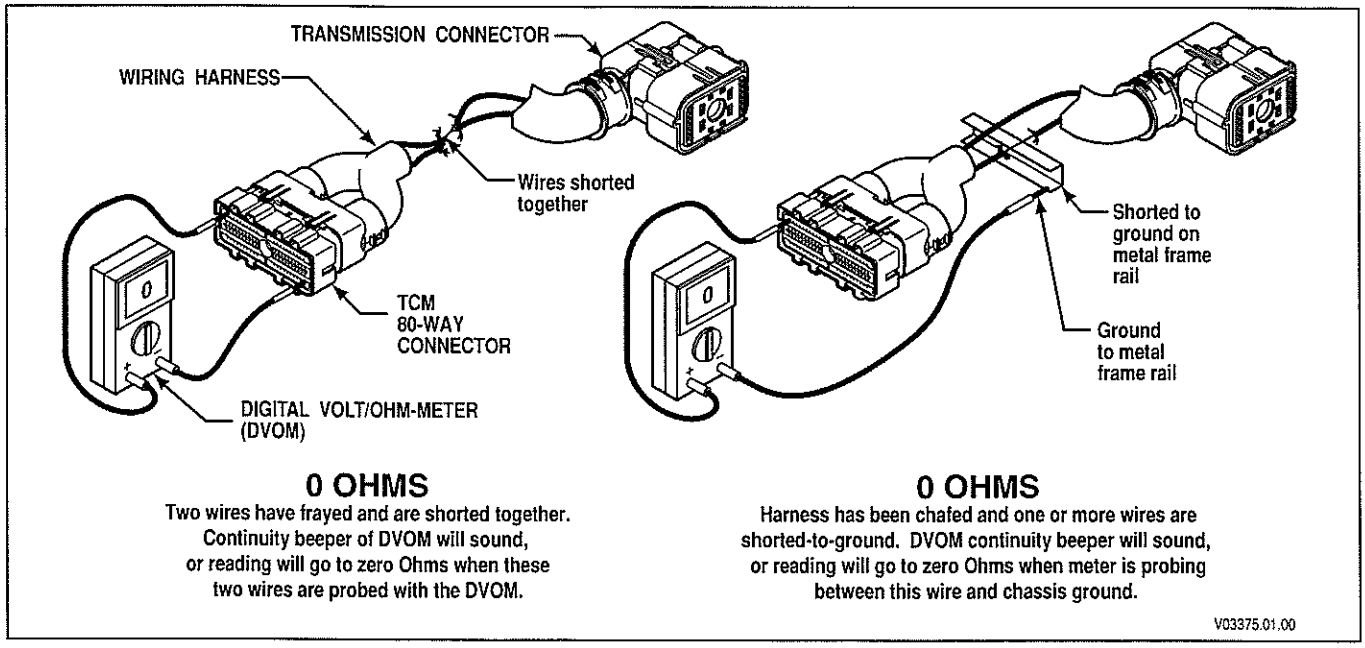


Figure 4–2. Short Between Wires and to Ground

WIRE TEST PROCEDURES

4–2. TESTING AT TRANSMISSION FEEDTHROUGH CONNECTOR FOR INTERNAL HARNESS OPENS, SHORTS BETWEEN WIRES, AND SHORTS-TO-GROUND

1. Disconnect the external wiring harness from the transmission.
2. Inspect the connectors. Any terminals which are corroded or dirty **must be** thoroughly cleaned.

CAUTION:

The cleaning solvent must not be:

- **Chlorine based**
- **Contain petroleum distillates**
- **Conduct electricity.**

The cleaning solvent should evaporate quickly to prevent the possibility of condensation within the connectors. Always blow or shake any excess cleaner from the connector before assembling it to its mating connector or hardware. Cleaner trapped in the connector can affect the connector seal. Refer to SIL 17-TR-94, latest revision, for detailed information on the recommended cleaners.

3. If the connectors are clean and connected correctly, determine which wires in the harness to test. Use the diagnostic code system schematic to locate the wire terminals. For this example, Code P0960 indicates an open in the Main Mod solenoid circuit, wires 111 and 174 (Figures 4–3 and 4–4).
   a. At the transmission connector, test the resistance of Main Mod solenoid circuit. Resistance of a solenoid circuit should be 4.0 to 7.8 Ohms, covering a temperature range of –20°C to 140°C (–4°F to 284°F). Refer to Solenoid Resistance vs. Temperature chart in Appendix K. No continuity in the circuit (infinite resistance) indicates an open in the internal harness, the feedthrough connector, or the solenoid coil. Locate and repair the open in the internal harness or replace the internal harness, replace the feedthrough connector, or the solenoid.

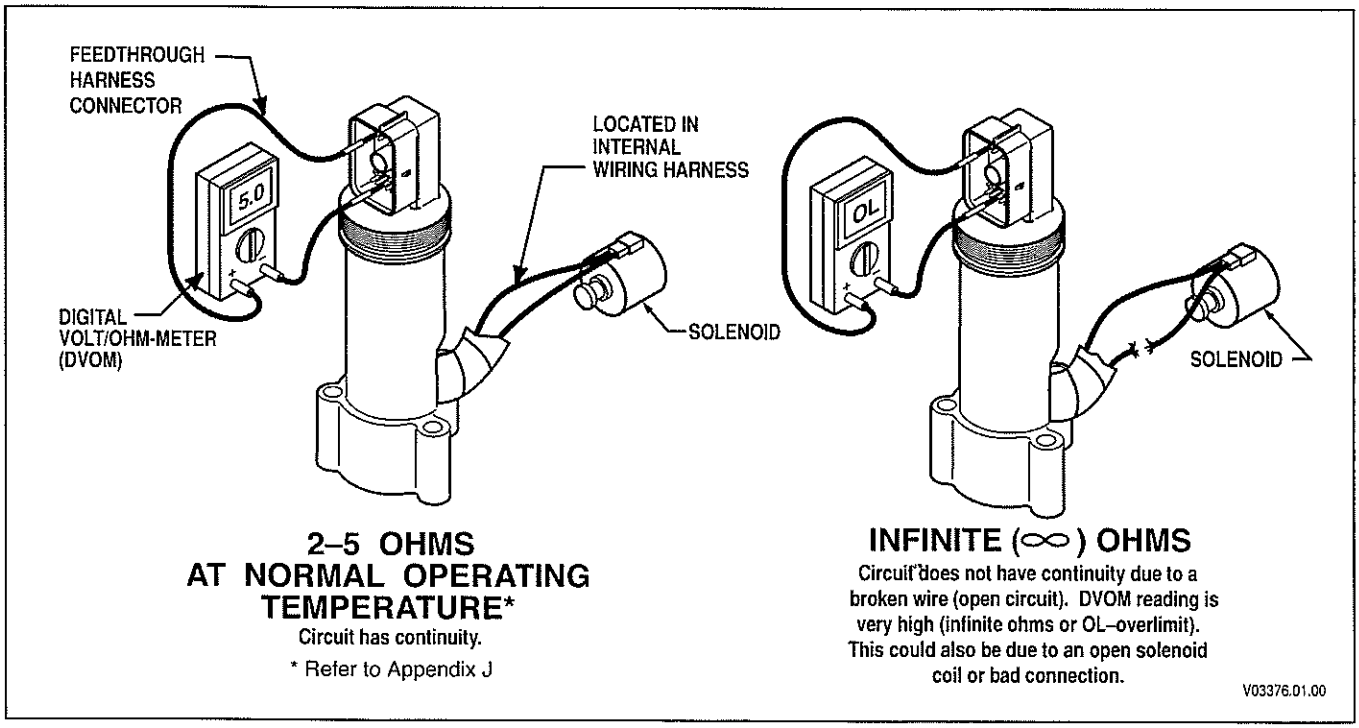


Figure 4–3. Checking Continuity

WIRE TEST PROCEDURES

b. If the resistance test is good, test the harness for shorts between wires and to ground by performing the following (Figure 4–4):

(1) At the transmission connector, touch one probe of the DVOM to one wire of the circuit being tested and touch the other probe to each terminal in the connector and to chassis ground and the transmission main housing. Do this for both wires in the circuit being tested.

(2) If the DVOM shows zero to low resistance, or the continuity beeper sounds, there is a short between the two points being probed, wire-to-wire or wire-to-ground. An indication of a short may be caused by a splice to the wire being checked. Review the wiring diagram in Appendix J for splice locations. If the short is not a splice, then isolate and repair the short.

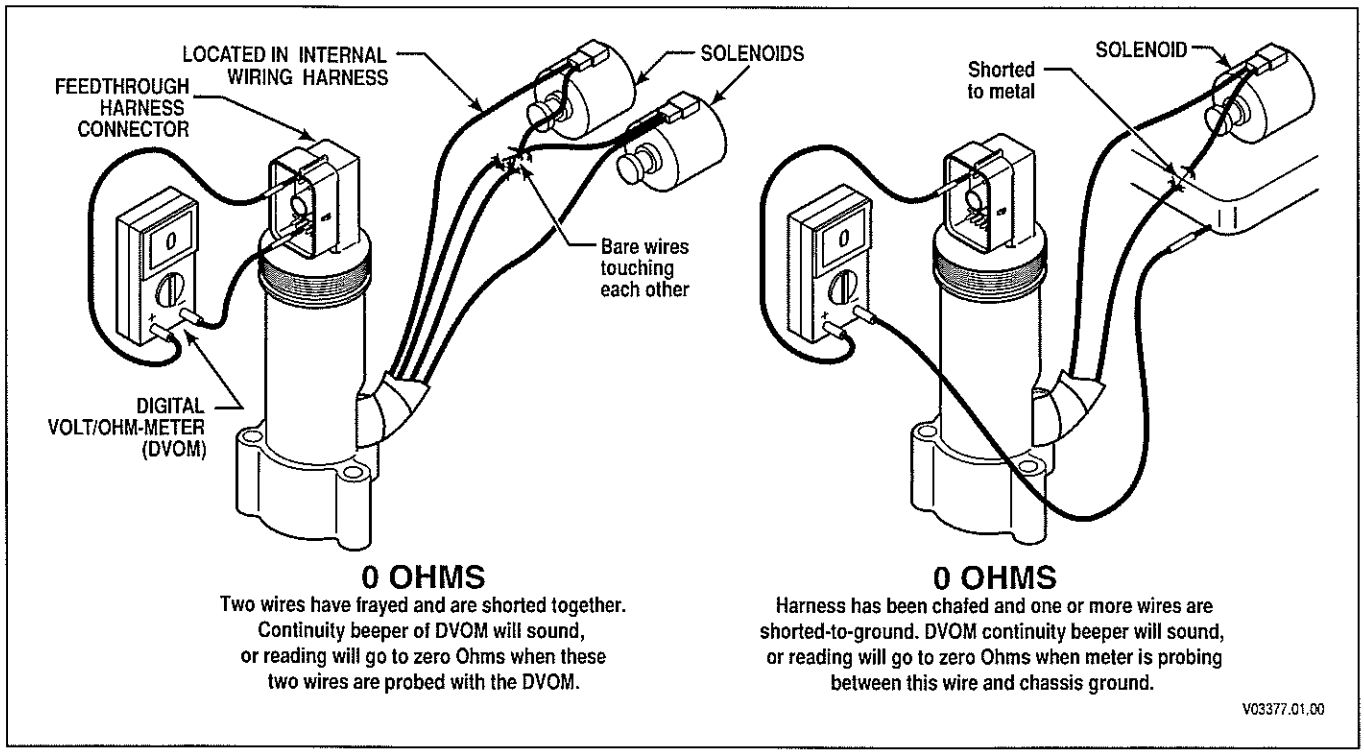


Figure 4–4. Short Between Wires and to Ground

NOTE: When conducting circuit tests that include the external harness, add one (1) Ohm to the values shown. Speed sensor resistance is 270–330 Ohms. PS1 diagnostic pressure switch resistance is two (2) Ohms maximum when switch is closed and 20,000 Ohms minimum when switch is open.

SECTION 5—OIL LEVEL SENSOR (OLS)

5–1. INTRODUCTION

The oil level sensor (Figure 5–1) provides a means of electronically checking the transmission fluid level from:

- The shift selector display
- Allison DOC™ For PC–Service Tool
- A customer-furnished remote display.

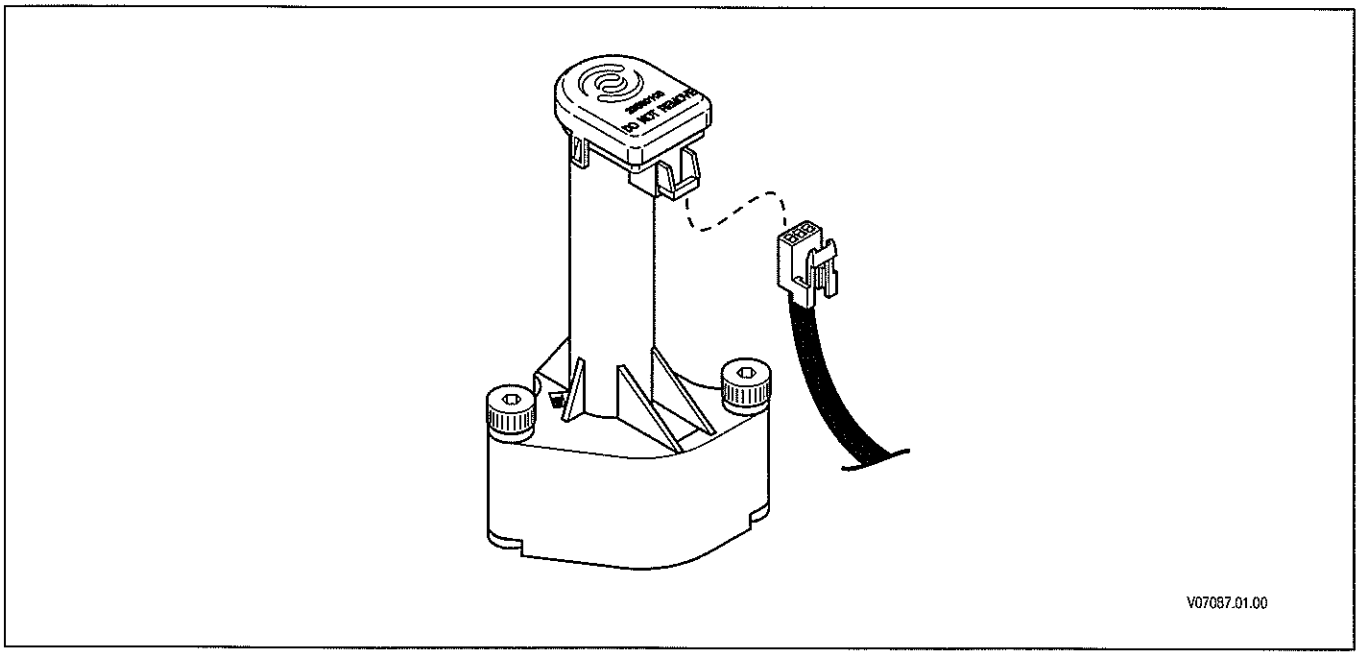


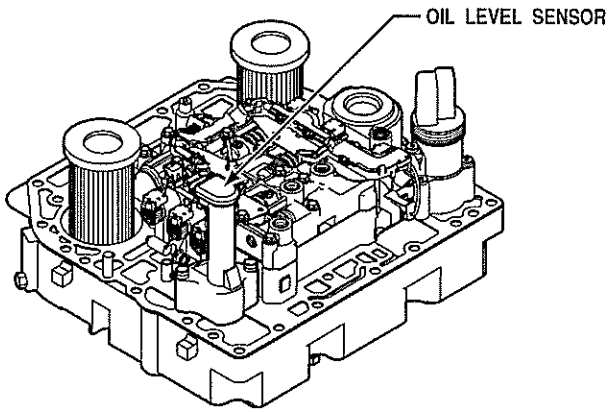
Figure 5–1. Oil Level Sensor

The Allison 4th Generation Controls oil level sensor (OLS) is a one-piece unit with a molded 3-terminal connector built into the sensor housing (see Figure 5–1 and SIL 19-WT-99 for more details). The internal wiring harnesses have been designed to include the 3-terminal connector for the OLS.

