



Welcome to the TS3192EN Troubleshooting Manual. We make every effort to keep our service information current and accurate. Because of the time lag involved with writing and printing processes, the transmission TCM may report a code that has not yet been added to this document. If you encounter a code that is not yet in this publication, please call the Allison Transmission Technical Assistance Center at 1-800-252-5283.

Go to the Table of Contents.

Troubleshooting Manual

2003 APRIL
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TS3192EN

Allison Transmission ELECTRONIC CONTROLS

1000 and 2000 Product Families



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FOREWORD — How to Use This Manual

This manual provides troubleshooting information for Allison Transmission 1000 and 2000 Product Families transmissions. Service Manual SM3191EN, Mechanics Tips MT3190EN, and Parts Catalog PC3062EN may be used in conjunction with this manual.

This manual includes:

- Description of the 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 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 service of wiring harnesses and wiring harness components as follows:*

- *Repair parts for the internal wiring harness 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 the vehicle OEM or the OEM is responsible for warranty on these parts.*

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.

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SERVICE LITERATURE

This service literature provides fully illustrated instructions for operation, maintenance, service, overhaul, and parts support for your transmission. To ensure maximum performance and service life from you unit, you may order publications from:

SGI, Inc.

Attn: Allison Literature Fulfillment Desk

8350 Allison Avenue

Indianapolis, IN 46268

TOLL FREE: 888-666-5799

INTERNATIONAL: 317-471-4995

1000 and 2000 Product Families Service Literature

Publication Name	Publication No.
Automatic Transmission Fluid Technician's Guide	GN2055EN
*Mechanic's Tips	MT3190EN
*In-Chassis Maintenance	JA3664EN
*EVS Operator's Manual	OM3761EN
*HS Operator's Manual	OM3757EN
*RDS Operator's Manual	OM3759EN
*MHS Operator's Manual	OM3364EN
*PTS Operator's Manual	OM3758EN
*BUS Operator's Manual	OM3765EN
*1000, 2000, 2400 Operator's Manual	OM3063EN
*Owner's Manual (2000MH)	OM3364EN
*Parts Catalog	PC3062EN
Parts Catalog On CD-ROM	CD3062EN
Principles Of Operation	PO3065EN
Service Manual	SM3191EN
Electronic Troubleshooting Manual	TS3192EN
* Also Available On The Internet At www.allisontransmission.com	



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SECTION 1—GENERAL DESCRIPTION

1-1. TRANSMISSION

The 1000 and 2000 Product Families Electronic Controls system features closed-loop clutch control to provide superior shift quality over a wide range of operating conditions. The 1000 and 2000 Product Families configurations can be programmed to provide five forward speeds, neutral, and reverse. The fifth range has an overdrive gear ratio. The 1000 and 2000 Product Families incorporate a variety of standard and optional design features.

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

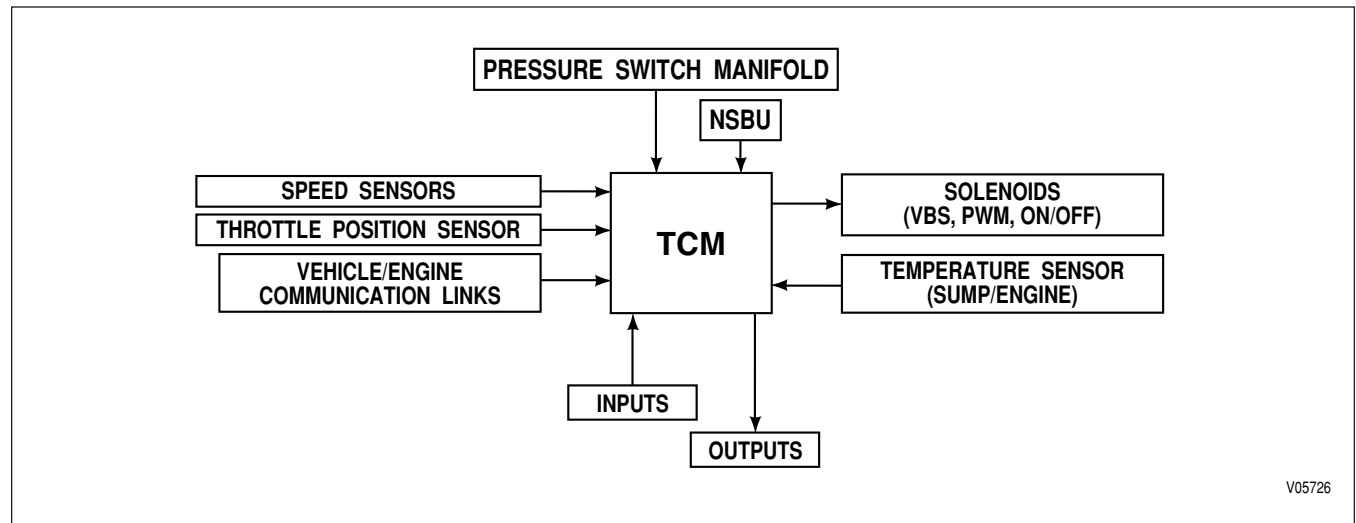


Figure 1-1. Transmission Control Module Block Diagram

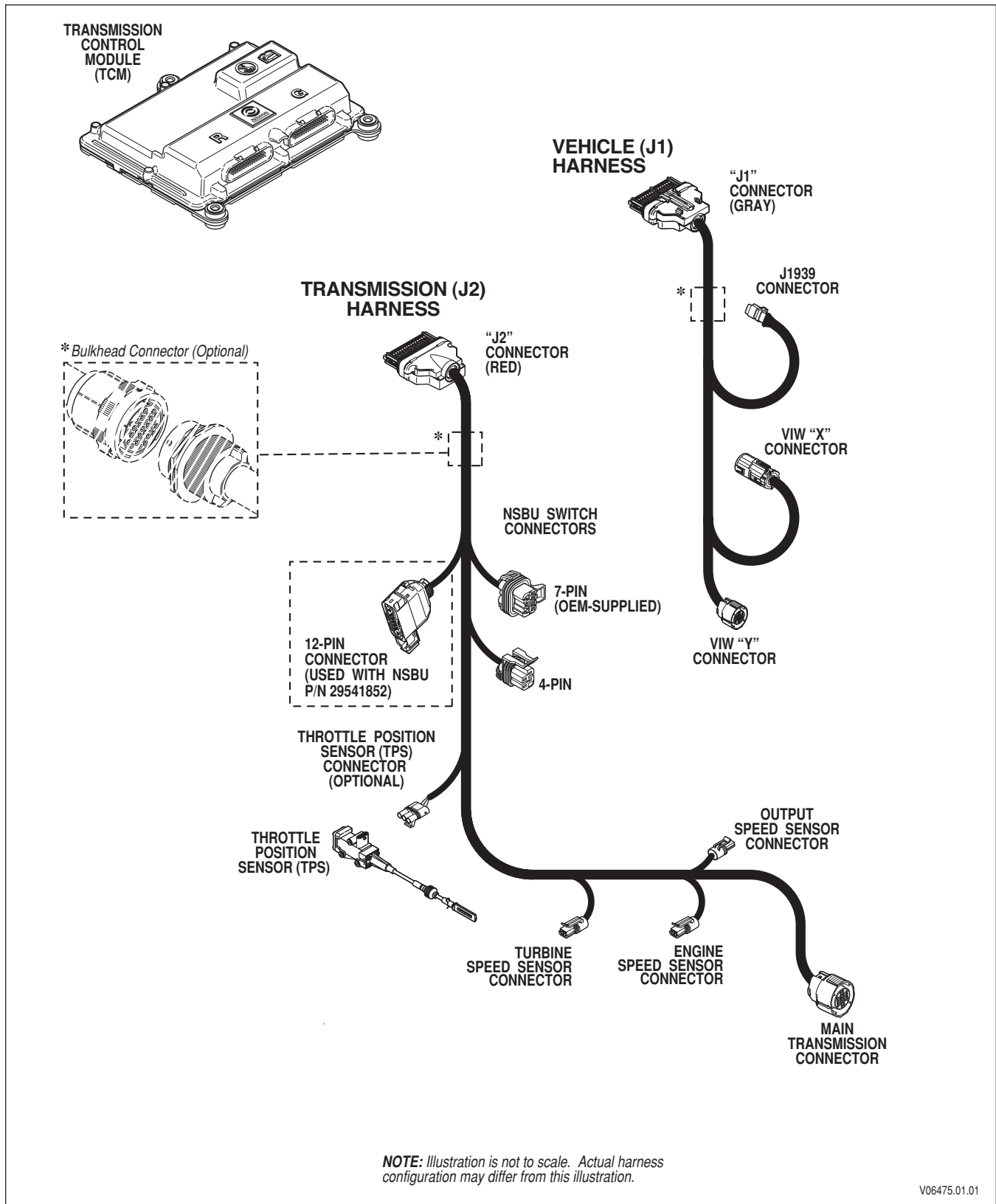
Figure 1-2 shows the electronic control components.

Electronic Controls consist of the following elements:

- Remote 12V or 24V Sealed Transmission Control Module (TCM)
- Throttle Position Sensor (TPS), electronic engine throttle data, or PWM signal
- Speed Sensors — Input (Engine), Turbine, and Output
- Control Valve Assembly (Electro-Hydraulic Valve Body)
- NSBU Switch
- Pressure Switch Manifold (PSM)
- Wiring Harnesses

NOTE: *All external harnesses are OEM-supplied.*

GENERAL DESCRIPTION



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Figure 1-2. Electronic 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 24V configurations to match the configuration of the vehicle electrical system.

The TCM (Figure 1-3) receives and processes signals from various switches and sensors. The TCM determines shift sequences, shift timing, and clutch apply and release pressures. The TCM uses the information to control transmission solenoids and valves, supply system status, and provide diagnostic information.

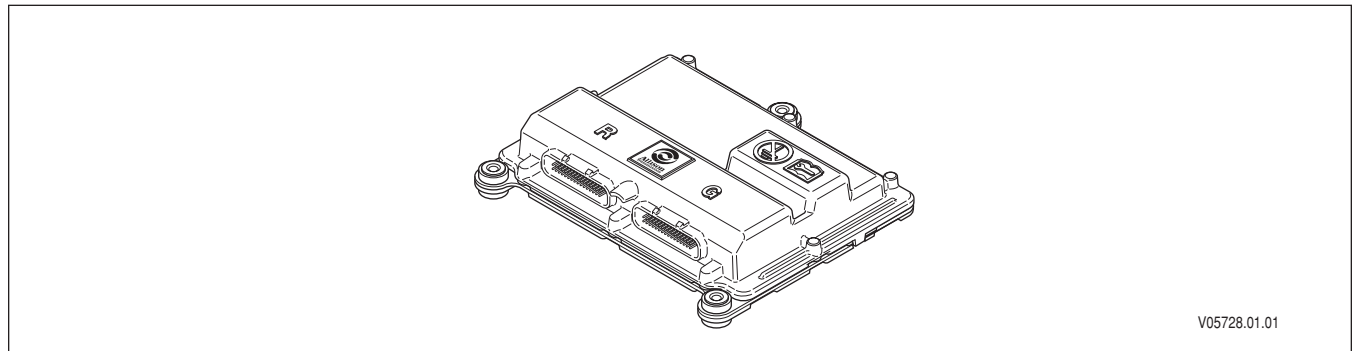


Figure 1-3. Transmission Control Module (TCM)

1-3. SHIFT SELECTOR

The vehicle is equipped with a lever-type shift selector (Figure 1-4). In addition to the lever assembly provided for the operator, other components associated with the shift selector are the manual selector valve in the main control valve body and an NSBU switch mounted on the selector shaft. Shift selector components (with the exception of the transmission selector shaft) are customer-supplied.

A. Shift Selector Range Positions

The operator chooses the transmission range by moving the selector lever to the appropriate gate position (Figure 1-4). When properly adjusted, the shifter gates prevent inadvertent shifting between ranges and correspond to the internal transmission detent positions. A positive detent is provided in the transmission to maintain the selector shaft in the selected position.

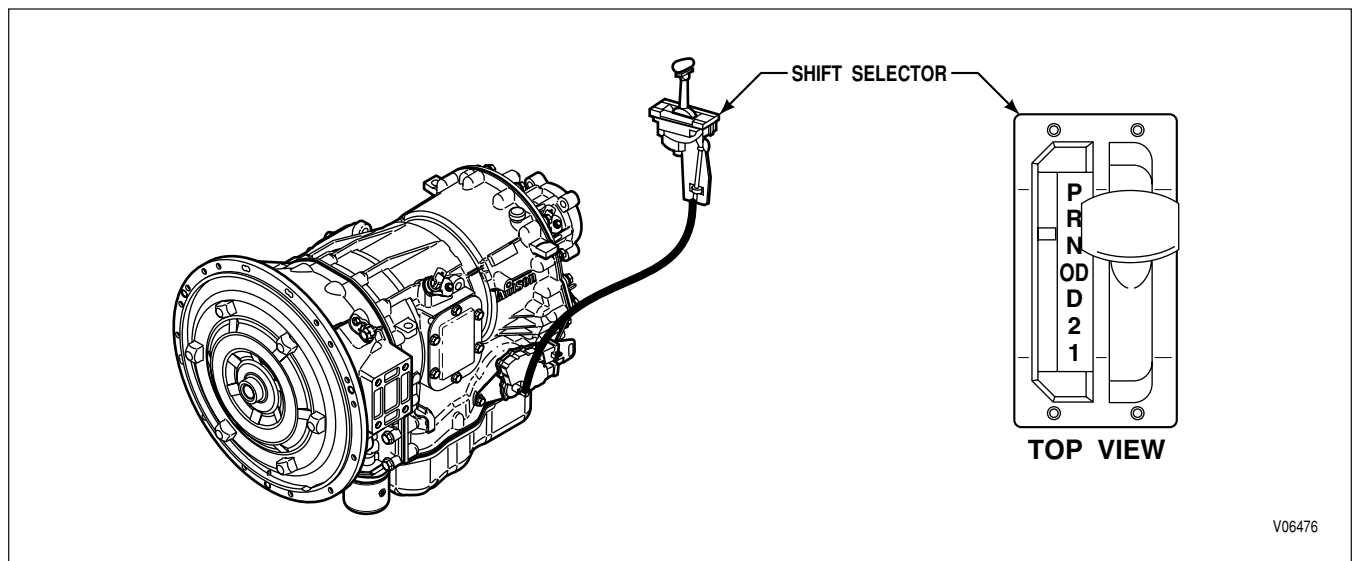


Figure 1-4. Typical Lever-Type Shift Selector

GENERAL DESCRIPTION

The TCM shift calibration determines the available forward ranges for each selector position. Although specific installations vary, typical selector positions for the 1000 and 2000 Product Families are:

P — Park. Parking pawl or parking brake is engaged, if available. This position is not available on all shift selectors.

R — Reverse.

N — Neutral. May be used when starting the engine and for stationary operations. The NSBU Switch disables the starter switch if a range other than **N** (Neutral) or **P** (Park) is selected before starting the vehicle.

OD — Overdrive. The highest forward range used for normal driving. The transmission shifts to first range for starting, then automatically upshifts through the ranges (as operating conditions permit) until the highest range is attained.

D, 2, 1 — Forward Range. The transmission shifts to first range for starting. The range selected on the shift selector is the highest range which will be attained during automatic shifting.

B. Manual Selector Valve

The manual shift selector shaft is attached to the manual selector valve within the transmission main control valve body. The selector valve has three positions: Reverse, Neutral, and Forward.

NOTE: *For transmissions equipped with a Park position, the selector valve remains in the Neutral position when the selector is moved to Park.*

The Neutral and Reverse selector valve positions (refer to Appendix H—Hydraulic Schematics) exhaust the C1 and C2 rotating clutches. By exhausting C1 and C2 clutches, forward range is inhibited. This provides the capability for the operator to override the electronically commanded ranges if **N** (Neutral) is required.

C. NSBU Switch

The installation of a transmission-mounted neutral start/reverse signal switch is required. This switch, commonly called an “NSBU Switch” (Figure 1–5), mounts directly onto the transmission housing from the outside and detects the angular position of the shift selector shaft. This position is communicated to the TCM so that certain vehicle control functions can be coordinated with the position of the shift controls. The NSBU switch has redundant circuitry to alert the TCM in the event of a single wire or switch failure.

The neutral signal output of the NSBU switch is typically used as confirmation that the transmission is in **N** (Neutral) before the engine starter is engaged. The NSBU switch is interfaced to the starter circuit with weatherproof electrical connectors. The reverse signal provision may be used to activate vehicle back-up lights and/or reverse warning devices.

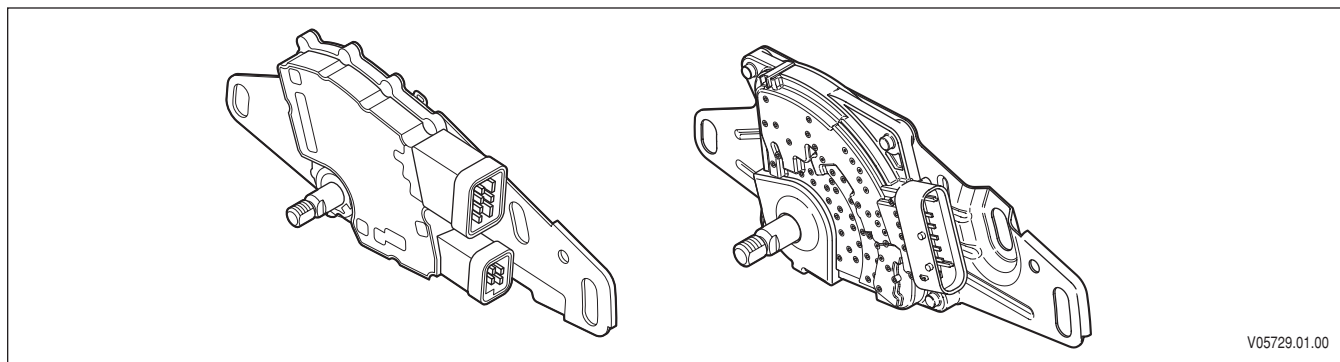


Figure 1–5. NSBU Switch

GENERAL DESCRIPTION

1-4. THROTTLE POSITION SENSOR

The Throttle Position Sensor (TPS) can be mounted to the engine, chassis, or transmission. The TPS (Figure 1-6) 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.

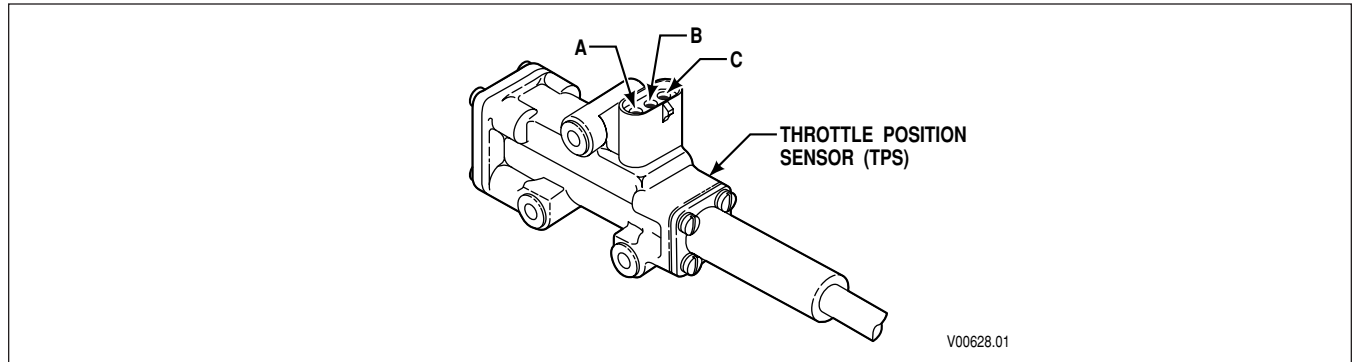


Figure 1-6. Throttle Position Sensor

1-5. SPEED SENSORS

There are three speed sensors available for use with 1000 and 2000 Product Families transmissions: the input (engine) speed sensor, the turbine speed sensor, and the output speed sensor (Figure 1-7). The speed sensors provide rpm information to the TCM. The speed ratios between the various sensors allow the TCM to determine the transmission operating range. Speed sensor information is also used to control the timing of clutch apply pressures, resulting in the best possible shift quality.

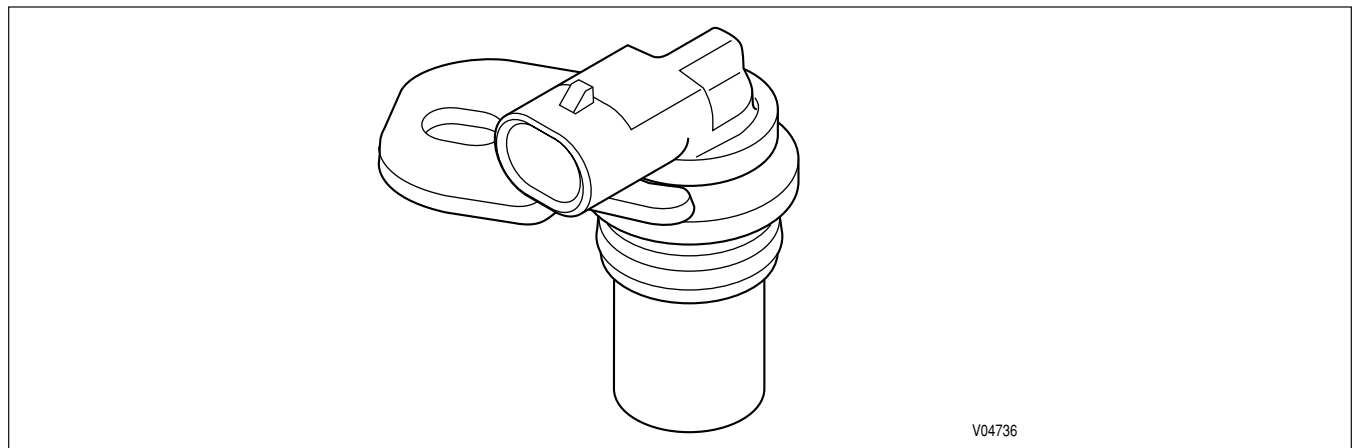


Figure 1-7. Typical Speed Sensor

The speed sensors are variable reluctance devices which convert mechanical motion to an AC voltage. Each sensor consists of a wire coil wrapped around a pole piece that is adjacent to a permanent magnet. These elements are contained in a housing which is mounted adjacent to a rotating ferrous member (such as a gear tooth). Two signal wires extend from one end of the housing and an exposed end of the pole piece is at the opposite end of the housing. The permanent magnet produces lines of flux around the pole piece. As a ferrous object (such as a gear tooth) approaches and passes through the gap at the end of the pole piece, an AC voltage pulse is induced in the wire coil. The TCM calculates the frequency of these AC pulses and converts it to a speed value. The AC voltage generated varies from 150mV at low speed to 15V at high speed. The signal wires from the sensor are formed as twisted pairs to cancel magnetically induced fields. The cable is also shielded to protect from voltage-related fields. Noise from other sources is eliminated by using two-wire differential inputs at the TCM.

GENERAL DESCRIPTION

NOTE: *Do not rotate the speed sensor in the retaining bracket. Orientation is fixed, and if changed, may cause improper operation.*

A. Input (Engine) Speed Sensor

The input speed sensor is externally mounted in the torque converter housing directed at the ribs protruding from the torque converter. The input speed sensor connector should be positioned at approximately four o'clock, as viewed from the left side of the transmission (Figure 1-8).

B. Turbine Speed Sensor

The turbine speed sensor is externally mounted in the main housing directed at the tone wheel or PTO drive gear attached to the rotating clutch module. The turbine speed sensor connector should be positioned at approximately three o'clock, as viewed from the left side of the transmission (Figure 1-8).

C. Output Speed Sensor

The output speed sensor is externally mounted in the rear cover and directed at the teeth of a tone wheel splined to and rotating with the output shaft. The output speed sensor connector should be positioned at approximately five o'clock, as viewed from the left side of the transmission (Figure 1-8).

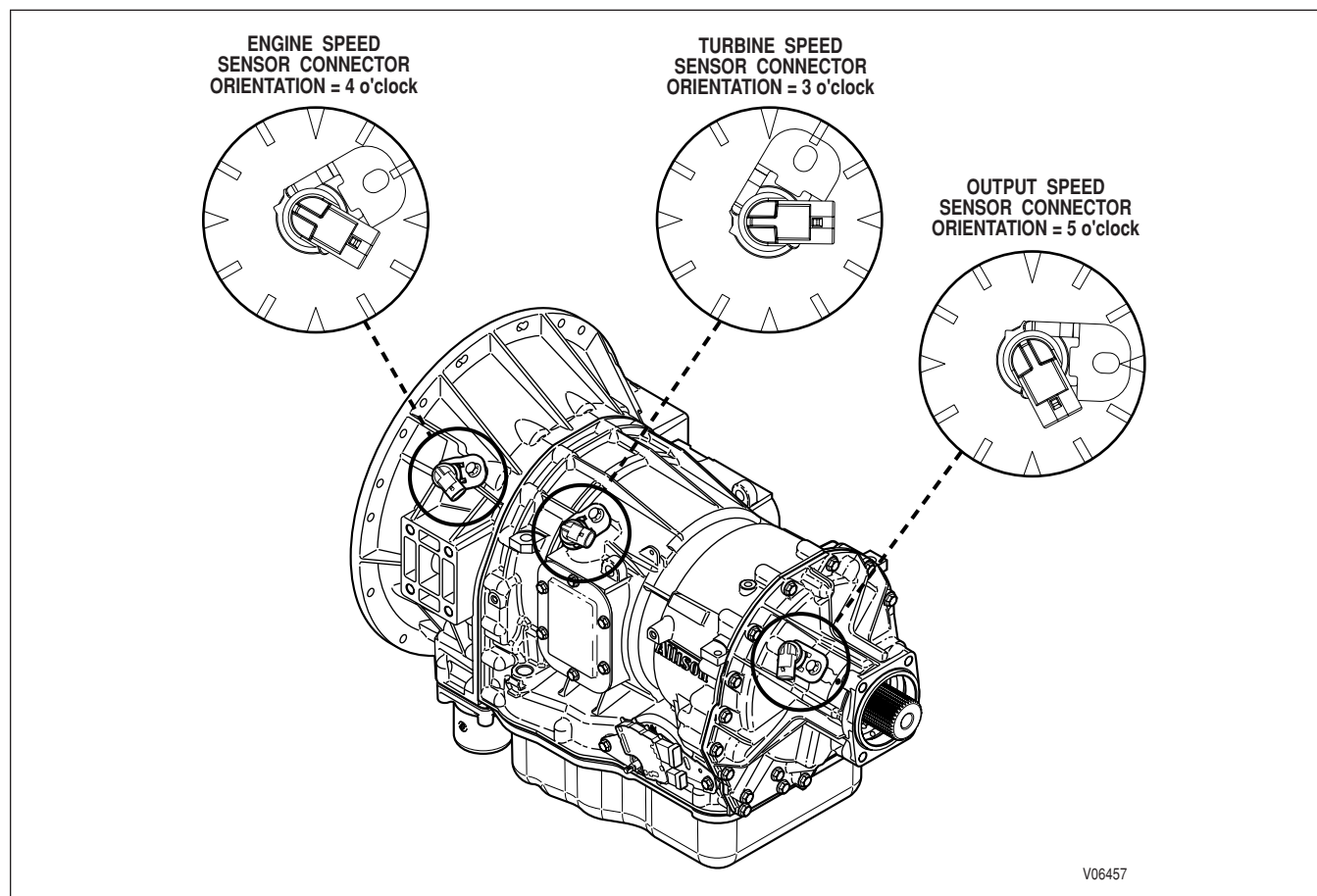


Figure 1-8. Speed Sensor Connector Orientation

GENERAL DESCRIPTION

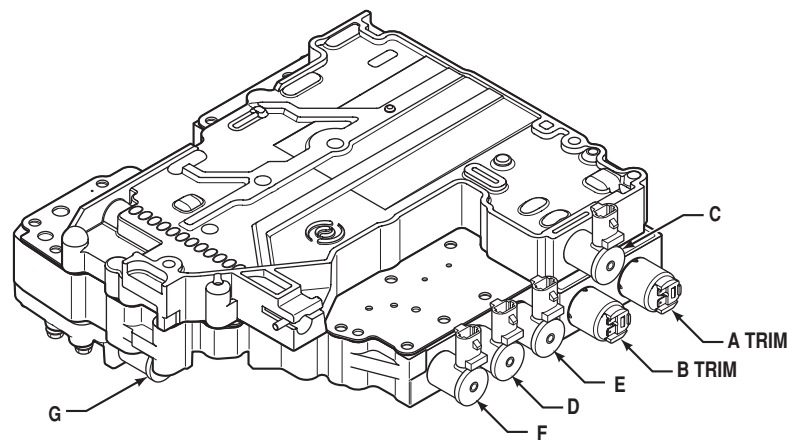
1-6. CONTROL VALVE ASSEMBLY

The hydraulic control valve assembly (Figure 1-9) governs fluid flow to the clutches (including the torque converter clutch). Solenoids, actuated by the TCM, control valve movement.

The control valve assembly consists of two components. The main valve body contains the trim valves, the TCC valve, the exhaust backfill valve, and the control main relief valve. The shift valve body contains the shift valves, the control main pressure valve, and the manual selector valve. The control valve assembly attaches to the bottom of the gearbox module and is enclosed by the oil pan. An internal wiring harness connects the solenoids and PSM to the main transmission connector and external wiring harness.

A. Modulated Main Pressure

Modulated main pressure was added to the 1000 and 2000 Product Families in the second quarter of 2003. Starting with DEE software level, the TCM will autodetect if the hardware is present. Main pressure is reduced by utilizing an additional on/off solenoid ("G") that is located in the control valve body assembly. The G solenoid body is bolted to the revised main valve body. Main pressure will be reduced under various conditions such as low throttle, low torque, low engine speeds, and low output speeds. The primary benefit of modulating main pressure is to increase cooler flow at low engine speeds.



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Figure 1-9. Control Valve Assembly

1-7. WIRING HARNESSES

A. External Wiring Harness (Figure 1-10)

The external wiring harness requirements are typically met through the use of two separate harnesses — one connecting the TCM to the transmission, throttle position sensor, NSBU switch, and speed sensors; another connecting the TCM to the Scan Tool (ST) and other vehicle interfaces. Each harness may be a single piece or may be divided into two segments joined by bulkhead connectors. All wiring harnesses and mating connectors are customer-supplied.

GENERAL DESCRIPTION

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

- Repair parts for the internal wiring harness 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 through the vehicle OEM. The OEM is responsible for warranty on these parts.

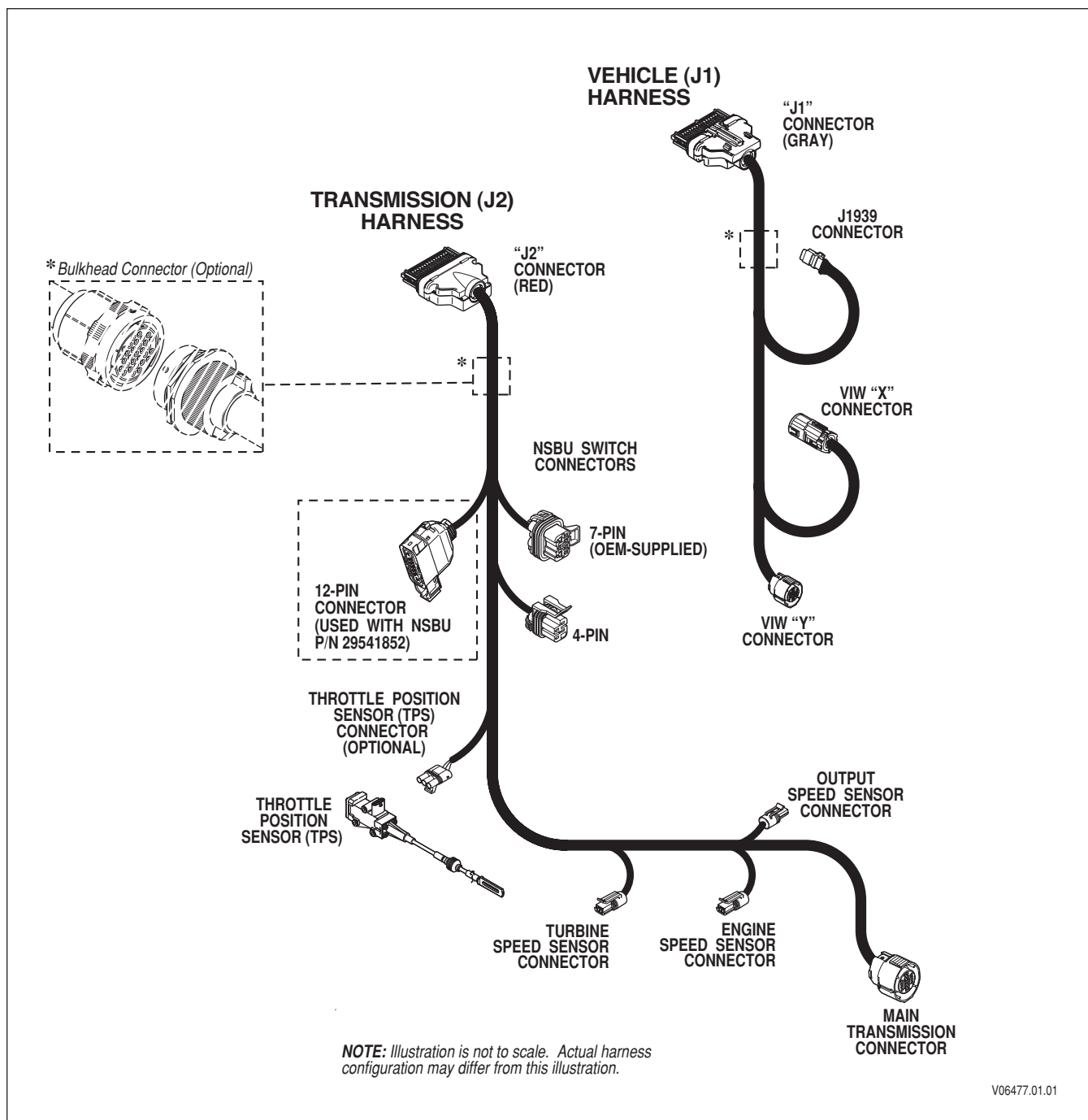


Figure 1-10. Typical External Wiring Harnesses

GENERAL DESCRIPTION

B. Internal Wiring Harness (Figure 1–11)

An internal wiring harness connects the shift solenoids, clutch trim solenoids, torque converter clutch solenoid, pressure switch manifold, and temperature sensor to the external harness leading to the TCM.

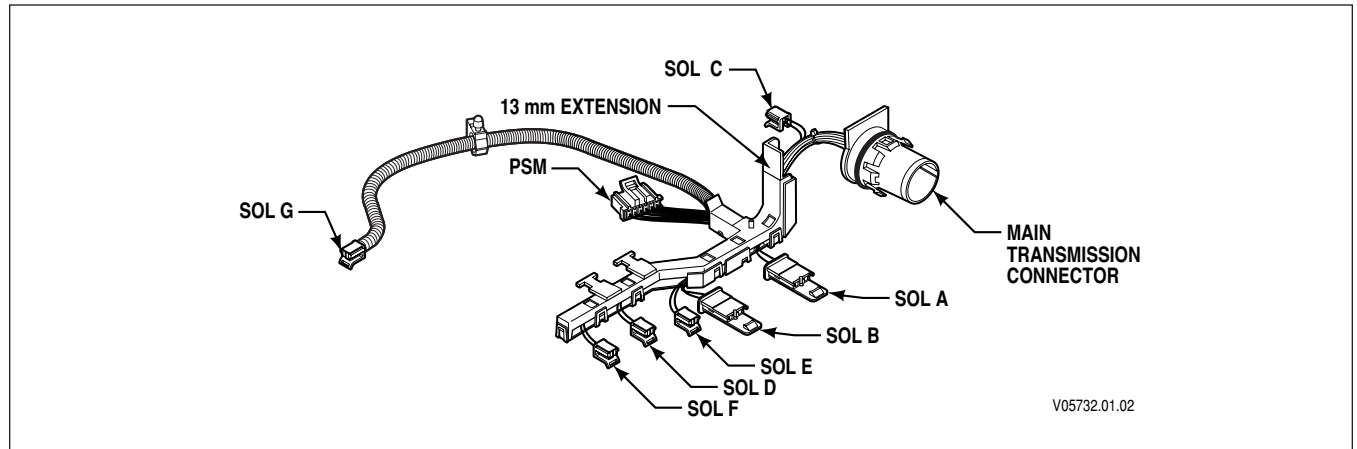


Figure 1–11. Typical Internal Wiring Harness

GENERAL DESCRIPTION

NOTES

SECTION 2—DEFINITIONS AND ABBREVIATIONS

2-1. CHECK TRANS LIGHT

The electronic control system is programmed to inform the operator of a problem with the transmission system and automatically take action to protect the operator, vehicle, and transmission. To do this, the TCM turns on the **CHECK TRANS** light on the instrument panel, which notifies the operator that a Diagnostic Trouble Code (DTC) has been stored.

Each time the engine is started, the TCM will illuminate the **CHECK TRANS** light, then turn it off after a few seconds. This is a circuit check to verify that the lamp and wiring are in proper working order. Illumination of the **CHECK TRANS** light at any time after start-up indicates that the TCM has set a DTC. The Scan Tool is used to verify that the TCM has set a DTC (see Paragraph 2-5). While the **CHECK TRANS** light is on, upshifts and downshifts may be restricted and direction changes (**D-R**, **R-D**) may not occur. The torque converter clutch is inhibited when transmission shifting is restricted or during any critical transmission malfunction.

The 1000 and 2000 Product Families transmissions DTCs are latching DTCs. When a failure condition is detected, the DTC set by the TCM remains active for the entire time the ignition is on. When the ignition is turned off and then on again, the transmission DTCs will reset and the TCM will recheck for the failure condition. If the failure condition is not present, the previously set DTC will remain in history; the **CHECK TRANS** light will turn off after the circuit check, and the transmission will function normally unless another failure occurs. This feature allows the vehicle to be driven to a service outlet.

2-2. SCAN TOOL INHIBITS

The following inhibit information may be displayed on the Allison DOC™ For PC (Scan Tool), depending on the TCM software level. If TCM software does not support one of the inhibits listed below, a N/A will be shown in the information box.

If an inhibit has occurred since the last DTC was cleared, the inhibit state will indicate **ON** and will stay **ON** until the next **manual DTC** clear with the Scan Tool. These inhibits do not turn **OFF** after a specified number ignition cycles.

The range inhibit light will illuminate and/or an inhibited state will be shown on the Scan Tool when the transmission is inhibited to Neutral for the following reasons:

- **Low Main Pressure**

If the transmission pressure switches do not indicate transmission pressurized at start-up, shifts-to-range may be inhibited and the range inhibit light will illuminate. The Scan Tool will indicate an active inhibit.

Common causes are transmission low on fluid, transmission filter has just been changed, or pan has been removed and fluid recently drained.

May produce P0701.

- **Transfer Case Neutral**

If the transfer case is shifted into neutral while the transmission is in drive or reverse at a speed above idle, the transmission will continue to command range until the output speed is reduced to a point where neutral range is commanded. The range inhibit light will illuminate and the Scan Tool will indicate an active inhibit.

- **Diagnostic Active**

This indicates that an active diagnostic code is set and that the **CHECK TRANS** light should be illuminated. In some failure modes, Reverse cannot and will not be commanded. If Reverse is selected during these failure modes a range inhibit light will illuminate in Reverse.

During diagnostic responses, Neutral-to-Range Inhibits and Direction Change Inhibits continue to operate, but they may latch under certain conditions. In these cases, shutting down ignition and waiting for at least 5 seconds before re-starting will clear the inhibit condition. The Scan tool will indicate an active inhibit.

DEFINITIONS AND ABBREVIATIONS

- **Auto Neutral for PTO**

Neutral-to-Drive and Neutral-to-Reverse shifts will be inhibited to neutral and the Scan Tool will show an inhibited state when TCM detects that auto neutral function input is active.

- **Reverse Enable**

Neutral-to-Reverse shifts will be inhibited to neutral and the Scan Tool will show an inhibited state when no input is detected from dash or floor mounted reverse enable switch when selecting reverse range. The Scan Tool will indicate an active inhibit.

This function is only used in European transit and tour buses applications.

- **Refuse Packer Step Switch**

Transmission operation is limited to only 1st range. Neutral-to-reverse shifts will be inhibited to neutral and the Scan Tool will show an inhibited state when input is detected from a step switch indicating that personnel is present on rear step platform.

- **Auxiliary Function Range Inhibit**

Neutral-to-Drive and Neutral-to-Reverse shifts will be inhibited to neutral and the Scan Tool will show an inhibited state when input is detected from an auxiliary switch or device. This inhibit will remain active until the auxiliary switch input is shut off and range is reselected.

- **PTO Neutral Lockup**

The Scan Tool will show an inhibited state when Neutral Lockup is active and range shifts are being inhibited to neutral. When the selector is moved, lockup is released and the inhibit clears.

- **Engine Speed**

Neutral-to-Drive and Neutral-to-Reverse shifts will be inhibited to neutral and the range inhibit light will illuminate if the Engine Speed is greater than a calibrated value (1400 rpm for medium duty non-emergency vehicles). The Scan Tool will indicate an active inhibit.

- **Output Speed**

Reverse-to-Drive, Drive-to-Reverse, and Neutral-to-Reverse shifts initiated above 300 rpm of output speed will be inhibited to neutral and the range inhibit light will illuminate. The Scan Tool will indicate an active inhibit.

- **Throttle**

Reverse-to-Drive, Drive-to-Reverse, Neutral-to-Drive, and Neutral-to-Reverse shifts where throttle position is greater than 25 percent will be inhibited to neutral and the range inhibit light will illuminate. The Scan Tool will indicate an active inhibit.

- **NSBU Function or Alignment**

Reverse-to-Drive, Drive-to-Reverse, Neutral-to-Drive, and Neutral-to-Reverse shifts will be inhibited to neutral and the range inhibit light will illuminate when a NSBU failure or misalignment is detected. Common cause would be an error in the four-bit NSBU switch input signal that is sent to the TCM. The Scan Tool will indicate an active inhibit.

- **NSBU RPS Disagree**

Reverse-to-Drive, Drive-to-Reverse, Neutral-to-Drive, and Neutral-to-Reverse shifts will be inhibited to neutral and the range inhibit light will illuminate when the reverse pressure switch status is in the incorrect state when compared to the NSBU switch state. The Scan Tool will indicate an active inhibit.

- **MSV Mis-Alignment/Unable to detect ratio after shift to range**

If the range verification test fails to detect turbine speed pull-down or valid gear ratio when shifting to either forward or reverse range from neutral, the transmission will shift back to a neutral condition and the range inhibit light will illuminate.

DEFINITIONS AND ABBREVIATIONS

Conditions that may cause this include: Attempts to shift the transmission from Neutral-to-Drive or Neutral-to-Reverse with the transfer case in neutral; transmission low on fluid; misadjustment in the NSBU or Selector Linkage; turbine or output speed sensor failure that may prevent the pull down test/ratio test from passing; solenoid A or B hydraulically failures; and possibly failed range clutch (C1 or C5 for 1st, C3 or C5 for Reverse).

The Scan Tool will indicate an active inhibit response.

- **Wheel Spin or Lock**

When the TCM detects that wheel lock or spin is occurring, the TCC is disengaged and a lock-to-range response is commanded for 6 seconds. The Scan Tool will indicate an active inhibit response.

2-3. SCAN TOOL (Allison DOC™ For PC) (Figure 2-1)

The current Scan Tool (ST) is the PC Tool Software Allison DOC™ For PC, which is available through Kent-Moore Heavy-Duty Division. When installed on a Windows® PC, the Allison DOC™ For PC transmits and receives data to and from the TCM via the vehicle data communications link, processes the data, and displays appropriate information. Use Allison DOC™ For PC during installation checkout and troubleshooting.

For more details on Allison DOC™ For PC features, see information in Appendix M.

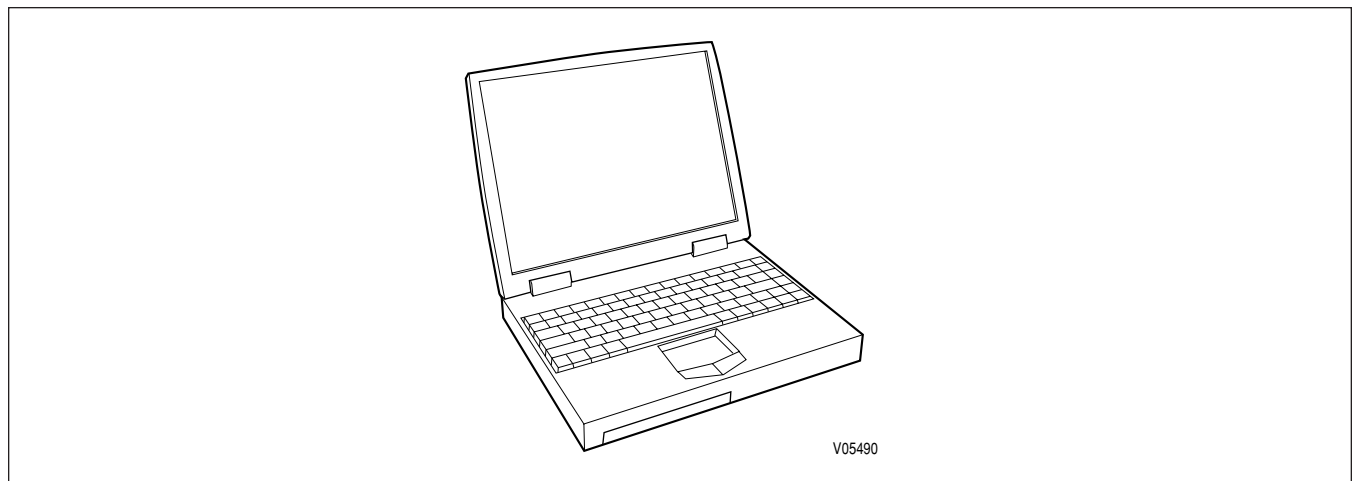


Figure 2-1. Scan Tool

DEFINITIONS AND ABBREVIATIONS

2–4. ABBREVIATIONS

A/N	A ssembly N umber
ABS	A nti-lock B rake S ystem—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	A mpere—Unit of electrical current
CAN	C ontroller A rea N etwork—A network for all SAE J1939 communications in a vehicle (engine, transmission, diagnostics, ABS, etc.)
CC	C alibration C ompatib il ity—First two digits of the CIN
CIN	C alibration I dentification N umber—Used to identify transmission controls software level
CT	C losed T hrottle
DNA	D oes N ot A dapt—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.
DTC	D iagnostics T rouble C ode
DVOM	D igital v olt/ o hm m eter
ECM	E ngine C ontroller M odule—Available on electronically-controlled engines—provides some relevant data to TCM.
EMI	E lectro M agnetic I nterference
GPI	G eneral P urpose I nterface—Input signal to the TCM to request a special operating mode or condition.
GPO	G eneral P urpose O utput—Output signal from the TCM to control vehicle components (such as PTOs, backup lights, etc.) or allow a special operating mode or condition.
IPC	I nstrument P anel C ontroller
J1939	High-speed vehicle serial data communications link.
LED	L ight- E mitting D iode—Electronic device used for illumination.
L RTP	L ow- R ange T orque P rotection—A feature limiting engine torque in lower ranges to protect the transmission from damage when a stall condition occurs.
NNC	N eutral N o C lutches—Neutral commanded with no clutches applied.
NSBU Switch	N eutral S tart B ackup S witch
NVL	N eutral V ery L ow—The TCM has sensed turbine speed below 150 rpm. This is usually caused by a dragging C1 or C3 clutch or a failed turbine speed sensor. When attained, the C4 and C5 clutches are applied to lock the transmission output.
OBD II	O n B oard D iagnostics Second generation. EPA mandated specification for vehicle diagnostics.
OEM	O riginal E quipment M anufacturer—Maker of vehicle or equipment.
Ohm	Unit of electrical resistance.
PC	P ersonal C omputer
PCCS	P roduction C alibration C onfiguration S ystem
PCM	P owertrain C ontroller M odule—Electronic device used on some vehicles.
PDM	P arallel D ata M odule

DEFINITIONS AND ABBREVIATIONS

2–4. ABBREVIATIONS (*cont'd*)

PPC	P ressure P roportional to C urrent solenoid. Solenoid control of clutch pressure is proportional to the current being supplied to the solenoid.
PROM	P rogrammable R ead O nly M emory
PSM	P ressure S witch M anifold—Part of transmission control system located inside the oil pan.
PTO	P ower T akeoff
PWM Solenoid	P ulse W idth M odulated S olenoid—Solenoids are controlled by pulse width modulation. Solenoid control of clutch pressures is based on the solenoid's duty cycle. Duty cycle is determined by the ratio of solenoid's on-time to off-time.
RFI	R adio F requency I nterference
RPR	R eturn to P revious R ange—Diagnostic response in which the transmission is commanded to return to previously commanded range.
SEM	S hift E nergy M anagement—Currently used on 2000MH Series. Allows the TCM to request torque reduction from the ECM during upshifts for increased clutch life.
SOL OFF	All S OLenoids O FF
ST	S can T ool—Most current version is the Allison DOC™ For PC. Diagnostic tool used to interrogate the TCM for diagnostic information.
TBC	T ruck B ody C ontroller
TCC	T orque C onverter C lutch
TCM	T ransmission C ontrol M odule (also commonly referred to as the “computer”)
TFT	T ransmission F luid T emperature—Data provided by thermistor that is part of the PSM.
TPS	T hrottle P osition S ensor—Potentiometer for signaling the position of the engine fuel control lever.
V	V ersion—Abbreviation used in describing TCM software levels.
VBS	V ariable B leed S olenoid—Another name for Pressure Proportional to Current (PPC) solenoid. Solenoid control of clutch pressure is proportional to the current being supplied to the solenoid.
VDC	V olts D irect C urrent (DC)
VIW	V ehicle I nterface W iring—Interfaces TCM programmed input and output functions with the vehicle wiring.
Volt	Unit of electrical force
VOM	V olt/ o hm m eter
WOT	W ide O pen T hrottle
∞	I nfinity—Condition of a circuit with higher resistance than can be measured; effectively an open circuit.

DEFINITIONS AND ABBREVIATIONS

2-5. RANGE INHIBIT RESPONSES

The range inhibit feature is a function of the TCM logic. The TCM senses when certain input variables are exceeded and takes action to prevent transmission damage. The TCM inhibits neutral-to-range shifts and illuminates a light on the dash when the inhibit is active.

Listed below are three variables that, when exceeded, cause inhibited shifts (with thresholds listed).

- Engine speed above 1000 rpm
- Throttle setting above 40 percent
- Output speed above 225 rpm

There are two levels of the special logic inhibits.

- Self-clearing inhibit—This inhibit clears itself if one of the above conditions is not present after a calibrated time. This is three seconds in the case of medium-duty vehicles. If the shift inhibit is active, but not latched, the bulb will stay lit until self-cleared.
- Latching inhibit — This inhibit latches when one of the conditions listed above is still present after a calibrated time. This is above three seconds for medium duty vehicles. To clear a latching inhibit, move the selector into any other position than the one originally selected.

SECTION 3—BASIC KNOWLEDGE

3-1. BASIC KNOWLEDGE REQUIRED

To service 1000 and 2000 Product Families Electronic Controls, the technician must understand basic electrical concepts. Technicians need to know how to use a volt/ohmmeter (VOM) to make resistance and continuity checks. Most troubleshooting checks consist of checking resistance and continuity, and checking for shorts between wires and to ground. 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 — Main Pressure Check Procedure.

Input power, ground, neutral start circuitry, etc., can cause problems with electronic controls or vehicle functioning and may not generate a DTC. A working knowledge of 1000 and 2000 Product Families Electronic Controls vehicle installation is necessary in troubleshooting installation-related problems.

Refer to Section 7 for information concerning performance complaints (non-DTC) troubleshooting. A complete wiring schematic is shown in Appendix J. Refer to the 1000/2000 Product Family Tech Data for information concerning electronic controls installation and the Installation Checklist. Reliable transmission operation and performance depend upon a correctly installed transmission. For proper installation, review the Installation Checklist in the 1000/2000 Product Family Tech Data, available on the extranet under Engineering at www.allisontransmission.com.

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

- *Repair parts for the internal wiring harness 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 through the vehicle OEM. The OEM is responsible for warranty on these parts.*

3-2. USING THE TROUBLESHOOTING MANUAL

Use this manual as an aid to troubleshooting the 1000 and 2000 Product Families Electronic 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 ensure 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.

3-3. SYSTEM OVERVIEW

1000 and 2000 Product Families Electronic Control functions are controlled by the TCM. The TCM reads shift selector range selection, output speed, and throttle position to determine when to command a shift. When a shift occurs, the TCM monitors turbine speed, output speed, and throttle position to control the oncoming and off-going clutches during the shift.

When the TCM detects an electrical fault, it logs a DTC 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 DTC. Once that shift has been retried, and a fault is still detected, the TCM sets a DTC and holds the transmission in a fail-to-range mode of operation.

BASIC KNOWLEDGE

The 1000 and 2000 Product Families transmission utilizes “**clutch to clutch**” shift control to achieve range changes. In every case (except shifts to or from neutral), one clutch is exhausted and another applied to make a range shift. The “handoff” between exhausting and applying clutches is very precisely controlled by use of two “**PPC**” (Pressure Proportional to Current) solenoids. These solenoids are labeled **A** and **B** in the transmission, and are referred to as “**trim**” solenoids. For example, to make a 1–2 shift, A solenoid is used to trim pressure off C5 clutch, and B solenoid is used to trim pressure on C4 clutch.

The **TCM** (transmission control module) modulates the current to both A and B solenoid, which translates to a proportional level of pressure to the clutch. In order to make a shift, the TCM uses software and calibration settings of several program parameters to determine the level of current sent to the respective trim solenoids. These parameters are referred to as “**adaptive values**.” With a new transmission and TCM calibration, the adaptive values are set to “**base calibration**” level. The transmission uses the base calibration to perform the first of each type of shift. However, once it has performed a shift, the TCM evaluates the actual shift and compares it to an “**ideal**” shift in the TCM’s memory. Based on that comparison, the TCM changes the settings of the adaptive values to a level that it believes will result in a shift closer to the “**ideal**” shift the next time it makes that type of shift. This is referred to as “**adaptive shifting**.”

When the transmission/TCM calibration is new, the TCM is in “**fast adaptive**” mode. In other words, the TCM is allowed to make relatively large changes in the adaptive values after each shift. Once the TCM determines that a given shift is close to its ideal level it switches to “**slow adaptive**” mode. In slow adaptive the TCM still is evaluating shifts and changing adaptive values, but is only allowed to do so in smaller increments. When a shift switches from fast to slow adaptive mode, it is described as “**converged**”.

The TCM is programmed to try to switch from fast to slow adaptive mode within approximately five shifts. It is important to understand that there are many different distinct shifts recognized by the TCM, and each of these shifts has its own adaptive values. For example, there are upshift and downshifts to and from each range, as well as unique adaptive values for several different throttle regions for each upshift and downshift. The point is, it may take a significant amount of time before most of the shifts converge from fast to slow adaptive, and **thus it is not unusual to experience somewhat harsh or unpleasant shift quality until these shifts are converged**.

TCC engagement is accomplished by a separate PWM (pulse-width modulated) solenoid labeled “**F**” in the transmission. There are adaptive values for this as well, and thus it will also require some driving for TCC engagement to converge.

3–4. IMPORTANT INFORMATION IN THE TROUBLESHOOTING PROCESS

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

- Allison recommended wire numbers (i.e. 212) are a combination of the first digit indicating the TCM connector number (i.e. J2) and the last two digits indicating the pin-out information (i.e. 12).
- 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 that pulling force is applied to the connector itself and **not the wires** extending from the connector.
- Resistance checks involving the wiring between the TCM connectors and other components adds about one Ohm of resistance to the component resistance shown.
- Inspect all connector terminals for damage. Terminals may have bent or lost the necessary tension to maintain firm contact.

BASIC KNOWLEDGE

- 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®.

CAUTION:

The cleaning solvent must not be chlorine based, contain petroleum distillates, or 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 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.

- DTCs displayed after system power is turned on while a harness connector is disconnected can be ignored and cleared from memory. Refer to Section 5, DTCs, for the DTC clearing procedure.

3–5. BASIC TROUBLESHOOTING INFORMATION

1. Begin troubleshooting by checking the transmission fluid level and ignition voltage. Remember that some problems may be temperature related. Do troubleshooting, including the fluid level and ignition voltage checks, at the temperature level where the problem occurs.

NOTE: *Fluid level and ignition voltage **MUST** be checked before any troubleshooting is performed.*

NOTE: *If you are experiencing harsh shifts, it is important to use the Scan Tool to check whether that particular shift is converged. If it is not, the TCM is still “learning” how to adapt that shift and simply needs to be driven further while performing more of that particular type of shift.*

If a particular shift is converged but still objectionable, it’s good troubleshooting practice to reset the adaptive values for that shift back to “base cal” level. This will automatically reset the TCM to fast adaptive mode. The vehicle should then be driven to allow the TCM to “re-learn” the shift. Many times this will correct the problem. It is possible to reset individual shifts without affecting the other shifts.

CAUTION:

Whenever a transmission is overhauled, exchanged, or has undergone repairs, the Transmission Control Module (TCM) must be “RESET TO UNADAPTED SHIFTS.” This will cause the TCM to erase previous adaptive information and begin to adapt in Fast Adaptive Mode from the base calibration. Failure to follow this procedure may cause premature failure of the overhauled, repaired, or replaced transmission.

2. If a transmission has been overhauled, exchanged, or repaired, use the Allison DOC™ For PC to “RESET TO UNADAPTED SHIFTS”. Accomplish the reset by doing the following:
 - Select the Shift Selector icon.
 - Select the Reset Adaptives icon.
 - Push the Reset All Adaptive Values button.

At the “Are you sure you want to reset all adaptive parameters?” prompt, select “OK.”

BASIC KNOWLEDGE

3. Before using your Allison DOC™ For PC Scan Tool, check the following:
 - The desktop or laptop computer must meet the minimum system requirements (see Allison DOC™ For PC User Guide, GN3433EN):
 - Microsoft Windows® 95B, Windows® ME, Windows NT® 4.0 (SP6 or later), Windows® 2000 (SP1 or later), or Windows® XP
 - 60 MB free hard drive space (an additional 440 MB of disc space needed if training videos are stored on hard drive)
 - 64 MB of RAM
 - Intel® Pentium® II processor
 - Available serial port and parallel port
 - 1024 x 768 screen resolution
 - 256-color palette
 - Small fonts
 - A media player program (Windows Media Player® is provided on the Allison DOC™ For PC CD)
 - Adobe® Acrobat® Reader® (provided on the Allison DOC™ For PC CD)

NOTE: Refer to the *CD Readme.txt* file for more information.

- The proper driver (electronic file) is installed for the Computer Interface Module.
- Power at the Deutsch 9-pin diagnostic connector (pin A is negative, pin B is positive).
- The proper connections exist for communicating with Allison DOC™ For PC Scan Tool (Figure 3–1 and Figure 3–2).

Presently there are two communication standards for Allison DOC™ For PC diagnostic software: J 1939 and J 1850. Both standards are supported by Allison DOC™ For PC (versions 2.0, 2.05, 3.0, and 3.1).

The Deutsch 9-pin vehicle connector should always be used to establish communication for troubleshooting. If it is necessary to use the J 43890 T-Adapter Harness, the following conditions will occur:

- DTC U2105 CAN bus error sets.
- The **CHECK TRANS** light illuminates (beginning with M04 software, effective March 2000).
- The TCM freezes shift adapts.
- The TCM inhibits TCC engagement.
- Throttle information is defaulted; the TCM estimates throttle data from torque converter slip.

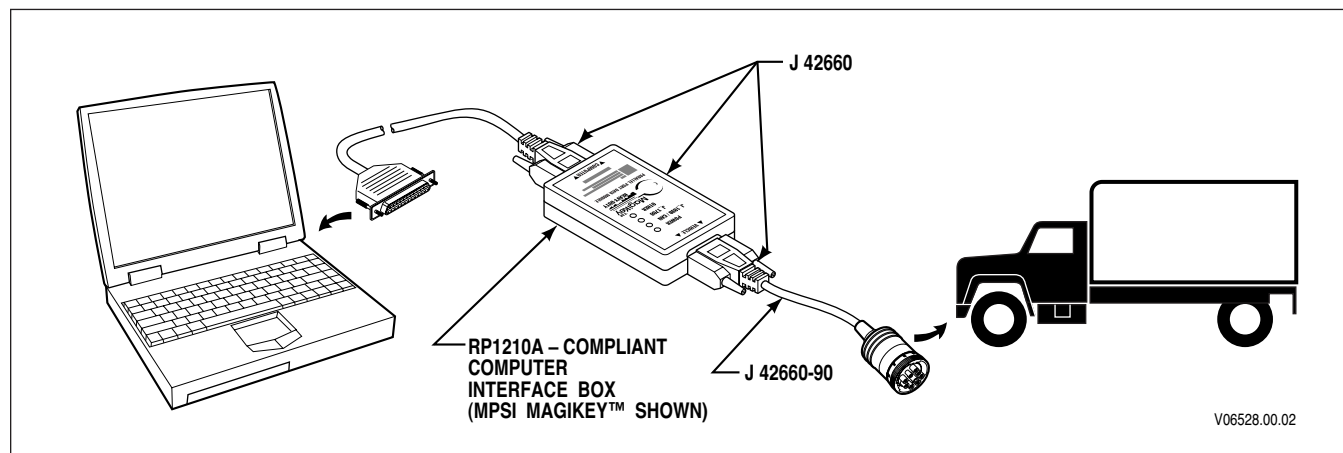


Figure 3–1. Proper Allison DOC™ For PC Scan Tool Connections — J1939

BASIC KNOWLEDGE

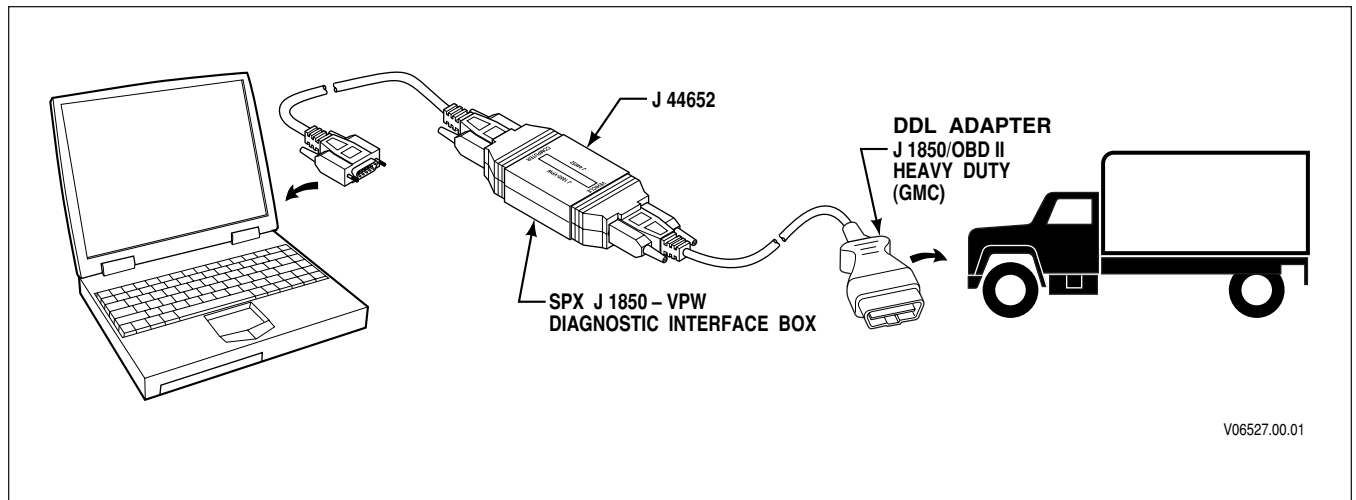


Figure 3–2. Proper Allison DOC™ For PC Scan Tool Connections — J1850

The J1850 Diagnostic Interface Box (J 44652) utilizes a serial port connection, rather than a parallel port, and is used only for off-board diagnostic communications. J1939 is still used for on-board communications such as throttle position; therefore it will necessary to use the J1939 T-Adapter Harness (J 43890) and MPSI MagiKey™ Interface Box (J 42660) to perform a recalibration (Figure 3–3).

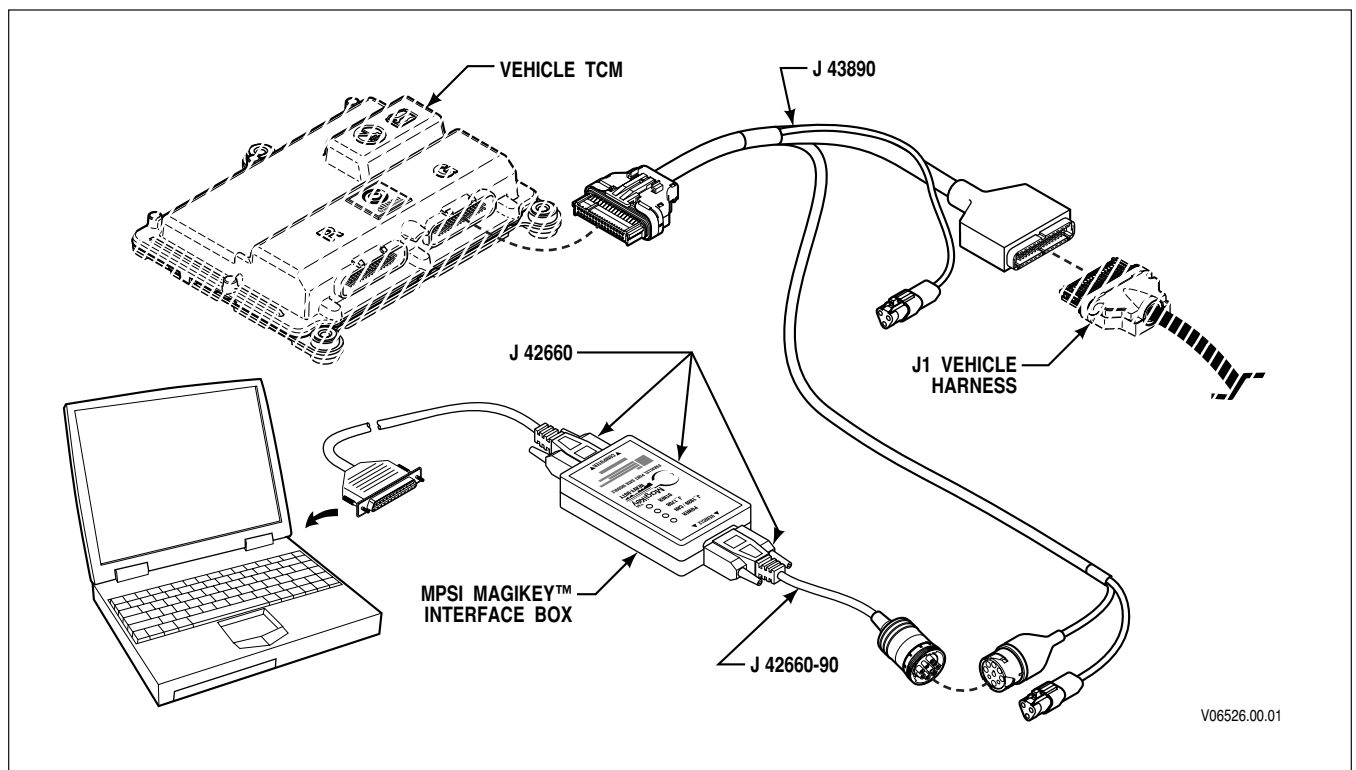


Figure 3–3. Proper Allison DOC™ For PC Scan Tool Connections Using J1939 T-Adapter Harness (J 43890)

BASIC KNOWLEDGE

4. Check DTCs by using the Scan Tool.
5. When a problem exists but a DTC is not indicated, refer to the General Troubleshooting Section (Section 7) for a listing of various electrical and hydraulic problems, their causes, and remedies.
6. If a DTC is found in the TCM memory, save all available DTC and failure record information before clearing the active indicator (refer to Section 5).
7. When certain DTCs are active, a range selection into reverse or forward may not be possible. To determine if a failure is electrical or hydraulic, perform the following “limp home” test.

WARNING!

Never remove electronic control connectors while the engine is running. Always turn off the ignition, set parking brakes and chock the wheels. Failure to follow this procedure may result in unexpected vehicle movement.

Limp Home Test

With the ignition in the OFF position (engine not running), the selector in **N** (Neutral) and the parking brake set, remove the wiring harness from the main transmission connector. When the engine is restarted, the transmission will default to a “limp home” capability. In this state, trim solenoid A (de-energized) allows C3 clutch to be applied. If the selector valve is moved to the reverse range position, main pressure will be routed to C5 clutch, allowing reverse operation. If the selector valve is moved to the drive range position, main pressure will be routed to C1 clutch, allowing third range operation.

This allows a technician to use “limp home” capability to determine if a hydraulic or an electrical problem exists. If reverse and third ranges are available in “limp home,” an electrical failure may be indicated. If only one of the two ranges or neither was obtainable, this may indicate an internal hydraulic failure (failed clutch, stuck valve, or solenoid failure). The clutches that could possibly have an indicated failure in “limp home” are C1, C3, and C5.

NOTE: *Removing the main transmission connector will induce several DTCs. Make sure all codes are cleared before proceeding with further troubleshooting.*

8. Test drive the vehicle to confirm a DTC or performance complaint.
 - If the DTC reappears, refer to the DTC section (Section 5) and the appropriate DTC table. The DTC section lists diagnostic codes and their description. Locate the appropriate troubleshooting table and follow the instructions.
 - If the DTC does not reappear and the test has passed, it may be an intermittent problem. Use the Scan Tool (Allison DOC™ For PC) and the DTC (Section 5). The DTC display procedure will identify possible causes of the problem.
 - Appendix A deals with the identification of potential circuit problems. Refer to Appendix A if a circuit problem is suspected.

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 REPLACEMENT PROCEDURE

- Using the Scan Tool, 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 J1 and J2 connectors from the suspect TCM; inspect the J1 and J2 connectors for damaged or bent pins.

BASIC KNOWLEDGE

- Replace TCM with a new or known good TCM from a similar vehicle.
- If the replacement TCM corrects the original complaint, reinstall the original TCM to verify the complaint returns. If original complaint is confirmed, reinstall 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 DTCs that may be present and test drive the vehicle to confirm the repair.

NOTE: *All 1000 and 2000 Product Families TCMs are designed to be isolated from the vehicle chassis ground. Be sure that the TCM case is not contacting the vehicle frame or any other point that might provide a ground connection.*

3-7. RESETTNG OF TCM PARAMETERS TO SUPPORT ENGINE UPDATE

Shift Energy Management (SEM) Autoselect feature was added to TCM software in the second quarter of 2002.

Autoselect is deactivated following the first 20 engine starts where engine and transmission communication are present. If during the first 20 engine 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.

TCM Autoselect Certified Engines

CC Level	Software Level	Autoselect Functionality Implemented in TCM Software	Engine Type Supported
16	U02	May 2002	Cummins ISB
18	U2A	July 2002	Cummins ISB02
19	DEE	September 2002	Cummins ISBe (6-cylinder)
N/A	N/A	Proposed first quarter 2004	Caterpillar C7

ISB engine software since December 2001 should support SEM, as well as most ISBe since October 2002. ISB02 ECM software started supporting SEM in July 2002.

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 engine 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 engines current SEM status.

NOTE: *Once TCM Autoselect locks, the only way to reactivate is to perform the power-off data erase procedure described below.*

3-8. RESETTNG TCM AUTOSELECT

Verify a new engine rating by checking the engine data tag. The engine must be compatible with the transmission rating. If the 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.

BASIC KNOWLEDGE

PCCS Load Station is used to reset Autoselect function, to do this it is necessary to clear all power-off data currently stored in the TCM.

- Go to the Maintenance button and select “Erase Power-off Data”
- After selecting “Erase Power-off data”, a message will indicate “PCCS is going to erase Power-off data”. Select “Yes”. Selecting “No” will abort the clearing of Power-off Data.
- After clearing Power-off Data, there will be a prompt to cycle the ignition.

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 shifts to converge.*

Autoselect reset function will be incorporated into the Allison DOC™ For PC service tool at a later date, along with an indication of the current SEM Autoselect status.

SECTION 4—WIRE CHECK PROCEDURES

4-1. CHECKING 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-check the circuit.
2. Disconnect and inspect all connectors.
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, or 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 for detailed information on the recommended cleaners.)

4. Review the wire numbering system described in Paragraph 3-4.
5. If all connectors are clean and properly seated, determine which wires in the chassis harness are indicated by the DTC. For example, DTC P0748, indicates an open or a short-to-ground in the solenoid A circuit — wires 222 and 223.
 - a. Check continuity of wires 222 and 223 by performing the following (Figure 4-1):
 - (1) Disconnect the red (J2) 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 and connector probes in J 39775-CP, connect wire 222 and 223 to each other, being careful not to distort the terminals. Jumping the wires together creates a circuit between wires 222 and 223.

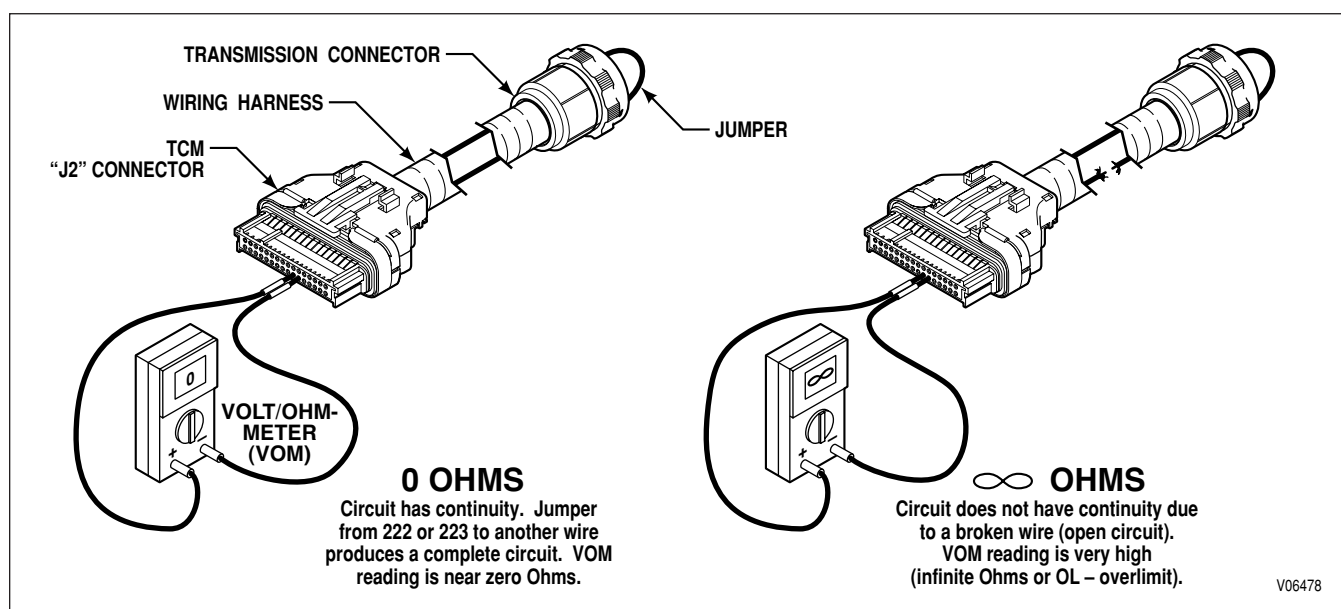


Figure 4-1. Checking Continuity (External Harness)

WIRE CHECK PROCEDURES

- (2) On the opposite end of the harness, check the continuity of the jumpered pair. No continuity in a jumpered pair circuit (infinite resistance reading) indicates an open in the wire being tested. Refer to OEM wiring harness repair procedure.
- b. If the continuity check is good (0–2 Ohms resistance), remove the jumpers. Check the harness for shorts between wires and shorts-to-ground by performing the following (refer to Figure 4–2):
 - (1) At the TCM end of the harness, touch one VOM probe 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.
 - (2) If at any time the VOM 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.

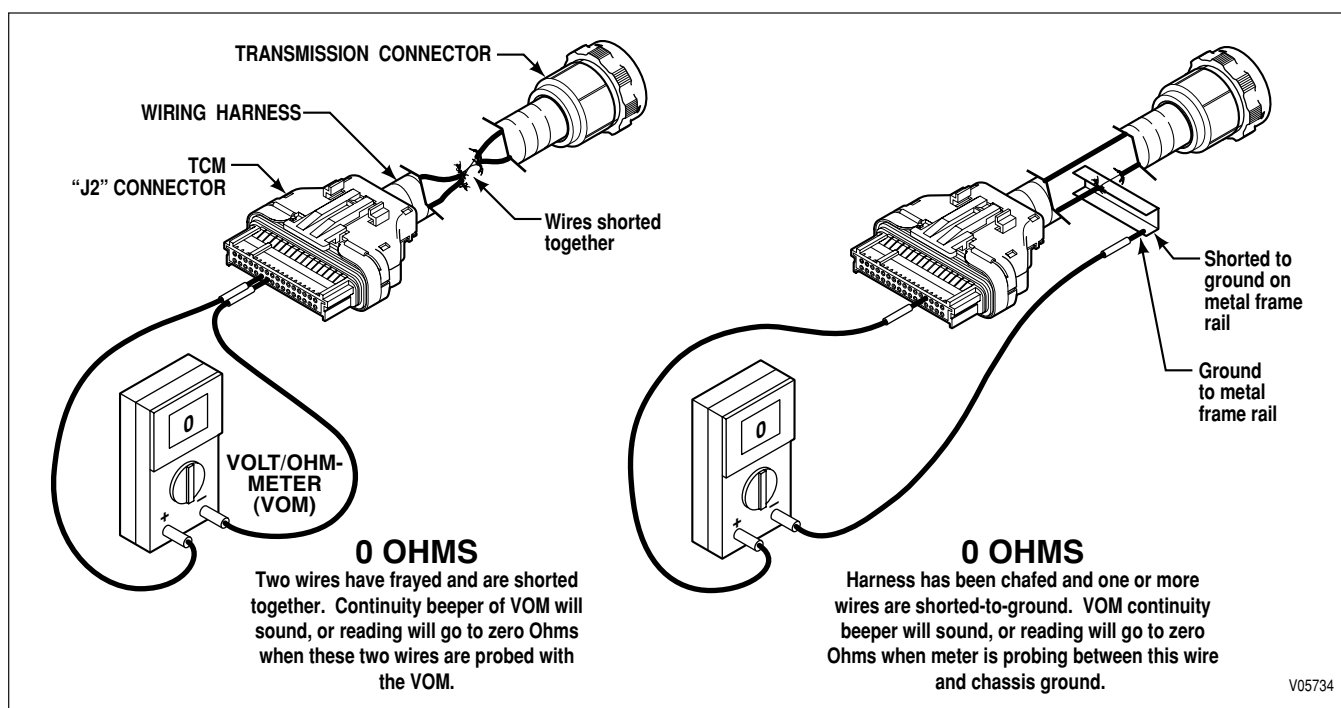


Figure 4–2. Short Between Wires and to Ground (External Harness)

4–2. CHECKING AT TRANSMISSION CONNECTOR AND THE INTERNAL HARNESS FOR 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, or 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 for detailed information on the recommended cleaners.)

WIRE CHECK PROCEDURES

3. If the connectors are clean and properly seated, determine which wires in the harness to test. Use the diagnostic code system schematic to locate the wire terminals. For this example, DTC P0748 indicates an open or a short-to-ground in the solenoid "A" circuit — wires 222 and 223 (refer to Figure 4–3 and Figure 4–4).
 - a. At the transmission connector, check the resistance of the A solenoid circuit. Resistance of a solenoid circuit should be 5.5–8 Ohms — covering a temperature range of -18°C to 149°C (0°F to 300°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. Replace the internal harness, replace the feedthrough connector, or replace the solenoid.

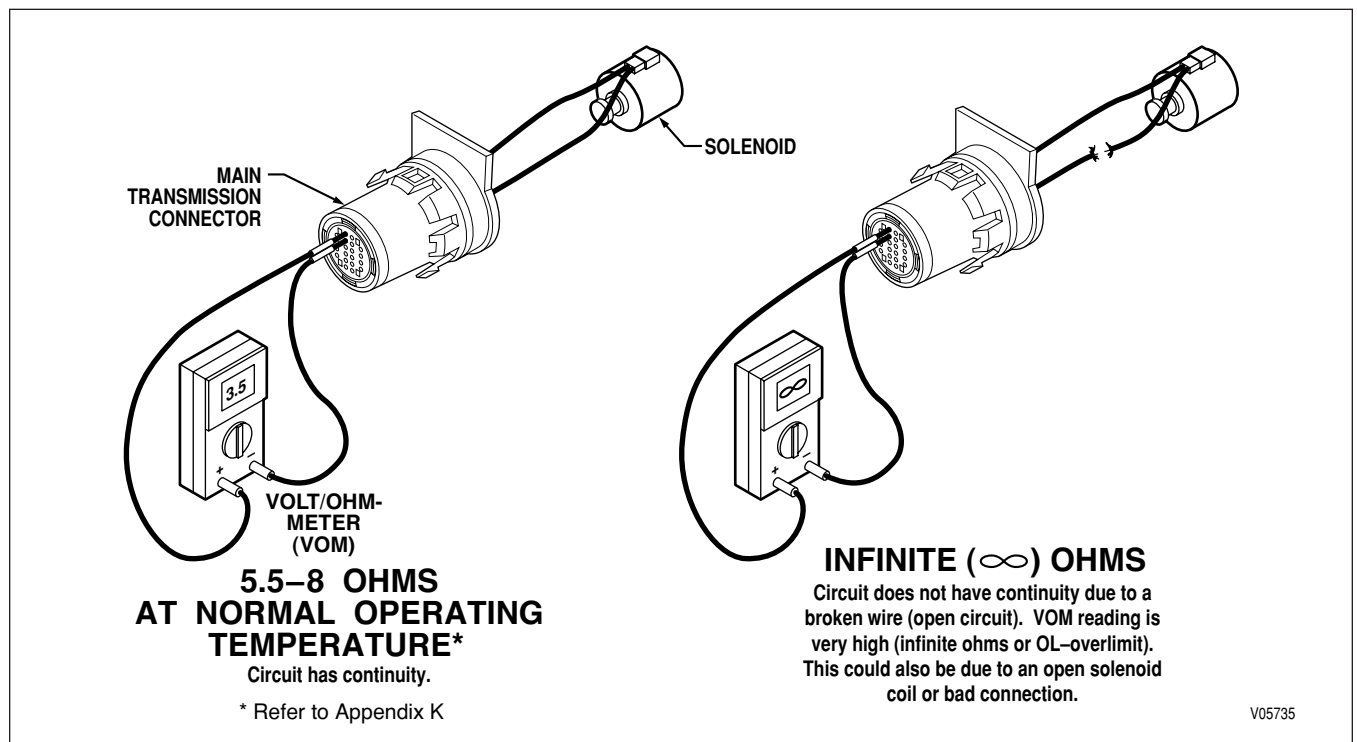


Figure 4–3. Checking Continuity (Internal Harness)

- b. If the resistance check is good, check the harness for shorts between wires and to ground by performing the following (refer to Figure 4–4):
 - (1) At the transmission connector, touch one probe of the VOM 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 VOM 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. Check the wiring diagram in Appendix J for splice locations. If the short is not a splice, then isolate and repair the short.

WIRE CHECK PROCEDURES

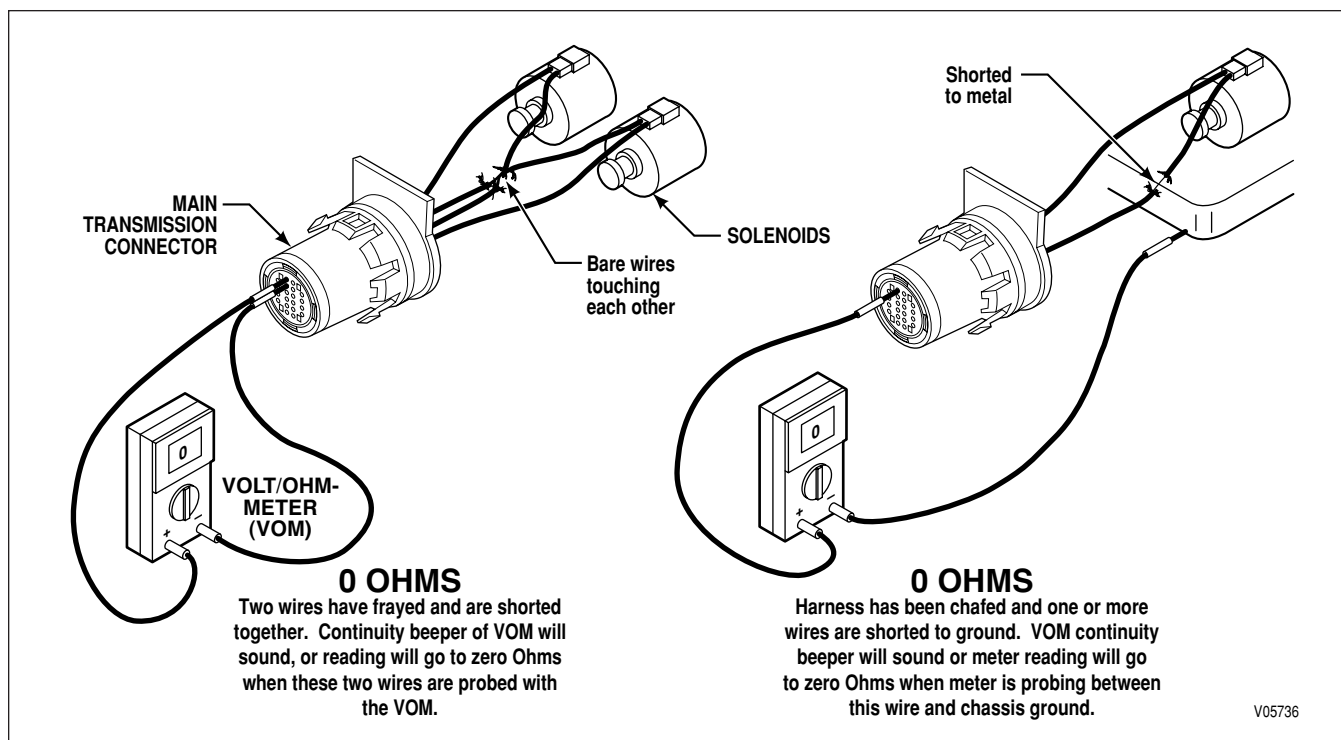


Figure 4-4. Short Between Wires and to Ground (Internal Harness)

NOTE: When conducting circuit checks that include the external harness, add one (1) Ohm to the values shown. Speed sensor resistance is 2304–2815 Ohms at 20°C (68°F).

SECTION 5—DIAGNOSTIC TROUBLE CODES (DTC)

5–1. DTC MEMORY

Diagnostic Trouble Codes (DTCs) are logged in a list in TCM memory. The DTCs contained in the list have information recorded as shown in Table 5–1 (DTCs are examples). The TCM is capable of displaying all historical and active DTCs.

Table 5–1. DTC List

Code	DTC Description	Active Indicator	CHECK TRANS Light
P0562	System Voltage Low	Y	Y
P0875	Transmission Pressure Switch Reverse Circuit	N	N
P0743	Torque Converter Clutch PWM Solenoid Circuit	N	Y
P1892	Throttle Position Sensor PWM Signal High Input	N	N

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

- A. Code.** The number assigned to a given fault condition in accordance with SAE J2012.
- B. DTC Description.** Name assigned to a given fault condition in accordance with SAE J2012.
- C. Active Indicator.** Indicates when a DTC is active. If a DTC is active, the Scan Tool displays **Y (Yes)**. If DTC is not active, **N (No)** is displayed.
- D. CHECK TRANS Light.** Indicates if **CHECK TRANS** Light/Malfunction Indicator Lamp (MIL) is illuminated.

5–2. FAILURE RECORDS

Failure records contain a snapshot of transmission data that is stored in the TCM when DTCs are logged. A limit of five failure records can be stored. When an additional DTC is logged, the new failure record pushes the oldest record from the TCM memory. Table 5–2 illustrates the failure record data stored in the TCM when a DTC is set.

Table 5–2. Failure Record Data

Data Description
Gear Selected
Gear Commanded
Current Gear
Previous Gear
Ignition Voltage
Trans Fluid Temperature (TFT)
Trans Input Shaft Speed
Trans Output Shaft Speed
Turbine Speed
Present Gear Ratio
Normalized TPS
Force Motor Solenoid A Actual Current
Force Motor Solenoid B Actual Current
Force Motor Solenoid A Pressure
Force Motor Solenoid B Pressure
TCC PWM Duty Cycle
PSM C
PSM D

DIAGNOSTIC TROUBLE CODES (DTC)

Table 5–2. Failure Record Data (*cont'd*)

Data Description
PSM E
PSM R
Shift Solenoid C
Shift Solenoid D
Shift Solenoid E
Engine Run Time

5–3. DTC READING AND DTC CLEARING

DTCs can be read and cleared by using the Allison DOC™ For PC scan tool. The use of Allison DOC™ For PC is described in the instruction manual furnished with each tool and briefly in Appendix M of this manual.

A. Clearing DTCs

- DTCs will automatically clear after 40 code-free warm-up cycles.
- DTCs can be manually cleared by the Allison DOC™ For PC.

B. Clearing Active Indicators

- A DTC's active indicator can be cleared, which removes the DTC's shift inhibitions while the DTC remains in the queue as inactive.
- The active indicator clearing method is to power down (all active indicators are cleared at TCM power down).

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. **N** (Neutral) must be manually selected.

5–4. BEGINNING THE TROUBLESHOOTING PROCESS

A. Starting Procedure

NOTE: *Review Paragraph 3–5, “Basic Troubleshooting Information” and check fluid level and ignition voltage before any troubleshooting is performed.*

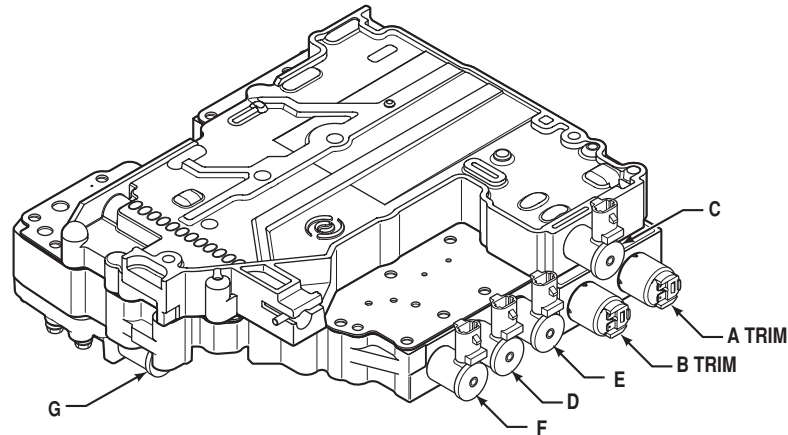
1. Begin troubleshooting by reading Paragraph 3–5, checking the transmission fluid level and the TCM input voltage. Check for DTCs by using the Allison DOC™ For PC diagnostic tool.
2. When a problem exists, but a DTC is not indicated, refer to Section 7 — General Troubleshooting Performance Complaint for a listing of various electrical and hydraulic problems, their causes, and remedies.
3. If a DTC is found in the TCM memory, record all available DTC information and failure record data before clearing the DTC (refer to Paragraph 5–3).
4. Test drive the vehicle to confirm a DTC or performance complaint.
 - If the DTC reappears, refer to the DTC paragraph (Paragraph 5–5) and the appropriate DTC table. The DTC section lists DTCs and their description. Locate the appropriate troubleshooting table and follow the instructions.
 - If the DTC does not reappear, it may be an intermittent problem. Use the Allison DOC™ For PC and the DTC display procedure described in Section 5. Refer to the troubleshooting table for possible causes of the problem.
 - Appendix A deals with the identification of potential circuit problems. Refer to Appendix A if a circuit problem is suspected.

DIAGNOSTIC TROUBLE CODES (DTC)

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 5–1. Refer to Figure 5–1 as necessary when using the DTC schematics.



V07476.01.01

Figure 5–1. Solenoid Locations

C. Wire/Terminal Numbering Scheme

Allison Transmission recommended wire numbers (i.e. 212) consist of three digits, where the first digit indicates the TCM connector number (i.e. J2=2), and the last two digits indicate the pin-out information (i.e. 12).

D. Available Diagnostic Adapters

Figures 5–2 and 5–3 show the J 43799 and J 44722 Adapters that are available for use with the J 39700 Breakout Box.

DIAGNOSTIC TROUBLE CODES (DTC)

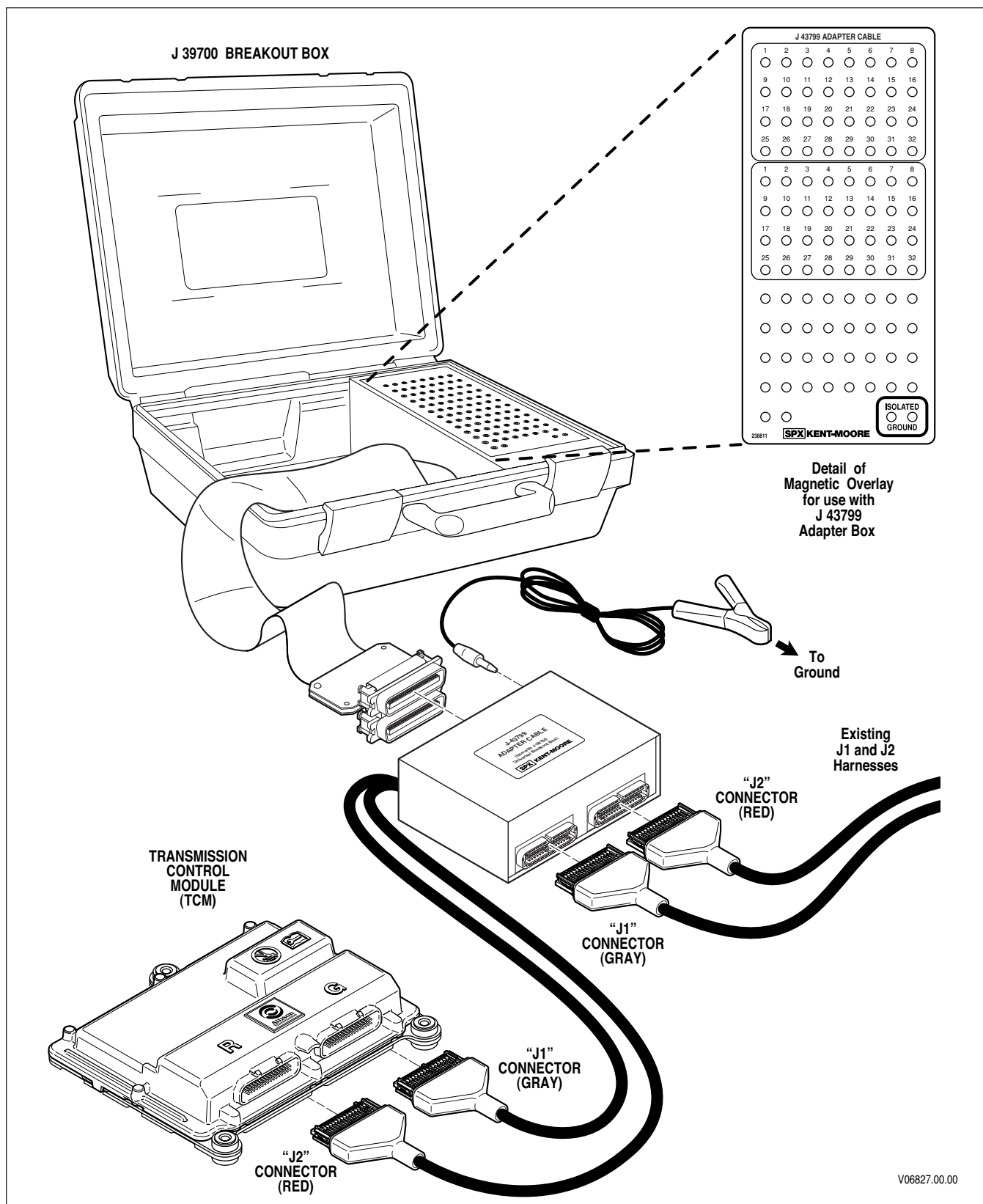


Figure 5-2. J 39700 Breakout Box And J 43799 Adapter

DIAGNOSTIC TROUBLE CODES (DTC)

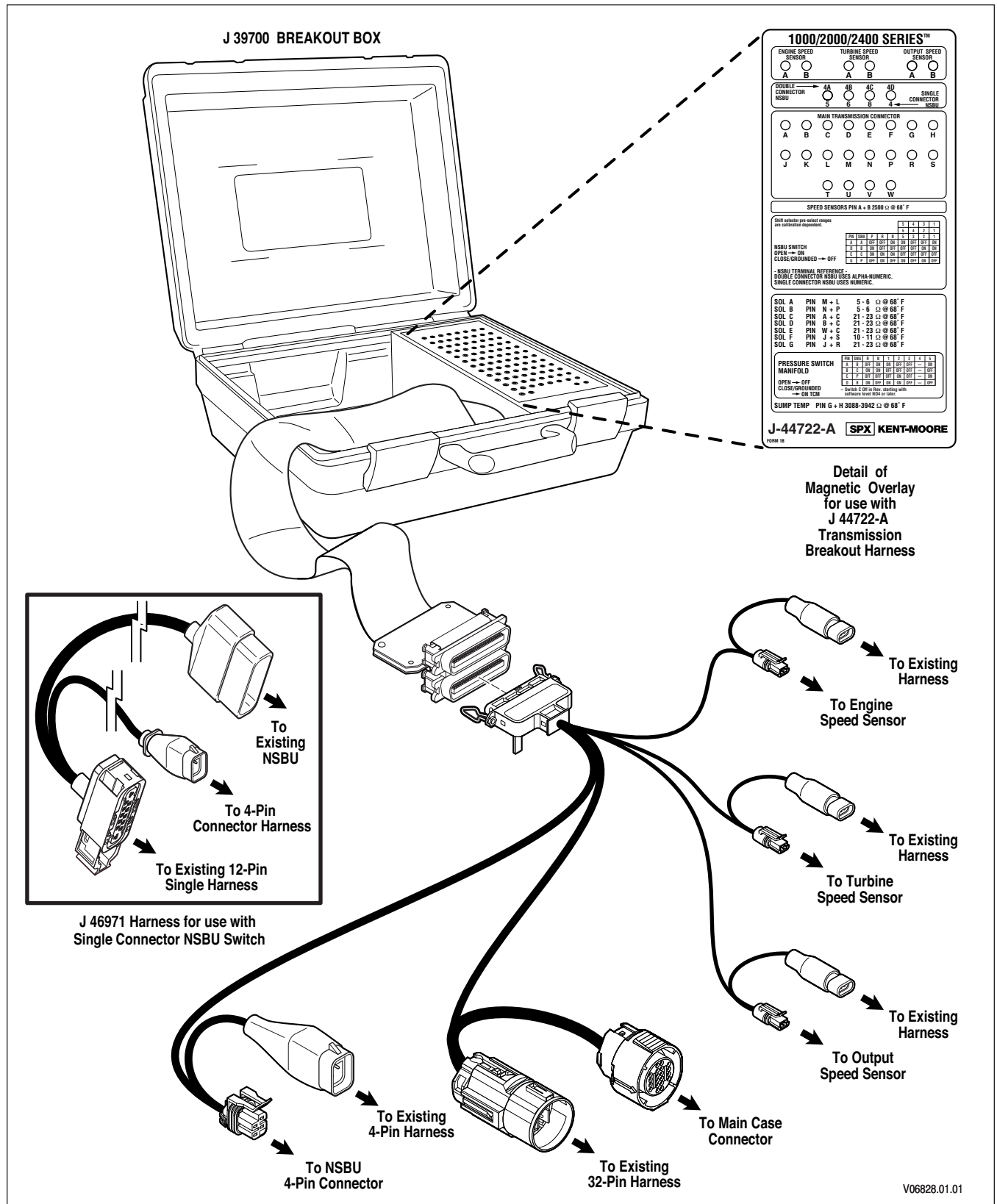


Figure 5-3. J 39700 Breakout Box And J 44722 Adapter

DIAGNOSTIC TROUBLE CODES (DTC)

5-5. DIAGNOSTIC TROUBLE CODES (DTCs)

DTC LIST AND DESCRIPTION INDEX

DTC	Description	CHECK TRANS Light	Page
P0122	Pedal Position Sensor Circuit Low Voltage	Yes	5-16
P0123	Pedal Position Sensor Circuit High Voltage	Yes	5-20
P0218	Transmission Fluid Over Temperature Condition	No	5-24
P0561	Unrealistic Variations In Vehicle System Voltage	Yes	5-27
P0562	System Voltage Low	Yes	5-31
P0563	System Voltage High	Yes	5-34
P0602	TCM Not Programmed	Yes	5-37
P0606	Controller Internal Performance—Not enabled for Pickups or med duty "04"	Yes	5-38
P0614	Torque Control Data Mismatch—ECM/TCM	Yes	5-39
P0701	Transmission Control System Performance	No	5-41
P0703	Brake Switch Circuit Malfunction—GMT800 only	No	5-43
P0705†	Transmission Range Sensor Circuit (PNRDL input) Not production enabled/could be in development calcs	N/A	
P0706†	Transmission Range Sensor Circuit (Performance) Not production enabled/could be in development calcs	N/A	
P0708	Transmission Range Sensor Circuit High Input	Yes	5-46
P0710†	Transmission Fluid Temperature Sensor Circuit Not production enabled/could be in development calcs	N/A	
P0711	Transmission Fluid Temperature Sensor Circuit Performance	No	5-50
P0712	Transmission Fluid Temperature Sensor Circuit Low Input (High Temperature)	No	5-54
P0713	Transmission Fluid Temperature Sensor Circuit High Input (Low Temperature)	No	5-58
P0716	Turbine Speed Sensor Circuit Performance	Yes	5-62
P0717	Turbine Speed Sensor Circuit No Signal	Yes	5-65
P0719	Brake Switch ABS Input Low	N/A	5-69
P0721	Output Speed Sensor Circuit Performance	Yes	5-71
P0722	Output Speed Sensor Circuit No Signal	Yes	5-75
P0726	Engine Speed Input Circuit Performance	No	5-79
P0727	Engine Speed Input Circuit No Signal	No	5-82
P0731	Incorrect 1st Gear Ratio	Yes	5-85
P0732	Incorrect 2nd Gear Ratio	Yes	5-88
P0733	Incorrect 3rd Gear Ratio	Yes	5-91
P0734	Incorrect 4th Gear Ratio	Yes	5-94
P0735	Incorrect 5th Gear Ratio	Yes	5-97
P0736	Incorrect Reverse Ratio	Yes	5-100
P0741	Torque Converter Clutch System Stuck Off	Yes	5-104
P0742	Torque Converter Clutch System Stuck On	Yes	5-107
P0743	Torque Converter Clutch PWM Solenoid Circuit—Electrical (Previously P1860)	Yes	5-110
P0746	Solenoid A Controlled Clutch Stuck Off (Previously P1720)	Yes	5-115
P0747	Solenoid A Controlled Clutch Stuck On (Previously P1723)	Yes	5-118
P0748	Pressure Control Solenoid A Electrical	Yes	5-121
P0763	Shift Solenoid C Electrical	Yes	5-126

DIAGNOSTIC TROUBLE CODES (DTC)

DTC LIST AND DESCRIPTION INDEX *(cont'd)*

DTC	Description	CHECK TRANS Light	Page
P0768	Shift Solenoid D Electrical	Yes	5-131
P0773	Shift Solenoid E Electrical	Yes	5-135
P0776	Solenoid B Controlled Clutch Stuck Off (Previously P1721)	Yes	5-139
P0777	Solenoid B Controlled Clutch Stuck On (Previously P1724)	Yes	5-142
P0778	Pressure Control Solenoid B Electrical	Yes	5-145
P0840	Transmission Pressure Switch Solenoid C Circuit	Yes	5-150
P0841	Transmission Pressure Switch Solenoid C Circuit Stuck Open	Yes	5-155
P0842	Transmission Pressure Switch Solenoid C Circuit Stuck Closed	Yes	5-160
P0843	Transmission Pressure Switch Solenoid C Circuit High	Yes	5-165
P0845	Transmission Pressure Switch Solenoid D Circuit	Yes	5-170
P0846	Transmission Pressure Switch Solenoid D Circuit Stuck Open	Yes	5-175
P0847	Transmission Pressure Switch Solenoid D Circuit Stuck Closed	Yes	5-180
P0848	Transmission Pressure Switch Solenoid D Circuit High	Yes	5-185
P0870	Transmission Pressure Switch Solenoid E Circuit (Previously P1709)	Yes	5-190
P0871	Transmission Pressure Switch Solenoid E Circuit Stuck Open (Previously P1710)	Yes	5-195
P0872	Transmission Pressure Switch Solenoid E Circuit Stuck Closed (Previously P1711)	Yes	5-200
P0873	Transmission Pressure Switch Solenoid E Circuit High (Previously P1712)	Yes	5-205
P0875	Transmission Reverse Pressure Switch Circuit Malfunction (Previously P1713)	Yes	5-210
P0876	Transmission Reverse Pressure Switch Circuit Stuck Open (Previously P1714) Not production enabled/could be in development calcs	Yes	5-215
P0877†	Transmission Reverse Pressure Switch Circuit Stuck Closed (Previously P1715) Not production enabled/could be in development calcs	N/A	
P0878†	Transmission Reverse Pressure Switch Circuit High (Previously P1716) Not production enabled/could be in development calcs	N/A	
P0880	TCM Supply Voltage (Previously P1760)	No	5-220
P0960†	Pressure Control Solenoid Control Circuit Not production enabled/could be in development calcs	N/A	
P1688	Unmanaged Engine Torque Delivered To TCM Signal	See Note	5-223
P1709	See DTC P0870		5-190
P1710	See DTC P0871		5-195
P1711	See DTC P0872		5-200
P1712	See DTC P0873		5-205
P1713	See DTC P0875		5-210
P1714	See DTC P0876		5-215
P1715	See DTC P0877		
P1716	See DTC P0878		
P1720	See DTC P0746		5-115
P1721	See DTC P0776		5-139
P1723	See DTC P0747		5-118
P1724	See DTC P0777		5-142
P1760	See DTC P0880		5-220
P1779	Engine Torque Delivered To TCM Signal	See Note	5-225

DIAGNOSTIC TROUBLE CODES (DTC)**DTC LIST AND DESCRIPTION INDEX** *(cont'd)*

DTC	Description	CHECK TRANS Light	Page
P1860	See DTC P0743		5–110
P1891	Throttle Position Sensor Pulse Width Modulation (PWM) Signal Low Input	No	5–227
P1892	Throttle Position Sensor Pulse Width Modulation (PWM) Signal High Input	No	5–230
P2771	Four-Wheel Drive Switch Circuit (Previously P0836, P1875)	Yes	5–233
P2773	Torque Control Request Ignored—ECM/TCM	Yes	5–237
P2810	Solenoid G Electrical	Yes	5–239
U0031	J1850 (Class 2) Serial Data Communication Link Low (Previously U1300)	No	5–244
U0032	J1850 (Class 2) Serial Data Communication Link High (Previously U1301)	No	5–247
U0073	CAN Bus Reset Counter Overrun (Previously U2104)	Yes	5–250
U0100	CAN Bus ECM Error (Previously U2105)	Yes	5–253
U1000	Class 2 Loss of Serial Data Communication		5–256
U1016	J1850 (Class 2) Powertrain Controller State of Health Failure	No *	5–256
U1041	J1850 (Class 2) ABS Controller State of Health Failure	No *	5–256
U1064	J1850 (Class 2) TBC Controller State of Health Failure	No *	5–256
U1096	J1850 (Class 2) IPC Controller State of Health Failure	No *	5–256
U1300	See DTC U0031		5–244
U1301	See DTC U0032		5–247
U2104	See DTC U0073		5–250
U2105	See DTC U0100		5–253

* Enabled for MY2001 Non-OBV Vehicles.

† Call Technical Assistance Center (TAC) at 1-800-252-5283 for further information.

NOTE: *Used with GM gasoline engine applications only—CHECK TRANS light will illuminate.***DTC REFERENCE TABLES****Gear Ratio Table**

Range	1000 Product Family Gear Ratio	2000 Product Family Gear Ratio
1	3.10:1	3.51:1
2	1.81:1	1.90:1
3	1.41:1	1.44:1
4	1.00:1	1.00:1
5	0.71:1	0.74:1
R	–4.49:1	–5.09:1

Main Pressure Schedule Table (Used Prior To S/N 6310004116)

Range	Main Pressure @ 600 rpm	Main Pressure @ 2100 rpm
Forward Converter	800–1380 kPa (115–200 psi)	1515–1795 kPa (220–260 psi)
Forward Lockup	—	1000–1170 kPa (145–170 psi)
Reverse	800–1380 kPa (115–200 psi)	1515–1795 kPa (220–260 psi)
Neutral/Park	900–1655 kPa (130–240 psi)	1515–1795 kPa (220–260 psi)

DIAGNOSTIC TROUBLE CODES (DTC)

Main Pressure Schedule Table (Used Starting With S/N 6310004116)

Range	Main Pressure @ 600 rpm	Main Pressure @ 2100 rpm
Forward Converter	700–1380 kPa (102–200 psi)	1515–1795 kPa (220–260 psi)
Forward Lockup	—	1000–1170 kPa (145–170 psi)
Reverse	700–1380 kPa (102–200 psi)	1515–1795 kPa (220–260 psi)
Neutral/Park	800–1655 kPa (116–240 psi)	1515–1795 kPa (220–260 psi)

Modulated Main Pressure Schedule (Transmissions with Modulated Main G Solenoid)

Range	Main Pressure @ 600 rpm	Main Pressure @ 2100 rpm
Forward/Reverse Converter with G Solenoid Active (viewable in Allison DOC™)	590–720 kPa (85–105 psi)	634–758 kPa (92–110 psi)
Forward Converter with G Solenoid Inactive	700–1380 kPa (101–200 psi)	1515–1795 kPa (220–260 psi)
Forward Lockup with G Solenoid Active*	—	510–627 kPa (74–91 psi)
Forward Lockup with G Solenoid Inactive*	—	1000–1170 kPa (145–170 psi)
Neutral/Park with G Solenoid Active	590–720 kPa (85–105 psi)	—
Neutral/Park	800–1655 kPa (130–240 psi)	1515–1795 kPa (220–260 psi)

* Medium duty gasoline engines only.

NSBU Switch Table

Selector Position			A	B	C	P
	P		OFF	ON	ON	OFF
	R		OFF	OFF	ON	ON
	N		ON	OFF	ON	OFF
5	5	5	ON	OFF	OFF	ON
3	4	4	OFF	OFF	OFF	OFF
2	2	3	OFF	ON	OFF	ON
1	1	1	ON	ON	OFF	OFF

ON = Open Circuit

OFF = Grounded Circuit

The NSBU Switch has only four positions available in the forward ranges. Therefore, one range position will be omitted at the selector. This position may be 2nd, 3rd, 4th, or 5th range depending upon chosen calibration.

DIAGNOSTIC TROUBLE CODES (DTC)

Solenoid and Clutch Table — Software Levels Prior To N04

Range Status	Logic	Clutch To Main	Trim Solenoids		Shift Solenoids			TCC Sol
			A	B	C	D	E	F
Steady State	R	—	De-energized; C3 Applied	Energized; C5 Applied	ON	ON	ON	OFF
Garage Shift	R–N	—	De-energizing; C3 Trimming Off	Energizing; C5 Applied	ON	ON	ON	OFF
Garage Shift	N–R	—	Energizing; C3 Trimming On	Energizing; C5 Applied	ON	ON	ON	OFF
Steady State	N	—	De-energized; C5 Applied	De-energized; Exhausted	ON	ON	ON	OFF
Garage Shift	N–1	—	De-energizing; C5 Applied	Energizing; C1 Trimming On	ON	ON	ON	OFF
Garage Shift	1–N	—	De-energizing; C5 Applied	Energizing; C1 Trimming Off	ON	ON	ON	OFF
Steady State	1	C1	De-energized; C5 Applied	De-energized; C4 Exhausted	OFF	ON	OFF	OFF
Upshift	1–2	C1	Energizing; C5 Trimming Off	Energizing; C4 Trimming On	OFF	ON	OFF	OFF
Downshift	2–1	C1	Energizing; C5 Trimming On	Energizing; C4 Trimming Off	OFF	ON	OFF	OFF
Steady State	2	C1	Energized; C3 Exhausted	Energized; C4 Applied	OFF	OFF	OFF	ON or OFF *
Upshift	2–3	C1	De-energizing; C3 Trimming On	De-energizing; C4 Trimming Off	OFF	OFF	OFF	ON
Downshift	3–2	C1	De-energizing; C3 Trimming Off	De-energizing; C4 Trimming On	OFF	OFF	OFF	ON
Steady State	3	C1	De-energized; C3 Applied	De-energized; C2 Exhausted	ON	OFF	OFF	ON
Upshift	3–4	C1	Energizing; C3 Trimming Off	Energizing; C2 Trimming On	ON	OFF	OFF	ON
Downshift	4–3	C1	Energizing; C3 Trimming On	Energizing; C2 Trimming Off	ON	OFF	OFF	ON
Steady State	4	C2	Energized; C3 Exhausted	Energized; C1 Applied	ON	OFF	ON	ON
Upshift	4–5	C2	De-energizing; C3 Trimming On	De-energizing; C1 Trimming Off	ON	OFF	ON	ON
Downshift	5–4	C2	De-energizing; C3 Trimming Off	De-energizing; C1 Trimming On	ON	OFF	ON	ON
Steady State	5	C2	De-energized; C3 Applied	De-energized	OFF	OFF	ON	ON

* Depending upon output speed

DIAGNOSTIC TROUBLE CODES (DTC)

Solenoid and Clutch Table — Software Level N04 And Later

Range Status	Logic	ClutchTo Main	Trim Solenoids		Shift Solenoids			TCC Sol
			A	B	C	D	E	F
Steady State with Throttle	R	—	De-energized; C3 Applied	Energized; C5 Applied	ON	ON	ON	OFF
Steady State at Closed Throttle	R	—	De-energized; C5 Applied	Energized; C3 Applied	OFF	ON	ON	OFF
Garage Shift	R–N	—	De-energizing; C3 Trimming Off	Energizing; C5 Applied	OFF	ON	ON	OFF
Garage Shift	N–R	—	Energizing; C3 Trimming On	Energizing; C5 Applied	OFF	ON	ON	OFF
Steady State	N	—	De-energized; C5 Applied	De-energized; Exhausted	ON	ON	ON	OFF
Garage Shift	N–1	—	De-energizing; C5 Applied	Energizing; C1 Trimming On	ON	ON	ON	OFF
Garage Shift	1–N	—	De-energizing; C5 Applied	Energizing; C1 Trimming Off	ON	ON	ON	OFF
Steady State	1	C1	De-energized; C5 Applied	De-energized; C4 Exhausted	OFF	ON	OFF	OFF
Upshift	1–2	C1	Energizing; C5 Trimming Off	Energizing; C4 Trimming On	OFF	ON	OFF	OFF
Downshift	2–1	C1	Energizing; C5 Trimming On	Energizing; C4 Trimming Off	OFF	ON	OFF	OFF
Steady State	2	C1	Energized; C3 Exhausted	Energized; C4 Applied	OFF	OFF	OFF	ON or OFF **
Upshift	2–3	C1	De-energizing; C3 Trimming On	De-energizing; C4 Trimming Off	OFF	OFF	OFF	ON
Downshift	3–2	C1	De-energizing; C3 Trimming Off	De-energizing; C4 Trimming On	OFF	OFF	OFF	ON
Steady State	3	C1	De-energized; C3 Applied	De-energized; C2 Exhausted	ON	OFF	OFF	ON
Upshift	3–4	C1	Energizing; C3 Trimming Off	Energizing; C2 Trimming On	ON	OFF	OFF	ON
Downshift	4–3	C1	Energizing; C3 Trimming On	Energizing; C2 Trimming Off	ON	OFF	OFF	ON
Steady State	4	C2	Energized; C3 Exhausted	Energized; C1 Applied	ON	OFF	ON	ON
Upshift	4–5	C2	De-energizing; C3 Trimming On	De-energizing; C1 Trimming Off	ON	OFF	ON	ON
Downshift	5–4	C2	De-energizing; C3 Trimming Off	De-energizing; C1 Trimming On	ON	OFF	ON	ON
Steady State	5	C2	De-energized; C3 Applied	De-energized	OFF	OFF	ON	ON

Beginning with N04 software level, the following throttle-dependent conditions occur in Reverse range:

At closed throttle (idle), C solenoid is OFF, A trim solenoid controls C-5 clutch, and B solenoid controls C-3 clutch.

Above 20 percent throttle*, C solenoid is ON, A trim solenoid controls C-3 clutch, and B solenoid controls C-5.

Under 10 percent throttle*, the TCM reverts to the closed throttle (idle) schedule.

* Values are calibration dependent

** Depending upon output speed

DIAGNOSTIC TROUBLE CODES (DTC)

Pressure Switch Status Table — Software Levels Prior To N04

Range	Pressure Switch C (N/O)		Pressure Switch D (N/O)		Pressure Switch E (N/O)		Pressure Switch R (N/C)	
	Switch Status	Scan Tool Status	Switch Status	Scan Tool Status	Switch Status	Scan Tool Status	Switch Status	Scan Tool Status
R	Closed	ON	Closed	ON	Closed	ON	Closed	ON
N	Closed	ON	Closed	ON	Closed	ON	Open	OFF
1	Open	OFF	Closed	ON	Open	OFF	Open	OFF
2	Open	OFF	Open	OFF	Open	OFF	Open	OFF
3	Closed	ON	Open	OFF	Open	OFF	Open	OFF
4	Closed	ON	Open	OFF	Closed	ON	Open	OFF
5	Open	OFF	Open	OFF	Closed	ON	Open	OFF
N/O = Normally Open/N/C = Normally Closed								

Pressure Switch Status Table — Software Level N04 And Later

Range	Pressure Switch C (N/O)		Pressure Switch D (N/O)		Pressure Switch E (N/O)		Pressure Switch R (N/C)	
	Switch Status	Scan Tool Status	Switch Status	Scan Tool Status	Switch Status	Scan Tool Status	Switch Status	Scan Tool Status
R	Open	OFF*	Closed	ON	Closed	ON	Closed	ON
N	Closed	ON	Closed	ON	Closed	ON	Open	OFF
1	Open	OFF	Closed	ON	Open	OFF	Open	OFF
2	Open	OFF	Open	OFF	Open	OFF	Open	OFF
3	Closed	ON	Open	OFF	Open	OFF	Open	OFF
4	Closed	ON	Open	OFF	Closed	ON	Open	OFF
5	Open	OFF	Open	OFF	Closed	ON	Open	OFF
N/O = Normally Open/N/C = Normally Closed								
* C pressure switch reverts to the CLOSED/ON state with throttle applied in Reverse.								

Solenoid Resistance vs. Temperature Table

Sump Temperature		Solenoid A, B Resistance	Solenoid C, D, E, G Resistance	Solenoid F Resistance
(°C)	(°F)	(Ω)	(Ω)	(Ω)
0	32	4.5	20.0	9.5
20	68	5.5	22.0	10.5
40	104	6.5	24.5	11.5
80	176	7.5	27.0	12.5
120	248	8.5	29.5	13.5

DIAGNOSTIC TROUBLE CODES (DTC)

Speed Sensor Resistance vs. Temperature Table

Temperature (°C)	Temperature (°F)	Minimum Resistance (Ω)	Nominal Resistance (Ω)	Maximum Resistance (Ω)
-25	-13	1929	2143	2358
0	32	2157	2397	2637
25	77	2340	2600	2860
50	122	2614	2904	3195
75	167	2842	3158	3474
100	212	3071	3412	3753
125	257	3299	3666	4032
150	302	3483	3870	4257

Transmission Fluid Temperature (TFT) Sensor Resistance vs. Temperature Table

Temperature (°C)	Temperature (°F)	Minimum Resistance (Ω)	Nominal Resistance (Ω)	Maximum Resistance (Ω)
-45	-49	128 565	141 951	155 338
-40	-40	95 826	100 735	105 644
-35	-31	68 952	72 315	75 679
-30	-22	50 153	52 480	54 807
-25	-13	36 854	38 478	40 103
-20	-4	27 345	28 488	29 631
-15	5	20 476	21 286	22 097
-10	14	15 467	16 045	16 624
-5	23	11 781	12 197	12 612
0	32	9045	9345	9646
5	41	6998	7219	7441
10	50	5458	5623	5787
15	59	4291	4413	4536
20	68	3398	3490	3582
25	77	2710	2779	2849
30	86	2173	2228	2282
35	95	1754	1797	1840
40	104	1424	1459	1493
45	113	1163	1191	1218
50	122	955.0	977.1	999.2
55	131	788.6	806.5	824.5

DIAGNOSTIC TROUBLE CODES (DTC)

Transmission Fluid Temperature (TFT) Sensor Resistance vs. Temperature Table (*cont'd*)

Temperature (°C)	Temperature (°F)	Minimum Resistance (Ω)	Nominal Resistance (Ω)	Maximum Resistance (Ω)
60	140	654.7	669.3	683.9
65	149	546.3	558.3	570.2
70	158	458.1	467.9	477.8
75	167	385.9	394.1	402.2
80	176	326.6	333.3	340.1
85	185	277.5	283.2	288.9
90	194	236.5	241.6	246.7
95	203	202.4	206.9	211.5
100	212	173.8	177.9	182.0
105	221	149.8	153.6	157.3
110	230	129.7	133.0	136.4
115	239	112.6	115.6	118.7
120	248	98.17	100.88	103.6
125	257	85.87	88.29	90.71
130	266	75.35	77.52	79.69
135	275	66.34	68.27	70.21
140	284	58.58	60.31	62.04
145	293	51.88	53.42	54.97
150	302	46.08	47.46	48.84
155	311	41.04	42.27	43.50
160	320	36.65	37.74	38.84

TPS Table (Distance (mm) of Travel vs. Volts)

mm	Volts
0	0
1	0.110
2	0.220
3	0.329
4	0.439
5	0.549
6	0.659
7	0.768
8	0.878
9	0.988
10	1.098
11	1.207

mm	Volts
12	1.317
13	1.427
14	1.537
15	1.646
16	1.756
17	1.866
18	1.976
19	2.085
20	2.195
21	2.305
22	2.415
23	2.524

mm	Volts
24	2.634
25	2.744
26	2.854
27	2.964
28	3.073
29	3.183
30	3.293
31	3.403
32	3.512
33	3.622
34	3.732
35	3.842

mm	Volts
36	3.951
37	4.061
38	4.171
39	4.281
40	4.390
41	4.500
42	4.610
43	4.720
44	4.829
45	4.939
46	5.049

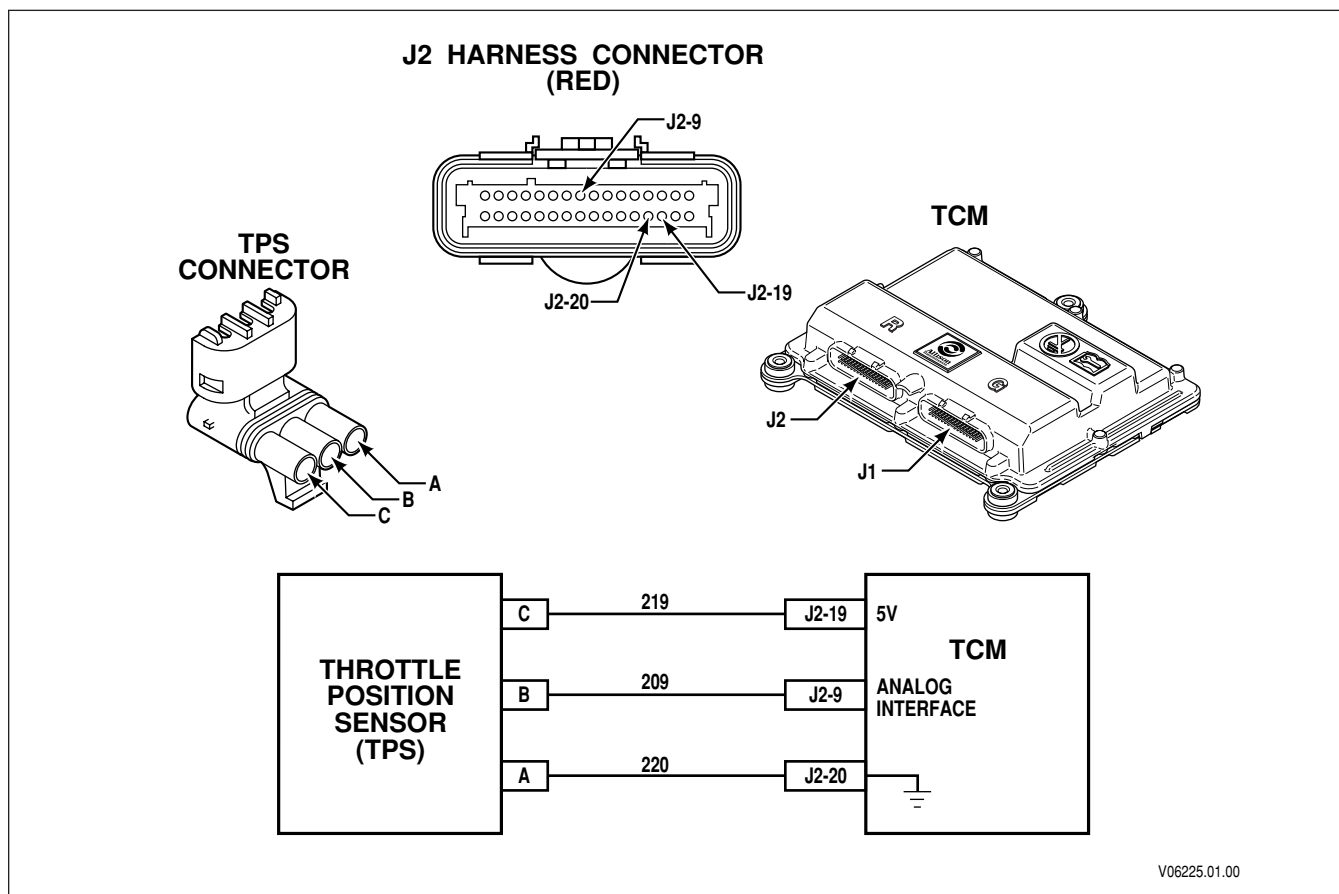
DIAGNOSTIC TROUBLE CODES (DTC)

Clutch Test Failure Table

Range — Clutches Applied	C1 Failure	C2 Failure	C3 Failure	C4 Failure	C5 Failure
*Reverse / C3 and C5			N _T > 0 in 3rd and 5th		N _T > 0 in 1st only
First / C1 and C5	N _T > 0 in 1st and 4th				N _T > 0 in 1st only
Second / C1 and C4	N _T > 0 in 1st and 4th			N _T > 0 in 4th only	
Third / C1 and C3	N _T > 0 in 1st and 4th		N _T > 0 in 3rd only		
Fourth / C1 and C2	N _T > 0 in 1st and 4th	N _T > 0 in 4th and 5th			
Fifth / C 2 and C3		N _T > 0 in 4th and 5th	N _T > 0 in 3rd and 5th		
* CAUTION: Reverse is not attainable in clutch test mode. Do not stall transmission in Reverse or driveline damage may occur. NOTE: N_T is transmission turbine speed observed during clutch test					

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0122 Pedal Position Sensor Circuit Low Voltage



V06225.01.00

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 0.178 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 18V and less than 32V (24V TCM).
- DTC P0123 Pedal Position Sensor Circuit High Voltage is not active.

DIAGNOSTIC TROUBLE CODES (DTC)

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

- DTC P0122 is stored in the TCM history.
- The TCM uses the default throttle value.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.
- The **CHECK TRANS** light is illuminated.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.

Test Description

The numbers below refer to the 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 reference voltage from TCM.
5. This step tests for dead spots in the TPS rheostat.
6. This step tests for a high or low resistance in the TPS internal circuit.
7. This step tests for a harness-wiring problem.

DTC P0122 Pedal Position Sensor Circuit Low Voltage

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Refer to Appendix F to check for proper TPS adjustment. Is the TPS adjusted properly?	—	<i>Go to Step 3</i>	<i>Adjust TPS to proper setting. Go to Step 11</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0122 Pedal Position Sensor Circuit Low Voltage

Step	Action	Value(s)	Yes	No
3	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	Go to Step 4	Resolve voltage problem (Refer to DTC P0562 and P0563)
4	1. Turn the ignition OFF. 2. Disconnect the J2 connector from the TCM and install the J43799 adapter box. 3. Reconnect the J2 connector to the adapter box. With the engine OFF, turn the ignition to the ON position. 4. Using a DVOM, measure the voltage between pins 19 and 20. Is the voltage within the specified value?	4.75–5.0V	Go to Step 5	Go to Step 10
5	1. With the engine OFF and the ignition in the ON position, monitor throttle percentage with the Scan Tool. 2. Slowly increase the throttle from Idle to the full throttle position. 3. Watch for a steady increase in throttle percentage. Was the throttle percentage steady and without interruptions?	—	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Disconnect the TPS connector. 3. Using a DVOM, measure the resistance at pins A and C. Is resistance within the specified value?	9,000–15,000 Ohms	Go to Step 7	Go to Step 9
7	1. Reconnect the TPS connector. 2. Disconnect J2 connector from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 19 and 20. Is resistance within the specified value?	9,000–15,000 Ohms	Go to Diagnostic Aids	Go to Step 8
8	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 10	—
9	Replace the throttle position sensor. Is the replacement complete?	—	Go to Step 11	—

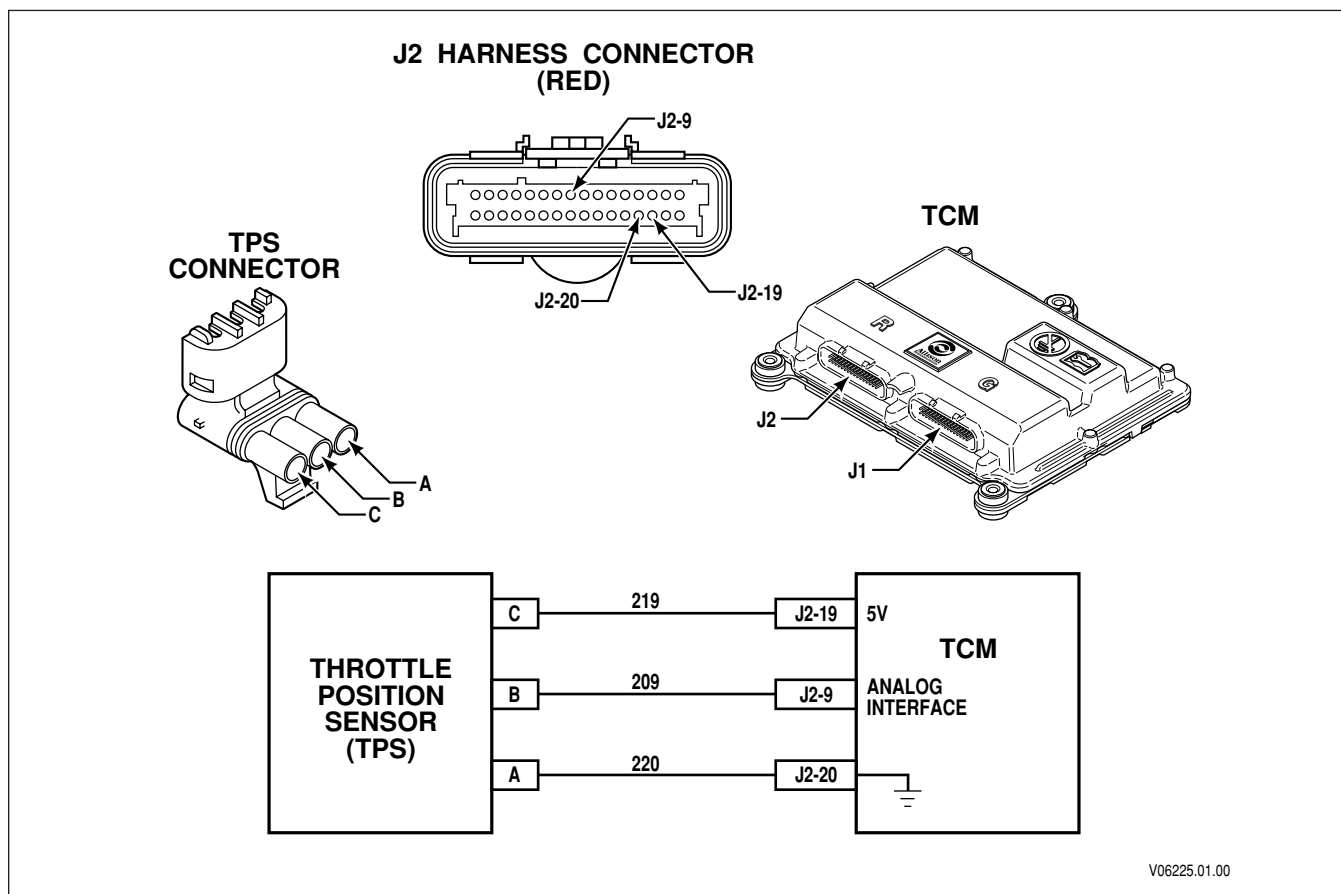
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0122 Pedal Position Sensor Circuit Low Voltage

Step	Action	Value(s)	Yes	No
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—
11	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 Circuit 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 0.178 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 18V and less than 32V (24V TCM).
- DTC P0122 Throttle/Pedal Position Sensor/Switch A Circuit Low Input is not active.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

- DTC P0123 is stored in the TCM history.
- The TCM uses the default throttle value.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.
- The **CHECK TRANS** light is illuminated.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.

Test Description

The numbers below refer to the 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 reference voltage from TCM.
5. This step tests for dead spots in the TPS rheostat.
6. This step tests for a high or low resistance in the TPS internal circuit.
7. This step tests for a harness-wiring problem.

DTC P0123 Pedal Position Sensor Circuit High Voltage

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Refer to Appendix F to check for proper TPS adjustment. Is the TPS adjusted properly?	—	<i>Go to Step 3</i>	<i>Adjust TPS to proper setting. Go to Step 11</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0123 Pedal Position Sensor Circuit High Voltage

Step	Action	Value(s)	Yes	No
3	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	Go to Step 4	Resolve voltage problem (Refer to DTC P0562 and P0563)
4	1. Turn the ignition OFF. 2. Disconnect the J2 connector from the TCM and install the J43799 adapter box. 3. Reconnect the J2 connector to the adapter box. With the engine OFF, turn the ignition to the ON position. 4. Using a DVOM, measure the voltage between pins 19 and 20. Is the voltage within the specified value?	4.75–5.0V	Go to Step 5	Go to Step 10
5	1. With the engine OFF and the ignition in the ON position, monitor throttle percentage with the Scan Tool. 2. Slowly increase the throttle from Idle to the full throttle position. 3. Watch for a steady increase in throttle percentage. Was the throttle percentage steady and without interruptions?	—	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Disconnect the TPS connector. 3. Using a DVOM, measure the resistance at pins A and C. Is resistance within the specified value?	9,000–15,000 Ohms	Go to Step 7	Go to Step 9
7	1. Reconnect the TPS connector. 2. Disconnect J2 connector from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 19 and 20. Is resistance within the specified value?	9,000–15,000 Ohms	Go to Diagnostic Aids	Go to Step 8
8	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 10	—
9	Replace the throttle position sensor. Is the replacement complete?	—	Go to Step 11	—

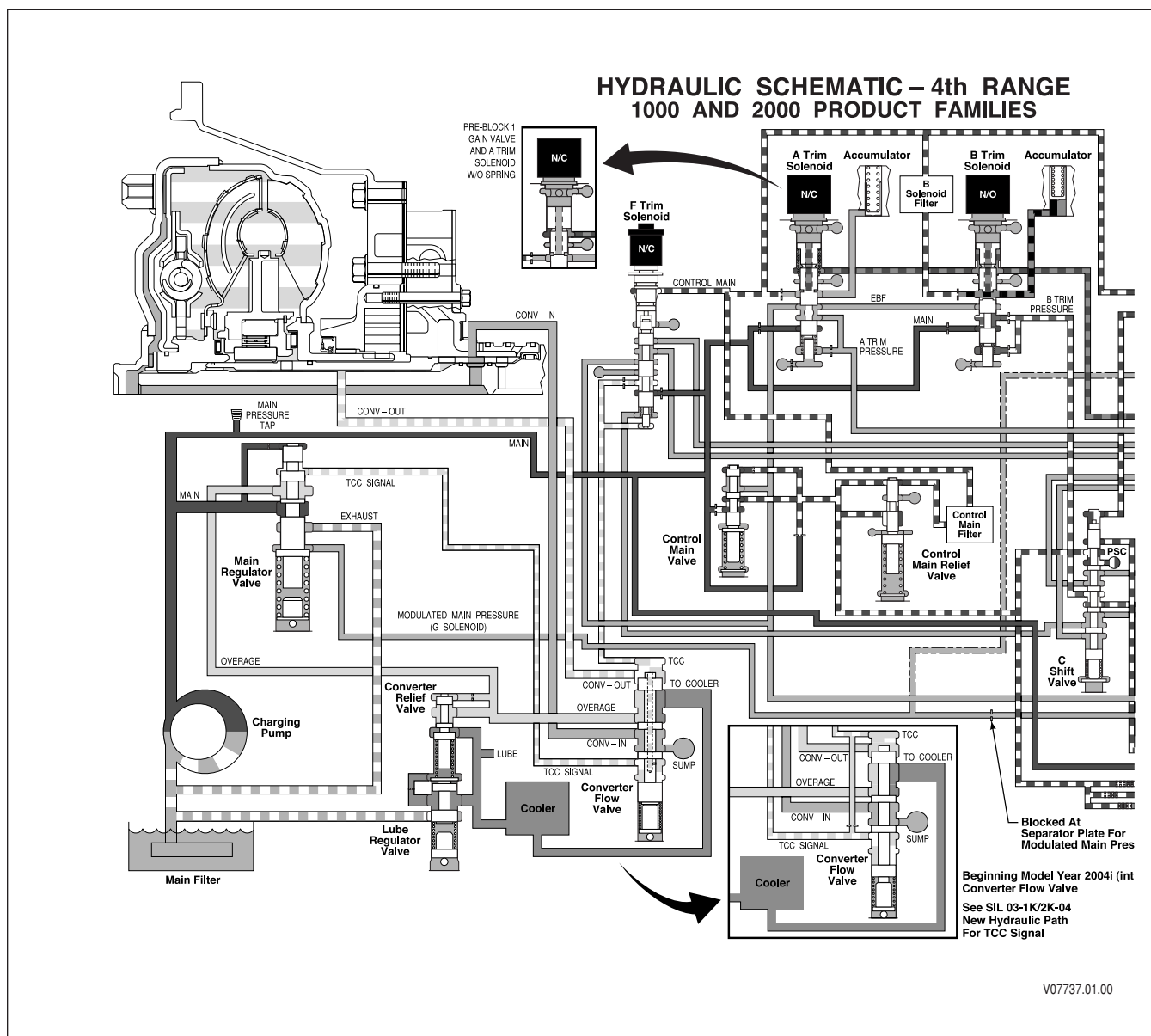
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0123 Pedal Position Sensor Circuit High Voltage

Step	Action	Value(s)	Yes	No
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—
11	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 Condition



Circuit Description

The flow of transmission fluid starts in the transmission pan. Fluid is then drawn through the filter and internal passages into the oil pump assembly. The oil pump pressurizes the fluid into main-pressure that is regulated at the main-pressure regulator valve. From this point, fluid is directed to the F trim solenoid and to the control-main regulator and control-main relief valve into the control-main filter assembly and on to all solenoids for use as control pressure. Hot fluid leaving the torque converter is routed through the converter flow valve to cooler lines and into the cooler assembly. The transmission oil cooler is located in the radiator. The vehicle may be equipped with an auxiliary oil cooler. The cooled fluid is returned to the transmission through the return cooler line and to the transmission lube circuit. The automatic transmission fluid temperature (TFT) sensor, which is part of the PSM, is located in the oil pan.

If the Transmission Control Module (TCM) detects a high TFT for an extended period of time, then DTC P0218 sets.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Running the DTC

- DTCs P0711, P0712, P0713 are not active.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm for more than 5 seconds.

Conditions for Setting the DTC

DTC P0218 sets when the TCM detects a transmission sump temperature greater than 126°C (252°F) for 10 seconds.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- The TCM freezes shift adapts (DNA).
- The TCM records the operating conditions when the conditions for setting the DTC are met. The TCM stores this information as Failure Records.
- DTC P0218 is stored in the TCM history.
- The TCM defaults to “hot mode” shift schedule where 4th-range is held and TCC is inhibited to increase engine speed and improve cooler flow.

Conditions for Clearing the DTC/CHECK TRANS Light

- A Scan Tool may be used to clear the code from the TCM history.
- The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.
- The TCM cancels the DTC default actions when the fault no longer exists and the DTC passes test.

Diagnostic Aids

- Verify the customer's driving habits, such as trailer towing, etc.
- The Scan Tool transmission fluid temperature (TFT) 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 for DTC P0218. Repairing the condition that set DTC P0711 will likely eliminate DTC P0218.

Test Description

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

3. This step inspects for air restriction and loss of transmission fluid flow, causing an extremely high TFT.
4. This step tests main-pressure.
5. This step inspects for a stuck torque converter stator.

DTC P0218 Transmission Fluid Over Temperature Condition

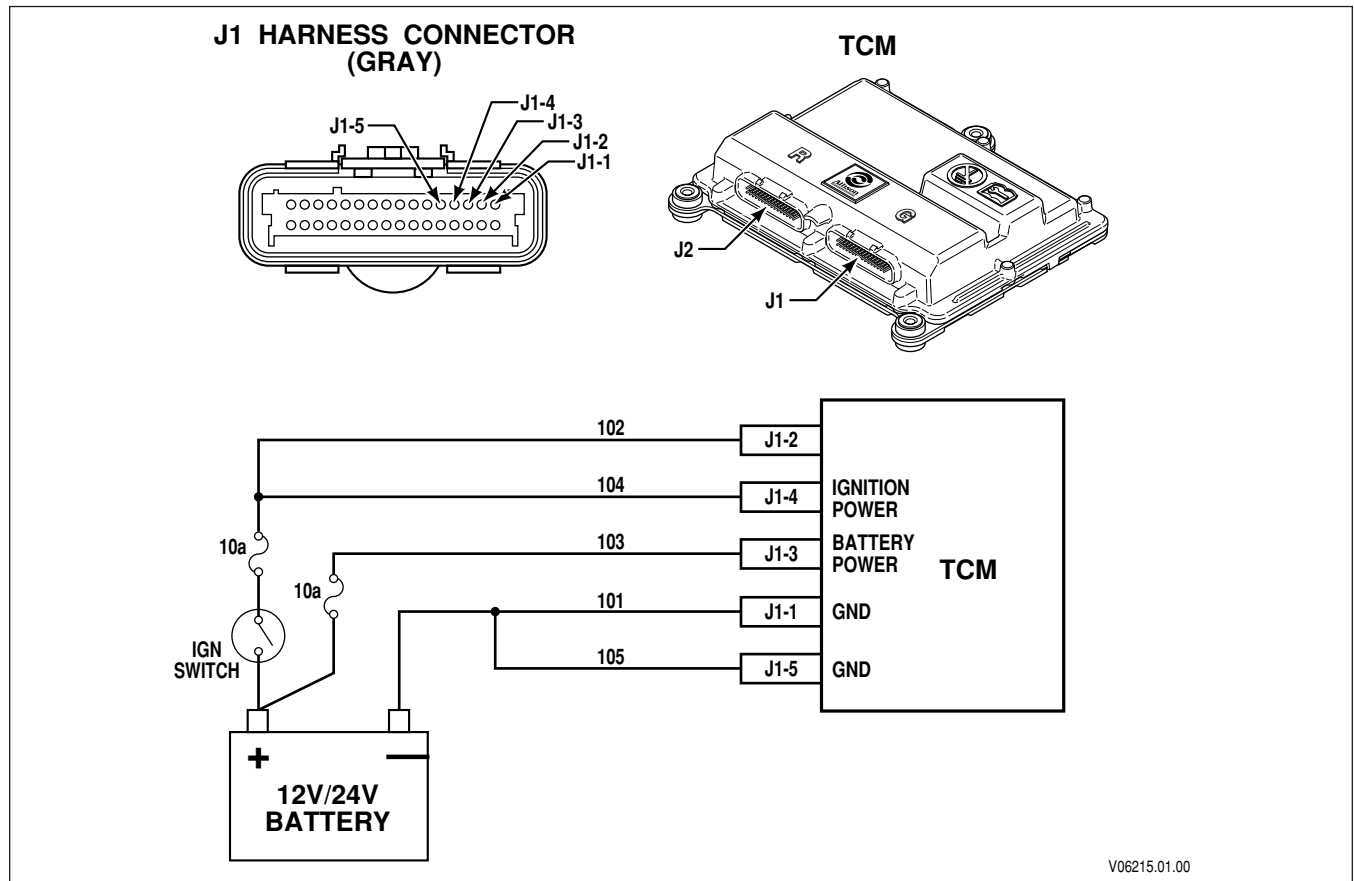
Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0218 Transmission Fluid Over Temperature Condition (cont'd)**

Step	Action	Yes	No
2	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the Failure Record data. 4. Clear the DTC. 5. Perform the A/T Fluid Checking Procedure (Appendix P). Was the A/T fluid level check performed?	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure. (Appendix P)</i>
3	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 • Debris • Damaged cooler lines or hoses Did you find and correct the condition?	<i>Go to Step 6</i>	<i>Go to Step 4</i>
4	Perform the Main Pressure Check Procedure. Refer to Appendix B. Did you find and correct a pressure problem?	<i>Go to Step 6</i>	<i>Go to Step 5</i>
5	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 Section 7. Did you find and correct the condition?	<i>Go to Step 6</i>	<i>Go to General Troubleshooting (Section 7)</i>
6	Perform the following procedure in order to verify your repair: 1. Clear the DTC. 2. Using the Scan Tool, monitor the transmission fluid temperature. 3. Operate the vehicle under the following conditions. 4. Turn ON the ignition, with the engine OFF. 5. The TFT must be less than 126°C (258°F) for at least 10 seconds. 6. Using the Scan tool, verify that the test to detect this code has run. Has the test run and passed?	<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0561 Unrealistic Variations in Vehicle System Voltage



Circuit Description

The Transmission Control Module (TCM) requires a switched ignition voltage input and a direct battery voltage input. This switched ignition voltage signal originates from the ignition switch or an ignition relay to supply voltage to pins 102 and 104 in the J1 connector at the TCM. Battery direct voltage is supplied to pin 103 at the J1 connector.

Conditions for Running the DTC

- The test becomes enabled when the engine has been running above 400 rpm for at least 0.5 seconds.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).

Conditions for Setting the DTC

P0561 sets when the TCM detects a large variation in ignition voltage or battery direct voltage. When an ignition or battery direct voltage variation of 4.0V or greater is detected for 0.5 seconds, a fault pending is reported. After 1.0 second of 4.0V or greater variation, a DTC is set with a failure response.

Action Taken When the DTC Sets

When DTC P0561 is active, the following conditions will occur:

- DTC P0561 is stored in the TCM history.
- Hydraulic default is commanded. Shift selector position and hydraulic state of logic valves determine the range attained.
- The **CHECK TRANS** light illuminates.

DIAGNOSTIC TROUBLE CODES (DTC)

- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- You may have to drive the vehicle in order to experience a fault.
- This DTC indicates a variation in ignition voltage or battery direct voltage. Common ignition circuit problems for this DTC are a fault in the feed wires to the TCM, a defective ignition switch, or a large vehicle accessory load on the ignition circuit. Battery direct voltage problems may be due to loose or corroded battery cables, a bad connection at the battery direct feed terminal (103), or an internal TCM failure due to a burnt trace.
- A vehicle charging system failure may cause this DTC under certain circumstances.
- This code may indicate that an internal voltage problem has occurred inside the TCM. The use of a substitute TCM would be a good way to diagnose this problem.
- A defective vehicle battery may induce this DTC.
- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

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

2. This step tests for an active DTC after clearing.
3. This step tests for the proper battery direct input voltage.
4. This step tests for the proper ignition input voltage.
5. This step tests for shorts or open conditions at battery direct input circuit.
6. This step tests for shorts or open conditions at ignition input circuit.

DTC P0561 Unrealistic Variations in Vehicle System Voltage

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?		<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0561 Unrealistic Variations in Vehicle System Voltage

Step	Action	Value(s)	Yes	No
2	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start vehicle and test drive. 6. Duplicate same operating conditions observed in failure records. NOTE: This DTC indicates that a voltage variation exists in the ignition voltage or at the battery direct input. This variation is measured from min. and max. voltage values. If the voltage variation is present for a pre-determined amount of time, this DTC sets. Did DTC P0561 return?	—	Go to Step 3	Go to Step 4
3	1. Turn the ignition OFF. 2. Disconnect TCM connector J1 (gray) at the TCM. 3. Install J 39700 Breakout Box and J 43799 Adapter box at the J1 connector. 4. Using a digital multimeter (DVOM), measure voltage at J1 connector pin 1 and pin 3. Is the voltage within the specified value?	11.5–12.5V	Go to Step 4	Go to Step 5
4	1. Using a digital multimeter (DVOM), sequentially measure voltage at J1 connector pins 2 and 4 using J1 connector pins 1 or 5 as ground return. 2. Turn ON the ignition, with the engine OFF. Is the voltage within the specified value?	11.5–12.5V	Go to Diagnostic Aids	Go to Step 6
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Inspect battery direct circuit 103 for one of the following conditions: • Intermittent open or short. • Loose or corroded connections at battery or connection points. • Defective battery. Was one of these conditions discovered and repaired?	—	Go to Step 8	Go to Step 7

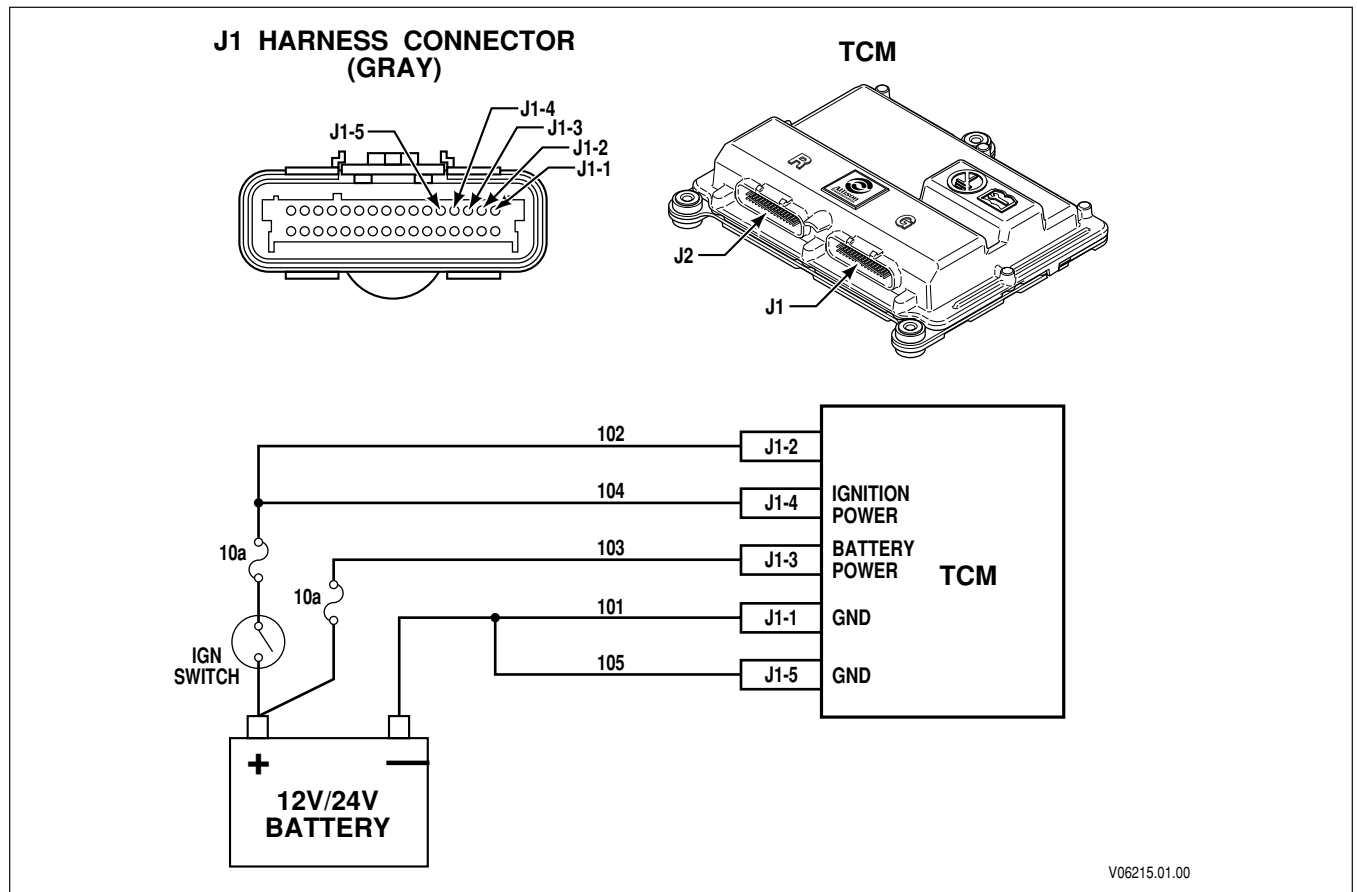
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0561 Unrealistic Variations in Vehicle System Voltage

Step	Action	Value(s)	Yes	No
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Inspect the TCM ignition input circuit for one of the following conditions: • Intermittent open or short at ignition input circuits 101, 102, 103, or 104. • Loose or corroded connections at ignition switch or ignition relay assembly. • Defective ignition switch or relay. • Loading of ignition circuit by defective vehicle accessories. Was one of these conditions discovered and repaired?	—	Go to Step 8	Go to Step 7
7	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 8	—
8	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions shown in failure records. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0562 System Voltage Low



Circuit Description

The Transmission Control Module (TCM) requires a switched ignition voltage input to operate. This switched ignition voltage signal originates from the ignition switch or an ignition relay to supply voltage to pins 102 and 104 in the J1 connector at the TCM.

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 18V and less than 32V (24V TCM).
- The engine speed is greater than 450 rpm for 10 seconds.

Conditions for Setting the DTC

DTC P0562 sets when the TCM detects the following condition:

- 12 volt TCM — Ignition voltage is detected below 8V at 0°C (32°F) for a total of 5 out of 7 seconds. The voltage threshold is temperature dependent varying from 5V at -60°C (-75°F) to 9V at 20°C (68°F).
- 24 volt TCM — Ignition voltage is detected below 17V at 0°C (32°F) for a total of 5 out of 7 seconds. The voltage threshold is temperature dependent varying from 14V at -60°C (-75°F) to 18V at 20°C (68°F).

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

- If the DTC is active while vehicle is in a forward range, transmission shifts to neutral, 1st, 3rd, or 5th range.
- If the DTC is active while in reverse or neutral, transmission shifts to neutral.
- If the shift selector is moved to forward range, transmission shifts to neutral, 1st, 3rd, or 5th range.
- If the shift selector is moved to reverse or neutral, transmission shifts to neutral. Diagnostic response honors the inhibit latched at the time the DTC is set. If a latched inhibit is present and PRNDL is incorrect, transmission shifts to neutral range. If PRNDL is correct, GPI request is responded to.
- The **CHECK TRANS** light is illuminated.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- A defective vehicle battery may allow this DTC to set. Test the vehicle battery to verify proper voltage and load capacity.
- A defective vehicle charging system may cause this DTC.
- Vehicle components such as an ignition switch or TCM ignition relay may cause this DTC to set and not be active, this indicates that an intermittent condition may exist in these components.
- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

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

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

DTC P0562 System Voltage Low

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>

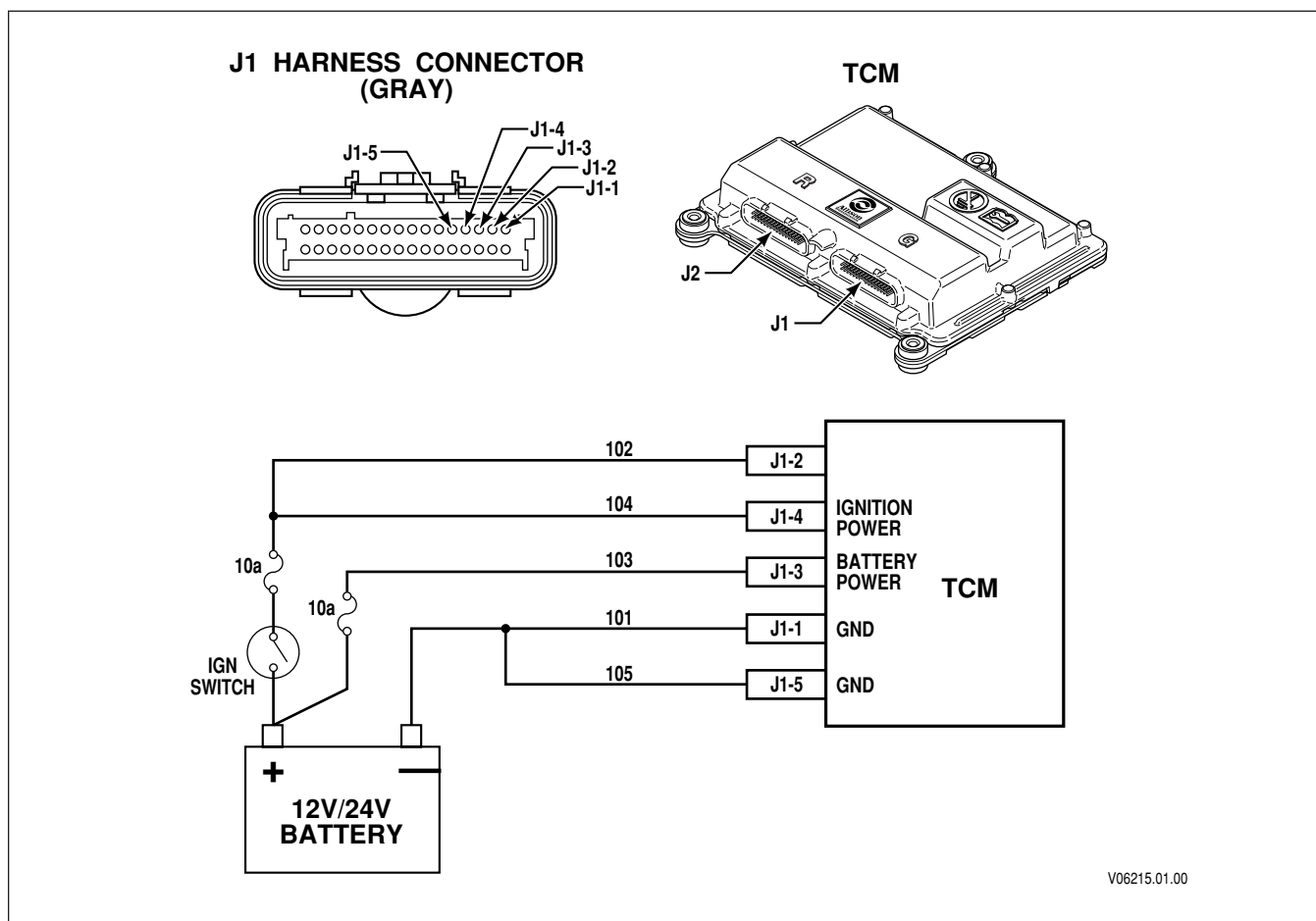
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0562 System Voltage Low (cont'd)

Step	Action	Value(s)	Yes	No
2	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Inspect the ignition voltage value on the Scan Tool. NOTE: This DTC sets when ignition voltage drops below a predetermined level that is temperature dependent for 5 out of 7 seconds. Is the ignition voltage below specified value?	Voltage should be above 9V (12V TCM) or 18V (24V TCM) at 20°C (68°F). See conditions for setting the DTC.	Go to Step 4	Go to Step 3
3	1. Start the vehicle, if possible. 2. If the DTC is not active, drive the vehicle. Attempt to duplicate the same operating conditions observed in the failure records. Did the DTC return?	—	Go to Step 4	Go to Diagnostic Aids
4	Test the vehicle battery per OEM instructions. This should include a voltage test and a load test. Does test indicate the battery is good?	See OEM for correct battery specifications	Go to Step 5	Replace the vehicle battery and go to Step 6
5	Test the vehicle charging system per the OEM recommended testing procedure. Is the charging system operating properly?	See OEM for correct charging system specifications	Go to Diagnostic Aids	Repair the charging system and go to Step 6
6	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions shown in the failure records when the DTC set. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0563 System Voltage High



Circuit Description

The Transmission Control Module (TCM) requires a switched ignition voltage input to operate. This switched ignition voltage signal originates from the ignition switch or an ignition relay to supply voltage to pins 102 and 104 in the J1 connector at the TCM.

Conditions for Running the DTC

- The engine speed is greater than 450 rpm for one second.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC P0563 sets when the TCM detects the following condition:

- 12 volt TCM — Ignition voltage is above 18V for 6 out of 10 seconds.
- 24 volt TCM — Ignition voltage is above 32V for 6 out of 10 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

- If the DTC is active while the vehicle is in a forward range, the transmission shifts to neutral, 1st, 3rd, or 5th range.
- If the DTC is active while in reverse or neutral, the transmission shifts to neutral.
- If the shift selector is moved to a forward range, the transmission shifts to neutral, 1st, 3rd, or 5th range. If the shift selector is moved to reverse or neutral, the transmission shifts to neutral. Diagnostic response honors the inhibit latched at the time the DTC is set. If a latched inhibit is present and PRNDL is incorrect, the transmission shifts to neutral range. If PRNDL is correct, the GPI request is responded to.
- The **CHECK TRANS** light is illuminated.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- A defective vehicle charging system that is overcharging may cause this DTC.
- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

Test Description

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

2. This step tests for the proper ignition input voltage.
3. This step tests for an active DTC after clearing.
5. This step tests vehicle charging system per OEM guidelines.

DTC P0563 System Voltage High

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0563 System Voltage High (cont'd)

Step	Action	Value(s)	Yes	No
2	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start vehicle engine and inspect the ignition voltage value on the Scan Tool. NOTE: This DTC sets when ignition voltage is detected above 18V for 12V systems or 32V for 24V systems for 6 out of 10 seconds. Is the ignition voltage above specified value?	See Conditions for Setting the DTC	Go to Step 4	Go to Step 3
3	1. Start the vehicle, if possible. 2. If the DTC is not active, drive the vehicle. Attempt to duplicate the same operating conditions observed in failure records. Did the DTC return?	—	Go to Step 4	Go to Diagnostic Aids
4	Test the vehicle charging system per the OEM recommended testing procedure. Is the charging system operating properly?	—	Go to Diagnostic Aids	Repair the charging system and go to Step 5
5	In order to verify your repair: 1. Clear DTC. 2. Drive vehicle under conditions shown in failure records when DTC set. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0602 TCM Not Programmed

NO SCHEMATIC FOR THIS DTC

Circuit Description

At the 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

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

Action Taken When the DTC Sets

- DTC P0602 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM returns to the boot program, and then waits to be recalibrated.
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

TCM must be recalibrated.

DTC P0602 TCM Not Programmed

Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. If DTC P0602 is present, the TCM must be recalibrated. Is recalibration complete?	<i>Go to Step 4</i>	—
3	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is replacement complete?	<i>Go to Step 4</i>	—
4	1. Install the Scan Tool. 2. Start the vehicle. Did the DTC return?	<i>Go to Step 3</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0606 Controller Internal Performance

NO SCHEMATIC FOR THIS DTC

Circuit Description

The Transmission Control Module (TCM) completes numerous scheduled tasks during normal operation. If one of the scheduled tasks fails to complete within a specific time limit the TCM will re-attempt this task.

NOTE: *The presence of DTC P0606 indicates a TCM software error has occurred and the Allison Transmission Service Department should be contacted at 1-800-252-5283.*

Conditions for Running the DTC

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

This test is run during the entire ignition cycle.

Conditions for Setting the DTC

DTC P0606 sets if a task fails to complete after two consecutive attempts.

Action Taken When the DTC Sets

- When DTC P0606 is active, the transmission will lock in **N** (Neutral).
- DTC P0606 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool can clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC 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 580 lb ft, Lower Range Torque Protection (LRTP) is used. This feature limits engine torque in lower ranges to protect the transmission from damage if a stall condition occurs.

Conditions for Running the DTC

- No DTC U2105 CAN bus error.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- This test runs for 30 seconds for the first 20 engine starts after the engine is detected on the J1939 CAN.
- Engine must be identified by the TCM as an approved make and model.
- Engine's torque configuration message (peak torque) must be greater than allowed without SEM (above 580 lb ft gross input torque).

NOTE: *Unapproved engines or low torque engines will operate without setting a P0614.*

Conditions for Setting the DTC

P0614 sets when the TCM detects one of the following conditions:

- TCM detects a valid engine having the proper torque rating but ECM software is not supporting all the messaging necessary for SEM.
- TCM detects a valid engine having a torque rating exceeding 580 lb ft that does not support Lower Range Torque Protection (LRTP) messaging.