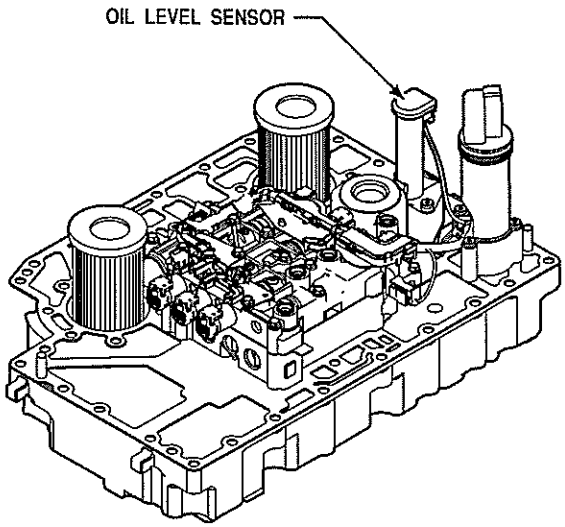
*NOTE: **The OLS is standard on all 3000 and 4000 Product Families transmissions except 3000 Product Family 7-speed transmissions.***

Figure 5–2 shows the position and orientation of the OLS on the control modules of the 3000 and 4000 Product Families transmissions. The OLS **must be** correctly positioned so the internal harness connector reaches the connector on the sensor. The control module must fit onto the transmission main case without interference. The one piece design reduces the complexity of the manufacturing and installation of the sensor. The current OLS uses shoulder bolts and Viton® ferrules to provide vibration dampening in the mounting.

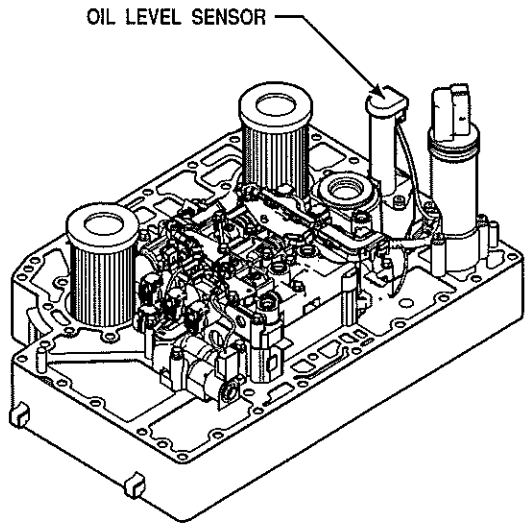
OIL LEVEL SENSOR (OLS)



6-SPEED
3000 PRODUCT FAMILY
CONTROL MODULE



6-SPEED
4000 PRODUCT FAMILY
CONTROL MODULE



7-SPEED
4000 PRODUCT FAMILY
CONTROL MODULE

V09271.00.00

Figure 5–2. Current Oil Level Sensor Orientation

OIL LEVEL SENSOR (OLS)

5–2. ELECTRONIC FLUID LEVEL READING (SHIFT SELECTOR)

CAUTION: **A low or high fluid level causes overheating and irregular shift patterns. An incorrect fluid level can damage the transmission.**

NOTE: The pushbutton and lever shift selectors can display two characters at a time. The strip pushbutton shift selector does not have diagnostic or display capability. Allison DOC™ For PC–Service Tool or a customer-furnished remote display must be used to obtain fluid level information when using the strip pushbutton shift selector.

A. Fluid Level Reading Procedure

1. Park the vehicle on a level surface and shift to **N** (Neutral). Apply the parking brake.
2. On the Pushbutton shift selector, simultaneously press the ↑ (Up) and ↓ (Down) arrow buttons once.
3. On the Lever shift selector, press the "display mode" button once.
4. For a strip pushbutton shift selector, refer to Allison publication GN3433EN, User Guide for Allison DOC™ For PC–Service Tool.

NOTE: The TCM may delay the fluid level reading until the following conditions are met:

- *The fluid temperature is between 60°C (140°F) and 104°C (220°F).*
- *The transmission is in N (Neutral).*
- *The vehicle has been stationary for approximately two minutes to allow the fluid to settle.*
- *The engine is at idle (below 1000 rpm—not "fast" idle).*

See "Invalid for Display" information in Steps (8) and (9).

5. Correct fluid level is reported when **o L** is displayed (**o L** indicates the Oil Level Check Mode), followed by **o K**. The **o K** display indicates the fluid level is within the proper fluid level zone. The sensor display and the transmission dipstick may not agree exactly because the oil level sensor compensates for fluid temperature.

   Example: **o L**; **o K**—Indicates correct fluid level.

6. Low fluid level is reported when **o L** is displayed, followed by **L o** and a number. **L o** indicates a low fluid level and the number is the number of quarts of fluid the transmission requires.

   Example: **o L**; **L o**; **2**—Indicates two (2) additional quarts of fluid will bring the fluid level within the proper fluid level.

OIL LEVEL SENSOR (OLS)

7. High fluid level is reported when **o L** is displayed, followed by **H I** and a number. **H I** indicates high fluid level and the number shows how many quarts the transmission is overfilled.

   Example: **o L, H I, 1**—Indicates one quart of fluid above the full level.

8. An Invalid for Display condition is reported when **o L** is displayed, followed by "–" and a number display. The displayed number is a fault code and indicates improper conditions or a system malfunction.

   Example: **o L, –, 7 0**—Indicates an Invalid for Display condition and fault code 70.

9. Invalid for Display is activated when conditions do not allow the fluid level to be checked electronically. Review the following codes and conditions, and correct as necessary.

Table 5–1. Invalid for Display Codes

CODE		CAUSE OF CODE
X*	—	Settling time too short
5 0	—	Engine speed (rpm) too low
5 9	—	Engine speed (rpm) too high
6 5	—	N (Neutral) must be selected
7 0	—	Sump fluid temperature too low
7 9	—	Sump fluid temperature too high
8 9	—	Output shaft rotation
9 5	—	Sensor failure**

* A number between 8 and 1 that flashes during the count-down period.
** Speed sensor, throttle sensor, temperature sensor, or oil level sensor.

10. To exit the fluid level display mode:

    - Pushbutton shift selector—press the **N** (Neutral) pushbutton or press ↑ (Up) and ↓ (Down) arrow pushbuttons simultaneously two times.
    - Lever shift selector—press the **"DISPLAY MODE"** button two times or move the lever.

OIL LEVEL SENSOR (OLS)

5–3. ELECTRONIC FLUID LEVEL READING (ALLISON DOC™ FOR PC–SERVICE TOOL)

Allison DOC™ For PC–Service Tool can also be used to electronically read the transmission's fluid level (refer to Allison publication GN3433EN, User Guide for Allison DOC™ For PC–Service Tool for further information).

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

A. Fluid Level Check Procedure

1. Connect the Allison DOC™ For PC–Service Tool to the diagnostic tool connector (Figure 1–2).
2. Select **Diagnostic** button.
3. Scroll down the Diagnostic Data List to "Custom Data Monitor" display.
4. Select "oil level deviation."
5. Read the fluid level deviation, repeat the reading to confirm the first reading.

NOTE: The TCM may delay the fluid level reading until the following conditions are met:

- *The fluid temperature is between 60°C (140°F) and 104°C (220°F).*
- *The transmission is in N (Neutral).*
- *The vehicle has been stationary for approximately two minutes to allow the fluid to settle.*
- *The engine is at idle.*

The reason for a delayed fluid level reading is indicated on the Allison DOC™ For PC–Service Tool by one of the following diagnostic messages.

Table 5–2. Diagnostic Message

O L	—	SETTLING TIME (8 down to 1)
O L	—	ENGINE SPEED LO
O L	—	ENGINE SPEED HI
O L	—	SELECT **N** (NEUTRAL)
O L	—	SUMP TEMP LO
O L	—	SUMP TEMP HI
O L	—	OUTPUT SPEED HI
O L	—	CHECK CODES

OIL LEVEL SENSOR (OLS)

NOTES

SECTION 6—DIAGNOSTIC TROUBLE CODES (DTC)

6–1. DIAGNOSTIC CODE MEMORY

Diagnostic codes are logged in a list in memory (sometimes referred to as the queue), listing the most recently occurring code first and logging all active and inactive codes. The codes contained in the list have information recorded as shown in the table below (codes are examples). Access to the code list position, DTC, and active indicator is through the shift selector display. The shift selector will display only five codes, beginning with the most recent active followed by the most recent inactive DTCs. Access to DTC, Active indicator, Historic indicator, Check Trans indicator, Failure Record indicator, and Description is through the Allison DOC™ For PC–Service Tool. Further details on the use of the Allison DOC™ For PC–Service Tool are presented in GN3433EN User Guide furnished with each tool.

Table 6–1. Code List

Code List Position*	DTC	Active**	Historic	Check Trans	Failure Record	Description
d1	P0880	Y	Y	N	Y	TCM Power Input Signal
d2	P2723	Y	Y	Y	Y	Pressure Control Solenoid 1 Stuck Off
d3	P0727	N	Y	N	Y	Engine Speed Input Circuit No Signal
d4	P0610	N	Y	N	Y	TCM Vehicle Options (TransID) Error
d5	—	—	—	—	—	—

* Displayed on shift selector only, d = diagnostic
** On shift selector, Y = Mode indicator (LED) illuminated

The following paragraphs define the different parts of the code list.

A. **Code List Position (shift selector only).** The position which a code occupies in the code list. Positions are displayed as "d1" through "d5" (Code List Position 1 through Code List Position 5).

B. **DTC.** The diagnostic trouble code number referring to the general condition or area of fault detected by the TCM. "Double click" on the numerical code in the DTC column to link to the specific troubleshooting instructions for the DTC.

C. **Active Indicator.** Indicates when a diagnostic code is active. The MODE indicator LED on the shift selector is illuminated or the diagnostic tool displays **Y** when DTC is active.

D. **Historic Indicator.** Indicates when the DTC has met sufficient criteria to be stored in long term memory. "Sufficient criteria" may mean the DTC occurred over a specific span of time or over multiple test cycles.

E. **Check Trans Indicator.** Indicates when the TCM is requesting the **CHECK TRANS** light as a result of the DTC.

F. **Failure Records Indicator.** Indicates when Failure Records are present. "Double click" on **Y** in the Failure Records column to display failure record information.

G. **Description.** Provides a brief description of the DTC. "Double click" on the DTC description to link to the specific troubleshooting instructions for the DTC.

DIAGNOSTIC TROUBLE CODES (DTC)

6–2. CODE READING AND CODE CLEARING

Diagnostic codes can be read and cleared by the following methods:

- Allison DOC™ For PC–Service Tool.
- Diagnostic display mode on the shift selector.

The use of Allison DOC™ For PC–Service Tool is described in Allison publication GN3433EN, User Guide, that is furnished with each tool. The method of reading and clearing codes described in this section refers to entering the diagnostic display mode of the shift selector.

The diagnostic display mode may be entered for viewing of codes at any speed. Active codes can only be cleared when the output speed = 0 and no output speed sensor failure is active.

A. Reading Codes. Enter the diagnostic display mode by pressing the ↑ (Up) and ↓ (Down) arrow buttons at the same time on a pushbutton selector, or by momentarily pressing the **MODE** button on a lever shift selector.

NOTE: If a DO NOT SHIFT condition is present (CHECK TRANS light illuminated) at this time, the shift selector may or may not respond to requested range changes.

NOTE: If an oil level sensor is present, then fluid level will be displayed first. Diagnostic code display is achieved by simultaneously depressing the ↑ (Up) and ↓ (Down) arrow buttons a second time or the MODE button a second time.

The code list or queue position is the first item displayed, followed by the DTC. Each item is displayed for about one second. The display cycles continuously until the next code list position is accessed by pressing the **MODE** button. The following example shows how DTC C1312 is displayed on the pushbutton and lever shift selectors:

SELECT	MONITOR
d	1
	C
1	3
1	2

To view the second, third, fourth, and fifth positions (d2, d3, d4, and d5), momentarily press the **MODE** button as explained above.

Momentarily press the **MODE** button after the fifth position is displayed to restart the sequence of code list positions.

An active code is indicated by the illumination of the LED indicator when a code position is displayed while in the diagnostic display mode. In the normal operating mode, the LED indicator illuminates to show a secondary mode operation.

Any code position which does not have a diagnostic code logged will display "–" for the DTC. No diagnostic codes are logged after an empty code position.

B. Clearing Active Indicators. A diagnostic code's active indicator can be cleared, which allows the code inhibit to be cleared but remains in the queue as inactive.

The active indicator clearing methods are:

1. Power down—All active indicators are cleared at TCM power down.

DIAGNOSTIC TROUBLE CODES (DTC)

2. Self-clearing—Some codes will clear their active indicator when the condition causing the code is no longer detected by the TCM.
3. Manual—Some active indicators can be cleared manually, while in the diagnostic display mode, after the condition causing the code is corrected.

CAUTION:	**If an active indicator is cleared while the transmission is locked in a forward range or reverse (fail-to-range), the transmission will remain in the forward range or reverse after the clearing procedure is completed. Neutral must be manually selected.**

C. Manually Clearing Codes and Active Indicators from the Code List. To clear active indicators or all codes:

1. Enter the diagnostic display mode.
2. Press and hold the **MODE** button for approximately ten seconds until the LED indicator flashes. All active and inactive indicators are cleared. All active indicators will be cleared at TCM power down.
3. Codes that cannot be manually cleared will remain.

D. Exiting the diagnostic display mode. Exit the diagnostic display mode using one of the following procedures:

1. On a pushbutton shift selector, press the ↑ (Up) and ↓ (Down) arrow buttons at the same time or press any range button, **D**, **N**, or **R**. The shift (**D**, **N**, or **R**) is commanded if not inhibited by an active code.
2. On a lever shift selector, momentarily press the **MODE** button or move the shift lever to any shift position other than the one it was in when the diagnostic display mode was activated. If the shift is inhibited, the TCM will continue to command the current transmission range attained and the lever should be returned to its original position.
3. Wait until timeout (approximately 10 minutes) and the system will automatically return to the normal operating mode.
4. Turn off power to the TCM (turn off the vehicle engine at the ignition switch).

6–3. DIAGNOSTIC CODE RESPONSE

The following TCM responses to a fault provide for safe transmission operation:

- **D**o **N**ot **S**hift (DNS) Response
  - — Release lockup clutch and inhibit lockup operation.
  - — Inhibit all shifts.
  - — Turn on the **CHECK TRANS** light.
  - — Display the range attained.
  - — Ignore any range selection inputs from the pushbutton or lever shift selector.
- **D**o **N**ot **A**dapt (DNA) Response
  - — The TCM stops adaptive shift control while the code is active. Do not adapt shifts when a code with the DNA response is active.

DIAGNOSTIC TROUBLE CODES (DTC)

- **SOL**enoid **OFF** (SOL OFF) Response
  - — All solenoids are commanded off (turning solenoids PCS1 and PCS2 off electrically causes them to be on hydraulically).
- **R**eturn to **P**revious **R**ange (RPR) Response
  - — When the speed sensor ratio or PS1 pressure switch tests associated with a shift are not successful, the TCM commands the same range as commanded before the shift.
- **N**eutral **N**o **C**lutches (NNC) Response
  - — When certain speed sensor ratio or PS1 pressure switch tests are not successful, the TCM commands a neutral condition with no clutches applied.

6–4. SHIFT SELECTOR DISPLAYS RELATED TO ACTIVE CODES

- "Cateye"—The forward slash segment and the middle horizontal segments (-/-) may be on under the following conditions:
  - — Lost communication between the TCM and shift selector (U0103 or U0291)
  - — J1939 Controlled Area Network (CAN) problems
  - — Invalid data from shift selector (U0592 or U0404)
- All Segments Displayed—All display segments will be illuminated during shift selector initialization. Low supply voltage can cause the shift selector to fail to complete initialization.