NOTE: *Valid engines with a torque rating exceeding 580 lb ft must have software that is compatible with LRTP or a P0614 is set.*

Action Taken When the DTC Sets

- DTC P0614 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- If the TCM and engine ECM software are not compatible, the transmission will be restricted to reverse, neutral, first range, or third range.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

3. This step tests for an incompatible engine calibration.
5. This step tests for the proper engine torque limit.

DTC P0614 Torque Control Data Mismatch — ECM/TCM

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	If a DTC U2105 is present, troubleshoot and resolve before going to the next step. Is a DTC U2105 present?	—	<i>Go to DTC U2105 and resolve before proceeding to Step 7</i>	<i>Go to Step 3</i>
3	Using the Scan tool, refer to the Transmission/Engine shift energy management (SEM) compatibility and the Lower Range Torque Protection compatibility display. Is the ECM shown as being incompatible with TCM request for SEM or LRTP?	<i>Scan Tool indicates with Yes or No Answer</i>	<i>Go to Step 4</i>	<i>Go to Step 5</i>
4	This indicates that engine software does not support shift energy management for either SEM or LRTP. Have the OEM install the proper engine software and calibration to support SEM. Is the proper software and calibration installed?	—	<i>Go to Step 7</i>	—
5	Using Scan Tool, refer to the engine torque rating display. Is the torque rating displayed as acceptable?	<i>Scan Tool indicates with Yes or No Answer</i>	<i>Go to Step 7</i>	<i>Go to Step 6</i>
6	This indicates that engine torque values are above the transmission ratings set in the TCM calibration. Inspect the TCM for proper software and calibration to support SEM. If the proper TCM software and calibration are installed, the engine rating is too high for the transmission. Recalibrate the engine to a lower torque rating. Was one of the above conditions found and resolved?	—	<i>Go to Step 7</i>	—
7	In order to verify your repair: 1. Connect the Scan Tool. 2. Clear the DTC. 3. Drive the vehicle under normal operating conditions. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0701 Transmission Control System Performance

NO SCHEMATIC FOR THIS DTC

Circuit Description

The Transmission Control Module (TCM) monitors the status of the pressure switches at start-up to detect the presence of hydraulic pressure.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- This test is run after engine start-up and runs as part of the transmission hydraulic initialization.

Conditions for Setting the DTC

DTC P0701 sets when transmission fluid temperature is above -25°C (-13°F) with an engine speed above 500 rpm for 6 seconds or 400 rpm for 15 seconds and forward or reverse range is selected and all the pressure switches do not indicate pressure.

Action Taken When the DTC Sets

- DTC P0701 is stored in the TCM history.
- The TCM inhibits TCC engagement.

Conditions for Clearing the MIL/DTC

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- DTC P0701 may be logged if a forward or reverse range is selected immediately after the engine is started and before the TCM detects pressure at the switches (2 to 6 seconds after engine start).
- A plugged control main filter may cause this code to set. The control main filter is to be changed after the first 8000 km (5,000 miles). Failure to change the filter at this interval may cause this code and other pressure switch codes to set.
- A cracked internal suction filter tube or damaged tube seal may cause this DTC to set.
- A stuck lube regulator valve (located in the front support) may cause this DTC to set. A high static oil level with the vehicle running is often a good indication of this complaint. Often pressure switch DTCs are set in this scenario.
- You may have to drive the vehicle in order to experience a fault.

Test Description

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

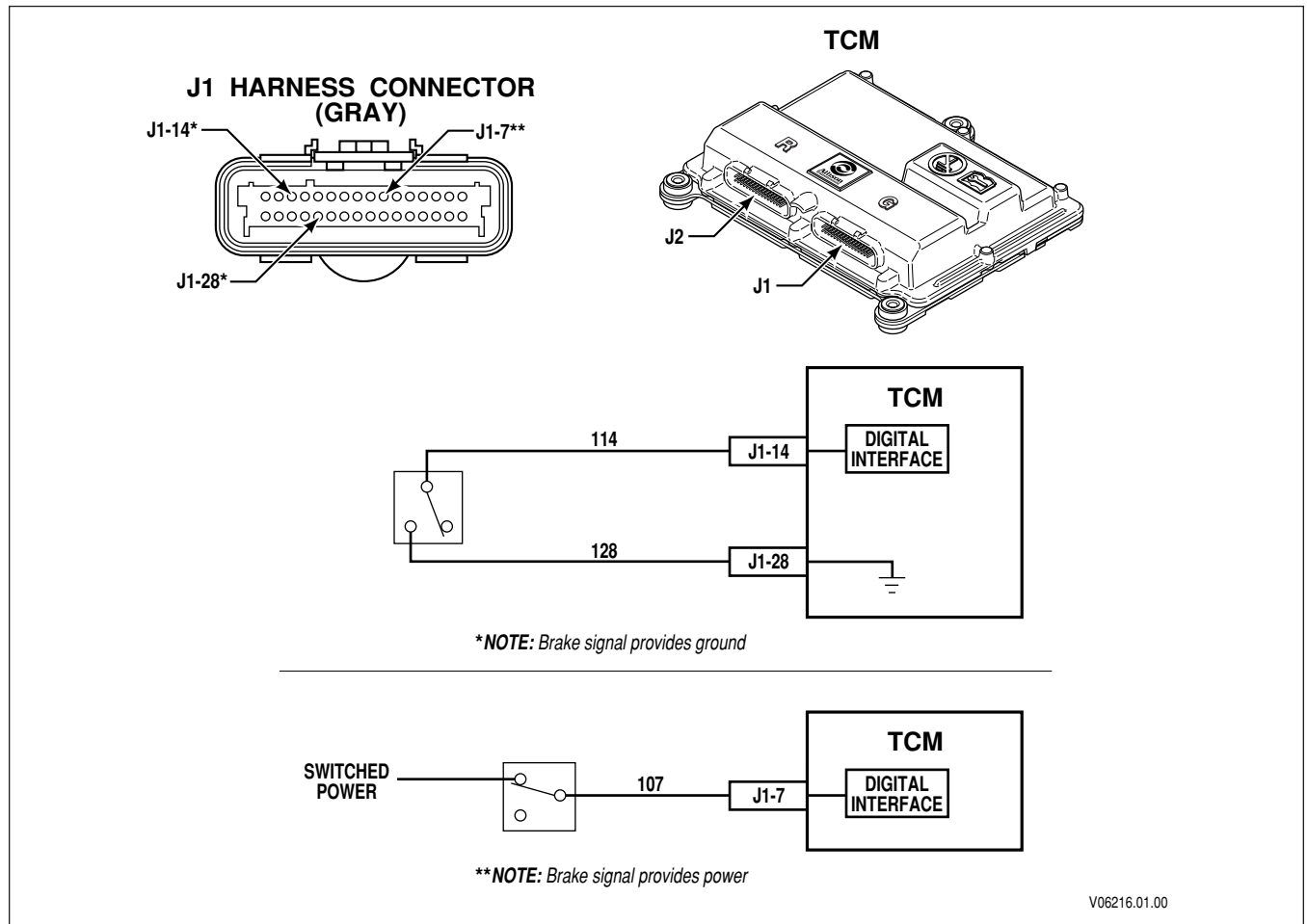
2. This step tests for proper fluid level.
5. This step tests for main pressure.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0701 Transmission Control System Performance**

Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn the ignition to ON, with the engine OFF. 3. Record the DTC Failure Record data. 4. Clear the DTC. 5. Start the engine; Check the Transmission Fluid Level. Is the fluid at the appropriate level?	<i>Go to Step 3</i>	<i>Go to Step 4</i>
3	This DTC can be set after performing fluid service and filter change, after replacement of the PSM, or after a long period of storage. Have any of these conditions occurred?	<i>Go to Step 7</i>	<i>Go to Step 5</i>
4	Add fluid to the proper level. Is the fluid at the appropriate level?	<i>Go to Step 5</i>	—
5	Check main pressure (refer to Main Pressure Check Procedure — Appendix B). Is the pressure within the specified value?	<i>Go to Step 7</i>	<i>Go to Step 6</i>
6	No main pressure at idle may be an indication of the following: • Stuck or sticking lube regulator valve • Stuck or sticking main pressure regulator valve • Loose or damaged suction filter • Defective suction filter seal Was the reason for no main pressure condition found and repaired?	<i>Go to Step 7</i>	<i>Go to General Troubleshooting (Section 7)</i>
7	In order to verify your repair: 1. Clear the DTC. 2. Start the vehicle. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	<i>Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0703 Brake Switch Circuit Malfunction



Circuit Description

A mechanical switch attached to the brake pedal sends a signal to the Transmission Control Module (TCM) indicating the service brake has been applied. This signal is either ignition voltage or a ground signal depending on the calibration installed in the TCM.

P0703 is a type C DTC.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM).
- No DTC P0721 or P0722.

Conditions for Setting the DTC

The TCM sets a DTC when either of the following conditions occur:

- The vehicle has accelerated 10 or more times with TCM input indicating brakes applied.
- Decelerated 10 or more times with TCM input indicating brakes released.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken when the DTC Sets

- No Grade Braking allowed.
- Use the default assumption that the brake is off.
- TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool can clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC active.

Diagnostic Aids

Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:

- A bent terminal.
- A backed-out.
- A damaged terminal.
- Poor terminal tension.
- A chafed wire.
- A broken wire inside the insulation.

When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.

DTC P0703 Brake Switch Circuit Malfunction

Step	Action	Value	Yes	No
1	Was the Beginning The Troubleshooting Process (Section 5-4A) Performed?		<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5-4a)</i>
2	1. Install the Scan Tool. 2. Turn the ignition ON, with the engine OFF. 3. Record the DTC Failure Record Data. 4. Apply and release the service brake. Does the Scan Tool indicate that brake switch is toggling off and on?		<i>Go to Diagnostic Aids</i>	<i>Go to Step 3</i>
3	1. Using a DVOM, probe pin 5 and pin 7 on the C1 connector. 2. Apply and release the service brake. 3. There should be no voltage reading at pin 7 when the brake is applied, with the brake released there should be 12V. Was voltage reading proper according to brake status?	Battery +	<i>Go to Step 8</i>	<i>Go to Step 4</i>
4	1. Go to the Stop Lamp Switch, with a DVOM probe pin C at the switch, supply a ground connection at other lead. 2. Apply and release the service brake. Is the switch turning voltage ON and OFF?	Battery +	<i>Go to Step 6</i>	<i>Go to Step 5</i>

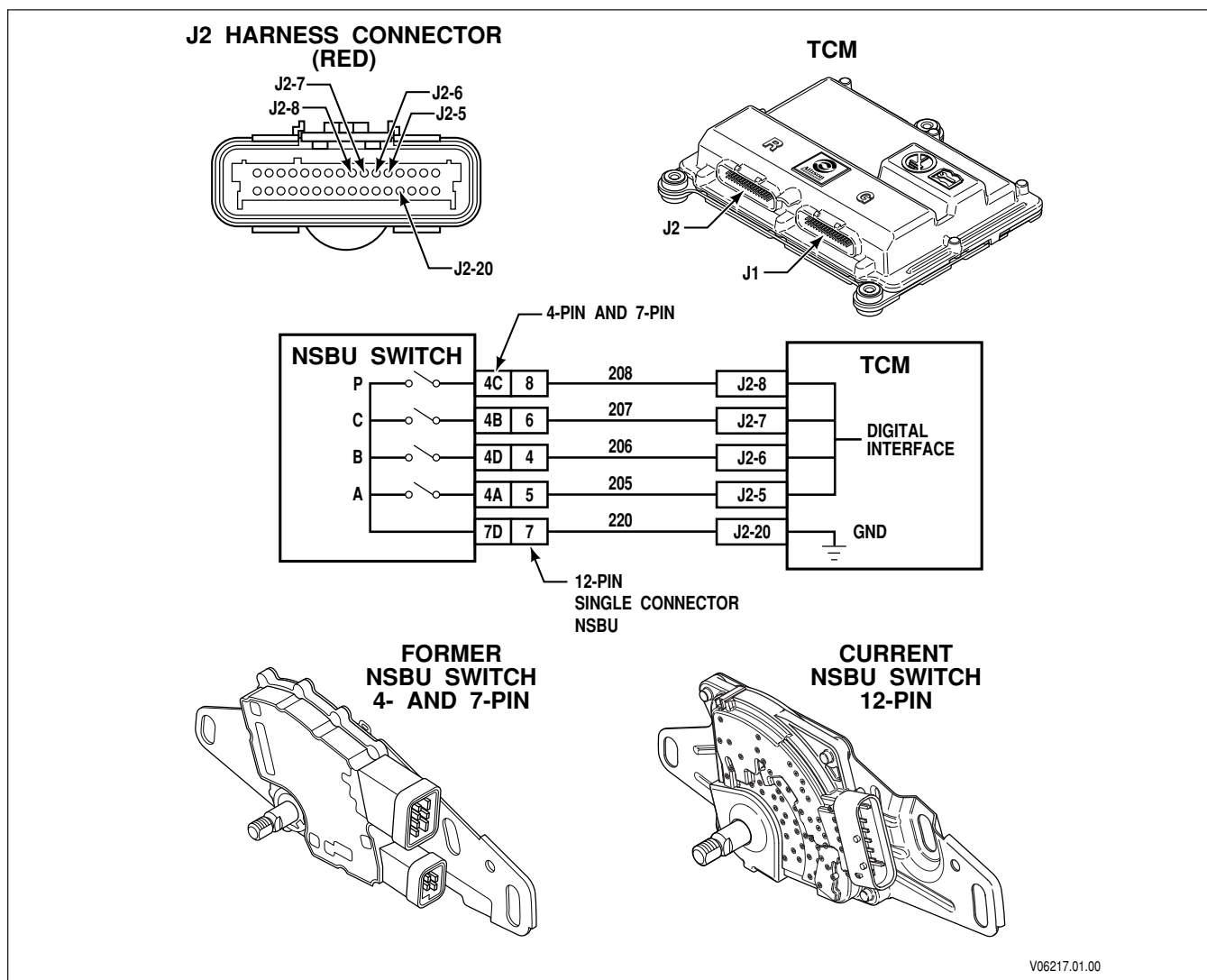
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0703 Brake Switch Circuit Malfunction

Step	Action	Value	Yes	No
5	Using a DVOM, check the voltage at pin D on the input side of the Stop Lamp Switch. Is voltage available at the input side of the Stop Lamp Switch?		<i>Go to Step 7</i>	<i>Resolve voltage problem</i>
6	Replace the TCC Brake Switch/Cruise Control harness. Is repair complete?		<i>Go to Step 9</i>	
7	Repair or replace the Stop Lamp Switch assembly. Is repair complete?		<i>Go to Step 9</i>	
8	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6).</i> Replace the TCM. Is the replacement complete?		<i>Go to Step 9</i>	
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle making at least 10 accelerations and decelerations cycles. Did the test run and pass?		<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0708 Transmission Range Sensor Circuit High Input



Circuit Description

The installation of a transmission-mounted Neutral Start/Back-Up (NSBU) switch is required. This switch mounts directly onto the transmission housing from the outside and detects the angular position of the shift selector shaft. This position is communicated to the Transmission Control Module (TCM) so that certain vehicle control functions can be coordinated with the position of the shift controls. The NSBU switch has redundant circuitry to alert the TCM in the event of a single wire or switch failure.

The neutral signal output of the NSBU switch is typically used as confirmation that the transmission is in **N** (Neutral) before the engine starter is engaged. The NSBU switch is interfaced to the starter circuit with weatherproof electrical connectors. The reverse signal provision may be used to activate vehicle back-up lights and/or reverse warning devices.

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V.
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC — Software Levels Prior To N11

DTC P0708 sets when the TCM detects an invalid condition or parity errors occurring over consecutive ignition cycles.

Actions Taken When the DTC Sets — Software Levels Prior To N11

- The diagnostic response is to shut all solenoids off and allow the transmission to operate in hydraulic default mode or “limp home”. Shift selector and hydraulic state of logic valves determines range attained.
- DTC P0708 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- Due to this failure and associated responses, P0722 and P0845 may also set.

Action Taken When the DTC Sets — Software Level N11 And Later

- The **CHECK TRANS** light illuminates but no diagnostic response is implemented until after 50 warm-up cycles occur when a NSBU switch parity error is active. A warm-up cycle is defined as a 20 degree change in transmission temperature.
- The diagnostic response is to shut all solenoids off and allow the transmission to operate in hydraulic default mode or “limp home.” Shift selector and hydraulic state of logic valves determines range attained.
- DTC P0708 is stored in the TCM history.
- The TCM inhibits TCC engagement.
- Due to this failure and associated responses, P0722 and P0845 may also set.
- A shift to **R** (Reverse) will allow reverse range if a P0876 (previously P1714) is not active.

Conditions for Clearing the MIL/DTC

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- 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.
- When a P0708 is shown in failure records, this indicates that conditions to set a P0708 were present at one time. If the condition was due to moisture intrusion, the moisture may no longer be present, and thus you may not be able to reproduce the DTC. In such case, variables such as vehicle mileage, external physical condition of the switch should be factored in when making a decision to replace the NSBU switch.

NOTE: *Due to the TCM logic used to detect and set a P0708, this code can remain active even after a NSBU switch replacement is complete and the ignition has been cycled. It is important to clear all active DTCs from the TCM after servicing the NSBU switch.*

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

3. This step tests NSBU switch status.
4. This step tests for proper TCM input response.
5. This step tests the wiring harness for opens or shorts.

DTC P0708 Transmission Range Sensor Circuit High Input

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Is the NSBU switch and shift linkage properly adjusted?	—	<i>Go to Step 3</i>	<i>Go to Mechanic's Tips</i>
3	1. Install the Scan Tool. 2. Turn the ignition ON with the engine OFF. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, monitor PRNDL A, B, C, P status while moving the shift selector through each range. Does each switch toggle ON and OFF in the correct sequence, and does the range selected displayed on the Scan Tool match the actual physically selected range?	<i>Refer to NSBU Switch Table (Page 5–9)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 4</i>
4	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Disconnect the NSBU 4-pin connector and the NSBU 7-pin connector. 4. Turn the ignition ON. 5. In sequence, connect J2 connector pin 20 to J2 pins 5, 6, 7, and 8. 6. Monitor the switch status on the Scan Tool. Does each switch toggle ON and OFF in the correct sequence as each pin is grounded?	A=pin 5 B=pin 6 C=pin 7 P=pin 8 Scan Tool Status ON=Open circuit OFF=Grounded circuit	<i>Go to Step 5</i>	<i>Go to Step 10</i>
5	Inspect the NSBU switch connector assembly. Does the NSBU have two connectors—a seven pin and four pin connector?		<i>Go to Step 6</i>	<i>Go to Step 7</i>
6	1. Turn the ignition OFF. 2. Reconnect J2 connector to the TCM. 3. In sequence, connect pins 4A, 4B, 4C, and 4D at the 4-pin NSBU connector to pin 7D** on the NSBU 7-pin connector. * 4. Monitor the switch status on the Scan Tool. Does the Scan Tool indicate the proper switch status for each switch when grounded?	Scan Tool Status ON=Open circuit OFF=Grounded circuit 7D=wire 220	<i>Go to Step 8</i>	<i>Go to Step 9</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0708 Transmission Range Sensor Circuit High Input (cont'd)

Step	Action	Value(s)	Yes	No
7	1. Turn the ignition OFF. 2. Reconnect J2 connector to the TCM. 3. At the NSBU connector in sequence, connect pins 4, 5, 6, and 8 to pin 7** at the 12 pin connector. 4. Monitor the switch status on the Scan Tool. Does the Scan Tool indicate the proper switch status for each switch when grounded?	Scan Tool Status ON=Open circuit OFF=Grounded circuit 7D=wire 220	Go to Step 8	Go to Step 9
8	Replace the NSBU switch (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 11	—
9	Repair the vehicle wiring harness. NOTE: The vehicle OEM has responsibility for all external wiring, wherefore the OEM should perform vehicle harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Is the repair 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 Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor PRNDL switch status while moving selector through all positions. Does each switch toggle according to switch table?	Refer to NSBU Switch Table (Page 5–9)	Begin the diagnosis again. Go to Step 1	System OK

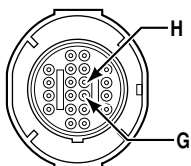
* If J 39700 Breakout Box and J 44722 Transmission Harness are available, they may be used to perform this operation.

** Use pin H at the magnetic overlay to provide a ground source when J 44722 Harness is used.

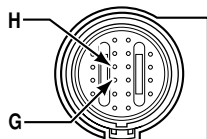
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance

TRANSMISSION HARNESS CONNECTOR

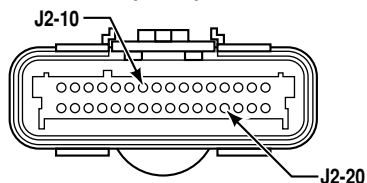


TRANSMISSION BULKHEAD CONNECTOR

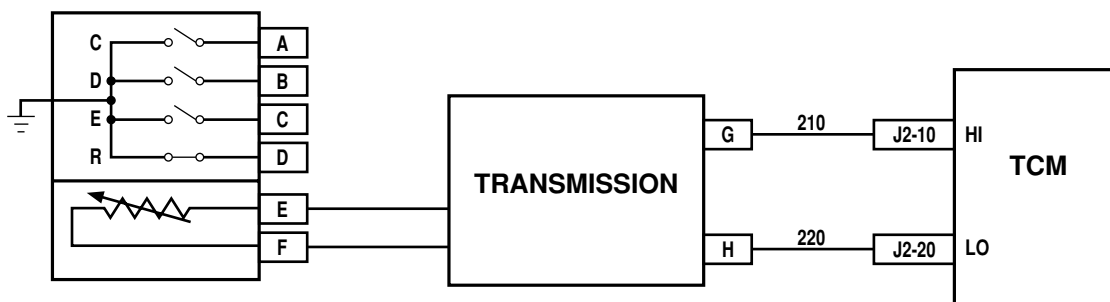
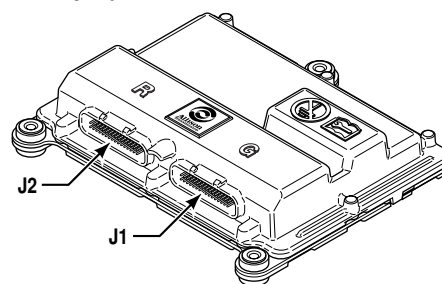


NOTE: Letters I, O, and Q are not used.

J2 HARNESS CONNECTOR (RED)

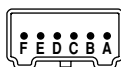
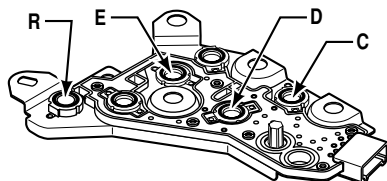


TCM



NOTE: Switches C, D, and E are N/O. Switch R is N/C.

PRESSURE SWITCH MANIFOLD



V06214.01.00

Circuit Description

The Transmission Fluid Temperature (TFT) sensor is part of the Pressure Switch Manifold (PSM) which is located in the transmission oil pan. The TFT sensor is a thermistor that changes its resistance value based on the temperature of the transmission fluid. The Transmission Control Module (TCM) supplies a 5V reference signal to the TFT sensor and measures the voltage drop in the circuit. When the transmission is cold, the sensor resistance is high and the TCM detects high signal voltage. As the transmission fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The TCM uses this information to control shift quality and to determine torque converter clutch applies.

If the TCM detects the TFT sensor resistance has no change, an unrealistic change in a short amount of time, or multiple changes within seconds, DTC P0711 sets.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Running the DTC

- No DTC P0721, P0722, P0717, P0716, P0713, or P0712.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- The engine speed is greater than 200 rpm for more than 5 seconds.
- The engine speed is greater than 450 rpm for more than 2 seconds with output speed of 100 rpm or above. This would indicate that a range is selected.
- A valid start-up temperature is detected.

Conditions for Setting the DTC

DTC P0711 sets when the TCM detects one of the following conditions:

- The TCM detects a temperature change that is under a set limit when compared to samples of the minimum and maximum temperature values.
- The TFT has an unrealistic temperature change of more than 10°C (50°F) for 10 occurrences.
- The temperature from start up decreases 40°C (104°F) or more within duration of 6 or more seconds.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- The TCM stores DTC P0711 in TCM history.
- The TCM uses calibration default for temperature values.

Conditions for Clearing the DTC/CHECK TRANS Light

- A Scan Tool may be used to clear the code from the TCM history.
- The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.
- The TCM cancels the DTC default actions when the fault no longer exists and the ignition has been cycled.

Diagnostic Aids

- The Scan Tool transmission fluid temperature (TFT) should rise steadily during warm-up cycles and then stabilize.
- DTC P0218 may set after DTC P0711 has set. Follow the diagnostic table for DTC P0711 before proceeding to the diagnostic for DTC P0218.

Test Description

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

2. This step tests for proper AT fluid level and condition.
3. This step tests for the proper reference voltage.
4. This step verifies which condition has set DTC P0711.
5. This step tests the resistance value of the internal wiring harness and TFT sensor.
6. This step tests for opens and shorts in the main wiring harness.
8. This step tests the resistance value of the internal TFT sensor.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Is the transmission fluid level correct?	—	<i>Go to Step 4</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Turn the ignition OFF. 2. Disconnect J2 connector at the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. With the engine OFF, turn the ignition to the ON position, Measure voltage between J2 connector pins 10 and 20. Is voltage within the specified value?	4.75–5.25V	<i>Go to Step 4</i>	<i>Go to Step 11</i>
4	1. Install the Scan Tool. 2. With the engine OFF, turn the ignition to the ON position. 3. Record the failure records. 4. Clear the DTCs. 5. Monitor the TFT on the Scan Tool. 6. Drive the vehicle and observe the Scan Tool for one of the following conditions: • No transmission temperature change. • An unrealistic transmission temperature change of greater than 1.5°C in (2.7°F) in one second. Did either of these conditions occur?	1.5°C (2.7°F)	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Disconnect the wiring harness from the main transmission connector. 2. Using a DVOM, measure resistance at main transmission connector pins G and H.* Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) <i>Refer to TFT Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 6</i>	<i>Go to Step 8</i>
6	1. Reconnect the wiring harness to the main transmission connector. 2. Disconnect connector J2 from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 10 and 20.* Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) <i>Refer to TFT Sensor Resistance Table Page 5–13)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 7</i>

DIAGNOSTIC TROUBLE CODES (DTC)

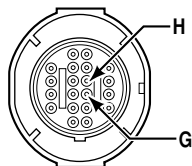
DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance (cont'd)

Step	Action	Value(s)	Yes	No
7	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Have the vehicle wiring harness repaired. Is the repair complete?	—	Go to Step 12	—
8	1. Remove the oil pan. 2. Disconnect the PSM from the internal wiring harness. 3. Using a DVOM, measure PSM resistance at pins E and F. Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) Refer to TFT Sensor Resistance Table Page 5–13)	Go to Step 9	Go to Step 10
9	Replace the internal wiring harness (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 12	—
10	Replace the PSM (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 12	—
11	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 12	—
12	In order to verify your repair: 1. Clear the DTC. 2. Using the Scan Tool, monitor the transmission fluid temperature. 3. Drive the vehicle under normal operating conditions. Look for significant changes in TFT. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

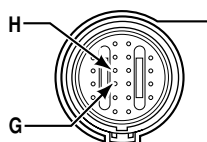
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0712 Transmission Fluid Temperature Sensor Circuit Low Input (High Temperature)

TRANSMISSION HARNESS CONNECTOR

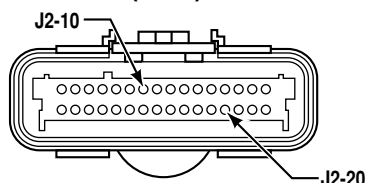


TRANSMISSION BULKHEAD CONNECTOR

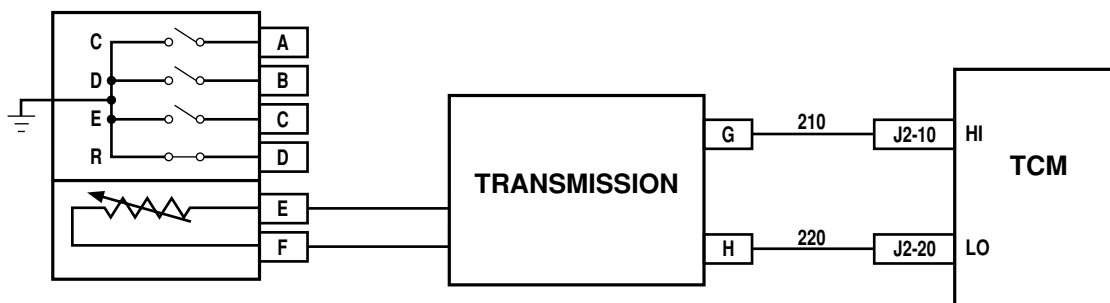
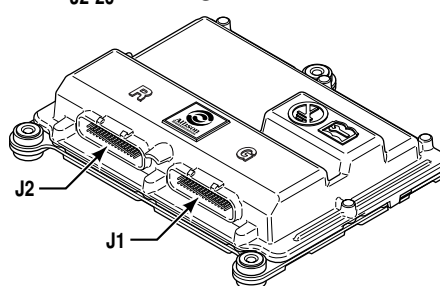


NOTE: Letters I, O, and Q are not used.

J2 HARNESS CONNECTOR (RED)

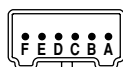
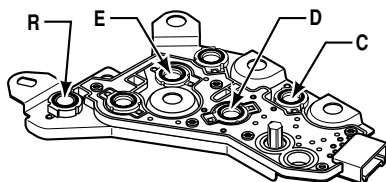


TCM



NOTE: Switches C, D, and E are N/O. Switch R is N/C.

PRESSURE SWITCH MANIFOLD



V06214.01.00

Circuit Description

The Transmission Fluid Temperature (TFT) sensor is part of the Pressure Switch Manifold (PSM) which is located in the transmission oil pan. The TFT sensor is a thermistor that changes its resistance value based on the temperature of the transmission fluid. The Transmission Control Module (TCM) supplies a 5V reference to the thermistor. The TCM's internal impedance provides resistance at the TCM so that voltage drop can be measured between the TCM and the thermistor. When the transmission is cold, the sensor resistance is high and the TCM detects high signal voltage. As the transmission fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The TCM uses this information to control shift quality and to determine torque converter clutch applies.

If the TCM detects a continuous short to ground in the TFT sensor or signal circuit, DTC P0712 is set.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Running the DTC

- No TFT sensor DTC P0711 or P0713.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- The engine is greater than 200 rpm for more than 5 seconds.
- The engine has been running for 20 seconds with a coolant temperature above 20°C (68°F).

Conditions for Setting the DTC

DTC P0712 sets when the TFT sensor indicates a voltage of less than 313mV for 2.5 seconds.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- The TCM stores DTC P0712 in TCM history.
- TCM uses calibration default for temperature values.

Conditions for Clearing the DTC/CHECK TRANS Light

- A Scan Tool may be used to clear the code from the TCM history.
- The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.
- The TCM cancels the DTC default actions when the fault no longer exists and the ignition has been cycled.

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.
- A short to ground on wire 210 may allow a code P0712 to set. A default value of 160°C (320°F) TFT on the Scan Tool would be a good indication this has occurred.

Test Description

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

2. This step tests for proper AT fluid level and condition.
3. This step tests for the proper reference voltage.
4. This step verifies which condition has set DTC P0712.
5. This step tests the resistance value of the internal wiring harness and TFT sensor.
6. This step tests for opens and shorts in the main wiring harness.
8. This step tests the resistance value of the internal TFT sensor.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0712 Transmission Fluid Temperature Sensor Circuit Low Input (High Temperature)

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Is the transmission fluid level correct?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Turn the ignition OFF. 2. Disconnect J2 connector at the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter at J2 connector. 3. With the engine OFF, turn the ignition to the ON position. Measure voltage at J2 connector pins 10 and 20. Is voltage within the specified value?	4.75–5.25V	<i>Go to Step 4</i>	<i>Go to Step 11</i>
4	1. Install the Scan Tool. 2. With the engine OFF, turn the ignition to the ON position. 3. Record the Failure Record data. 4. Clear the DTC. 5. Select TFT on the Scan Tool. Drive the vehicle and inspect for unrealistic TFT readings. Is the TFT reading at or above the specified value? This DTC may indicate a short to ground at wire 210.	150°C (302°F)	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Disconnect the wiring harness from the main transmission connector. 2. Using a DVOM, measure resistance at main transmission connector pins G and H.* Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) <i>Refer to TFT Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 6</i>	<i>Go to Step 8</i>
6	1. Reconnect the wiring harness to the main transmission connector. 2. Disconnect J2 connector from the TCM. 3. Using a DVOM, measure resistance at J2 connector pins 10 and 20. Is the resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) <i>Refer to TFT Sensor Resistance Table Page 5–13)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 7</i>

DIAGNOSTIC TROUBLE CODES (DTC)

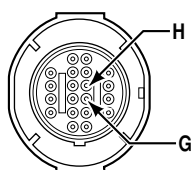
DTC P0712 Transmission Fluid Temperature Sensor Circuit Low Input
(High Temperature) (cont'd)

Step	Action	Value(s)	Yes	No
7	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Have the vehicle wiring harness repaired. Is the repair complete?	—	Go to Step 12	—
8	1. Remove the oil pan. 2. Disconnect the PSM from the internal wiring harness. 3. Using a DVOM, measure PSM resistance at pins E and F. Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) Refer to TFT Sensor Resistance Table Page 5–13)	Go to Step 9	Go to Step 10
9	Replace the internal wiring harness (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 12	—
10	Replace the PSM (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 12	—
11	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 12	—
12	In order to verify your repair: 1. Clear the DTC. 2. Using the Scan Tool, monitor the transmission fluid temperature. 3. Drive the vehicle under normal operating conditions making sure coolant temperature is over 20°C (68°F). 4. Watch for significant change in TFT. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

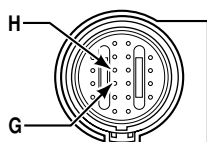
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0713 Transmission Fluid Temperature Sensor Circuit High Input (Low Temperature)

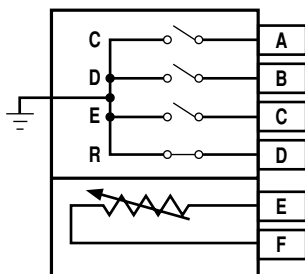
TRANSMISSION HARNESS CONNECTOR



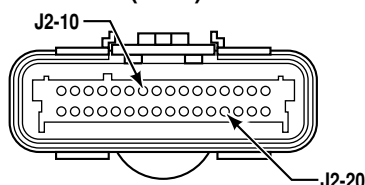
TRANSMISSION BULKHEAD CONNECTOR



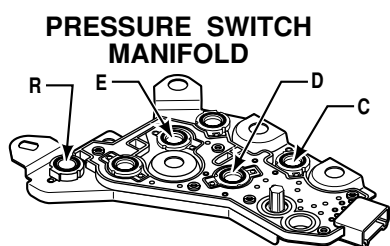
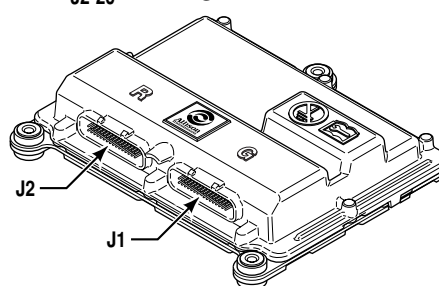
NOTE: Letters I, O, and Q are not used.



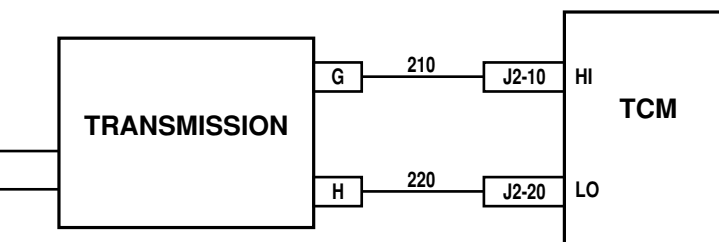
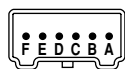
J2 HARNESS CONNECTOR (RED)



TCM



NOTE: Switches C, D, and E are N/O. Switch R is N/C.



V06214.01.00

Circuit Description

The Transmission Fluid Temperature (TFT) sensor is part of the Pressure Switch Manifold (PSM) which is located in the transmission oil pan. The TFT sensor is a thermistor that changes its resistance value based on the temperature of the transmission fluid. The Transmission Control Module (TCM) supplies a 5V reference to the thermistor. The TCM's internal impedance provides resistance at the TCM so that voltage drop can be measured between the TCM and the thermistor. When the transmission is cold, the sensor resistance is high and the TCM detects high signal voltage. As the transmission fluid temperature warms to a normal operating temperature, the resistance becomes less and the signal voltage decreases. The TCM uses this information to control shift quality and to determine torque converter clutch applies.

If the TCM detects a continuous open or short-to-power in the TFT sensor or signal circuit, DTC P0713 sets.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Running the DTC

- No DTC P0711 or P0712.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm for more than 5 seconds.
- The engine has been running for 20 seconds with a coolant temperature above 20°C (68°F).

Conditions for Setting the DTC

DTC P0713 sets when the TCM detects a voltage greater than 4.84V for 2.5 seconds.

Action Taken When the DTC Sets

- The TCM does not illuminate the **CHECK TRANS** light.
- The TCM stores DTC P0713 in TCM history.
- TCM uses calibration default for temperature values.

Conditions for Clearing the DTC/CHECK TRANS Light

- A Scan Tool may be used to clear the code from the TCM history.
- The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.
- The TCM cancels the DTC default actions when the fault no longer exists and the ignition has been cycled.

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.
- An open or a short to power at wire 210 may allow DTC P0713 to set. A default value of –60°C (–76°F) would be a good indication this has occurred.

Test Description

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

2. This step tests for proper AT fluid level and condition.
3. This step tests for the proper reference voltage.
4. This step verifies which condition has set DTC P0713.
5. This step tests the resistance value of the internal wiring harness and TFT sensor.
6. This step tests for opens and shorts in the main wiring harness.
8. This step tests the resistance value of the internal TFT sensor.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0713 Transmission Fluid Temperature Sensor Circuit High Input (Low Temperature)

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Is the transmission fluid level correct?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Turn the ignition OFF. 2. Disconnect J2 connector at the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. With the engine OFF, turn the ignition to the ON position. Measure voltage between J2 connector pins 10 and 20. Is voltage within the specified value?	4.75–5.25V	<i>Go to Step 4</i>	<i>Go to Step 11</i>
4	1. Install the Scan Tool. 2. With the engine OFF, turn the ignition to the ON position. 3. Record the Failure Record data. 4. Clear the DTC. 5. Select TFT on the Scan Tool. Drive the vehicle and inspect for unrealistic TFT readings. Is the TFT reading at or below the specified value? This DTC may indicate an open or short to power at wire 210.	–36°C (–32.8°F)	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Disconnect the wiring harness from the main transmission connector. 2. Using a DVOM, measure resistance at main transmission connector pins G and H.* Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) <i>Refer to TFT Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 6</i>	<i>Go to Step 8</i>
6	1. Reconnect the wiring harness to the main transmission connector. 2. Disconnect the J2 connector from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 10 and 20. Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) <i>Refer to TFT Sensor Resistance Table Page 5–13)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 7</i>

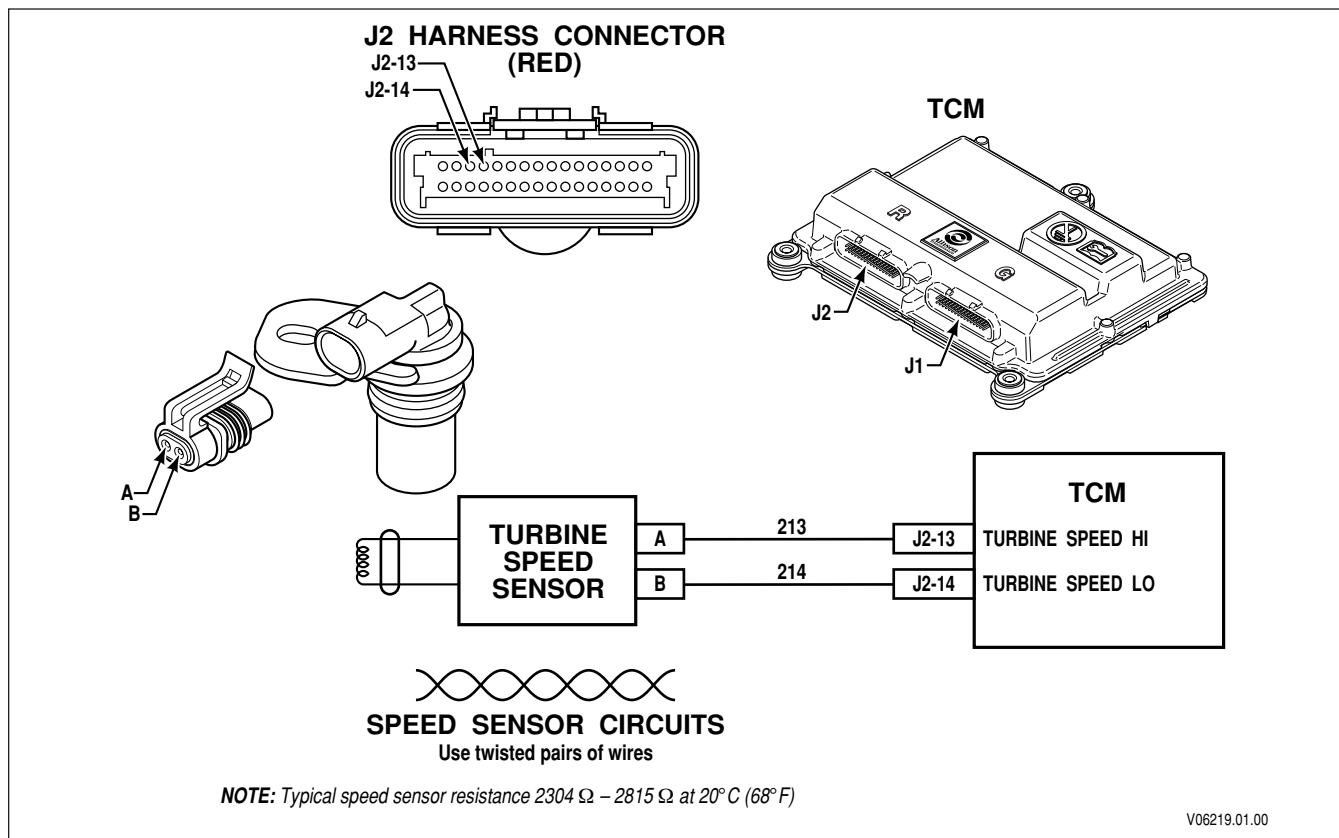
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0713 Transmission Fluid Temperature Sensor Circuit High Input
(Low Temperature) (cont'd)

Step	Action	Value(s)	Yes	No
7	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 12	—
8	1. Remove the oil pan. 2. Disconnect the PSM from the internal wiring harness. 3. Using a DVOM, measure PSM resistance at pins E and F. Is resistance within the specified values?	3398–3582 Ohms at 20°C (68°F) <i>Refer to TFT Sensor Resistance Table Page 5–13)</i>	Go to Step 9	Go to Step 10
9	Replace the internal wiring harness (refer to Mechanic's Tips). Is the repair or replacement complete?	—	Go to Step 12	—
10	Replace the PSM (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 12	—
11	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 12	—
12	In order to verify your repair: 1. Clear the DTC. 2. Using the Scan Tool, monitor the transmission fluid temperature. 3. Drive the vehicle under normal operating conditions making sure coolant temperature is over 20°C (68°F). Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0716 Turbine Speed Sensor Circuit Performance



Circuit Description

The speed sensors are variable reluctance devices which convert mechanical motion to an AC voltage. Each sensor consists of a wire coil wrapped around a pole piece that is adjacent to a permanent magnet. These elements are contained in a housing which is mounted adjacent to a rotating ferrous member. Two signal wires extend from one end of the housing and an exposed end of the pole piece is at the opposite end of the housing. The permanent magnet produces lines of flux around the pole piece. As a ferrous object (such as a gear tooth) approaches and passes through the gap at the end of the pole piece, an AC voltage pulse is induced in the wire coil. The Transmission Control Module (TCM) calculates the frequency of these AC pulses and converts it to a speed value. The AC voltage generated varies from 150mV at low speed to 15V at high speed. The signal wires from the sensor are formed as twisted pairs to cancel magnetically induced fields. The cable is also shielded to protect from voltage-related fields. Noise from other sources is eliminated by using two-wire differential inputs at the TCM.

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 18V and less than 32V (24V TCM).
- DTC P0717, P0721, or P0722 is not active.
- Turbine speed is above 200 rpm.
- Shift is complete and range attained is not neutral.

Conditions for Setting the DTC

DTC P0716 is set when one of the following conditions occur:

- Unrealistic large change in turbine speed. Failure is set if an unrealistic change in transmission turbine speed is detected at or above 800 rpm for 0.15 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

- Noisy turbine speed signal. Noise is determined with two counters. A low counter is incremented when turbine speed change is below 800 rpm for 2.0 seconds. A high counter is incremented when turbine speed change is above 800 rpm. When both counters accumulate 5 events, a failure is set.

Action Taken When the DTC Sets

- When DTC P0716 is active, the following conditions will occur:
 - If failure occurs while in a forward range and a shift has been completed, the transmission will remain in the current range.
 - If failure occurs while in a forward range and a shift is in progress, the transmission will return to the previous range, except in post-shift state; then the transmission will continue to the commanded range.
- DTC P0716 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.
- You may have to drive the vehicle in order to experience a fault.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection.
 - Excessive vibration (driveline or engine torsionals).
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).
- Install a known good speed sensor and see if normal function is restored to rule out an internal short or open in the sensor removed.
- Check that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.
- Inspect the turbine speed tone wheel/PTO gear for possible damage.

Test Description

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

- This step tests ignition voltage.
- This step tests for proper turbine speed sensor resistance at the TCM side of the harness.
- This step tests turbine speed sensor resistance.

DIAGNOSTIC TROUBLE CODES (DTC)

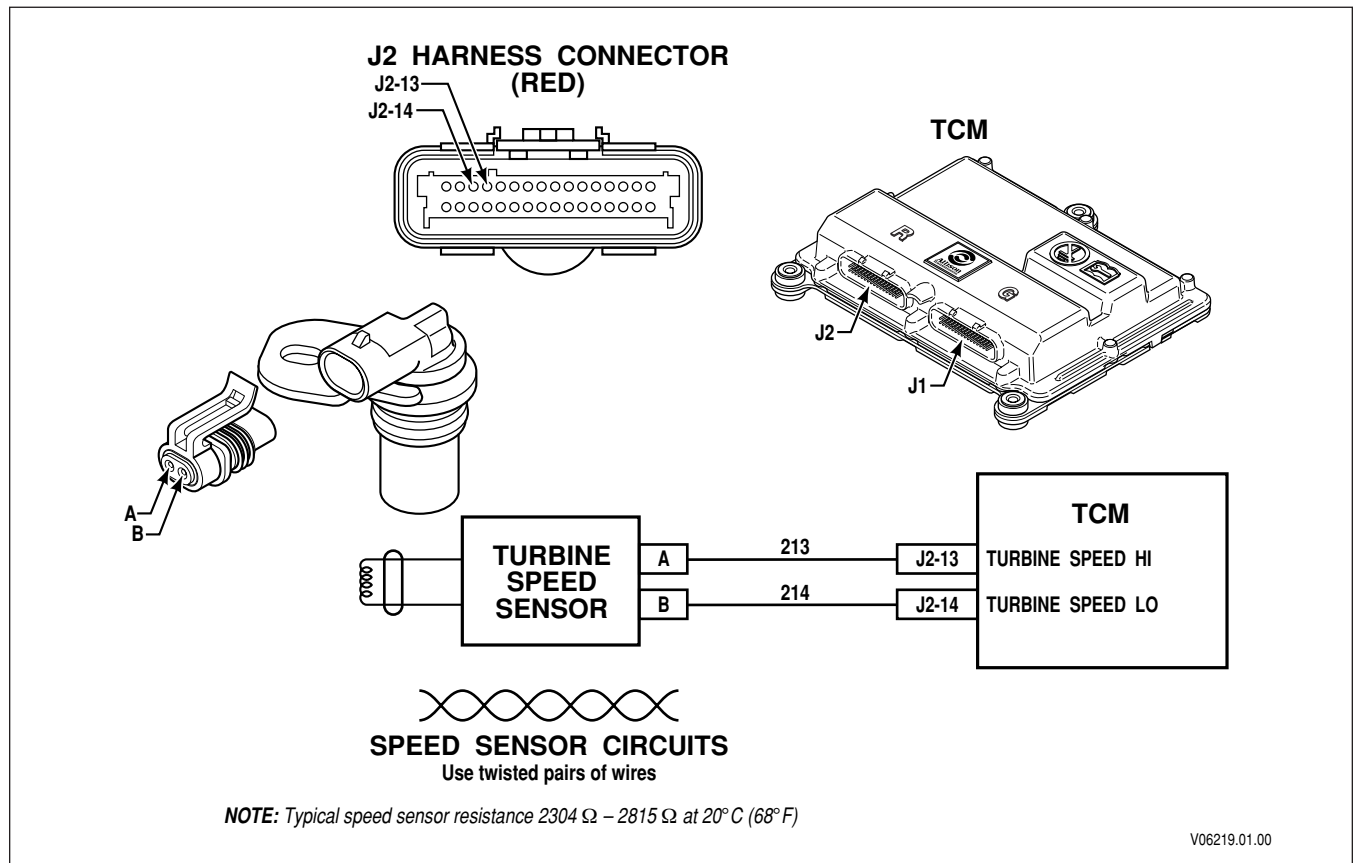
DTC P0716 Turbine Speed Sensor Circuit Performance

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Turn the ignition OFF. 2. Disconnect the J2 connector at the TCM. 3. Using a DVOM, measure the resistance between connector J2 pin 13 and connector J2 pin 14. Is the speed sensor resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 4</i>
4	1. Disconnect the wiring harness from the turbine speed sensor. 2. Using a DVOM, check the resistance between the speed sensor terminals.* Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 5</i>	<i>Go to Step 6</i>
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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?	—	<i>Go to Step 7</i>	—
6	NOTE: Do not rotate the speed sensor in the retaining bracket. Orientation is fixed, and if changed, may cause improper operation. Replace the turbine speed sensor (refer to Mechanic's Tips). Is the replacement complete?	—	<i>Go to Step 7</i>	—
7	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor turbine speed sensor operation. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0717 Turbine Speed Sensor Circuit No Signal



Circuit Description

The speed sensors are variable reluctance devices which convert mechanical motion to an AC voltage. Each sensor consists of a wire coil wrapped around a pole piece that is adjacent to a permanent magnet. These elements are contained in a housing which is mounted adjacent to a rotating ferrous member. Two signal wires extend from one end of the housing and an exposed end of the pole piece is at the opposite end of the housing. The permanent magnet produces lines of flux around the pole piece. As a ferrous object (such as a gear tooth) approaches and passes through the gap at the end of the pole piece, an AC voltage pulse is induced in the wire coil. The Transmission Control Module (TCM) calculates the frequency of these AC pulses and converts it to a speed value. The AC voltage generated varies from 150mV at low speed to 15V at high speed. The signal wires from the sensor are formed as twisted pairs to cancel magnetically induced fields. The cable is also shielded to protect from voltage-related fields. Noise from other sources is eliminated by using two-wire differential inputs at the TCM.

Conditions for Running the DTC

- Components are powered and the ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V or less than 32V (24V TCM).
- DTC P0721, P0722, P0731, P0732, P0733, P0734, P0735, P0736, or P1718 is not active.
- When unrealistic large change in turbine speed is detected.
 - Engine is running.
 - Shift is not in process.
 - Range attained is not neutral.
 - Transmission fluid temperature is above -25°C (-13°F).

DIAGNOSTIC TROUBLE CODES (DTC)

- When unrealistic low turbine speed is detected.
 - Engine is running.
 - Shift is not in process.
 - Range attained is not neutral.
 - Transmission fluid temperature is above -25°C (-13°F).
 - Transmission output speed is at or above 150 rpm or engine speed is at or above 400 rpm.

Conditions for Setting the DTC

DTC P0717 is set when one of the following conditions occur:

- Unrealistic large change in turbine speed. A Failure pending is set if an unrealistic change in transmission turbine speed is detected at or above 800 rpm. The failure pending response is to lock in the current range.
- Unrealistic low value in turbine speed. A failure pending is set if turbine speed is detected below 61 rpm. A failure is set when turbine speed is below 61 rpm and output speed is detected above 500 rpm for more than 1 second.

Action Taken When the DTC Sets

- When DTC P0717 is active, the following conditions will occur:
 - If failure occurs while in a forward range and a shift has been completed, the transmission will remain in the current range.
 - If failure occurs while in a forward range and a shift is in progress, the transmission will return to the previous range, except in post-shift state; then the transmission will continue to the commanded range.
 - If failure occurs under other conditions, the transmission shifts to 1st, 3rd, or 5th.
 - If the shift selector is moved to **N** (Neutral), **R** (Reverse), or any other forward range, the transmission will lock in **N** (Neutral).
- DTC P0717 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.
- You may have to drive the vehicle in order to experience a fault.

DIAGNOSTIC TROUBLE CODES (DTC)

- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection
 - Excessive vibration (driveline or engine torsionals)
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel)
- Install a known good speed sensor and see if normal function is restored to rule out an internal short or open in the sensor removed.
- Check that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.
- Install a known good TCM, if available. If the DTC does not return, reinstall the old TCM to verify the repair.

Test Description

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

2. This step tests ignition voltage.
3. This step tests for proper turbine speed sensor resistance at the TCM side of the harness.
4. This step tests turbine speed sensor resistance at the sensor.

DTC P0717 Turbine Speed Sensor Circuit No Signal

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Turn the ignition OFF. 2. Disconnect connector J2 from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 13 and 14. Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 4</i>
4	1. Disconnect the wiring harness from the turbine speed sensor. 2. Using a DVOM, measure resistance at the speed sensor terminals.* Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 5</i>	<i>Go to Step 6</i>

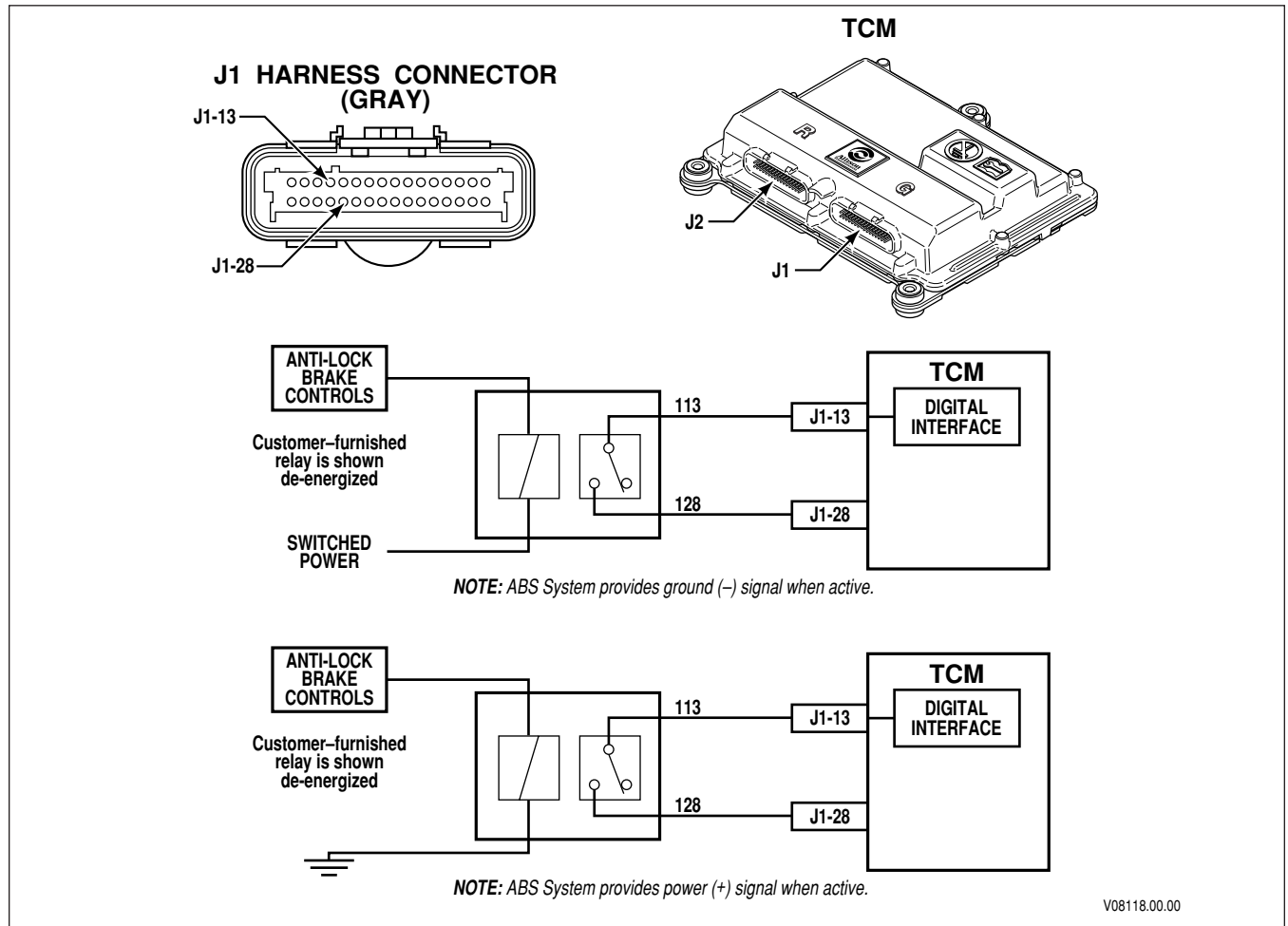
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0717 Turbine Speed Sensor Circuit No Signal (*cont'd*)

Step	Action	Value(s)	Yes	No
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 7	—
6	NOTE: Do not rotate the speed sensor in the retaining bracket. Orientation is fixed, and if changed, may cause improper operation. Replace the turbine speed sensor (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 7	—
7	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor turbine speed sensor operation. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0719 Brake Switch ABS Input Low



Circuit Description

If the vehicle is equipped with anti-lock brake system (ABS), an interface between the ABS and TCM is required. This interface allows disengagement of the Torque Converter Clutch (TCC) when the ABS is activated.

This ABS action is initiated with a discrete input from the ABS system, when the ABS is activated a ground signal is sent to TCM input wire 113. This may be a ground signal direct from the ABS controller or a positive signal from the ABS controller that powers a relay field coil to supply a ground through the relay contacts. (Some ABS systems require that the ground signal be switched through a relay.)

Conditions for Running the DTC

- Components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- DTCs P0721, P0722 are not active.

Conditions for Setting the DTC

DTC P0719 will set after the TCM detects one or more vehicle acceleration cycles where the TCM ABS brake switch input is in the "ON" activated state.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken when DTC sets

- The TCM uses the default assumption that the ABS is OFF.
- DTC P0719 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool can be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

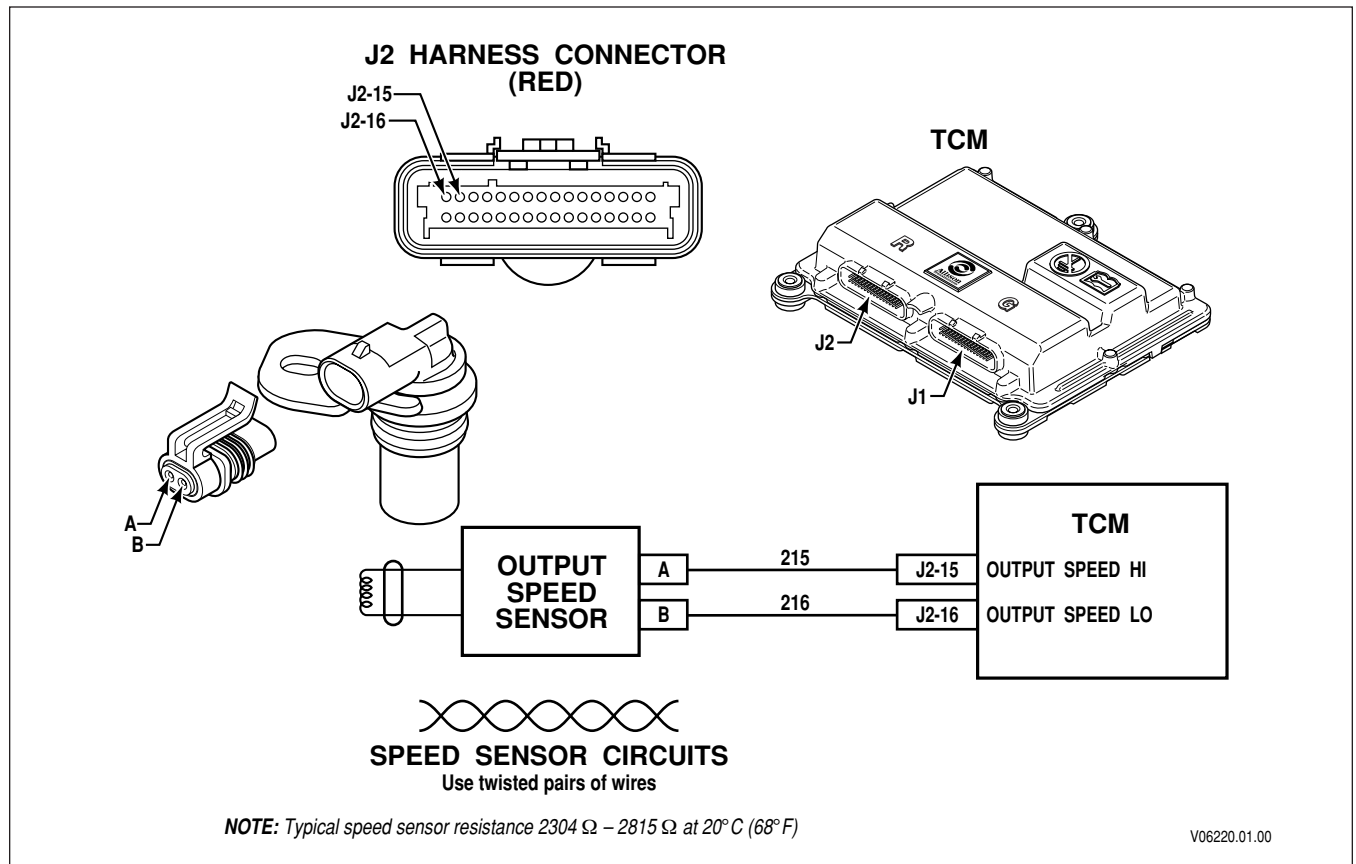
- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change.
- ABS system interface to the TCM input can be wired one of three different ways, check with the OEM for proper wiring information concerning ABS applied input before troubleshooting.

DTC P0719 Brake Switch ABS Input Low

Step	Action	Value	Yes	No
1	Was the Beginning the Troubleshooting Process (Section 5-4A) Performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5-4A)</i>
2	Remove ABS input wire (113) from J1 connector. Clear code and test-drive vehicle. Did the code return?	—	<i>Go to Step 4</i>	<i>Go to Step 3</i>
3	Return vehicle to OEM for troubleshooting of wiring leading to ABS controller. Was the problem found and corrected?	—	<i>Go to Step 5</i>	—
4	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3-6). Replace the TCM. Is the replacement complete?	—	<i>Go to Step 5</i>	—
5	In order to verify your repair: Clear the DTC. 1. Operate the vehicle under normal driving conditions. Check for proper operation of ABS. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1.</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0721 Output Speed Sensor Circuit Performance



Circuit Description

The speed sensors are variable reluctance devices which convert mechanical motion to an AC voltage. Each sensor consists of a wire coil wrapped around a pole piece that is adjacent to a permanent magnet. These elements are contained in a housing which is mounted adjacent to a rotating ferrous member. Two signal wires extend from one end of the housing and an exposed end of the pole piece is at the opposite end of the housing. The permanent magnet produces lines of flux around the pole piece. As a ferrous object (such as a gear tooth) approaches and passes through the gap at the end of the pole piece, an AC voltage pulse is induced in the wire coil. The Transmission Control Module (TCM) calculates the frequency of these AC pulses and converts it to a speed value. The AC voltage generated varies from 150mV at low speed to 15V at high speed. The signal wires from the sensor are formed as twisted pairs to cancel magnetically induced fields. The cable is also shielded to protect from voltage-related fields. Noise from other sources is eliminated by using two-wire differential inputs at the TCM.

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 18V and less than 32V (24V TCM).
- DTC P0716, P0717, or P0722 is not active.
- Turbine speed is above 200 rpm.
- Shift is complete and range attained is not neutral.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0721 is set when one of the following conditions occur:

- Unrealistic large change in output speed. A Failure pending is set if an unrealistic change in transmission output speed is detected at or above 500 rpm. The failure pending response is to lock in the current range.
- Noisy output speed signal. Noise is determined with two counters. A low counter is incremented when output speed change is below 500 rpm for 2.5 seconds. A high counter is incremented when output speed change is above 500 rpm. When both counters accumulate 5 events, a failure is set.

Action Taken When the DTC Sets

- When DTC P0721 is active, the following conditions will occur:
 - If failure occurs while in a forward range and a shift has been completed, the transmission will remain in the current range.
 - If failure occurs while in a forward range and a shift is in progress, the transmission will return to the previous range, except in post-shift state; then the transmission will continue to the commanded range.
 - If failure occurs under other conditions, the transmission shifts to 1st, 3rd, or 5th.
 - If the shift selector is moved to **N** (Neutral), **R** (Reverse), or any other forward range, the transmission will lock in **N** (Neutral).
 - If a latched inhibit is present, the transmission locks to neutral.
- DTC P0721 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.
- You may have to drive the vehicle in order to experience a fault.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection
 - Excessive vibration (driveline or engine torsionals)
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel)
- Install a known good speed sensor and see if normal function is restored to rule out an internal short or open in the sensor removed.
- Check that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests ignition voltage.
3. This step tests for proper output speed sensor resistance.
4. This step tests for proper resistance at the output speed sensor.

DTC P0721 Output Speed Sensor Circuit Performance

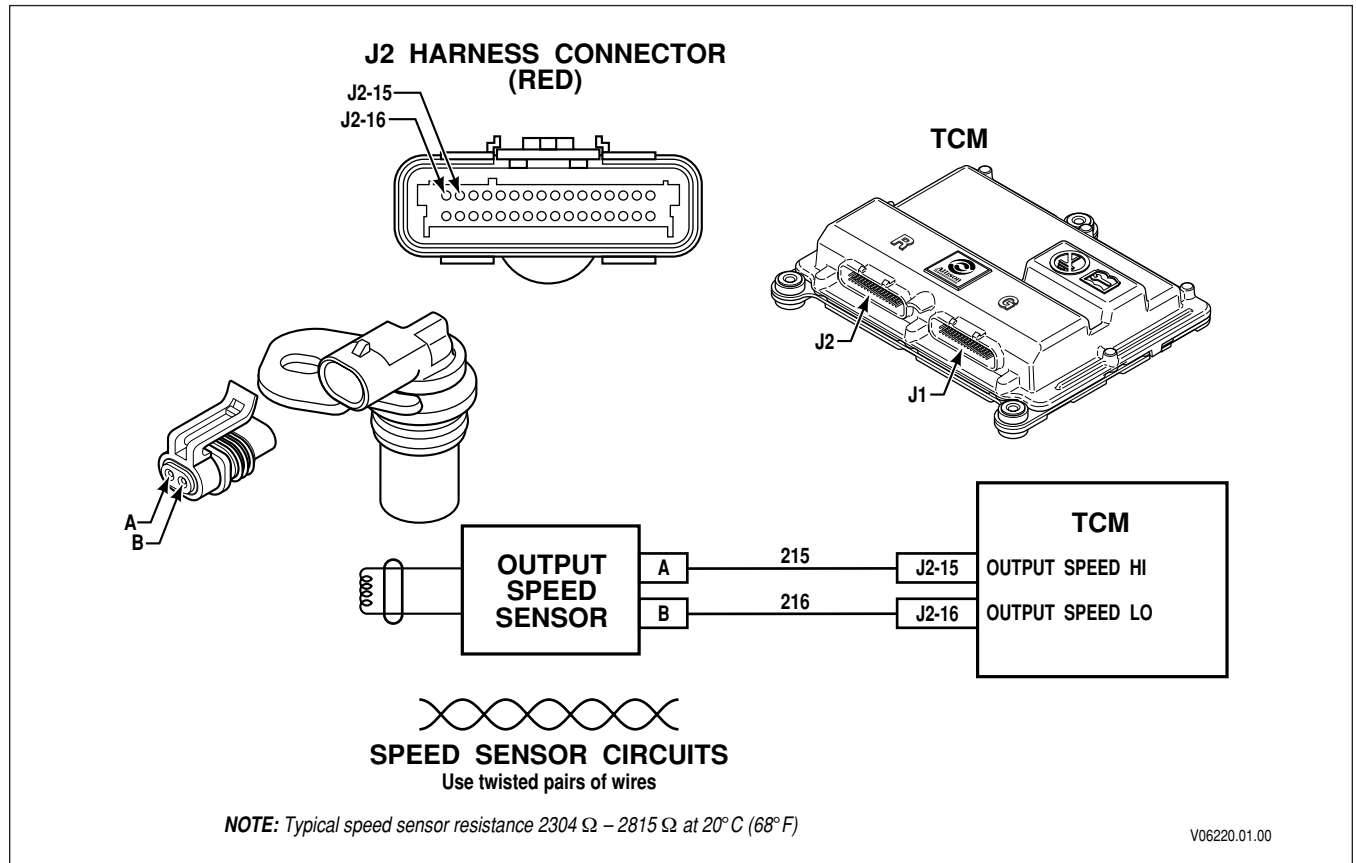
Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Turn the ignition OFF. 2. Disconnect connector J2 from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 15 and 16. Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Go to Diagnostic Aids</i>	<i>Go to Step 4</i>
4	1. Disconnect the wiring harness from the output speed sensor. 2. Using a DVOM, measure resistance at the speed sensor terminals.* Is resistance within the specified values?	2304–2815 Ohms at 20°C (68°F) <i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 5</i>	<i>Go to Step 6</i>
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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?	—	<i>Go to Step 7</i>	—
6	NOTE: Do not rotate the speed sensor in the retaining bracket. Orientation is fixed, and if changed, may cause improper operation. Replace the output speed sensor (refer to Mechanic's Tips). Is the replacement complete?	—	<i>Go to Step 7</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0721 Output Speed Sensor Circuit Performance (cont'd)**

Step	Action	Value(s)	Yes	No
7	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor output speed sensor operation. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0722 Output Speed Sensor Circuit No Signal



Circuit Description

The speed sensors are variable reluctance devices which convert mechanical motion to an AC voltage. Each sensor consists of a wire coil wrapped around a pole piece that is adjacent to a permanent magnet. These elements are contained in a housing which is mounted adjacent to a rotating ferrous member. Two signal wires extend from one end of the housing and an exposed end of the pole piece is at the opposite end of the housing. The permanent magnet produces lines of flux around the pole piece. As a ferrous object (such as a gear tooth) approaches and passes through the gap at the end of the pole piece, an AC voltage pulse is induced in the wire coil. The Transmission Control Module (TCM) calculates the frequency of these AC pulses and converts it to a speed value. The AC voltage generated varies from 150mV at low speed to 15V at high speed. The signal wires from the sensor are formed as twisted pairs to cancel magnetically induced fields. The cable is also shielded to protect from voltage-related fields. Noise from other sources is eliminated by using two-wire differential inputs at the TCM.

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 18V and less than 32V (24V TCM).
- DTC P0716, P0717, P0721, P0731, P0732, P0733, P0734, P0735, P0736, or P1718 is not active.
- When unrealistic large change in output speed is detected, output speed is at or above 600 rpm for more than 1 second.

DIAGNOSTIC TROUBLE CODES (DTC)

- When unrealistically low output speed is detected.
 - Engine is running.
 - Shift is not in process.
 - Range attained is not neutral.
 - Transmission fluid temperature is above -25°C (-13°F).
 - Transmission turbine speed is at or above 1050 rpm.
 - Manual selector valve is not being moved to a forward range.

Conditions for Setting the DTC

DTC P0722 is set when one of the following conditions occur:

- Unrealistic large change in output speed. A failure pending is set if an unrealistic change in transmission output speed is detected at or above 600 rpm. A failure is set if neutral range is attained.
- Unrealistic low value in output speed. A failure pending is set if output speed is detected below 61 rpm. A failure is set when output speed is below 61 rpm and transmission range is 3rd, 4th, or 5th for more than 1 second.

Action Taken When the DTC Sets

- When DTC P0722 is active, the following conditions will occur:
 - If failure occurs while in a forward range and a shift has been completed, the transmission will remain in the current range.
 - If failure occurs while in a forward range and a shift is in progress, the transmission will return to the previous range, except in post-shift state; then the transmission will continue to the commanded range.
 - If failure occurs under other conditions, the transmission shifts to 1st, 3rd, or 5th.
 - If the shift selector is moved to **N** (Neutral), **R** (Reverse), or any other forward range while the diagnostic response is active, the transmission will lock in **N** (Neutral).
 - If a latched inhibit is present, the transmission locks in neutral.
- DTC P0722 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.
- You may have to drive the vehicle in order to experience a fault.

DIAGNOSTIC TROUBLE CODES (DTC)

- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection
 - Excessive vibration (driveline or engine torsionals)
 - **Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel)**
- Install a known good speed sensor and see if normal function is restored to rule out an internal short or open in the sensor removed.
- Check that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.
- Install a known good TCM, if available. If the DTC does not return, reinstall the old TCM to verify the repair.

Test Description

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

2. This step tests ignition voltage.
3. This step tests for proper output speed sensor resistance at the TCM side of the wiring harness.
4. This step tests for proper output speed sensor resistance.

DTC P0722 Output Speed Sensor Circuit No Signal

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Turn the ignition OFF. 2. Disconnect connector J2 from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 15 and 16. Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 4</i>
4	1. Disconnect the wiring harness from the output speed sensor. 2. Using a DVOM, measure resistance at the speed sensor terminals.* Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 5</i>	<i>Go to Step 6</i>

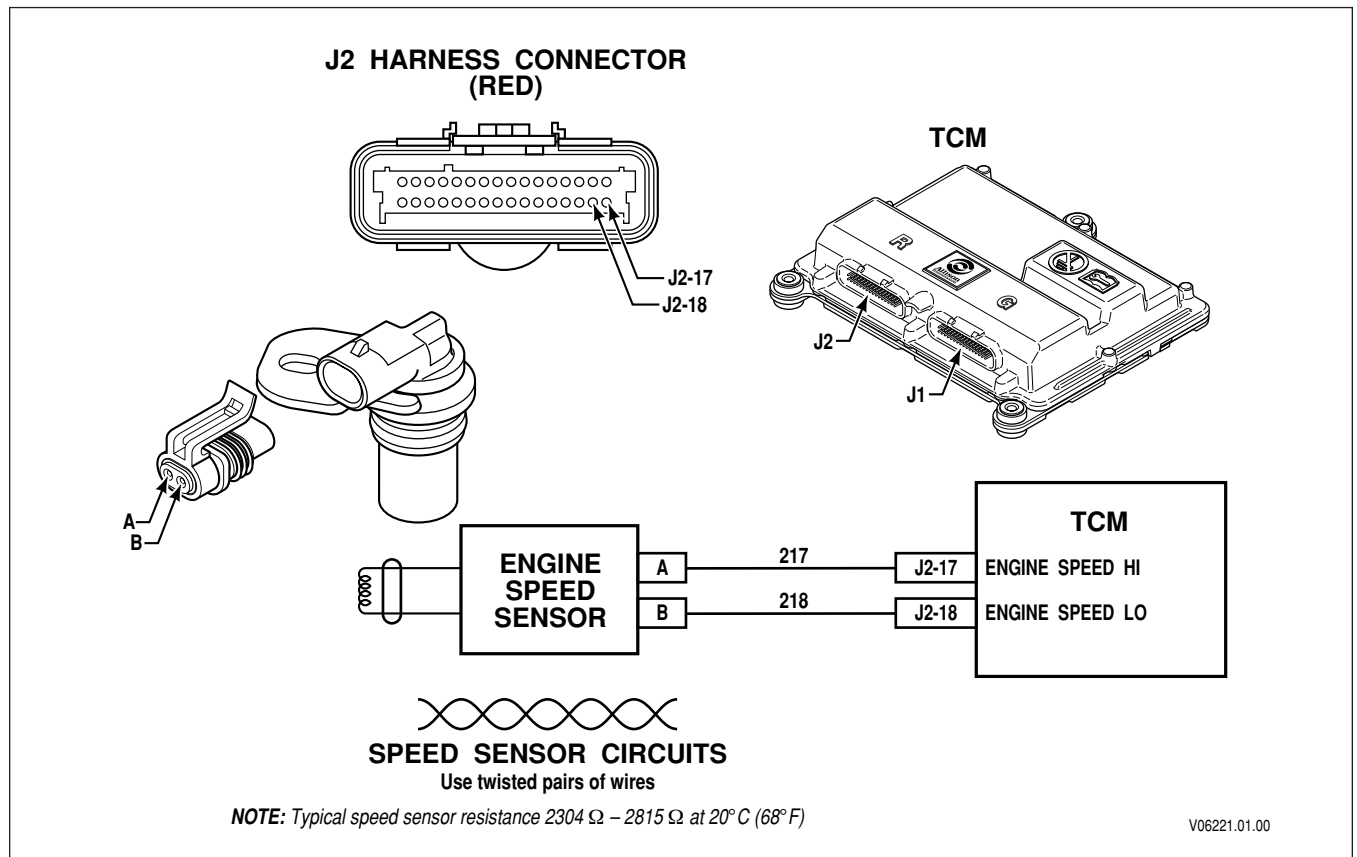
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0722 Output Speed Sensor Circuit No Signal (cont'd)

Step	Action	Value(s)	Yes	No
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 7	—
6	NOTE: Do not rotate the speed sensor in the retaining bracket. Orientation is fixed, and if changed, may cause improper operation. Replace the output speed sensor (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 7	—
7	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor output speed sensor operation. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0726 Engine Speed Input Circuit Performance



Circuit Description

The speed sensors are variable reluctance devices which convert mechanical motion to an AC voltage. Each sensor consists of a wire coil wrapped around a pole piece that is adjacent to a permanent magnet. These elements are contained in a housing which is mounted adjacent to a rotating ferrous member. Two signal wires extend from one end of the housing and an exposed end of the pole piece is at the opposite end of the housing. The permanent magnet produces lines of flux around the pole piece. As a ferrous object (such as a gear tooth) approaches and passes through the gap at the end of the pole piece, an AC voltage pulse is induced in the wire coil. The Transmission Control Module (TCM) calculates the frequency of these AC pulses and converts it to a speed value. The AC voltage generated varies from 150mV at low speed to 15V at high speed. The signal wires from the sensor are formed as twisted pairs to cancel magnetically induced fields. The cable is also shielded to protect from voltage-related fields. Noise from other sources is eliminated by using two-wire differential inputs at the TCM.

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 18V and less than 32V (24V TCM).
- DTC P0716, P0717, P0721, or P0727 is not active.
- Engine speed is above 600 rpm for 1 second.
- Shift is complete and range attained is not neutral.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0726 is set when one of the following conditions occur:

- Unrealistic large change in engine speed. Failure is set if an unrealistic change in transmission engine speed is detected at or above 600 rpm.
- Noisy input speed signal. Noise is determined with two counters. A low counter is incremented when engine speed change is below 650 rpm for 2.5 seconds. A high counter is incremented when engine speed change is above 650 rpm. When both counters accumulate 5 events, a failure is set.

Action Taken When the DTC Sets

- DTC P0726 is stored in the TCM history.
- The TCM defaults engine speed to turbine speed. Turbine speed is used to determine the missing engine speed.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.
- You may have to drive the vehicle in order to experience a fault.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection.
 - Excessive vibration (driveline or engine torsionals).
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).
- Install a known good speed sensor and see if normal function is restored to rule out an internal short or open in the sensor removed.
- Check that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.

Test Description

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

2. This step tests ignition voltage.
3. This step tests for proper engine speed sensor resistance at the TCM side of the wiring harness.
4. This step tests for proper resistance value at the engine speed sensor.

DIAGNOSTIC TROUBLE CODES (DTC)

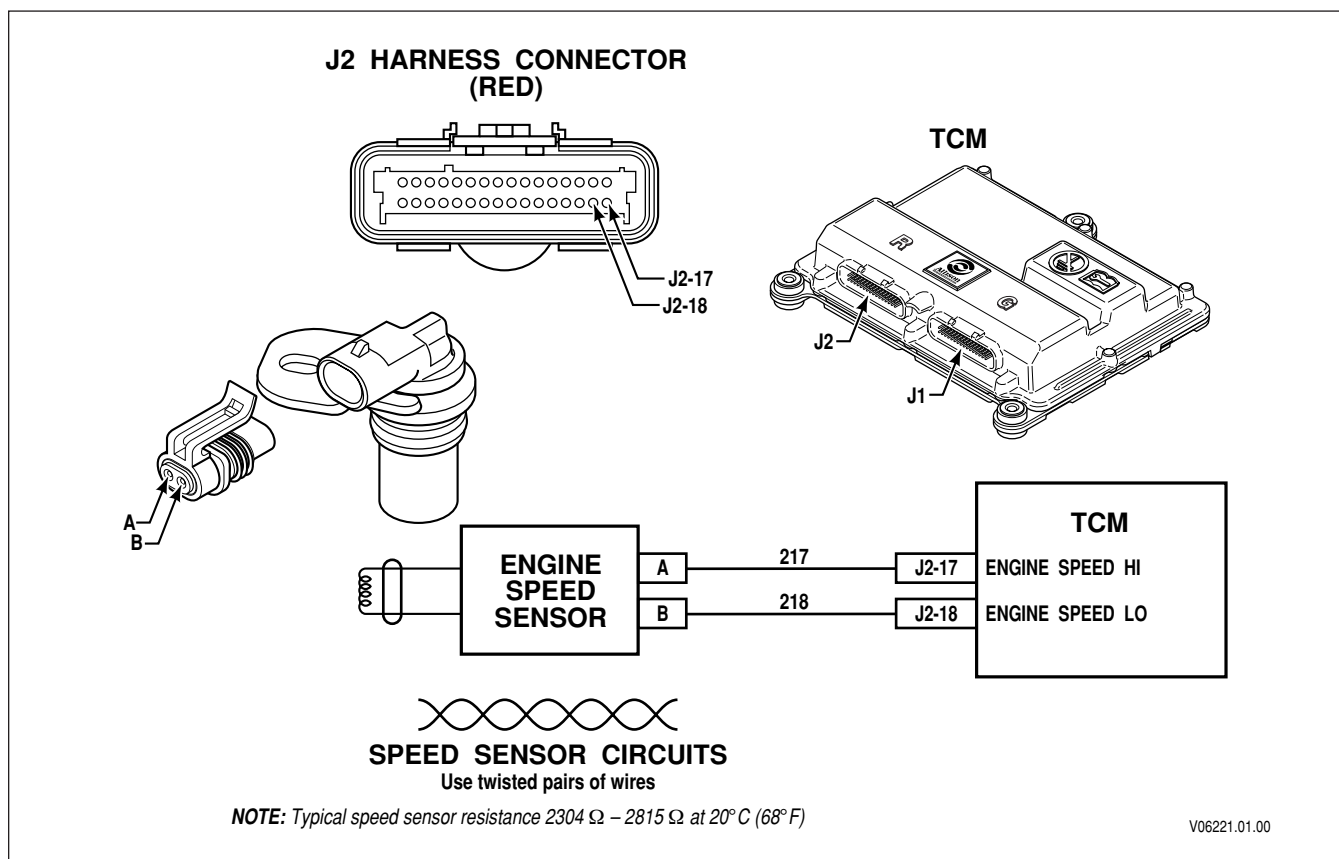
DTC P0726 Engine Speed Input Circuit Performance

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Turn the ignition OFF. 2. Disconnect connector J2 from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 17 and 18. Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Diagnostic Aids</i>	<i>Go to Step 4</i>
4	1. Disconnect the wiring harness from the engine speed sensor. 2. Using a DVOM, measure resistance at the speed sensor terminals.* Is resistance within the specified values?	<i>Refer to Speed Sensor Resistance Table Page 5–13)</i>	<i>Go to Step 5</i>	<i>Go to Step 6</i>
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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?	—	<i>Go to Step 7</i>	—
6	NOTE: Do not rotate the speed sensor in the retaining bracket. Orientation is fixed, and if changed, may cause improper operation. Replace the engine speed sensor (refer to Mechanic's Tips). Is the replacement complete?	—	<i>Go to Step 7</i>	—
7	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor engine speed sensor operation. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0727 Engine Speed Input Circuit No Signal



Circuit Description

The speed sensors are variable reluctance devices which convert mechanical motion to an AC voltage. Each sensor consists of a wire coil wrapped around a pole piece that is adjacent to a permanent magnet. These elements are contained in a housing which is mounted adjacent to a rotating ferrous member. Two signal wires extend from one end of the housing and an exposed end of the pole piece is at the opposite end of the housing. The permanent magnet produces lines of flux around the pole piece. As a ferrous object (such as a gear tooth) approaches and passes through the gap at the end of the pole piece, an AC voltage pulse is induced in the wire coil. The Transmission Control Module (TCM) calculates the frequency of these AC pulses and converts it to a speed value. The AC voltage generated varies from 150mV at low speed to 15V at high speed. The signal wires from the sensor are formed as twisted pairs to cancel magnetically induced fields. The cable is also shielded to protect from voltage-related fields. Noise from other sources is eliminated by using two-wire differential inputs at the TCM.

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 18V and less than 32V (24V TCM).
- DTC P0716, P0717, or P0726 is not active.
- Unrealistically low engine speed detected.
- Engine is running.
- Transmission turbine speed is at or above 400 rpm.
- Ignition is in the ON position.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0727 is set when one of the following conditions occur:

- Unrealistic large change in engine speed. Failure pending is set if an unrealistic change in engine speed is detected at or above 1140 rpm.
- Unrealistic low value in engine speed. Failure is set if engine speed is detected below 61 rpm for 4 seconds.

Action Taken When the DTC Sets

- The TCM defaults engine speed to turbine speed. Turbine speed is used to determine missing engine speed.
- TCM inhibits TCC momentarily.
- DTC P0727 is stored in TCM history

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.
- You may have to drive the vehicle in order to experience a fault.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection.
 - Excessive vibration (driveline or engine torsionals).
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel).
- Install a known good speed sensor and see if normal function is restored to rule out an internal short or open in the sensor removed.
- Check that the speed sensor wiring consists of twisted pairs at the rate of 12 to 16 twists per 300 mm. These twists must extend the entire length of the wiring harness to within at least 50 mm of the speed sensor connector.
- Install a known good TCM, if available. If the DTC does not return, reinstall the old TCM to verify the repair.

Test Description

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

2. This step tests ignition voltage.
3. This step tests for proper engine speed sensor resistance at the TCM side of the wiring harness.
4. This step tests for proper resistance value at the engine speed sensor.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0727 Engine Speed Input Circuit No Signal

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to Beginning The Troubleshooting Process (Paragraph 5–4A)
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem (Refer to DTC P0562 and P0563)
3	1. Turn the ignition OFF. 2. Disconnect connector J2 from the TCM. 3. Using a DVOM, measure resistance at connector J2 pins 17 and 18. Is resistance within the specified values?	Refer to Speed Sensor Resistance Table Page 5–13)	Go to Diagnostic Aids	Go to Step 4
4	1. Disconnect the wiring harness from the engine speed sensor. 2. Using a DVOM, measure resistance at the speed sensor terminals.* Is resistance within the specified values?	Refer to Speed Sensor Resistance Table Page 5–13)	Go to Step 5	Go to Step 6
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 7	—
6	NOTE: Do not rotate the speed sensor in the retaining bracket. Orientation is fixed, and if changed, may cause improper operation. Replace the engine speed sensor (refer to Mechanic's Tips). Is the replacement complete?	—	Go to Step 7	—
7	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor engine speed sensor operation. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0731 Incorrect 1st Gear Ratio**

REFER TO 1st RANGE HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

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

Conditions for Running the DTC

- Output speed exceeds 200 rpm.
- First range is selected and attained.
- DTC P0716, P0717, P0721, or P0722 is not active.

Conditions for Setting the DTC

DTC P0731 sets when the calculated first range ratio (steady state) differs from the known first range ratio.

Action Taken When the DTC Sets

- When DTC P0731 is active, the following conditions will occur:
 - The transmission will fail to 2nd or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) unless the transmission is compromised by overspeeding or a direction change; then it will lock in **N** (Neutral).
- DTC P0731 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- Incorrect ratio codes typically indicate mechanical problems with specific clutches, i.e. C1 or C5 for 1st range.
- An incorrect ratio code could indicate a hydraulically failed solenoid. Check the DTC information for the specific solenoid.
- You may have to drive the vehicle to experience the fault. Clutch test mode can be used to check stall speed.
- Incorrect TCM calibrations will cause this DTC to set. Verify that the proper TCM calibration is being used with the correct transmission family (there are different gear ratios for the 1000 and 2000 Product Families transmissions).

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

3. This step tests ignition voltage.
4. This step tests for current first range ratio.
5. This step tests speed sensor readings.
6. This step tests for clutch slippage in first range.
7. This step checks for evidence of clutch failure.

DTC P0731 Incorrect 1st Gear Ratio

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Start the engine. 2. Record the DTC Failure Record data. 3. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Install the Scan Tool. 2. Monitor the gear ratio. Is the correct first range ratio shown?	3.1 for 1000 3.51 for 2000/ 2400	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Turn the ignition ON and drive the vehicle under normal operating conditions. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	<i>Go to the appropriate speed sensor DTC</i>	<i>Go to Step 6</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0731 Incorrect 1st Gear Ratio (cont'd)

Step	Action	Value(s)	Yes	No
6	WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you: • Put the transmission in N (Neutral)...and • Apply the parking brake and service brake...and • Chock the vehicle wheels and take any other steps necessary to prevent the vehicle from moving...and Warn personnel to keep clear of the vehicle and its path. CAUTION: Do not perform a clutch test in fourth or fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select clutch test mode. 2. With brakes applied, move the selector lever to D (Drive). 3. With engine at idle, select and attain the range indicated by the DTC. Turbine speed should go to zero. 4. Monitor turbine speed while increasing engine speed to 1400 rpm. Did turbine speed remain at zero?	—	Go to Diagnostic Aids	Go to Step 7
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 8	Go to Step 9
8	Remove the transmission for overhaul or replacement (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 11	—
9	Inspect the control valve body for stuck or sticking trimmer valves (refer to Mechanic's Tips). Was a valve problem found and repaired?	—	Go to Step 11	Go to Step 10
10	Replace A solenoid (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0732 Incorrect 2nd Gear Ratio**

REFER TO 2nd RANGE HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

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

Conditions for Running the DTC

- Output speed exceeds 200 rpm.
- Second range is selected and attained.
- DTC P0716, P0717, P0721, or P0722 is not active.

Conditions for Setting the DTC

DTC P0732 sets when the calculated second range ratio (steady state) differs from the known second range ratio.

Action Taken When the DTC Sets

- When DTC P0732 is active, the following conditions will occur:
 - The transmission will fail to 3rd range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) unless the transmission is compromised by overspeeding or a direction change; then it will lock in **N** (Neutral).
- DTC P0732 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- Incorrect ratio codes typically indicate mechanical problems with specific clutches, i.e. C1 and C4 for 2nd range.
- An incorrect ratio code could indicate a hydraulically failed solenoid. Check the DTC information for the specific solenoid.
- You may have to drive the vehicle to experience the fault. Clutch test mode can be used to check stall speed.
- Incorrect TCM calibrations will cause this DTC to set. Verify that the proper TCM calibration is being used with the correct transmission family (there are different gear ratios for the 1000 and 2000 Product Families transmissions).

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

3. This step tests ignition voltage.
4. This step tests speed sensor readings.
5. This step tests for turbine speed not remaining at zero in second range.
6. This step checks for evidence of clutch failure.

DTC P0732 Incorrect 2nd Gear Ratio

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Start the engine. 2. Record the DTC Failure Record data. 3. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	<i>Go to appropriate speed sensor DTC</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0732 Incorrect 2nd Gear Ratio (cont'd)

Step	Action	Value(s)	Yes	No
5	WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you: • Put the transmission in N (Neutral)...and • Apply the parking brake and service brake...and • Chock the vehicle wheels and take any other steps necessary to prevent the vehicle from moving...and Warn personnel to keep clear of the vehicle and its path. CAUTION: Do not perform a clutch test in fourth or fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select clutch test mode. 2. With brakes applied, move the selector lever to D (Drive). 3. With engine at idle, select and attain the range indicated by the DTC. Turbine speed should go to zero. 4. Monitor turbine speed while increasing engine speed to 1400 rpm. Did turbine speed remain at zero?	—	Go to Diagnostic Aids	Go to Step 6
6	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 7	Go to Step 8
7	Remove the transmission for overhaul or replacement (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
8	Inspect the control valve body for stuck or sticking trimmer valves (refer to Mechanic's Tips). Was a valve problem found and repaired?	—	Go to Step 10	Go to Step 9
9	Replace B solenoid (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
10	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0733 Incorrect 3rd Gear Ratio**

REFER TO 3rd RANGE HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

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

Conditions for Running the DTC

- Output speed exceeds 200 rpm.
- Third range is selected and attained.
- DTC P0716, P0717, P0721, or P0722 is not active.

Conditions for Setting the DTC

DTC P0733 sets when the calculated third range ratio (steady state) differs from the known third range ratio.

Action Taken When the DTC Sets

- When DTC P0733 is active, the following conditions will occur:
 - The transmission will fail to 4th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **N** (Neutral).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will lock in **N** (Neutral).
- DTC P0733 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- Incorrect ratio codes typically indicate mechanical problems with specific clutches, i.e. C1 and C3 for 3rd range.
- An incorrect ratio code could indicate a hydraulically failed solenoid. Check the DTC information for the specific solenoid.
- You may have to drive the vehicle to experience the fault. Clutch test mode can be used to check stall speed.
- Incorrect TCM calibrations will cause this DTC to set. Verify that the proper TCM calibration is being used with the correct transmission family (there are different gear ratios for the 1000 and 2000 Product Families transmissions).

Test Description

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

3. This step tests ignition voltage.
4. This step tests speed sensor readings.
5. This step tests for turbine speed not remaining at zero in third range.
6. This step checks for evidence of clutch failure.

DTC P0733 Incorrect 3rd Gear Ratio

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Start the engine. 2. Record the DTC Failure Record data. 3. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	<i>Go to appropriate speed sensor DTC</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0733 Incorrect 3rd Gear Ratio (cont'd)

Step	Action	Value(s)	Yes	No
5	WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you: • Put the transmission in N (Neutral)...and • Apply the parking brake and service brake...and • Chock the vehicle wheels and take any other steps necessary to prevent the vehicle from moving...and Warn personnel to keep clear of the vehicle and its path. CAUTION: Do not perform a clutch test in fourth or fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select clutch test mode. 2. With brakes applied, move the selector lever to D (Drive). 3. With engine at idle, select and attain the range indicated by the DTC. Turbine speed should go to zero. 4. Monitor turbine speed while increasing engine speed to 1400 rpm. Did turbine speed remain at zero?	—	Go to Diagnostic Aids	Go to Step 6
6	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 7	Go to Step 8
7	Remove the transmission for overhaul or replacement (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
8	Inspect the control valve body for stuck or sticking trimmer valves (refer to Mechanic's Tips). Was a valve problem found and repaired?	—	Go to Step 10	Go to Step 9
9	Replace A solenoid (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
10	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0734 Incorrect 4th Gear Ratio**

REFER TO 4th RANGE HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

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

Conditions for Running the DTC

- Output speed exceeds 200 rpm.
- Fourth range is selected and attained.
- DTC P0716, P0717, P0721, or P0722 is not active.

Conditions for Setting the DTC

DTC P0734 sets when the calculated fourth range ratio (steady state) differs from the known fourth range ratio.

Action Taken When the DTC Sets

- When DTC P0734 is active, the following conditions will occur:
 - The transmission will fail to 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) unless the transmission is compromised by a direction change; then the transmission will shift to **N** (Neutral).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will lock in **N** (Neutral).
- DTC P0734 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- Incorrect ratio codes typically indicate mechanical problems with specific clutches, i.e. C1 and C2 for 4th range.
- An incorrect ratio code could indicate a hydraulically failed solenoid. Check the DTC information for the specific solenoid.
- You may have to drive the vehicle to experience the fault. Clutch test mode can be used to check stall speed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

3. This step tests ignition voltage.
4. This step tests speed sensor readings.
5. This step tests for turbine speed not remaining at zero in fourth range.
6. This step checks for evidence of clutch failure.

DTC P0734 Incorrect 4th Gear Ratio

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Start the engine. 2. Record the DTC Failure Record data. 3. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	<i>Go to appropriate speed sensor DTC</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0734 Incorrect 4th Gear Ratio (cont'd)

Step	Action	Value(s)	Yes	No
5	WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you: • Put the transmission in N (Neutral)...and • Apply the parking brake and service brake...and • Chock the vehicle wheels and take any other steps necessary to prevent the vehicle from moving...and Warn personnel to keep clear of the vehicle and its path. CAUTION: Do not perform a clutch test in fourth or fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select clutch test mode. 2. With brakes applied, move the selector lever to D (Drive). 3. With engine at idle, select and attain the range indicated by the DTC. Turbine speed should go to zero. 4. Monitor turbine speed while increasing engine speed to 1400 rpm. Did turbine speed remain at zero?	—	Go to Diagnostic Aids	Go to Step 6
6	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 7	Go to Step 8
7	Remove the transmission for overhaul or replacement (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
8	Inspect the control valve body for stuck or sticking trimmer valves (refer to Mechanic's Tips). Was a valve problem found and repaired?	—	Go to Step 10	Go to Step 9
9	Replace B solenoid (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
10	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0735 Incorrect 5th Gear Ratio**

REFER TO

5th RANGE HYDRAULIC SCHEMATIC

(APPENDIX H)

Circuit Description

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

Conditions for Running the DTC

- Output speed exceeds 200 rpm.
- Fifth range is selected and attained.
- DTC P0716, P0717, P0721, or P0722 is not active.

Conditions for Setting the DTC

DTC P0735 sets when the calculated fifth range ratio (steady state) differs from the known fifth range ratio.

Action Taken When the DTC Sets

- When DTC P0735 is active, the following conditions will occur:
 - The transmission will fail to 4th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) unless the transmission is compromised by a direction change; then the transmission will shift to **N** (Neutral).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will lock in **N** (Neutral).
- DTC P0735 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- Incorrect ratio codes typically indicate mechanical problems with specific clutches, i.e. C2 and C3 for 5th range.
- An incorrect ratio code could indicate a hydraulically failed solenoid. Check the DTC information for the specific solenoid.
- You may have to drive the vehicle to experience the fault. Clutch test mode can be used to check stall speed.
- Incorrect TCM calibrations will cause this DTC to set. Verify that the proper TCM calibration is being used with The correct transmission family (there are different gear ratios for the 1000 and 2000 Product Families transmissions).

Test Description

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

3. This step tests ignition voltage.
4. This step tests speed sensor readings.
5. This step tests for turbine speed not remaining at zero in fifth range.
6. This step checks for evidence of clutch failure.

DTC P0735 Incorrect 5th Gear Ratio

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Start the engine. 2. Record the DTC Failure Record data. 3. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	<i>Go to appropriate speed sensor DTC</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0735 Incorrect 5th Gear Ratio (cont'd)

Step	Action	Value(s)	Yes	No
5	WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you: • Put the transmission in N (Neutral)...and • Apply the parking brake and service brake...and • Chock the vehicle wheels and take any other steps necessary to prevent the vehicle from moving...and Warn personnel to keep clear of the vehicle and its path. CAUTION: Do not perform a clutch test in fourth or fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select clutch test mode. 2. With brakes applied, move the selector lever to D (Drive). 3. With engine at idle, select and attain the range indicated by the DTC. Turbine speed should go to zero. 4. Monitor turbine speed while increasing engine speed to 1400 rpm. Did turbine speed remain at zero?	—	Go to Diagnostic Aids	Go to Step 6
6	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 7	Go to Step 8
7	Remove the transmission for overhaul or replacement (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
8	Inspect the control valve body for stuck or sticking trimmer valves (refer to Mechanic's Tips). Was a valve problem found and repaired?	—	Go to Step 10	Go to Step 9
9	Replace A solenoid (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—
10	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0736 Incorrect Reverse Ratio

REFER TO REVERSE RANGE HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

The Transmission Control Module (TCM) uses input from the turbine speed sensor and output speed sensor to determine gear ratios. The TCM then compares the known gear ratio to the calculated gear ratio for the current gear.

Conditions for Running the DTC

- Output speed exceeds 200 rpm.
- Reverse is selected and attained.
- DTC P0716, P0717, P0721, or P0722 is not active.

Conditions for Setting the DTC

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

Action Taken When the DTC Sets

- When DTC P0736 is active, the transmission will lock in **N** (Neutral).
- DTC P0736 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- Incorrect ratio codes typically indicate mechanical problems with specific clutches, i.e. C3 and C5 for Reverse range.
- An incorrect ratio code could indicate a hydraulically failed solenoid. Check the DTC information for the specific solenoid.
- You may have to drive the vehicle to experience the fault. Clutch test mode can be used to check stall speed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

3. This step tests ignition voltage.
4. This step tests for current reverse range ratio.
5. This step tests for noise induced from the engine speed sensor.
6. This step tests for turbine speed not remaining at zero in reverse range.
7. This step checks for evidence of clutch failure.

DTC P0736 Incorrect Reverse Ratio

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Start the engine. 2. Record the DTC Failure Record data. 3. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	Using the Scan Tool, monitor the reverse gear ratio. Is the gear ratio correct for the transmission family that is installed in the vehicle?	4.49 for 1000 Product Family; 5.09 for 2000 Product Family	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Turn the ignition ON. 2. Start the engine and run at idle. 3. Using the Scan Tool, monitor engine, turbine, and output speed readings in Reverse range with the vehicle brakes applied. Is noise indicated on the output speed sensor or turbine speed sensor data?	—	<i>Go to appropriate speed sensor DTC</i>	<i>Go to Step 6</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0736 Incorrect Reverse Ratio (cont'd)

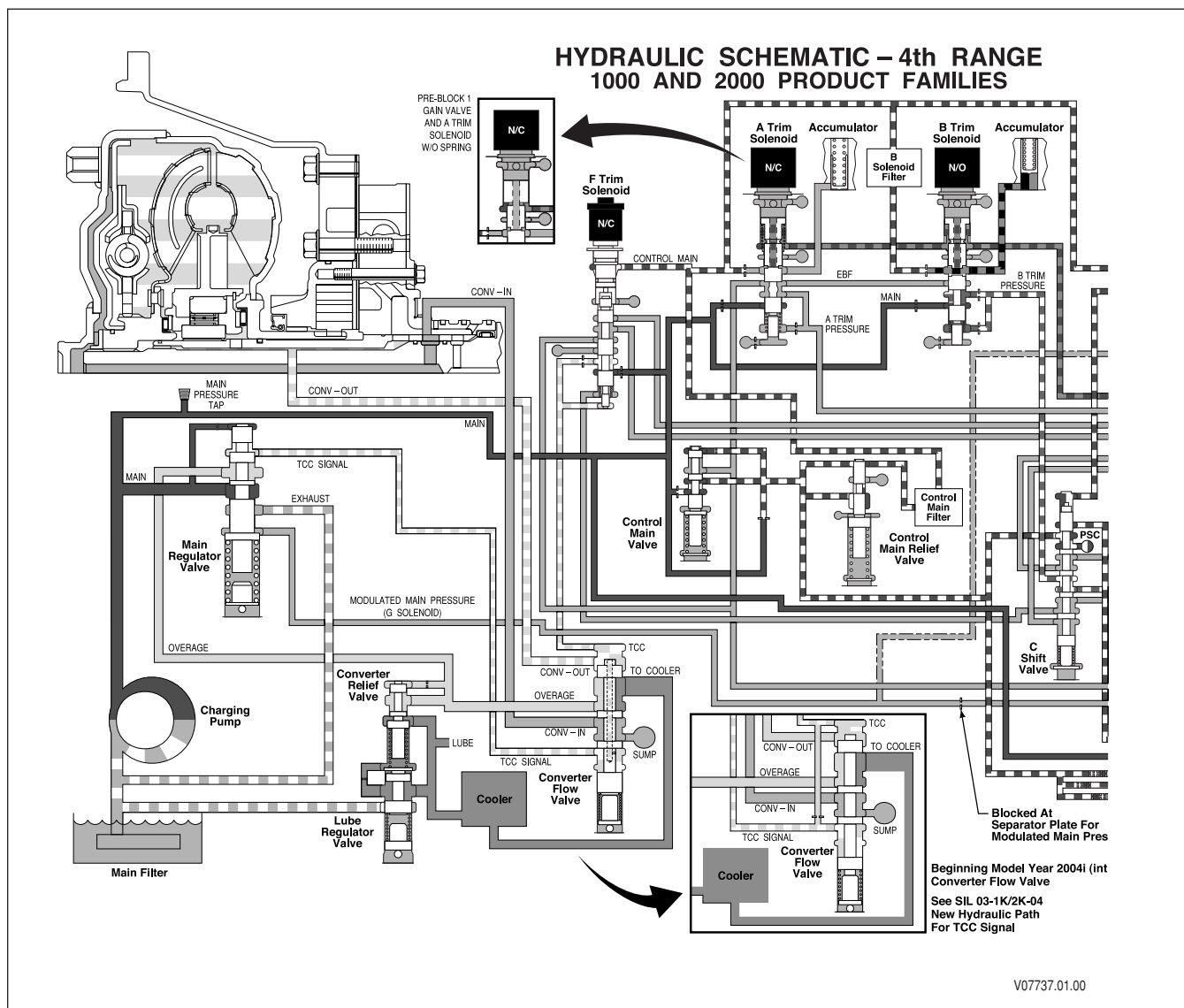
Step	Action	Value(s)	Yes	No
6	WARNING: To help avoid injury or property damage caused by sudden and unexpected vehicle movement, do not start a stationary stall test until you: • Put the transmission in N (Neutral)...and • Apply the parking brake and service brake...and • Chock the vehicle wheels and take any other steps necessary to prevent the vehicle from moving...and Warn personnel to keep clear of the vehicle and its path. CAUTION: NEVER perform a full throttle stall test (brakes held) in reverse range, or damage to the vehicle driveline or axle may occur. 1. Apply vehicle brakes and select Reverse. 2. With engine at idle and Reverse range attained, turbine speed should go to zero. 3. Using the Scan Tool, monitor turbine speed while increasing engine speed to 1000 rpm. Did turbine speed remain at zero?	—	Go to Diagnostic Aids	Go to Step 7
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 9	Go to Step 8
8	Using the Scan Tool, monitor turbine speed while selecting first range. If turbine speed is ever greater than zero after first range is attained, there may be a problem with A solenoid or A trimmer valve. If shift to first range is harsh and delayed, there may be a problem with B solenoid or B trimmer valve. Remove the control valve body and inspect for stuck or sticking trimmer valves. If valves are moving freely, replace either solenoid A or B (refer to Mechanic's Tips) based on the shift characteristics described. Is replacement complete?	—	Go to Step 10	—
9	Remove the transmission for overhaul or replacement (refer to Mechanic's Tips). Is replacement complete?	—	Go to Step 10	—

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

Step	Action	Value(s)	Yes	No
10	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle in all ranges under normal driving conditions. The ratio must fall within the specified range. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0741 Torque Converter Clutch System Stuck Off



Circuit Description

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

Conditions for Running the DTC

- DTC P0122, P0123, P0716, P0717, P0721, P0722, or P0743 (previously P1860) is not active.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm for 5 seconds.
- Transmission is in a valid forward range.
- Throttle position is over 10 percent but less than 90 percent.
- 6 seconds or more have expired since TCC was applied in a range.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0741 sets when the TCM detects a torque converter clutch slip value greater than 80 rpm for more than 15 seconds, indicating no TCC apply.

Action Taken When the DTC Sets

- DTC P0741 is stored in the TCM history.
- The **CHECK TRANS** light illuminates on the second occurrence.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- Residue or contamination may cause shift valves to stick intermittently.

Test Description

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

2. This step tests for a slip speed indicating the TCC is not applied when it should be.
4. This step verifies the repair performed.

DTC P0741 Torque Converter Clutch System Stuck Off

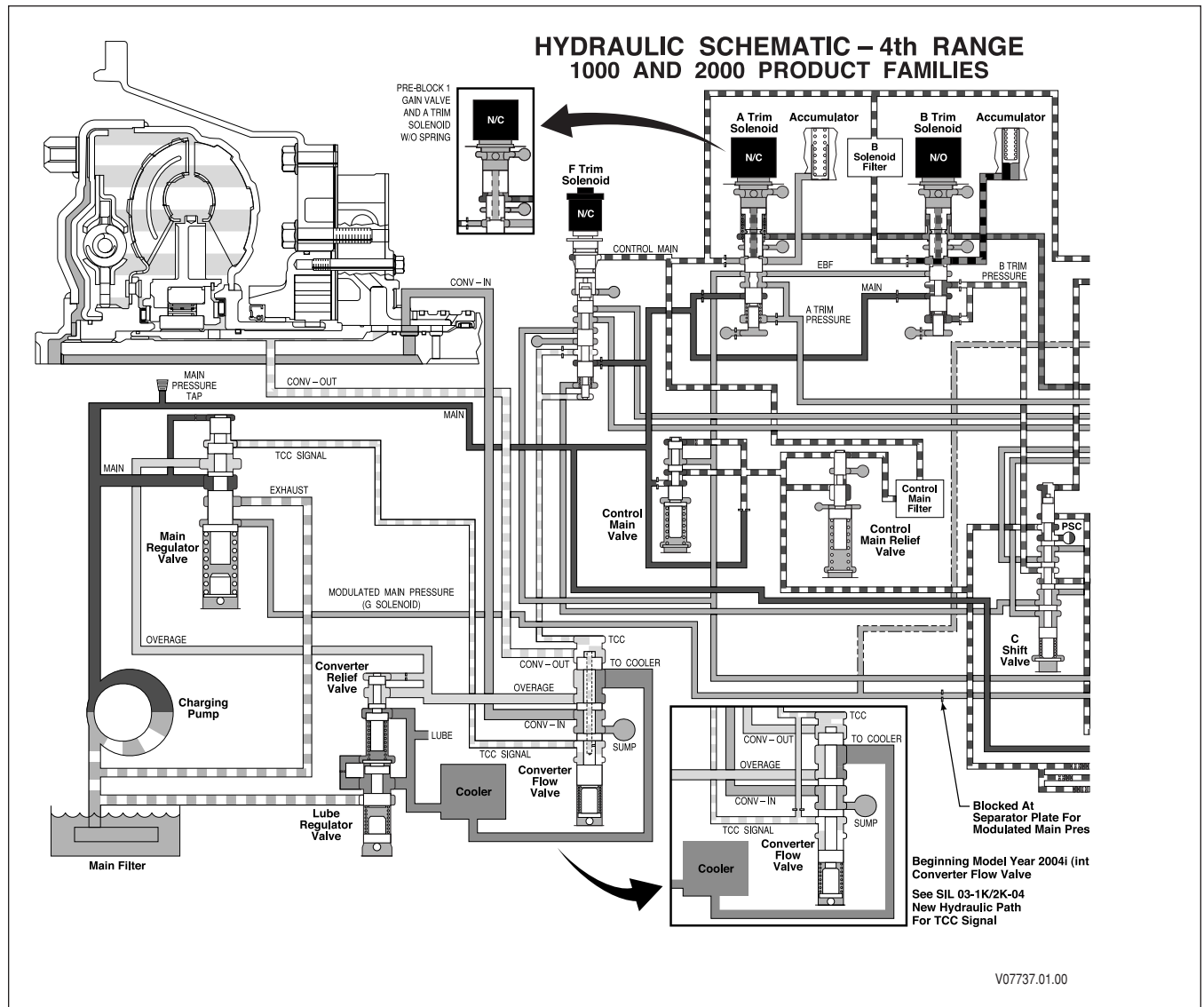
Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. 6. With the Scan Tool, monitor converter slip speed indicated when a range is attained where the TCC should be applied. NOTE: This DTC sets when converter slip speed is detected above 80 rpm for 15 seconds or more. This indicates the TCC has not applied. Is the slip speed value at or above the specified value when the TCC should be applied?	More than 80 rpm	<i>Go to Step 3</i>	<i>Go to Diagnostic Aids</i>

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

Step	Action	Value(s)	Yes	No
3	This condition indicates that the TCC is mechanically stuck OFF. Check for the following conditions: • Worn TCC clutch • Faulty solenoid F • Debris in the TCC valve bore (stuck valve) • Clogged or restricted converter relief passage Did you find and repair a problem?	—	<i>Go to Step 4</i>	—
4	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Using the Scan Tool, monitor TCC slip speed. The TCC must engage/disengage when commanded. 4. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0742 Torque Converter Clutch System Stuck On

**Circuit Description**

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

Conditions for Running the DTC

- DTC P0122, P0123, P0716, P0717, P0721, P0722, P0726, P0727, or P0743 (previously P1860) is not active.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm for 5 seconds.
- Transmission is in a valid forward range.
- The torque converter clutch is OFF.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0742 sets when the conditions listed below are present and the TCM detects converter slip speed between -5 and -40 rpm for over 2 seconds.

- Transmission output speed is 100 rpm or higher.
- Engine throttle percentage is 15 percent or higher.
- Engine torque is 130 N·m or higher.
- Engine and turbine speed are under 5500 rpm.

Action Taken When the DTC Sets

- Illuminate **CHECK TRANS** light on second occurrence.
- Response is calibration dependent.
- If response is disabled, no action is performed.
- If enabled, when DTC is set before or during a shift, response is a shift to neutral. If DTC is set after shifting is complete, transmission shifts to neutral or 1st range. While response is active, if the selector is moved to a forward range, transmission shifts to neutral or 1st range. If the selector is moved to reverse, the transmission shifts to neutral or reverse.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

This DTC sets when converter slip speed indicates the TCC is staying applied when it should be released for a period of time that is calibration dependent. This may indicate an internal failure of the TCC or a stuck or sticking TCC valve.

Test Description

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

2. This step tests for a slip speed indicating the TCC is locked up when it should be off.
4. This step verifies the repair performed.

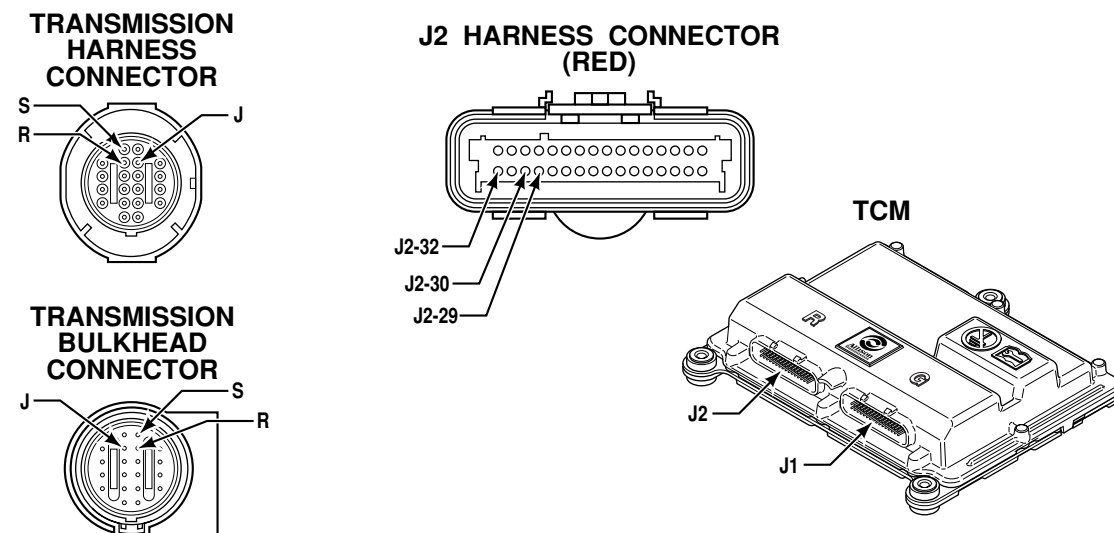
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0742 Torque Converter Clutch System Stuck On

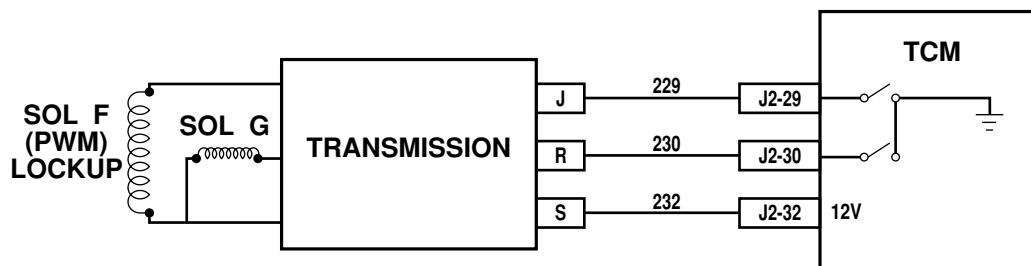
Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Drive the vehicle. 6. With the Scan Tool, observe converter slip speed indicated when a range is attained where TCC should not be applied. NOTE: This DTC sets when converter slip speed is detected between –5 and –40 rpm for over 2 seconds. This indicates that TCC did not release properly and remained in a locked state for over a calibration dependent time. Is the slip speed value between the specified values?	–5 to –40 rpm for more than 2 seconds. See Conditions for Setting the DTC	<i>Go to Step 3</i>	<i>Go to Diagnostic Aids</i>
3	This condition indicates that the TCC is mechanically stuck ON, check for the following conditions: • Worn TCC clutch • Faulty solenoid F • Stuck or sticking TCC valve • Clogged converter relief passage Did you find and repair a problem?	—	<i>Go to Step 6</i>	—
4	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions in failure records. 3. Using the Scan Tool, monitor TCC slip speed. The TCC must engage/disengage when commanded. 4. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0743 (Previously P1860) Torque Converter Clutch Pulse Width Modulation (PWM) Solenoid Circuit — Electrical



NOTE: Letters I, O, and Q are not used.



NOTE: Wire 232 is a 12V DC ignition power source for TCC solenoids F and G.

V06222.01.00

Circuit Description

The torque converter clutch (TCC) solenoid, solenoid F, is a pulse width modulated solenoid. Pulse width modulation (PWM) occurs when the signal from the transmission control module (TCM) to a solenoid is modulated at an established frequency, causing the steel check ball in the solenoid to rapidly open and close the solenoid passage. This serves to vary the output fluid pressure.

Conditions for Running the DTC

- DTC P0122, P0123, P0716, P0717, P0721, P0722, or P0743 (previously P1860) is not active.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater 18V and less than 32V (24V TCM).
- TCC is commanded on.
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P0743 sets when the TCM detects an open circuit, a short to power, or a short to ground in the solenoid F circuit for 6 seconds or longer.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

- DTC P0743 is stored in the TCM history.
- The **CHECK TRANS** light illuminates on the second occurrence.
- Reverse operation is disabled.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- If this DTC is cleared and does not return, but the TCC appears to be cycling, an intermittent circuit connection may exist that is not detected by the TCM since the circuit error must be present for more than 6 seconds. **If a short to ground occurs at wire 229, the TCC will apply regardless of the range selected.** A shudder in reverse may be caused by the intermittent apply or release of C5 clutch through the F solenoid valve.
- Inspect the wiring for poor electrical connections at the TCM connector and the transmission main connector. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A broken wire inside the insulation.
- Inspect the OEM wiring harness routing looking for possible contact points where chafing could occur. Moving parts on the vehicle could be contacting the harness. Items to check would include the parking brake drum, suspension components, transmission shift linkage, etc.
- Inspect the internal transmission wiring harness for possible contact areas where chafing may occur.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. **Refer to Section 4 wire check procedures.**
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where the DTC was set.
- If the DTC appears to be temperature related, suspect a defective F solenoid. It is possible for a shift solenoid to be temperature sensitive causing resistance values to fluctuate. This may cause an intermittent DTC to be set.

Test Description

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

2. This step tests for proper ignition voltage.
3. This step tests for an active DTC.
4. This step tests the TCM for proper command status.
5. This step tests the OEM wiring harness for an open condition.
6. This step tests for proper resistance at the main transmission connector.
8. This step tests for the proper resistance value at the shift solenoid.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0743 Torque Converter Clutch Pulse Width Modulation (PWM) Solenoid Circuit—Electrical

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to Beginning The Troubleshooting Process (Paragraph 5–4A)
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Use the Scan Tool to measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem (Refer to DTC P0562 and P0563)
3	1. Turn ON the ignition, with the engine OFF. 2. Record the failure records. 3. Clear the DTC. 4. Drive the vehicle under the same condition noted in the failure records. 5. Using the Scan Tool, observe the TCC solenoid F status. NOTE: This DTC sets when an open, a short to ground or a short to power is present in the TCC circuit for over 6 seconds. Did the DTC return?	—	Go to Step 4	Go to Diagnostic Aids
4	With the Scan Tool in Solenoid Test Mode command F solenoid ON. Does the Scan Tool indicate a duty cycle at or above the indicated value?	85 percent duty cycle or above	Go to Step 5	Go to Step 11
5	NOTE: Review Section 4 — Wire Check Procedures before performing the following steps. 1. Turn the ignition OFF. 2. Disconnect J2 connector from TCM. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter, connect only to the J2 harness connector. See Beginning the Troubleshooting Process, Page 5–4, Figure 5–2 for diagram of J 43799 adapter harness hook-ups. 3. Using a DVOM, attach leads to J2 pins 29 and 32. 4. Measure the resistance of the circuit. Is the resistance reading within the specified value	Refer to Solenoid Resistance Table (Page 5–12) NOTE: To allow for resistance of harness wire, add 0.1 Ohms per foot of length for 18-gauge wire.	Go to Step 6	Go to Diagnostic Aids

DIAGNOSTIC TROUBLE CODES (DTC)

**DTC P0743 Torque Converter Clutch Pulse Width Modulation (PWM)
Solenoid Circuit—Electrical (cont'd)**

Step	Action	Value(s)	Yes	No
6	1. Turn the ignition OFF. 2. Disconnect the transmission main connector from the back of the transmission. Using J 39700 Breakout Box and J 44722 Adapter Harness, connect only to the transmission main connector at the rear of the transmission. Do not attach the other end of J 44722 to the vehicle transmission harness. See Beginning the Troubleshooting Process, Page 5–5, Figure 5–3 for diagram of J 44722 transmission harness hook-ups. 3. Using a DVOM, measure the resistance between pins S and J at the magnetic overlay. Is the resistance within the specified value?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 7	Go to Step 8
7	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 12	—
8	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Remove the internal wiring harness from Solenoid F (TCC) connector. 3. Using a DVOM, measure the resistance of solenoid F. Is resistance within the specified values?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 9	Go to Step 10
9	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 12	—
10	Replace F (TCC) Solenoid. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 12	—
11	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 12	—

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0743 Torque Converter Clutch Pulse Width Modulation (PWM)
Solenoid Circuit—Electrical (cont'd)**

Step	Action	Value(s)	Yes	No
12	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0746 (Previously P1720) Solenoid A Controlled Clutch Stuck Off

REFER TO HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

Trim solenoid A is used to control on-coming, off-going, and holding pressure in any one of five clutches. This solenoid is referred to as a Pressure Proportional to Current (PPC) solenoid since the output hydraulic pressure supplied by this solenoid is proportional to the controlled current command.

The Transmission Control Module (TCM) uses information from the turbine and output speed sensors to detect if a clutch is slipping. The clutch being controlled by the solenoid A will vary depending on the shift that is being completed.

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 18V and less than 32V (24V TCM).
- Turbine speed is greater than 60 rpm.
- Output speed is greater than 125 rpm.
- Transmission is at normal operating temperature.
- DTC P0708, P0716, P0717, P0721, P0722, P0875, or P0876 is not active.

Conditions for Setting the DTC

DTC P0746 sets when the TCM detects an incorrect oncoming ratio (range-to-range) for an accumulated number of occurrences.

Action Taken When the DTC Sets

- When DTC P0746 is active, the following conditions will occur:
 - If failure occurs while in a forward range, the transmission will shift to the previous range.
 - If failure occurs while in **N** (Neutral) or **R** (Reverse), the transmission will lock in **N** (Neutral).
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral) (some cases may lock in **N** (Neutral)).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) or **N** (Neutral).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will shift to **N** (Neutral).
- DTC P0746 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- This DTC indicates the on-coming clutch being controlled by solenoid A is not applied or applied too slowly. This could indicate a leak or obstruction in a specific clutch apply circuit. Check the Scan Tool Failure Record data for previous or current range information when the DTC was set to determine the specific shift when the DTC was set. Refer to the Solenoid and Clutch Table (Appendix C) to determine which clutch circuit is suspect.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection
 - Excessive vibration (driveline or engine torsionals)
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel)
- Inspect and confirm that the OEM engine rating does not exceed the transmission model rating. Also inspect for the presence of an add-on engine power package or module. Whenever the engine horsepower or torque is increased over the transmission factory rating, a shift flare condition may occur leading to the diagnostic code indicated.

NOTE: Clutch failure due to an OEM engine rating exceeding the Allison transmission rating, or the installation of a engine power package or module will not be covered under the Allison transmission warranty.

Test Description

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

3. This step tests the ignition voltage.
4. This step tests for erratic speed sensor readings or signal dropout.
5. This step tests for internal hydraulic leakage.
6. This step tests for clutch capacity.

DTC P0746 (Previously P1720) Solenoid A Controlled Clutch Stuck Off

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Use the Failure Record data to determine during which shift the code was set. 5. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. Make the shift determined in Step 3. 2. Using the Scan Tool, monitor turbine, engine, and output speed sensor readings. Is speed sensor data erratic or are dropouts in signal indicated?	—	<i>Go to the appropriate speed sensor DTC</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0746 (Previously P1720) Solenoid A Controlled Clutch Stuck Off (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Connect a 2000 kPa (300 psi) pressure gauge to the main-pressure tap (refer to Mechanic's Tips). 2. Use the Scan Tool, in clutch test mode, to cycle through all transmission ranges with the engine at idle and vehicle brakes applied. 3. Record main pressure in each range. Was the main pressure low in a specific range or in ranges where the same clutch was applied?	—	Go to General Troubleshooting — Low Pressure (Section 7)	Go to Step 6
6	CAUTION: Do not perform a clutch test on fourth and fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select the clutch test mode. 2. With engine at idle speed (600 rpm), vehicle brakes applied, select D (Drive). 3. Using clutch test mode, select and attain first range. Turbine speed should go to zero. 4. Increase engine speed to 1400 rpm. Did turbine speed remain at zero? 5. Repeat the two previous steps for ranges two through five. Did turbine speed remain at zero in all ranges?	Refer to Main Pressure Table (Pages 5–8 and 5–9)	Go to Diagnostic Aids	Go to Step 7
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 8	Go to Step 9
8	Remove the transmission for overhaul or replacement. Is the overhaul or replacement complete?	—	Go to Step 11	—
9	Inspect the control valve body for stuck or sticking trimmer valves (refer to Mechanic's Tips). Was a valve problem found and repaired?	—	Go to Step 11	Go to Step 10
10	Replace A solenoid. Is solenoid replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Use the Scan Tool to reset adaptive for all shifts. 3. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0747 (Previously P1723) Solenoid A Controlled Clutch Stuck On

REFER TO HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

Trim solenoid A is used to control on-coming, off-going, and holding pressure to any one of the five clutches. This solenoid is referred to as a Pressure Proportional to Current (PPC) solenoid since the output hydraulic pressure supplied by this solenoid is proportional to the controlled current command.

The Transmission Control Module (TCM) uses information from the turbine and output speed sensors to detect if a clutch is in a tie-up condition or 3 clutches are applied. The clutch being controlled by solenoid A will vary depending on the shift.

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 18V and less than 32V (24V TCM).
- One of the following conditions occurs:
 - Output speed is greater than 200 rpm.
 - Turbine speed is greater than 200 rpm.
- DTC P0708, P0716, P0717, P0721, P0722, P0875, or P0876 is not active.

Conditions for Setting the DTC

DTC P0747 sets when the TCM detects an incorrect offgoing ratio (range-to-range) for an accumulated number of occurrences.

Action Taken When the DTC Sets

- When DTC P0747 is active, the following conditions will occur:
 - If failure occurs while in a forward range, the transmission will shift to the previous range.
 - If failure occurs while in **N** (Neutral) or **R** (Reverse), the transmission will lock in **N** (Neutral).
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) or **N** (Neutral) (some cases may lock in **N** (Neutral)).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will shift to **N** (Neutral).
- DTC P0747 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- This DTC indicates the off-going clutch being controlled by solenoid A is not releasing or is slow to release. This could indicate a leak or obstruction in a specific clutch apply circuit. Check the Scan Tool Failure Record data for previous or current range information when the DTC was set to determine the specific shift when the DTC was set. Refer to the Solenoid and Clutch Table (Appendix C) to determine which clutch circuit is suspect.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection
 - Excessive vibration (driveline or engine torsionals)
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel)
- Inspect and confirm that the OEM engine rating does not exceed the transmission model rating. Also inspect for the presence of an add-on engine power package or module. Whenever the engine horsepower or torque is increased over the transmission factory rating, a shift flare condition may occur leading to the diagnostic code indicated.

NOTE: Clutch failure due to an OEM engine rating exceeding the Allison transmission rating, or the installation of a engine power package or module will not be covered under the Allison transmission warranty.

Test Description

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

3. This step tests the ignition voltage.
4. This step tests for erratic speed sensor readings or signal dropout.
5. This step tests for internal hydraulic leakage.
6. This step tests for clutch capacity.

DTC P0747 (Previously P1723) Solenoid A Controlled Clutch Stuck On

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Use the Failure Record data to determine during which shift the code was set. 5. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. Make the shift determined in Step 3. 2. Using the Scan Tool, monitor turbine, engine, and output speed sensor readings. Is speed sensor data erratic or are dropouts in signal indicated?	—	<i>Go to the appropriate speed sensor DTC</i>	<i>Go to Step 5</i>

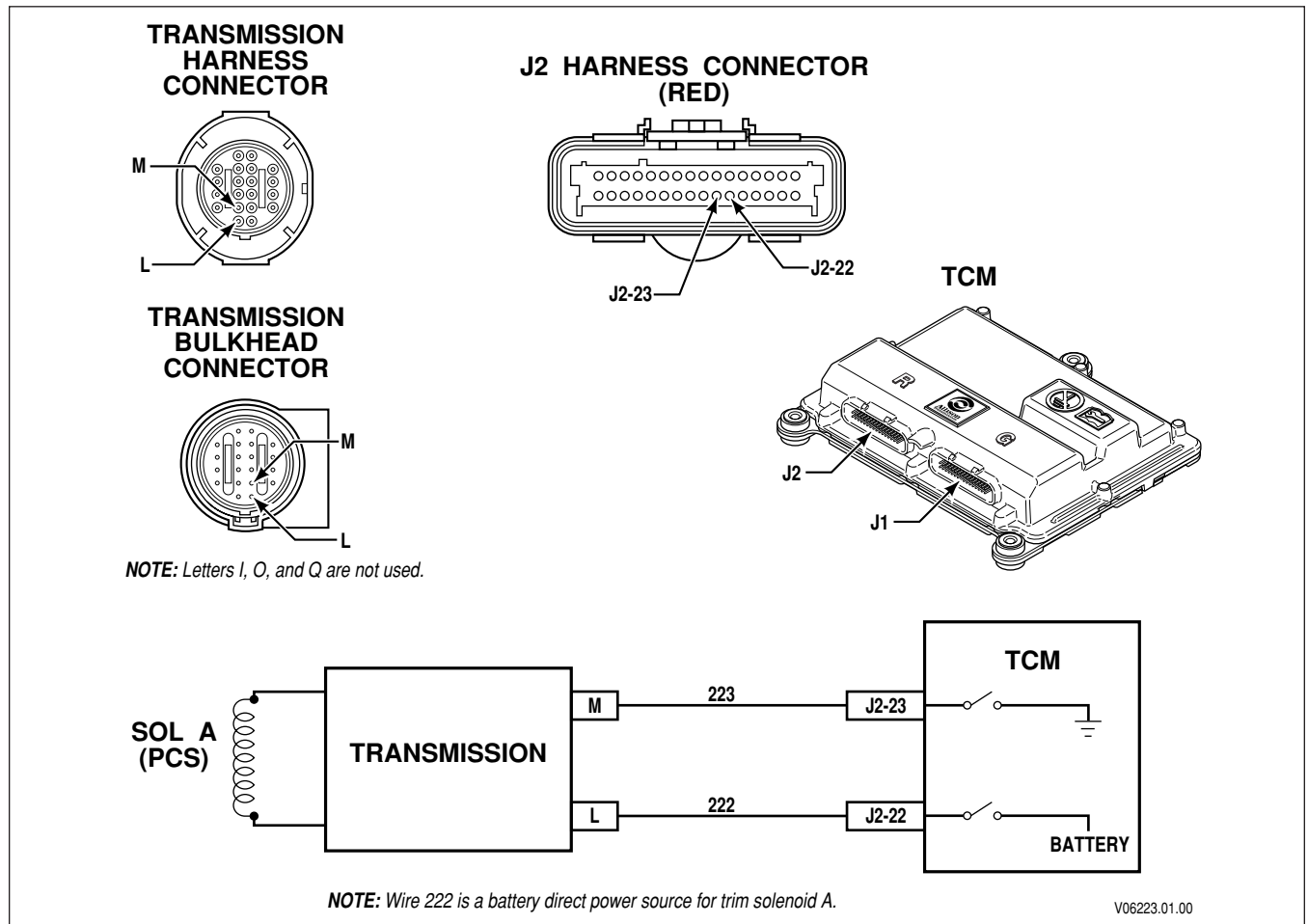
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0747 (Previously P1723) Solenoid A Controlled Clutch Stuck On (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Connect a 2000 kPa (300 psi) pressure gauge to the main-pressure tap. Refer to Mechanic's Tips. 2. Use the Scan Tool, in clutch test mode, to cycle through all transmission ranges with the engine at idle and vehicle brakes applied. 3. Record main pressure in each range. Was the main pressure low in a specific range or in ranges where the same clutch was applied?	—	Go to General Troubleshooting — Low Pressure (Section 7)	Go to Step 6
6	CAUTION: Do not perform a clutch test on fourth and fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select the clutch test mode. 2. With engine at idle speed (600 rpm), vehicle brakes applied, select D (Drive). 3. Using clutch test mode, select and attain first range. Turbine speed should go to zero. 4. Increase engine speed to 1400 rpm. Did turbine speed remain at zero? 5. Repeat the two previous steps for ranges two through five. Did turbine speed remain at zero in all ranges?	Refer to Main Pressure Table (Pages 5–8 and 5–9)	Go to Diagnostic Aids	Go to Step 7
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 8	Go to Step 9
8	Remove the transmission for overhaul or replacement. Is the overhaul or replacement complete?	—	Go to Step 11	—
9	Inspect the control valve body for stuck or sticking trimmer valves. Refer to Mechanic's Tips. Was a valve problem found and repaired?	—	Go to Step 11	Go to Step 10
10	Replace A solenoid. Is solenoid replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Use the Scan Tool to reset adaptive for all shifts. 3. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0748 Pressure Control Solenoid A Electrical



Circuit Description

Trim solenoid A is used to control on-coming, off-going, and holding pressure to any one of the five clutches. This solenoid is referred to as a Pressure Proportional to Current (PPC) solenoid since the pressure output is proportional to the amount of controlled current commanded by the TCM.

The solenoid operates at a very high 1000 Hz frequency. Unlike the pulse width modulated Torque Converter Clutch (TCC) solenoid, where the ball follows the pulse width square wave, the PPC ball remains stationary due to the high frequency at which the solenoid operates. This allows the ball to move in a linear up and down motion proportional to the current commanded from the TCM. This supplies the desired signal pressure to control the trim valve.

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 18V and less than 32V (24V TCM).
- Engine crank time is under 4 seconds.

Conditions for Setting the DTC

DTC P0748 is set when one of the following conditions is detected for 125 milliseconds.

- Open circuit — TCM commanded duty cycle between 31 percent and 87 percent with no current present at trim solenoid A.

DIAGNOSTIC TROUBLE CODES (DTC)

- Short to ground — TCM commanded duty cycle is over 87 percent with a current of less than 1.0 ampere at trim solenoid A.
- Short to power — TCM commanded duty cycle is under 15 percent with electrical current present.
- Whenever a P0748, P0778 combination is set in failure records, this is generally caused by having the transmission harness disconnected at the main transmission connector while the vehicle ignition is ON. Check the connection at the transmission and clear codes.

Action Taken When the DTC Sets

- When DTC P0748 is active, the following conditions will occur:
 - If failure occurs while in a forward range, the transmission shifts to 1st, 3rd, or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) unless the transmission is compromised by a direction change; then the transmission will shift to or lock in **N** (Neutral).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will lock in **N** (Neutral).
- DTC P0748 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

The diagnostic test performed to detect this DTC is very sensitive. Therefore, there is a high probability that an intermittent circuit condition may be causing this DTC to set. Check for the following conditions at the OEM harness first, then at the transmission internal harness.

- Inspect the wiring for poor electrical connections at the TCM connector and the transmission main connector. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
 - Inspect OEM wiring harness routing, looking for possible contact points where chafing could occur. Moving parts on the vehicle could be contacting the harness. Check for contact at the parking brake drum, suspension components, transmission shift linkage, etc.
 - Inspect the internal transmission wiring harness for possible contact areas where chafing may occur.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode where the DTC was set.
- If this DTC appears to be temperature-related, suspect a defective solenoid. A failing solenoid may be temperature sensitive causing resistance values to fluctuate. This may cause an intermittent DTC to be set.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests the TCM for proper operation.
4. This step tests for the proper resistance at the OEM vehicle harness.
5. This step tests the resistance value at the transmission main connector.
7. This step tests the resistance value at the trim solenoid.

DTC P0748 Pressure Control Solenoid A Electrical

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Install the Scan Tool. 2. Turn the ignition ON, with the engine OFF. 3. In solenoid test mode, command A trim solenoid ON. Did the Scan Tool indicate A solenoid as being commanded ON?	Duty cycle value of 75 percent is an indication that the TCM is commanding the solenoid ON.	<i>Go to Step 4</i>	<i>Go to Step 10</i>
4	NOTE: Review Section 4 — Wire Check Procedures before performing the following steps. 1. Turn the ignition OFF. 2. Disconnect J2 connector from TCM. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter, connect only to the J2 harness connector. See Beginning the Troubleshooting Process, Page 5–4, Figure 5–2 for diagram of J 43799 adapter harness hook-ups. 3. Using a DVOM, attach leads to J2 pins 22 and 23. 4. Measure the resistance of the circuit. Is the resistance reading within the specified value?	<i>Refer to Solenoid Resistance Table (Page 5–12)</i> NOTE: To allow for resistance of harness wire, add 0.1 Ohms per foot of length for 18-gauge wire.	<i>Go to Diagnostic Aids</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0748 Pressure Control Solenoid A Electrical (*cont'd*)

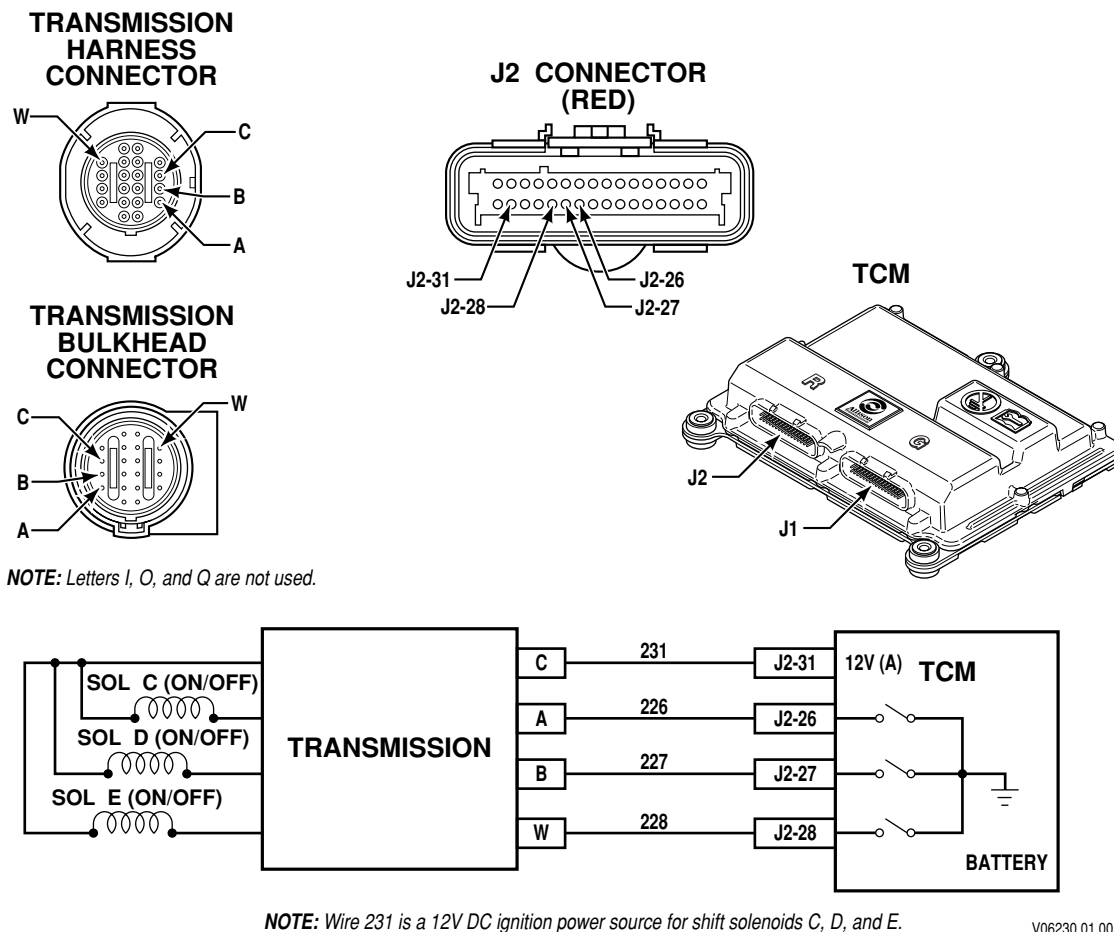
Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the wiring harness from the main transmission connector at the back of the transmission. Using J 39700 Breakout Box and J 44722 Adapter Harness, connect only to the transmission main connector at the rear of the transmission. Do not attach the other end of J 44722 to the vehicle transmission harness. See Beginning the Troubleshooting Process, Page 5–5, Figure 5–3 for diagram of J 44722 transmission harness hook-ups. 3. Using a DVOM, measure the resistance between pins L and M at the magnetic overlay. Is the resistance within the specified value?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 6	Go to Step 7
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 11	—
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Remove the internal wiring harness at solenoid A connector. 3. Using a DVOM, measure the resistance of solenoid A. Is the solenoid resistance within the specified value?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 8	Go to Step 9
8	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
9	Replace solenoid A. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0748 Pressure Control Solenoid A Electrical (cont'd)**

Step	Action	Value(s)	Yes	No
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0763 Shift Solenoid C Electrical



Circuit Description

Shift solenoid C is a normally closed (N/C) solenoid that provides control main pressure to stroke the C shift valve. The TCM determines the proper solenoid command logic to move the C shift valve to attain a particular range requested. A pressure switch, located at the end of the shift valve, sends shift valve position feedback to the TCM.

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 18V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P0763 is set when the TCM detects one of the following conditions for more than 100 milliseconds:

- Open circuit or short to ground detected when C solenoid is commanded OFF.
- Short to power is detected when C solenoid is commanded ON.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

- When DTC P0763 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to 1st, 3rd, or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to neutral or reverse.
 - If the shift selector is moved to a forward range or reverse and transmission is compromised by overspeeding or direction change, transmission shifts to neutral.
 - If this failure is present at the solenoid electrical feed wire 231, the response is hydraulic default.
- DTC P0763 is stored in TCM history.
- The **CHECK TRANS** light illuminates on first occurrence.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A scan tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- The diagnostic test performed to detect this DTC is very sensitive. Therefore, there is a high probability that an intermittent circuit condition may be causing this DTC to set. Make sure you check for the following conditions at the OEM harness first and then at the transmission internal harness.
- Inspect the wiring for poor electrical connections at the TCM connector and the transmission main connector. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
 - Inspect OEM wiring harness routing, looking for possible contact points where chafing could occur. Moving parts on the vehicle could be contacting the harness. Check for contact at the parking brake drum, suspension components, transmission shift linkage etc.
 - Inspect the internal transmission wiring harness for possible contact areas where chafing may occur.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where DTC was set.
- If the DTC appears to be temperature related, suspect a defective shift solenoid. It is possible for a shift solenoid to be temperature sensitive causing resistance values to fluctuate. This may cause an intermittent DTC to be set.
- If the circuit problem (open or short) is present at the 231 solenoid feed wire, other shift solenoid electrical DTCs may be present (C, D, E electrical codes).

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests the TCM for proper command status.
4. This step tests the OEM harness for an open condition.
5. This step tests for the proper resistance at the main transmission connector.
7. This step tests for the proper resistance value at the shift solenoid.

DTC P0763 Shift Solenoid C Electrical

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Turn the ignition OFF. 2. Disconnect the J2 connector (RED) at the TCM. 3. Install J 39700 breakout box and J 43799 breakout box adapter 4. Turn ON the ignition, with the engine OFF. 5. Using the Scan Tool in solenoid test mode, command C solenoid to ON. 6. Using a DVOM measure the voltage between J2 terminal 26 and terminal 31. Is the voltage within the range specified when C solenoid is commanded ON?	Battery Voltage	<i>Go to Step 4</i>	<i>Go to Step 10</i>
4	NOTE: Review Section 4 — Wire Check Procedures before performing the following steps. 1. Turn the ignition OFF. 2. Disconnect J2 connector from TCM. 3. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter Harness, connect only to the J2 harness connector. See Beginning the Troubleshooting Process, Page 5–4, Figure 5–2 for diagram of J 43799 adapter harness hook-ups. 4. Using a DMM, attach leads to J2 pins 31 and 26 5. Measure the resistance of the circuit. Is the resistance within the specified value?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table (Page 5–12)</i> NOTE: To allow for resistance of harness wire, add 0.1 Ohms per foot of length for 18-gauge wire.	<i>Go to Diagnostic Aids</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0763 Shift Solenoid C Electrical (cont'd)

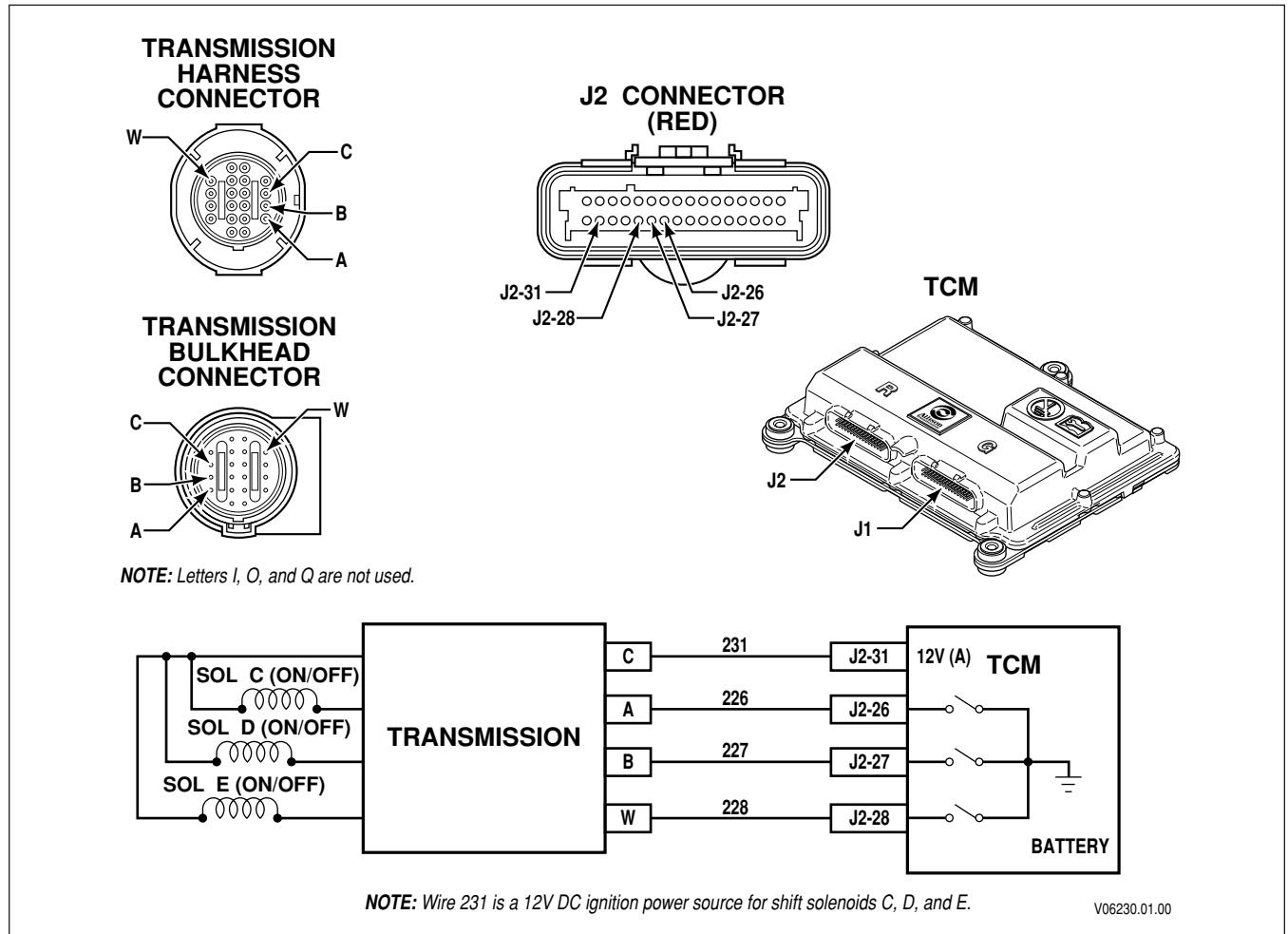
Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the wiring harness from the main transmission connector at the back of the transmission. 3. Using J 39700 Breakout Box and J 44722 Adapter Harness, connect only to the transmission main connector at the rear of the transmission. Do not attach the other end of J 44722 to the vehicle transmission harness. See Beginning the Troubleshooting Process, Page 5–5, Figure 5–3 for diagram of J 44722 transmission harness hook-ups. 4. Using a DMM, measure resistance between bulkhead connector pins A and C at the magnetic overlay. Is the resistance within the specified values?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table (Page 5–12)</i>	Go to Step 6	Go to Step 7
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Repair or replace the vehicle wiring harness. Is the repair complete?	—	Go to Step 11	—
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Remove the connector from C solenoid. 3. Using a DMM, measure the resistance at the solenoid. Is the solenoid resistance within the specified value?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table (Page 5–12)</i>	Go to Step 8	Go to Step 9
8	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
9	Replace solenoid C. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0763 Shift Solenoid C Electrical (cont'd)**

Step	Action	Value(s)	Yes	No
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0768 Shift Solenoid D Electrical



Circuit Description

Shift solenoid D is a normally closed (N/C) solenoid that provides control main pressure to stroke the D shift valve. The TCM determines the proper solenoid command logic to move the D shift valve to attain a particular range requested. A pressure switch, located at the end of the shift valve, sends shift valve position feedback to the TCM.

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 18V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P0768 is set when the TCM detects one of the following conditions for more than 100 milliseconds:

- Open circuit or short to ground detected when D solenoid is commanded OFF.
- Short to power is detected when D solenoid is commanded ON.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

- When DTC P0768 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to 1st, 3rd, or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to neutral or reverse.
 - If the shift selector is moved to a forward range or reverse and transmission is compromised by overspeeding or direction change, transmission shifts to neutral.
 - If this failure is present at the solenoid electrical feed wire 231, the response is hydraulic default.
- DTC P0768 is stored in TCM history.
- The **CHECK TRANS** light illuminates on first occurrence.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A scan tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- The diagnostic test performed to detect this DTC is very sensitive. Therefore, there is a high probability that an intermittent circuit condition may be causing this DTC to set. Make sure you check for the following conditions at the OEM harness first and then at the transmission internal harness.
- Inspect the wiring for poor electrical connections at the TCM connector and the transmission main connector. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
 - Inspect OEM wiring harness routing, looking for possible contact points where chafing could occur. Moving parts on the vehicle could be contacting the harness. Check for contact at the parking brake drum, suspension components, transmission shift linkage etc.
 - Inspect the internal transmission wiring harness for possible contact areas where chafing may occur.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where DTC was set.
- If the DTC appears to be temperature related, suspect a defective shift solenoid. It is possible for a shift solenoid to be temperature sensitive causing resistance values to fluctuate. This may cause an intermittent DTC to be set.
- If the circuit problem (open or short) is present at the 231 solenoid feed wire, other shift solenoid electrical DTCs may be present (C, D, E electrical codes).

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests the TCM for proper command status.
4. This step tests the OEM harness for an open condition.
5. This step tests for the proper resistance at the main transmission connector.
7. This step tests for the proper resistance value at the shift solenoid.

DTC P0768 Shift Solenoid D Electrical

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to <i>Beginning The Troubleshooting Process</i> (Paragraph 5–4A)
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem (Refer to DTC P0562 and P0563)
3	1. Turn the ignition OFF. 2. Disconnect the J2 connector (RED) at the TCM. 3. Install J 39700 breakout box and J 43799 breakout box adapter 4. Turn ON the ignition, with the engine OFF. 5. Using the Scan Tool in solenoid test mode, command D solenoid to ON. 6. Using a DVOM measure the voltage between J2 terminal 27 and terminal 31. Is the voltage within the range specified when D solenoid is commanded ON?	Battery Voltage	Go to Step 4	Go to Step 10
4	NOTE: Review Section 4 — Wire Check Procedures before performing the following steps. 1. Turn the ignition OFF. 2. Disconnect J2 connector from TCM. 3. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter Harness, connect only to the J2 harness connector. See Beginning the Troubleshooting Process, Page 5–4, Figure 5–2 for diagram of J 43799 adapter harness hook-ups. 4. Using a DMM, attach leads to J2 pins 27 and 31 5. Measure the resistance of the circuit. Is the resistance within the specified value?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table</i> (Page 5–12) NOTE: To allow for resistance of harness wire, add 0.1 Ohms per foot of length for 18-gauge wire.	Go to Diagnostic Aids	Go to Step 5

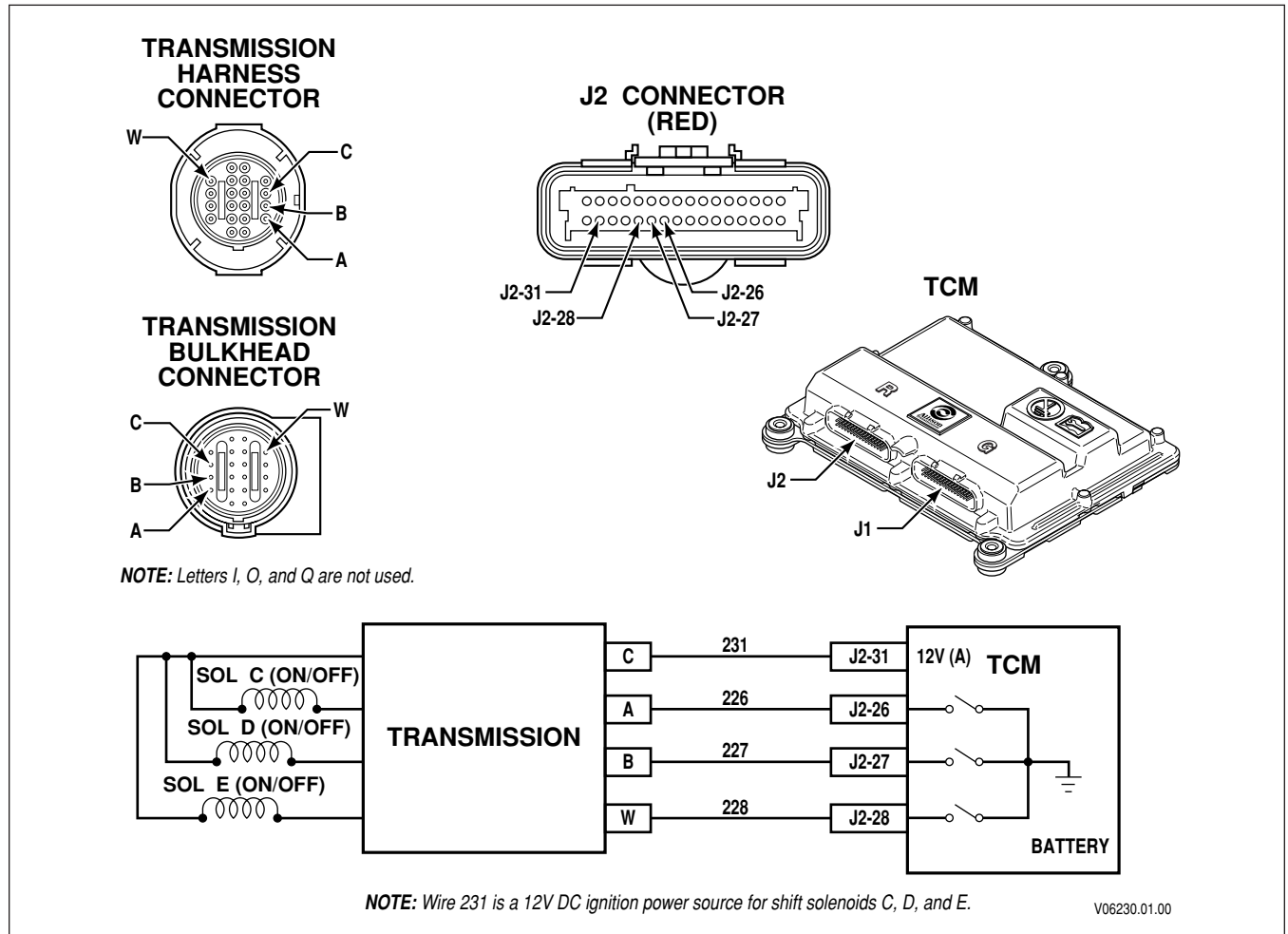
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0768 Shift Solenoid D Electrical (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the wiring harness from the main transmission connector at the back of the transmission. 3. Using J 39700 Breakout Box and J 44722 Adapter Harness, connect only to the transmission main connector at the rear of the transmission. Do not attach the other end of J 44722 to the vehicle transmission harness. See Beginning the Troubleshooting Process, Page 5–5, Figure 5–3 for diagram of J 44722 transmission harness hook-ups. 4. Using a DMM, measure resistance between pins B and C at the magnetic overlay. Is the resistance within the specified values?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table (Page 5–12)</i>	Go to Step 6	Go to Step 7
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Repair or replace the vehicle wiring harness. Is the repair complete?	—	Go to Step 11	—
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Remove the connector from D solenoid. 3. Using a DMM, measure the resistance at the solenoid. Is the resistance within the specified value?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table (Page 5–12)</i>	Go to Step 8	Go to Step 9
8	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
9	Replace solenoid D. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0773 Shift Solenoid E Electrical



Circuit Description

Shift solenoid E is a normally closed (N/C) solenoid that provides control main pressure to stroke the E shift valve. The TCM determines the proper solenoid command logic to move the E shift valve to attain a particular range requested. A pressure switch, located at the end of the shift valve, sends shift valve position feedback to the TCM.

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 18V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.

Conditions for Setting the DTC

DTC P0773 is set when the TCM detects one of the following conditions for more than 100 milliseconds:

- Open circuit or short to ground detected when E solenoid is commanded OFF.
- Short to power is detected when E solenoid is commanded ON.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

- When DTC P0773 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to 1st, 3rd, or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to neutral or reverse.
 - If the shift selector is moved to a forward range or reverse and transmission is compromised by overspeeding or direction change, transmission shifts to neutral.
 - If this failure is present at the solenoid electrical feed wire 231, the response is hydraulic default.
- DTC P0773 is stored in TCM history.
- The **CHECK TRANS** light illuminates on first occurrence.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A scan tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- The diagnostic test performed to detect this DTC is very sensitive. Therefore, there is a high probability that an intermittent circuit condition may be causing this DTC to set. Make sure you check for the following conditions at the OEM harness first and then at the transmission internal harness.
- 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.
 - Inspect OEM wiring harness routing, looking for possible contact points where chafing could occur. Moving parts on the vehicle could be contacting the harness. Check for contact at the parking brake drum, suspension components, transmission shift linkage etc.
 - Inspect the internal transmission wiring harness for possible contact areas where chafing may occur.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where DTC was set.
- If the DTC appears to be temperature related, suspect a defective shift solenoid. It is possible for a shift solenoid to be temperature sensitive causing resistance values to fluctuate. This may cause an intermittent DTC to be set.
- If the circuit problem (open or short) is present at the 231 solenoid feed wire, other shift solenoid electrical DTCs may be present (C, D, E electrical codes).

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests the TCM for proper command status.
4. This step tests the OEM harness for an open condition.
5. This step tests for the proper resistance at the main transmission connector.
7. This step tests for the proper resistance value at the shift solenoid.

DTC P0773 Shift Solenoid E Electrical

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to <i>Beginning The Troubleshooting Process</i> (Paragraph 5–4A)
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	Go to Step 3	Resolve voltage problem (Refer to DTC P0562 and P0563)
3	1. Turn the ignition OFF. 2. Disconnect the J2 connector (RED) at the TCM. 3. Install J 39700 breakout box and J 43799 breakout box adapter 4. Turn ON the ignition, with the engine OFF. 5. Using the Scan Tool in solenoid test mode, command E solenoid to ON. 6. Using a DVOM measure the voltage between J2 terminal 28 and terminal 31. Is the voltage within the range specified when E solenoid is commanded ON?	Battery Voltage	Go to Step 4	Go to Step 10
4	NOTE: Review Section 4 — Wire Check Procedures before performing the following steps. 1. Turn the ignition OFF. 2. Disconnect J2 connector from TCM. 3. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter Harness, connect only to the J2 harness connector. See Beginning the Troubleshooting Process, Page 5–4, Figure 5–2 for diagram of J 43799 adapter harness hook-ups. 4. Using a DMM, attach leads to J2 pins 31 and 28 5. Measure the resistance of the circuit. Is the resistance within the specified value?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table</i> (Page 5–12) NOTE: To allow for resistance of harness wire, add 0.1 Ohms per foot of length for 18-gauge wire.	Go to Diagnostic Aids	Go to Step 5

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0773 Shift Solenoid E Electrical (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the wiring harness from the main transmission connector at the back of the transmission. 3. Using J 39700 Breakout Box and J 44722 Adapter Harness, connect only to the transmission main connector at the rear of the transmission. Do not attach the other end of J 44722 to the vehicle transmission harness. See Beginning the Troubleshooting Process, Page 5–5, Figure 5–3 for diagram of J 44722 transmission harness hook-ups. 4. Using a DMM, measure resistance between pins W and C at the magnetic overlay. Is the resistance within the specified values?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table (Page 5–12)</i>	Go to Step 6	Go to Step 7
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Repair or replace the vehicle wiring harness. Is the repair complete?	—	Go to Step 11	—
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Remove the connector from E solenoid. 3. Using a DMM, measure the resistance at the solenoid. Is the resistance within the specified value?	22 Ohms at 68°F <i>Refer to Solenoid Resistance Table (Page 5–12)</i>	Go to Step 8	Go to Step 9
8	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
9	Replace solenoid E. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0776 (Previously P1721) Solenoid B Controlled Clutch Stuck Off

REFER TO HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

Trim solenoid B is used to control on-coming, off-going, and holding pressure to any one of the five clutches. This solenoid is referred to as a Pressure Proportional to Current (PPC) solenoid since the output hydraulic pressure supplied by this solenoid is proportional to the controlled current command.

The Transmission Control Module (TCM) uses information from the turbine and output speed sensors to detect if a clutch is slipping. The clutch being controlled by the solenoid B will vary depending on the shift that was being completed.

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 18V and less than 32V (24V TCM).
- Turbine speed is greater than 60 rpm.
- Output speed is greater than 125 rpm.
- Transmission is at normal operating temperature.
- DTC P0708, P0716, P0717, P0721, P0722, P0875, or P0876 is not active.

Conditions for Setting the DTC

DTC P0776 sets when the TCM detects an incorrect oncoming ratio (range-to-range) for an accumulated number of occurrences.

Action Taken When the DTC Sets

- When DTC P0776 is active, the following conditions will occur:
 - If failure occurs while in a forward range, the transmission will shift to the previous range.
 - If failure occurs while in **N** (Neutral) or **R** (Reverse), the transmission will lock in **N** (Neutral).
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral) (some cases may lock in **N** (Neutral)).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) or **N** (Neutral).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will shift to **N** (Neutral).
- DTC P0776 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- This DTC indicates the on-coming clutch being controlled by solenoid B is not applied or applied too slowly. This could indicate a leak or obstruction in a specific clutch apply circuit. Check the Scan Tool Failure Record data for previous or current range information when the DTC was set to determine the specific shift when the DTC was set. Refer to the Solenoid and Clutch Table (Appendix C) to determine which clutch circuit is suspect.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection
 - Excessive vibration (driveline or engine torsionals)
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel)
- Inspect and confirm that the OEM engine rating does not exceed the transmission model rating. Also inspect for the presence of an add-on engine power package or module. Whenever the engine horsepower or torque is increased over the transmission factory rating, a shift flare condition may occur leading to the diagnostic code indicated.

NOTE: Clutch failure due to an OEM engine rating exceeding the Allison transmission rating, or the installation of a engine power package or module will not be covered under the Allison transmission warranty.

Test Description

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

- This step tests the ignition voltage.
- This step tests speed sensor readings.
- This step tests for internal hydraulic leakage.
- This step tests for clutch capacity.