6–5. DIAGNOSTIC CODE LIST AND DESCRIPTION

Table 6–2. Diagnostic Troubleshooting Codes (DTC) and Descriptions

DTC	Description	CHECK TRANS Light	Inhibited Operation Description
C1312	Retarder Request Sensor Failed Low	No	May inhibit retarder operation if not using J1939 datalink
C1313	Retarder Request Sensor Failed High	No	May inhibit retarder operation if not using J1939 datalink
P0122	Pedal Position Sensor Low Voltage	No	Use default throttle values. Freezes shift adapts.
P0123	Pedal Position Sensor High Voltage	No	Use default throttle values. Freezes shift adapts.
P0218	Transmission Fluid Over Temperature	No	Use hot mode shift schedule. Holds fourth range. TCC is inhibited. Freezes shift adapts.
P0602	TCM Not Programmed	Yes	Lock in Neutral
P0610	TCM Vehicle Options (TransID) Error	Yes	Use TID A calibration
P0613	TCM Processor	No	All solenoids off
P0614	Torque Control Data Mismatch—ECM/TCM	Yes	Allows operation only in reverse and second range.
P0634	TCM Internal Temperature Too High	Yes	SOL OFF (hydraulic default)
P063E	Auto Configuration Throttle Input Not Present	Yes	Use default throttle values

DIAGNOSTIC TROUBLE CODES (DTC)

Table 6–2. Diagnostic Troubleshooting Codes (DTC) and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Inhibited Operation Description
P063F	Auto Configuration Engine Coolant Temp Input Not Present	No	None
P0658	Actuator Supply Voltage 1 (HSD1) Low	Yes	DNS, SOL OFF (hydraulic default)
P0659	Actuator Supply Voltage 1 (HSD1) High	Yes	DNS, SOL OFF (hydraulic default)
P0702	Transmission Control System Electrical (TransID)	Yes	Uses TID A calibration
P0703	Brake Switch Circuit Malfunction	No	No Neutral to Drive shifts for refuse packer. TCM inhibits retarder operation if a TPS code is also active.
P0708	Transmission Range Sensor Circuit High Input	Yes	Ignore defective strip selector inputs
P070C	Transmission Fluid Level Sensor Circuit—Low Input	No	None
P070D	Transmission Fluid Level Sensor Circuit—High Input	No	None
P0711	Transmission Fluid Temperature Sensor Circuit Performance	Yes	Use default sump temp
P0712	Transmission Fluid Temperature Sensor Circuit Low Input	Yes	Use default sump temp
P0713	Transmission Fluid Temperature Sensor Circuit High Input	Yes	Use default sump temp
P0716	Turbine Speed Sensor Circuit Performance	Yes	DNS, Lock in current range
P0717	Turbine Speed Sensor Circuit No Signal	Yes	DNS, Lock in current range
P0719	Brake Switch ABS Input Low	No	TCM assumes ABS is OFF
P071A	RELS Input Failed On	Yes	Inhibit RELS operation
P071D	General Purpose Input Fault	Yes	None
P0721	Output Speed Sensor Circuit Performance	Yes	DNS, Lock in current range
P0722	Output Speed Sensor Circuit No Signal	Yes	DNS, Lock in current range
P0726	Engine Speed Sensor Circuit Performance	No	Default to turbine speed
P0727	Engine Speed Sensor Circuit No Signal	No	Default to turbine speed
P0729	Incorrect 6th Gear Ratio	Yes	DNS, Attempt 5th, then 3rd
P0731	Incorrect 1st Gear Ratio	Yes	DNS, Attempt 2nd, then 5th
P0732	Incorrect 2nd Gear Ratio	Yes	DNS, Attempt 3rd, then 5th
P0733	Incorrect 3rd Gear Ratio	Yes	DNS, Attempt 4th, then 6th
P0734	Incorrect 4th Gear Ratio	Yes	DNS, Attempt 5th, then 3rd
P0735	Incorrect 5th Gear Ratio	Yes	DNS, Attempt 6th, then 3rd, then 2nd
P0736	Incorrect Reverse Gear Ratio	Yes	DNS, Lock in Neutral
P0741	Torque Converter Clutch System Stuck Off	Yes	None
P0776	Pressure Control Solenoid 2 Stuck Off	Yes	DNS, RPR
P0777	Pressure Control Solenoid 2 Stuck On	Yes	DNS, RPR

DIAGNOSTIC TROUBLE CODES (DTC)

Table 6–2. Diagnostic Troubleshooting Codes (DTC) and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Inhibited Operation Description
P0796	Pressure Control Solenoid 3 Stuck Off	Yes	DNS, RPR
P0797	Pressure Control Solenoid 3 Stuck On	Yes	DNS, RPR
P0842	Transmission Pressure Switch 1 Circuit Low	Yes	DNS, Lock in current range
P0843	Transmission Pressure Switch 1 Circuit High	Yes	DNS, Lock in current range
P0880	TCM Power Input Signal	No	None
P0881	TCM Power Input Signal Performance	No	None
P0882	TCM Power Input Signal Low	Yes	DNS, SOL OFF (hydraulic default)
P0883	TCM Power Input Signal High	No	None
P0894	Transmission Component Slipping	Yes	DNS, Lock in first
P0960	Pressure Control Solenoid Main Mod Control Circuit Open	Yes	None
P0962	Pressure Control Solenoid Main Mod Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)
P0963	Pressure Control Solenoid Main Mod Control Circuit High	Yes	None
P0964	Pressure Control Solenoid 2 (PCS2) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)
P0966	Pressure Control Solenoid 2 (PCS2) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)
P0967	Pressure Control Solenoid 2 (PCS2) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)
P0968	Pressure Control Solenoid 3 (PCS3) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)
P0970	Pressure Control Solenoid 3 (PCS3) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)
P0971	Pressure Control Solenoid 3 (PCS3) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)
P0973	Shift Solenoid 1 (SS1) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)
P0974	Shift Solenoid 1 (SS1) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)
P0975	Shift Solenoid 2 (SS2) Control Circuit Open	Yes	7-speed: Allow 2 through 6, N, R
P0976	Shift Solenoid 2 (SS2) Control Circuit Low	Yes	7-speed: Allow 2 through 6, N, R. Inhibit TCC operation
P0977	Shift Solenoid 2 (SS2) Control Circuit High	Yes	7-speed: Allow 2 through 6, N, R
P0989	Retarder Pressure Sensor Failed Low	No	None
P0990	Retarder Pressure Sensor Failed High	No	None
P1739	Incorrect Low Gear Ratio	Yes	Command 2nd and allow shifts 2 through 6, N, R
P1891	Throttle Position Sensor PWM Signal Low Input	No	Use default throttle values
P1892	Throttle Position Sensor PWM Signal High Input	No	Use default throttle values
P2184	Engine Coolant Temperature Sensor Circuit Low Input	No	Use default engine coolant values

DIAGNOSTIC TROUBLE CODES (DTC)

Table 6–2. Diagnostic Troubleshooting Codes (DTC) and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Inhibited Operation Description
P2185	Engine Coolant Temperature Sensor Circuit High Input	No	Use default engine coolant values
P2637	Torque Management Feedback Signal (SEM)	Yes	Inhibit SEM
P2641	Torque Management Feedback Signal (LRTP)	Yes	Inhibit LRTP
P2670	Actuator Supply Voltage 2 (HSD2) Low	Yes	DNS, SOL OFF (hydraulic default)
P2671	Actuator Supply Voltage 2 (HSD2) High	Yes	DNS, SOL OFF (hydraulic default)
P2685	Actuator Supply Voltage 3 (HSD3) Low	Yes	DNS, SOL OFF (hydraulic default)
P2686	Actuator Supply Voltage 3 (HSD3) High	Yes	DNS, SOL OFF (hydraulic default)
P2714	Pressure Control Solenoid 4 (PCS4) Stuck Off	Yes	DNS, RPR
P2715	Pressure Control Solenoid 4 (PCS4) Stuck On	Yes	DNS, SOL OFF (hydraulic default)
P2718	Pressure Control Solenoid 4 (PCS4) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)
P2720	Pressure Control Solenoid 4 (PCS4) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)
P2721	Pressure Control Solenoid 4 (PCS4) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)
P2723	Pressure Control Solenoid 1 (PCS1) Stuck Off	Yes	DNS, RPR
P2724	Pressure Control Solenoid 1 (PCS1) Stuck On	Yes	DNS, RPR
P2727	Pressure Control Solenoid 1 (PCS1) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)
P2729	Pressure Control Solenoid 1 (PCS1) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)
P2730	Pressure Control Solenoid 1 (PCS1) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)
P2736	Pressure Control Solenoid 5 (PCS5) Control Circuit Open	Yes	Inhibit retarder operation
P2738	Pressure Control Solenoid 5 (PCS5) Control Circuit Low	Yes	Allow 2 through 6, N, R. Inhibit retarder and TCC operation
P2739	Pressure Control Solenoid 5 (PCS5) Control Circuit High	Yes	Inhibit retarder operation
P2740	Retarder Oil Temperature Hot	No	None
P2742	Retarder Oil Temperature Sensor Circuit—Low Input	No	Use default retarder temp values
P2743	Retarder Oil Temperature Sensor Circuit—High Input	No	Use default retarder temp values
P2761	TCC PCS Control Circuit Open	Yes	Inhibit TCC operation
P2763	TCC PCS Control Circuit High	Yes	Inhibit TCC operation
P2764	TCC PCS Control Circuit Low	Yes	7-speed: allow 2 through 6, N, R. Inhibit TCC operation
P278A	Kickdown Input Failed ON	No	Inhibit kickdown operation
P2793	Gear Shift Direction Circuit	Yes	Ignores PWM input from shift selector
P2808	Pressure Control Solenoid 6 (PCS6) Stuck Off	Yes	DNS, RPR

DIAGNOSTIC TROUBLE CODES (DTC)

Table 6–2. Diagnostic Troubleshooting Codes (DTC) and Descriptions *(cont'd)*

DTC	Description	CHECK TRANS Light	Inhibited Operation Description
P2809	Pressure Control Solenoid 6 (PCS6) Stuck On	Yes	DNS, RPR
P2812	Pressure Control Solenoid 6 (PCS6) Control Circuit Open	Yes	DNS, SOL OFF (hydraulic default)
P2814	Pressure Control Solenoid 6 (PCS6) Control Circuit Low	Yes	DNS, SOL OFF (hydraulic default)
P2815	Pressure Control Solenoid 6 (PCS6) Control Circuit High	Yes	DNS, SOL OFF (hydraulic default)
U0001	Hi Speed CAN Bus Reset Counter Overrun (IESCAN)	No	Use default values, inhibit SEM
U0010	CAN BUS Reset Counter Overrun	No	Use default values, inhibit SEM
U0100	Lost Communications with ECM/PCM (J1587)	Yes	Use default values
U0103	Lost Communication With Gear Shift Module (Shift Selector) 1	Yes	Maintain range selected, observe gear shift direction circuit
U0115	Lost Communication With ECM	Yes	Use default values
U0291	Lost Communication With Gear Shift Module (Shift Selector) 2	Yes	Maintain range selected, observe gear shift direction circuit
U0304	Incompatible Gear Shift Module 1 (Shift Selector) ID	Yes	Ignore shift selector inputs
U0333	Incompatible Gear Shift Module 2 (Shift Selector) ID	Yes	Ignore shift selector inputs
U0404	Invalid Data Received From Gear Shift Module (Shift Selector) 1	Yes	Maintain range selected, observe gear shift direction circuit
U0592	Invalid Data Received From Gear Shift Module (Shift Selector) 2	Yes	Maintain range selected, observe gear shift direction circuit

DIAGNOSTIC TROUBLE CODES (DTC)

TRANSMISSION COMPONENT WIRING DIAGRAMS AND DIAGNOSTICS

DIAGNOSTIC TROUBLE CODES (DTC)

NOTES

DIAGNOSTIC TROUBLE CODES (DTC)

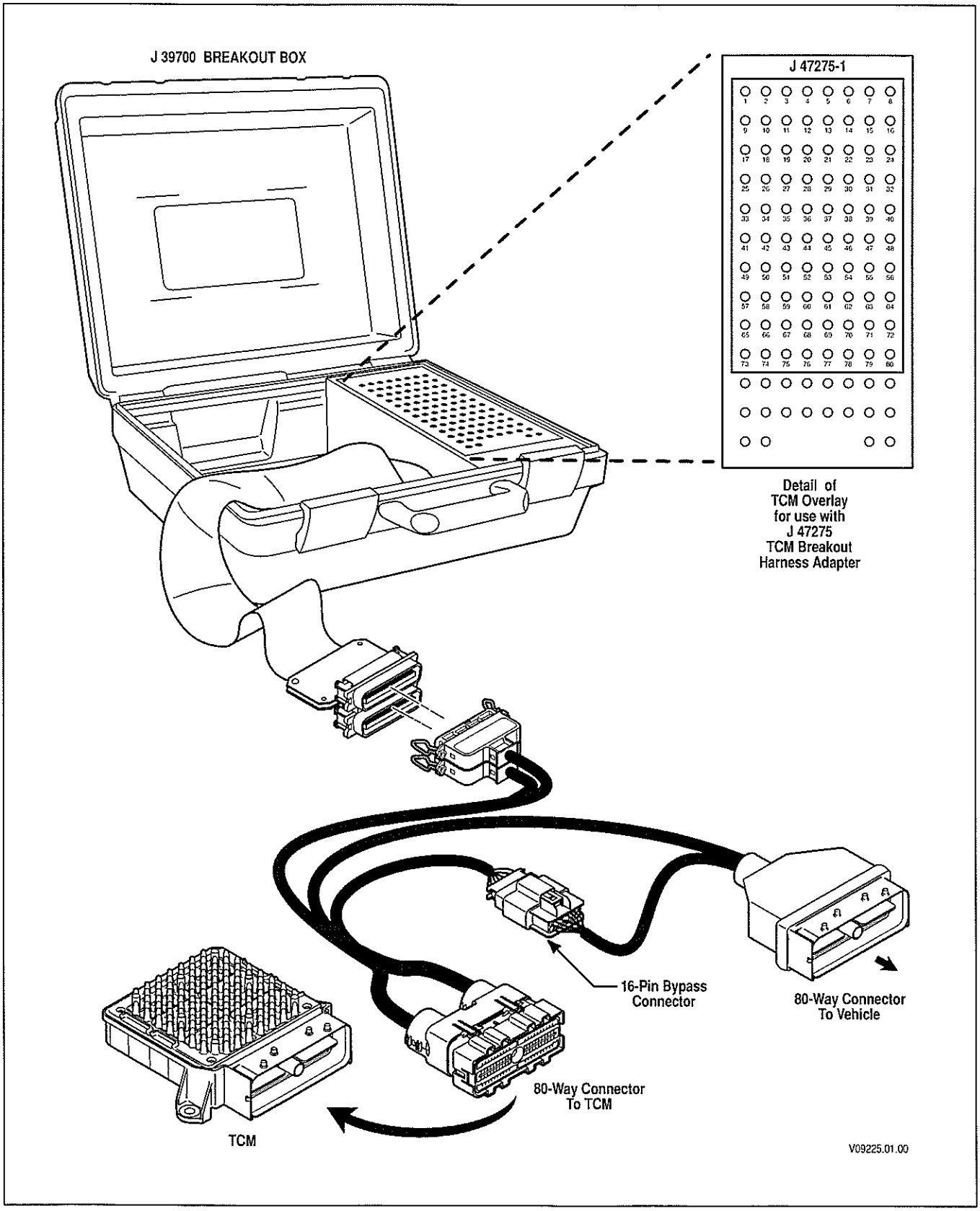


Figure 6–1. J 39700 Breakout Box and J 47275 TCM Breakout Harness Adapter

DIAGNOSTIC TROUBLE CODES (DTC)