DTC P0776 (Previously P1721) Solenoid B Controlled Clutch Stuck Off

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to Beginning The Troubleshooting Process (Paragraph 5–4A)
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	Go to Step 3	Go to A/T Fluid Checking Procedure (Appendix P)
3	1. Install the Scan Tool. 2. Start the engine. 3. Record DTC Failure Record data. 4. Use the Failure Record data to determine during which shift the code was set. 5. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	Go to Step 4	Resolve voltage problem (Refer to DTC P0562 and P0563)
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. Make the shift determined in Step 3. 2. Using the Scan Tool, monitor turbine, engine, and output speed sensor readings. Is speed sensor data erratic or are dropouts in signal indicated?	—	Go to the appropriate speed sensor DTC	Go to Step 5

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0776 (Previously P1721) Solenoid B Controlled Clutch Stuck Off (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Connect a 2000 kPa (300 psi) pressure gauge to the main-pressure tap (refer to Mechanic's Tips). 2. Use the Scan Tool, in clutch test mode, to cycle through all transmission ranges with the engine at idle and vehicle brakes applied. 3. Record main pressure in each range. Was the main pressure low in a specific range or in ranges where the same clutch was applied?	—	Go to General Troubleshooting — Low Pressure (Section 7)	Go to Step 6
6	CAUTION: Do not perform a clutch test on fourth and fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select the clutch test mode. 2. With engine at idle speed (600 rpm), vehicle brakes applied, select D (Drive). 3. Using clutch test mode, select and attain first range. Turbine speed should go to zero. 4. Increase engine speed to 1400 rpm. Did turbine speed remain at zero? 5. Repeat the two previous steps for ranges two through five. Did turbine speed remain at zero in all ranges?	Refer to Main Pressure Table (Pages 5–8 and 5–9)	Go to Diagnostic Aids	Go to Step 7
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 8	Go to Step 9
8	Remove the transmission for overhaul or replacement. Is the overhaul or replacement complete?	—	Go to Step 11	—
9	Inspect the control valve body for stuck or sticking trimmer valves (refer to Mechanic's Tips). Was a valve problem found and repaired?	—	Go to Step 11	Go to Step 10
10	Replace B solenoid. Is solenoid replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Use the Scan Tool to reset adaptive for all shifts. 3. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0777 (Previously P1724) Solenoid B Controlled Clutch Stuck On

REFER TO HYDRAULIC SCHEMATIC (APPENDIX H)

Circuit Description

Trim solenoid B is used to control on-coming, off-going, and holding pressure to any one of five clutches. This solenoid is referred to as a Pressure Proportional to Current (PPC) solenoid since the output hydraulic pressure supplied by this solenoid is proportional to the controlled current command.

The Transmission Control Module (TCM) uses information from the turbine and output speed sensors to detect if a clutch is in a tie-up condition or if three clutches are applied. The clutch being controlled by solenoid B will vary depending on the shift.

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 18V and less than 32V (24V TCM).
- One of the following conditions occurs:
 - Output speed is greater than 200 rpm.
 - Turbine speed is greater than 200 rpm.
- DTC P0708, P0716, P0717, P0721, P0722, P0875, or P0876 is not active.

Conditions for Setting the DTC

DTC P0777 sets when the TCM detects an incorrect off-going ratio, range-to-range, for an accumulated number of occurrences.

Action Taken When the DTC Sets

- When DTC P0777 is active, the following conditions will occur:
 - If failure occurs while in a forward range, the transmission will shift to the previous range.
 - If failure occurs while in **N** (Neutral) or **R** (Reverse), the transmission will lock in **N** (Neutral).
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to **N** (Neutral).
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to **R** (Reverse) or **N** (Neutral) (some cases may lock in **N** (Neutral)).
 - If the shift selector is returned to a forward range and the transmission is compromised by overspeeding or a direction change, the transmission will shift to **N** (Neutral).
- DTC P0777 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- This DTC indicates the off-going clutch being controlled by solenoid B is not released or is released too slowly. This could indicate a leak or obstruction in a specific clutch apply circuit. Check the Scan Tool Failure Record data for previous or current range information when the DTC was set to determine the specific shift when the DTC was set. Refer to the Solenoid and Clutch Table (Appendix C) to determine which clutch circuit is suspect.
- If the condition is intermittent, connect the Scan Tool and select the speed sensor indicated by the code. If the signal is erratic, investigate and eliminate the following:
 - Intermittent wiring connection
 - Excessive vibration (driveline or engine torsionals)
 - Irregular sensor gap (loose sensor, loose tone wheel, or damaged tone wheel)
- Inspect and confirm that the OEM engine rating does not exceed the transmission model rating. Also inspect for the presence of an add-on engine power package or module. Whenever the engine horsepower or torque is increased over the transmission factory rating, a shift flare condition may occur leading to the diagnostic code indicated.

NOTE: Clutch failure due to an OEM engine rating exceeding the Allison transmission rating, or the installation of a engine power package or module will not be covered under the Allison transmission warranty.

Test Description

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

3. This step tests the ignition voltage.
4. This step tests for correct speed sensor operation.
5. This step tests for internal hydraulic leakage.
6. This step tests for clutch capacity.

DTC P0777 (Previously P1724) Solenoid B Controlled Clutch Stuck On

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P) and correct the fluid level if necessary. Did you perform the procedure?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Use the Failure Record Data to determine during which shift the code was set. 5. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
4	1. Turn the ignition ON and drive the vehicle under normal operating conditions. Make the shift determined in Step 3. 2. Using the Scan Tool, monitor turbine, engine, and output speed sensor readings. Is speed sensor data erratic or are dropouts in signal indicated?	—	<i>Go to the appropriate speed sensor DTC</i>	<i>Go to Step 5</i>

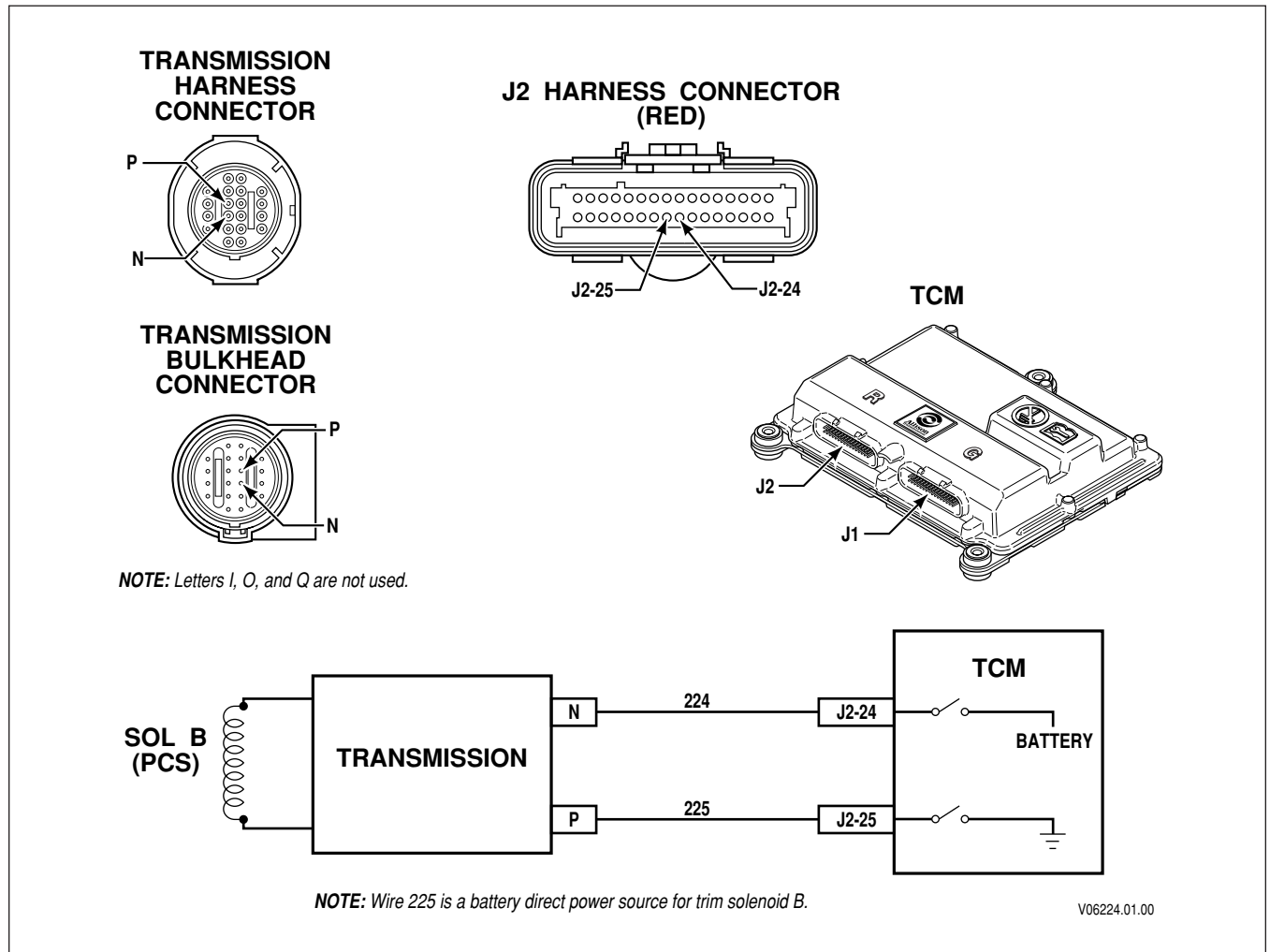
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0777 (Previously P1724) Solenoid B Controlled Clutch Stuck On (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Connect a 2000 kPa (300 psi) pressure gauge to the main-pressure tap. Refer to Mechanic's Tips. 2. Use the Scan Tool, in clutch test mode, to cycle through all transmission ranges with the engine at idle and vehicle brakes applied. 3. Record main pressure in each range. Was the main pressure low in a specific range or in ranges where the same clutch was applied?	—	Go to General Troubleshooting — Low Pressure (Section 7)	Go to Step 6
6	CAUTION: Do not perform a clutch test on fourth and fifth range under stall conditions (above 1400 rpm with brakes held), or possible clutch damage could occur. 1. Using the Scan Tool, select the clutch test mode. 2. With engine at idle speed (600 rpm), vehicle brakes applied, select D (Drive). 3. Using clutch test mode, select and attain first range. Turbine speed should go to zero. 4. Increase engine speed to 1400 rpm. Did turbine speed remain at zero? 5. Repeat the two previous steps for ranges two through five. Did turbine speed remain at zero in all ranges?	Refer to Main Pressure Table (Pages 5–8 and 5–9)	Go to Diagnostic Aids	Go to Step 7
7	Remove the dipstick and inspect the transmission fluid for clutch debris or burnt odor. If necessary, drain a small amount of fluid for this inspection. Are there signs of a clutch failure?	—	Go to Step 8	Go to Step 9
8	Remove the transmission for overhaul or replacement. Is the overhaul or replacement complete?	—	Go to Step 11	—
9	Inspect the control valve body for stuck or sticking trimmer valves. Refer to Mechanic's Tips. Was a valve problem found and repaired?	—	Go to Step 11	Go to Step 10
10	Replace B solenoid. Is solenoid replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Use the Scan Tool to reset adaptive for all shifts. 3. Operate the vehicle in all ranges under normal driving conditions. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0778 Pressure Control Solenoid B Electrical



Circuit Description

Trim solenoid B is used to control on-coming, off-going, and holding pressure to any of the five clutches. This solenoid is referred to as a Pressure Proportional to Current (PPC) solenoid since the output hydraulic pressure supplied by this solenoid is proportional to the controlled current command.

The solenoid operates at a very high 1000 Hz frequency. Unlike the pulse width modulated Torque Converter Clutch (TCC) solenoid, where the ball follows the pulse width square wave, the PPC ball remains stationary due to the high frequency at which the solenoid operates. This allows the ball to move in a linear up and down motion proportional to the current commanded from the TCM. This supplies the desired signal pressure to control the trim valve.

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 18V and less than 32V (24V TCM).
- Engine crank time is under 4 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0748 is set when one of the following conditions is detected for 125 milliseconds.

- Open circuit — TCM commanded duty cycle between 31 percent and 87 percent with no current present at trim solenoid A.
- Short to ground — TCM commanded duty cycle is over 87 percent with a current of less than 1.0 ampere at trim solenoid A.
- Short to power — TCM commanded duty cycle is under 15 percent with electrical current present.
- Whenever a P0748, P0778 combination is set in failure records, this is generally caused by having the transmission harness disconnected at the main transmission connector while the vehicle ignition is ON. Check the connection at the transmission and clear codes.

Action Taken When the DTC Sets

- When DTC P0778 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission will shift to 1st, 3rd, or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission will shift to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by over-speeding or a direction change, the transmission shifts to neutral.
- DTC P0778 is stored in the TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

The diagnostic test performed to detect this DTC is very sensitive. Therefore, there is a high probability that an intermittent circuit condition may be causing this DTC to set. Check for the following conditions at the OEM harness first, then at the transmission internal harness.

- Inspect the wiring for poor electrical connections at the TCM connector and the main transmission connector. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
 - Inspect OEM wiring harness routing, looking for possible contact points where chafing could occur. Moving parts on the vehicle could be contacting the harness. Check for contact at the parking brake drum, suspension components, transmission shift linkage, etc.
 - Inspect the internal transmission wiring harness for possible contact areas where chafing may occur.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures.

DIAGNOSTIC TROUBLE CODES (DTC)

- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time etc. This data can be useful in reproducing the failure mode where the DTC was set.
- If this DTC appears to be temperature-related, suspect a defective trim solenoid. It is possible for a trim solenoid to be temperature sensitive causing resistance values to fluctuate. This may cause an intermittent DTC to be set.

Test Description

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

- This step tests for proper ignition voltage.
- This step tests the command signal from the TCM and tests the external wiring harness for shorts or opens.
- This step tests for the proper resistance at the OEM vehicle harness.
- This step tests for the proper resistance value at the main transmission connector.
- This step tests for the proper resistance value at the trim solenoid.

DTC P0778 Pressure Control Solenoid B Electrical

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Install the Scan Tool. 2. Turn the ignition ON, with the engine OFF. 3. In solenoid test mode, command B trim solenoid ON. Did the Scan Tool indicate B solenoid as being commanded ON?	Duty cycle value of 75 percent is an indication that the solenoid is in the ON state.	<i>Go to Step 4</i>	<i>Go to Step 10</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0778 Pressure Control Solenoid B Electrical (cont'd)

Step	Action	Value(s)	Yes	No
4	NOTE: Review Section 4 — Wire Check Procedures before performing the following steps. 1. Turn the ignition OFF. 2. Disconnect J2 connector from TCM. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter, connect only to the J2 harness connector. See Beginning the Troubleshooting Process, Page 5–4, Figure 5–2 for diagram of J 43799 adapter harness hook-ups. 3. Using a DVOM, attach leads to J2 pins 24 and 25. 4. Measure the resistance of the circuit. Is the resistance reading within the specified value?	Refer to Solenoid Resistance Table (Page 5–12) NOTE: To allow for resistance of harness wire, add 0.1 Ohms per foot of length for 18-gauge wire.	Go to Diagnostic Aids	Go to Step 5
5	1. Turn the ignition OFF. 2. Disconnect the wiring harness from the main transmission connector at the back of the transmission. Using J 39700 Breakout Box and J 44722 Adapter Harness, connect only to the transmission main connector at the rear of the transmission. Do not attach the other end of J 44722 to the vehicle transmission harness. See Beginning the Troubleshooting Process, Page 5–5, Figure 5–3 for diagram of J 44722 transmission harness hook-ups. 3. Using a DVOM, measure resistance between transmission bulkhead connector pins N and P at the magnetic overlay. Is resistance within the specified values?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 6	Go to Step 7
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 11	—
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Remove the internal wiring harness at solenoid B connector. 3. Using a DVOM, measure the resistance of solenoid B. Is the solenoid resistance within the specified value?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 8	Go to Step 9

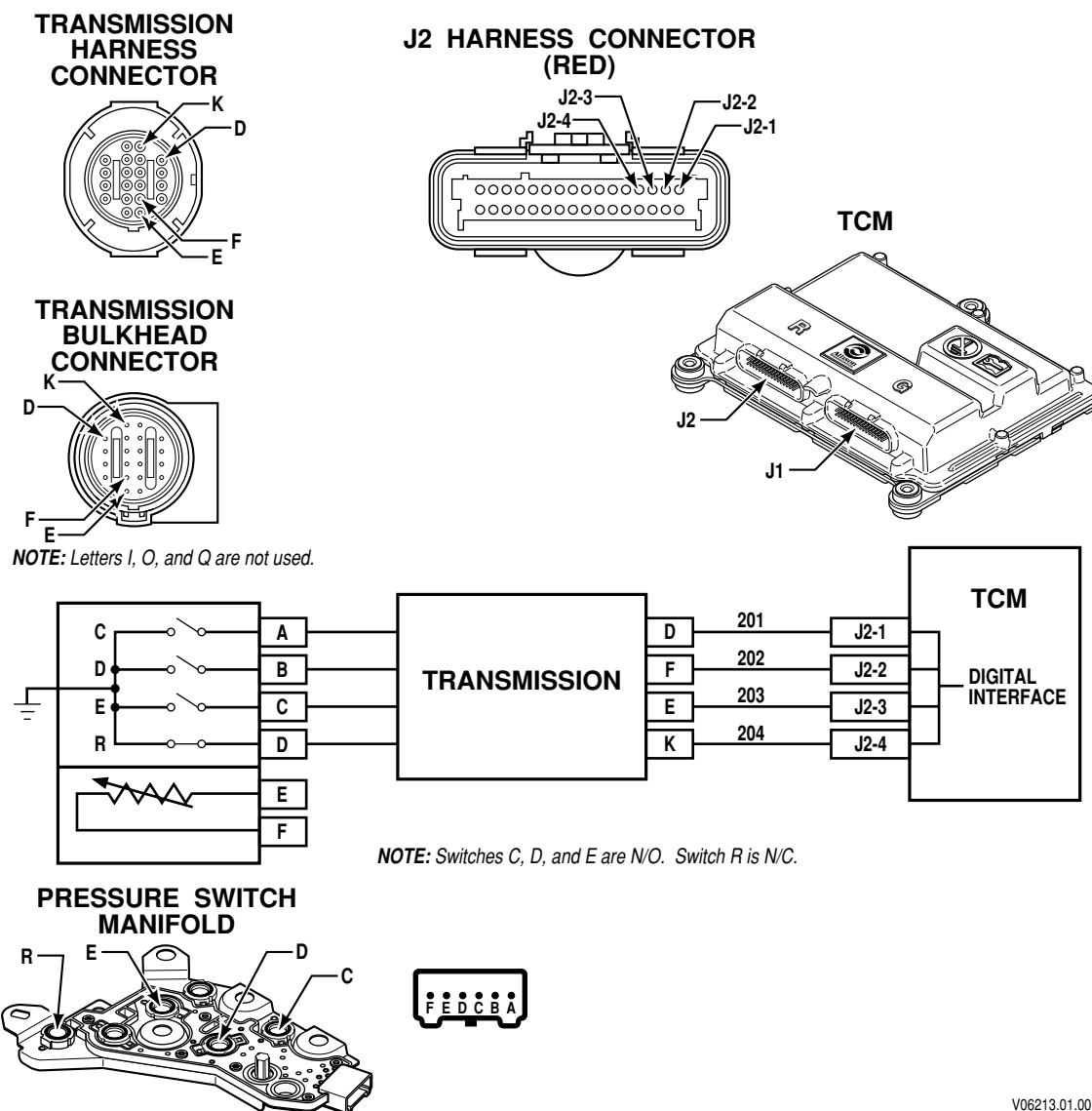
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0778 Pressure Control Solenoid B Electrical (cont'd)

Step	Action	Value(s)	Yes	No
8	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
9	Replace solenoid B. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0840 Transmission Pressure Switch Solenoid C Circuit



V06213.01.00

Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The C pressure switch monitors C shift valve positioning and relays it to the TCM. When C pressure switch is in the open state, C shift valve should be in the destroyed position.

Conditions for Running the DTC

- Components are powered and the ignition voltage is greater than 5V.
- DTC P0561, P0562, or P0563 is not active.
- C shift valve is destroyed.
- Transmission temperature is above -25°C (-13°F).
- Vehicle shutdown is not in process.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0840 sets during steady state operation when C shift valve is in the destroke state (commanded OFF) and C pressure switch status is detected as stroked (commanded ON). Steady state is defined as attaining a valid range. The intent of this code is to detect shorts to ground in the pressure switch wiring circuit or the pressure switch.

Later software levels incorporate retry logic that allows the TCM to command C solenoid ON and OFF. If the pressure switch state does not change, and remains in the ON state, DTCs P0840 and P0842 will set.

Action Taken When the DTC Sets

- When DTC P0840 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to 1st, 3rd, or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by over-speeding or direction change, the transmission shifts to neutral.
- DTC P0840 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 only a P0840 is set, look for an intermittent short to ground at the pressure switch circuit or intermittent hydraulic failure (sticking valve). This code is set when the condition occurs more than 3 times during the current drive cycle. See Appendix A, Section B — Finding an Intermittent Fault.
- When a P0840 and P0842 are set in combination, this may indicate a short to ground at the pressure switch circuit or the shift valve is stuck in the stroked state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. Check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for shorts in the OEM wiring harness.
7. This step tests for shorts in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0840 Transmission Pressure Switch Solenoid C Circuit

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC indicates that a short circuit condition may exist in the OEM harness, the internal transmission wiring harness, or the PSM. Did DTC P0840 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0840 Transmission Pressure Switch Solenoid C Circuit (cont'd)**

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 1 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 12</i>
6	1. Turn the ignition OFF and reconnect the J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 201 (pin D) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 11</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin A. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 10</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch C membrane. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go To Diagnostic Aids</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0840 Transmission Pressure Switch Solenoid C Circuit (*cont'd*)

Step	Action	Value(s)	Yes	No
11	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 13	—
12	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 13	—
13	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0841 is set when C solenoid is commanded ON and C pressure switch status remains OFF for a period of time. The time period is 5 seconds at 0°C (32°F) to -40°C (-40°F). The intent of this DTC is to detect a stuck shift valve, in the destroyed state, a mechanical solenoid failure, or an open circuit.

Action Taken When the DTC Sets

- When DTC P0841 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to 1st, 3rd or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0841 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 a P0841 and P0843 are set in combination, this may indicate an open circuit condition is present at the pressure switch circuit or the shift valve is stuck in the destroyed state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground or opens at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for opens in the OEM wiring harness.
7. This step tests for opens in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0841 Transmission Pressure Switch Solenoid C Circuit Stuck Open

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to <i>Beginning The Troubleshooting Process</i> (Paragraph 5–4A)
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	Go to Step 3	Go to <i>A/T Fluid Checking Procedure</i> (Appendix P)
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	Refer to <i>Main Pressure Table</i> (Pages 5–8 and 5–9)	Go to Step 4	Go to <i>General Troubleshooting</i> (Section 7)
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC may indicate a stuck shift valve, mechanically failed solenoid, open in switch circuit, or defective PSM. Did DTC P0841 return?	—	Go to Step 5	Go to <i>Diagnostic Aids</i>
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 1 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	Go to Step 6	Go to Step 15

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0841 Transmission Pressure Switch Solenoid C Circuit Stuck Open (cont'd)**

Step	Action	Value(s)	Yes	No
6	1. Turn the ignition OFF and reconnect the J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 201 (pin D) on the harness connector to a known good ground.* Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 14</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin A. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 13</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch C membrane. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?		<i>Go to Step 9</i>	<i>Go to Step 12</i>
9	Remove the control valve body and check for a stuck or sticking C shift valve. Refer to Service Manual or Mechanic's Tips. Was the C shift valve stuck or sticking?		<i>Go to Step 11</i>	<i>Go to Step 10</i>
10	Replace the C shift solenoid and reinstall the control valve body. Refer to Service Manual or Mechanic's Tips. Is replacement of solenoid and reinstalling of control valve body complete?		<i>Go to Step 16</i>	
11	Clean and/or polish the sticking valve to restore free movement or replace the control valve body assembly. Refer to Service Manual or Mechanic's Tips. Was free movement restored or valve body replaced?		<i>Go to Step 16</i>	
12	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 16</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

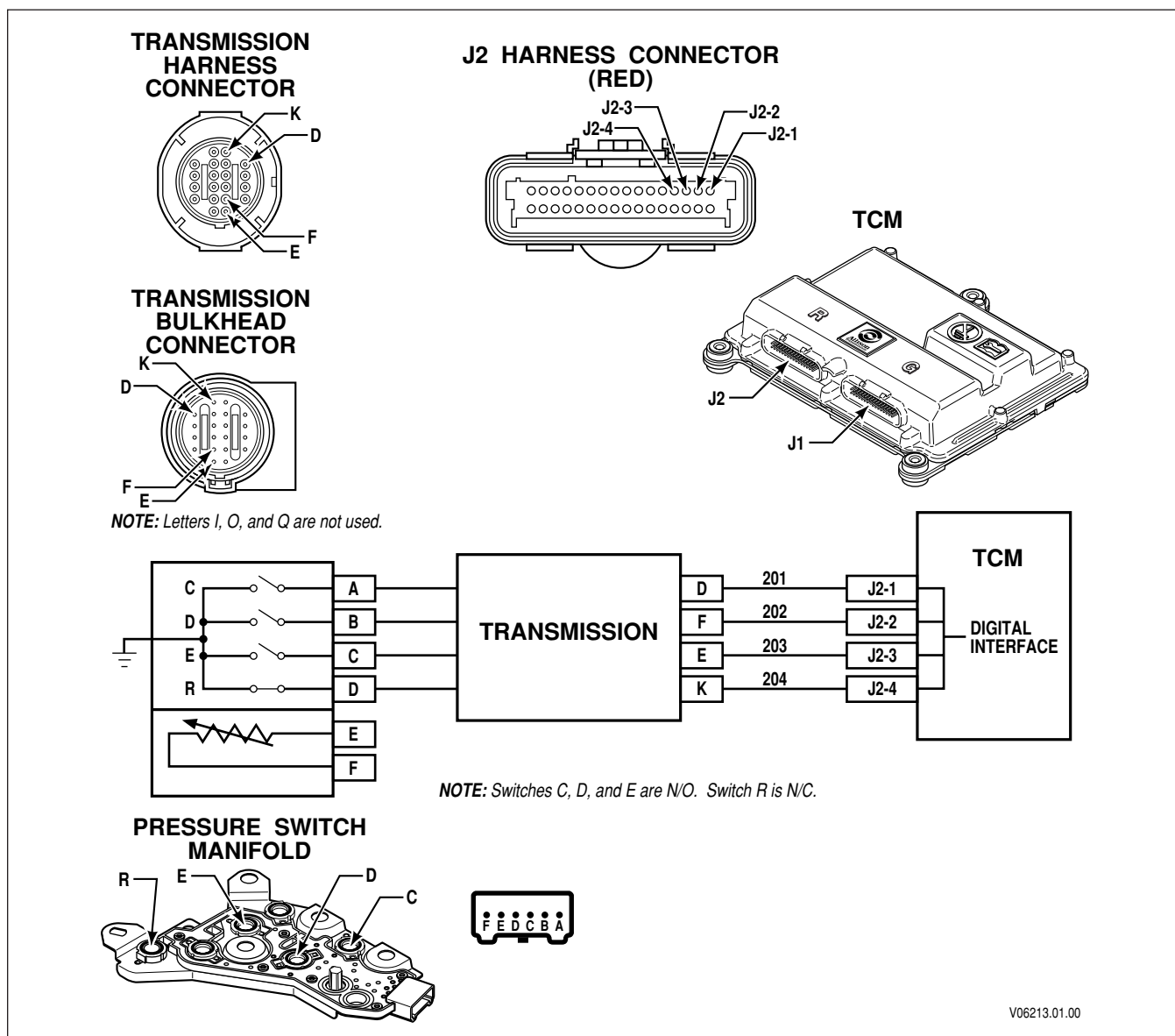
DTC P0841 Transmission Pressure Switch Solenoid C Circuit Stuck Open (cont'd)

Step	Action	Value(s)	Yes	No
13	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 16	—
14	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 16	—
15	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 16	—
16	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0842 Transmission Pressure Switch Solenoid C Circuit Stuck Closed



Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The C pressure switch monitors C shift valve positioning and relays it to the TCM. When C pressure switch is in the open state, C shift valve should be in the destroyed position.

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 18V and less than 32V (24V TCM).
- DTC P0561, P0562, or P0563 is not active.
- C shift valve is commanded to the OFF (destroyed) position.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0842 is set when C solenoid is commanded OFF and C pressure switch status remains ON for a period of time that is temperature dependent. The time period is 2 seconds at 0°C (32°F) or up to 6 seconds at -40°C (-40°F). The intent of this DTC is to detect a stuck shift valve, in the stroked state, a mechanical solenoid failure, or a circuit short to ground.

Action Taken When the DTC Sets

- When DTC P0842 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0842 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 a P0842 and P0840 are set in combination, this may indicate a short to ground at the pressure switch circuit or the shift valve is stuck in the stroked state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for shorts in the OEM wiring harness.
7. This step tests for shorts in the internal wiring harness.
8. This step tests the PSM switch function.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0842 Transmission Pressure Switch Solenoid C Circuit Stuck Closed

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC may indicate a stuck shift valve, mechanically failed solenoid, short to ground in the switch circuit, or a defective PSM. Did DTC P0842 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 1 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 15</i>
6	1. Turn the ignition OFF and reconnect the J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 201 (pin D) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 14</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0842 Transmission Pressure Switch Solenoid C Circuit Stuck Closed (cont'd)

Step	Action	Value(s)	Yes	No
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin A. Does the Scan Tool indicate reverse pressure switch C status as ON when grounded and OFF when circuit is open?	—	Go to Step 8	Go to Step 13
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch C membrane. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?		Go to Step 9	Go to Step 12
9	Remove the control valve body and inspect for a stuck or sticking C shift valve. Refer to Service Manual or Mechanic's Tips. Was the C shift valve stuck or sticking?		Go to Step 11	Go to Step 10
10	Replace the C shift solenoid and reinstall the control valve body. Refer to Service Manual or Mechanic's Tips. Is replacement of solenoid and reinstalling of valve body complete?		Go to Step 16	
11	Clean and/or polish the sticking valve to restore free movement or replace the control valve body assembly. Refer to Service Manual or Mechanic's Tips. Was free movement restored or valve body replaced?		Go to Step 16	
12	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 16	—
13	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 16	—
14	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 16	—

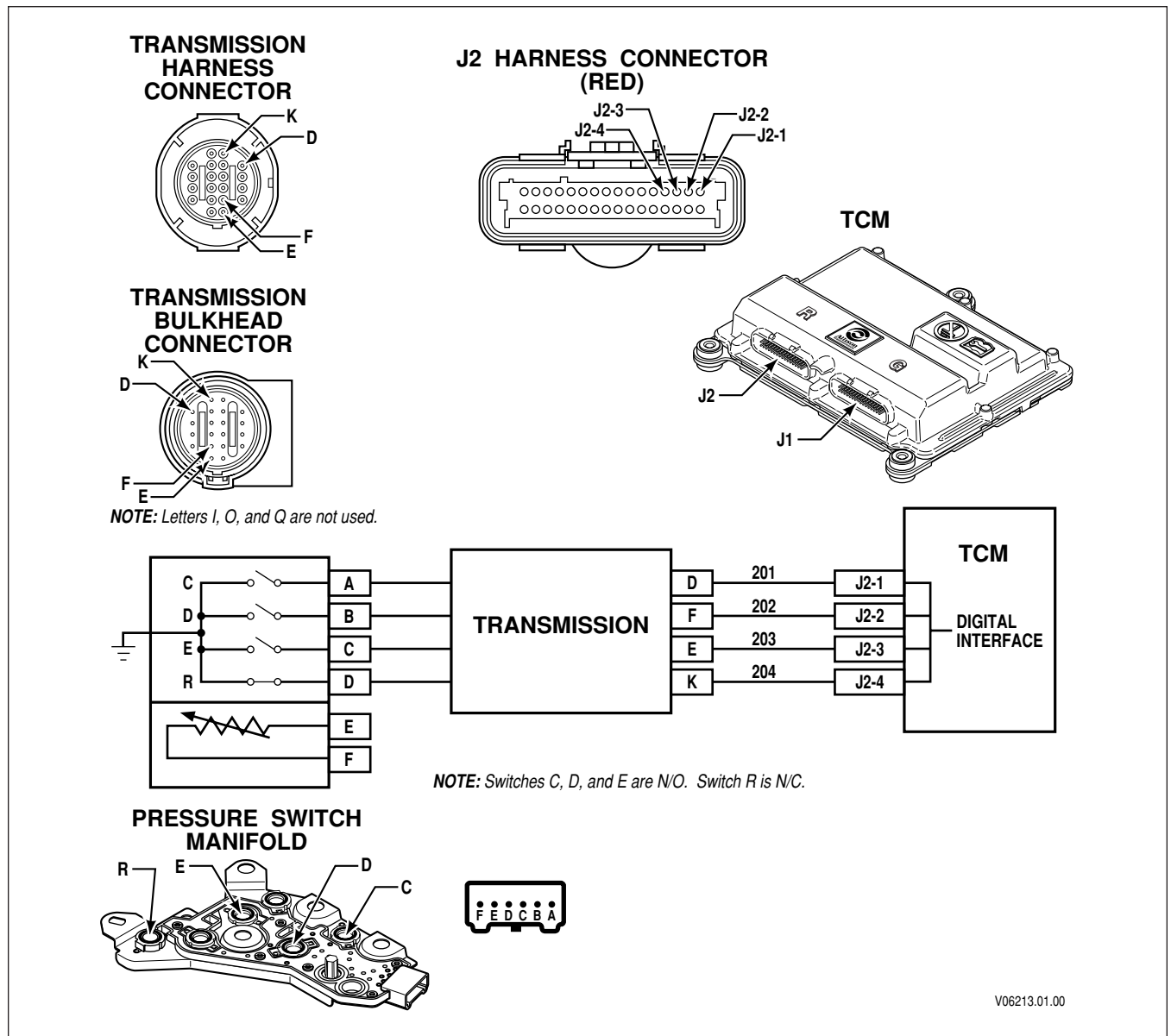
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0842 Transmission Pressure Switch Solenoid C Circuit Stuck Closed *(cont'd)*

Step	Action	Value(s)	Yes	No
15	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6).</i> Replace the TCM. Is the replacement complete?	—	Go to Step 16	—
16	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0843 Transmission Pressure Switch Solenoid C Circuit High



Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The C pressure switch monitors C shift valve positioning and relays it to the TCM. When C pressure switch is in the open state, C shift valve should be in the destroyed position.

Conditions for Running the DTC

- Components are powered and the ignition voltage is greater than 5V.
- DTC P0561, P0562, or P0563 is not active.
- C shift valve is commanded to the ON (stroked) position.
- Transmission temperature is above -25°C (-13°F).
- Vehicle shutdown is not in process.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0843 sets during steady state operation when C shift valve is in the stroked state (commanded ON) and C pressure switch status is detected as destroyed (commanded OFF). Steady state is defined as attaining a valid range. The intent of this code is to detect an open condition in the pressure switch wiring circuit or the pressure switch.

Later software levels incorporate retry logic that allows the TCM to command C solenoid OFF and ON. If the pressure switch state does not change, and remains in the OFF state, DTCs P0841 and P0843 will set.

Action Taken When the DTC Sets

- When DTC P0843 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0843 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 only a DTC P0843 is set, look for an intermittent open condition at the pressure switch circuit or an intermittent hydraulic failure (sticking valve). This code is set when the condition is present more than 3 times during a current drive cycle. See Appendix A, Section B — Finding an Intermittent Fault.
- When a P0843 and P0841 are set in combination, this may indicate an open circuit condition is present at the pressure switch circuit or the shift valve is stuck in the destroyed state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for an open condition at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for opens in the OEM wiring harness.
7. This step tests for opens in the internal wiring harness.
8. This step tests for PSM switch function.

DTC P0843 Transmission Pressure Switch Solenoid C Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC indicates an open circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM. Did DTC P0843 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>

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

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 1 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 12</i>
6	1. Turn the ignition OFF and reconnect the J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 201 (pin D) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 11</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin A. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 10</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch C membrane. Does the Scan Tool indicate pressure switch C status as ON when grounded and OFF when circuit is open?		<i>Go to Diagnostic Aids</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—

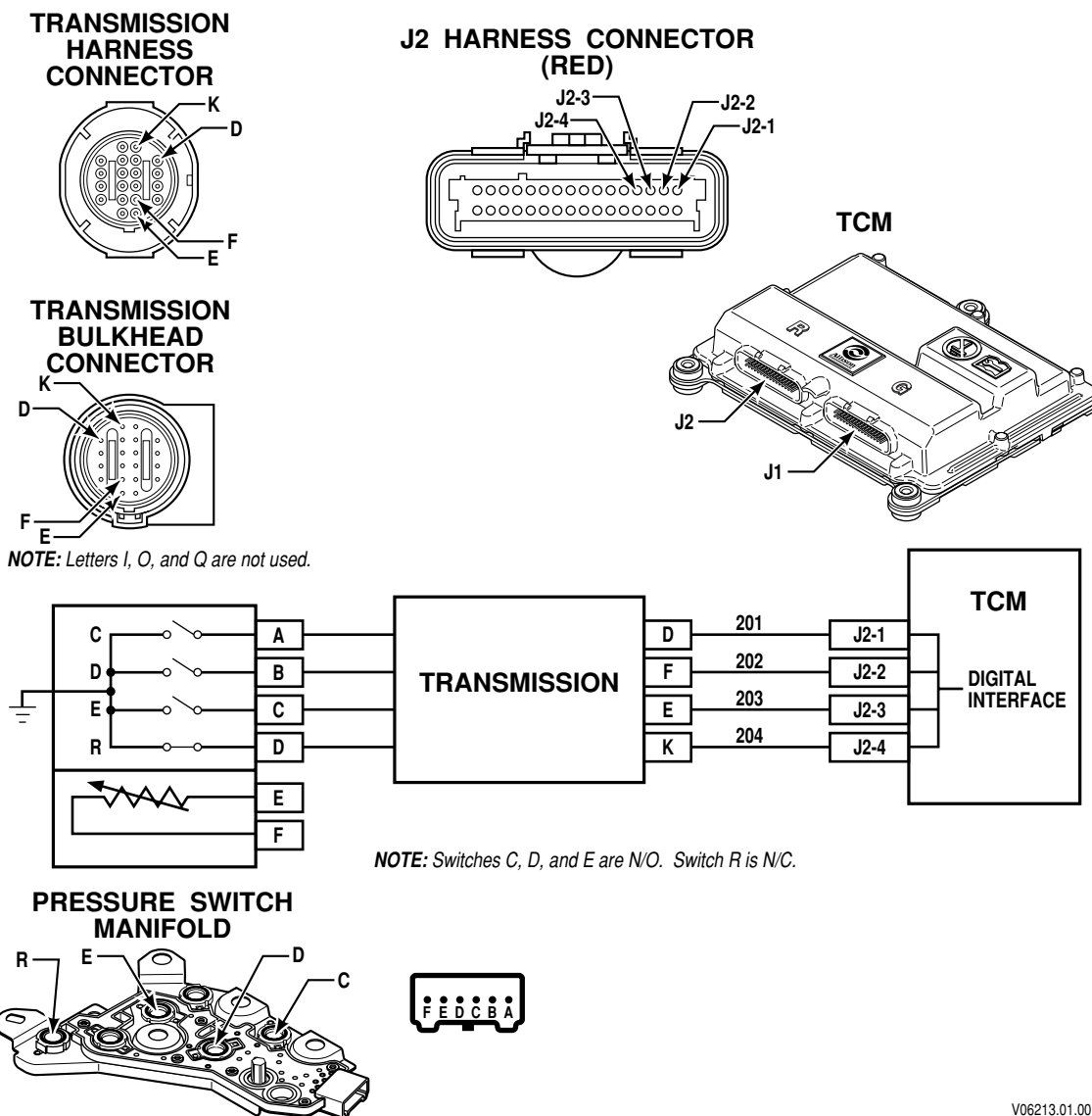
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0843 Transmission Pressure Switch Solenoid C Circuit High (cont'd)

Step	Action	Value(s)	Yes	No
11	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 13	—
12	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 13	—
13	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0845 Transmission Pressure Switch Solenoid D Circuit



V06213.01.00

Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The D pressure switch monitors D shift valve positioning and relays it to the TCM. When D pressure switch is in the open state, D shift valve should be in the destroyed position.

Conditions for Running the DTC

- Components are powered and the ignition voltage is greater than 5V.
- DTC P0561, P0562, or P0563 is not active.
- D shift valve is commanded to the OFF (destroyed) position.
- Transmission temperature is above -25°C (-13°F).
- Vehicle shutdown is not in process.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0845 sets during steady state operation when D shift valve is in the destroyed state (commanded OFF) and D pressure switch status is detected as stroked (commanded ON). Steady state is defined as attaining a valid range. The intent of this code is to detect shorts to ground in the pressure switch wiring circuit or the pressure switch.

Later software levels incorporate retry logic that allows the TCM to command D solenoid ON and OFF. If the pressure switch state does not change, and remains in the ON state, DTCs P0845 and P0847 will set.

Action Taken When the DTC Sets

- When DTC P0845 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0845 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 only a DTC P0845 is set, look for an intermittent short to ground at the pressure switch circuit or an intermittent hydraulic failure (sticking valve). This code is set when the condition is present more than 3 times during a current drive cycle. See Appendix A, Section B — Finding an Intermittent Fault.
- When a P0845 and P0847 are set in combination, this may indicate a short to ground is present at the pressure switch circuit or the shift valve is stuck in the stroked state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for shorts in the OEM wiring harness.
7. This step tests for shorts in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0845 Transmission Pressure Switch Solenoid D Circuit

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC indicates a short circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM. Did DTC P0845 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0845 Transmission Pressure Switch Solenoid D Circuit (cont'd)**

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 2 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 12</i>
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 202 (pin F) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 11</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin B. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 10</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch D membrane. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Diagnostic Aids</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0845 Transmission Pressure Switch Solenoid D Circuit (cont'd)

Step	Action	Value(s)	Yes	No
11	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 13	—
12	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 13	—
13	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure report. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0846 sets when D solenoid is commanded ON and D pressure switch status remains OFF for a period of time. The time period is 5 seconds at 0°C (32°F) to –40°C (–40°F). The intent of this DTC is to detect a stuck shift valve, in the destroyed state, a mechanical solenoid failure, or an open circuit.

Action Taken When the DTC Sets

- When DTC P0846 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0846 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 a P0846 and P0848 are set in combination, this may indicate an open circuit condition is present at the pressure switch circuit or the shift valve is stuck in the destroyed state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for an open condition at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for opens in the OEM wiring harness.
7. This step tests for opens in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0846 Transmission Pressure Switch Solenoid D Circuit Stuck Open

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to Beginning The Troubleshooting Process (Paragraph 5–4A)
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	Go to Step 3	Go to A/T Fluid Checking Procedure (Appendix P)
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	Refer to Main Pressure Table (Pages 5–8 and 5–9)	Go to Step 4	Go to General Troubleshooting (Section 7)
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC may indicate a stuck shift valve, solenoid mechanically failed, an open condition in the switch circuit, or a defective PSM. Did DTC P0846 return?	—	Go to Step 5	Go to Diagnostic Aids
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 2 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	Go to Step 6	Go to Step 15

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0846 Transmission Pressure Switch Solenoid D Circuit Stuck Open (cont'd)**

Step	Action	Value(s)	Yes	No
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 202 (pin F) on the harness connector to a known good ground.* Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 14</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin B. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 13</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch D membrane. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 9</i>	<i>Go to Step 12</i>
9	Remove the control valve body and check for a stuck or sticking D shift valve. Refer to Service Manual or Mechanic's Tips. Was the D shift valve stuck or sticking?	—	<i>Go to Step 11</i>	<i>Go to Step 10</i>
10	Replace the D shift solenoid and reinstall the control valve body. Refer to Service Manual or Mechanic's Tips. Is replacement of the solenoid and reinstalling of the control valve body complete?	—	<i>Go to Step 16</i>	—
11	Clean and/or polish the sticking valve to restore free movement or replace the control valve body assembly. Refer to Service Manual or Mechanic's Tips. Was free movement restored or valve body replaced?	—	<i>Go to Step 16</i>	—
12	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 16</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

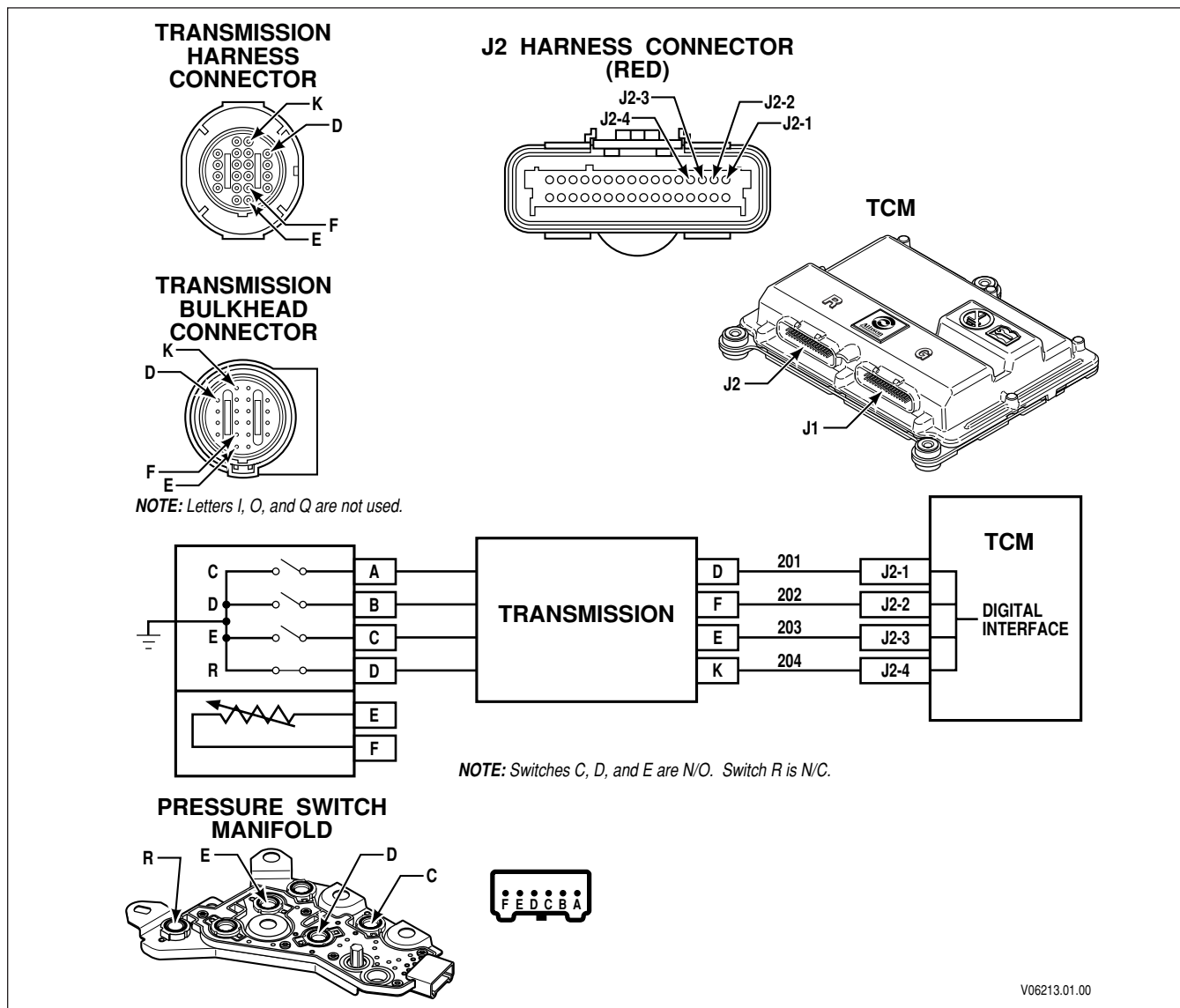
DTC P0846 Transmission Pressure Switch Solenoid D Circuit Stuck Open (cont'd)

Step	Action	Value(s)	Yes	No
13	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 16	—
14	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 16	—
15	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 16	—
16	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0847 Transmission Pressure Switch Solenoid D Circuit Stuck Closed



Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The D pressure switch monitors D shift valve positioning and relays it to the TCM. When D pressure switch is in the open state, D shift valve should be in the destroyed position.

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 18V and less than 32V (24V TCM).
- D shift valve is commanded to the OFF (destroyed) position.

Conditions for Setting the DTC

DTC P0847 sets when D solenoid is commanded OFF and D pressure switch status remains ON for a period of time that is temperature dependent. The time period is 2 seconds at 0°C (32°F) or up to 16 seconds at -40°C (-40°F). The intent of this DTC is to detect a stuck shift valve, in the stroked state, a mechanical solenoid failure, or a circuit short to ground.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

- When DTC P0847 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0847 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 a P0847 and P0845 are set in combination, this may indicate a short to ground is present at the pressure switch circuit or the shift valve is stuck in the stroked state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests for the TCM proper switch status.
6. This step tests for shorts in the OEM wiring harness.
7. This step tests for shorts in the internal wiring harness.
8. This step tests the PSM switch function.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0847 Transmission Pressure Switch Solenoid D Circuit Stuck Closed

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC may indicate a stuck shift valve, solenoid mechanically failed, a short to ground in the switch circuit, or a defective PSM. Did DTC P0847 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 2 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 15</i>
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 202 (pin F) on the harness connector to a known good ground.* Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 14</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0847 Transmission Pressure Switch Solenoid D Circuit Stuck Closed (cont'd)

Step	Action	Value(s)	Yes	No
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin B. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	Go to Step 8	Go to Step 13
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch D membrane. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?		Go to Step 9	Go to Step 12
9	Remove the control valve body and check for a stuck or sticking D shift valve. Refer to Service Manual or Mechanic's Tips. Was the D shift valve stuck or sticking?		Go to Step 11	Go to Step 10
10	Replace the D shift solenoid and reinstall the control valve body. Refer to Service Manual or Mechanic's Tips. Is the replacement of the solenoid and reinstalling of the control valve body complete?		Go to Step 16	
11	Clean and/or polish the sticking valve to restore free movement or replace the control valve body assembly. Refer to Service Manual or Mechanic's Tips. Was free movement restored or valve body replaced?		Go to Step 16	
12	Replace the PSM (refer to Service Manual or Mechanic's Tips). Is the replacement complete?	—	Go to Step 16	—
13	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 16	—
14	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 16	—

DIAGNOSTIC TROUBLE CODES (DTC)

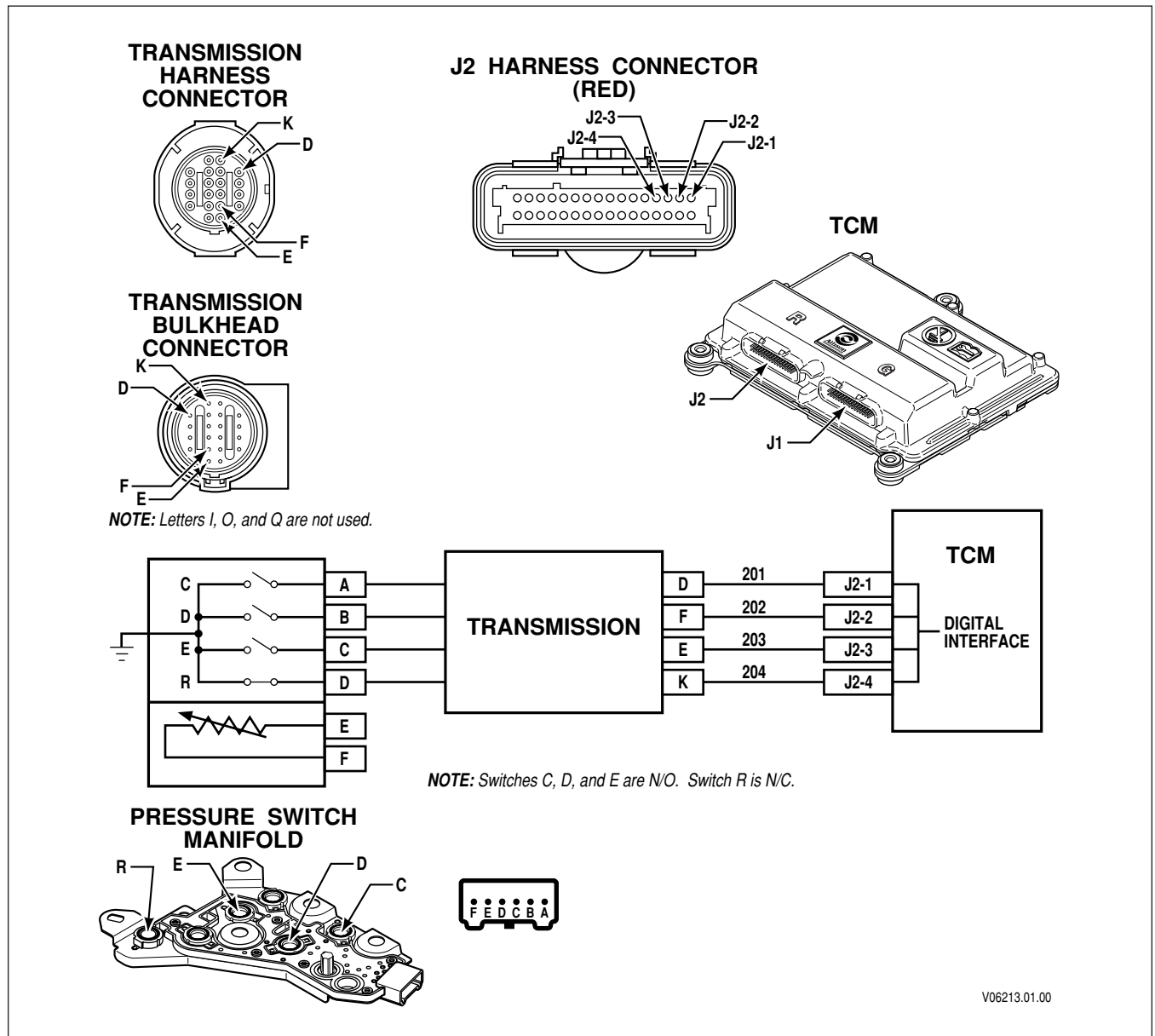
DTC P0847 Transmission Pressure Switch Solenoid D Circuit Stuck Closed *(cont'd)*

Step	Action	Value(s)	Yes	No
15	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6).</i> Replace the TCM. Is the replacement complete?	—	<i>Go to Step 16</i>	—
16	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0848 Transmission Pressure Switch Solenoid D Circuit High



Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The D pressure switch monitors D shift valve positioning and relays it to the TCM. When D pressure switch is in the open state, D shift valve should be in the destroyed position.

Conditions for Running the DTC

- Components are powered and the ignition voltage is greater than 5V.
- DTC P0561, P0562, or P0563 is not active.
- D shift valve is commanded to the ON (stroked) position.
- Transmission temperature is above -25°C (-13°F).
- Vehicle shutdown is not in process.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0848 sets during steady state operation when D shift valve is in the stroked state (commanded ON) and D pressure switch status is detected as destroyed (commanded OFF). Steady state is defined as attaining a valid range. The intent of this code is to detect an open condition in the pressure switch wiring circuit or the pressure switch.

Later software levels incorporate retry logic that allows the TCM to command D solenoid OFF and ON. If the pressure switch state does not change, and remains in the OFF state, DTCs P0848 and P0846 will set.

Action Taken When the DTC Sets

- When DTC P0848 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0848 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 only a DTC P0848 is set, look for an intermittent open condition at the pressure switch circuit or an intermittent hydraulic failure (sticking valve). This code is set when the condition is present more than 3 times during a current drive cycle. See Appendix A, Section B — Finding an Intermittent Fault.
- When a P0848 and P0846 are set in combination, this may indicate an open circuit condition is present at the pressure switch circuit or the shift valve is stuck in the destroyed state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for an open condition at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for opens in the OEM wiring harness.
7. This step tests for opens in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0848 Transmission Pressure Switch Solenoid D Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC indicates an open circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM. Did DTC P0848 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0848 Transmission Pressure Switch Solenoid D Circuit High (cont'd)**

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 2 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 12</i>
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 202 (pin F) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 11</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin B. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 10</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch D membrane. Does the Scan Tool indicate pressure switch D status as ON when grounded and OFF when circuit is open?	—	<i>Go to Diagnostic Aids</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—

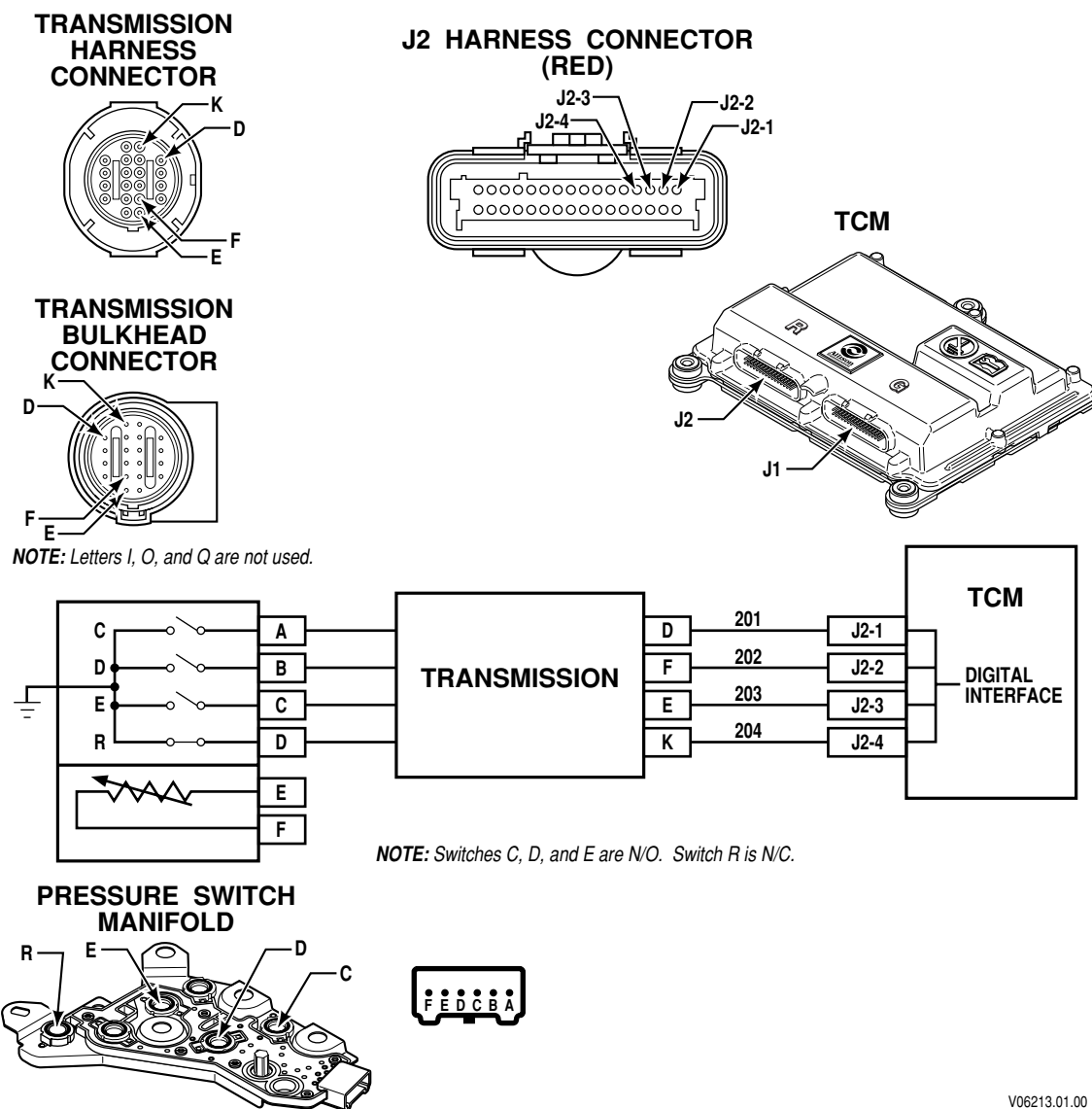
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0848 Transmission Pressure Switch Solenoid D Circuit High (cont'd)

Step	Action	Value(s)	Yes	No
11	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 13	—
12	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 13	—
13	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0870 (Previously P1709) Transmission Pressure Switch Solenoid E Circuit



Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The E pressure switch monitors E shift valve positioning and relays it to the TCM. When E pressure switch is in the open state, E shift valve should be in the destroyed position.

Conditions for Running the DTC

- Components are powered and the ignition voltage is greater than 5V.
- DTC P0561, P0562, or P0563 is not active.
- E shift valve is commanded to the OFF (destroyed) position.
- Transmission temperature is above -25°C (-13°F).
- Vehicle shutdown is not in process.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0870 sets during steady state operation when E shift valve is in the destroyed state (commanded OFF) and E pressure switch status is detected as stroked (commanded ON). Steady state is defined as attaining a valid range. The intent of this code is to detect shorts to ground in the pressure switch wiring circuit or the pressure switch.

Later software levels incorporate retry logic that allows the TCM to command E solenoid ON and OFF. If the pressure switch state does not change, and remains in the ON state, DTCs P0870 and P0872 will set.

Action Taken When the DTC Sets

- When DTC P0870 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0870 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 only a DTC P0870 is set, look for an intermittent short to ground at the pressure switch circuit or an intermittent hydraulic failure (sticking valve). This code is set when the condition is present more than 3 times during a current drive cycle. See Appendix A, Section B — Finding an Intermittent Fault.
- When a P0870 and P0872 are set in combination, this may indicate a short to ground is present at the pressure switch circuit or the shift valve is stuck in the stroked state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for shorts in the OEM wiring harness.
7. This step tests for shorts in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0870 (Previously P1709) Transmission Pressure Switch Solenoid E Circuit

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC indicates a short circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM. Did DTC P0870 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0870 (Previously P1709) Transmission Pressure Switch Solenoid E Circuit (cont'd)**

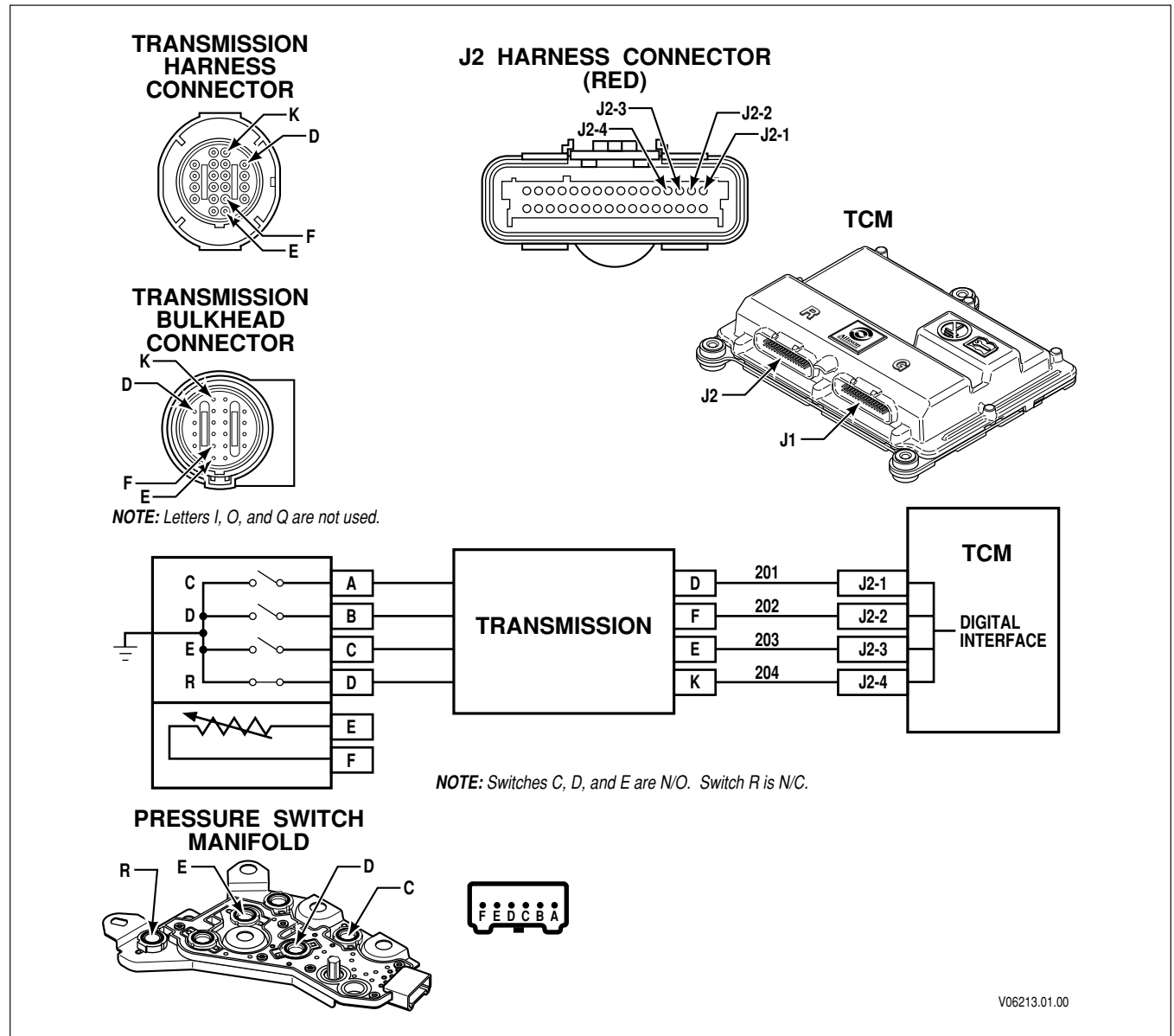
Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 3 to known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 12</i>
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 203 (pin E) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 11</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin C. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 10</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger at the eraser end of a pencil to push gently on the pressure switch E membrane. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Diagnostic Aids</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0870 (Previously P1709) Transmission Pressure Switch Solenoid E Circuit (cont'd)

Step	Action	Value(s)	Yes	No
11	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 13	—
12	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 13	—
13	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0871 (Previously P1710) Transmission Pressure Switch
Solenoid E Circuit Stuck Open

Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The E pressure switch monitors E shift valve positioning and relays it to the TCM. When E pressure switch is in the open state, E shift valve should be in the destroyed position.

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 18V and less than 32V (24V TCM).
- E shift valve is commanded to the ON (stroked) position.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0871 sets when E solenoid is commanded ON and E pressure switch status remains OFF for a period of time. The time period is 5 seconds at 0°C (32°F) to -40°C (-40°F). The intent of this DTC is to detect a stuck shift valve, in the destroyed state, a mechanical solenoid failure, or an open circuit.

Action Taken When the DTC Sets

- When DTC P0871 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - if the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0871 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 a P0871 and P0873 are set in combination, this may indicate an open circuit condition is present at the pressure switch circuit or the shift valve is stuck in the destroyed state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for an open condition at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.

DIAGNOSTIC TROUBLE CODES (DTC)

4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for opens in the OEM wiring harness.
7. This step tests for opens in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0871 (Previously P1710) Trans Pressure Switch Solenoid E Circuit Stuck Open

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC may indicate a stuck shift valve, solenoid mechanically failed, an open condition in the switch circuit, or a defective PSM. Did DTC P0871 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 3 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 15</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0871 (Previously P1710) Trans Pressure Switch
Solenoid E Circuit Stuck Open (cont'd)**

Step	Action	Value(s)	Yes	No
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector. 3. Turn the ignition ON. 4. Connect wire 203 (pin E) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 14</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin C. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 13</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch E membrane. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 9</i>	<i>Go to Step 12</i>
9	Remove the control valve body and inspect for a stuck or sticking E shift valve. Refer to Service Manual or Mechanic's Tips. Was the E shift valve stuck or sticking?	—	<i>Go to Step 11</i>	<i>Go to Step 10</i>
10	Replace the E shift solenoid and reinstall the control valve body. Refer to Service Manual or Mechanic's Tips. Is replacement of the solenoid and reinstalling of the control valve body complete?	—	<i>Go to Step 16</i>	—
11	Clean and/or polish the sticking valve to restore free movement or replace the control valve body assembly. Refer to Service Manual or Mechanic's Tips. Was free movement restored or valve body replaced?	—	<i>Go to Step 16</i>	—

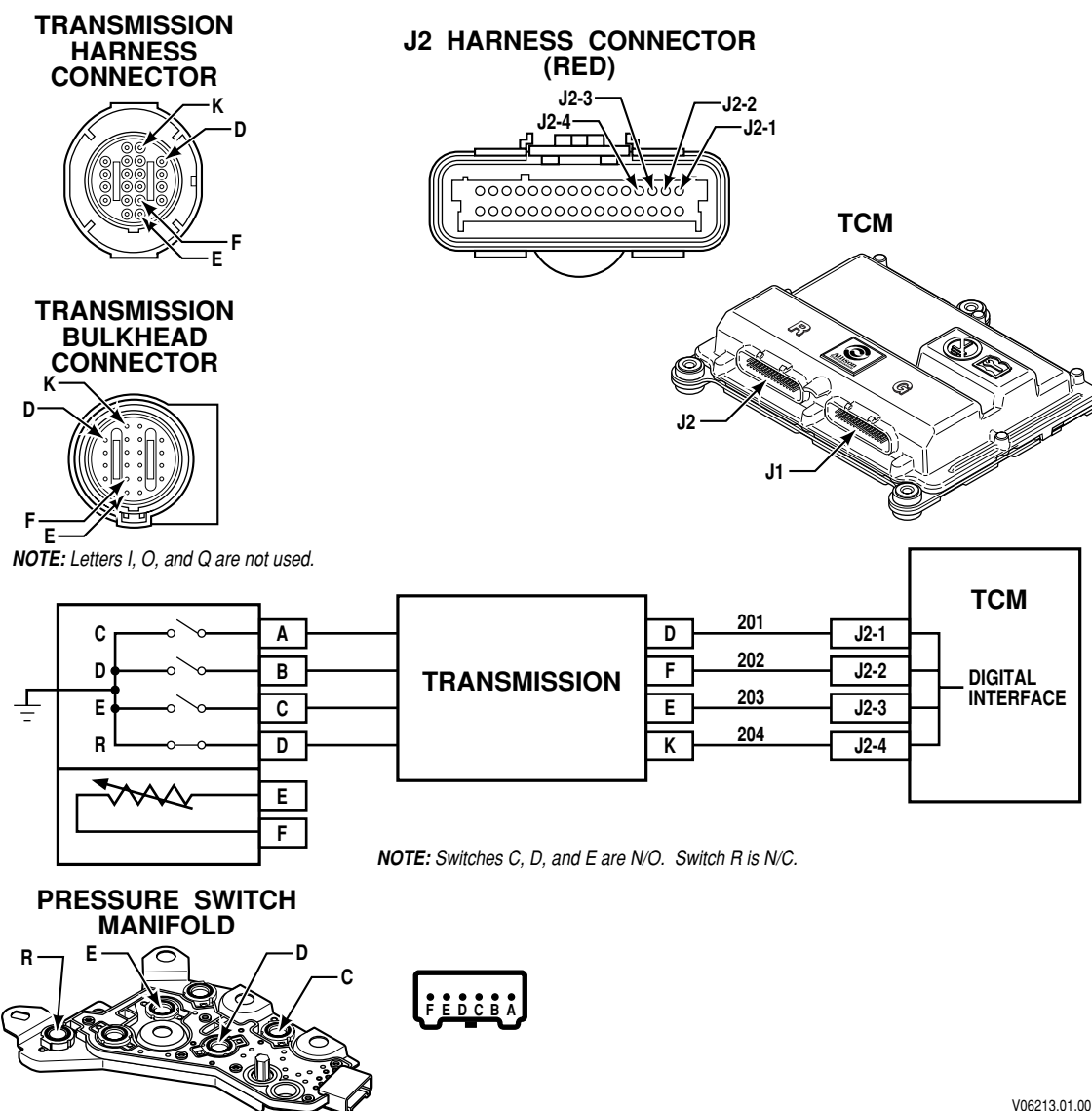
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0871 (Previously P1710) Trans Pressure Switch
Solenoid E Circuit Stuck Open (cont'd)

Step	Action	Value(s)	Yes	No
12	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 16	—
13	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 16	—
14	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 16	—
15	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 16	—
16	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0872 (Previously P1711) Transmission Pressure Switch Solenoid E Circuit Stuck Closed



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Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The E pressure switch monitors E shift valve positioning and relays it to the TCM. When E pressure switch is in the open state, E shift valve should be in the destroyed position.

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 18V and less than 32V (24V TCM).
- E shift valve is commanded to the OFF (destroyed) position.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0872 sets when E solenoid is commanded OFF and E pressure switch status remains ON for a period of time that is temperature dependent. The time period is 2 seconds at 0°C (32°F) or up to 20 seconds at -40°C (-40°F). The intent of this DTC is to detect a stuck shift valve, in the stroked state, a mechanical solenoid failure, or a circuit short to ground.

Action Taken When the DTC Sets

- When DTC P0872 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0872 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 a P0872 and P0870 are set in combination, this may indicate a short to ground is present at the pressure switch circuit or the shift valve is stuck in the stroked state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.

DIAGNOSTIC TROUBLE CODES (DTC)

4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for shorts in the OEM wiring harness.
7. This step tests for shorts in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0872 (Previously P1711) Trans Pressure Switch Solenoid E Circuit Stuck Closed

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC may indicate a stuck shift valve, solenoid mechanically failed, a short to ground in the switch circuit, or a defective PSM. Did DTC P0872 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 3 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 15</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0872 (Previously P1711) Trans Pressure Switch Solenoid E
Circuit Stuck Closed (cont'd)**

Step	Action	Value(s)	Yes	No
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 203 (pin E) at the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 14</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin C. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 13</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch E membrane. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 9</i>	<i>Go to Step 12</i>
9	Remove the control valve body and check for a stuck or sticking E shift valve. Refer to Service Manual or Mechanic's Tips. Was the E shift valve stuck or sticking?	—	<i>Go to Step 11</i>	<i>Go to Step 10</i>
10	Replace the E shift solenoid and reinstall the control valve body. Refer to Service Manual or Mechanic's Tips. Is replacement of the solenoid and reinstalling of the control valve body complete?	—	<i>Go to Step 16</i>	—
11	Clean and/or polish the sticking valve to restore free movement or replace the control valve body assembly. Refer to Service Manual or Mechanic's Tips. Was free movement restored or valve body replaced?	—	<i>Go to Step 16</i>	—

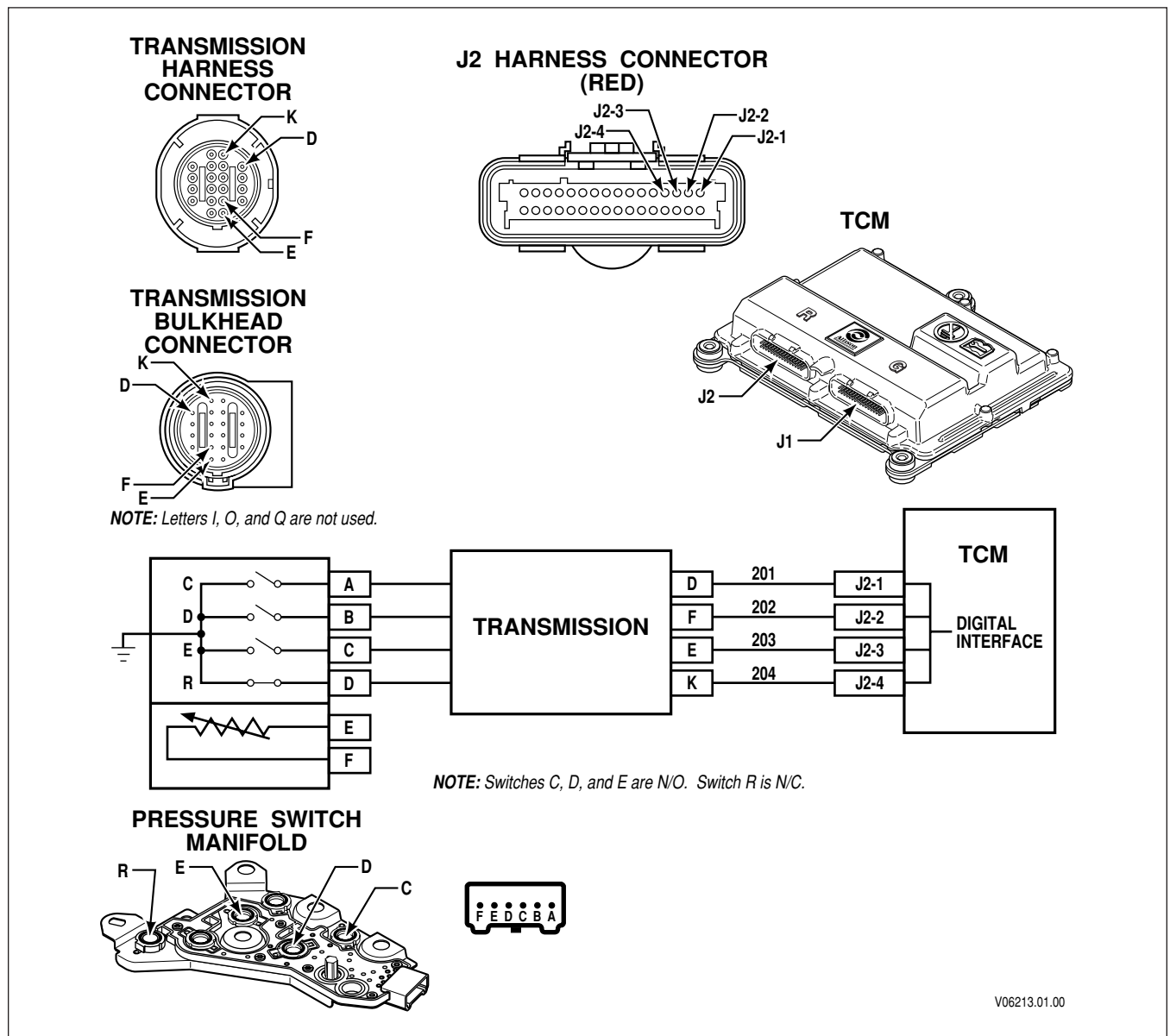
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0872 (Previously P1711) Trans Pressure Switch Solenoid E
Circuit Stuck Closed (*cont'd*)

Step	Action	Value(s)	Yes	No
12	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 16</i>	—
13	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 16</i>	—
14	<i>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</i> Repair the vehicle wiring harness. Is the repair complete?	—	<i>Go to Step 16</i>	—
15	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6).</i> Replace the TCM. Is the replacement complete?	—	<i>Go to Step 16</i>	—
16	In order to verify your repair: 1. Clear the DTC. 2. Operate the vehicle under conditions as noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0873 (Previously P1712) Transmission Pressure Switch Solenoid E Circuit High



Circuit Description

The Pressure Switch Manifold (PSM) is a multiple-switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. The E pressure switch monitors E shift valve positioning and relays it to the TCM. When E pressure switch is in the open state, E shift valve should be in the destroyed position.

Conditions for Running the DTC

- Components are powered and the ignition voltage is greater than 5V.
- DTC P0561, P0562, or P0563 is not active.
- E shift valve is commanded to the ON (stroked) position.
- Transmission temperature is above -25°C (-13°F).
- Vehicle shutdown is not in process.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0873 sets during steady state operation when E shift valve is in the stroked state (commanded ON) and E pressure switch status is detected as destroyed (commanded OFF). Steady state is defined as attaining a valid range. The intent of this code is to detect an open condition in the pressure switch wiring circuit or the pressure switch.

Later software levels incorporate retry logic that allows the TCM to command E solenoid OFF and ON. If the pressure switch state does not change, and remains in the OFF state, DTCs P0873 and P0871 will set.

Action Taken When the DTC Sets

- When DTC P0873 is active, the following conditions will occur:
 - If the failure occurs while in a forward range, the transmission shifts to another forward range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral.
- DTC P0873 is stored in TCM history.
- The **CHECK TRANS** light illuminates.
- The TCM inhibits TCC engagement.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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 only a DTC P0873 is set, look for an intermittent open condition at the pressure switch circuit or an intermittent hydraulic failure (sticking valve). This code is set when the condition is present more than 3 times during a current drive cycle. See Appendix A, Section B — Finding an Intermittent Fault.
- When a P0873 and P0871 are set in combination, this may indicate an open circuit condition is present at the pressure switch circuit or the shift valve is stuck in the destroyed state. See Section 4 — Beginning the Troubleshooting Process.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for an open condition at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for opens in the OEM wiring harness.
7. This step tests for opens in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0873 (Previously P1712) Transmission Pressure Switch Solenoid E Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC indicates an open circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM. Did DTC P0873 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0873 (Previously P1712) Transmission Pressure Switch
Solenoid E Circuit High (cont'd)**

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 3 to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 12</i>
6	1. Turn the ignition OFF and reconnect J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Turn the ignition ON. 4. Connect wire 203, pin E, on the main transmission connector to a known good ground.* Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 11</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin C. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 10</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the pressure switch E membrane. Does the Scan Tool indicate pressure switch E status as ON when grounded and OFF when circuit is open?	—	<i>Go to Diagnostic Aids</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 13</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

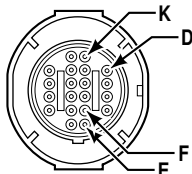
DTC P0873 (Previously P1712) Transmission Pressure Switch
Solenoid E Circuit High (cont'd)

Step	Action	Value(s)	Yes	No
11	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 13	—
12	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 13	—
13	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK
* If J 39700 and J 44722 are available, they may be used to perform this operation.				

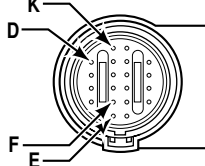
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0875 (Previously P1713) Transmission Reverse Pressure Switch Circuit Malfunction

TRANSMISSION HARNESS CONNECTOR

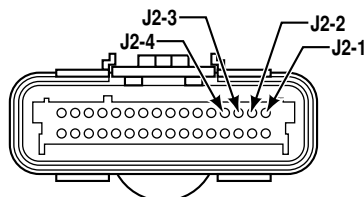


TRANSMISSION BULKHEAD CONNECTOR

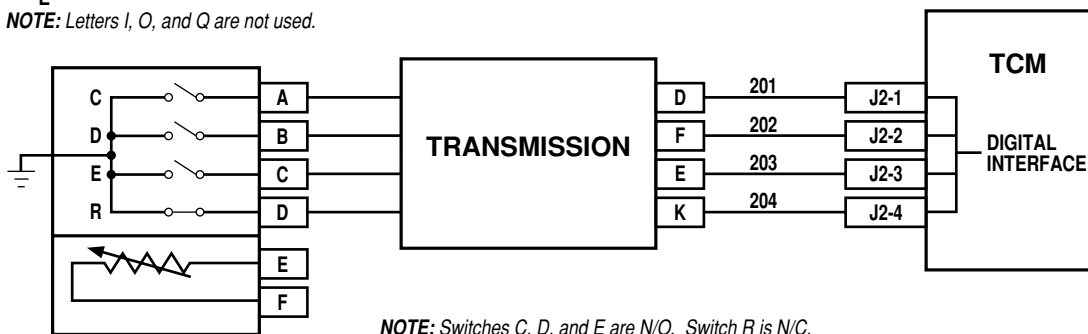
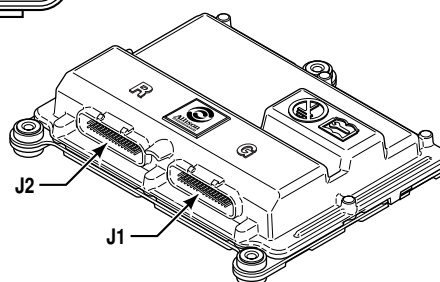


NOTE: Letters I, O, and Q are not used.

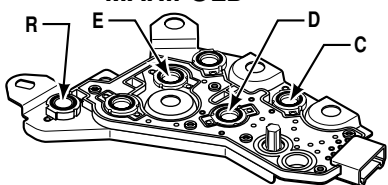
J2 HARNESS CONNECTOR (RED)



TCM



PRESSURE SWITCH MANIFOLD



V06213.01.00

Circuit Description

The Pressure Switch Manifold (PSM) is a multiple switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. Fluid pressure is supplied to the reverse pressure switch, holding it open, when the manual selector valve is in any position except reverse. When the manual selector valve is moved to Reverse, pressure to the reverse pressure switch is cut off, allowing the switch to close.