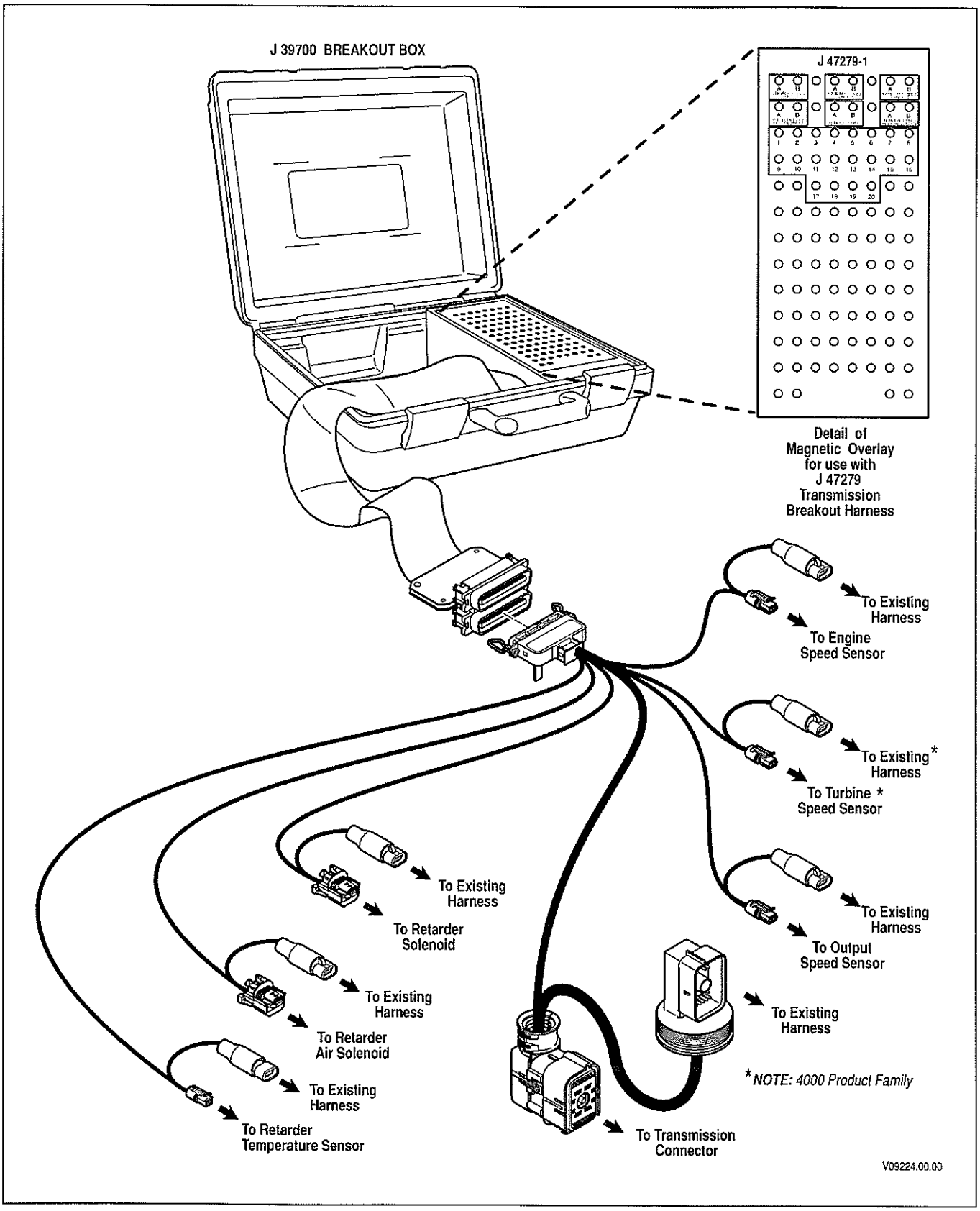


Figure 6–2. J 39700 Breakout Box and J 47279 Transmission Breakout Harness

DIAGNOSTIC TROUBLE CODES (DTC)

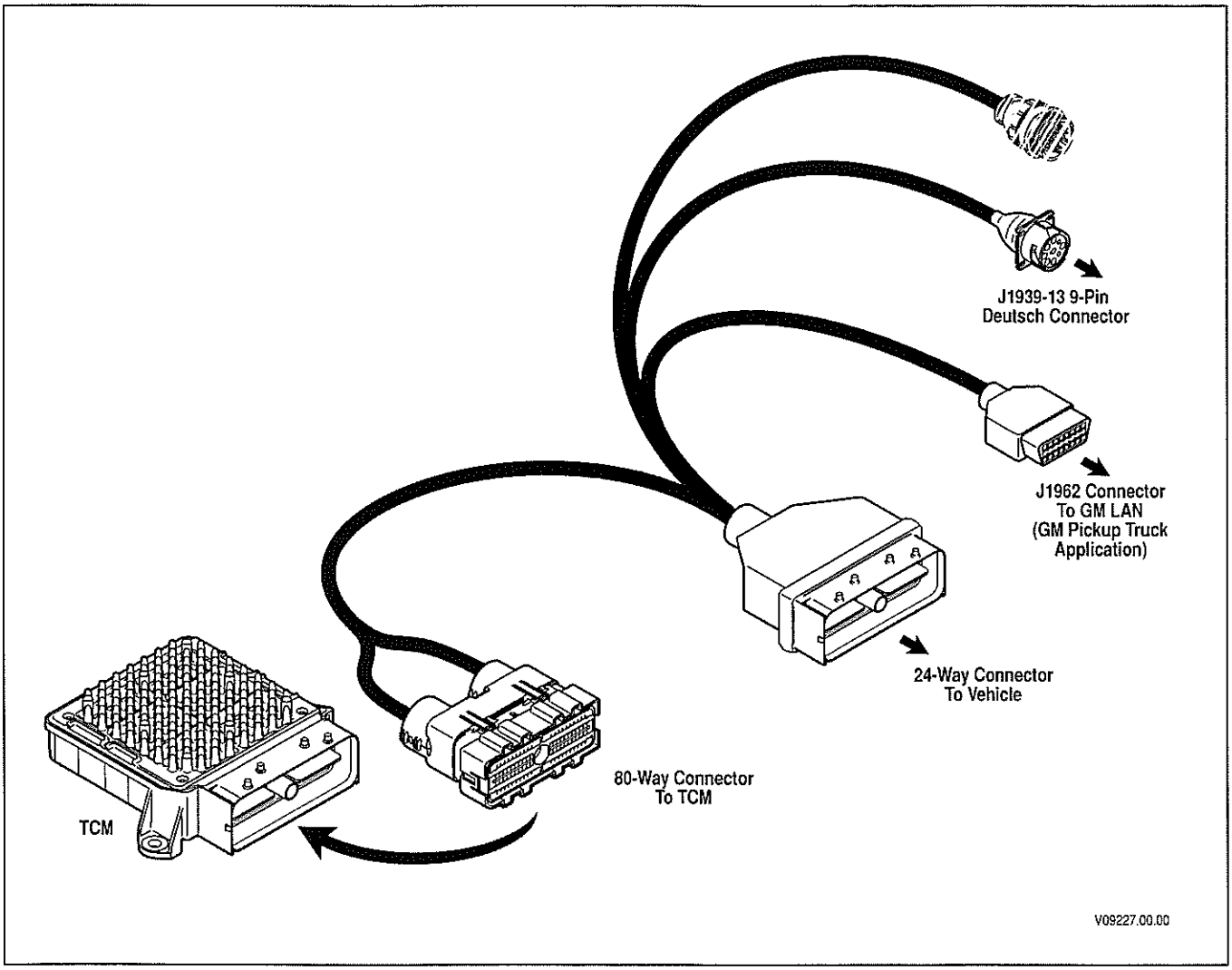


Figure 6–3. J 47276 "T" Breakout and TCM Reflashing Harness

DIAGNOSTIC TROUBLE CODES (DTC)

6–6. DIAGNOSTIC CODE TROUBLESHOOTING

A. Beginning The Troubleshooting Process

1. Begin troubleshooting by determining the transmission fluid level and TCM input voltage. Access diagnostic codes by using:
   - The shift selector display.
   - Allison DOC™ For PC–Service Tool.
2. When a problem exists but a diagnostic code is not indicated, refer to Section 8, General Troubleshooting of Performance Complaints for a listing of various electrical and hydraulic problems, their causes, and remedies.
3. If a diagnostic code is found in the TCM memory, record all available code information and clear the active indicator. Read TCM freeze frame data using Allison DOC™ For PC–Service Tool. Refer to Section 6–2.
4. Test drive the vehicle to confirm a diagnostic code or performance complaint.
   - If the code reappears, refer to Section 6–5, Table 6–2. Table 6–2 lists diagnostic codes and their description.
   - If the code does not reappear, it may be an intermittent problem. Use Allison DOC™ For PC–Service Tool or the code display procedure described in Section 6–2.
   - The code display procedure will indicate the number of times the diagnostic code has occurred. Refer to Section 8, General Troubleshooting of Performance Complaints, for the possible cause(s) of the problem.
   - Use pressure gauges as necessary to evaluate hydraulic conditions.
   - Appendix A deals with the identification of potential circuit problems. Refer to Appendix A if a circuit problem is suspected.
5. If difficulties arise, you have unanswered questions, or if you are unable to quickly identify the root cause during troubleshooting, please contact the Technical Assistance Center (TAC):

   Technical Assistance Center
   PO Box 894, Mail Code 462-470-PF9
   Indianapolis, IN 46206-0894
   Phone: 1-800-252-5283

*NOTE: **Information concerning specific items is contained in the appendices located in the back of this manual. The appendices are referred to throughout the manual.***

B. Solenoid Locations

Solenoid locations in the control module are as illustrated in Figure 6–3. Refer to Figure 6–3 as necessary when using the diagnostic code schematics.

C. Diagnostic Code Schematics

The diagnostic code schematics in this section show wiring for both the optional oil level sensor and retarder, where applicable. If your transmission is not equipped with an oil level sensor or retarder, disregard the portions of the schematic pertaining to those optional pieces of equipment. Refer to the appropriate transmission service manual for solenoid replacement procedures.

DIAGNOSTIC TROUBLE CODES (DTC)

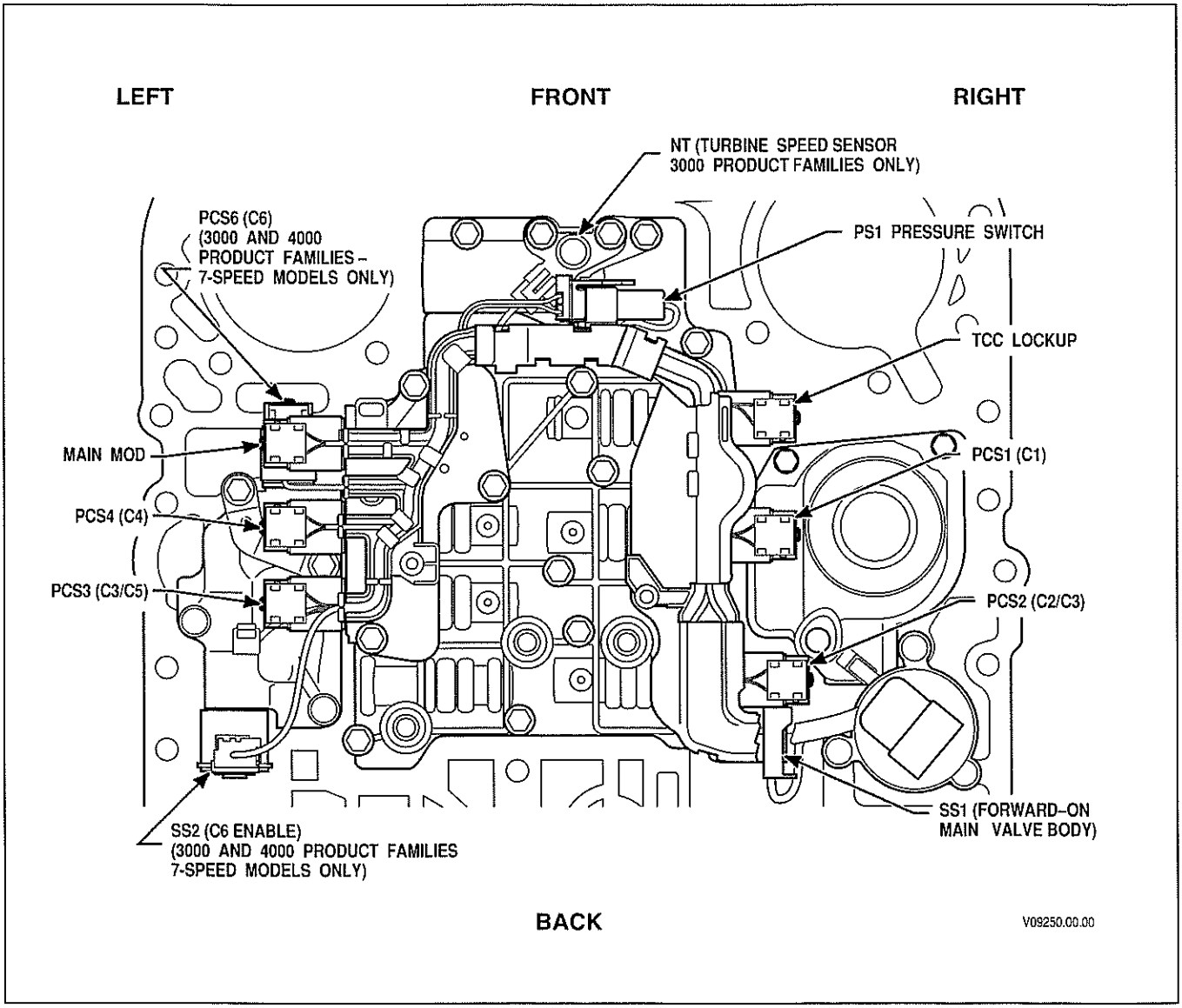
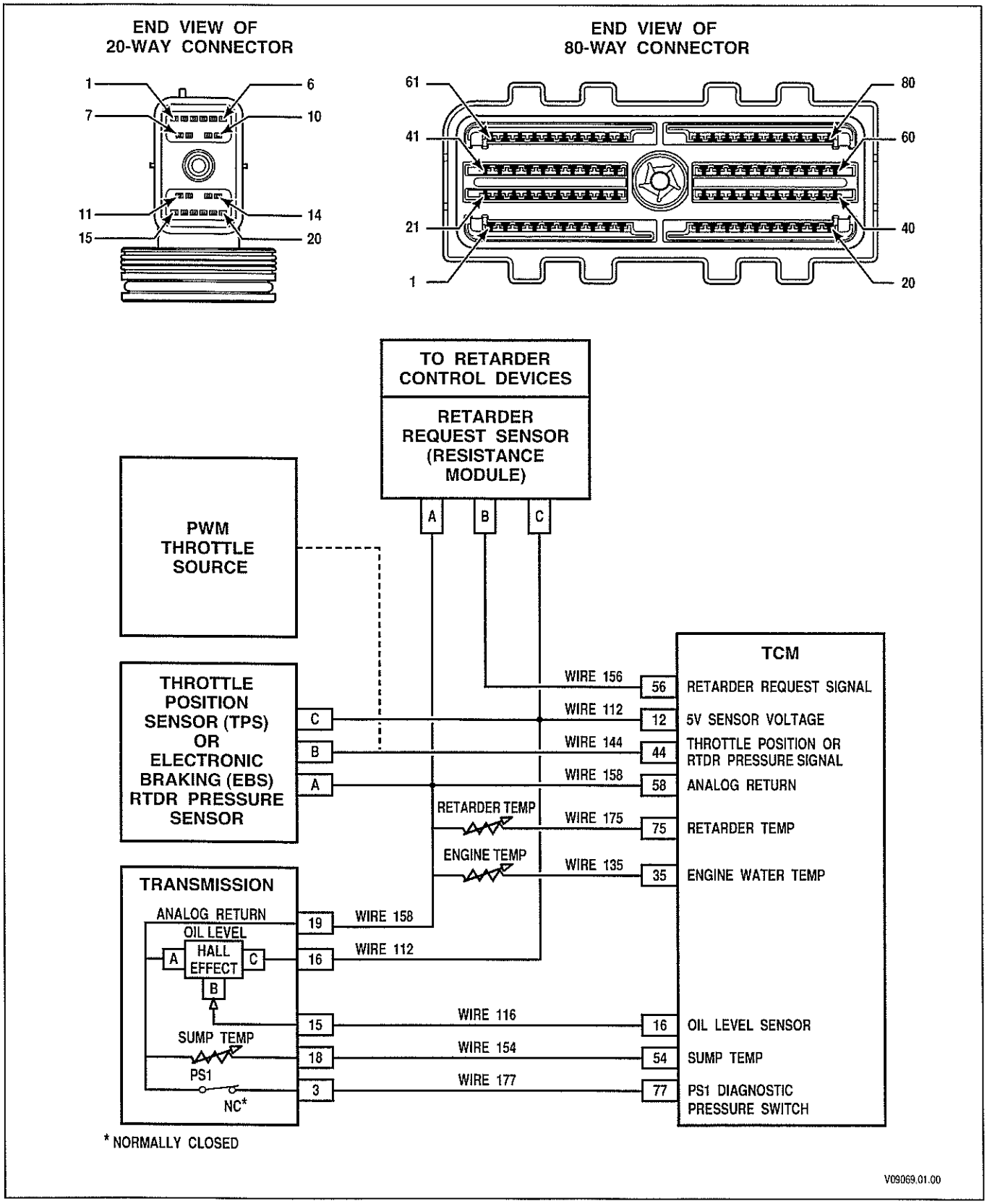


Figure 6–4. Control Module Solenoid Location

DIAGNOSTIC TROUBLE CODES (DTC)

DTC C1312 Retarder Request Sensor Failed Low



DIAGNOSTIC TROUBLE CODES (DTC)

DTC C1312 Retarder Request Sensor Failed Low

Circuit Description

The Transmission Control Module (TCM) can be calibrated to receive a retarder request signal from a retarder request sensor, sometimes called a resistance module. The TCM is connected to the retarder request sensor by:

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

The TCM provides a 5V reference voltage to the retarder request sensor. A voltage divider network in the sensor produces a retarder request signal in response to inputs from the retarder control device(s). The TCM interprets this signal as a percent retarder requested.

Conditions for Running the DTC

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

Conditions for Setting the DTC

DTC C1312 sets if the TCM is calibrated to receive the retarder request signal, and the signal voltage is less than 0.3V for five seconds.

Actions Taken When the DTC Sets

When DTC C1312 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM may inhibit retarder operation, if not using the J1939 Datalink for retarder request signal.

Conditions for Clearing DTC/CHECK TRANS Light

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

Diagnostic Aids

- DTC C1312 indicates the TCM has detected a voltage signal from the retarder request sensor in the low error zone. The code can be caused by:
  - — Faulty wiring.
  - — Faulty connections to the retarder request sensor or retarder control device.
  - — A faulty retarder request sensor (resistance module).
  - — A faulty retarder control device.
  - — A faulty TCM.
- DTC C1312 can be caused by an open or short-to-ground in either the 5V reference wire 112 or retarder request signal wire 156. The retarder request sensor shares a common 5V reference voltage with the transmission oil level sensor (OLS) and throttle position sensor (TPS) on wire 112. An open or short-to-ground in the common 5V reference causes a "sensor failed low" code for the other devices as well. An open or short-to-ground on wire 156 will cause a DTC C1312 only.

DIAGNOSTIC TROUBLE CODES (DTC)

- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.

Test Description

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

2. This step tests for an active DTC.
3. This step tests for defective wiring in external harness.
5. This step tests for retarder request sensor functionality.
6. This step tests for proper 5V reference voltage at the TCM with OEM harness disconnected.

DTC C1312 Retarder Request Sensor Failed Low

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Clear the DTC and drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the retarder request sensor voltage is below a set voltage for a set period of time. It may also indicate an open or short-to-ground in either the 5V reference wire 112 or retarder request signal wire 156.*** Did DTC C1312 return?		*Go to Step 3*	*Go to Diagnostic Aids*
3	1. Turn OFF the ignition. 2. Inspect the routing of 5V reference wire 112, retarder request signal wire 156, and analog return (ground) wire 158 between the TCM and the retarder request sensor. 3. Disconnect the 80-way connector from the TCM. 4. Install the OEM-side of the 80-way connector to J 47275 TCM Breakout. Leave the TCM disconnected. 5. Disconnect the transmission 20-way connector, RMR connector, and TPS connector, if installed. 6. Test for opens or shorts-to-ground on wires 112 and 156. Was chafing or wire damage found?		*Go to Step 4*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
5	1. Turn OFF the ignition. 2. Reconnect the TCM to J 47275 TCM Breakout. 3. Reconnect the RMR connector, transmission 20-way connector, and TPS connector, if installed. 4. Turn ON the ignition. 5. At J 47275-1 TCM overlay, connect a DVOM and measure voltage between pins 56 and 58 for each position of each retarder control device used on the vehicle. If two resistance modules are used, disconnect one of them when measuring voltage signals from the other. Are the voltages within the specified values?	Refer to Table 6–3	*Go to Step 10*	*Go to Step 6*
6	1. Turn OFF the ignition. 2. Disconnect the 16-pin bypass connector on J 47275 TCM Breakout. 3. Turn ON the ignition. 4. At J 47275-1 TCM Overlay, connect a DVOM and measure voltage between pins 12 and 58. Is the voltage within the specified value?	4.75–5.0V	*Go to Step 7*	*Go to Step 10*
7	Replace the retarder request sensor (resistance module). Is replacement complete?		*Go to Step 8*	
8	After replacing the retarder request sensor, perform the following: 1. Turn ON the ignition. 2. Reconnect the 16-pin bypass connector on J 47275 TCM Breakout. 3. At J 47275-1 TCM overlay, connect a DVOM and measure voltage between pins 56 and 58 for each position of each retarder control device used on the vehicle. If two resistance modules are used, disconnect one of them when measuring voltage signals from the other. Are voltages within specified values?	Refer to Table 6–3	*Go to Step 11*	*Go to Step 9*
9	Replace the retarder control device. Is replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
11	In order to verify your repair: 1. Clear the DTC. 2. Use Allison DOC™ For PC–Service Tool to monitor retarder request signal. 3. Drive the vehicle under conditions noted in failure records. 4. Confirm with the service tool in the test passed section that the diagnostic test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

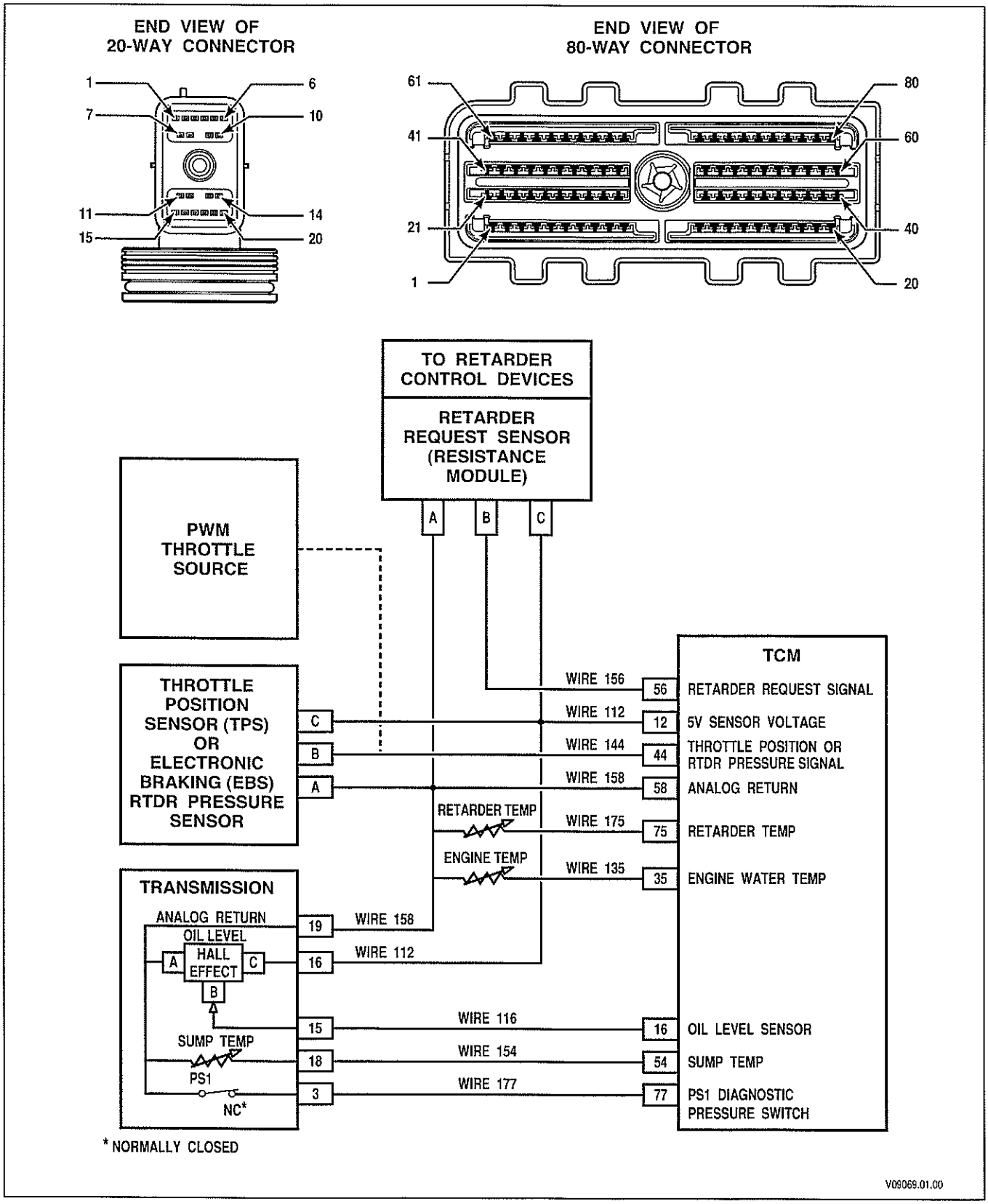
Table 6–3. Voltage/Resistance

	Resistance Test in Resistance Module*		Voltage Signal**		Wiring to Control Device
Description	Terminals	Resistance KΩ +/– 5%	% Retarder Application	Voltage +/– 0.2V	Device Terminal
Auto Full On	A to C	12	100	3.6	No connections
Pressure Switch	A to C	32			
Full On			0	1.1	A
High			100	3.6	B
3-Step E-10R	A to C	32	0	1.1	A
Bendix Pedal			32	1.9	B
			58	2.8	C
			100	3.6	D
6-Step Hand Lever	A to C	32			
OFF			0	1.1	+
Position 1			14	1.5	1
Position 2			28	1.9	2
Position 3			45	2.3	3
Position 4			65	2.8	4
Position 5			82	3.2	5
Position 6			100	3.6	6
Auto 1/2 ON	A to C	12	50	2.4	No connections
3 Pressure Switches	A to C	32	0	1.1	
Low			32	1.9	A and B
Medium			68	2.8	A and B
High			100	3.6	A and B
Auto 1/2 ON	A to C	21.4			
2 Pressure Switches					
Auto			32	1.9	A
Medium			68	2.8	B
High			100	3.6	A and B
Dedicated Pedal	No Check	Interface not a resistance module	0	0.7–1.2	A
			100	3.4–3.5	B
					C

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

DIAGNOSTIC TROUBLE CODES (DTC)

DTC C1313 Retarder Request Sensor Failed High



DIAGNOSTIC TROUBLE CODES (DTC)

DTC C1313 Retarder Request Sensor Failed High

Circuit Description

The Transmission Control Module (TCM) can be calibrated to receive a retarder request signal from a retarder request sensor, sometimes called a resistance module. The TCM is connected to the retarder request sensor by:

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

The TCM provides a 5V reference voltage to the retarder request sensor. A voltage divider network in the sensor produces a retarder request signal in response to inputs from the retarder control device(s). The TCM interprets this signal as a percent retarder requested.

Conditions for Running the DTC

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

Conditions for Setting the DTC

DTC C1313 sets if the TCM is calibrated to receive the retarder request signal, and the signal voltage is greater than 4.7V for 5 seconds.

Actions Taken When the DTC Sets

When DTC C1313 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- TCM may inhibit retarder operation, if not using the J1939 Datalink for retarder request signal.

Conditions for Clearing DTC/CHECK TRANS Light

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

Diagnostic Aids

- DTC C1313 indicates the TCM has detected a voltage signal from the retarder request sensor in the high error zone. The code can be caused by:
  - — Faulty wiring.
  - — Faulty connections to the retarder request sensor or retarder control device.
  - — A faulty retarder request sensor (resistance module).
  - — A faulty retarder control device.
  - — A faulty TCM.
- DTC C1313 can be caused by a short-to-battery in the 5V reference wire 112 or retarder request signal wire 156. DTC C1313 can also be caused by an open in analog return wire 158. The retarder request sensor shares a common 5V reference voltage with the transmission oil level sensor (OLS) and throttle position sensor (TPS) on wire 112. A short-to-battery in the 5V reference wire 112 or open in analog return wire 158 causes a "sensor failed high" code for the other devices as well. A short-to-battery in retarder request signal wire 156 will produce a DTC C1313 only.

DIAGNOSTIC TROUBLE CODES (DTC)

- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
  - — A bent terminal
  - — A backed-out terminal
  - — A damaged terminal
  - — Poor terminal tension
  - — A chafed wire
  - — A broken wire inside the insulation.

Test Description

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

2. This step tests for an active DTC.
3. This step tests for defective wiring in external harness.
5. This step tests for retarder request sensor functionality.
6. This step tests for proper 5V reference voltage at the TCM with OEM harness disconnected.

DTC C1313 Retarder Request Sensor Failed High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the failure records. 4. Clear the DTC and drive the vehicle. Attempt to duplicate same operating conditions observed in failure records. ***NOTE: This DTC indicates that the retarder request sensor voltage is above a set voltage for a set period of time. It may also indicate a short-to-battery on 5V reference wire 112 or an open on analog return wire 158.*** Did DTC C1313 return?		*Go to Step 3*	*Go to Diagnostic Aids*
3	1. Turn OFF the ignition. 2. Inspect the routing of 5V reference wire 112, retarder request signal wire 156, and analog return (ground) wire 158 between the TCM and the retarder request sensor. 3. Disconnect the 80-way connector from the TCM. 4. Install the OEM-side of the 80-way connector to the J 47275 TCM Breakout. Leave the TCM disconnected. 5. Disconnect the transmission 20-way connector, RMR connector, and TPS connector, if installed. 6. Test for shorts-to-battery on wires 112 and 156, and opens on wire 158. Was chafing or wire damage found?		*Go to Step 4*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 11*	
5	1. Turn OFF the ignition. 2. Reconnect the TCM to J 47275 TCM Breakout. 3. Reconnect the RMR connector, transmission 20-way connector, and TPS connector, if installed. 4. Turn ON the ignition. 5. At J 47275-1 TCM Overlay, connect a DVOM and measure voltage between pins 56 and 58 for each position of each retarder control device used on the vehicle. If two resistance modules are used, disconnect one of them when measuring voltage signals from the other. Are the voltages within the specified values?	Refer to Table 6–4	*Go to Step 10*	*Go to Step 6*
6	1. Turn OFF the ignition. 2. Disconnect the 16-pin bypass connector on J 47275 TCM Breakout. 3. Turn ON the ignition. 4. At J 47275-1 TCM Overlay, connect a DVOM and measure voltage between pins 12 and 58. Is the voltage within the specified value?	4.7–5.0V	*Go to Step 7*	*Go to Step 10*
7	Replace the retarder request sensor (resistance module). Is replacement complete?		*Go to Step 8*	
8	After replacing the retarder request sensor, perform the following: 1. Turn ON the ignition. 2. Reconnect the 16-pin bypass connector on J 47275 TCM Breakout. 3. At J 47275-1 TCM Overlay, connect a DVOM and measure voltage between pins 56 and 58 for each position of each retarder control device used on the vehicle. If two resistance modules are used, disconnect one of them when measuring voltage signals from the other. Are voltages within specified values?	Refer to Table 6–4	*Go to Step 11*	*Go to Step 9*
9	Replace the retarder control device. Is replacement complete?		*Go to Step 11*	
10	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM.*** Refer to TCM diagnostic procedure, Section 3–6. Is Section 3–6 complete?		*Go to Step 11*	

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
11	In order to verify your repair: 1. Clear the DTC. 2. Use Allison DOC™ For PC–Service Tool to monitor retarder request signal. 3. Drive the vehicle under conditions noted in failure records. 4. Confirm with the service tool in the test passed section that the diagnostic test was run. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