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 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- TFT is greater than 0°C (32°F).
- The hydraulic system is pressurized.
- DTC P0708 is not active.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0875 sets when **P** (Park), **N** (Neutral), or a forward range is selected and the reverse pressure switch state remains in the mechanically closed/electrically ON position for a period of time that is calibration dependent.

Action Taken When the DTC Sets

- When DTC P0875 is active, the following conditions will occur:
 - Calibration Dependent — The transmission will either lock-to-neutral or shift to 3rd or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - If the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral. If an output speed fault or NSBU fault is present when this test fails, then hydraulic default is implemented.
- DTC P0875 is stored in TCM history.
- The **CHECK TRANS** light illuminates on the second occurrence.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- This DTC could indicate a hydraulic leak path exhausting pressure from the reverse pressure switch (refer to hydraulic schematic).
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed. To help reduce multiple pressure switch DTCs from setting due to a plugged control main filter or slow pump prime, later software levels have a time delay up to 30 seconds before a pressure switch test is enabled.
- If a P0875 (previously P1713) is shown in failure records as being logged first on the failure list followed by P0872 (previously P1711) combined with P0708, this generally indicates a NSBU internal switch failure. Often when the codes are cleared they do not return. This may be due to moisture that was present at the time the code was logged, causing an internal short. Inspect the NSBU switch linkage for proper adjustment and for signs of damage. If the shift linkage is properly adjusted and no damage is noted, replacement of the switch may be indicated.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for shorts in the OEM wiring harness.
7. This step tests for shorts in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0875 (Previously P1713) Reverse Pressure Switch Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	Go to Step 2	Go to <i>Beginning The Troubleshooting Process</i> (Paragraph 5–4A)
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	Go to Step 3	Go to <i>A/T Fluid Checking Procedure</i> (Appendix P)
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	Refer to <i>Main Pressure Table</i> (Pages 5–8 and 5–9)	Go to Step 4	Go to <i>General Troubleshooting</i> (Section 7)
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC is set when P (Park), N (Neutral), or a forward range has been selected and the reverse pressure switch indicates mechanically closed/electrically ON for a period of time that is calibration dependent. This DTC may indicate that a short circuit condition exists in the OEM harness, internal transmission harness or the PSM. A defective NSBU switch may also set this code. The intent of this DTC is to detect discrepancies between range selected at the NSBU and the actual position of the manual selector valve. Did DTC P0875 return?	—	Go to Step 5	Go to <i>Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0875 (Previously P1713) Reverse Pressure Switch Circuit Malfunction (cont'd)**

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Remove the J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. Leave the vehicle harness disconnected from the J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 4 on the Breakout Box panel to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 13</i>
6	1. Turn the ignition OFF and reconnect the J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Connect wire 204 (pin K) at the main transmission connector to a known good ground.* 4. Turn the ignition ON. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 12</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin D. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 11</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the reverse pressure switch membrane. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 10</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 14</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

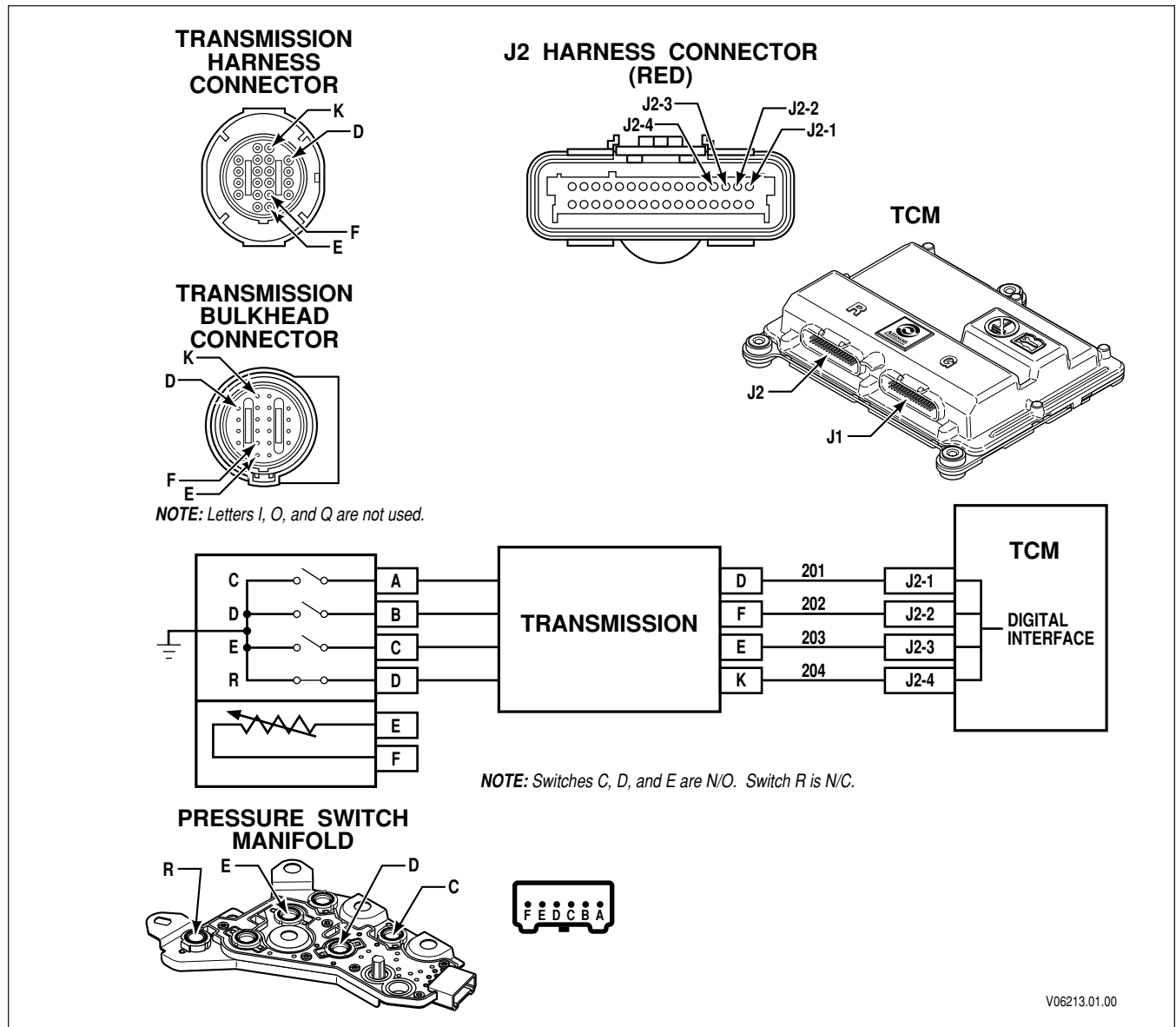
DTC P0875 (Previously P1713) Reverse Pressure Switch Circuit Malfunction (cont'd)

Step	Action	Value(s)	Yes	No
10	1. Inspect for a missing or a damaged seal at the reverse pressure switch assembly. 2. Inspect for loose reverse transfer tube. 3. Inspect for proper shift linkage adjustment. Shift linkage out of adjustment can allow pressure to apply the reverse pressure switch. Did you find and repair a problem?	—	Go to Step 14	Go to Diagnostic Aids
11	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 14	—
12	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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	—
13	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 14	—
14	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0876 (Previously P1714) Transmission Reverse Pressure Switch Circuit Stuck Open



Circuit Description

The Pressure Switch Manifold (PSM) is a multiple switch assembly made up of three normally open (N/O) and one normally closed (N/C) pressure switches. Fluid pressure is supplied to the reverse pressure switch, holding it open, when the manual selector valve is in any position except reverse. When the manual selector valve is moved to Reverse, pressure to the reverse pressure switch is cut off allowing the switch to close.

Conditions for Running the DTC

- TFT is greater than 0°C (32°F).
- DTC P0706, P0708, or P0875 is not active.
- There are two cases where this DTC runs.
 - Case 1 Ignition voltage is above 9V (12V TCM) or 18V (24V TCM). The PRNDL state and the reverse pressure switch state do not agree.
 - Case 2 Ignition voltage is under 9V (12V TCM) or 18V (24V TCM). All speed sensors are under 50 rpm.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC P0876 sets in two cases:

- When PRNDL and reverse pressure switch do not agree. When reverse range is selected and the reverse pressure switch is detected in the mechanically open/electrically OFF state for more than 1 second.
- When engine shutdown and reverse pressure switch do not agree. When engine shutdown is in process and the reverse pressure switch is detected in an improper state, mechanically open/electrically OFF, for more than a period of time that is temperature dependent. The time period is 5 seconds at 35°C (95°F) to 30 seconds at -20°C (-4°F).

Action Taken When the DTC Sets

- When DTC P0876 is active, the following conditions will occur:
 - Calibration Dependent — The transmission will either lock-to-neutral or shift to 3rd or 5th range.
 - If the shift selector is moved to **N** (Neutral), the transmission will shift to neutral.
 - if the shift selector is moved to **R** (Reverse), the transmission shifts to reverse.
 - If the shift selector is moved to a forward range or reverse and the transmission is compromised by overspeeding or direction change, the transmission shifts to neutral. If an output speed fault or NSBU fault is present when this test fails, then hydraulic default is implemented.
- DTC P0876 is stored in TCM history.
- The **CHECK TRANS** light illuminates on the second occurrence.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4 — Wire Check Procedures and Appendix A, Section B.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode when the DTC was set.
- Multiple inactive pressure switch DTCs may be due to a plugged Control Main Filter. Ensure that the initial 8000 km (5,000 mile) filter change was performed. To help reduce multiple pressure switch DTCs from setting due to a plugged control main filter or slow pump prime, later software levels have a time delay up to 30 seconds before a pressure switch test is enabled.

DIAGNOSTIC TROUBLE CODES (DTC)

Test Description

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

2. This step tests for proper fluid level.
3. This step tests for proper main pressure.
4. This step tests for an active DTC.
5. This step tests the TCM for proper switch status.
6. This step tests for an open condition in the OEM wiring harness.
7. This step tests for an open condition in the internal wiring harness.
8. This step tests the PSM switch function.

DTC P0876 (Previously P1714) Reverse Pressure Switch Circuit Stuck Open

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Perform the A/T Fluid Checking Procedure (Appendix P). Did you perform the procedure and correct fluid level if necessary?	—	<i>Go to Step 3</i>	<i>Go to A/T Fluid Checking Procedure (Appendix P)</i>
3	Perform the Main Pressure Check Procedure (Appendix B). Is main pressure within the specified values?	<i>Refer to Main Pressure Table (Pages 5–8 and 5–9)</i>	<i>Go to Step 4</i>	<i>Go to General Troubleshooting (Section 7)</i>
4	1. Install the Scan Tool. 2. Turn ON the ignition, with the engine OFF. 3. Record the failure records. 4. Clear the DTC. 5. Start the vehicle and perform a test drive. Attempt to duplicate the same operating conditions observed in failure records (range attained, transmission temperature, etc.). NOTE: This DTC is set when reverse range is selected and reverse switch status remains in the mechanically open/electrically OFF state for more than a time that is calibration dependent. This DTC can also set at engine shutdown when the reverse pressure switch is detected in the mechanically open/electrically OFF state for a period of time that is temperature dependent. The time period is 5 seconds at 35° C (95° F) to 30 seconds at –20° C (–4° F). Did DTC P0876 return?	—	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P0876 (Previously P1714) Reverse Pressure Switch Circuit Stuck Open (cont'd)**

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Remove the J2 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. Leave the vehicle wiring harness disconnected from the J 43799 Breakout Box Adapter. 3. Connect J2 connector pin 4 on the Breakout Box panel to a known good ground. 4. Turn the ignition ON. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 6</i>	<i>Go to Step 13</i>
6	1. Turn the ignition OFF and reconnect the J2 connector to the TCM. 2. Disconnect the transmission wiring harness from the main transmission connector at the back of the transmission. 3. Connect wire 204 (pin K) at the main transmission connector to a known good ground.* 4. Turn the ignition ON. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 7</i>	<i>Go to Step 12</i>
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Disconnect the internal wiring harness from the PSM and ground pin D. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 8</i>	<i>Go to Step 11</i>
8	1. Remove the PSM from the control valve body and leave the internal harness connected. Refer to Service Manual or Mechanic's Tips. 2. Provide a ground connection for the PSM to either the control valve body or the transmission main case. 3. Use your finger or the eraser end of a pencil to push gently on the reverse pressure switch membrane. Does the Scan Tool indicate reverse pressure switch status as ON when grounded and OFF when circuit is open?	—	<i>Go to Step 10</i>	<i>Go to Step 9</i>
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	<i>Go to Step 14</i>	—

DIAGNOSTIC TROUBLE CODES (DTC)

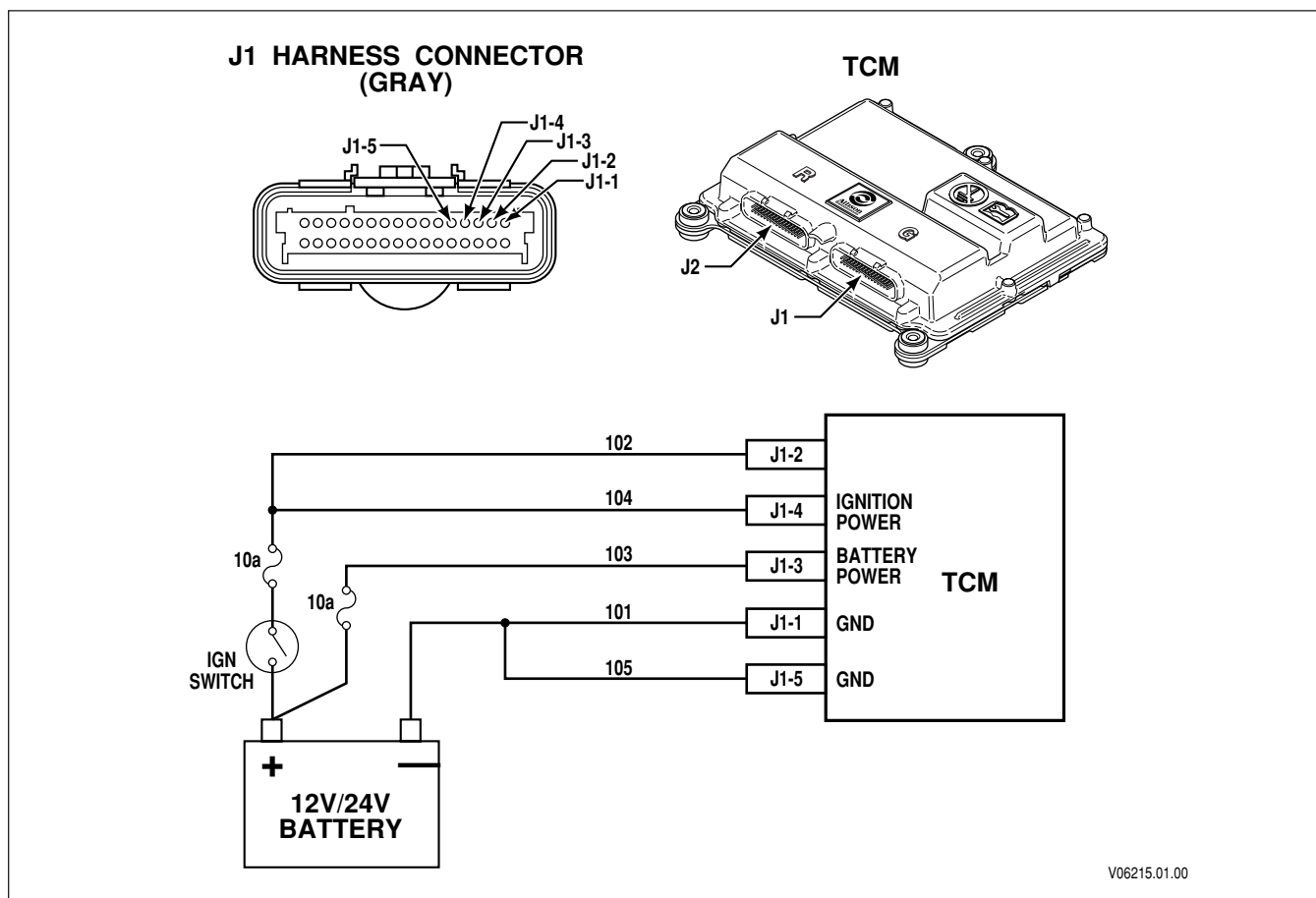
DTC P0876 (Previously P1714) Reverse Pressure Switch Circuit Stuck Open (cont'd)

Step	Action	Value(s)	Yes	No
10	1. Inspect for a missing or a damaged seal at the reverse pressure switch assembly. 2. Inspect for loose reverse transfer tube. 3. Inspect for proper shift linkage adjustment. Shift linkage out of adjustment can allow pressure to apply the reverse pressure switch. Did you find and repair a problem?	—	Go to Step 14	Go to Diagnostic Aids
11	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 14	—
12	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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	—
13	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 14	—
14	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

* If J 39700 and J 44722 are available, they may be used to perform this operation.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0880 (Previously P1760) TCM Supply Voltage



Circuit Description

DTC P0880 sets if an abnormal power-down sequence has occurred. This condition means the Transmission Control Module (TCM) has lost supply voltage (wire 103) before it has finished saving information from that drive cycle. This process is usually completed in less than 10 seconds.

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 18V and less than 32V (24V TCM).
- Loss of TCM supply voltage before drive cycle data is saved.

Conditions for Setting the DTC

DTC P0880 sets during the next ignition cycle if the TCM loses TCM supply voltage less than 10 seconds after the ignition voltage has been turned off.

Action Taken When the DTC Sets

- DTC P0880 is stored in the TCM history.
- The TCM loses adaptive information for the drive cycle.
- The TCM reverts to previous adaptive settings.

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without 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.

Test Description

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

2. This step tests the system voltage.
4. This step tests the vehicle charging system.
5. This step tests the external wiring harness for shorts or opens.

DTC P0880 (Previously P1760) TCM Supply Voltage

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn the ignition to the RUN position with the engine OFF. 3. Record the DTC Failure Record data. NOTE: If other DTCs are present refer to the applicable diagnostic tables before continuing. 4. Using a DVOM, measure and record voltage at the battery terminals. Is voltage greater than the specified value?	10.5V (12V TCM); 22V (24V TCM)	<i>Go to Step 4</i>	<i>Resolve battery problem</i>
3	Start the engine and warm to normal operating temperature. Is the Alternator/Check Engine lamp ON?	—	<i>Repair charging system</i>	<i>Go to Step 4</i>
4	1. Increase the engine speed to 1000–1500 rpm. 2. Using the Scan Tool, monitor system voltage. Is voltage within the specified value?	13–15V (12V TCM); 25–30V (24V TCM)	<i>Go to Step 5</i>	<i>Repair charging system</i>

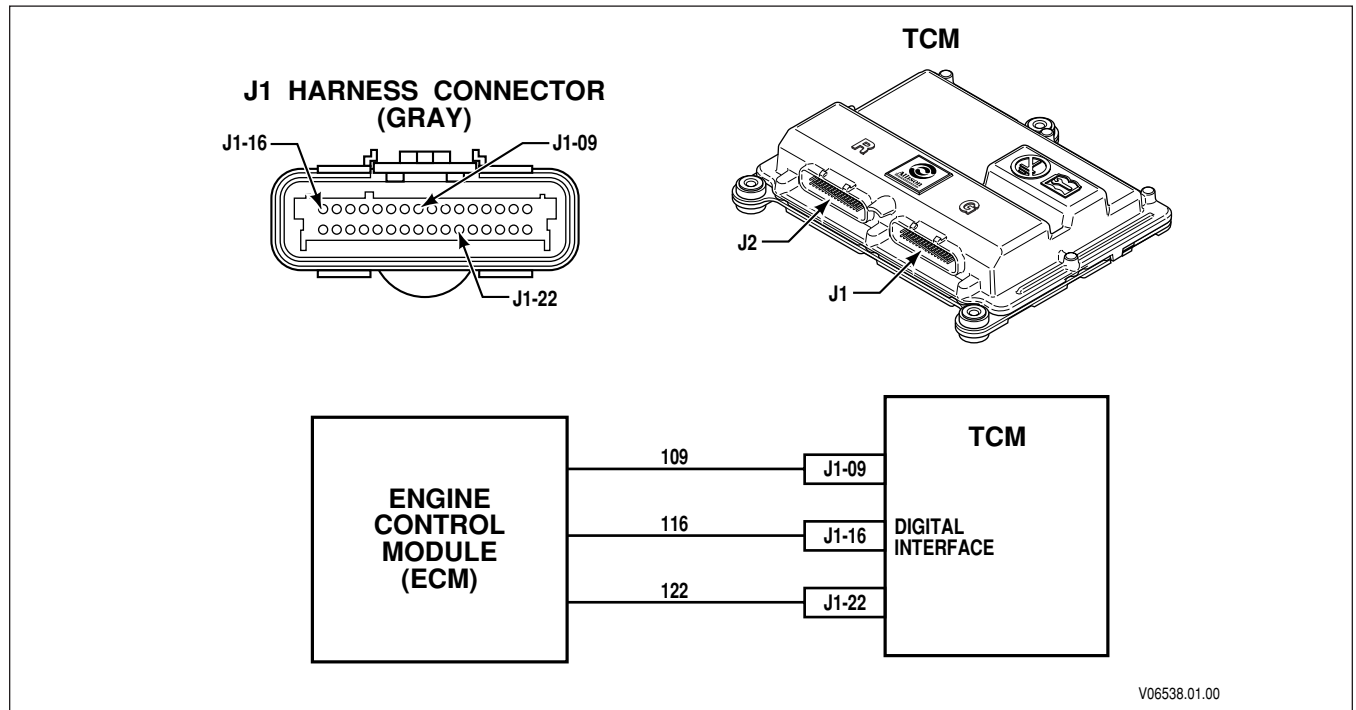
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0880 (Previously P1760) TCM Supply Voltage (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect J1 connector from the TCM and install J 39700 Breakout Box and J 43799 Breakout Box Adapter. 3. Using a DVOM, measure voltage at connector J1 pins 1 and 2 with the ignition ON and J1 connector pins 1 and 3 with the ignition OFF. 4. Compare the battery voltage to the wire voltage. Is the voltage difference greater than the specified value?	0.5V	Go to Step 6	Go to Step 7
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 8	—
7	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 8	—
8	In order to verify your repair: 1. Clear the DTC. 2. Start the engine and warm to normal operating temperature. 3. Using the Scan Tool, monitor system voltage. System voltage should be 9–18V for a 12V TCM or 18–32V for a 24V TCM. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1688 Unmanaged Engine Torque Delivered To TCM Signal



Circuit Description

The GM 8.1 liter gasoline engine is used in some medium duty applications. The 8.1 liter engine uses a 3-wire system to communicate engine torque data/requests between the powertrain control module (PCM) and the transmission control module (TCM).

Unmanaged engine torque is sent from the PCM to the TCM over wire 109 (GM wire 2467).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- Pulse Width Modulation (PWM) driver demand torque option is selected in transmission calibration.

Conditions for Setting the DTC

DTC P1688 sets if unmanaged (gross) engine torque signal (circuit 2467) is under 1.5 percent or over 98.5 percent for more than a 2 second period.

Actions Taken When the DTC Sets

- DTC P1688 is stored in the TCM history.
- The **CHECK TRANS** light illuminates on the second occurrence.
- The TCM defaults to a calculated unmanaged torque (gross) input value using throttle and engine speed.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

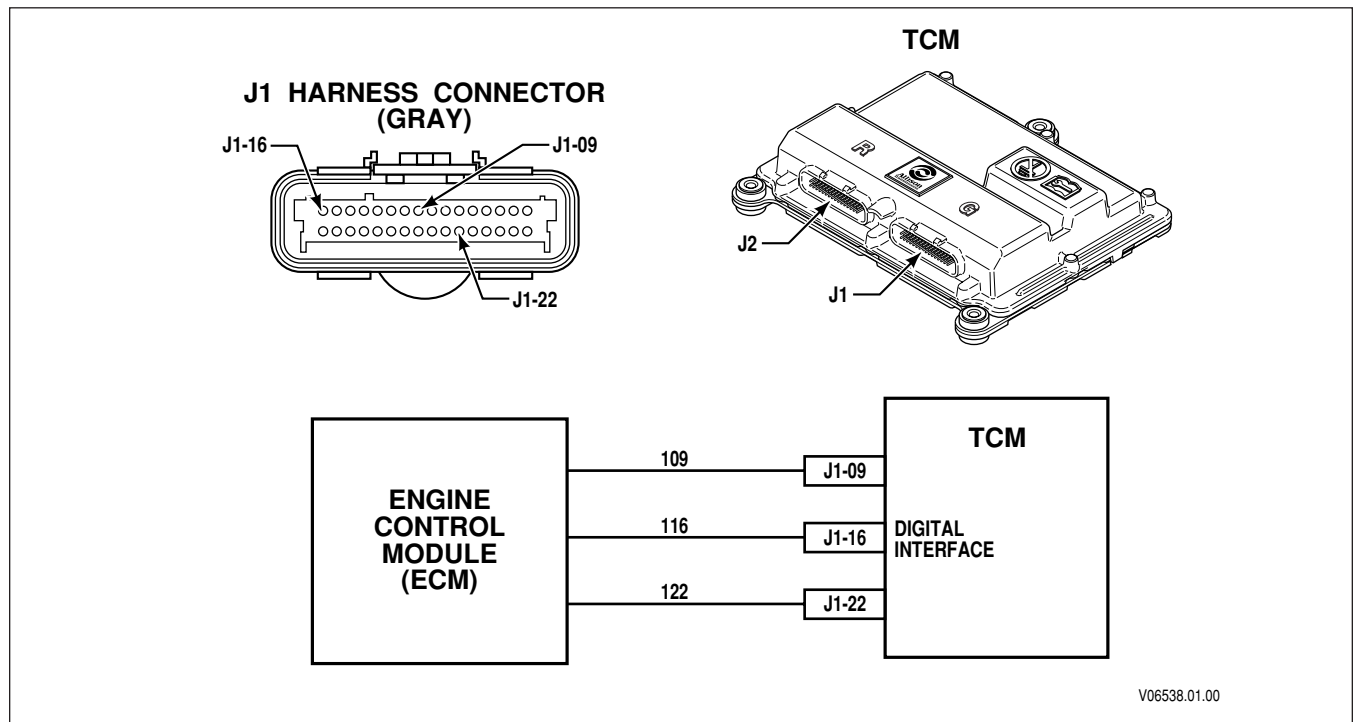
An Intermittent condition may be the cause of the problem. Return the vehicle to the OEM for further troubleshooting.

DTC P1688 Engine Torque Unmanaged Delivered To TCM Signal

Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record DTC failure records. 4. Clear the DTC and drive the vehicle. Attempt to duplicate the same operating conditions observed in failure records. NOTE: This DTC indicates that the unmanaged engine torque signal sent from the engine PCM to the transmission TCM is either under or over a set percentage value for a set period of time. Did DTC P1688 return?	<i>Go to Step 3</i>	<i>Go to Diagnostic Aids</i>
3	Inspect the routing of wire 109 (GM wire circuit 2467) between the TCM and PCM. Was chafing or wire damage found?	<i>Go to Step 4</i>	<i>Go to Step 5</i>
4	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Repair or replace the vehicle wiring harness. Is the repair complete?	<i>Go to Step 6</i>	—
5	Return the vehicle to the OEM to troubleshoot for cause of low or high torque signal. Below are some possible causes for this DTC. • Defective engine PCM. • Circuit fault at wire 109. • Improper calibration for engine PCM. Was problem found and repaired?	<i>Go to Step 6</i>	—
6	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1779 Engine Torque Delivered To TCM Signal



Circuit Description

The GM 8.1 liter gasoline engine is used in some medium duty applications. The 8.1 liter engine uses a 3-wire system to communicate engine torque data/requests between the powertrain control module (PCM) and the transmission control module (TCM).

Managed engine torque is sent from the PCM to the TCM over wire 116 (GM wire 464).

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- Pulse Width Modulation (PWM) driver demand torque option is selected in transmission calibration.
- No DTC is active at the time of this test.

Conditions for Setting the DTC

DTC P1779 sets if managed engine torque (net) signal (circuit 464) is under 1.5 percent or over 98.5 percent for more than a 2 second period.

Actions Taken When the DTC Sets

- DTC P1779 is stored in the TCM history.
- The **CHECK TRANS** light illuminates on the second occurrence.
- The TCM defaults to a calculated managed torque (net) input value using throttle and engine speed.
- The TCM defaults to a calculated unmanaged torque (gross) input value using throttle and engine speed.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

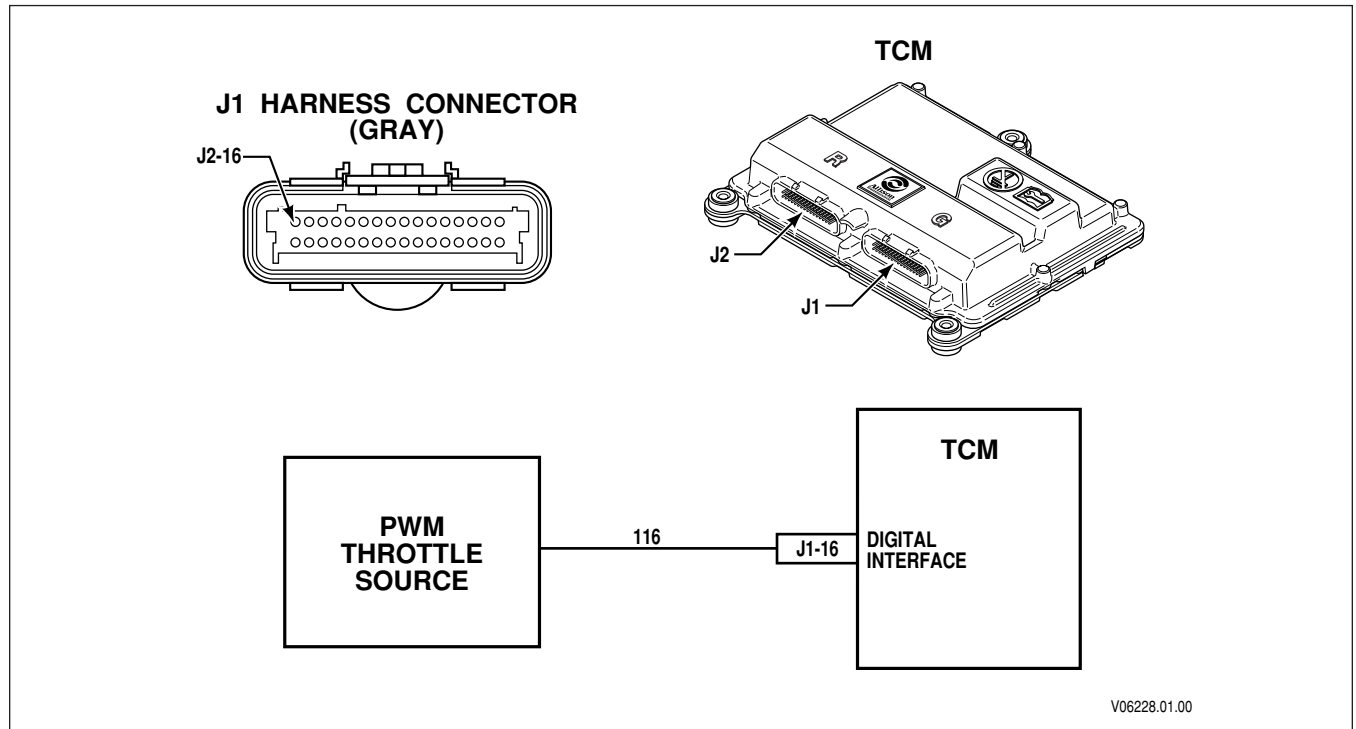
An Intermittent condition may be the cause of the problem. Return the vehicle to the OEM for further troubleshooting.

DTC P1779 Engine Torque Delivered To TCM Signal

Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record DTC failure records. 4. Clear the DTC and drive the vehicle. Attempt to duplicate the same operating conditions observed in failure records. NOTE: This DTC indicates that the managed engine torque signal sent from the engine PCM to the transmission TCM is either under or over a set percentage value for a set period of time. Did DTC P1779 return?	<i>Go to Step 3</i>	<i>Go to Diagnostic Aids</i>
3	Inspect the routing of wire 109 (GM wire circuit 2467) between the TCM and PCM. Was chafing or wire damage found?	<i>Go to Step 4</i>	<i>Go to Step 5</i>
4	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Repair or replace the vehicle wiring harness. Is the repair complete?	<i>Go to Step 6</i>	—
5	Return the vehicle to the OEM to troubleshoot for cause of low or high torque signal. Below are some possible causes for this DTC. • Defective engine PCM. • Circuit fault at wire 116. • Improper calibration for engine PCM. Was problem found and repaired?	<i>Go to Step 6</i>	—
6	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1891 Throttle Position Sensor (TPS) Pulse Width Modulation (PWM) Signal Low Input



Circuit Description

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

Conditions for Running the DTC

- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater than 18V and less than 32V (24V TCM).
- The components are powered and engine speed is within a 5 rpm range for 5 seconds.

Conditions for Setting the DTC

DTC P1891 sets if the TCM is calibrated to receive the PWM signal and the throttle percentage falls below 5 percent for 5 seconds.

Action Taken When the DTC Sets

- DTC P1891 is stored in the TCM history.
- The TCM uses the default throttle value.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.
- MY '00 through '02 — no **CHECK TRANS** light. MY '03 **CHECK TRANS** light is illuminated.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

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.

Test Description

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

2. This step tests the system voltage.
3. This step tests the PWM signal.
4. This step tests for shorts or opens at wire 116.

DTC P1891 Throttle Position Sensor (TPS) Pulse Width Modulation (PWM) Signal Low Input

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Install the Scan Tool. 2. Turn the ignition to the RUN position with the engine OFF. 3. Record the DTC Failure Record data. 4. Verify that the throttle source is functioning correctly. Is PWM signal OK?	—	<i>Go to Step 4</i>	—
4	Check wire 116 for shorts or opens. Did you find a problem?	—	<i>Go to Step 5</i>	<i>Go to Step 6</i>

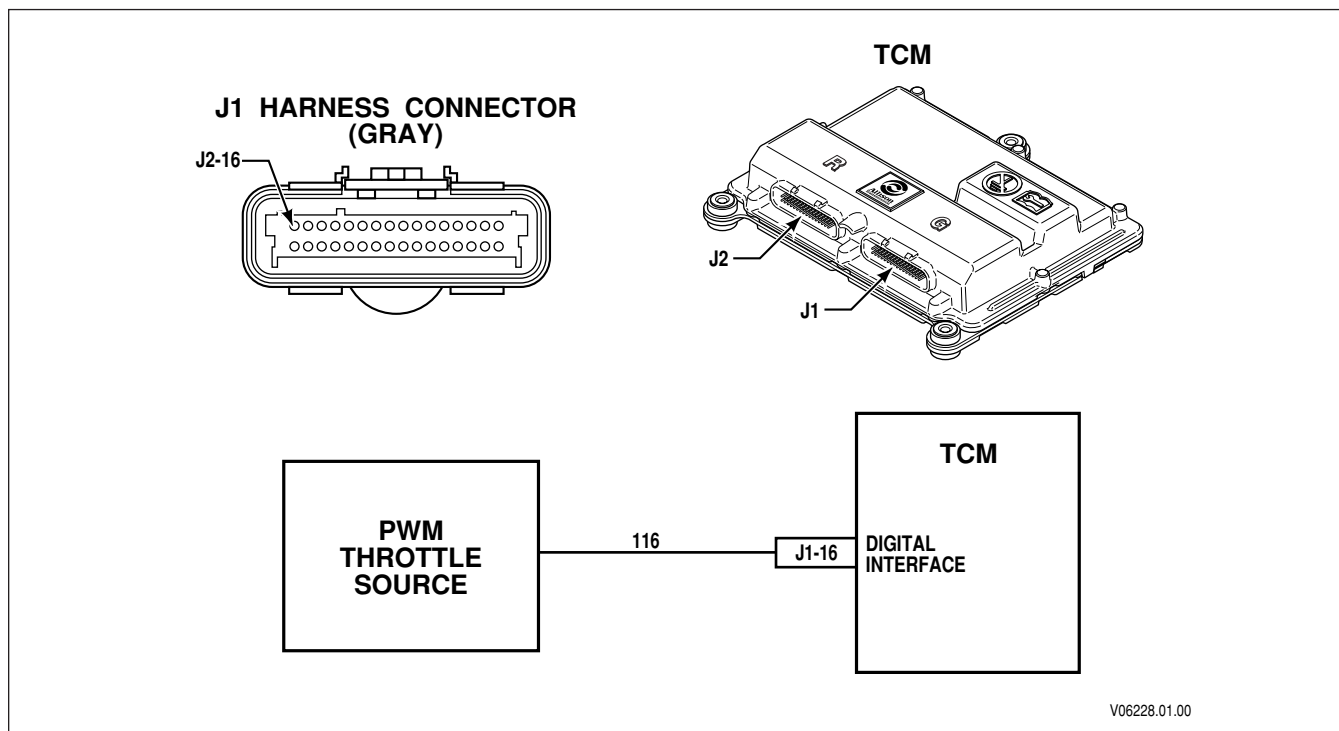
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1891 Throttle Position Sensor (TPS) Pulse Width Modulation (PWM)
Signal Low Input (cont'd)

Step	Action	Value(s)	Yes	No
5	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 9	—
6	Inspect the TCM and Engine Control Module (ECM) connectors and terminals for damage and/or corrosion. Did you find a problem?	—	Go to Step 7	Go to Step 8
7	Repair and clean terminals if possible. Is the repair complete?	—	Go to Step 9	Go to Step 8
8	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM, if necessary. Is the replacement complete?	—	Go to Step 9	—
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor throttle position and engine coolant temperature. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1892 Throttle Position Sensor (TPS) Pulse Width Modulation (PWM) Signal High Input



Circuit Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

DTC P1892 sets if the TCM is calibrated to receive the PWM signal and the throttle percentage exceeds 95 percent for 5 seconds.

Action Taken When the DTC Sets

- DTC P1892 is stored in the TCM history.
- The TCM uses the default throttle value.
- The TCM freezes shift adapts (DNA).
- The TCM inhibits TCC engagement.
- MY '00 through '02 — no **CHECK TRANS** light. MY '03 **CHECK TRANS** light is illuminated.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

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.

Test Description

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

2. This step tests the system voltage.
3. This step tests the PWM signal.
4. This step tests for shorts or opens at wire 116.

DTC P1892 Throttle Position Sensor (TPS) Pulse Width Modulation (PWM) Signal High Input

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Install the Scan Tool. 2. Turn the ignition to the RUN position with the engine OFF. 3. Record the DTC Failure Record data. 4. Verify that the throttle source is functioning correctly. Is the PWM signal OK?	—	<i>Go to Step 4</i>	—
4	Check wire 116 for shorts or opens. Did you find a problem?	—	<i>Go to Step 5</i>	<i>Go to Step 6</i>

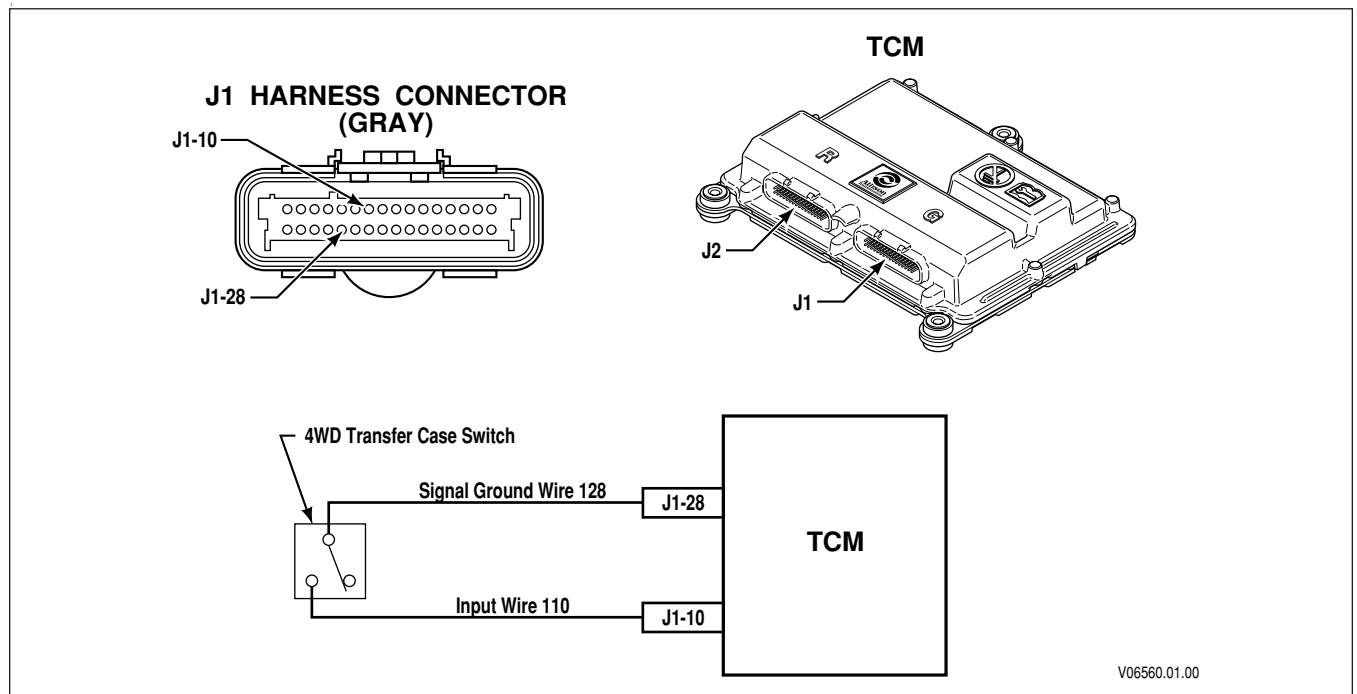
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1892 Throttle Position Sensor (TPS) Pulse Width Modulation (PWM) Signal High Input

Step	Action	Value(s)	Yes	No
5	<i>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</i> Repair the vehicle wiring harness. Is the repair complete?	—	Go to Step 9	—
6	Inspect the TCM and Engine Control Module (ECM) connectors and terminals for damage and/or corrosion. Did you find a problem?	—	Go to Step 7	Go to Step 8
7	Repair and clean terminals if possible. Is the repair complete?	—	Go to Step 9	Go to Step 8
8	<i>NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6).</i> Replace the TCM, if necessary. Is the replacement complete?	—	Go to Step 9	—
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor throttle position and engine coolant temperature. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2771 (Previously P0836, P1875) Four-Wheel Drive Switch Circuit



Circuit Description

Detects abnormal conditions for the four-wheel drive indication switch input. Four wheel-drive statuses are detected using speed and ratios.

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 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- DTCs P0721 and P0722 (output speed sensor circuits) are not active.
- Output speed is above 60 rpm.
- Transmission fluid temperature is between 20°C (68°F) and 130°C (266°F).
- Shift is complete and the range attained is not neutral.

Conditions for Setting the DTC

P2771 sets when one of the following conditions occurs:

- The transfer case switch indicates high range, and the calculated range is low range for 5 seconds or more.
- The transfer case switch indicates low range, and the calculated range is high range for 5 seconds or more.

Actions Taken When the DTC Sets

- DTC P2771 will be stored in the TCM memory.
- The **CHECK TRANS** light illuminates on the second occurrence.
- The TCM inhibits TCC engagement.

Conditions for Clearing the DTC/CHECK TRANS Light

- A Scan Tool can be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without a failure.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostics 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.
- Inspect for any transmission DTCs that may have reset.
- When testing for a short or ground, the transmission should be in a range where the switch or solenoid is in the OFF state. When testing for an open, the transmission should be in a range where the switch or solenoid is in the ON state.

Test Description

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

2. This step tests the status of the 4WD Low switch.
3. This step tests for a 4WD switch failure to ground.
4. This step tests for a short in the wiring harness.
9. This step tests for 4WD switch failure to an open state.
10. This step tests for an open in the wiring harness.

DTC P2771 Four-Wheel Drive Switch Circuit

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Section 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Section 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn the ignition to the RUN position with the engine OFF. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, monitor 4WD low status and select 4HI followed by 4LO with the transfer case selector. Does the Scan Tool indicate 4WD low status as NO when 4HI is selected, and YES when 4LO is selected?	—	<i>Go to Diagnostic Aids</i>	<i>Go to Step 3</i>
3	Select 4HI followed by 4LO using the transfer case selector. Does the Scan Tool indicate 4WD low status as YES for both selector positions?	—	<i>Go to Step 4</i>	<i>Go to Step 9</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2771 Four-Wheel Drive Switch Circuit (cont'd)

Step	Action	Value(s)	Yes	No
4	Remove the connector at the transfer case selector. Does the Scan Tool indicate 4WD low status as YES?	—	Go to Step 5	Go to Step 7
5	Inspect wire 110 for a short to ground. Did you find a problem?	—	Go to Step 6	Go to Step 15
6	Repair the short to ground in wire 110. Is the repair complete (refer to OEM repair procedures)?	—	Go to Step 16	—
7	Inspect the transfer case switch for proper operation or a short to ground. Did you find a problem (refer to OEM repair procedures)?	—	Go to Step 8	Go to Step 15
8	Repair the short to ground in the switch? Is the repair complete?	—	Go to Step 16	—
9	Select 4HI followed by 4LO using the transfer case selector. Does the Scan Tool indicate 4WD low status as NO for both selector positions?	—	Go to Step 10	Go to Step 15
10	1. Remove the connector at the transfer case switch. 2. Ground wire 110 to a known ground. Does the Scan Tool indicate 4WD low status as NO?	—	Go to Step 11	Go to Step 13
11	Inspect wire 110 for an open condition. Did you find a problem?	—	Go to Step 12	Go to Step 15
12	Repair the open condition in wire 110. Is the repair complete (refer to OEM repair procedures)?	—	Go to Step 16	—
13	Inspect the transfer case switch for an open condition. Did you find a problem?	—	Go to Step 14	Go to Step 15
14	Repair the open condition in the switch? Is the repair complete?	—	Go to Step 16	—
15	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 16	—

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P2771 Four-Wheel Drive Switch Circuit (cont'd)**

Step	Action	Value(s)	Yes	No
16	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under normal operating conditions. 3. Using the Scan Tool, monitor the 4WD low status. The 4WD low status must indicate NO when 4WDHI is selected, and YES when 4WDLO is selected. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1.</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2773 Torque Control Request Ignored — 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 during upshifts, shifts can be made quicker and at a more consistent output torque. This increases clutch life by reducing clutch engagement temperatures.

Conditions for Running the DTC

- DTC U2105 CAN bus error is not active.
- The components are powered and ignition voltage is greater than 9V and less than 18V (12V TCM) or greater 18V and less than 32V (24V TCM).
- Engine speed is greater than 200 rpm but less than 7500 rpm for 5 seconds.
- SEM has been activated for this vehicle.

Conditions for Setting the DTC

DTC P2773 sets when the TCM detects one of the following conditions for a minimum of four upshifts (consecutive or nonconsecutive) during one drive cycle:

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

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- All 4–5 upshifts and full throttle 3–4 upshifts are inhibited.

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The DTC is cleared if, for one ignition cycle, actual engine torque follows TCM commanded torque for 20 consecutive upshifts. To be counted as one upshift, engine torque demand must be above 80 N·m (59 lb ft).

Diagnostic Aids

- It will be necessary to drive the vehicle with heavy to moderate throttle settings for at least four upshift cycles in order to set a DTC P2773.
- If DTC P2773 becomes active shortly AFTER an engine update and the troubleshooting procedure for P2773 has been performed, see Resetting of TCM Parameters to Support Engine Update, Section 3–7.

Test Description

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

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

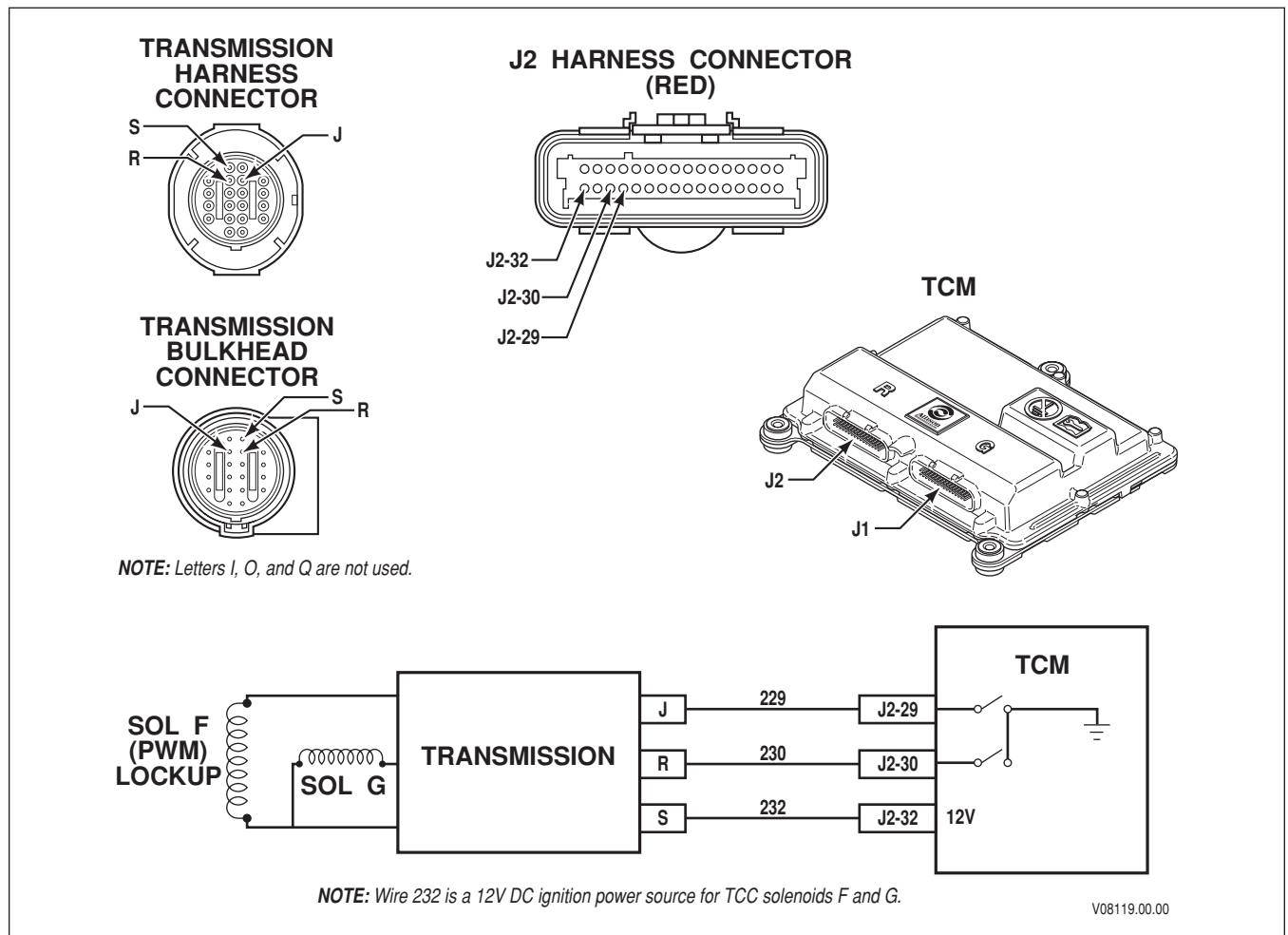
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2773 Torque Control Request Ignored — ECM/TCM

Step	Action		Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?		<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	This code indicates that the engine controller has disregarded the torque request sent by the TCM. Use the Scan Tool and refer to Transmission/Engine Torque Reduction Status. Does the Scan Tool indicate the ECM response to torque reduction request as incorrect?	—	<i>Go to Step 5</i>	<i>Go to Step 3</i>
3	Use the Scan Tool to identify an unapproved torque reduction device. Is the unapproved device one of the following? 1. Engine 2. Null address or all /any (information not valid)	<i>The Scan Tool shows the actual device at fault</i>	<i>Go to Step 5</i>	<i>Go to Step 4</i>
4	If the Scan Tool is indicating another device such as the brakes, cruise control, transmission, etc., inspect the controller for the device indicated. If possible, eliminate the device by disconnecting it from the J1939 CAN backbone. It may be possible that the device causing the interruption is only triggered under certain conditions. For example, a traction controller may only send commands under certain road conditions. Since these conditions may not be easily repeatable, replacement of the indicated controller with a known good controller may be the only way to verify the failure. Was the device causing the problem replaced or repaired?	—	<i>Go to Step 6</i>	—
5	Verify that compatible engine controller software is utilized. If the software is correct, replace the engine controller. If neither solves the problem, use a lower engine torque/power rating. Was the software updated or engine controller replaced?	—	<i>Go to Step 6</i>	—
6	In order to verify your repair: 1. Connect the Scan Tool. 2. Clear the DTC. 3. Drive the vehicle under heavy to moderate throttle settings for at least four upshift cycles. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2810 Solenoid G Electrical



Circuit Description

Solenoid G is a normally closed (N/C) solenoid used to modulate the transmission main pressure schedule. The TCM commands the G solenoid ON when specific transmission and engine conditions are met. When G solenoid is applied, pressure is routed to the main regulator valve. This in turn reduces the main pressure schedule and improves the volume of oil sent through the overage circuit. By modulating main pressure, cooler flow can be increased, allowing improved cooling and reduced pump noise.

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 18V and less than 32V (24V TCM).
- TCM initialization is in process or engine speed is greater than 200 rpm and less than 7500 rpm for 5 seconds.
- The TCM must autodetect G solenoid for this test to run.

Conditions for Setting the DTC

DTC P2810 is set when the TCM detects an open circuit, short to ground or short to power at G solenoid circuit for more than 2 seconds.

DIAGNOSTIC TROUBLE CODES (DTC)

Action Taken When the DTC Sets

When DTC P2810 is active, the following conditions will occur:

- DTC P2810 is stored in TCM history.
- The **CHECK TRANS** light illuminates.

Conditions for Clearing the DTC/CHECK TRANS Light

A scan tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without failure.

Diagnostic Aids

- When this code is set there will be a noticeable reduction of engine performance.
- An intermittent circuit condition may allow this DTC to set. Make sure you check for the following conditions at the OEM harness first and then at the transmission internal harness.
- Inspect the wiring for poor electrical connections at the TCM connector and the transmission main connector. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
 - Inspect OEM wiring harness routing, looking for possible contact points where chafing could occur. Moving parts on the vehicle could be contacting the harness. Check for contact at the parking brake drum, suspension components, transmission shift linkage etc.
 - Inspect the internal transmission wiring harness for possible contact areas where chafing may occur.
- When diagnosing for an intermittent short or open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for shorting to ground at individual wires within a harness to isolate an intermittent condition. Refer to Section 4—Wire Check Procedures.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where DTC was set.
- If the DTC appears to be temperature related, suspect a defective G solenoid. It is possible for a solenoid to be temperature sensitive causing resistance values to fluctuate. This may cause an intermittent DTC to be set.

Test Description

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

2. This step tests for the proper ignition voltage.
3. This step tests the TCM for proper command status.
4. This step tests the OEM harness for an open condition.
5. This step tests for the proper resistance at the main transmission connector.
7. This step tests for the proper resistance value at the G solenoid.

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2810 Shift Solenoid E Electrical

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Start the engine. 3. Record the DTC Failure Record data. 4. Using the Scan Tool, measure ignition voltage. Is voltage within the specified value?	9–18V (12V TCM); 18–32V (24V TCM)	<i>Go to Step 3</i>	<i>Resolve voltage problem (Refer to DTC P0562 and P0563)</i>
3	1. Turn the ignition OFF. 2. Disconnect the J2 connector (RED) at the TCM. 3. Install J 39700 breakout box and J 43799 breakout box adapter 4. Turn ON the ignition, with the engine OFF. 5. Using the Scan Tool in solenoid test mode, command G solenoid to ON. 6. Using a DVOM measure the voltage between J2 terminal 30 and terminal 32. Is the voltage within the range specified when G solenoid is commanded ON?	Battery Voltage	<i>Go to Step 4</i>	<i>Go to Step 10</i>
4	NOTE: Review Section 4 — Wire Check Procedures before performing the following steps. 1. Turn the ignition OFF. 2. Disconnect J2 connector from TCM. 3. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter Harness, connect only to the J2 harness connector. See Beginning the Troubleshooting Process, Page 5–4, Figure 5–2 for diagram of J 43799 adapter harness hook-ups. 4. Using a DVOM, attach leads to J2 pins 30 and 32. 5. Measure the resistance of the circuit. Is the resistance within the specified value?	<i>Refer to Solenoid Resistance Table (Page 5–12)</i> NOTE: To allow for resistance of harness wire, add 0.1 Ohms per foot of length for 18-gauge wire.	<i>Go to Diagnostic Aids</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2810 Shift Solenoid E Electrical (cont'd)

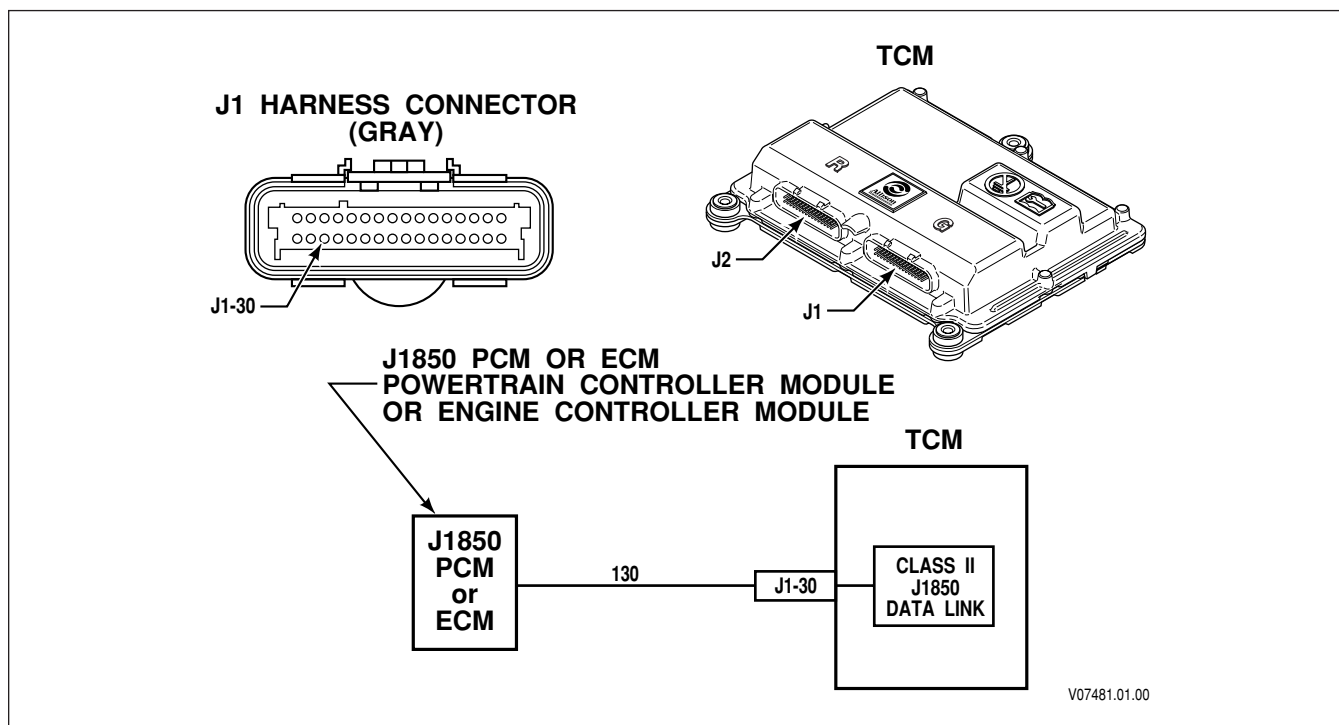
Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the wiring harness from the main transmission connector at the back of the transmission. 3. Using J 39700 Breakout Box and J 43799 Breakout Box Adapter, connect only to the transmission main connector at the rear of the transmission. Do not attach the other end of J 44722 to the vehicle transmission harness connector. See Beginning the Troubleshooting Process, Page 5–5, Figure 5–3 for diagram of J 44722 transmission harness hook-ups. 4. Using a DVOM, measure resistance between pins R and S at the magnetic overlay. Is the resistance within the specified values?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 6	Go to Step 7
6	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Repair or replace the vehicle wiring harness. Is the repair complete?	—	Go to Step 11	—
7	1. Remove the oil pan. Refer to Service Manual or Mechanic's Tips. 2. Remove the connector from G solenoid. 3. Using a DMM, measure the resistance at the solenoid. Is the resistance within the specified value?	Refer to Solenoid Resistance Table (Page 5–12)	Go to Step 8	Go to Step 9
8	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
9	Replace solenoid G. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	Go to Step 11	—
10	NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6). Replace the TCM. Is the replacement complete?	—	Go to Step 11	—

DIAGNOSTIC TROUBLE CODES (DTC)**DTC P2810 Shift Solenoid E Electrical (cont'd)**

Step	Action	Value(s)	Yes	No
11	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle under conditions noted in failure records. 3. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0031 (Previously U1300) J1850 (Class 2) Serial Data Communication Link Low



Circuit Description

Applications that employ J1850 class 2 serial communication use wire 130 to send operational information and commands among the various control modules. Included modules would be Powertrain Control Module (PCM), Antilock Brake System (ABS) Controller, Truck Body Controller (TBC), and Instrument Panel Cluster (IPC). Each controller sends out a state of health (SOH) message approximately once every second. The TCM uses these SOH messages to monitor the condition of the devices on the class 2 serial link.

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 18V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0031 is set when low voltage is detected on the class 2 data circuit for more than 3 seconds. This would normally indicate a short-to-ground at wire 130.

Action Taken When the DTC Sets

- The **CHECK TRANS** light does not illuminate.
- DTC U0031 is stored in the TCM history.
- TCM uses default values for missing/erroneous information.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring. The TCM self-clears this DTC when software detects a failure recovery has occurred.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- If communication can be established with the Scan Tool at the OBDII connector, then the U0031 should be shown in failure records only. This may indicate that an intermittent short-to-ground was present at one time. Refer to Appendix A—Identification of Potential Circuit Problems.
- It is not possible to communicate with J1850 with this DTC active.
- Use the J 43890 T-harness to communicate with the TCM to determine if the U0031 is still active.
- U0031 in failure records may be present along with a U1000–U1096 that is active. This would indicate that the malfunction occurred when the ignition was ON.
- This code indicates that voltage is low at wire 130. Normally, this is an indication that a short-to-ground exists at wire 130. Inspect wire 130 for this condition.
- Inspect wire 130 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 this DTC is active an engine no-start condition may exist. Class 2 messages will not be sent to enable the fuel pump and starter.

Test Description

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

2. This step checks engine data.
3. This step tests for shorts or opens at wire 130.

DTC U0031 (Previously U1300) J1850 (Class 2) Serial Data Communication Link Low

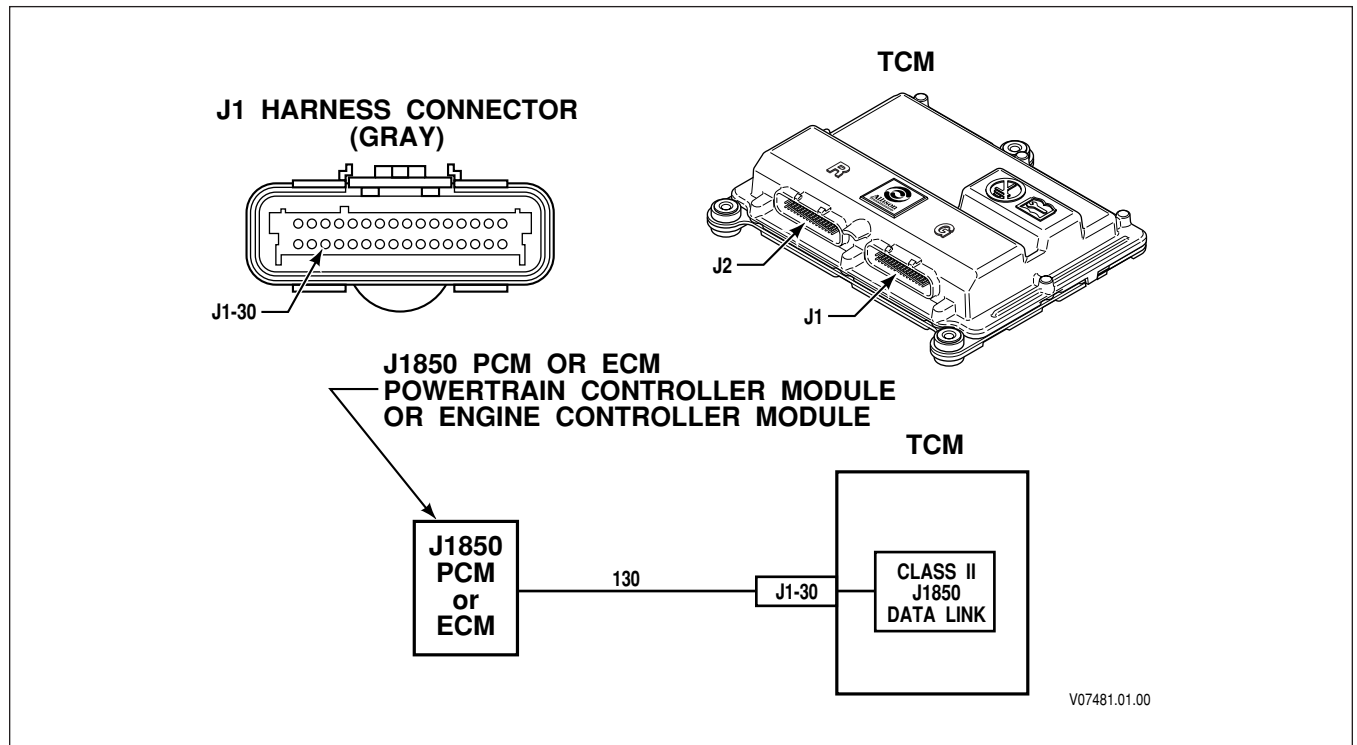
Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn the ignition ON with the engine OFF. 3. Verify engine data is being communicated via J1850. NOTE: U0031 is set when low voltage is detected on the J1850 serial communication link by the TCM for a time exceeding 3 seconds. This may indicate a short-to-ground exists at wire 130. Is engine data communicated to the Scan Tool?	<i>Go to Diagnostic Aids</i>	<i>Go to Step 3</i>
3	Inspect wire 130 for a possible short-to-ground. Did you find a problem?	<i>Go to Step 4</i>	<i>Go to Step 5</i>

DIAGNOSTIC TROUBLE CODES (DTC)**DTC U0031 (Previously U1300) J1850 (Class 2) Serial Data Communication Link Low**

Step	Action	Yes	No
4	<i>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</i> Repair the vehicle wiring harness. Is the repair complete?	Go to Step 6	—
5	Switch the current TCM with a known good unit. Check for proper communication. If this repairs the condition, reinstall the “defective” TCM to verify the TCM failure and then install a new TCM. Is replacement complete?	Go to Step 6	—
6	In order to verify your repair: 1. Connect the Scan Tool. 2. Clear the DTC. Did the DTC return?	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0032 (Previously U1301) J1850 (Class 2) Serial Data Communication Link High



Circuit Description

Applications that employ J1850 class 2 serial communication use wire 130 to send operational information and commands among the various control modules. Included modules would be Powertrain Control Module (PCM), Antilock Brake System (ABS) Controller, Truck Body Controller (TBC), and Instrument Panel Cluster (IPC). Each controller sends out a state of health (SOH) message approximately once every second. The TCM uses these SOH messages to monitor the condition of the devices on the class 2 serial link.

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 18V and less than 32V (24V TCM).

Conditions for Setting the DTC

DTC U0032 is set when high voltage is detected on the class 2 data circuit for more than 3 seconds. This would normally indicate a short-to-power at wire 130.

Action Taken When the DTC Sets

- The **CHECK TRANS** light does not illuminate.
- DTC U0032 is stored in the TCM history.
- TCM uses default values for missing/erroneous information.
- The TCM freezes shift adapts (DNA).

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring. The TCM self-clears this DTC when software detects a failure recovery has occurred.

Diagnostic Aids

- If communication can be established with the Scan Tool at the OBDII connector, then the U0032 should be shown in failure records only. This may indicate that an intermittent short-to-power was present at one time. Refer to Appendix A—Identification of Potential Circuit Problems.
- It is not possible to communicate with J1850 with this DTC active.
- Use the J 43890 T-harness to communicate with the TCM to determine if the U0032 is still active.
- U0032 in failure records may be present along with a U1000–U1096 that is active. This would indicate that the malfunction occurred when the ignition was ON.
- This code indicates that voltage is high at wire 130. Normally, this is an indication that a short-to-power exists at wire 130. Inspect wire 130 for this condition.
- 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 this DTC is active an engine no-start condition may exist. Class 2 messages will not be sent to enable the fuel pump and starter.

Test Description

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

2. This step checks engine data.
3. This step tests for shorts or opens at wire 130.

DTC U0032 J1850 (Class 2) Serial Data Communication Link High

Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn the ignition ON, with the engine OFF. 3. Verify engine data is being communicated via J1850. NOTE: U0032 is set when high voltage is detected on the J1850 serial communication link by the TCM for a time exceeding 3 seconds. This may indicate a short-to-power exists at wire 130. Is the engine data communicated to the Scan Tool?	<i>Go to Diagnostic Aids</i>	<i>Go to Step 3</i>

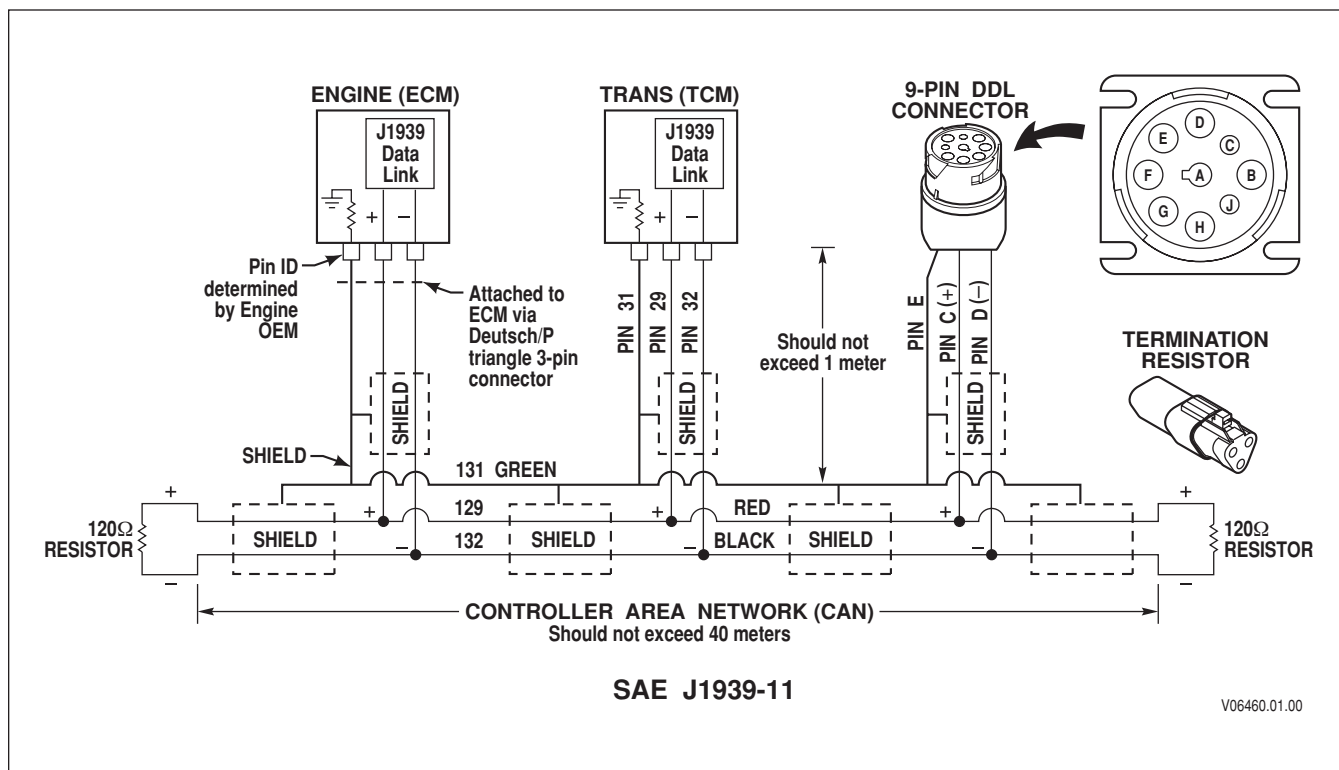
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0032 J1850 (Class 2) Serial Data Communication Link High (*cont'd*)

Step	Action	Yes	No
3	Inspect wire 130 for possible short-to-power. Did you find a problem?	<i>Go to Step 4</i>	<i>Go to Step 5</i>
4	<i>NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty.</i> Repair the vehicle wiring harness. Is the repair complete?	<i>Go to Step 6</i>	—
5	Switch the current TCM with a known good unit. Check for proper communication. If this repairs the condition, reinstall the “defective” TCM to verify the TCM failure and then install a new TCM. Is replacement complete?	<i>Go to Step 6</i>	—
6	In order to verify your repair: 1. Inspect the Scan Tool. 2. Clear the DTC. Did the DTC return?	<i>Begin the diagnosis again. Go to Step 1</i>	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0073 (Previously U2104) CAN Bus Reset Counter Overrun



Circuit Description

J1939 is the protocol currently used in medium duty applications to allow communication between an electronically-controlled engine and the Allison 1000 and 2000 Product Families transmission. A signal is sent over a two-wire network harness that incorporates two 120 Ohm resistors in parallel. There are two versions of J1939 currently in use in the medium duty market. Version J1939-11, the most widely used, incorporates a third shield wire. There is also J1939-15, which uses a two-wire connection without shielding.

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

Conditions for Setting the DTC

DTC U0073 is set when the TCM detects no communication on the Controller Area Network (CAN) backbone harness for 3 seconds or more. This may be due to a shorted wire to ground or power in the CAN backbone harness.

Action Taken When the DTC Sets

- DTC U0073 is stored in the TCM history.
- The **CHECK TRANS** light does not illuminate.
- The TCM defaults to the last-used adaptive shift values and engine throttle percentage is calculated from torque clip speed.
- The TCM freezes shift adapts (DNA).

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

Diagnostic Aids

- If communication can be established at the vehicle nine-pin connector and U0073 is listed in failure records, this indicates an intermittent short condition was present.
- When diagnosing for intermittent shorts-to-ground, massage the wiring harness while watching the test equipment for a change. Refer to Section 4, Wire Check Procedures.
- If an active U0073 is present, Scan Tool communication will not be possible. The cause of the active DTC must be discovered and repaired before communication can be established with the TCM.
- A short between wires 129 and 132 within the CAN harness can cause this DTC.
- A short between wires 129 and 131 within the CAN harness can cause this DTC.
- A short to a vehicle ground and wire 129 can cause this DTC.
- A short to vehicle power and wire 132 can cause this DTC.
- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
 - A bent terminal.
 - A backed-out terminal.
 - A damaged terminal.
 - Poor terminal tension.
 - A chafed wire.
 - A broken wire inside the insulation.
- For proper data communications it is necessary to have two 120 Ohm resistors installed in parallel at the J1939 CAN backbone harness.
- If this DTC is present in a new vehicle, harsh shifting may occur due to adaptive function inhibit (DNA).

Test Description

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

3. This step inspects the CAN backbone harness for shorts-to-ground or power.
5. This step checks TCM function.

DTC U0073 CAN Bus Reset Counter Overrun

Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	1. Install the Scan Tool. 2. Turn the ignition ON with the engine OFF. Is Scan Tool communication possible at the diagnostic connector?	<i>Go to Diagnostic Aids</i>	<i>Go to Step 3</i>

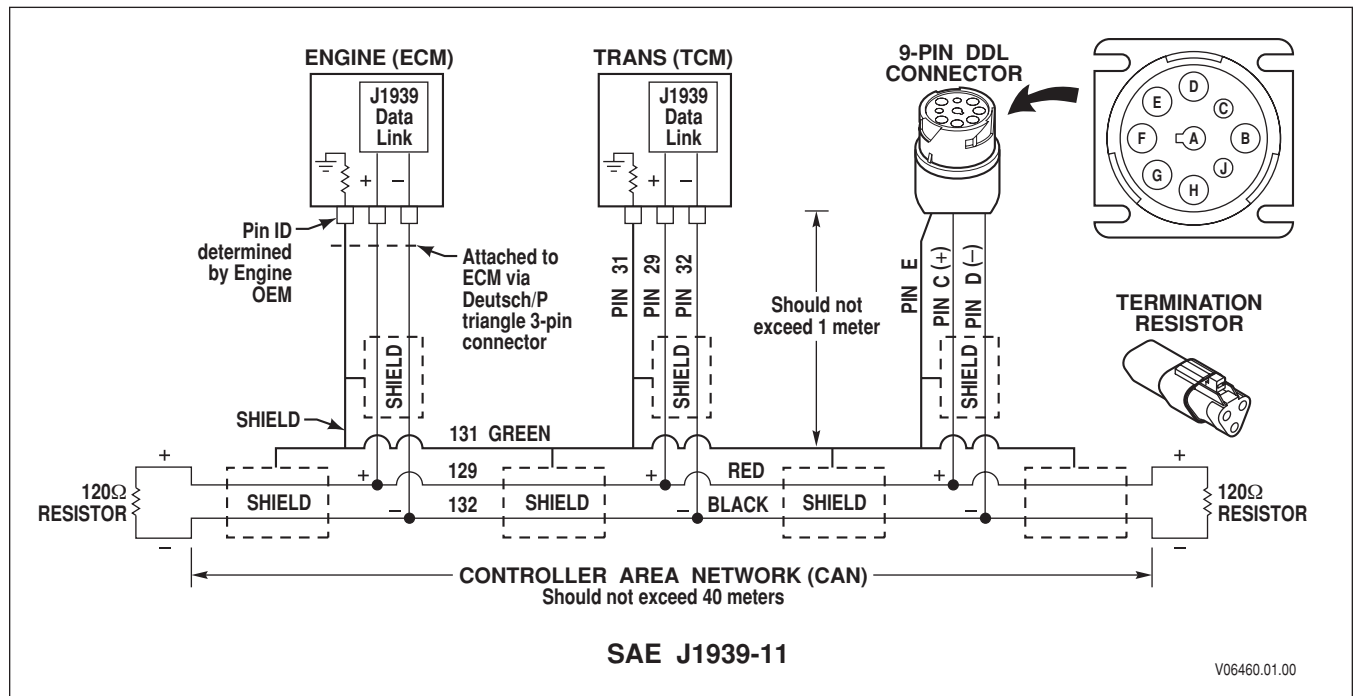
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0073 CAN Bus Reset Counter Overrun (*cont'd*)

Step	Action	Yes	No
3	1. Inspect wires 129 (positive), 132 (negative), 131 (shield) at engine and transmission connectors for a possible shorting condition or terminal damage. NOTE: No Scan Tool communication is possible when this DTC is active. 2. This DTC indicates that a CAN bus hardware error has occurred. This may indicate a short-to-power or ground has occurred at the CAN bus wiring harness. Was a wiring problem found?	<i>Go to Step 4</i>	<i>Go to Step 5</i>
4	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by Allison Transmission distributors and dealers are not covered by Allison Transmission warranty. Repair the vehicle J1939 CAN wiring harness. Is the repair complete?	<i>Go to Step 7</i>	<i>Go to Step 4</i>
5	Switch the current TCM with a known good unit. Check for proper communication. If this repairs the condition, reinstall the “defective” TCM to verify the TCM failure and then install a new TCM. Is replacement complete?	<i>Go to Step 6</i>	—
6	In order to verify your repair: 1. If communication is established with the Scan Tool, clear the DTC. 2. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	<i>Begin the diagnosis again.</i> <i>Go to Step 1</i>	<i>System OK</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0100 (Previously U2105) CAN Bus ECM Error



Circuit Description

J1939 is the protocol currently used in medium duty applications to allow communication between an electronically-controlled engine and the Allison 1000 and 2000 Product Families transmission. A signal is sent over a two-wire network harness that incorporates two 120 Ohm resistors in parallel. There are two versions of J1939 currently in use in the medium duty market. Version J1939-11, the most widely used, incorporates a third shield wire. There is also J1939-15, which uses a two-wire connection without shielding.

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

Conditions for Setting the DTC

DTC U0100 is set when the TCM detects that no engine torque or throttle messages are being received on the Controller Area Network (CAN) backbone harness for 3 seconds or more.

Action Taken When the DTC Sets

- The **CHECK TRANS** light illuminates.
- DTC U0100 is stored in the TCM history.
- The TCM defaults to last-used adaptive shift values and engine throttle percentage is calculated from torque converter slip speed.
- The TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring.

DIAGNOSTIC TROUBLE CODES (DTC)

Diagnostic Aids

- Often an active U0100 will prevent Scan Tool communication with the TCM. Install J1939 T-adapter harness J 43890 to confirm that the TCM is operational. This harness is only useful to confirm that the TCM is able to communicate with the Scan Tool. An active U0100 will be set whenever J 43890 is used.
- When Scan Tool communication with the TCM can be established at the nine-pin vehicle connector and the U0100 is active, generally it points to an open connection at wires 129 or 132 at the ECM or a terminal in the wrong location at the engine ECM connector.
- Engine ECM parameters improperly set can cause this DTC to set.
- A missing terminating resistor can cause this DTC to set. This will prevent Scan Tool communication with the TCM or produce very erratic communication.
- If DTC U0100 becomes active shortly AFTER an engine update and the troubleshooting procedure for U0100 has been performed, see Resetting of TCM Parameters to Support Engine Update, Section 3–7.
- 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 open, massage the wiring harness while watching the test equipment for a change. It may be necessary to check for opens at individual wires within a harness to isolate an intermittent condition. Refer to Section 4, Wire Check Procedures.
- You may have to drive the vehicle in order to experience a fault. Use the data obtained from failure records to determine transmission range and/or certain vehicle operating variables such as temperature, run time, etc. This data can be useful in reproducing the failure mode where the DTC was set.
- Intermittent cycling of the TCC could indicate a J1939 wiring problem exists. It is possible to have an open condition at the CAN backbone harness allowing TCC to cycle without a U0100 setting. For a U0100 to set, an open condition needs to be present for 3 seconds.
- For proper data communications, it is necessary to have two 120 Ohm resistors installed in parallel at the J1939 CAN backbone harness.
- If this DTC is present in new vehicle, harsh shifting may occur due to adaptive function inhibit (DNA).

Test Description

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

3. This step inspects the CAN backbone harness for open conditions to ground or terminal damage.
5. This step tests the CAN backbone harness for the proper resistance value.