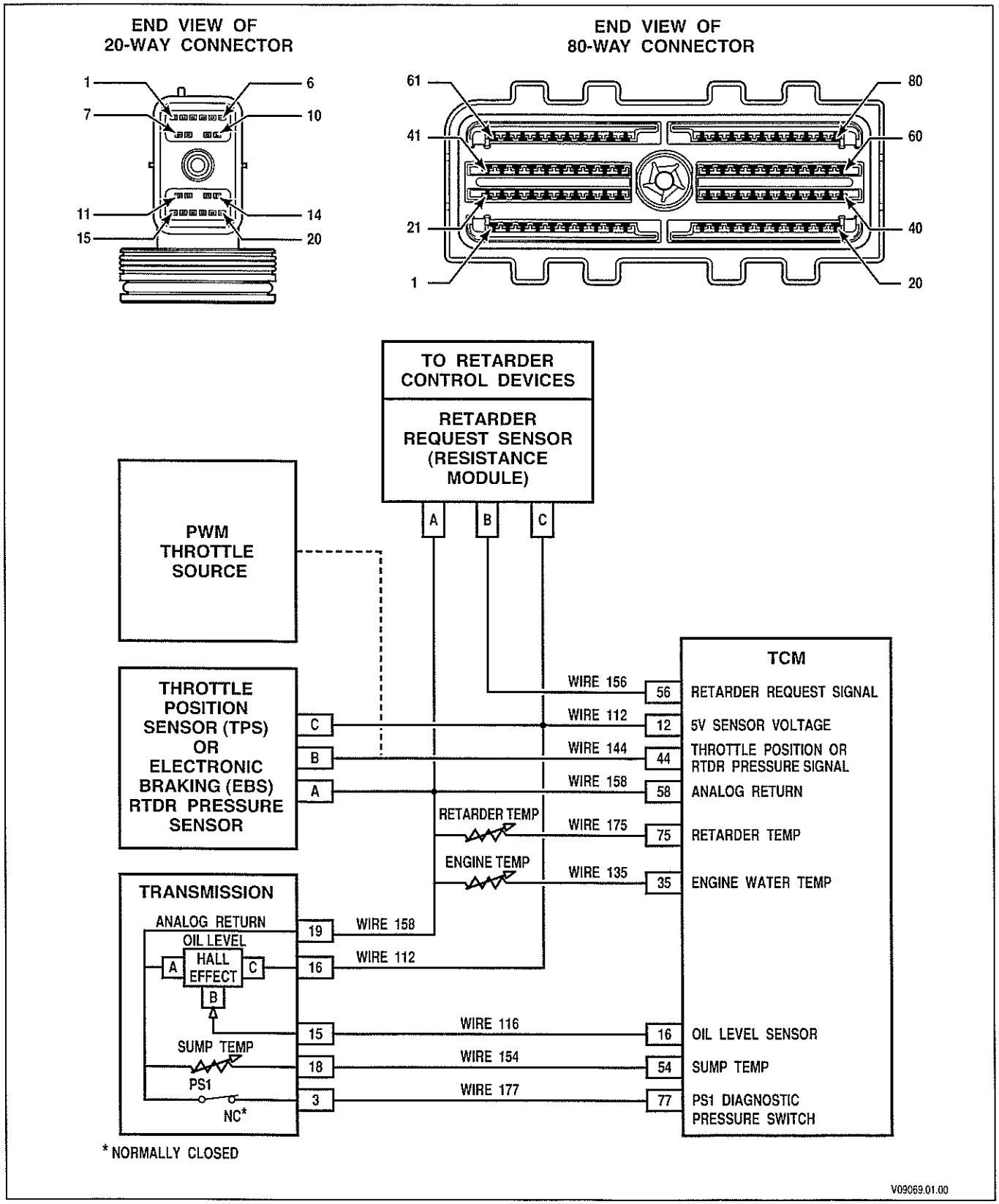
Table 6–4. Voltage/Resistance

	Resistance Test in Resistance Module*		Voltage Signal**		Wiring to Control Device
Description	Terminals	Resistance KΩ +/– 5%	% Retarder Application	Voltage +/– 0.2V	Device Terminal
Auto Full On	A to C	12	100	3.6	No connections
Pressure Switch	A to C	32			
Full On			0	1.1	A
High			100	3.6	B
3-Step E-10R	A to C	32	0	1.1	A
Bendix Pedal			32	1.9	B
			58	2.8	C
			100	3.6	D
6-Step Hand Lever	A to C	32			
OFF			0	1.1	+
Position 1			14	1.5	1
Position 2			28	1.9	2
Position 3			45	2.3	3
Position 4			65	2.8	4
Position 5			82	3.2	5
Position 6			100	3.6	6
Auto 1/2 ON	A to C	12	50	2.4	No connections
3 Pressure Switches	A to C	32	0	1.1	
Low			32	1.9	A and B
Medium			68	2.8	A and B
High			100	3.6	A and B
Auto 1/2 ON	A to C	21.4			
2 Pressure Switches					
Auto			32	1.9	A
Medium			68	2.8	B
High			100	3.6	A and B
Dedicated Pedal	No Check	Interface not a resistance module	0 100	0.7–1.2 3.4–3.5	A B C

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

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0122 Pedal Position Sensor Low Voltage



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0122 Pedal Position Sensor Low Voltage

Circuit Description

The Transmission Control Module (TCM) may receive input on throttle position from either a Throttle Position Sensor (TPS) or a signal transmitted by the engine electronic controls.

Vehicles not equipped with electronically-controlled engines have a TPS attached to the engine fuel control linkage. The TPS continuously sends the exact throttle position to the transmission TCM.

The TPS is a sliding resistor sensor (potentiometer) actuated by a mechanical linkage. The TCM delivers a constant voltage to one terminal of the TPS resistive strip. The other TPS terminal connects to ground. The resistor contacts of the TPS provide a regulated voltage signal input to the TCM.

When actuated by the mechanical throttle cable, the contacts of the resistor move along the resistive strip. As the contacts slide along the resistive strip, a voltage is sent to the TCM. At each increment of 0.78 mm (0.007 inch) along the resistive strip, the contacts deliver a different voltage to the TCM. The different voltages are interpreted as throttle sensor movement. The TCM converts travel distance (mm) into throttle opening percentage.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- The components are powered and engine speed is greater than 200 rpm.
- DTC P0122 Pedal Position Sensor Circuit High Voltage is not active.

Conditions for Setting the DTC

DTC P0122 sets when the TCM detects a throttle position sensor voltage less than 0.55V for 5 seconds.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC P0122 is stored in the TCM memory.
- The TCM uses the default throttle value, based on engine torque and speed.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS LIGHT

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

Diagnostic Aids

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

DIAGNOSTIC TROUBLE CODES (DTC)

- DTC P0122 can be caused by an open or short-to-ground in either the 5V reference wire 112 or TPS signal wire 144. The TPS shares a common 5V reference voltage wire 112 with the optional transmission oil level sensor (OLS) and retarder request sensor. An open or short-to-ground in the common 5V reference causes a "sensor failed low" code for the other devices as well. An open or short-to-ground on wire 144 will cause a DTC P0122 only.

Test Description

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

2. This step tests for the proper adjustment of TPS.
3. This step tests for the proper ignition voltage.
4. This step tests for the proper TCM 5V reference voltage.
5. This step tests for dead spots in the potentiometer.
6. This step tests for abnormal TPS resistance.
7. This step tests for proper resistance of the TPS circuit.
8. This step tests for an open or short-to-ground in TPS signal wire 144.
9. This step tests for proper 5V reference voltage at TCM without OEM harness.
10. This step tests for an open or short-to-ground on 5V reference wire 112.

DTC P0122 Pedal Position Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Refer to Appendix F to check for proper TPS adjustment. Is the TPS adjusted properly?		*Go to Step 3*	*Adjust TPS to proper setting. Go to Step 12*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the DTC failure record data. 4. Using the Allison DOC™ For PC–Service Tool, measure ignition voltage. Is voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 4*	*Resolve voltage problem (refer to DTC P0882 and DTC P0883)*
4	1. Turn OFF the ignition. 2. Disconnect the 80-way connector from the TCM and install the J 47275 TCM Breakout between the TCM and the OEM-side connector. 3. With the engine OFF, turn the ignition to the ON position. 4. Using a DVOM, measure the voltage between pins 12 and 58. Is the voltage within the specified value?	4.75–5.0V	*Go to Step 5*	*Go to Step 9*

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
5	1. With the engine OFF and the ignition in the ON position, monitor TPS percentage with Allison DOC™ For PC–Service Tool. 2. Slowly increase the throttle from idle to full throttle position. 3. Watch for a steady increase in TPS percentage. Was the throttle percentage steady and without interruptions?		*Go to Diagnostic Aids*	*Go to Step 6*
6	1. Turn OFF the ignition. 2. Disconnect the TPS connector. 3. Using a DVOM, measure the resistance between TPS pins A and C. Is resistance within the specified value?	9000–15,000 Ohms	*Go to Step 7*	*Go to Step 11*
7	1. Reconnect the TPS connector. 2. Disconnect the J 47275 TCM Breakout from the TCM. Leave the OEM 80-way connector mated to the J 47275 TCM Breakout. 3. Using a DVOM, measure resistance between 80-way connector pins 12 and 58. Is resistance within the specified value?	9000–15,000 Ohms	*Go to Step 8*	*Go to Step 10*
8	1. Turn OFF the ignition. 2. Disconnect the TPS connector. 3. Using a DVOM at J47275-1 TCM Overlay, test for opens, wire-to-wire shorts, and shorts-to-ground at pin 44. Were any opens, wire-to-wire shorts, or shorts-to-ground found?		*Go to Step 10*	*Go to Step 11*
9	1. Turn OFF the ignition. 2. Disconnect the 16-pin bypass connector on J 47275 TCM breakout. 3. Turn ON the ignition. 4. Using a DVOM at J 47275-1 TCM Overlay, measure voltage between pins 12 and 58. Is the voltage within the specified value?	4.75–5.0V	*Go to Step 10*	*Go to Step 13*
10	1. Turn OFF the ignition. 2. Disconnect the J 47275 TCM Breakout from the TCM. Leave the OEM 80-way connector mated to the J 47275 TCM Breakout. 3. Reconnect the 16-pin bypass connector on J 47275 TCM Breakout. 4. Disconnect the TPS connector, transmission 20-way connector, and RMR device, if installed. 5. Using a DVOM at J 47275-1 TCM Overlay, test for opens, wire-to-wire shorts, and shorts-to-ground at pin 12. 6. Test for opens at pin 58. Were any opens, wire-to-wire shorts, or shorts-to-ground found?		*Go to Step 11*	*Go to Diagnostic Aids*

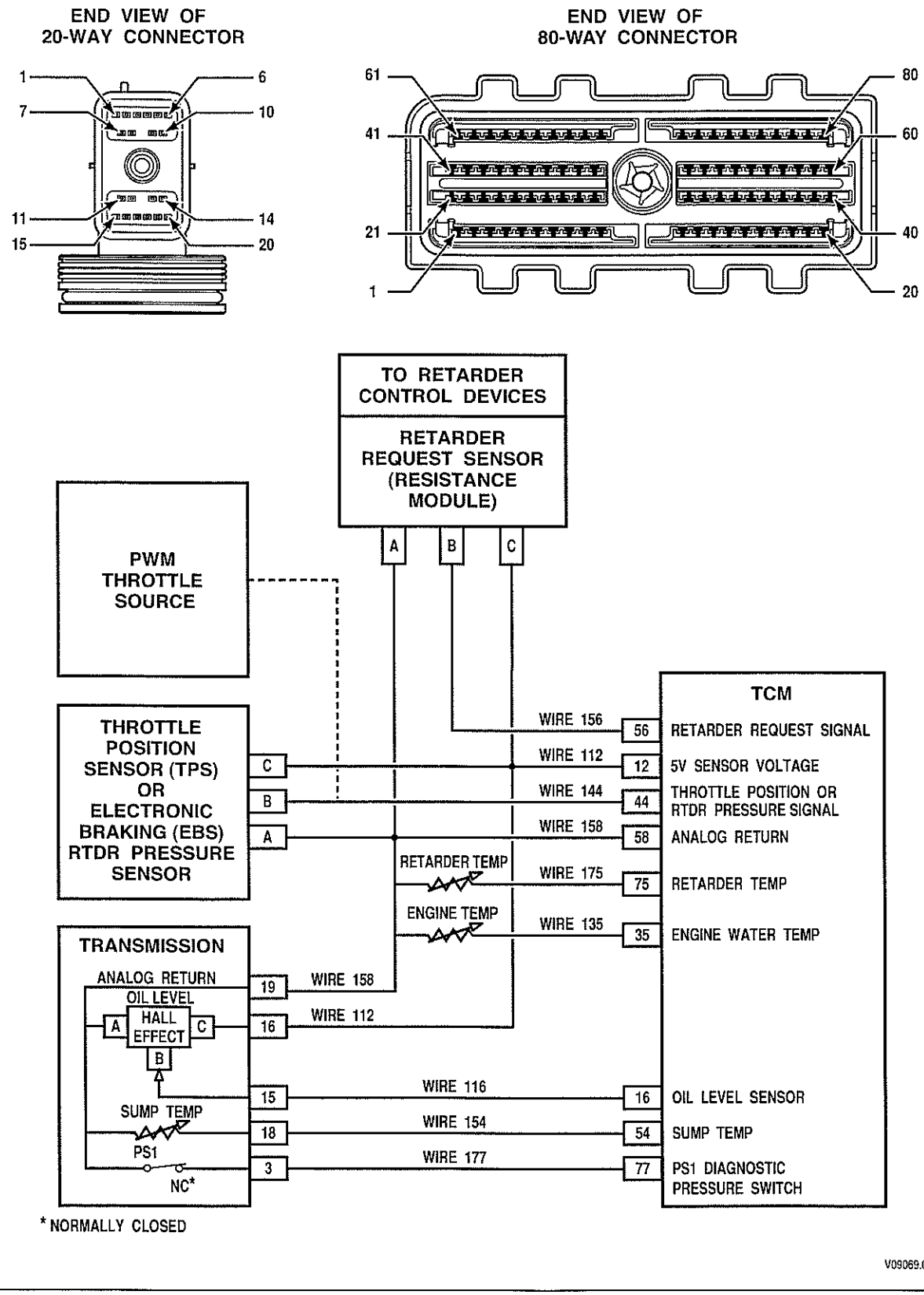
DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
11	***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.*** Repair the vehicle wiring harness. Is the repair complete?		*Go to Step 14*	
12	Replace the throttle position sensor. Is the replacement complete?		*Go to Step 14*	
13	***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 the replacement complete?		*Go to Step 14*	
14	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0123 Pedal Position Sensor High Voltage



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0123 Pedal Position Sensor High Voltage

Circuit Description

The Transmission Control Module (TCM) receives input on throttle position from either a Throttle Position Sensor (TPS) or a signal transmitted by the engine electronic controls.

Vehicles not equipped with electronically-controlled engines have a TPS attached to the engine fuel control linkage. The TPS continuously sends the exact throttle position to the transmission TCM.

The TPS is a sliding resistor sensor (potentiometer) actuated by a mechanical linkage. The TCM delivers a constant voltage to one terminal of the TPS resistive strip. The other TPS terminal connects to ground. The resistor contacts of the TPS are connected to provide a regulated voltage signal input to the TCM.

When actuated by the mechanical throttle cable, the contacts of the resistor move along the resistive strip. As the contacts slide along the resistive strip, a voltage is sent to the TCM. At each increment of 0.78 mm (0.007 inch) along the resistive strip, the contacts deliver a different voltage to the TCM. The different voltages are interpreted as throttle sensor movement. The TCM converts travel distance (mm) into throttle opening percentage.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less the 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- The components are powered and engine speed is greater than 200 rpm.
- DTC P0123 Throttle/Pedal Position Sensor/Switch A Circuit Low Input is not active.

Conditions for Setting the DTC

DTC P0123 sets when the TCM detects a throttle position sensor voltage greater than 4.75V for 5 seconds.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC P0123 is stored in the TCM history.
- The TCM uses the default throttle value, based on engine torque and speed.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS LIGHT

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

Diagnostic Aids

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

DIAGNOSTIC TROUBLE CODES (DTC)

- DTC P0123 can be caused by a short-to-battery in either the 5V reference wire 112 or TPS signal wire 144. DTC P0123 can also be caused by an open in analog return wire 158. The TPS shares a common 5V reference voltage wire 112 with the transmission oil level sensor (OLS) and retarder request sensor. A short-to-battery in 5V reference wire or open in analog return wire 158 causes a "sensor failed high" code for the other devices as well. A short-to-battery on TPS signal wire 144 will produce a DTC P0123 only.

Test Description

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

2. This step tests for the proper adjustment of TPS.
3. This step tests for the proper ignition voltage.
4. This step tests for the proper TCM 5V reference voltage.
5. This step tests for dead spots in the potentiometer.
6. This step tests for abnormal TPS resistance.
7. This step tests for proper resistance of the TPS circuit.
8. This step tests for a short-to-battery in TPS signal wire 144.
9. This step tests for proper 5V reference voltage at TCM without OEM harness.
10. This step tests for a short-to-battery in 5V reference wire 112 or open in analog return wire 158.