DTC U0100 CAN Bus ECM Error

Step	Action	Value(s)	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	—	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>

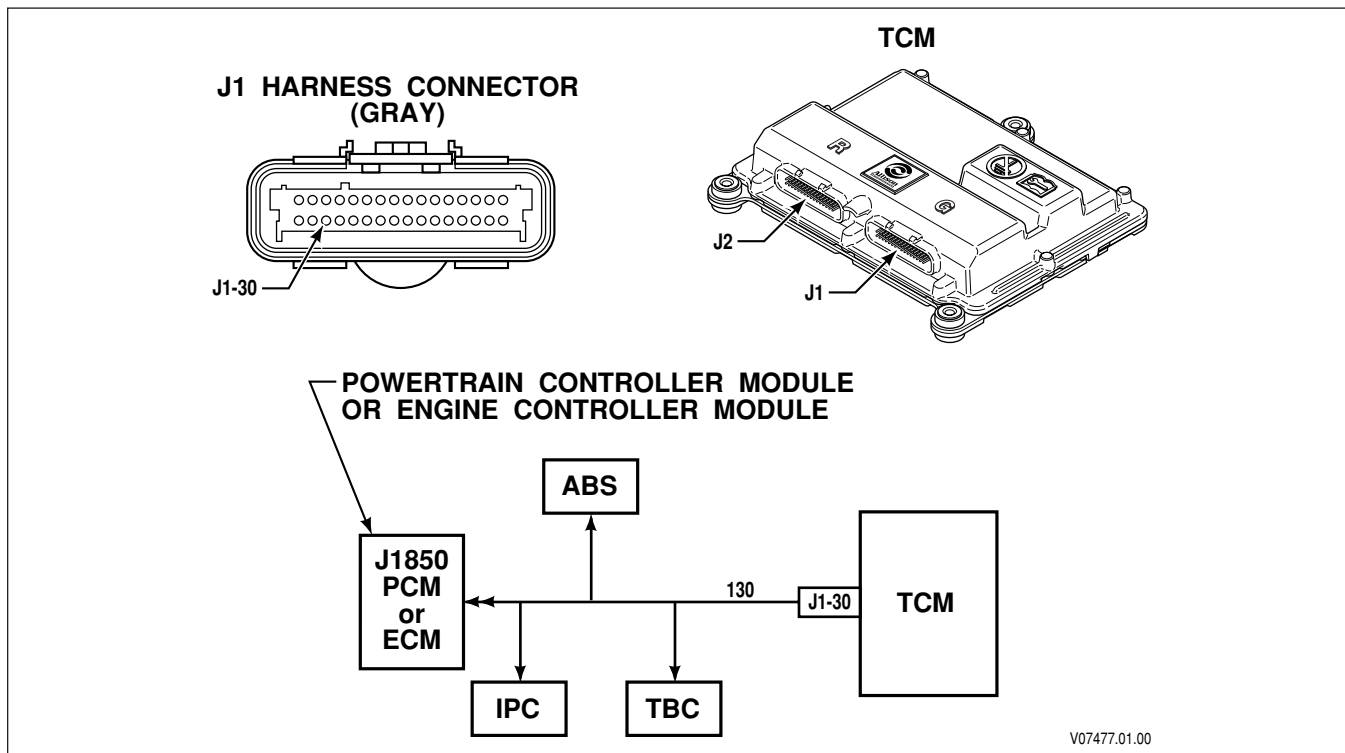
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0100 CAN Bus ECM Error (cont'd)

Step	Action	Value(s)	Yes	No
2	1. Install the Scan Tool. 2. Turn the ignition ON, with the engine OFF. Is Scan Tool communication possible at the diagnostic connector?	—	Go to Step 3	Go to Diagnostic Aids
3	Inspect wires 129 (positive), 132 (negative), and 131 (shield) at engine and transmission connectors for a possible open condition or terminal damage. NOTE: This DTC indicates that the TCM is not receiving engine information. This may indicate an open condition has occurred at the CAN bus wiring harness. Was a wiring problem found?	—	Go to Step 4	Go to Step 5
4	NOTE: The vehicle OEM has responsibility for all external wiring harness repair. 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 7	—
5	Using a DVOM, measure resistance between pins C and D at the vehicle 9-pin diagnostic connector. Does the resistance match the specified value?	60 Ohms	Go to Step 6	Go to Step 7
6	NOTE: A resistance reading other than 60 Ohms indicates that a terminating resistor is missing or a resistor with an improper value is installed. There should be two 120 Ohm resistors wired in parallel in the J1939 CAN. Return the vehicle to the OEM for repair. Is the repair complete?	—	Go to Step 8	—
7	Return the vehicle to OEM for inspection of the following: 1. Confirm that the engine ECM is properly set to broadcast J1939 messages. 2. Improper pin location at the engine ECM. 3. Defective engine ECM. Is the repair complete?	—	Go to Step 8	—
8	In order to verify your repair: 1. If communication is established with the Scan Tool, clear the DTC. 2. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	—	Begin the diagnosis again. Go to Step 1	System OK

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U1000–U1096 Class 2 Controller State of Health Failure



Circuit Description

Applications that employ J1850 class 2 serial communication use wire 130 to send operational information and commands among the various control modules. The control modules included are the Powertrain Control Module (PCM), Antilock Brake System Controller (ABS), Truck Body Controller (TBC) and Instrument Panel Cluster (IPC). Each controller sends out a state of health (SOH) message approximately once every second. The TCM uses these SOH messages to monitor the condition of the devices on the class 2 serial link.

The following DTCs identify the specific controller noted:

DTC Number	Control Module
U1000	Class II–Loss of Serial Data Communication
U1016	Powertrain Control Module (PCM)
U1041	Antilock Brake System Module (ABS)
U1064	Truck Body Controller Module (TBC)
U1096	Instrument Panel Cluster Module (IPC)

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 18V and less than 32V (24V TCM).

DIAGNOSTIC TROUBLE CODES (DTC)

Conditions for Setting the DTC

DTC U1000–U1096 is set when the TCM has not received a state of health (SOH) message from the Control Module indicated for a period of time exceeding 2 seconds.

Action Taken When the DTC Sets

- The **CHECK TRANS** light does not illuminate.
- DTC U1000–U1096 is stored in the TCM history.
- TCM uses default values for missing/erroneous information.
- For U1016 only—the TCM freezes shift adapts (DNA).

Conditions for Clearing the DTC/CHECK TRANS Light

A Scan Tool may be used to clear the code from the TCM history. The TCM automatically clears the DTC from the TCM history if the vehicle completes 40 warm-up cycles without the DTC recurring. The TCM self-clears the DTC when the software detects a failure recovery has occurred.

Diagnostic Aids

- An intermittent open between a module and the connector node may cause this DTC to set.
- A poor connection at a module or the connector node may cause this DTC to set.
- An intermittent open in a connector node may cause this DTC to set.
- An open voltage or ground circuit to a module may cause this DTC to set.
- An internal module malfunction may cause this DTC to set.

Test Description

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

2. This step tests for proper power inputs at the indicated module.
3. This step tests for an open condition between the controller module and the connection at wire 130.
5. This step tests the module function per OEM procedures.

DTC U1000–U1096 Class 2 Controller State of Health Failure

Step	Action	Yes	No
1	Was the Beginning The Troubleshooting Process (Paragraph 5–4A) performed?	<i>Go to Step 2</i>	<i>Go to Beginning The Troubleshooting Process (Paragraph 5–4A)</i>
2	Test the following circuits of the module for an open or a short to ground: 1. The battery positive (fuses) and ground connections at the module. 2. The ignition positive (fuses) and ground connections. NOTE: The DTC set indicates the module for which the state of health (SOH) message was not detected by the TCM for a period of time exceeding 2 seconds. This may indicate an open wire leading to the module, or a defective module. Did you find and correct the condition?	<i>Go to Step 6</i>	<i>Go to Step 3</i>

DIAGNOSTIC TROUBLE CODES (DTC)

DTC U1000–U1096 Class 2 Controller State of Health Failure (cont'd)

Step	Action	Yes	No
3	Inspect for opens at the connector and the wire connecting the module to the TCM (wire 130). Did you find a problem?	<i>Go to Step 4</i>	<i>Go to Step 5</i>
4	Repair the module class 2 wiring harness connection. NOTE: The vehicle OEM has responsibility for all external wiring harness repairs. Harness repairs performed by Allison Transmission distributors and dealers are not covered under Allison Transmission warranty. Is the repair complete?	<i>Go to Step 6</i>	—
5	Refer to troubleshooting procedures specific to the controller module indicated. Replace the module, if defective. Is replacement or repair complete?	<i>Go to Step 6</i>	—
6	In order to verify your repair: 1. Clear the DTC. 2. Use the Scan Tool, in the test passed section, to confirm the diagnostic test was run. Did the DTC return?	<i>Begin the diagnosis again. Go to Step 1</i>	<i>System OK</i>

SECTION 6—INPUT AND OUTPUT FUNCTIONS

6-1. SPECIAL INPUT AND OUTPUT FUNCTIONS

Each transmission control system provides additional functional control of transmission and/or vehicle operations tailored to the expected duty of the vehicle. Specific vocational requirements can be satisfied using input and output functions. Although these features may be used independently to control the function of the TCM, they can be combined to provide more comprehensive vehicle control functions. An example of the combined use of input and output functions is the combination of control signals which automatically commands the transmission to Neutral when a PTO is operated.

NOTE: *Wiring diagrams for input and output functions are shown in Appendix N.*

A. Input Functions

Input functions are control signals that send vehicle data to the TCM to designate the operating state of other vehicle systems. "Ground input" control wires activate the programmed function when the input wire is switched to an isolated circuit ground. "Power input" control wires activate the programmed function when the input wire is switched to 12V or 24V power. Typical input functions are:

- Secondary Shift Schedule
- PTO Enable
- Auxiliary Function Range Inhibit
- Exhaust Brake and Preselect Request (Standard, Optional, and Special)
- Automatic Neutral for PTO
- Reverse Enable
- Kickdown
- Refuse Packer Step Switch
- Overdrive Disable

B. Output Functions

Output function signals send data from the TCM for use in controlling the operation of non-transmission components. As determined by programmed logic or attainment of preselected conditions, the TCM activates the appropriate output control wire (the circuit goes from OPEN to GROUND). This energizes a customer-supplied relay or switch to complete the external vehicle circuit.

The output functions may be turned on and off based on the state of the input function signals and the operating state of the transmission. Typical output functions are:

- Sump Temperature Indicator
- Range Indicator
- Output Speed Indicator

INPUT AND OUTPUT FUNCTIONS

NOTES

SECTION 7—GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

IMPORTANT:

Make the following general checks before beginning specific troubleshooting, removing the transmission, or removing attached components.

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

After making these general checks use the various sections of this manual to isolate the listed problems. The following charts address specific vehicle complaints. Some complaints involve DTCs, so all troubleshooting checks should involve checking the system for DTCs.

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints

Problem	Possible Cause	Suggested Remedy
VEHICLE WILL NOT START — ENGINE WILL NOT CRANK	Lever shift selector not in N (Neutral) or P (Park) or PB (Park Brake Apply)*	Select N (Neutral) and restart
	Dead battery	Recharge battery
	Disconnected battery*	Reconnect battery
	Faulty starter circuit	Repair vehicle starter circuit
	Faulty NSBU switch*	Replace NSBU switch (refer to Mechanic's Tips)
	Misadjusted NSBU switch*	Adjust NSBU switch (refer to Mechanic's Tips)
	Faulty wiring in vehicle neutral start circuit*	Repair wiring
CHECK TRANS LIGHT WILL NOT GO OUT AT START-UP	Connectors not properly seated on NSBU switch*	Properly install connector
	TCM has logged a DTC	Install Scan Tool to determine if DTC is present
	A. Vehicle Drives Normally	Faulty CHECK TRANS light, relay, or circuit.
		Replace relay or repair circuit
	B. Vehicle Does Not Drive Normally	Bad or no calibration in TCM
		Calibrate TCM via PCCS
		Vehicle cannot establish communication with TCM
CHECK TRANS LIGHT FLASHES INTERMITTENTLY		Repair J1939 backbone
		Faulty wiring harness
		Repair wiring harness (refer to Section 4 and Appendix E)
		Faulty TCM
		Replace the TCM
	Intermittent power to TCM*	Check input power to the TCM and correct if necessary
	Faulty vehicle wiring	Repair vehicle wiring
	Loose wiring to CHECK TRANS light	Repair wiring
	Faulty or incorrect ground wire attachment	Repair ground circuit
	Intermittent opening in Circuit 125	Repair Circuit 125

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
NO CHECK TRANS LIGHT AT IGNITION	Faulty light bulb or socket	Replace light bulb or socket
	Incorrect wiring to and from CHECK TRANS light bulb	Repair wiring (refer to Appendix E)
	Faulty vehicle wiring	Repair vehicle wiring
	Circuit 125 open	Repair Circuit 125
	Faulty TCM	Replace TCM
TRANSMISSION WILL NOT SHIFT TO FORWARD OR REVERSE — STAYS IN NEUTRAL	Engine rpm too high*	Reduce engine rpm (it may be necessary to reselect Neutral also, and then D or R)
	Low fluid level*	Add fluid to correct level (refer to Mechanic's Tips for proper dipstick calibration)
	Faulty throttle sensor or circuit*	See throttle sensor section for installation and operation information (Appendix F)
	Faulty throttle signal from engine	Correct engine throttle signal
	Faulty or misadjusted shift selector*	Repair or adjust shift selector
	Faulty speed sensor or circuit*	Repair circuit or replace speed sensor(s) (refer to speed sensor DTCs and Appendix E)
	Mechanical failure to C5 clutch	Repair transmission
	Mechanical failure in transmission torque converter, shafts, or planetaries	Repair transmission
	Low main pressure*	See Low Pressure Section
	Faulty wiring in TCM Input/Output function circuits*	Correct circuit wiring
	Auxiliary function range inhibit active*	Correct circuit wiring
	Misadjusted NSBU switch*	Adjust NSBU switch (refer to Mechanic's Tips)

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
TRANSMISSION WILL NOT STAY IN FORWARD OR REVERSE	Faulty auto-neutral for PTO circuit (input function)*	Repair quick-to-neutral circuit
	Low fluid level*	Add fluid to correct level (refer to Mechanic's Tips for proper dipstick calibration)
	Low main pressure*	See Low Pressure Section
	Faulty solenoid — leaking*	Replace solenoid (refer to Mechanic's Tips)
TRANSMISSION WILL NOT MAKE A SPECIFIC SHIFT	Low engine power	Correct engine problem (refer to engine Service Manual)
	Extreme fluid temperature	Inspect cooling system and fluid level
	Faulty speed sensor or circuit*	Repair circuit or replace speed sensor(s) (refer to speed sensor DTCs and Appendix E)
	Faulty temperature sensor or circuit	Check for temperature reading which inhibits shifts
	Incorrect calibration	Install proper calibration
	Faulty or misadjusted shift selector*	Repair or adjust shift selector
TRANSMISSION DOES NOT SHIFT PROPERLY — ROUGH SHIFTS, SHIFTS OCCURRING AT TOO LOW OR TOO HIGH SPEED	Engine idle speed too high (neutral to range shift)*	Adjust engine idle speed (refer to vehicle Service Manual)
	Faulty throttle sensor or circuit*	See throttle sensor section for installation and operation information (Appendix F)
	Faulty or sticking bleed ball in C1 piston housing	Replace C1 piston housing
	Excessive clutch running clearance*	Rebuild transmission and adjust clearances
	Incorrect TCM calibration	Install correct calibration
	Instrument panel tachometer incorrect	Repair or replace tachometer
	Incorrectly calibrated electronic speedometer	Calibrate electronic speedometer
	Faulty speed sensor or circuit*	Repair circuit or replace speed sensor(s) (refer to speed sensor DTCs and Appendix E)
	Degraded fluid	Change transmission fluid and filter (refer to Mechanic's Tips)

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7-1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
TRANSMISSION DOES NOT SHIFT PROPERLY — ROUGH SHIFTS, SHIFTS OCCURRING AT TOO LOW OR TOO HIGH SPEED (<i>cont'd</i>)	Loose speed sensor	Tighten speed sensor retainer bolt
	Incorrect fluid level*	Correct fluid level (refer to Mechanic's Tips for proper dipstick calibration)
	Low main pressure*	See Low Pressure Section
	Intermittent problems*	Check wiring harnesses and connectors (refer to Appendix E)
	Loose or damaged speed gear	Replace speed gear
	Sticking valves in control valve assembly*	Overhaul control valve assembly
	Leaking trim solenoids*	Repair or replace trim solenoids (refer to Service Manual)
	Incorrect TCM calibration	Install correct calibration
ABNORMAL TRANSMISSION ACTIVITIES OR RESPONSES		
A. Excessive Creep in First and Reverse Gears	Engine idle speed too high*	Adjust engine idle speed (refer to vehicle Service Manual)
B. Vehicle Moves Forward in Neutral	C1 clutch failed or not released*	Rebuild C1 clutch assembly (refer to transmission Service Manual)
C. Vehicle Moves Backward in Neutral	C3 clutch failed or not released*	Rebuild C3 clutch assembly (refer to transmission Service Manual)
EXCESSIVE FLARE — ENGINE OVERSPEED ON FULL-THROTTLE UPSHIFTS	TPS Adjustment:	
	— Overstroke	— Adjust TPS linkage for proper stroke (refer to Appendix F)
	— Loose	— Tighten loose bolts or connections
	Incorrect TCM calibration	Install correct calibration
	Incorrect fluid level*	Correct fluid level (refer to Mechanic's Tips for proper dipstick calibration)
	Sticking valves in control valve assembly*	Rebuild control valve assembly
	Low main pressure*	See Low Pressure Section

* See Inhibit Section 2-5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
EXCESSIVE FLARE — ENGINE OVERSPEED ON FULL- THROTTLE UPSHIFTS (<i>cont'd</i>)	Leaking trim solenoids*	Repair or replace trim solenoids (refer to Service Manual)
	G solenoid mechanical failure	Repair or replace trim solenoids (refer to Service Manual)
	Erratic speed sensor signal	See speed sensor DTCs
	Leaking piston seals or slipping clutch plates in range involved*	Overhaul transmission (refer to transmission Service Manual)
SHUDDER WHEN SHIFTING INTO FORWARD OR REVERSE RANGE	Intermittent short to ground at F (TCC) solenoid circuit (wire 229). Could be accompanied by a P0743—F solenoid electrical DTC. It is possible to have this complaint without a DTC setting on earlier software.* This complaint is worse with pre- N04 software levels due to the different hydraulic schedule. Reverse range is not fully attainable due to TCC valve application blocking C5 feed circuit. This causes the range inhibit light to illuminate.	Repair or replace wire 229
	Low main pressure*	See Low Pressure Section
	Faulty trim solenoid*	Replace solenoid (refer to Service Manual or Mechanic's Tips)
	Sticky trim valve*	Rebuild control valve assembly (refer to Service Manual or Mechanic's Tips)
	C–1 or C–3 clutch failure*	Repair transmission (refer to Service Manual)
ABNORMAL STALL SPEEDS (Stall In First Range — Fifth Range)		
A. High Stall Speeds	Not in gear	Select D (Drive)
	Low fluid level, aerated fluid*	Add fluid to correct level (refer to Mechanic's Tips for proper dipstick calibration)
	Faulty torque converter	Replace torque converter
	Incorrect torque converter	Replace torque converter (refer to transmission Service Manual)
	Clutch pressure low*	See Low Pressure Section and Appendix B

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
ABNORMAL STALL SPEEDS (Stall In First Range — Fifth Range) (<i>cont'd</i>)	C1 or C5 clutch slipping* Note: Use the Scan Tool to check turbine speed	Rebuild C1 or C5 clutch assembly (refer to transmission Service Manual)
	Engine too powerful	Confirm proper engine match
B. Low Stall Speeds	Engine not performing efficiently (may be due to plugged or restricted injectors, high altitude conditions, dirty air filters, out of time, throttle linkage, electronic engine controls problem)	Repair engine (refer to engine Service Manual or vehicle Service Manual)
	Stall speeds 66 percent of normal implies freewheeling stator	Replace converter assembly (refer to transmission Service Manual)
	Engine smoke controls	Compare lugback vs. static stall speed
	Incorrect torque converter	Install correct torque converter (refer to transmission Service Manual)
OVERHEATING IN ALL RANGES	Aerated fluid — incorrect fluid level*	Correct fluid level, check for defective pump (refer to Mechanic's Tips and transmission Service Manual)
	Air flow to cooler obstructed	Remove air flow obstruction
	Engine overheat	Correct overheat situation (refer to vehicle Service Manual)
	Inaccurate temperature gauge or sending unit	Replace gauge and/or sending unit
	Inaccurate sump temperature sensor	Replace Pressure Switch Manifold (PSM) or internal harness (refer to transmission Service Manual)
	Inadequate cooler sizing	See vehicle OEM for specifications
	Excessive cooler circuit pressure drop	Check for plugged cooler, lines too small, collapsed hose, too many elbows in circuit
	Transmission cooler lines reversed	Connect cooler lines properly (oil and water should flow in opposite directions)
	Fluid cooler lines restricted	Remove restrictions, clean or replace lines (refer to Vehicle Service Manual)

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
OVERHEATING IN ALL RANGES (<i>cont'd</i>)	Torque converter (wrong converter, no lockup, stuck stator, or slipping stator)	Replace or repair converter assembly (refer to transmission Service Manual) Note: Stuck stator will not allow cool down in neutral
	Cooler flow loss due to internal transmission leakage	Overhaul transmission (refer to transmission Service Manual)
INTERMITTENT NOISE — BUZZING	Low fluid level*	Add fluid to correct level (refer to Mechanic's Tips for proper dipstick calibration)
	Air leak in oil suction screen canister*	Replace suction filter (refer to Mechanic's Tips)
	Clogged filter*	Replace filter (refer to Mechanic's Tips)
	Aerated fluid causes noisy pump*	Correct fluid level (refer to Mechanic's Tips for proper dipstick calibration)
	Low main pressure causes main regulator valve to oscillate*	See transmission Service Manual
LEAKING FLUID — FILL TUBE AND/OR BREATHER	Dipstick loose	Tighten cap, replace if necessary
	Incorrect fluid level*	Correct fluid level (refer to Mechanic's Tips for proper dipstick calibration)
	Breather stopped up — clogged	Clean or replace breather (refer to transmission Service Manual)
	Fluid contaminated with foreign liquid	Drain and replace fluid. Locate and fix source of additional fluid (refer to transmission Service Manual)
	Dipstick or fill tube seal worn	Replace seals or dipstick
	Incorrect dipstick marking	Calibrate dipstick (refer to Mechanic's Tips)
LEAKING FLUID — TRANSMISSION OUTPUT	Faulty or missing seal at output flange	Install new lip-type seal in rear of transmission housing (refer to Mechanic's Tips)
	Machine lead on output flange seal surface	Replace flange
	Rear cover porosity	Repair or replace cover

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
LEAKING FLUID — TRANSMISSION OUTPUT (<i>cont'd</i>)	Flange worn at seal surface	Replace flange
	Insufficient seal around seal OD	Replace seal (refer to Mechanic's Tips)
	Damaged, missing, or loose output flange bolt	Replace and/or torque output flange bolts
LEAKING FLUID — TRANSMISSION INPUT	Leaking front seal	Replace front seal (refer to Mechanic's Tips)
	Leaking manifold seal	Replace manifold seal (refer to Mechanic's Tips)
	Leaking front support bolt seals	Replace bolt seals
	Leaking converter	Check converter seals, cracked converter pump tangs, converter cover, or converter housing porosity; replace parts as required (refer to transmission Service Manual)
	Leaking spin-on filter	Replace filter (refer to Mechanic's Tips)
	Leaking main pressure plug	Replace or torque main pressure plug
	Worn pump bushing	Rebuild and repair pump
DIRTY FLUID	Failure to change fluid and filters	Change fluid and install new filters (refer to Mechanic's Tips)
	Excessive heat	Check cooling system for restrictions and proper capacity
	Substandard fluid	Use recommended fluid (refer to Mechanic's Tips)
	Clutch/transmission failure*	Overhaul transmission (refer to transmission Service Manual)

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
RANGE CLUTCH TROUBLESHOOTING SECTION		
EXCESSIVE SLIPPAGE AND CLUTCH CHATTER	Incorrect TCM calibration	Install correct calibration
	Throttle Position Sensor out of adjustment or failed*	Adjust or replace throttle position sensor (refer to Appendix F)
	Incorrect speed sensor readings*	See speed sensor DTCs
	Incorrect fluid level*	Correct fluid level (refer to Mechanic's Tips for proper dipstick calibration)
	Low main pressure*	See Low Pressure Section
	TCC clutch not applied	Inspect lockup clutch system wiring, pressure, and controls; repair as necessary (refer to transmission Service Manual and Appendix B)
A. Ranges 1, 2, 3, 4 Only	C1 clutch slipping, leaks at rotating clutch seals, leaks at piston seals, C1 clutch plates worn*	Inspect C1 clutch plates, piston seals, and rotating seals; replace/rebuild as necessary (refer to transmission Service Manual and Appendix B)
B. Ranges 4, 5 Only	C2 clutch slipping, leaks at rotating clutch seals, leaks at piston seals, C2 clutch plates worn*	Inspect C2 clutch plates, piston seals, and rotating seals; replace/rebuild as necessary (refer to transmission Service Manual and Appendix B)
C. Ranges 3, 5, R Only	C3 clutch slipping, leaks at piston seals, C3 clutch plates worn*	Inspect C3 clutch plates and piston seals; replace/rebuild as necessary (refer to transmission Service Manual and Appendix B)
D. Range 2 Only	C4 clutch slipping, leaks at piston seals, C4 clutch plates worn*	Inspect C4 clutch plates and piston seals; replace/rebuild as necessary (refer to transmission Service Manual and Appendix B)
E. Ranges 1, R Only	C5 clutch slipping, leaks at piston seals, C5 clutch plates worn*	Inspect C5 clutch plates and piston seals; replace/rebuild as necessary (refer to transmission Service Manual and Appendix B)

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

Table 7–1. Troubleshooting Performance Complaints (*cont'd*)

Problem	Possible Cause	Suggested Remedy
LOW PRESSURE SECTION		
A. Low or No Main Pressure in All Ranges	Incorrect fluid level*	Correct fluid level (refer to Mechanic's Tips for proper dipstick calibration)
	Clogged or faulty oil filter element*	Replace oil filter (refer to Mechanic's Tips)
	Plugged or faulty suction filter*	Clean or replace oil suction filter element and refill the transmission (refer to Mechanic's Tips)
	Sticking main pressure regulator valve*	Overhaul front support assembly (refer to transmission Service Manual)
	Leaking solenoids in control valve assembly*	Repair or replace solenoids (refer to Mechanic's Tips)
	G solenoid failure	Replace G solenoid. See transmission Service Manual.
	Weak, broken, or missing main pressure regulator valve spring*	Check spring and replace if necessary (refer to transmission Service Manual)
	Control valve body leakage* (loose control valve body bolts)	Replace or rebuild control valve assembly. Care should be taken when removing and labeling shift springs (refer to transmission Service Manual)
	Faulty or incorrect fluid pressure gauge*	Repair or replace gauge
	Worn or damaged oil pump*	Replace or rebuild oil pump (refer to transmission Service Manual)
B. Low Main Pressure in Specific Ranges, Normal Pressure in Other Ranges	Leak in suction circuit*	Check suction circuit for leaking seal, gasket, or mating surface
		See transmission Service Manual

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

NOTES

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APPENDICES

NOTES

APPENDIX A—DIAGNOSING INTERMITTENT DTCs

Intermittent Diagnostic Trouble Codes (DTC) are a result of faults that are detected, logged, and then disappear, only to recur later. If, when troubleshooting, a DTC is cleared in anticipation of it recurring and it does not, check the items in the following list for the fault's source.

A. Circuit Inspection

1. Intermittent power/ground problems — can cause voltage problems during TCM diagnostic checks which can set various DTCs depending upon where the TCM was in the diagnostic process.
2. Damaged terminals.
3. Dirty or corroded terminals.
4. Terminals not fully seated in the connector. Check indicated wires by uncoupling connector and gently pulling on the wire at the rear of the connector and checking for excessive terminal movement.
5. Connectors not fully mated. Check for missing or damaged locktabs.
6. Screws or other sharp pointed objects pushed into or through one of the harnesses.
7. Harnesses which have rubbed through and may be allowing intermittent electrical contact between two wires or between wires and vehicle frame members.
8. Broken wires within the braiding and insulation.

B. Finding an Intermittent Fault Condition

To find a fault, like one of those listed, examine all connectors and the external wiring harnesses. Harness routing may make it difficult to see or feel the complete harness. However, it is important to thoroughly check each harness for chafed or damaged areas. Road vibrations and bumps can damage a poorly installed harness by moving it against sharp edges and cause some of the faults. If a visual inspection does not identify a cause, move and wiggle the harness by hand until the fault is duplicated.

The next most probable cause of an intermittent DTC is an electronic part exposed to excessive vibration, heat, or moisture. Examples of this are:

1. Exposed harness wires subjected to moisture.
2. A defective connector seal allows moisture to enter the connector or part.
3. An electronic part (TCM, solenoid, or throttle sensor) affected by vibration, heat, or moisture may cause abnormal electrical conditions within the part.

When troubleshooting Item 3, eliminate all other possible causes before replacing any parts.

Another cause of intermittent DTCs is good parts in an abnormal environment. The abnormal environment will usually include excessive heat, moisture, or voltage. For example, a TCM that receives excessive voltage will generate a diagnostic code as it senses high voltage in a circuit. The DTC may not be repeated consistently because different circuits may have this condition on each check. The last step in finding an intermittent DTC is to observe if the DTC is set during sudden changes in the operating environment.

Troubleshooting an intermittent DTC requires looking for common conditions that are present whenever the DTC is diagnosed. Use the failure record information from the scan tool to identify the conditions when the DTC was set.

APPENDIX A—DIAGNOSING INTERMITTENT DTCs

C. Recurring Conditions

A recurring condition might be:

- Rain
- Outside temperature above or below a certain temperature
- Only on right-hand or left-hand turns
- When the vehicle hits a bump, etc.

If such a condition can be related to the DTC, it is easier to find the cause. If the time between DTC occurrences is very short, troubleshooting is easier than if it is several weeks or more between DTC occurrences.

- Repair parts for the internal wiring harness 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 through the vehicle OEM and the OEM is responsible for warranty on these parts.

APPENDIX B—MAIN PRESSURE CHECK PROCEDURE

Checking main pressures helps to determine if a transmission malfunction is due to a mechanical or an electrical problem. Properly making these pressure checks requires transmission and vehicle (or test stand) preparation, recording of data, and comparing recorded data against specifications provided.

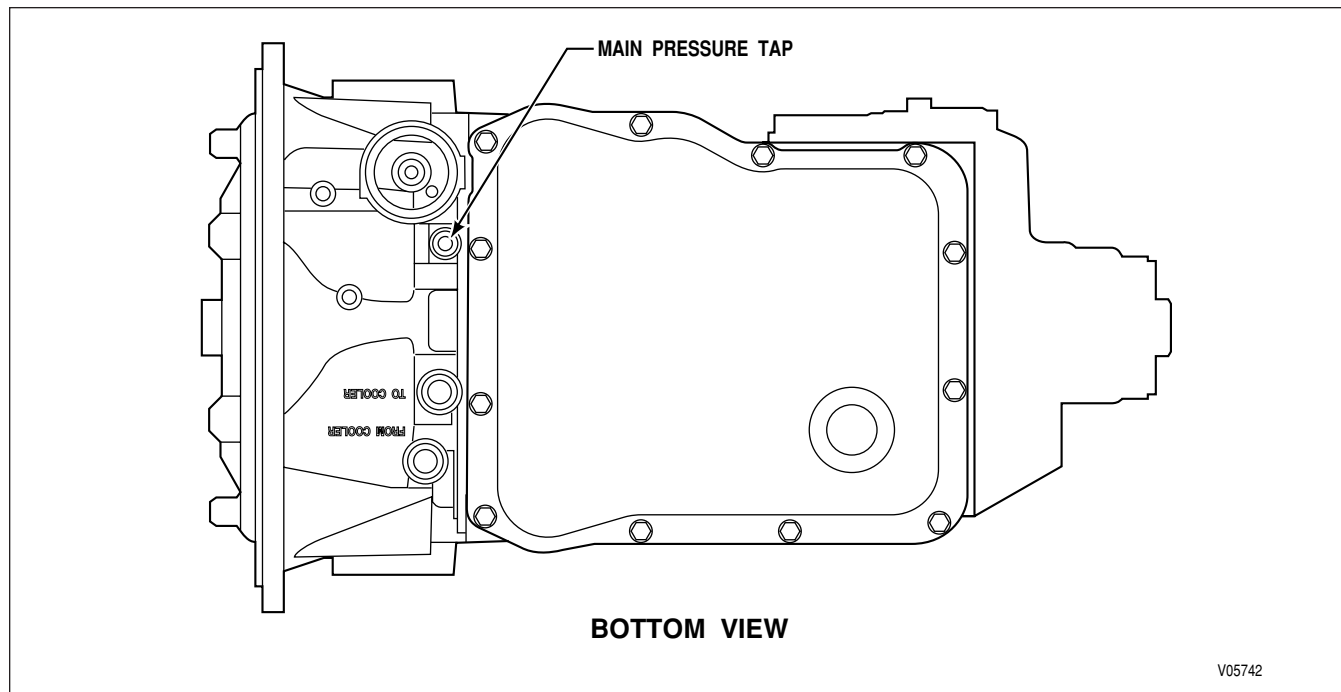


Figure B–1. Main Pressure Check Point

WARNING!

Observe safety precautions during hydraulic pressure check procedures. All personnel must stand clear of the vehicle. Take precautions against movement of the vehicle. Be sure that gauges (vacuum, pressure, tachometer) have extended lines so that they can be read from inside the vehicle.

1. All transmission fluid level and pressure checks must be made at normal operating temperatures 71–93°C (160–200°F) sump; 82–104°C (180–220°F) converter-out. Check transmission fluid level.
2. Connect a 0–2070 kPa (0–300 psi) oil pressure gauge at the main pressure tap (Figure B–1). Use the scan tool to check engine rpm. See Table B–1 for main pressure levels.
3. Disconnect the driveshaft.
4. With brakes applied, check main pressure with the engine running at 2100 rpm and 600 rpm.
5. Continue the procedure for all ranges.

APPENDIX B—MAIN PRESSURE CHECK PROCEDURE**Table B–1. Main Pressure Test Conditions**

(Used Prior To S/N 6310004116)		
Range	Main Pressure @ 600 rpm	Main Pressure @ 2100 rpm
Forward (Converter — Torque Converter Clutch not applied)	800–1380 kPa (115–200 psi)	1515–1795 kPa (220–260 psi)
Forward (Torque Converter Clutch Applied)	—	1000–1170 kPa (145–170 psi)
Reverse	800–1380 kPa (115–200 psi)	1515–1795 kPa (220–260 psi)
Neutral/Park	900–1655 kPa (130–240 psi)	1515–1795 kPa (220–260 psi)

(Used Starting With S/N 6310004116)		
Range	Main Pressure @ 600 rpm	Main Pressure @ 2100 rpm
Forward (Converter)	700–1280 kPa (101–186 psi)	1515–1795 kPa (220–260 psi)
Forward (Torque Converter Clutch Applied)	—	1000–1170 kPa (145–170 psi)
Reverse	700–1280 kPa (101–186 psi)	1515–1795 kPa (220–260 psi)
Neutral/Park	800–1655 kPa (130–240 psi)	1515–1795 kPa (220–260 psi)

Table B–2. Modulated Main Pressure Schedule (Transmissions with Modulated Main G Solenoid)

Range	Main Pressure @ 600 rpm	Main Pressure @ 2100 rpm
Forward/Reverse Converter with G Solenoid Active	590–720 kPa (85–105 psi)	634–758 kPa (92–110 psi)
Forward Converter with G Solenoid Inactive	700–1380 kPa (101–200 psi)	1515–1795 kPa (220–260 psi)
Forward Lockup with G Solenoid Active*	—	510–627 kPa (74–91 psi)
Forward Lockup with G Solenoid Inactive*	—	1000–1170 kPa (145–170 psi)
Neutral/Park with G Solenoid Active	590–720 kPa (85–105 psi)	—
Neutral/Park	800–1655 kPa (130–240 psi)	1515–1795 kPa (220–260 psi)
* Medium duty gasoline engines only.		

APPENDIX C—SOLENOID AND CLUTCH TABLE

Normal operation of the transmission requires application of two clutches to attain a forward or reverse range. A unique combination of solenoid and shift valve actuation produces clutch application in a given range. Table C-1 lists the transmission range shifts, the clutches that are applied in each range, and the electrical state (On/Off) of each solenoid for each range.

C-1. Solenoid and Clutch Table — Software Levels Prior To N04

Range Status	Logic	Clutch To Main	Trim Solenoids		Shift Solenoids			TCC Sol
			A	B	C	D	E	F
Steady State	R	—	De-energized; C3 Applied	Energized; C5 Applied	ON	ON	ON	OFF
Garage Shift	R-N	—	De-energizing; C3 Trimming Off	Energizing; C5 Applied	ON	ON	ON	OFF
Garage Shift	N-R	—	Energizing; C3 Trimming On	Energizing; C5 Applied	ON	ON	ON	OFF
Steady State	N	—	De-energized; C5 Applied	De-energized; — Exhausted	ON	ON	ON	OFF
Garage Shift	N-1	—	De-energizing; C5 Applied	Energizing; C1 Trimming On	ON	ON	ON	OFF
Garage Shift	1-N	—	De-energizing; C5 Applied	Energizing; C1 Trimming Off	ON	ON	ON	OFF
Steady State	1	C1	De-energized; C5 Applied	De-energized; C4 Exhausted	OFF	ON	OFF	OFF
Upshift	1-2	C1	Energizing; C5 Trimming Off	Energizing; C4 Trimming On	OFF	ON	OFF	OFF
Downshift	2-1	C1	Energizing; C5 Trimming On	Energizing; C4 Trimming Off	OFF	ON	OFF	OFF
Steady State	2	C1	Energized; C3 Exhausted	Energized; C4 Applied	OFF	OFF	OFF	ON or OFF *
Upshift	2-3	C1	De-energizing; C3 Trimming On	De-energizing; C4 Trimming Off	OFF	OFF	OFF	ON
Downshift	3-2	C1	De-energizing; C3 Trimming Off	De-energizing; C4 Trimming On	OFF	OFF	OFF	ON
Steady State	3	C1	De-energized; C3 Applied	De-energized; C2 Exhausted	ON	OFF	OFF	ON
Upshift	3-4	C1	Energizing; C3 Trimming Off	Energizing; C2 Trimming On	ON	OFF	OFF	ON
Downshift	4-3	C1	Energizing; C3 Trimming On	Energizing; C2 Trimming Off	ON	OFF	OFF	ON
Steady State	4	C2	Energized; C3 Exhausted	Energized; C1 Applied	ON	OFF	ON	ON
Upshift	4-5	C2	De-energizing; C3 Trimming On	De-energizing; C1 Trimming Off	ON	OFF	ON	ON
Downshift	5-4	C2	De-energizing; C3 Trimming Off	De-energizing; C1 Trimming On	ON	OFF	ON	ON
Steady State	5	C2	De-energized; C3 Applied	De-energized;	OFF	OFF	ON	ON

* Depending upon output speed

APPENDIX C—SOLENOID AND CLUTCH TABLE

Table C–1. Solenoid and Clutch Table — Software Level N04 And Later

Range Status	Logic	Clutch To Main	Trim Solenoids		Shift Solenoids			TCC Sol
			A	B	C	D	E	F
Steady State with Throttle	R	—	De-energized; C3 Applied	Energized; C5 Applied	ON	ON	ON	OFF
Steady State at Closed Throttle	R	—	De-energized; C5 Applied	Energized; C3 Applied	OFF	ON	ON	OFF
Garage Shift	R–N	—	De-energizing; C3 Trimming Off	Energized; C5 Applied	OFF	ON	ON	OFF
Garage Shift	N–R	—	Energizing; C3 Trimming On	Energizing; C5 Applied	OFF	ON	ON	OFF
Steady State	N	—	De-energized; C5 Applied	De-energized; — Exhausted	ON	ON	ON	OFF
Garage Shift	N–1	—	De-energizing; C5 Applied	Energizing; C1 Trimming On	ON	ON	ON	OFF
Garage Shift	1–N	—	De-energizing; C5 Applied	Energizing; C1 Trimming Off	ON	ON	ON	OFF
Steady State	1	C1	De-energized; C5 Applied	De-energized; C4 Exhausted	OFF	ON	OFF	OFF
Upshift	1–2	C1	Energizing; C5 Trimming Off	Energizing; C4 Trimming On	OFF	ON	OFF	OFF
Downshift	2–1	C1	Energizing; C5 Trimming On	Energizing; C4 Trimming Off	OFF	ON	OFF	OFF
Steady State	2	C1	Energized; C3 Exhausted	Energized; C4 Applied	OFF	OFF	OFF	ON or OFF **
Upshift	2–3	C1	De-energizing; C3 Trimming On	De-energizing; C4 Trimming Off	OFF	OFF	OFF	ON
Downshift	3–2	C1	De-energizing; C3 Trimming Off	De-energizing; C4 Trimming On	OFF	OFF	OFF	ON
Steady State	3	C1	De-energized; C3 Applied	De-energized; C2 Exhausted	ON	OFF	OFF	ON
Upshift	3–4	C1	Energizing; C3 Trimming Off	Energizing; C2 Trimming On	ON	OFF	OFF	ON
Downshift	4–3	C1	Energizing; C3 Trimming On	Energizing; C2 Trimming Off	ON	OFF	OFF	ON
Steady State	4	C2	Energized; C3 Exhausted	Energized; C1 Applied	ON	OFF	ON	ON
Upshift	4–5	C2	De-energizing; C3 Trimming On	De-energizing; C1 Trimming Off	ON	OFF	ON	ON
Downshift	5–4	C2	De-energizing; C3 Trimming Off	De-energizing; C1 Trimming On	ON	OFF	ON	ON
Steady State	5	C2	De-energized; C3 Applied	De-energized	OFF	OFF	ON	ON

Beginning with N04 software level, the following throttle-dependent conditions occur in Reverse range:

At closed throttle (idle), C solenoid is OFF, A trim solenoid controls C-5 clutch, and B solenoid controls C-3 clutch.

Above 20 percent throttle*, C solenoid is ON, A trim solenoid controls C-3 clutch, and B solenoid controls C-5.

Under 10 percent throttle*, the TCM reverts to the closed throttle (idle) schedule.

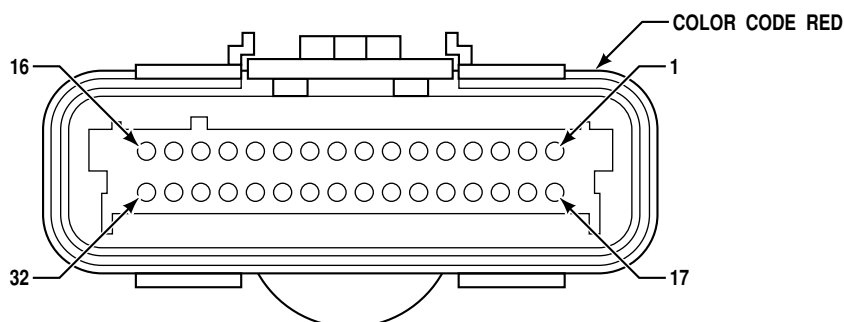
* Values are calibration dependent ** Depending upon output speed

APPENDIX D—WIRE/CONNECTOR TABLES

The connector information in this appendix is provided for the convenience of the servicing technician. The connector illustration and pin identifications for connection to Allison Transmission components will be accurate. Allison Transmission components are the TCM, speed sensors, and transmission connectors. Other kinds of connectors for optional or customer-furnished components are provided based on typical past practice for an Allison-designed system.

Contact your vehicle manufacturer for information on connectors not found in this appendix.

APPENDIX D—WIRE/CONNECTOR TABLES



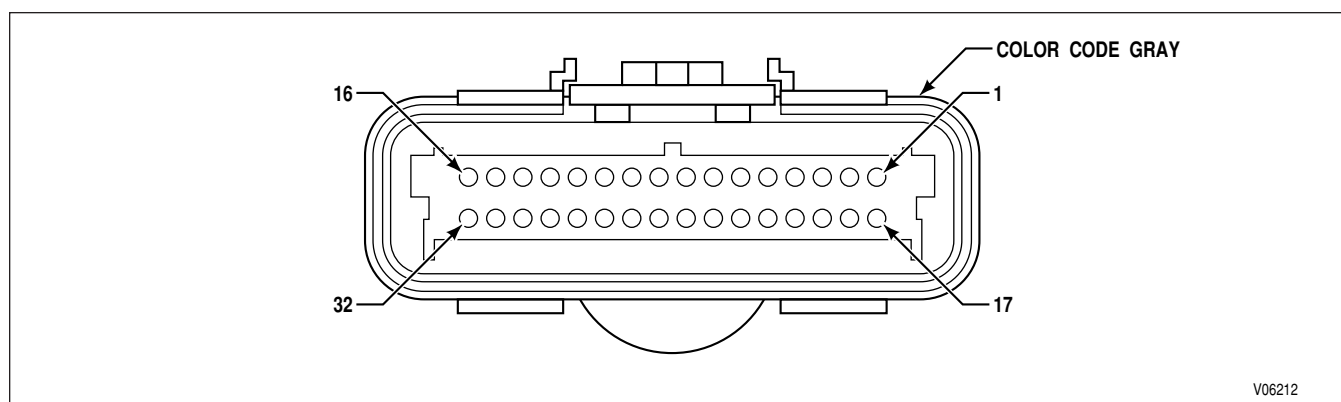
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Figure D-1. TCM Connector J2

TCM CONNECTOR J2 (RED)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
1	Blue	201	PSM Input	TRANS-D
2	Pink	202	PSM Input	TRANS-F
3	White	203	PSM Input	TRANS-E
4	Green	204	PSM Input	TRANS-K
5	Blue	205	NSBU Input	NSBU-4A
6	Yellow	206	NSBU Input	NSBU-4D
7	Gray	207	NSBU Input	NSBU-4B
8	White	208	NSBU Input	NSBU-4C
9	Blue	209	Throttle Position Sensor	TPS-B
10	Tan	210	Sump Temperature Input	TRANS-G
11	Orange	211	Retarder Temperature Input (optional)	RTEMP-A
12	Blue	212	Engine Coolant Temperature Input (optional)	ENGWAT TEMP-A
13	Orange	213	Turbine Speed Sensor High	NT-A
14	Blue	214	Turbine Speed Sensor Low	NT-B
15	Yellow	215	Output Speed Sensor High	NO-A
16	Green	216	Output Speed Sensor Low	NO-B
17	Tan	217	Engine Speed Sensor High	NE-A
18	Orange	218	Engine Speed Sensor Low	NE-B
19	Pink	219	Sensor Power	TPS-C
20	Green	220	Analog Ground	TRANS-H, R-TEMP-B, ENG-WAT TEMP-B, NSBU-7D, TPS-A
21	Yellow	221		TRANS-T
22	Yellow	222	A Solenoid High (VBS) Variable Bleed Solenoid	TRANS-L
23	White	223	A Solenoid Low (VBS) Variable Bleed Solenoid	TRANS-M
24	Pink	224	B Solenoid High (VBS) Variable Bleed Solenoid	TRANS-N
25	Orange	225	B Solenoid Low (VBS) Variable Bleed Solenoid	TRANS-P
26	Green	226	C Solenoid Low (ON/OFF)	TRANS-A
27	Blue	227	D Solenoid Low (ON/OFF)	TRANS-B
28	Gray	228	E Solenoid Low (ON/OFF)	TRANS-W
29	White	229	F Solenoid Low (PWM)	TRANS-J
30	Blue	230	G Solenoid Low (ON/OFF)	TRANS-R
31	Tan	231	ON/OFF Solenoid High	TRANS-C
32	Green	232	PWM Solenoid High/G Solenoid	TRANS-S

APPENDIX D—WIRE/CONNECTOR TABLES



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Figure D-2. TCM Connector J1

TCM CONNECTOR J1 (GRAY)

Terminal No.	Color	Wire No.	Description	Termination Point(s)
1	Gray	101	Battery Ground	Vehicle System
2	Yellow	102	Ignition Power	Vehicle System
3	Pink	103	Battery Power	Vehicle System
4	Yellow	104	Ignition Power	Vehicle System
5	Gray	105	Battery Ground	Vehicle System
6	Blue	106	GPI 1	Vehicle System
7	Orange	107	GPI 2	Vehicle System
8	Green	108	GPI 3	Vehicle System
9	White	109	GPI 4	Vehicle System
10	Yellow	110	GPI 5	Vehicle System
11	Green	111	GPI 6	Vehicle System
12	Blue	112	GPI 7	Vehicle System
13	Pink	113	GPI 8	Vehicle System
14	Orange	114	GPI 9	Vehicle System
15				
16	White	116	PWM Throttle	Vehicle System
17	Pink	117	Sensor Power (optional)	RMR-C
18	Green	118	Analog Ground	RMR-A
19	Tan	119	GPO 1	Vehicle System
20	Orange	120	GPO 2	Vehicle System
21	White	121	GPO 3	Vehicle System
22	Blue	122	GPO 4	Vehicle System
23	Pink	123	Range Inhibit Indicator	Vehicle System
24	White	124	GPO 6	Vehicle System
25	Green	125	CHECK TRANS	Vehicle System
26	Tan	126	Vehicle Speed	Vehicle System
27	Pink	127	Vehicle Speed	Vehicle System
28	Yellow	128	Digital Ground	Vehicle System
29	Red	129	CAN High	J1939 A or H
30	Blue	130	ISO 9141 Class II J-1850	Vehicle System
31	Green	131	CAN Shield	J1939 C or S
32	Black	132	CAN Low	J1939 B or L

APPENDIX D—WIRE/CONNECTOR TABLES

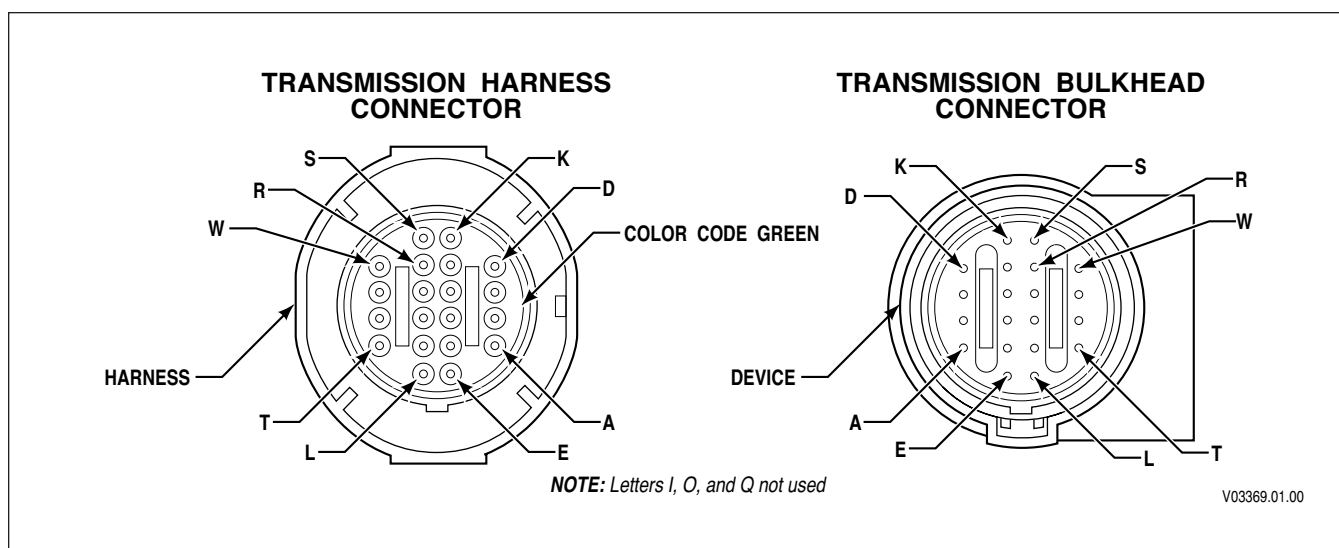


Figure D-3. Delphi-Packard Main Transmission Connector

DELPHI-PACKARD MAIN TRANSMISSION CONNECTOR

Terminal No.*	Color	Wire No.	Description	Termination Point(s)*
A	Green	226	C Solenoid Low (ON/OFF)	TCM J2-26
B	Yellow/Black	227	D Solenoid Low (ON/OFF)	TCM J2-27
C	Pink	231	ON/OFF Solenoid High	TCM J2-31
D	Light Green	201	PSM Input	TCM J2-1
E	Red	203	PSM Input	TCM J2-3
F	Dark Blue	202	PSM Input	TCM J2-2
G	Yellow	210	Sump Temperature Input	TCM J2-10
H	Black	220	Analog Ground	TCM J2-20
J	Brown	229	F Solenoid Low (PWM)	TCM J2-29
K	Tan	204	PSM Input	TCM J2-4
L	Red/Black	222	A Solenoid High Variable Bleed Solenoid (VBS)	TCM J2-22
M	Light Blue	223	A Solenoid Low Variable Bleed Solenoid (VBS)	TCM J2-23
N	Gray	224	B Solenoid High Variable Bleed Solenoid (VBS)	TCM J2-24
P	Purple	225	B Solenoid Low Variable Bleed Solenoid (VBS)	TCM J2-25
R	Blue	230	G Solenoid Low (ON/OFF)	TCM J2-30
S	Black	232	PWM Solenoid High/F, G Solenoid	TCM J2-32
T	White	221		TCM J2-21
U	Dark Green	—	—	—
V	Dark Green	—	—	—
W	Black/White	228	E Solenoid Low (ON/OFF)	TCM J2-28

* Terminal number and termination points shown only apply when an Allison Transmission recommended harness configuration and bulkhead connector are used.

APPENDIX D—WIRE/CONNECTOR TABLES

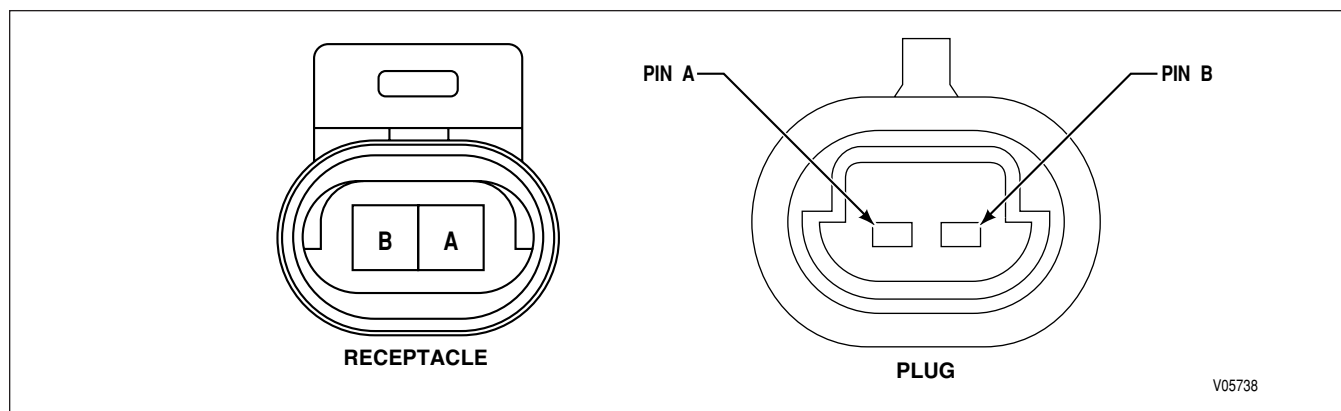


Figure D-4. Speed Sensor Connector

ENGINE SPEED SENSOR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Tan	217	Engine Speed Sensor Hi	TCM J2-17
B	Orange	218	Engine Speed Sensor Lo	TCM J2-18

TURBINE SPEED SENSOR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Orange	213	Turbine Speed Sensor Hi	TCM J2-13
B	Blue	214	Turbine Speed Sensor Lo	TCM J2-14

OUTPUT SPEED SENSOR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Yellow	215	Output Speed Sensor Hi	TCM J2-15
B	Green	216	Output Speed Sensor Lo	TCM J2-16

APPENDIX D—WIRE/CONNECTOR TABLES

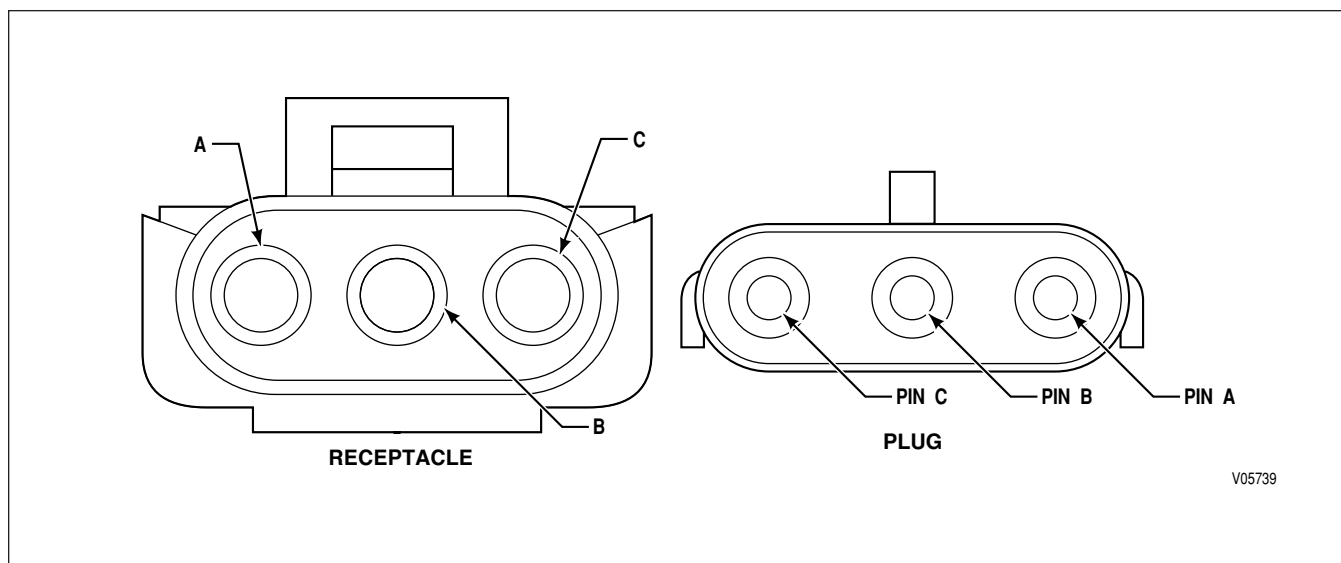


Figure D-5. TPS Connector

THROTTLE POSITION SENSOR CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Green	220	Analog Ground	TCM J2-20
B	Blue	209	TPS Signal	TCM J2-9
C	Pink	219	TPS Hi	TCM J2-19

APPENDIX D—WIRE/CONNECTOR TABLES

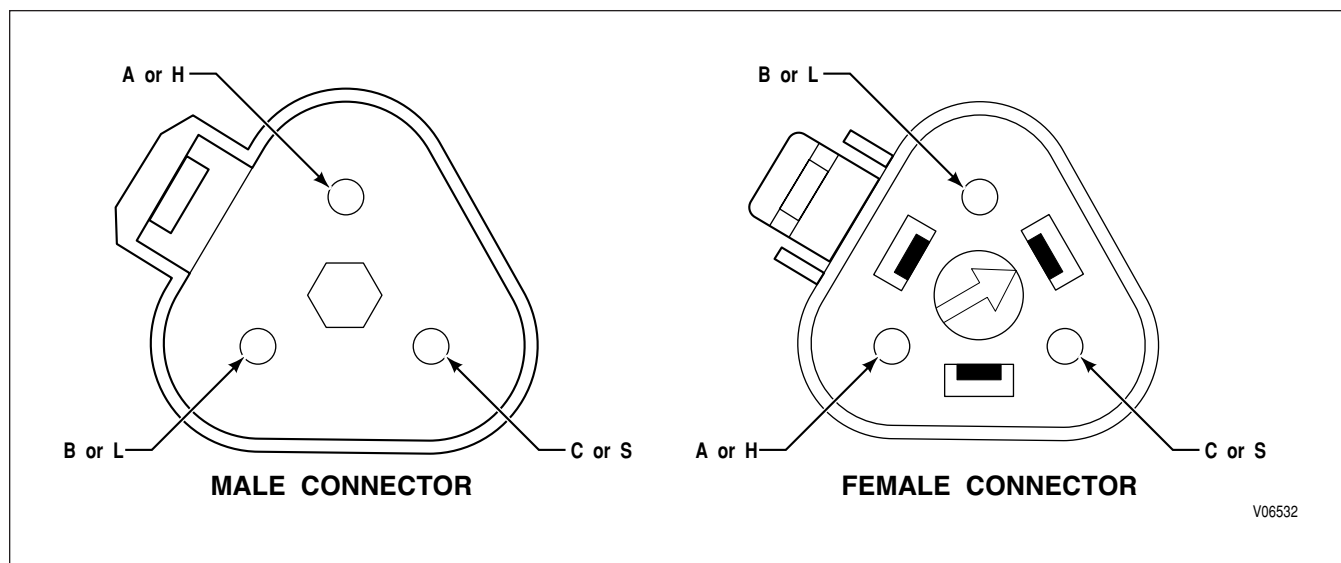


Figure D-6. J1939 Interface Connector

J1939 INTERFACE CONNECTOR

J1939 Connector			TCM Connector		
Terminal No.	Color	Wire No.	Description	Terminal No.	Color
A or H	Yellow	129	J1939 Controller, High	TCM J1-29	Red
B or L	Green	132	J1939 Controller, Low	TCM J1-32	Black
C or S	Uninsulated	131	J1939 Shield/Ground	TCM J1-31	Green

APPENDIX D—WIRE/CONNECTOR TABLES

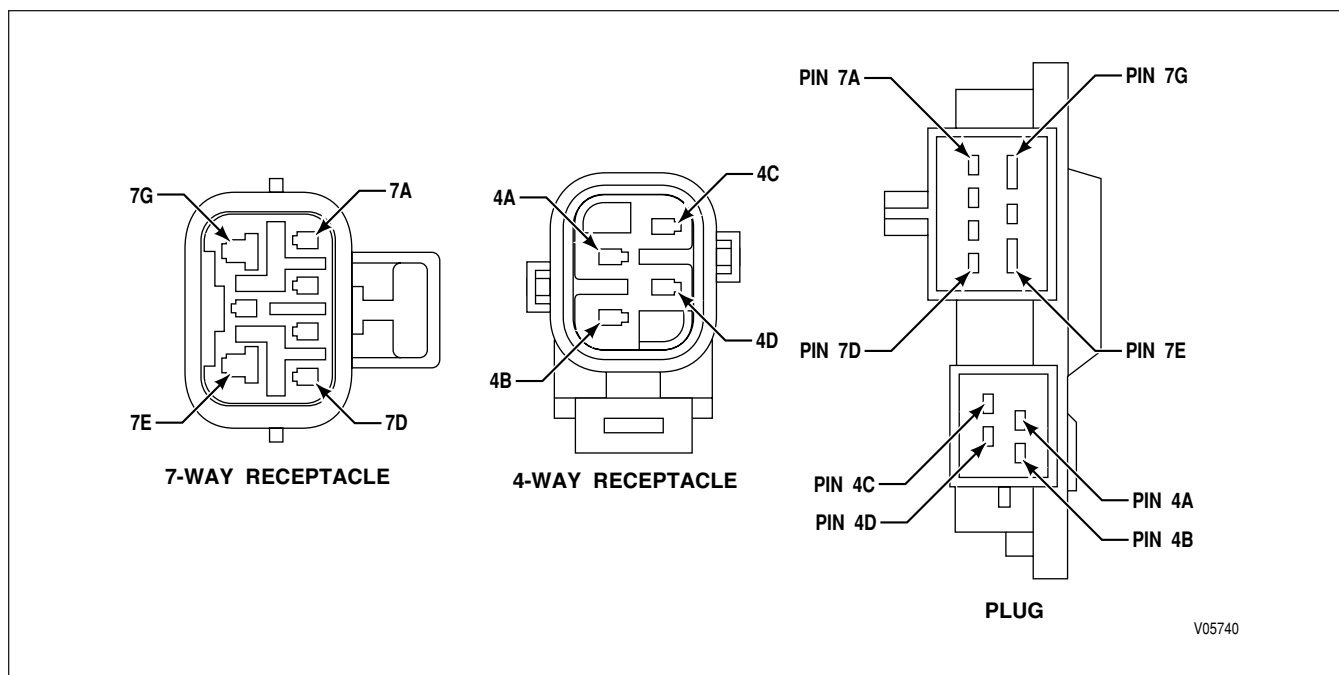


Figure D-7. NSBU Switch Connectors

NSBU SWITCH CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
4A	Blue	205	NSBU Output	TCM J2-5
4B	Gray	207	NSBU Output	TCM J2-7
4C	White	208	NSBU Output	TCM J2-8
4D	Yellow	206	NSBU Output	TCM J2-6
7A	—	—	—	—
7B	Tan	—	NSBU Input	Park Accessory
7C	Blue	—	NSBU Output	Reverse and Park Accessory Feed
7D	Green	220	Analog Ground	TCM J2-20
7E	Yellow	—	NSBU Output	Park and Neutral Start Feed
7F	Pink	—	NSBU Input	Reverse Lamps
7G	Orange	—	NSBU Input	Starter Solenoid/Starter Relay

APPENDIX D—WIRE/CONNECTOR TABLES

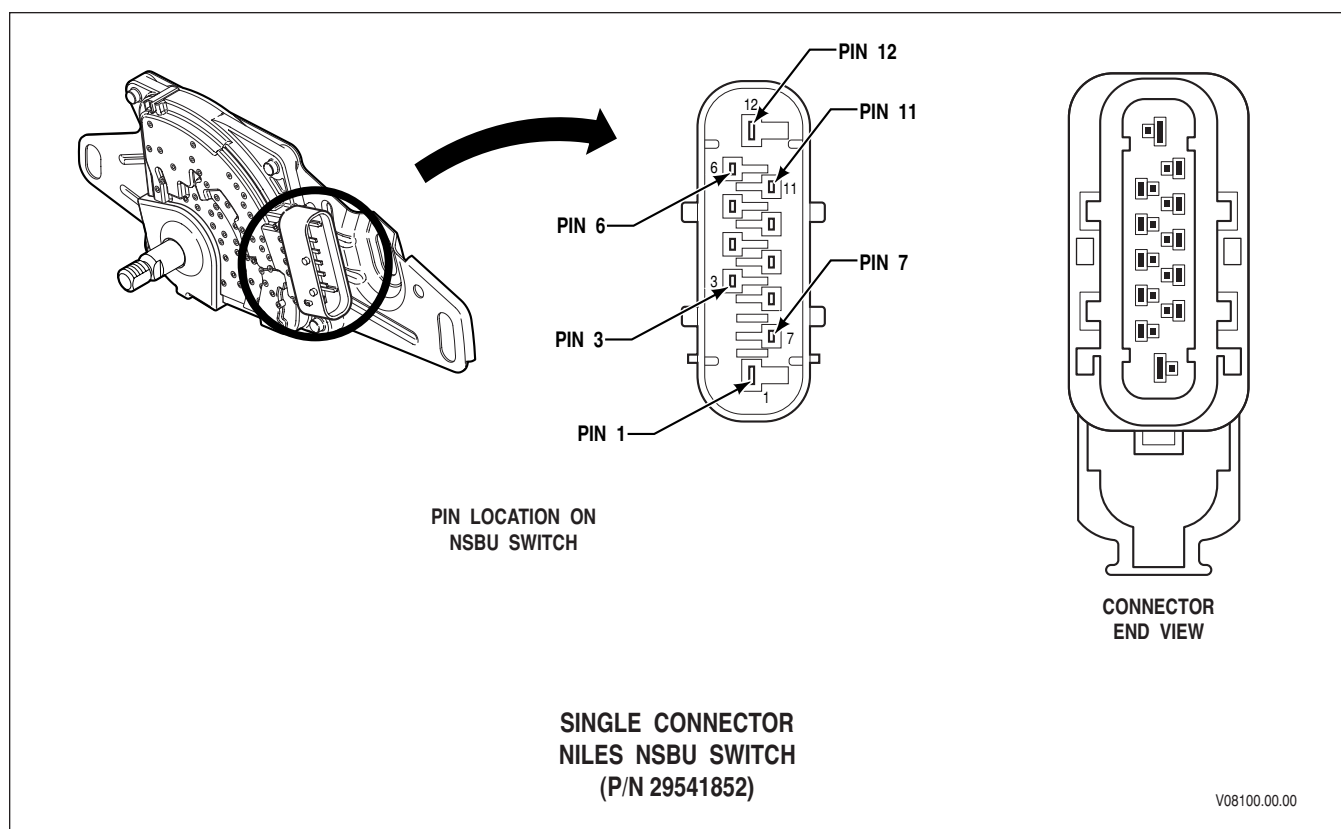
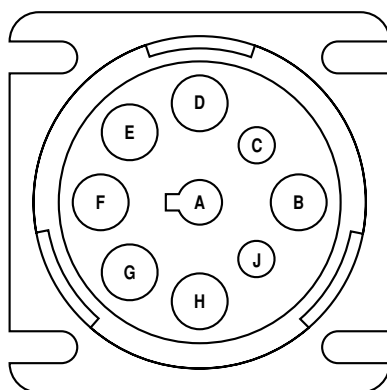


Figure D–8. Single Connector NSBU

NSBU SWITCH CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
1	Orange	—	NSBU Input	Starter Solenoid/Starter Relay
2 and 3	—	—	—	—
4	Yellow	206	NSBU Output	TCM J2-6
5	Blue	205	NSBU Output	TCM J2-5
6	Gray	207	NSBU Output	TCM J2-7
7	Green	220	Analog Ground	TCM J2-20
8	White	208	NSBU Output	TCM J2-8
9	—	—	—	—
10	Pink	—	NSBU Input	Reverse Lamps
11	Blue	—	NSBU Output	Reverse and Park Accessory Feed
12	Yellow	—	NSBU Output	Park and Neutral Start Feed

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9-PIN

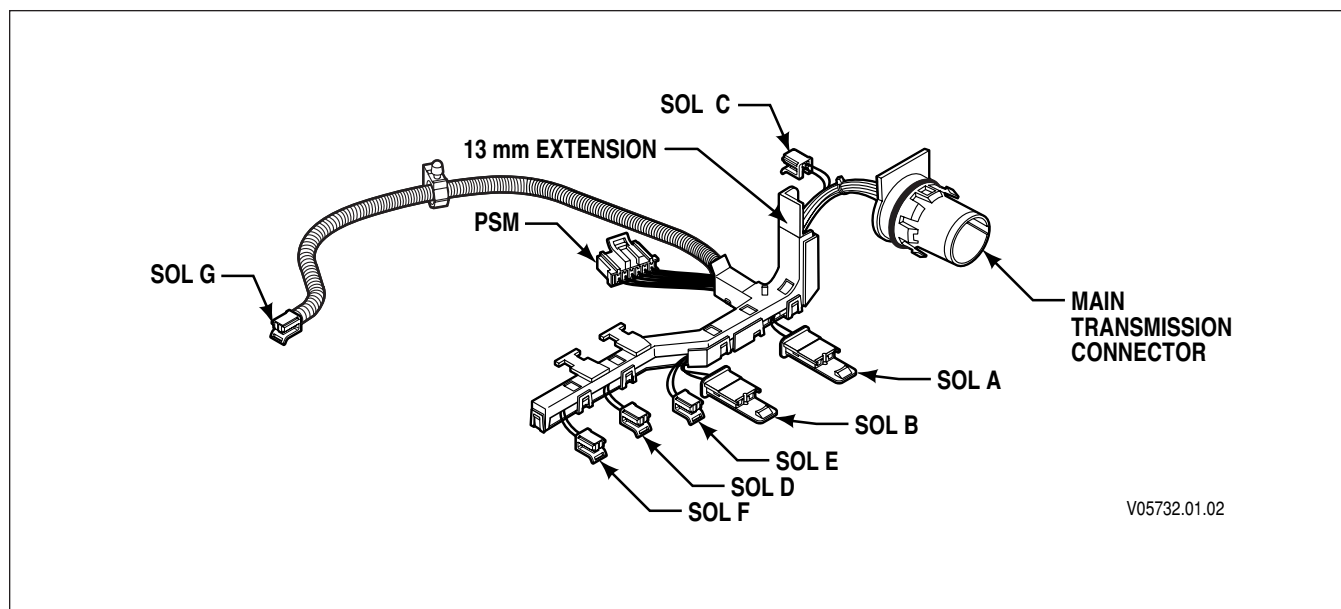
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Figure D–9. Deutsch DDR Connector

SAE STD 9-PIN DIAGNOSTIC (J1939 DIAGNOSTIC LINK) CONNECTOR

Terminal No.	Color	Wire No.	Description	Termination Point(s)
A	Determined By OEM	—	Battery Ground (–)	Vehicle System
B	Determined By OEM	—	Ignition Power (+)	Vehicle System
B (Optional)	Determined By OEM	—	Battery Power (+)	Vehicle System
C	Yellow	129	J1939 High	J1939 Backbone A
D	Green	132	J1939 Low	J1939 Backbone B
E	Uninsulated	131	J1939 Shield/Ground	J1939 Backbone C
F	Determined By OEM	—	Serial Communication (+)	Vehicle System
G	Determined By OEM	—	Serial Communication (–)	Vehicle System

APPENDIX D—WIRE/CONNECTOR TABLES



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Figure D-10. Transmission Internal Harness

TRANSMISSION INTERNAL HARNESS CONNECTORS

Connector Name	Connector Pin No.	Main Connector		Wire Color	TCM Pin No.
			Pin No.		
Solenoid A	1		M	Light Blue	J2-23
	2		L	Red/Blk Strp	J2-22
Solenoid B	1		N	Gray	J2-24
	2		P	Purple	J2-25
Solenoid C	A		C	Pink	J2-31
	B		A	Dark Green	J2-26
Solenoid D	A		C	Pink	J2-31
	B		B	Yellow/Blk Strp	J2-27
Solenoid E	A		C	Pink	J2-31
	B		W	Black/Wht Strp	J2-28
Solenoid F	A		S	Black	J2-32
	B		J	Brown	J2-29
Solenoid G	A		S	Black	J2-32
	B		R	Orange	J2-30
Pressure Switch Manifold	A		D	Light Green	J2-1
	B		F	Dark Blue	J2-2
	C		E	Red	J2-3
	D		K	Tan	J2-4
	E		G	Yellow	J2-10
	F		H,T (Trans ID)	Blk (H), White (T)	J2-20, J2-21

APPENDIX D—WIRE/CONNECTOR TABLES

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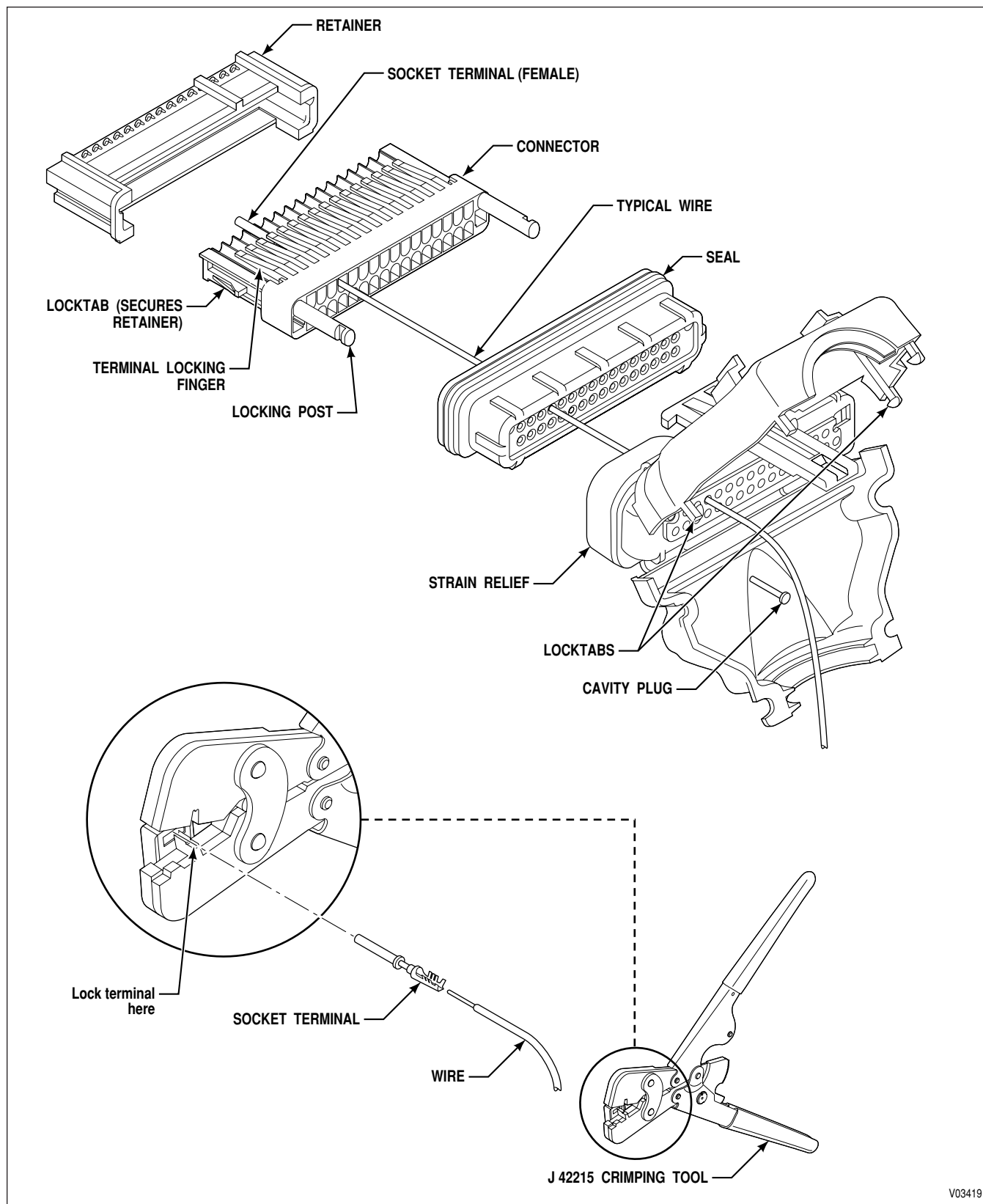
NOTE: *Allison Transmission is providing for service of wiring harnesses and wiring harness components as follows:*

- *Repair parts for the internal wiring harness 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 through the vehicle OEM and the OEM is responsible for warranty on these parts.*

APPENDIX E—CONNECTOR REPAIR INFORMATION**List Of Special Tools Required To Service 1000 and 2000 Product Families Wiring Harnesses**

Tool Number	Tool Type	Paragraph Reference
23046604	Splice, Sealed (14–16 AWG)	1–8
23046605	Splice, Sealed (18–22 AWG)	1–8
J 25070	Heat Gun	1–8
J 34182	Crimper 1	1–6, 1–7
J 34513	Remover 1	1–6
J 35123	Crimper (Alternate)	1–2, 1–3
J 35606	Crimper (Alternate)	1–5
J 35615	Wire Stripper 1	1–2, 1–3, 1–8
J 35689-A	Remover	1–2, 1–3
J 38125-10	Remover	1–5
J 38125-6	Crimper	1–5
J 38125-7	Crimper	1–2
J 38125-8	Crimper	1–8
J 38582-3	Remover	1–6
J 38852	Crimper (Alternate)	1–5
J 39227	Remover	1–1
J 41194	Extractor/Insertor	1–6
J 42215	Crimper	1–1

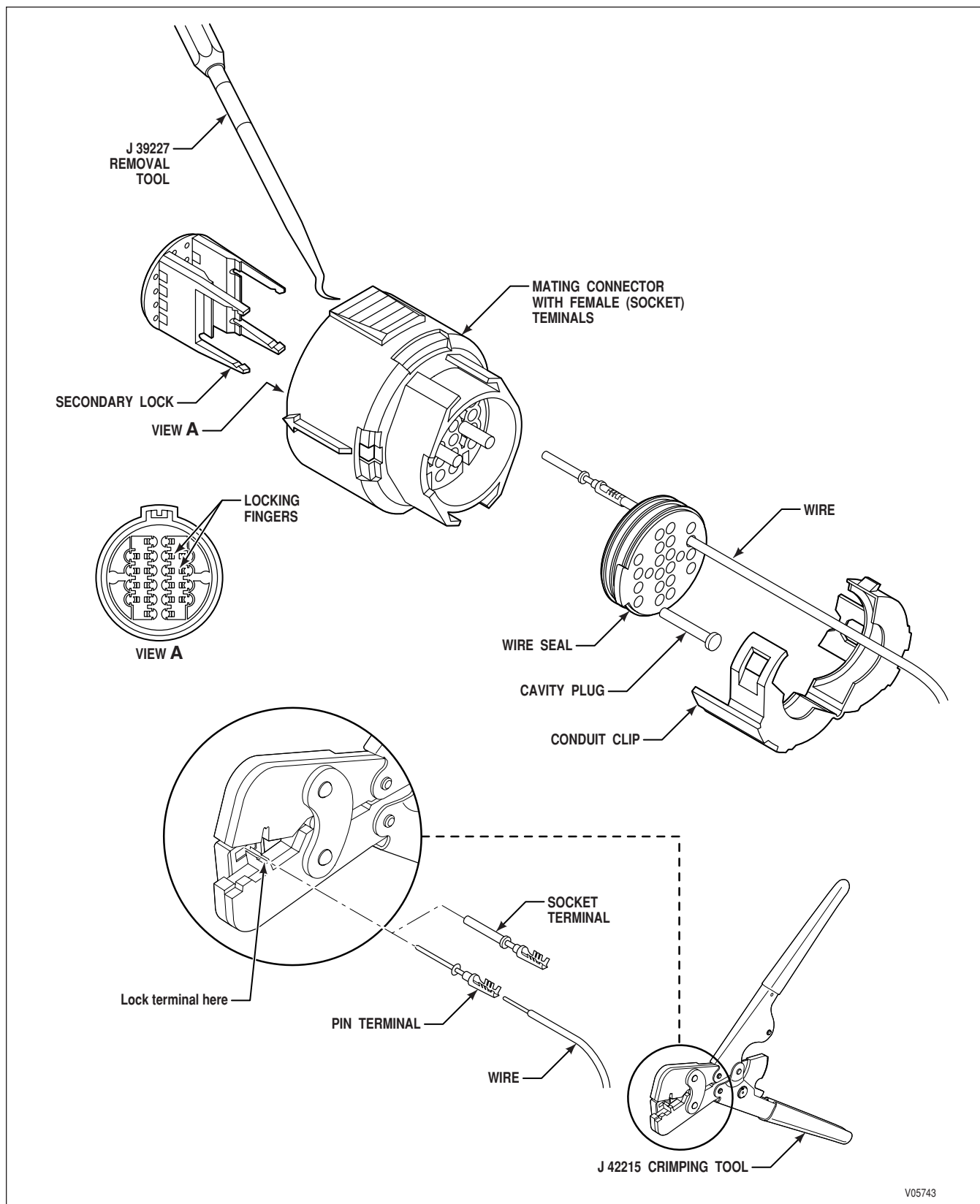
APPENDIX E—CONNECTOR REPAIR INFORMATION



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Figure E-1A. Delphi-Packard Micro Pack Connector (TCM J1 and J2)

APPENDIX E—CONNECTOR REPAIR INFORMATION



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Figure E-1B. Delphi-Packard Micro Pack Connector (Main Transmission Connector)

APPENDIX E—CONNECTOR REPAIR INFORMATION

1-1. DELPHI-PACKARD MICRO PACK 100W CONNECTORS (TCM J1 AND J2, MAIN TRANSMISSION CONNECTOR)

A. Connector/Terminal Repairs

Required Tools

Crimping Tool	J 42215
Remover Tool	J 39227

Use	Description	Manufacturers P/N
Main Transmission Connector	Connector, 20F MIC/P 100W Gray	12160280
	Lock, Secondary 20F Green	12160494
	Terminal, Socket 100W	12084912
	Cavity Plug, 100W	12129557
	Conduit Clip, 13mm Black	12176394

B. Terminal Removal

1. TCM Harness Connectors (*Figure E-1A*)

- Use a small-bladed screwdriver to gently release the locktabs at the splitline of the strain relief.
- Spread the strain relief open.
- Remove the retainer from the connector by using a small-bladed screwdriver to depress the locktabs on the side of the connector.
- Remove a selected terminal by pushing forward on the wire or by lifting the locking finger and pulling the wire and terminal rearward out of the connector.