DTC P0123 Pedal Position Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Refer to Appendix F to determine proper TPS adjustment. Is the TPS adjusted properly?		*Go to Step 3*	*Adjust TPS to proper setting. Go to Step 14*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the engine. 3. Record the DTC failure record data. 4. Using the Allison DOC™ For PC–Service Tool, measure ignition voltage. Is voltage within the specified values?	9–18V (12V TCM) 18–32V (24V TCM)	*Go to Step 4*	*Resolve voltage problem (refer to DTC P0882 and DTC P0883)*
4	1. Turn OFF the ignition. 2. Disconnect the 80-way connector from the TCM and install the J 47275 TCM Breakout between the TCM and the OEM-side connector. 3. With the engine OFF, turn the ignition to the ON position. 4. Using a DVOM, measure the voltage between pins 12 and 58. Is the voltage within the specified value?	4.75–5.0V	*Go to Step 5*	*Go to Step 9*

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
5	1. With the engine OFF and the ignition in the ON position, monitor TPS percentage with Allison DOC™ For PC–Service Tool. 2. Slowly increase the throttle from idle to full throttle position. 3. Watch for a steady increase in TPS percentage. Was TPS percentage steady and without interruptions?		*Go to Step 6*	*Go to Step 12*
6	1. Turn OFF the ignition. 2. Disconnect the TPS connector. 3. Using a DVOM, measure the resistance between TPS pins A and C. Is resistance within the specified value?	9000–15,000 Ohms	*Go to Step 7*	*Go to Step 11*
7	1. Reconnect the TPS connector. 2. Disconnect the J 47275 TCM Breakout from the TCM. Leave the OEM 80-way connector mated to the J 47275 TCM Breakout. 3. Using a DVOM, measure resistance between 80-way connector pins 12 and 58. Is resistance within the specified value?	9000–15,000 Ohms	*Go to Step 8*	*Go to Step 10*
8	1. Turn OFF the ignition. 2. Disconnect the TPS connector. 3. Using a DVOM at J 47275-1 TCM Overlay, test for wire-to-wire shorts and shorts-to-battery at pin 44. Were any wire-to-wire shorts or shorts-to-battery found?		*Go to Step 9*	*Go to Step 11*
9	1. Turn OFF the ignition. 2. Disconnect the 16-pin bypass connector on J 47275 TCM breakout. 3. Turn ON the ignition. 4. Using a DVOM at J 47275-1 TCM Overlay, measure voltage between pins 12 and 58. Is the voltage within the specified value?	4.75–5.0V	*Go to Step 10*	*Go to Step 13*
10	1. Turn OFF the ignition. 2. Disconnect the J 47275 TCM Breakout from the TCM. Leave the OEM 80-way connector mated to the J 47275 TCM Breakout. 3. Reconnect the 16-pin bypass connector on J 47275 TCM Breakout. 4. Disconnect the TPS connector, transmission 20-way connector, and RMR connector, if installed. 5. Using a DVOM at J 47275-1 TCM Overlay, test for opens, wire-to-wire shorts, and shorts-to-ground at pin 12. 6. Test for opens at pin 58. Were any opens, wire-to-wire shorts, or shorts-to-ground found?		*Go to Step 11*	*Go to Diagnostic Aids*

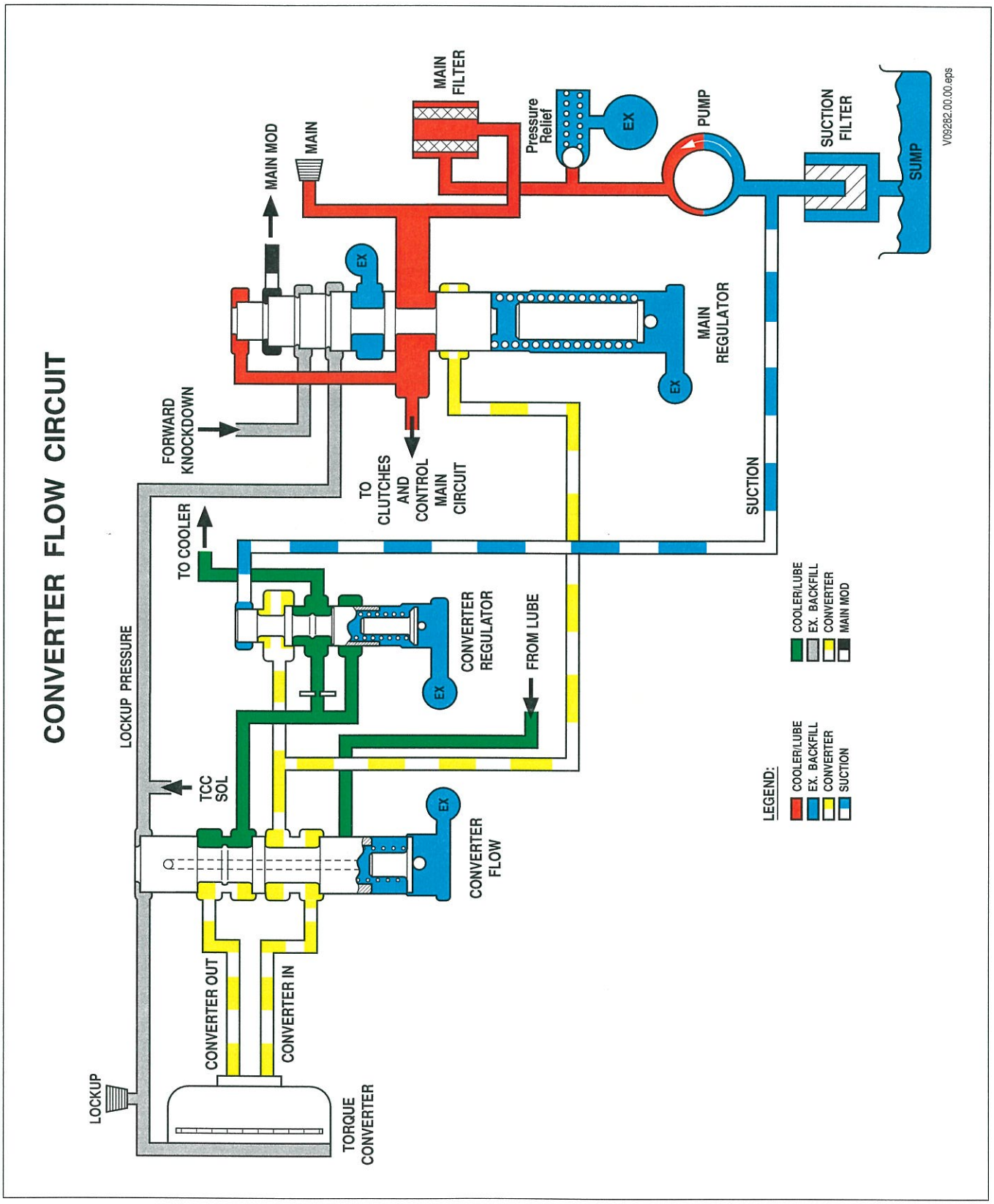
DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
11	***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.*** Repair the vehicle wiring harness. Is the repair complete?		*Go to Step 14*	
12	Replace the throttle position sensor. Is the replacement complete?		*Go to Step 14*	
13	***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 the replacement complete?		*Go to Step 14*	
14	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under normal driving conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0218 Transmission Fluid Over-Temperature



DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0218 Transmission Fluid Over-Temperature

Circuit Description

Transmission fluid flow starts in the transmission sump. Fluid is drawn into the oil pump assembly through the suction filter and internal passages in the main housing and front support. The gerotor gear set in the oil pump assembly turns at engine speed and pressurizes the fluid. The main regulator valve regulates the discharge pressure at the oil pump. Pressurized fluid returns to the hydraulic control module where it is directed to the clutch apply circuits and the control main regulator valve. Control main pressure is used to stroke solenoid regulator valves, which apply and release transmission clutches in response to solenoid commands from the Transmission Control Module (TCM).

The main pump produces substantially more fluid flow than is required by the clutch apply circuit. Surplus oil pressure (overage) at the main regulator valve is relieved into the converter flow circuit. The converter flow circuit routes pressurized fluid to the torque converter via the converter flow valve and the converter regulator valve. Hot fluid leaving the torque converter is routed back through the converter flow valve into cooler lines that run to the transmission oil cooler in the vehicle cooling system. The cooled fluid is returned to the transmission and enters the transmission lubrication circuit. The lube regulator valve regulates the proper lubrication pressure and directs excess fluid back to the sump. The transmission fluid temperature sensor is part of the internal wiring harness and measures the sump temperature.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- The components are powered and engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- Engine is running. If engine runtime is less than 10 minutes, then engine coolant temperature must be above 20°C (68°F) for more than 20 seconds.

Conditions for Setting the DTC

The TCM detects transmission fluid temperature greater than 126.85°C (260°F) value for more than 10 seconds.

Actions Taken When the DTC Sets

When DTC P0218 is active, the following conditions will occur:

- The TCM does not illuminate the **CHECK TRANS** light.
- DTC is stored in TCM history.
- The TCM freezes shift adapts (DNA).
- TCM defaults to "hot mode" shift schedule where fourth range is held and TCC is inhibited to increase engine speed and improve cooler flow.

Conditions for Clearing the DTC/CHECK TRANS Light

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

The TCM cancels the DTC default actions when the fault no longer exists and the DTC passes test.

Diagnostic Aids

- The Allison DOC™ For PC–Service Tool transmission fluid temperature should rise steadily during warm-up cycles and then stabilize.
- DTC P0218 may set after DTC P0711 (not active) has set. Follow the diagnostic table for DTC P0711 before proceeding to the diagnostic table for P0218. Repairing the condition that set DTC P0711 will likely eliminate DTC P0218.
- A stuck autoflow valve can cause overheating in retarder-equipped transmissions. Refer to section 8 for general troubleshooting of performance complaints.

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 proper transmission fluid level and condition.
3. This step monitors the status of DTC P0218.
4. This step verifies which condition has set the DTC P0218.
5. This step tests for proper resistance value in entire circuit.
6. This step tests for wire-to-wire shorts, shorts-to-ground, or an open on wire 154.
7. This step tests the resistance value of the internal harness and sump temperature sensor.
9. This step tests the resistance value of the internal sump temperature sensor.
12. This step tests to determine source of overheat—the engine or transmission.
13. This step tests for proper cooler pressure drop.
14. This step tests for stuck stator.
15. This step inspects vehicle's engine and transmission cooling systems.

DTC P0218 Transmission Fluid Over-Temperature

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	Perform the Fluid Check Procedure. Refer to the appropriate mechanic's tips. Is transmission fluid level correct?		*Go to Step 3*	*Go to mechanic's tips*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Install temperature gauges for transmission temperature and engine water temperature. 3. Turn ON the ignition. 4. Record the failure records. 5. Clear the DTCs. 6. Drive the vehicle and monitor the sump temperature on Allison DOC™ For PC–Service Tool. Did DTC P0218 return?		*Go to Step 4*	*Go to Diagnostic Aids*
4	Compare the manual temperature gauge reading to the Allison DOC™ For PC–Service Tool transmission temperature when the DTC is set. Does the manual temperature gauge confirm the transmission fluid temperature actually is hot when DTC P0218 is produced?		*Go to Step 12*	*Go to Step 5*

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the 80-way connector from the TCM. 3. Connect J 47425 TCM Breakout to the OEM connector. Leave the TCM disconnected. The TCM should not be connected to properly perform this test. 4. Using a DVOM at J 47275-1 TCM Overlay, measure the resistance between pins 54 and 58. Is the resistance within the specified value?	3511–3653 Ohms at 20°C (68°F) Refer to Appendix Q	*Go to Step 6*	*Go to Step 7*
6	1. Disconnect the transmission 20-way connector, TPS, and RMR, if installed. 2. At J 47275-1 TCM Overlay connect a DVOM, test for opens, wire-to-wire shorts, and shorts-to-ground at pin 54 and 58. Were any wiring defects found?		*Go to Step 8*	*Go to Step 16*
7	1. Disconnect the 20-way connector at the transmission and install J 47279 Transmission Breakout. Connect only the J 47279 Transmission Breakout to the transmission; the vehicle side of the harness should not be connected for this test. 2. At J 47279-1 Transmission Overlay, using a DVOM, measure resistance at main transmission connector pins 18 and 19. Is the resistance within the specified value?	3511–3653 Ohms at 20°C (68°F) Refer to Appendix Q	*Go to Step 8*	*Go to Step 9*
8	***NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.*** Coordinate with the vehicle OEM to repair or replace the vehicle wiring. Is the repair complete?		*Go to Step 17*	
9	1. Remove the hydraulic control module assembly. 2. Disconnect the sump thermistor from the internal wiring harness. 3. Using a DVOM, measure thermistor resistance at pins A and B. Is resistance within the specified values?	3511–3653 Ohms at 20°C (68°F) Refer to Appendix Q	*Go to Step 10*	*Go to Step 11*
10	Replace the internal harness (refer to mechanic's tips). Is the replacement complete?		*Go to Step 17*	
11	Replace the sump thermistor (refer to mechanic's tips). Is replacement complete?		*Go to Step 17*	

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
12	1. Use temperature gauge readings obtained in Step 4 above. 2. Compare engine water temperature to transmission fluid temperature. Did the transmission become hot before the engine?		*Go to Step 13*	*Go to Step 15*
13	1. Install pressure gauges in the "To" and "From" cooler lines. 2. Start the engine. 3. Subtract "From Cooler" from "To Cooler" pressure to obtain pressure drop across the transmission oil cooler. 4. Verify cooler pressure drop satisfies limits of Table 6–5 (4000 Product Family) or Table 6–6 (3000 Product Family). Is cooler pressure drop within specified values?	Refer to Table 6–5 for 4000 Product Family. Refer to Table 6–6 for 3000 Product Family	*Go to Step 14*	*Go to Step 15*
14	Check for a possible torque converter stator malfunction. A stuck stator would be indicated by no cool-down in Neutral after stalling the transmission. Refer to appropriate service manual for Stall Test Procedures. Did you find and correct the condition?		*Go to Step 17*	*Go to Section 8, General Troubleshooting of Performance Complaints*
15	1. Inspect the engine cooling system for the following conditions: • Air flow restrictions • Air flow blockage • System fluid level and condition • Debris 2. Inspect the transmission cooling system for the following conditions: • Air flow restrictions • Air flow blockage • System fluid level and condition • Damaged cooler lines and hoses Did you find and correct the condition?		*Go to Step 17*	
16	***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 17*	
17	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, monitor the transmission fluid temperature. 3. Drive the vehicle under normal operating conditions. Watch for significant change in TFT. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0218 Transmission Fluid Over-Temperature

External Hydraulic Circuit Characteristics

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

Table 6–5. 4000 Product Family

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

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0218 Transmission Fluid Over-Temperature

External Hydraulic Circuit Characteristics

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

Table 6–6. 3000 Product Family

CONVERTER OPERATION MAXIMUM COOLER FLOW AT MINIMUM PRESSURE DROP				
	Flow		Pressure Drop	
Input rpm	L/s	gpm	kPa	psi
600	0.10	1.6	0	0
800	0.23	3.7	0	0
1200	0.47	7.4	0	0
1400	0.61	9.7	0	0
1600	0.74	11.7	0	0
2000	0.94	14.9	0	0
2400	1.19	18.9	0	0
3200	1.28	20.3	0	0
CONVERTER OPERATION MAXIMUM ALLOWABLE PRESSURE DROP				
600	0.10	1.6	10.0	1.5
800	0.23	3.5	40.0	5.8
1200	0.45	7.1	159.0	23.1
1400	0.57	9.0	252.0	36.6
1600	0.67	10.6	338.0	49.0
2000	0.80	12.7	481.0	69.8
2400	0.85	13.5	549.0	79.6
3200	0.85	13.5	549.0	79.6
LOCKUP OPERATION MAXIMUM COOLER FLOW AT MINIMUM PRESSURE DROP				
600	0.10	1.6	0	0
800	0.23	3.7	0	0
1200	0.50	7.9	0	0
1400	0.63	10.0	0	0
1600	0.77	12.2	0	0
2000	0.95	15.1	0	0
2400	1.12	17.8	0	0
2800	1.22	19.3	0	0
3200	1.28	20.3	0	0
LOCKUP OPERATION MAXIMUM ALLOWABLE PRESSURE DROP				
600	0.10	1.6	5.0	0.7
800	0.23	3.7	46.0	6.7
1200	0.48	7.6	148.0	21.5
1400	0.62	9.8	247.0	35.8
1600	0.73	11.6	346.0	50.2
2000	0.90	14.3	561.0	81.4
2400	1.07	17.0	737.0	106.9
2800	1.10	17.4	770.0	111.7
3200	1.10	17.4	791.0	114.7

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0602 TCM Not Programmed

NO SCHEMATIC FOR THIS DTC

Circuit Description

At power up and after clearing codes, the Transmission Control Module (TCM) performs a self-test to determine if the calibration in memory is valid.

Conditions for Running the DTC

This test will run before any TCM functions.

Conditions for Setting the DTC

DTC P0602 sets if the TCM determines the present calibration is invalid.

Actions Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM returns to the boot program, and waits to be recalibrated.
- TCM inhibits shifts to range.

Conditions for Clearing the DTC/CHECK TRANS Light

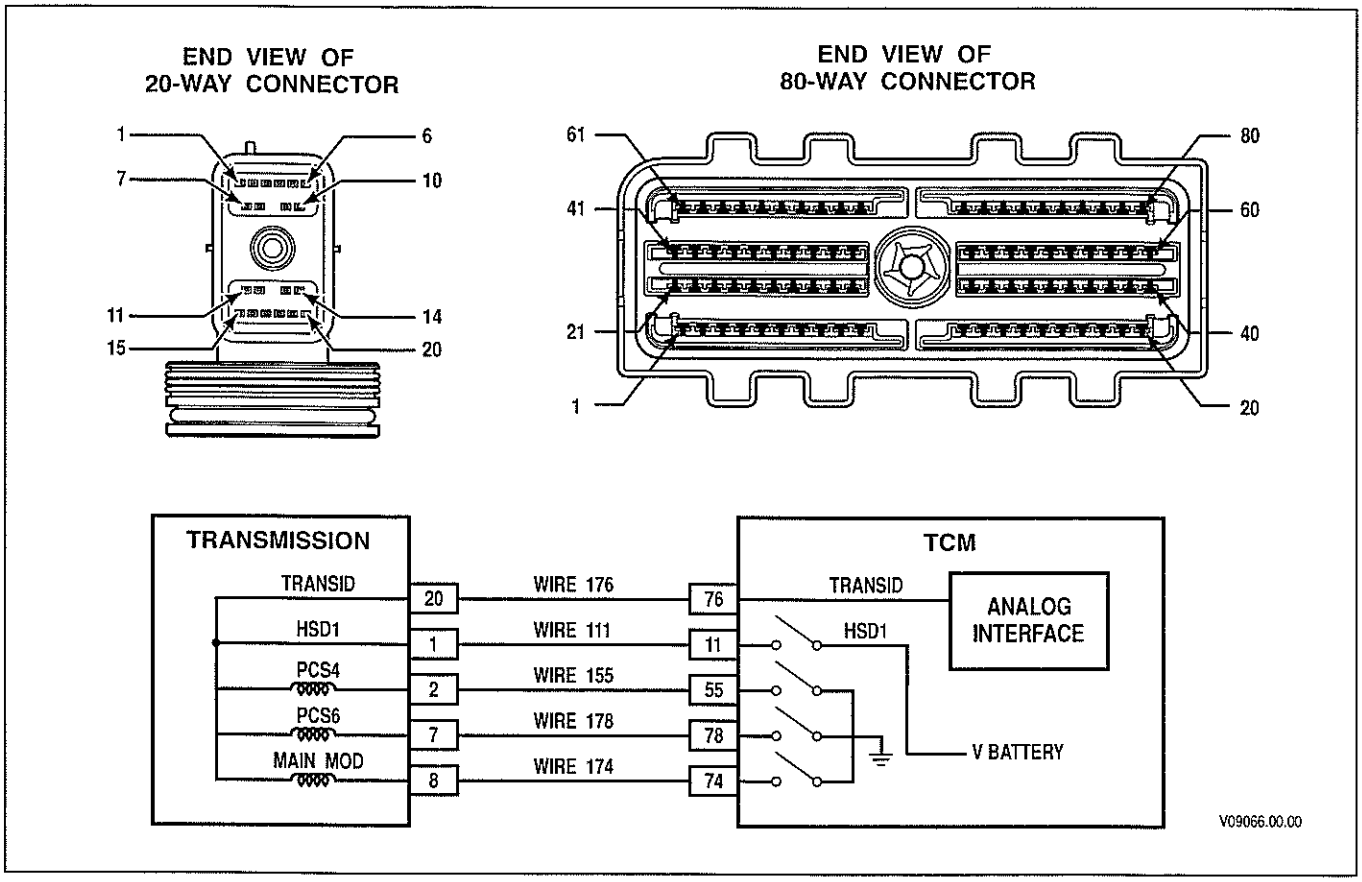
The TCM must be recalibrated.

DTC P0602 TCM Not Programmed

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. If DTC P0602 is present, the TCM **must be** recalibrated. Is recalibration complete?		*Go to Step 4*	
3	***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 4*	
4	1. Install the Allison DOC™ For PC–Service Tool. 2. Start the vehicle. Did the DTC return?		*Go to Step 3*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0610 TCM Vehicle Options (TransID) Error



Circuit Description

The TransID (TID) feature enables the TCM to recognize various transmission hardware configurations and select an appropriate software calibration. The TCM senses the transmission configuration using TID wire 176. In initial versions of 4th Generation Controls, wire 176 is connected to High Side Driver 1 (HSD1), wire 111, in the internal wiring harness. HSD1 supplies power to the Main Mod solenoid, and Pressure Control Solenoids (PSC) 4 and 6. This wiring configuration is designated TID A.

Conditions for Running the DTC

The test is enabled by the TCM calibration.

Conditions for Setting the DTC

DTC P0610 sets if the TCM determines the controls are incompatible with transmission hardware.

Actions Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM uses a TID A calibration.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Clearing the DTC/CHECK TRANS Light

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

DTC P0610 TCM Vehicle Options (TransID) Error

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition. 3. Using Allison DOC™ For PC–Service Tool, determine the highest available TID level supported by the TCM calibration. 4. Consult the transmission bill of material or build history to determine the actual TID level of the transmission. 5. Compare the highest available TID level in the calibration to the actual transmission hardware. Is the highest available TID level greater than or equal to the actual TID of the transmission?		*Go to Step 3*	*Go to Step 4*
3	1. Reset Autodetect using Allison DOC™ For PC–Service Tool. 2. Monitor "TransID level Used" on Allison DOC™ For PC–Service Tool. 3. Compare the TID level indicated on Allison DOC™ For PC–Service Tool to the actual TID level of the transmission. Did the TCM detect the correct TID level?		*Go to Step 6*	*Go to Step 5*
4	Recalibrate the TCM with a TID calibration that matches the actual TID level of the transmission. Is the recalibration complete?		*Go to Step 6*	
5	***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 6*	
6	In order to verify your repair: 1. Clear the DTC. 2. Using Allison DOC™ For PC–Service Tool, reset Autodetect. 3. Verify the TCM detects the correct TID level. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0613 TCM Processor

NO SCHEMATIC FOR THIS DTC

Circuit Description

The Transmission Control Module (TCM) continually performs a series of processing steps known as a 'processing loop' during normal operation. The TCM must complete the processing loop within a specific time limit. The TCM will reset if it does not complete two consecutive loops inside a predetermined time interval.

*NOTE: **The presence of DTC P0613 indicates a TCM processing error has occurred. Contact the Allison Transmission Service Department at 1-800-252-5283.***

Conditions for Running the DTC

This test is run during the entire ignition cycle.

Conditions for Setting the DTC

DTC P0613 sets if the TCM does not complete two processing loops within the allotted time.

Actions Taken When the DTC Sets

- When DTC P0613 is active, the TCM commands OFF all solenoids (SOL OFF). Following recovery from the processor reset, the TCM commands the range that resulted after solenoids were commanded OFF. The TCM resumes normal operation.
- The TCM does not illuminates the **CHECK TRANS** light.
- DTC is stored in TCM history.

Conditions for Clearing the DTC/CHECK TRANS Light

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

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0614 Torque Control Data Mismatch—ECM/TCM

NO SCHEMATIC FOR THIS DTC

Circuit Description

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

Conditions for Running the DTC

- TCM detects a J1939 EEC1 message from the engine.
- Then, the TCM requests the J1939 component ID and engine configuration messages from the engine.
- The TCM identifies the engine as an approved "make and model" by matching the component ID with the engine configuration message.
- The test runs for 15 seconds for the first 20 engine starts after the engine is detected on the J1939 communications link.
- The "engine start" counter resets if the TCM is reprogrammed.

Conditions for Setting the DTC

DTC P0614 sets during the following conditions:

- The TCM requires a SEM engine but the engine does not support SEM, i.e., is not on the approved list.
- The TCM requires a SEM and LRTP engine but the engine does not support SEM and LRTP, i.e., is not on the approved list.
- The engine does not respond to a SEM torque reduction request message within 20 ignition cycles.
- The engine does not respond to a LRTP torque reduction request message within 20 ignition cycles.

Actions Taken When the DTC Sets

When DTC P0614 is active, the following conditions will occur:

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM will allow operation in Reverse and second range only.
- TCM freezes shift adapts (DNA).
- TCM inhibits the torque converter clutch (TCC).

Conditions for Clearing the DTC/CHECK TRANS Light

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

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

3. This step verifies the engine is on the recognized list of SEM/LRTP engines.
4. This step verifies the engine supports SEM.
5. This step verifies the engine supports LRTP.

DTC P0614 Torque Control Data Mismatch—ECM/TCM

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	If a DTC U0115 is present, troubleshoot and resolve before going to the next step. Is a DTC U0115 present?		*Go to DTC U0115 and resolve before proceeding to Step 8*	*Go to Step 3*
3	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition. 3. Refer to **Engine Hardware Status** in SEM/LRTP AND AUTODETECT INFO display of Allison DOC™ For PC–Service Tool. Is the Engine Hardware Status recognized as a SEM/LRTP capable engine?	Recognized Or Not Recognized	*Go to Step 4*	*Go to Step 7*
4	Refer to **SEM Validated Status** in SEM/LRTP AND AUTODETECT INFO display of Allison DOC™ For PC–Service Tool. Does the ECM support SEM?	ECM Supports SEM Or ECM Doesn't Support SEM	*Go to Step 5*	*Go to DTC P2637, Step 3*
5	Refer to **LRTP Validated Status** in SEM/LRTP AND AUTODETECT INFO display of Allison DOC™ For PC–Service Tool. Does the ECM support LRTP?	ECM Supports LRTP Or ECM Doesn't Support LRTP	*Go to Step 6*	*Go to DTC P2641, Step 3*
6	This indicates the engine torque values are above the transmission ratings set in the TCM calibration. 1. Inspect the TCM for proper calibration to support SEM and LRTP. If proper TCM calibration is installed, the engine rating is too high for the transmission. 2. Recalibrate the engine to a lower torque rating. Was one of the above conditions found and resolved?		*Go to Step 8*	
7	Turn over the vehicle to the engine manufacturer to install the proper engine software and calibration to support SEM and/or LRTP. Has the proper software and calibration been installed?		*Go to Step 8*	

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
8	In order to verify your repair: 1. Using Allison DOC™ For PC–Service Tool, reset SEM AUTOSELECT. Refer to Section 3–8. 2. Clear the DTC. 3. Turn OFF ignition, wait 5 seconds, and then turn ON again. 4. Drive the vehicle under normal operating conditions. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0634 TCM Internal Temperature Too High

NO SCHEMATIC FOR THIS DTC

Circuit Description

The Transmission Control Module (TCM) is equipped with an internal temperature sensor mounted directly to its circuit board. The TCM will take action to protect against damage from overheat.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 9V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for more than 10 seconds.

Conditions for Setting the DTC

DTC P0634 sets if the TCM internal temperature is greater than or equal to 140°C (284°F) for 10 seconds with engine running.

Actions Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM commands OFF all solenoids (SOL OFF).

Conditions for Clearing the DTC/CHECK TRANS Light

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

Diagnostic Aids

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

DTC P0634 TCM Internal Temperature Too High

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Install the Allison DOC™ For PC–Service Tool. 2. Turn ON the ignition. 3. Record the failure records. 4. Clear the DTCs. 5. Drive the vehicle and monitor TCM internal temperature on Allison DOC™ For PC–Service Tool. Did DTC P0634 return?		*Go to Step 3*	*Go to Diagnostic Aids*

DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
3	1. Inspect the TCM and surrounding area. 2. Be sure there are no high temperature components such as engine exhaust pipes mounted in the vicinity of the TCM. 3. Shield or relocate the TCM, if possible. Do you find and correct the problem?		*Go to Step 5*	*Go to Step 4*
4	***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 5*	
5	In order to verify your repair: 1. Install Allison DOC™ For PC–Service Tool. 2. Monitor TCM internal temperature. 3. Drive the vehicle under conditions noted in failure records. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P063E Auto Configuration Throttle Input Not Present

NO SCHEMATIC FOR THIS DTC

Circuit Description

When first activated and during the first group of power-on cycles, the Transmission Control Module (TCM) searches for a valid throttle input. The TCM may receive throttle input from an analog throttle position sensor, a pulse-width modulated (PWM) throttle source, or over one of the SAE digital data links as accelerator pedal position and/or percent engine load. The TCM logs a DTC P063E if it fails to detect a throttle source during autodetect.

Conditions for Running the DTC

The test is enabled by the TCM calibration.

Conditions for Setting the DTC

DTC P063E sets if the TCM fails to detect throttle position information for a specified time interval.

Actions Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC is stored in TCM history.
- The TCM uses default throttle values.

Conditions for Clearing the DTC/CHECK TRANS Light

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

Test Description

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

2. This step tests to see if TCM is reading throttle information.
3. This step determines what throttle source the vehicle manufacturer intends to use.
4. This step looks for throttle information on the data link.

DTC P063E Auto Configuration Throttle Input Not Present

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P063E Auto Configuration Throttle Input Not Present *(cont'd)*

Step	Action	Value(s)	Yes	No
2	1. Turn OFF the ignition. 2. Install the Allison DOC™ For PC–Service Tool. 3. Turn ON the ignition. 4. Using Allison DOC™ For PC–Service Tool, determine the throttle source being used by the TCM. 5. Depress and release the accelerator pedal while monitoring throttle percentage on Allison DOC™ For PC–Service Tool. Does throttle percentage on Allison DOC™ For PC–Service Tool respond as expected to changes in the accelerator pedal position?		*Go to Step 7*	*Go to Step 3*
3	Consult with the engine or vehicle manufacturer. Determine if the vehicle is using a digital data link (SAE J1587, SAE J1939 or IES CAN) to communicate pedal position or percent engine load. Otherwise, determine if the vehicle is using an analog or PWM throttle position sensor. Did the vehicle manufacturer intend to communicate throttle position to the TCM over a digital data link?		*Go to Step 4*	*Go to Step 7*
4	1. Monitor Data Bus Viewer on Allison DOC™ For PC–Service Tool. 2. Depress and release the accelerator pedal while watching the Data Bus Viewer. Does accelerator pedal position information on Data Bus Viewer respond as expected to changes in accelerator pedal position?		*Go to Step 5*	*Go to Step 6*
5	Using Allison DOC™ For PC–Service Tool attempt to manually select the TCM throttle source to a data link with valid throttle information. Did the TCM detect a throttle source?		*Go to Step 8*	*Go to Step 6*
6	Coordinate with the vehicle or engine manufacturer to determine the cause of loss of throttle information on the data link. Is the repair complete?		*Go to Step 8*	
7	Coordinate with the vehicle or engine manufacturer to repair the analog or PWM throttle sensor. Is the repair complete?		*Go to Step 8*	
8	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle. 3. Using Allison DOC™ For PC–Service Tool, monitor throttle percent. 4. Verify the TCM detects a valid throttle source. Did the DTC return?		*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P063F Auto Configuration Engine Coolant Temp Input Not Present

NO SCHEMATIC FOR THIS DTC

Circuit Description

When first activated and during the first group of power-on cycles, the Transmission Control Module (TCM) searches for a valid engine coolant temperature input. The TCM may receive engine coolant temperature input from an analog temperature sensor, or from one of the SAE digital data links. The TCM logs a DTC P063F if it fails to detect an engine coolant temperature source during autodetect.

Conditions for Running the DTC

The test is enabled by the TCM calibration.

Conditions for Setting the DTC

DTC P063F sets if the TCM fails to detect engine coolant temperature information for a specified time interval.

Actions Taken When the DTC Sets

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

Conditions for Clearing the DTC/CHECK TRANS Light

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

Test Description

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

2. This step tests to see if TCM is reading engine coolant information.
3. This step determines what engine coolant temperature source the vehicle manufacturer intends to use.
4. This step looks for engine coolant temperature information on the data link.

DTC P063F Auto Configuration Engine Coolant Temp Input Not Present

Step	Action	Value(s)	Yes	No
1	Was Section 3–5, Beginning The Troubleshooting Process, performed?		*Go to Step 2*	*Go to Section 3–5, Beginning the Troubleshooting Process*
2	1. Turn OFF the ignition. 2. Install the Allison DOC™ For PC–Service Tool. 3. Start the engine. 4. Using Allison DOC™ For PC–Service Tool, determine the engine coolant temp source being used by the TCM. 5. Allow the engine to warm-up and monitor engine coolant temp on Allison DOC™ For PC–Service Tool. Does engine coolant temperature on Allison DOC™ For PC–Service Tool slowly rise as the engine warms?		*Go to Step 7*	*Go to Step 3*