2. Main Transmission Connectors (*Figure E-1B*)

- Use a small bladed screw driver to gently release the locktabs at the split line of the conduit clamp.
- Remove conduit clamp.
- Use a small-bladed screw driver to gently release the locktab remove the lock assembly.
- Remove a selected terminal by pushing forward on the wire or by lifting the locking finger and pulling the wire and terminal rearward out of the connector.

C. Terminal Crimping

- Carefully strip 5.0 mm $\pm$ 0.5 mm (0.20 $\pm$ 0.02 inch) of insulation from the end of the wire.
- Insert the new terminal to be crimped in the J 42215 crimping tool. There is a spring-loaded terminal positioner at the front of the tool to hold the terminal in place. Squeeze the crimper handles for a few clicks to start the crimping process but leave room to insert the wire end.
- Insert the bare wire end into the terminal. Squeeze the crimper handles to complete the crimping process and until the crimper handles open when released to remove the terminal/wire from the tool.

APPENDIX E—CONNECTOR REPAIR INFORMATION

C. Terminal Crimping *(cont'd)*

4. Complete terminal installation for Main Transmission Connector as follows: *(Figure E-1B)*
 - a. Insert the wire seal in the back of the connector.
 - b. Push the terminal/wire assembly through the proper hole in the back of the wire seal. Push the wire in until the terminal clicks into position. Gently pull rearward on the wire to be sure that the terminal is fully seated. Install cavity plugs as needed.
 - c. Install the lock assist or secondary lock into the connector body.
 - d. Close the conduit clip around the conduit and lock the clip into the rear of the connector body.
5. Complete terminal installation of the TCM Connectors as follows: *(Figure E-1A)*
 - a. Align the locking posts on the connector with the seal and push the locking posts through the seal into the mating holes in the strain relief (if the connector was removed from the strain relief).
 - b. Push the terminal/wire assembly through the proper hole in the back of the seal. Push the wire in until the terminal clicks into position.

NOTE: *All terminals must be properly positioned to install the retainer in Step (5c).*

- c. Install the retainer on the connector body to lock the terminals in position. Pull gently on the wire to be sure that the terminal is fully seated. Install cavity plugs as needed.
- d. Position the conduit inside the strain relief and snap the strain relief halves together.

APPENDIX E—CONNECTOR REPAIR INFORMATION

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APPENDIX E—CONNECTOR REPAIR INFORMATION

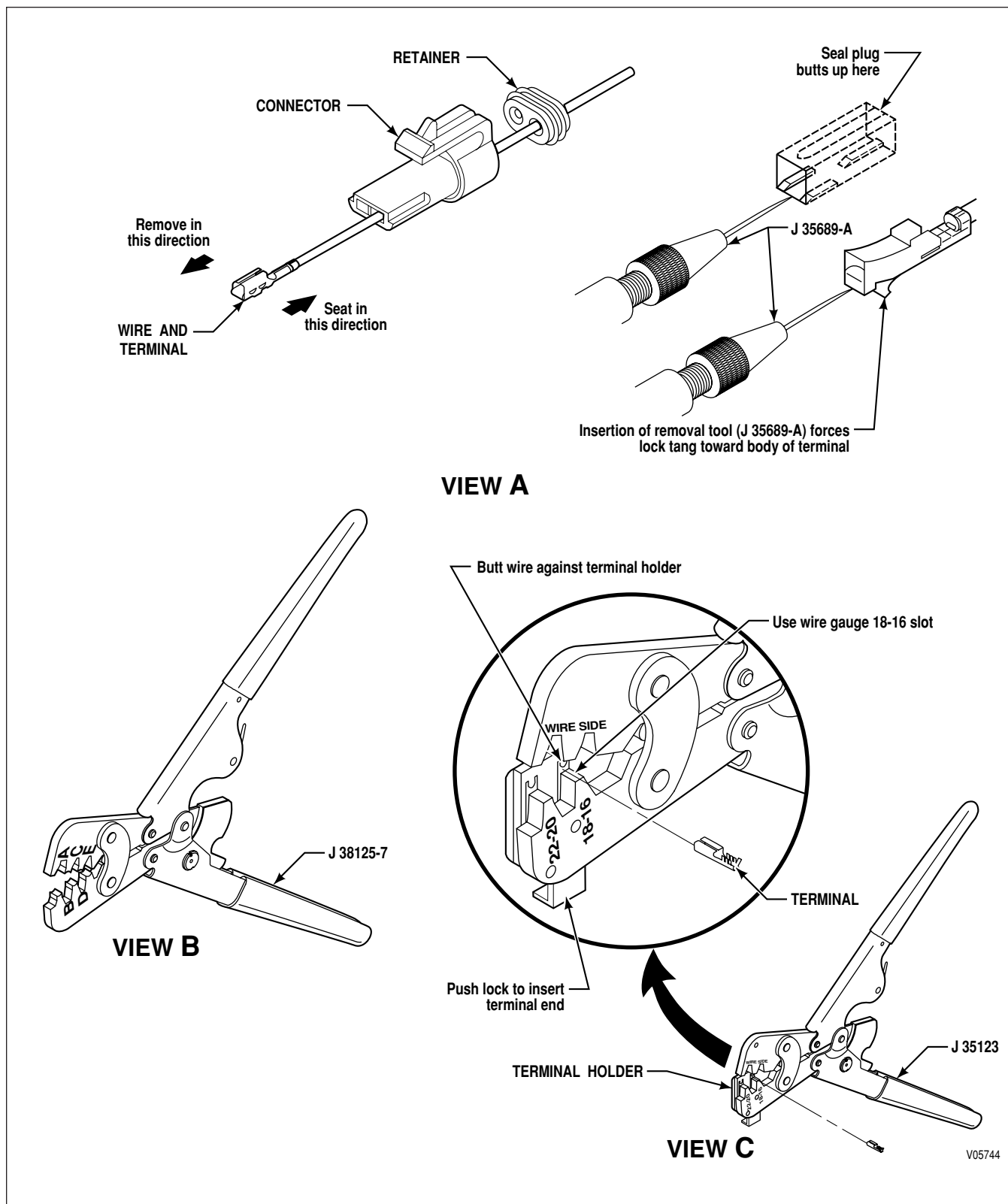


Figure E-2. Delphi-Packard Metri-Pack 150 Series Connectors — Pull-to-Seat (Speed Sensors)

APPENDIX E—CONNECTOR REPAIR INFORMATION

1–2. DELPHI-PACKARD METRI-PACK 150 SERIES CONNECTORS — PULL-TO-SEAT (SPEED SENSORS)

A. Connector/Terminal Repairs

Required Tools

Crimping Tool	J 38125-7
Wire Crimp	Anvil “E”
Insulation Crimp	Anvil “C”
Alternate Crimping Tool	J 35123
Remover Tool	J 35689-A
Automatic Wire Stripper	J 35615

Use	Description	Manufacturers P/N
Engine Speed (Ne) Sensor	Connector	12162193
	Terminal	12103881
Turbine Speed (Nt) Sensor	Connector	12162193
	Terminal	12103881
Output Speed (No) Sensor	Connector	12162193
	Terminal	12103881

B. Terminal Removal

NOTE: Do not solder crimps.

1. Insert the needle end of terminal remover J 35689-A into the small notch between the connector and the terminal to be removed (Figure E–2, View A). Push the lock tang toward the terminal.
2. Push the wire and terminal out of the connector (this is a “pull-to-seat” terminal).
3. Pull the terminal as far as necessary from the connector. This will be limited by the number of other wires inserted into the connector and by the distance between the back side of the connector and the beginning of the harness covering.
4. If a terminal is to be replaced, cut the terminal between the core and the insulation crimp to minimize wire loss.

C. Terminal Crimping — Speed Sensor Terminals (Standard Crimping Tool)

1. If a spare wire is used, the wire should be pushed through the proper hole in the strain relief (if used), through the wire seal, and out the other side of the connector before stripping.
2. Carefully strip 4.5 mm $\pm$ 0.5 mm (0.18 $\pm$ 0.02 inch) of insulation from the end of the wire. Unless the insulation crimp is overtight, Automatic Wire Stripper J 35615 will remove the insulation and crimp from an old terminal without damaging the wire.
3. Place the core crimp portion of the terminal on the bed of anvil “E” and squeeze the crimper enough to keep the terminal from dropping (Figure E–2, View B).
4. Position the wire core in the terminal and squeeze the crimper tool to complete the core crimp. **Be sure to orient the terminal so that it is properly aligned with the terminal cavity in the connector.** The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).

APPENDIX E—CONNECTOR REPAIR INFORMATION

C. Terminal Crimping — Speed Sensor Terminals (Standard Crimping Tool) (*cont'd*)

5. Position the insulation crimp of the terminal on anvil "C" so that the entire insulation crimp area and a portion of the terminal between the core and insulation crimp areas are supported by the anvil. Complete the insulation crimp.
6. Be sure the lock tang is lifted to allow proper reseating of the terminal.
7. Pull on the wire to pull the terminal completely into the cavity. (A click will be heard and the terminal should stay in place if the wire is pushed.)

D. Terminal Crimping Using Alternate Tool J 35123

1. If a spare wire is used, the wire should be pushed through the proper hole in the strain relief (if used) and the wire seal, and out the other side of the connector prior to stripping.
2. Insert the remover tool in the front side of the connector to release the locktab, and push the terminal out the front of connector. Pull the terminal and wire out the front of the connector to complete Steps (3) through (7).
3. Push open the terminal holder on the crimper tool J 35123 and insert a terminal into the opening marked 18–16 (Figure E–2, View C) so that the crimp ends point up. Release the terminal holder.
4. Slightly close the crimping tool (close until one click is heard) but do not start to crimp the terminal. Place the terminal on the wire so it is in the same position as it will be when pulled back into the connector. The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).
5. Insert the wire into the terminal until the wire contacts the holder. (By doing this, the core and insulation should be properly positioned for the core and insulation crimp wings.)
6. Squeeze the crimper fully until it opens when released.
7. Open the terminal holder and remove the wire and terminal from the crimping tool.
8. Pull on the terminal to assure a tight crimp.
9. Be sure the lock tang is lifted to allow proper reseating of the terminal.
10. Pull on the wire to pull the terminal completely into the cavity. (A click will be heard and the terminal should stay in place if the wire is pushed.)

APPENDIX E—CONNECTOR REPAIR INFORMATION

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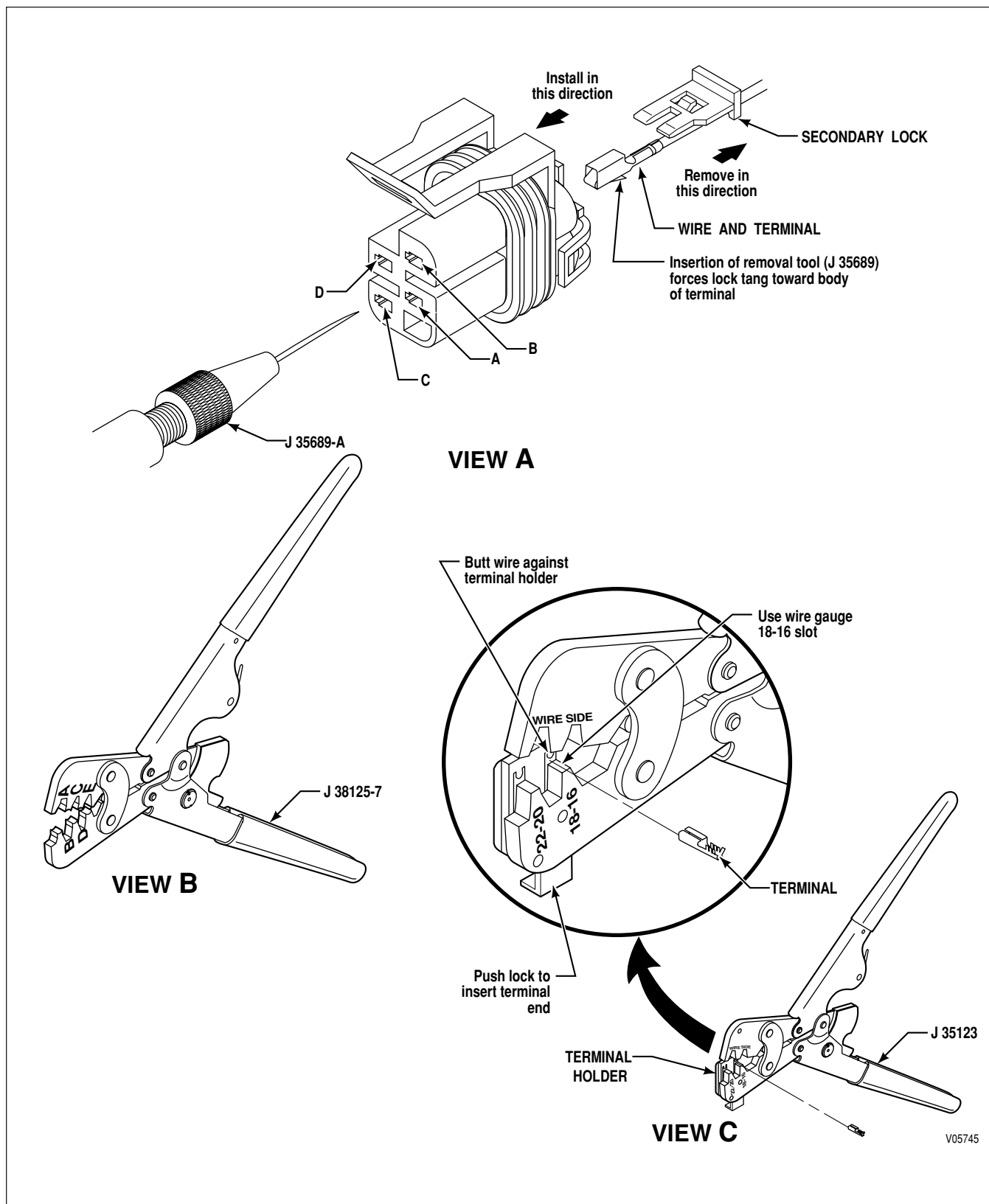


Figure E-3. Delphi-Packard Metri-Pack 150 Series Connectors — Push-to-Seat (NSBU Switch)

APPENDIX E—CONNECTOR REPAIR INFORMATION

1–3. DELPHI-PACKARD METRI-PACK 150 SERIES CONNECTORS — PUSH-TO-SEAT (NSBU SWITCH)

A. Connector/Terminal Repairs

Required Tools

Crimping Tool	J 38125–7
Wire Crimp	Anvil “E”
Insulation Crimp	Anvil “C”
Alternate Crimping Tool	J 35123
Remover Tool	J 35689–A
Automatic Wire Stripper	J 35615

Use	Description	Manufacturers P/N
NSBU Switch	4 Way Tower Connector	12191757
	Wire Type Seal, Dk Red	12048086
	150f Terminal	12048074

B. Terminal Removal

NOTE: *Do not solder crimps.*

1. Remove the secondary lock.
2. Insert the needle end of terminal remover J 35689-A into the small notch between the connector and the terminal to be removed (Figure E–3, View A). Push the lock tang toward the terminal.
3. Pull the wire and terminal out the rear of the connector (this is a “push-to-seat” terminal).
4. Pull the terminal as far as necessary from the connector. This will be limited by the number of other wires inserted into the connector and by the distance between the back side of the connector and the beginning of the harness covering.
5. If a terminal is to be replaced, cut the terminal between the core and the insulation crimp to minimize wire loss.

C. Terminal Crimping

1. Carefully strip 4.5 mm $\pm$ 0.5 mm (0.18 $\pm$ 0.02 inch) of insulation from the end of the wire. Unless the insulation crimp is overtight, Automatic Wire Stripper J 35615 will remove the insulation and crimp from an old terminal without damaging the wire.
2. Place the core crimp portion of the terminal on the bed of anvil “E” and squeeze the crimper enough to keep the terminal from dropping (Figure E–3, View B).
3. Position the wire core in the terminal and squeeze the crimper tool to complete the core crimp. **Be sure to orient the terminal so that it is properly aligned with the terminal cavity in the connector.** The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).
4. Position the insulation crimp of the terminal on anvil “C” so that the entire insulation crimp area and a portion of the terminal between the core and insulation crimp areas are supported by the anvil. Complete the insulation crimp.

APPENDIX E—CONNECTOR REPAIR INFORMATION

C. Terminal Crimping *(cont'd)*

5. Be sure the lock tang is lifted to allow proper reseating of the terminal.
6. Push on the wire until the terminal is completely into the cavity. (A click will be heard and the terminal should stay in place when the wire is lightly pulled.)

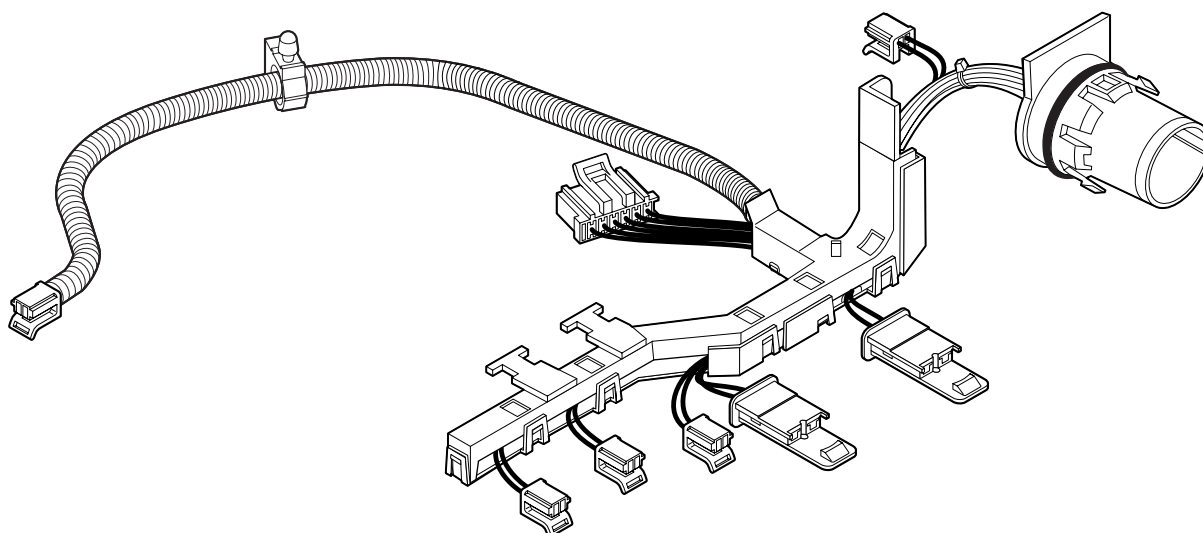
D. Terminal Crimping Using Alternate Tool J 35123

1. Insert the remover tool in the front side of the connector to release the locktab, and pull the terminal out the rear of the connector. Pull the terminal and wire out the rear of the connector to complete Steps (3) through (7).
2. Push open the terminal holder on the crimper tool J 35123 and insert a terminal into the opening marked 18–16 (Figure E–3, View C) so that the crimp ends point up. Release the terminal holder.
3. Slightly close the crimping tool (close until one click is heard) but do not start to crimp the terminal. Place the terminal on the wire so it is in the same position as it will be when pulled back into the connector. The terminal should be positioned so that the lock tang is on the side of the cavity which has the notch in the middle (for the remover tool).
4. Insert the wire into the terminal until the wire contacts the holder. (By doing this, the core and insulation should be properly positioned for the core and insulation crimp wings.)
5. Squeeze the crimper fully until it opens when released.
6. Open the terminal holder and remove the wire and terminal from the crimping tool.
7. Pull on the terminal to assure a tight crimp.
8. Be sure the lock tang is lifted to allow proper reseating of the terminal.
9. Push on the wire until the terminal is completely into the cavity. (A click will be heard and the terminal should stay in place if the wire is lightly pulled.)

APPENDIX E—CONNECTOR REPAIR INFORMATION

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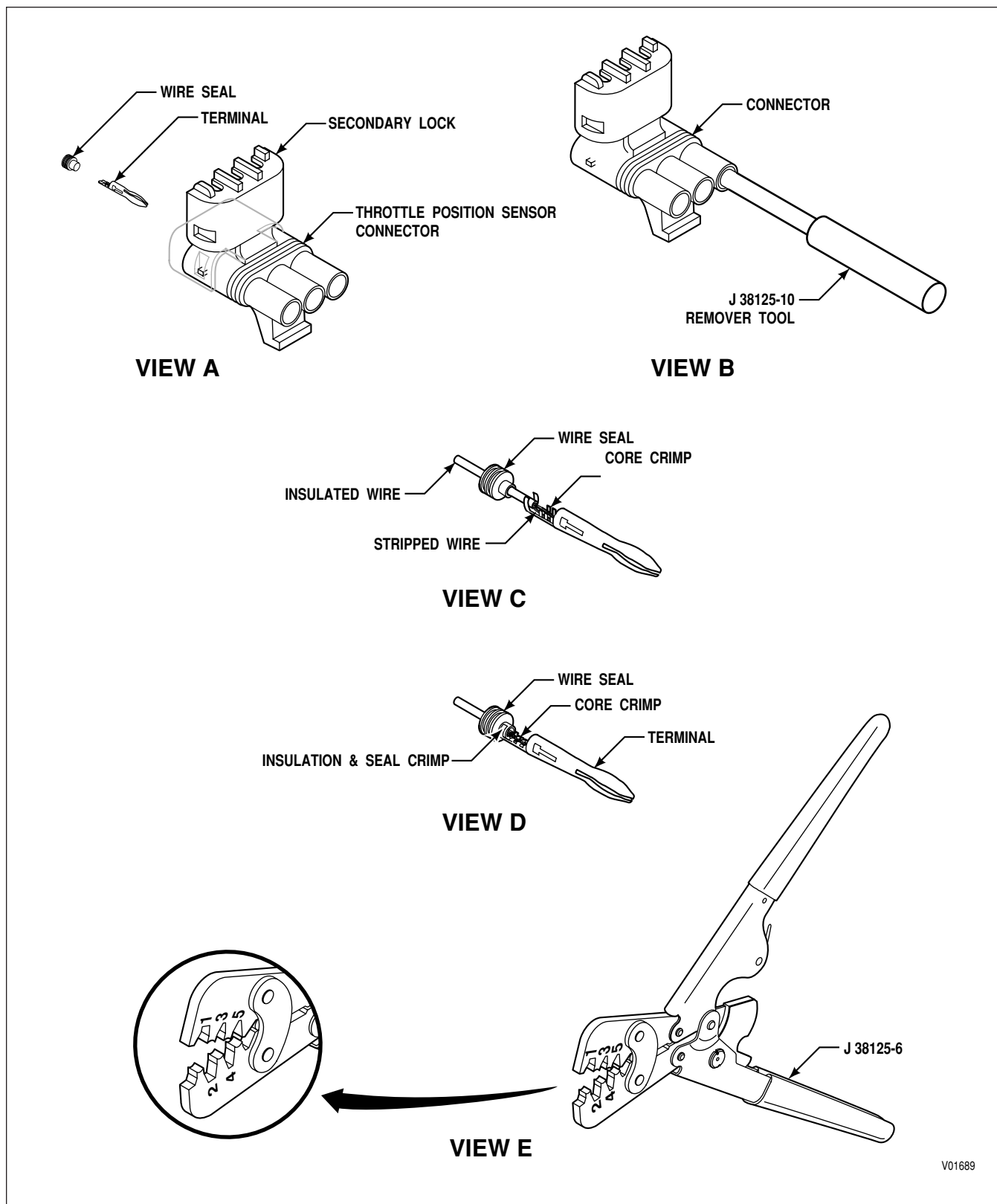
Figure E-4. Internal Wiring Harness

APPENDIX E—CONNECTOR REPAIR INFORMATION

1-4. INTERNAL WIRING HARNESS

Service with internal wiring harness assembly P/N 15321154 (Figure E-4).

APPENDIX E—CONNECTOR REPAIR INFORMATION



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Figure E-5A. Delphi-Packard WeatherPack Connectors (TPS)

APPENDIX E—CONNECTOR REPAIR INFORMATION

1–5. DELPHI-PACKARD WEATHERPACK CONNECTORS (TPS)

A. Connector/Terminal Repairs

Required Tools

Crimping Tool	J 38125-6
Wire Crimp	Anvil “2”
Insulation Crimp	Anvil “5”
Alternate Crimping Tool	J 35606 or J 38852
Remover Tool	J 38125-10

Use	Description	Manufacturers P/N
Throttle Position Sensor (TPS)	Connector	12015793
	Terminal	12089040
	Wire Seal	12089444

B. Terminal Removal

1. Unlatch and open the secondary lock on the connector (Figure E–5A, View A).
2. From the front of the connector, insert remover tool J 38125-10 over the terminal. Push the tool over the terminal and pull the terminal out the back of the connector (Figure E–5A, View B).
3. If a terminal is to be replaced, cut the terminal between the core and the insulation crimp to minimize wire loss.

NOTE: *Two special tools are available for this operation — tool J 38125-6 (Paragraph C) and tool J 35606 or J 38852 (Paragraph D).*

C. Terminal Crimping Using Crimping Tool J 38125-6

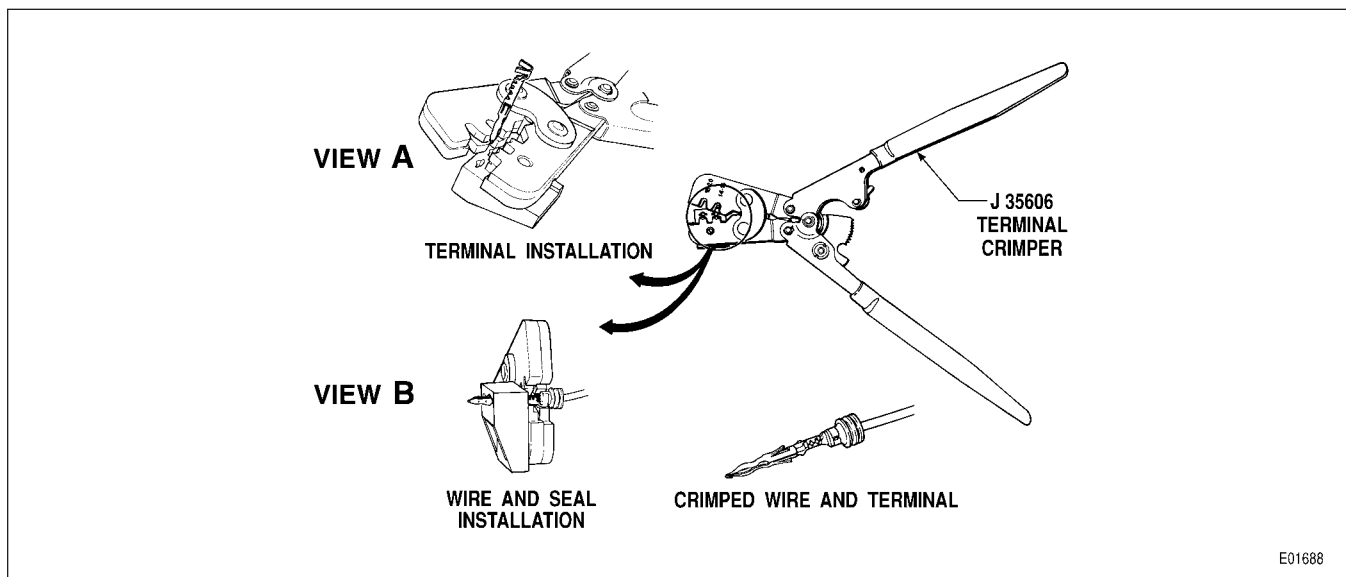
1. Place the wire seal onto the wire before stripping the wire (Figure E–5A, View C).
2. Strip 6.0 ± 0.25 mm (0.24 ± 0.01 inch) of insulation from the end of the wire.
3. Place the terminal onto crimping tool J 38125-6 (Figure E–5A, View E), anvil “2.”
4. Slightly close the crimping tool to hold the terminal steady.
5. Insert the wire so that the stripped portion of the wire is in the core crimp area and the insulated portion of the wire is in the insulation crimping area (Figure E–5A, View C).
6. Crimp the stripped section of the wire.
7. Remove the terminal from the crimping tool.
8. Push the wire seal onto the terminal (Figure E–5A, View D). The second crimp will wrap around the wire seal. This will seal the insulated area of the wire.
9. Use a pair of needle nose pliers, if necessary, to squeeze the terminal wings together to fit in anvil “5.”
10. Crimp the wire seal in anvil “5.”
11. Tug on the terminal to be sure the crimp is tight.

APPENDIX E—CONNECTOR REPAIR INFORMATION**C. Terminal Crimping Using Crimping Tool J 38125-6 (cont'd)**

12. Insert the terminal into the connector. The terminal will click into place and should not pull out.
13. Secure the secondary lock. Both sides of the connector must be latched.

D. Terminal Crimping Using Alternate Crimper Pliers J 35606 or J 38852

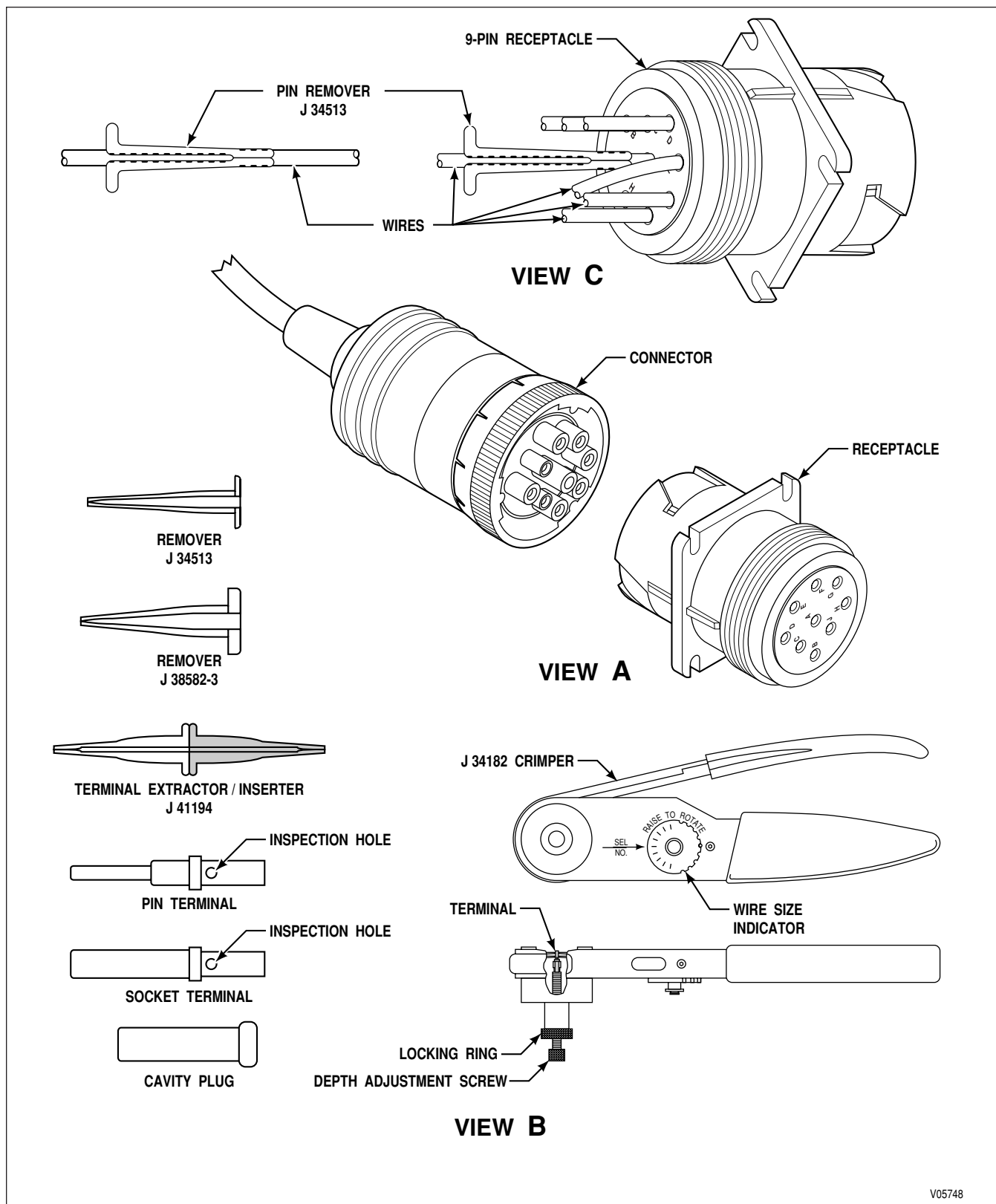
1. Place the wire seal onto the wire before stripping the wire (Figure E-5A, View C).
2. Strip 6.0 ± 0.25 mm (0.24 ± 0.01 inch) of insulation from the end of the wire.
3. Insert terminal into crimping tool J 35606 (Figure E-5B, View A), opening marked 18-20.
4. Position the terminal so the crimp wings are pointing up from the bottom jaw of the crimper and are properly positioned.
5. Slightly close the crimping tool to hold the terminal steady.
6. Slide the wire seal to the edge of the insulation and insert the wire and seal into the terminal (Figure E-5B, View B).
7. Position the wire and seal and squeeze the crimping tool until it opens when released.
8. Tug on the terminal to be sure the crimp is tight.
9. Insert the terminal into the connector. The terminal will click into place and should not pull out.
10. Secure the secondary lock. Both sides of the connector must be latched.

**Figure E-5B. Terminal Crimping With Tool J 35606**

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APPENDIX E—CONNECTOR REPAIR INFORMATION



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Figure E-6. Deutsch IPD/ECD Connectors (9-Way DDR)

APPENDIX E—CONNECTOR REPAIR INFORMATION

1–6. DEUTSCH IPD/ECD CONNECTORS (J1939 DIAGNOSTIC LINK 9-WAY DDR)

A. Connector/Terminal Repairs

Required Tools

Crimping Tool	J 34182
Extractor/Insertor Tool	J 41194 (18 GA ECD Bulkhead)
Remover Tool Set	J 34513
Remover Tool (DDR Connector)	J 38582-3 (12–14 GA)

Use	Description	Manufacturers P/N
J1939 Diag Link (9-Way DDR)	9-Way Receptacle	HD10-9-1939P

NOTE: *If difficulty is encountered in removing or installing the plug backshell, insert the plug into the receptacle, do not lock it into place, and loosen the backshell.*

B. Terminal Removal (Figure E–6, View A)

NOTE: *When using remover/insertor tool J 41194, take care not to break the tip of the tool. Lay the wire in the widest part of the wire slot and work toward the tool tip.*

1. Loosen and slide the backshell along the convolute conduit.
2. Remove the convolute conduit from the base of the backshell follower. Peel enough conduit from the harness to allow working access.
3. Slide the backshell follower clear of the connector housing.
4. Remove as much tape wrap as necessary to allow working access.
5. Fully insert the proper remover/extractor tool into the back of the connector until it releases the terminal.
6. Pull the terminal, wire, and tool out the back of the connector.
7. If replacing a terminal, cut the wire through the middle of the terminal crimp to minimize wire loss.

C. Terminal Crimping (Figure E–6, View B)

1. Strip approximately 6–8 mm (0.236–0.315 inch) of insulation from the end of the wire.
2. Set the crimping tool wire size to number 12. To set the wire size, remove the retainer pin. Lift and rotate the indicator until the number 12 is aligned with the SEL NO. arrow. Reinstall the retainer pin.
3. Insert the contact end of the terminal into crimping tool J 34182. To adjust the crimping tool depth, loosen the locking ring until the depth adjusting screw is free. Turn the adjusting screw until the top of the terminal is just above flush with the top of the crimping hole (the crimp jaws will contact the middle of the terminal barrel). Tighten the locking ring to retain the adjustment.
4. Fully insert the wire into the terminal so that the stripped portion of the wire is in the crimp area. A small section (0.5–1.0 mm (0.02–0.04 inch)) of wire will be visible above the terminal barrel.

APPENDIX E—CONNECTOR REPAIR INFORMATION

C. Terminal Crimping (*Figure E-6, View B*) (*cont'd*)

5. Squeeze the crimping tool handle until it releases. The terminal is now crimped onto the wire.
6. Remove the terminal and wire from the crimping tool.
7. Tug on the terminal to be sure the crimp is tight.
8. Install a 25 mm (one inch) long piece of heat shrink tubing over the wire insulation just behind the terminal. Apply heat to shrink and lock the tubing to the insulation.

D. Terminal Insertion (all connectors except ECD bulkhead)

1. Insert the terminal and attached wire through the proper hole in the grommet.
2. Push on the terminal and wire until the terminal clicks into position. Pull gently on the wire to be sure that the terminal is fully seated.

APPENDIX E—CONNECTOR REPAIR INFORMATION

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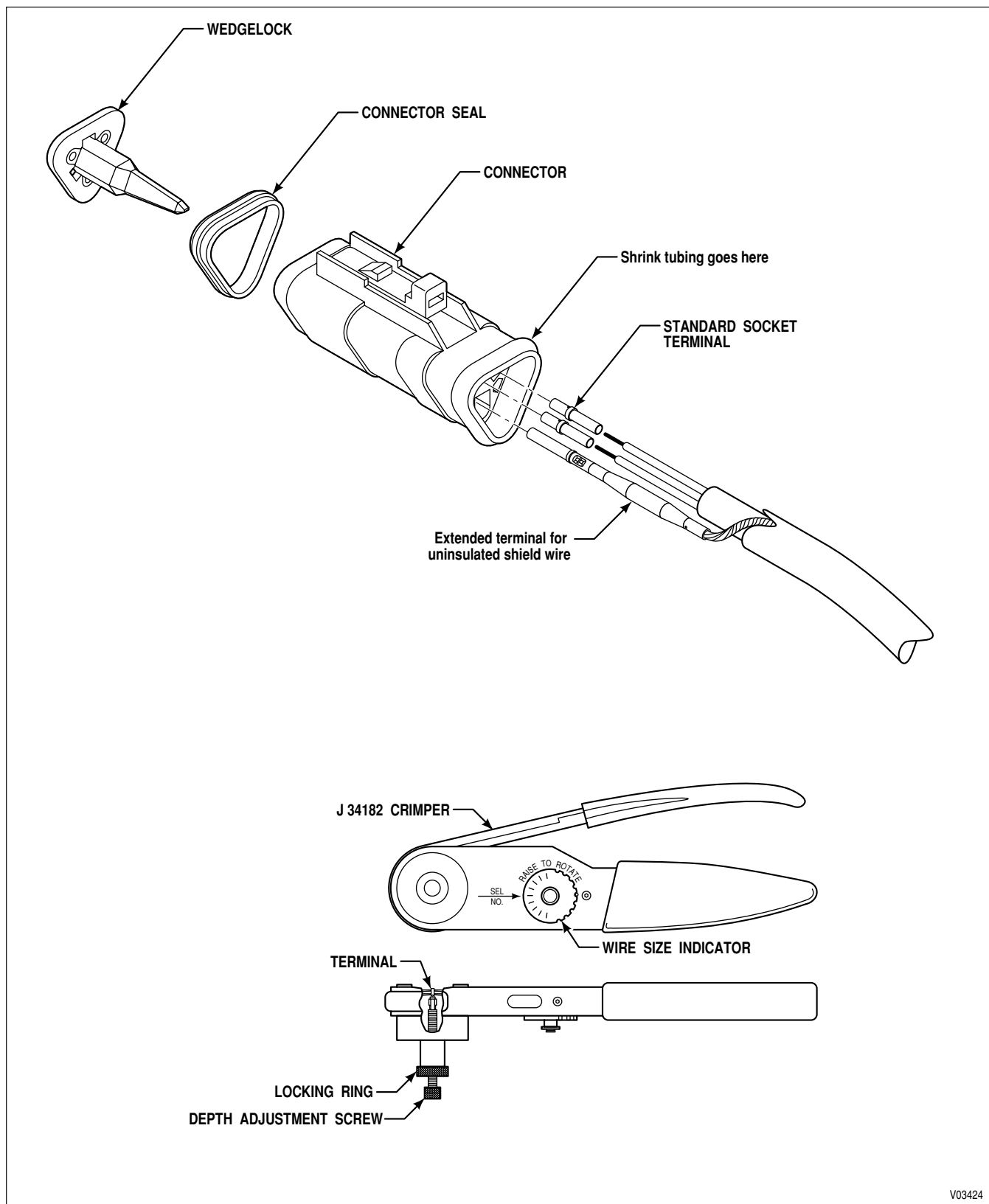


Figure E-7. Deutsch DT Series Connector (3-Way J1939 Interface)

APPENDIX E—CONNECTOR REPAIR INFORMATION

1-7. DEUTSCH DT SERIES CONNECTORS (3-WAY J1939 INTERFACE)

A. Connector/Terminal Repair

Required Tools

Crimping Tool J 34182

Use

J1939 Interface

Description

Connector, Plug, 3-Way
Wedglock, Plug
Contact, Socket (Standard)
Contact, Socket (Extended)
Cable, J1939 Databus

Manufacturers P/N

DT06-3S-E008
W3S-1939
3662-204-1690
0462-221-1631
23-000-13

B. Terminal Removal (*Figure E-7*)

1. Use a small-bladed screwdriver to remove the wedglock that holds the terminals in place.
2. Use a sharp knife to carefully remove the shrink tubing from the rear of the connector plug.
3. Use a small screwdriver to release the locking lever for all of the terminals. Pull the wire and terminal out the rear of the connector.
4. Slide a new piece of shrink tubing over the removed terminals and onto the cable.
5. If replacing a terminal, cut the wire through the middle of the terminal crimp to minimize wire loss.

C. Terminal Crimping (*Figure E-7*)

1. Strip approximately 6–8 mm (0.24–0.31 inch) of insulation from the end of the wire. (There is no insulation on the shield wire.)
2. Set the crimping tool wire size to number 18. To set the wire size, remove the retainer pin. Lift and rotate the indicator until the number 18 is aligned with the SEL NO. arrow. Reinstall the retainer pin.
3. Insert the contact end of the terminal down into crimping tool J 34182. To adjust the crimping tool depth, loosen the locking ring until the depth adjusting screw is free. Turn the adjusting screw until the wire end of the terminal is just above flush with the top of the crimping hole. The depth adjustment screw will need to be backed out a large amount to accept the extended shield terminal. The crimp jaws will now contact the middle of the terminal barrel. Tighten the locking ring to retain the adjustment.
4. Fully insert the wire into the terminal so that the stripped portion of the wire is in the crimp area. A small section (0.5–1.0 mm (0.02–0.04 inch)) of wire will be visible above the terminal barrel.
5. Squeeze the crimping tool handle until it releases. The terminal is now crimped onto the wire.
6. Remove the terminal and wire from the crimping tool.
7. Tug on the terminal to be sure the crimp is tight.

APPENDIX E—CONNECTOR REPAIR INFORMATION

D. Terminal Insertion

1. Insert the terminal and attached wire into the back of the connector.
2. Push on the terminal and wire until the terminal clicks into position. Check the front of the connector to see that the terminal is at the same height as other terminals. Pull gently on the wire to be sure that the terminal is fully seated.
3. Insert the wedge lock to hold the terminals in place. Slide the sealing plug back into place at the rear of the connector.
4. Slide the shrink tubing over the raised area at the rear of the connector. Use a heat gun to shrink the tubing into position over the connector and cable.

APPENDIX E—CONNECTOR REPAIR INFORMATION

1–8. REPAIR OF A BROKEN WIRE WITH IN-LINE BUTT SPLICE

A. Connector Check Before Repair

NOTE: *Before repairing or replacing wiring harness, sensor, solenoid, switch, or TCM as indicated for a diagnosed problem, follow the procedure below:*

1. Disconnect the connector or connectors associated with the problem and inspect for:
 - Bent terminals
 - Broken terminals
 - Dirty terminals
 - Pushed back terminals
 - Missing terminals
 - Condition of mating tabs
 - Condition of mating terminals

Ensure that terminals are secure in the connector. Clean, straighten, or replace parts as required.

2. Reconnect all previous unmated connectors. Ensure connectors are fully inserted or twisted until they lock in place. Connectors with locking tabs make an audible click when the lock is engaged.
3. If the trouble recurs after starting the vehicle, follow the repair procedures for the trouble code or complaint.
4. If the trouble does not recur, or if the appropriate repairs and/or replacements have been made, the problem should be corrected.

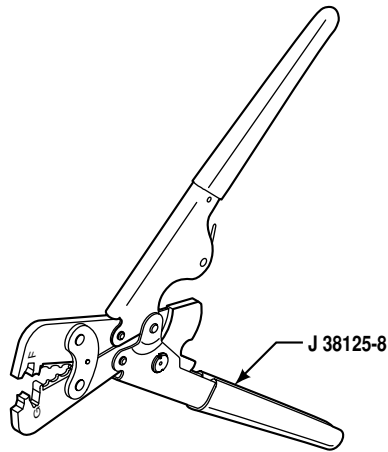
B. Special Tools

- Heat Gun, J 25070 or equivalent
- Crimping Tool for Pre-insulated Crimp J 38125-8 (Figure E–8)

NOTE: *Use crimping anvils “F” and “G.”*

- Wire Strippers, J 35615
- Splices P/N 23046604 14–16 AWG
- Splices P/N 23046605 18–22 AWG

NOTE: *Each splice must be properly crimped and then heated to shrink the covering to protect and insulate the splice. Insulation-piercing splice clips should not be used.*

APPENDIX E—CONNECTOR REPAIR INFORMATION

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Figure E-8. Crimper J 38125-8**C. Straight Lead Repair Procedure**

1. Locate the damaged wire.
2. Remove 8.0 mm (0.3 inch) of insulation from the end of each segment of the damaged wire.
3. Insert the stripped end of one wire into the crimp barrel of the splice, and crimp.
4. Insert the stripped end of the other wire into the other end of the crimp barrel, and crimp.
5. Pull on the connection to be sure of crimping integrity.
6. Heat the splice with a heat gun until the covering shrinks and adhesive flows from under the covering.
7. The splice is now sealed and insulated. Electrical tape is not necessary and should not be used.

APPENDIX E—CONNECTOR REPAIR INFORMATION

CONNECTOR	MFG. P/N	PART NAME	MANUFACTURER	CONFIG	MATING P/N	MFG. P/N	MATING PART NAME
TCM J2	15336800	STRAIN RELIEF, 32-WAY RED	DELPHI-PACKARD	1-PC/TCM J2	12186041	12186041	TCM HEADER
TCM J2	15305333	SEAL, 32-WAY	DELPHI-PACKARD	1-PC/TCM J2			
TCM J2	15305371	INNER CONNECT, 32-WAY	DELPHI-PACKARD	1-PC/TCM J2			
TCM J2	12129024	TPA, 32-WAY RED	DELPHI-PACKARD	1-PC/TCM J2			
TCM J2	12084912	TERMINAL, SOCKET 100W	DELPHI-PACKARD	1-PC/TCM J2			
TCM J2	12129557	CAVITY PLUG, 100W	DELPHI-PACKARD	1-PC/TCM J2			
TCM J2	12177289	CPA, 32-WAY RED	DELPHI-PACKARD	1-PC/TCM J2			
TCM J1	12191002	STRAIN RELIEF, 32-WAY GRAY	DELPHI-PACKARD	1-PC/TCM J1	12186043	12186043	TCM HEADER
TCM J1	15305333	SEAL, 32-WAY	DELPHI-PACKARD	1-PC/TCM J1			
TCM J1	15305371	INNER CONNECT, 32-WAY	DELPHI-PACKARD	1-PC/TCM J1			
TCM J1	12129022	TPA, 32-WAY GRAY	DELPHI-PACKARD	1-PC/TCM J1			
TCM J1	12084912	TERMINAL, SOCKET 100W	DELPHI-PACKARD	1-PC/TCM J1			
TCM J1	12129557	CAVITY PLUG, 100W	DELPHI-PACKARD	1-PC/TCM J1			
TCM J1	12177289	CPA, 32-WAY RED	DELPHI-PACKARD	1-PC/TCM J1			
TCM J1	12084913	TERMINAL, SOCKET 100W	DELPHI-PACKARD	1-PC/TCM J1			
GP19	15300027	CONNECTOR, 2-WAY	DELPHI-PACKARD	1-PC/COMP J1	15300002	15300002	CONNECTOR, 2-WAY
GP19	12077411	TERMINAL, SOCKET	DELPHI-PACKARD	1-PC/COMP J1	12048159	12048159	TERMINAL, PIN
GP19	12089444	SEAL, WIRE TYPE, SILICONE	DELPHI-PACKARD	1-PC/COMP J1	12089444	12089444	SEAL, WIRE TYPE, SILICONE
GP19	15300014	LOCK, SECONDARY	DELPHI-PACKARD	1-PC/COMP J1	15300014	15300014	LOCK, SECONDARY
J1939	DT06-3S-E008	CONNECTOR, PLUG 3-WAY	DEUTSCH	1-PC/COMP J1		DT04-3P-E008	CONNECTOR, REC., 3-WAY
J1939	W3S	WEDGELOCK, PLUG	DEUTSCH	1-PC/COMP J1		W3P	WEDGELOCK, RECEPTACLE
J1939	29511366	CONTACT, SOCKET #16	DEUTSCH	1-PC/COMP J1	29511369	3660-201-1690	CONTACT, PIN #16
J1939	29538614	CONTACT, EXTENDED SOCKET	DEUTSCH	1-PC/COMP J1		0460-247-1631	CONTACT, EXTENDED PIN
J1939		CABLE, J1939 DATABUS		1-PC/COMP J1			
VIW X	12160542	CONN 20M MIC/P 100W GRAY	DELPHI-PACKARD	1-PC/COMP J1	12160280	12160280	CONN 20F MIC/P 100W GRAY
VIW X	12110693	CABLE SEAL, 14M GREEN	DELPHI-PACKARD	1-PC/COMP J1	15304882	15304882	CABLE SEAL, 14F GRAY
VIW X	12191178	LOCK ASSIST/SEAL, 20M WHITE	DELPHI-PACKARD	1-PC/COMP J1	12191173	12191173	LOCK, SECONDARY 20F WHITE
VIW X	12160551	TERMINAL, PIN 100W	DELPHI-PACKARD	1-PC/COMP J1	12084912	12084912	TERMINAL, SOCKET 100W
VIW X	12129557	CAVITY PLUG, 100W	DELPHI-PACKARD	1-PC/COMP J1	12129557	12129557	CAVITY PLUG, 100W
VIW X	12176394	CONDUIT CLIP, 13 mm BLACK	DELPHI-PACKARD	1-PC/COMP J1	12176394	12176394	CONDUIT CLIP, 13 mm BLACK
VIW Y	12160280	CONN 20F MIC/P 100W GRAY	DELPHI-PACKARD	1-PC/COMP J1	12160280	12160280	CONN 20F MIC/P 100W GRAY
VIW Y	15304882	CABLE SEAL, 16F RED	DELPHI-PACKARD	1-PC/COMP J1	15304882	15304882	CABLE SEAL, 14F GRAY
VIW Y	12191172	LOCK SECONDARY, 20F BLUE	DELPHI-PACKARD	1-PC/COMP J1	12191172	12191172	LOCK, SECONDARY 20F BLUE
VIW Y	12084912	TERMINAL, SOCKET 100W	DELPHI-PACKARD	1-PC/COMP J1	12084912	12084912	TERMINAL, SOCKET 100W
VIW Y	12129557	CAVITY PLUG, 100W	DELPHI-PACKARD	1-PC/COMP J1	12129557	12129557	CAVITY PLUG, 100W
VIW Y	12176394	CONDUIT CLIP, 13 mm BLACK	DELPHI-PACKARD	1-PC/COMP J1	12176394	12176394	CONDUIT CLIP, 13 mm BLACK
RMR	12015795	CONNECTOR, 3-WAY	DELPHI-PACKARD	1-PC/COMP J1	12015092	12015092	CONNECTOR, SHROUD 3-WAY
RMR	12089040	TERMINAL, PIN	DELPHI-PACKARD	1-PC/COMP J1	12089188	12089188	TERMINAL, SOCKET
RMR	12089444	SEAL, WIRE TYPE, SILICONE	DELPHI-PACKARD	1-PC/COMP J1	12089444	12089444	SEAL, WIRE TYPE, SILICONE

APPENDIX E—CONNECTOR REPAIR INFORMATION

CONNECTOR	MFG. P/N	PART NAME	MANUFACTURER	CONFIG	MATING P/N	MFG. P/N	MATING PART NAME
NE	12162193	CONNECTOR, 2-WAY	DELPHI-PACKARD	1-PC/COMP J2	12066016		ENGINE SPEED SENSOR
NE	12103881	TERMINAL, 150F	DELPHI-PACKARD	1-PC/COMP J2	Actual sensor uses molded receptacle similar to 12066016		
NO	12162193	CONNECTOR, 2-WAY	DELPHI-PACKARD	1-PC/COMP J2			OUTPUT SPEED SENSOR
NO	12103881	TERMINAL, 150F	DELPHI-PACKARD	1-PC/COMP J2	Actual sensor uses molded receptacle similar to 12066016		
NT	12162193	CONNECTOR, 2-WAY	DELPHI-PACKARD	1-PC/COMP J2			TURBINE SPEED SENSOR
NT	12103881	TERMINAL, 150F	DELPHI-PACKARD	1-PC/COMP J2	Actual sensor uses molded receptacle similar to 12066016		
TPS	12015793	CONNECTOR, 3-WAY	DELPHI-PACKARD	1-PC/COMP J2			TPS HEADER
TPS	12089040	TERMINAL, PIN	DELPHI-PACKARD	1-PC/COMP J2	TPS header similar to 12010717 connector with 12089188 sockets molded into the TPS.		
TPS	12089444	SEAL, WIRE TYPE, SILICONE	DELPHI-PACKARD	1-PC/COMP J2			
H2OT	12015792	CONNECTOR, TOWER, 2-WAY	DELPHI-PACKARD	ADAPTER (MDR)	12010973	12010973	CONNECTOR, SHROUD, 2-WAY
H2OT	12089040	TERMINAL, PIN	DELPHI-PACKARD	ADAPTER (MDR)	12089188	12089188	TERMINAL, SOCKET
H2OT	12089444	SEAL, SILICONE	DELPHI-PACKARD	ADAPTER (MDR)	12089444	12089444	SEAL, WIRE TYPE, SILICONE
NSBU	12191757	CONNECTOR, TOWER, 4-WAY	DELPHI-PACKARD	1-PC/COMP J2		12459915	NSBU
NSBU	12048086	SEAL, WIRE TYPE, DK RED	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	12129802	TERMINAL, 150F	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	15416722	CONNECTOR, 12-WAY	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	15441828	BACKSHELL	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	12191819	18 GAUGE, 18AWG TXL	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	12191818	20 GAUGE, 20AWG TXL	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	15366684	14 GAUGE, 14AWG TXL	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	15304719	18 GAUGE, 18AWG TXL	DELPHI-PACKARD	1-PC/COMP J2			
NSBU	15304718	20 GAUGE, 20AWG TXL	DELPHI-PACKARD	1-PC/COMP J2			
TLCT	12160280	CONN 20F MIC/P 100W GRAY	DELPHI-PACKARD	1-PC/COMP J2	12160782		CONN 20M MIC/P 100W
TLCT	12177159	CABLE SEAL, 20F ORANGE	DELPHI-PACKARD	1-PC/COMP J2		15317365	LOCK ASST/SEAL 20M MIC/P100W
TLCT	12160494	LOCK, SECONDARY 20F GREEN	DELPHI-PACKARD	1-PC/COMP J2			
TLCT	12084912	TERMINAL, SOCKET 100W	DELPHI-PACKARD	1-PC/COMP J2	12160551		TERMINAL, PIN 100W
TLCT	12129557	CAVITY PLUG, 100W	DELPHI-PACKARD	1-PC/COMP J2			
TLCT	12176394	CONDUIT CLIP, 13MM BLACK	DELPHI-PACKARD	1-PC/COMP J2			
BLKHD RCP	29511368	CONNECTOR, REC., 31-WAY	DEUTSCH	TCM J2/COMP	29511365		CONNECTOR, PLUG, 31-WAY
BLKHD RCP	29511369	CONTACT, PIN #16	DEUTSCH	TCM J2/COMP	29511366		CONTACT, SOCKET #16
BLKHD RCP	29511371	SEALING PLUG	DEUTSCH	TCM J2/COMP	29511371		SEALING PLUG
BLKHD RCP	29514041	HOUSING, BACKSHELL, 24/19	DEUTSCH	TCM J2/COMP	29514041		HOUSING, BACKSHELL, 24/19
BLKHD RCP	29514042	FOLLOWER, BACKSHELL, 24/19	DEUTSCH	TCM J2/COMP	29514042		FOLLOWER, BACKSHELL, 24/19
BLKHD RCP	29514043	GROMMET, BACKSHELL #24	DEUTSCH	TCM J2/COMP	29514043		GROMMET, BACKSHELL, 24/19
BLKHD RCP	29527000	NUT, PANEL	DEUTSCH	TCM J2/COMP	—		
BLKHD RCP	29512839	O-RING	DEUTSCH	TCM J2/COMP	—		
BLKHD PGP	29511855	CONNECTOR, PLUG, 31-WAY	DEUTSCH	COMP J2	29511854		CONNECTOR, REC., 31-WAY
BLKHD PGP	29511369	CONTACT, PIN #16	DEUTSCH	COMP J2	29511366		CONTACT, SOCKET #16
BLKHD PGP	29511371	SEALING PLUG	DEUTSCH	COMP J2	29511371		SEALING PLUG
BLKHD PGP	29514041	HOUSING, BACKSHELL, 24/19	DEUTSCH	COMP J2	29514041		HOUSING, BACKSHELL, 24/19

APPENDIX E—CONNECTOR REPAIR INFORMATION

CONNECTOR	MFG. P/N	PART NAME	MANUFACTURER	CONFIG	MATING P/N	MFG. P/N	MATING PART NAME
BLKHD PGP	29514042	FOLLOWER, BACKSHELL, 24/19	DEUTSCH	COMP J2	29514042		FOLLOWER, BACKSHELL
BLKHD PGP	29514043	GROMMET, BACKSHELL #24	DEUTSCH	COMP J2	—		
BLKHD RCS	29511854	CONNECTOR, REC., 31-WAY	DEUTSCH	TCM J2/COMP	29511855		CONNECTOR, PLUG, 31-WAY
BLKHD RCS	29511366	CONTACT, SOCKET #16	DEUTSCH	TCM J2/COMP	29511369		CONTACT, PIN #16
BLKHD RCS	29511371	SEALING PLUG	DEUTSCH	TCM J2/COMP	29511371		SEALING PLUG
BLKHD RCS	29514041	HOUSING, BACKSHELL, 24/19	DEUTSCH	TCM J2/COMP	29514041		HOUSING, BACKSHELL, 24/19
BLKHD RCS	29514042	FOLLOWER, BACKSHELL, 24/19	DEUTSCH	TCM J2/COMP	29514042		FOLLOWER, BACKSHELL, 24/19
BLKHD RCS	29527000	NUT, PANEL	DEUTSCH	TCM J2/COMP	—		
BLKHD RCS	29512839	O-RING	DEUTSCH	TCM J2/COMP	—		
BLKHD PGS	29511365	CONNECTOR, PLUG, 31-WAY	DEUTSCH	COMP J1	29511368		CONNECTOR, REC., 31-WAY
BLKHD PGS	29511366	CONTACT, SOCKET #16	DEUTSCH	COMP J1	29511369		CONTACT, PIN #16
BLKHD PGS	29511371	SEALING PLUG	DEUTSCH	COMP J1	29511371		SEALING PLUG
BLKHD PGS	29514041	HOUSING, BACKSHELL, 24/19	DEUTSCH	COMP J1	29514041		HOUSING, BACKSHELL, 24/19
BLKHD PGS	29514042	FOLLOWER, BACKSHELL, 24/19	DEUTSCH	COMP J1	29514042		FOLLOWER, BACKSHELL, 24/19
BLKHD PGS	29514043	GROMMET, BACKSHELL #24	DEUTSCH	COMP J1	29514043		GROMMET, BACKSHELL, #24

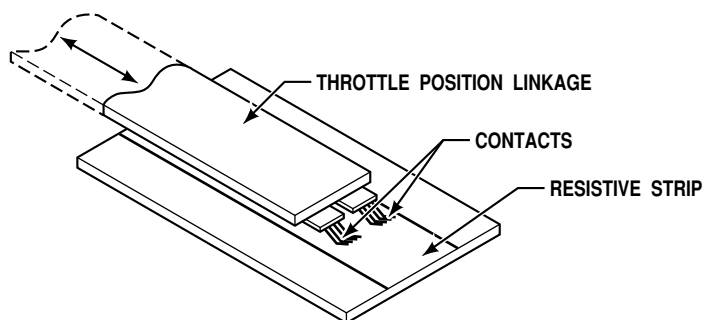
APPENDIX E—CONNECTOR REPAIR INFORMATION

NOTES

APPENDIX F—TPS ADJUSTMENT

A. Description of Operation

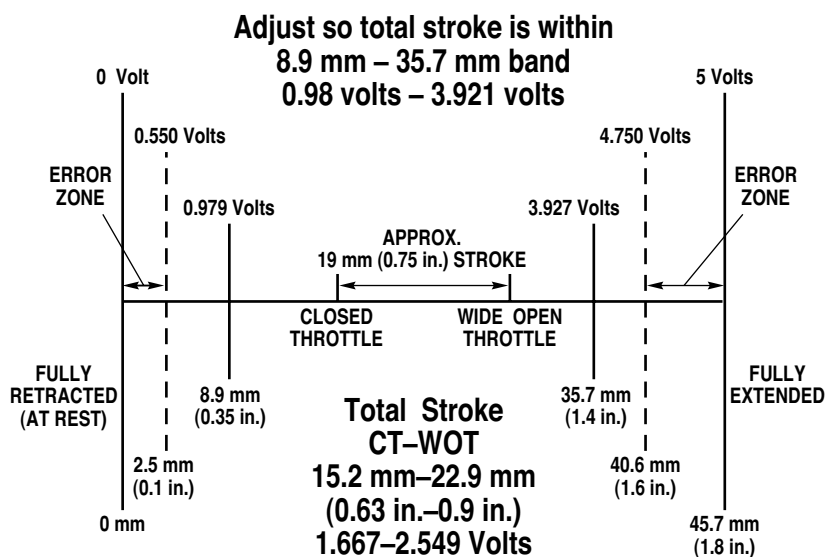
1. To properly communicate throttle position to the TCM, the throttle position sensor must convert mechanical movement to an electrical form the TCM can understand. To accomplish this, contacts move across a resistive strip inside the sensor which translates position into voltage (Figure F-1).



V00656.01

Figure F-1. Throttle Position-to-Voltage Conversion

2. Each position gives a different voltage. The TCM then converts this voltage into throttle percent. Each millimeter of travel converts to approximately 0.110 volts. Figure F-2 diagrams the voltage and throttle movement relationship.



V05746.00.01

Figure F-2. Throttle Position Determination Diagram

3. Throttle percent is proportional to the amount of travel of the throttle position sensor. Therefore a small amount of travel corresponds to a low throttle percentage, and a large amount of travel corresponds to a high throttle percentage (Table F-1, Page F-3).

APPENDIX F—TPS ADJUSTMENT

4. The throttle position sensor is self-calibrating within its normal range of operation. Each time the vehicle is started and the TCM is initialized, the idle position that is stored for closed throttle is increased from its previous lowest reading. Also, the wide open throttle position is reduced from its previous highest reading. Once the new position is read from the TPS, the idle and wide open throttle set points are continuously readjusted to the lowest and highest points, respectively. This compensates for fuel control system wear or previous mechanical adjustment. One area of particular concern is when the throttle sensor extends into the error zone. This indicates a TPS misadjustment to the TCM, and 100 percent throttle is assumed until readjustment is performed. Simply clearing the DTC will not resolve the situation; use the Scan Tool to reset the TPS calibrations after a TPS adjustment.

B. Throttle Position Sensor (TPS) Adjustment

When properly installed by the equipment manufacturer (Figure F-3), the TPS should not require adjustment. Confirm that the throttle sensor is installed to manufacturer specifications before adjusting the throttle position sensor. The idle position should be approximately 8.9 mm or 0.98 volts or higher, and the full throttle position should be approximately 35.7 mm or 3.921 volts or lower. The TPS is self-calibrating, meaning there is no optimum closed throttle or wide open position. As long as the travel is within the 8.5–35.7 mm range the TPS is set properly. A total stroke of 15.2–22.9 mm must be maintained. Watch the movement of the throttle sensor as the controls move it through the full stroke. Make certain the idle and full throttle positions are not in the error zones (refer to Figure F-2). The error zones occur when the idle position is less than 2.5 mm, or when the full throttle position is more than 40.6 mm. When idle or wide open throttle positions are in the error zones, the TCM will log a code. When a TPS code is logged the TCM assumes a default throttle setting which will negatively affect shift quality.

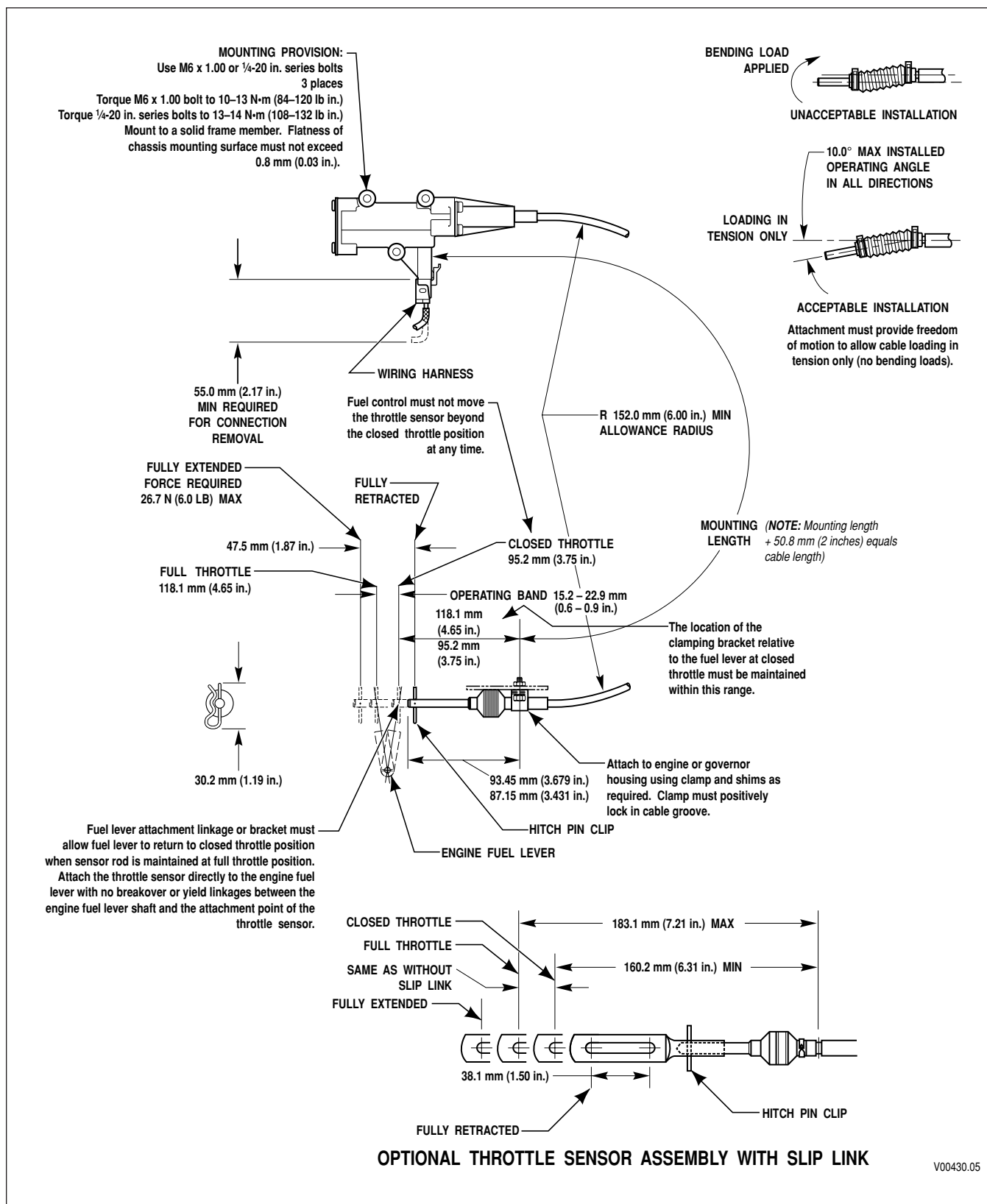
NOTE: Use Test Harness J 41339 for measuring voltages.

APPENDIX F—TPS ADJUSTMENT**Table F–1. Distance (mm) of Travel Versus Volts**

mm	Volts
0	0
1	0.110
2	0.220
3	0.329
4	0.439
5	0.549
6	0.659
7	0.768
8	0.878
9	0.988
10	1.098
11	1.207
12	1.317
13	1.427
14	1.537
15	1.646
16	1.756
17	1.866
18	1.976
19	2.085
20	2.195
21	2.305
22	2.415
23	2.524

mm	Volts
24	2.634
25	2.744
26	2.854
27	2.964
28	3.073
29	3.183
30	3.293
31	3.403
32	3.512
33	3.622
34	3.732
35	3.842
36	3.951
37	4.061
38	4.171
39	4.281
40	4.390
41	4.500
42	4.610
43	4.720
44	4.829
45	4.939
46	5.049

APPENDIX F—TPS ADJUSTMENT



V00430.05

Figure F-3. Throttle Position Sensor Adjustment

APPENDIX G—WELDING ON VEHICLE/VEHICLE INTERFACE MODULE

1-1. WELDING ON VEHICLE

When frame or other welding is required on the vehicle, take the following precautions to protect the electronic control components:

1. Disconnect the wiring harness connectors at the transmission control module (TCM).
2. Disconnect the positive and negative battery connections, and any electronic control ground wires connected to the frame or chassis.
3. Cover electronic control components and wiring to protect them from hot sparks, etc.
4. Do not connect welding cables to electronic control components.

WARNING!

Do not jump start a vehicle with arc welding equipment. Arc welding equipment's dangerously high currents and voltages cannot be reduced to safe levels.

APPENDIX G—WELDING ON VEHICLE/VEHICLE INTERFACE MODULE

NOTES

APPENDIX H—HYDRAULIC SCHEMATICS

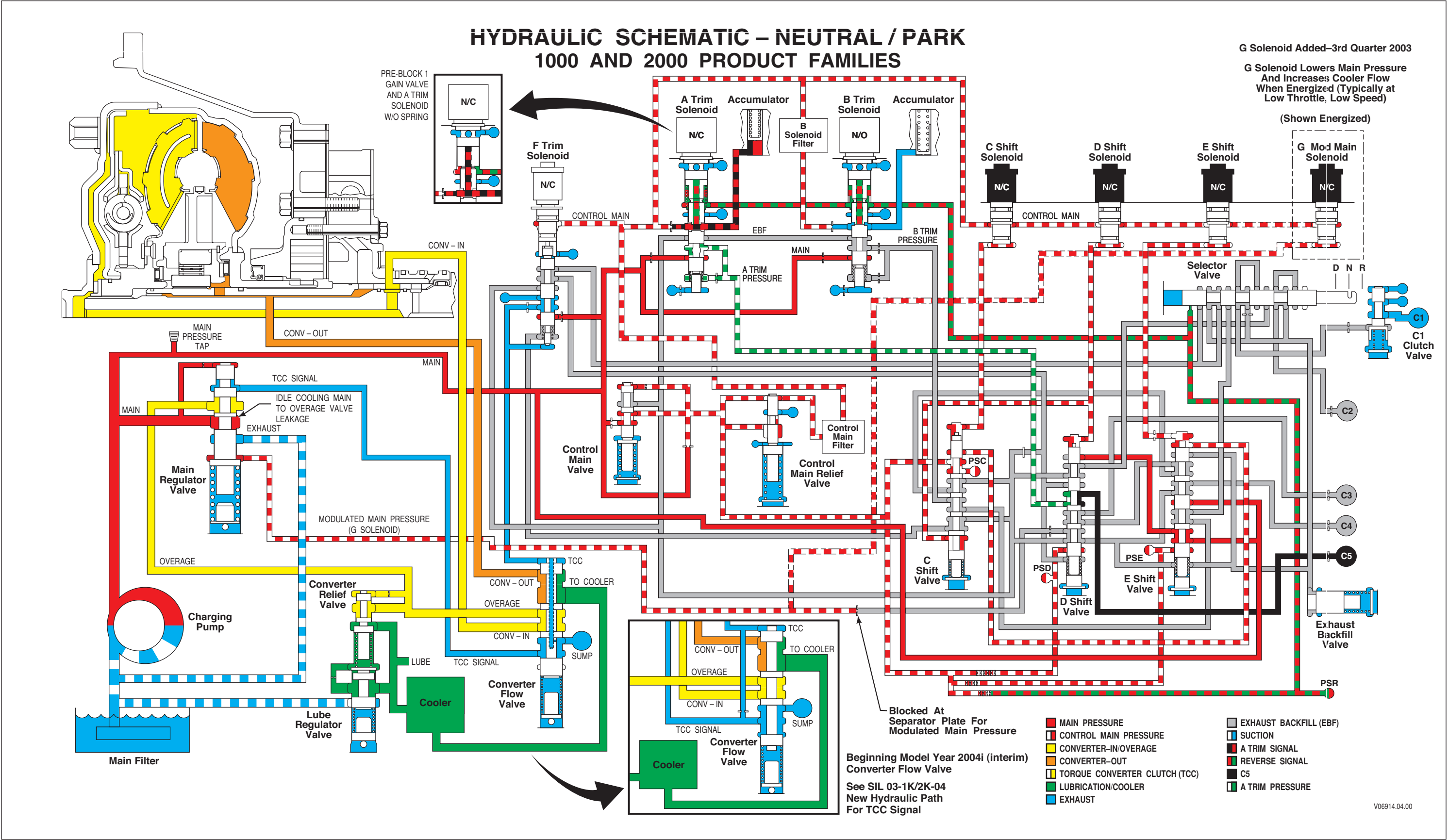
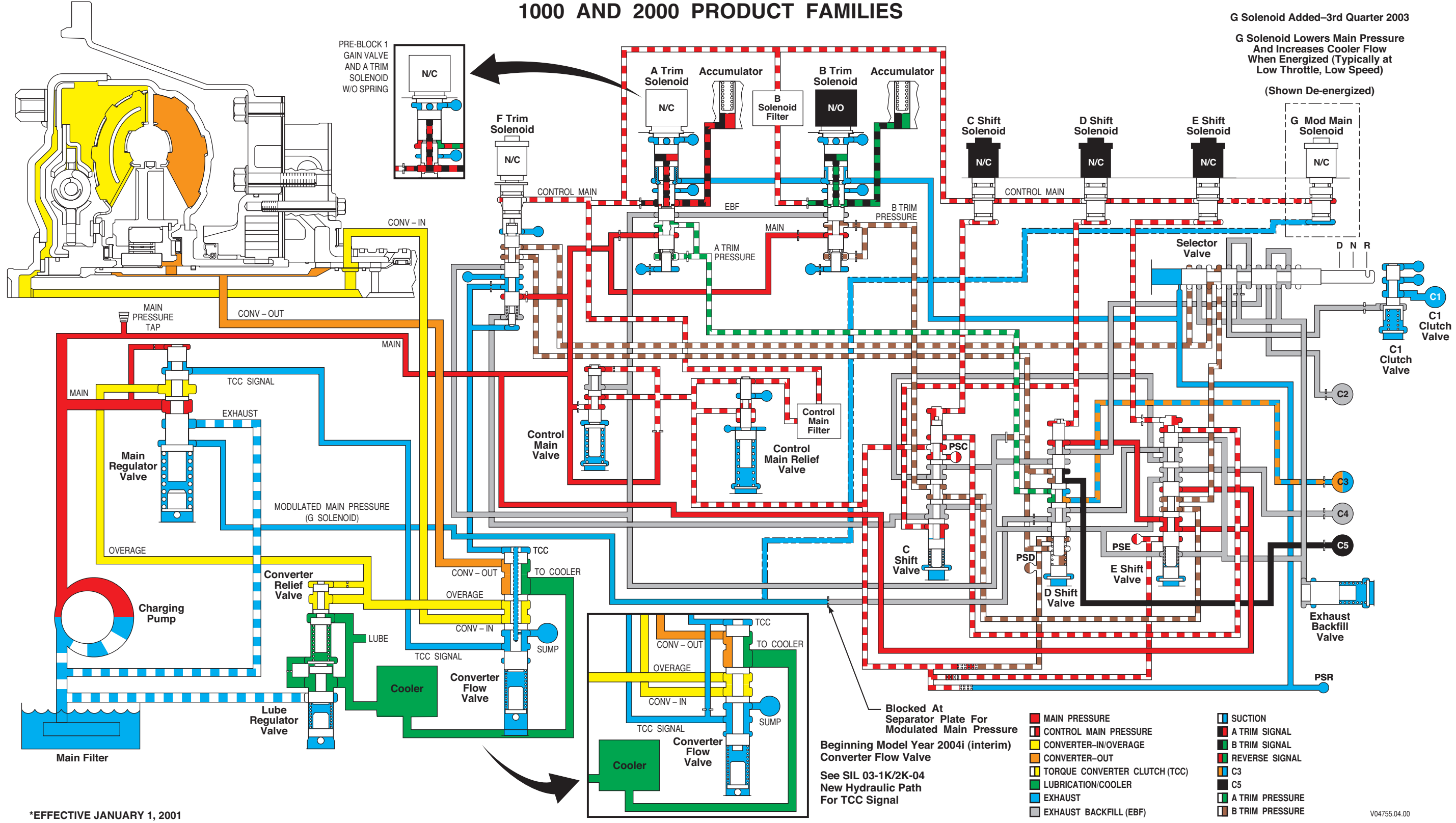


Figure H-1. Hydraulic Schematic — Neutral/Park

APPENDIX H—HYDRAULIC SCHEMATICS

HYDRAULIC SCHEMATIC – REVERSE (PRIOR TO, AND INCLUDING, NO4* SOFTWARE WITH THROTTLE APPLIED)
1000 AND 2000 PRODUCT FAMILIES



*EFFECTIVE JANUARY 1, 2001

V04755.04.00

Figure H-2. Hydraulic Schematic — Reverse (Prior To Software Level N04)

APPENDIX H—HYDRAULIC SCHEMATICS

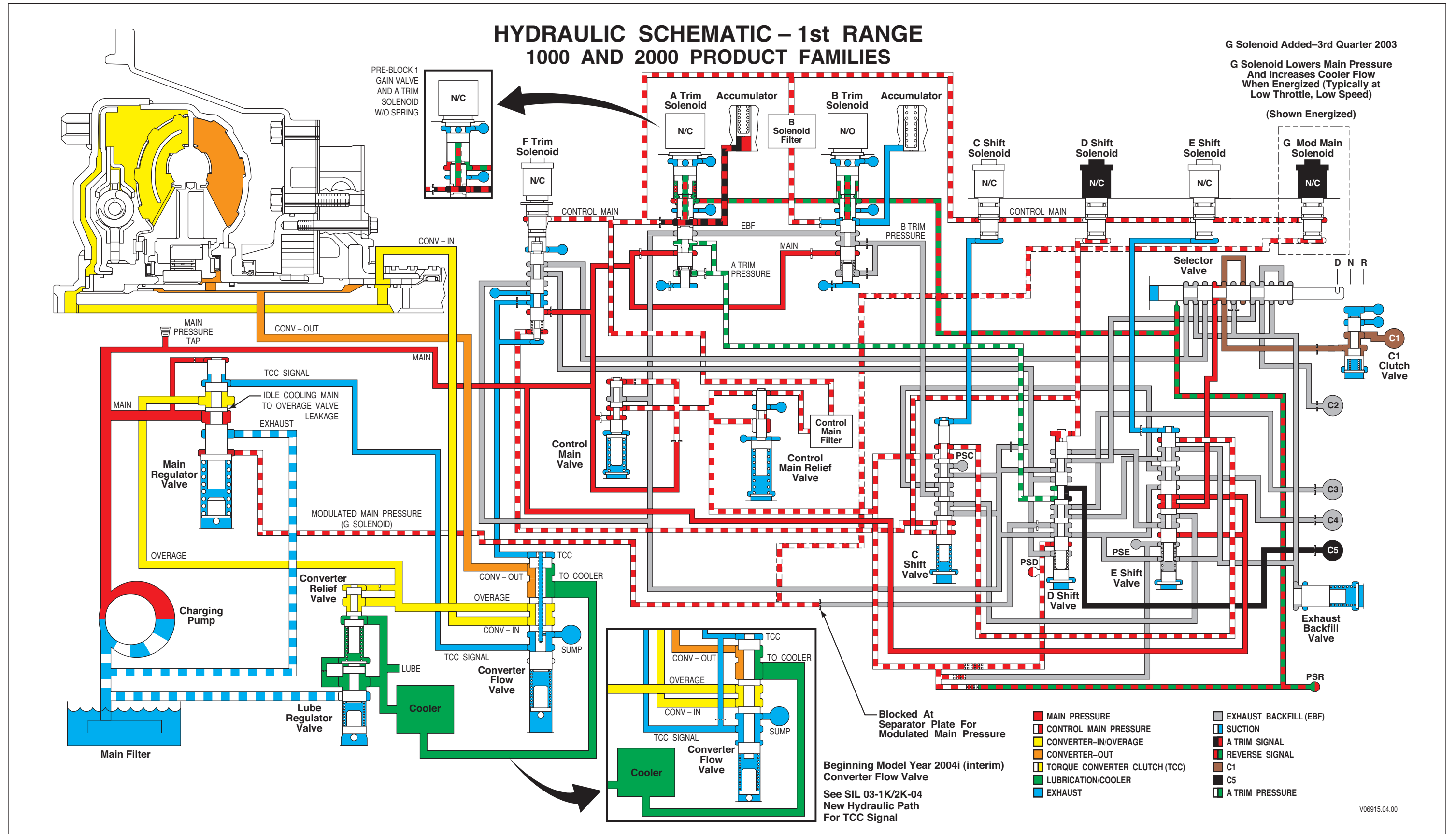


Figure H-4. Hydraulic Schematic — 1st Range

APPENDIX H—HYDRAULIC SCHEMATICS

HYDRAULIC SCHEMATIC – 2nd RANGE 1000 AND 2000 PRODUCT FAMILIES

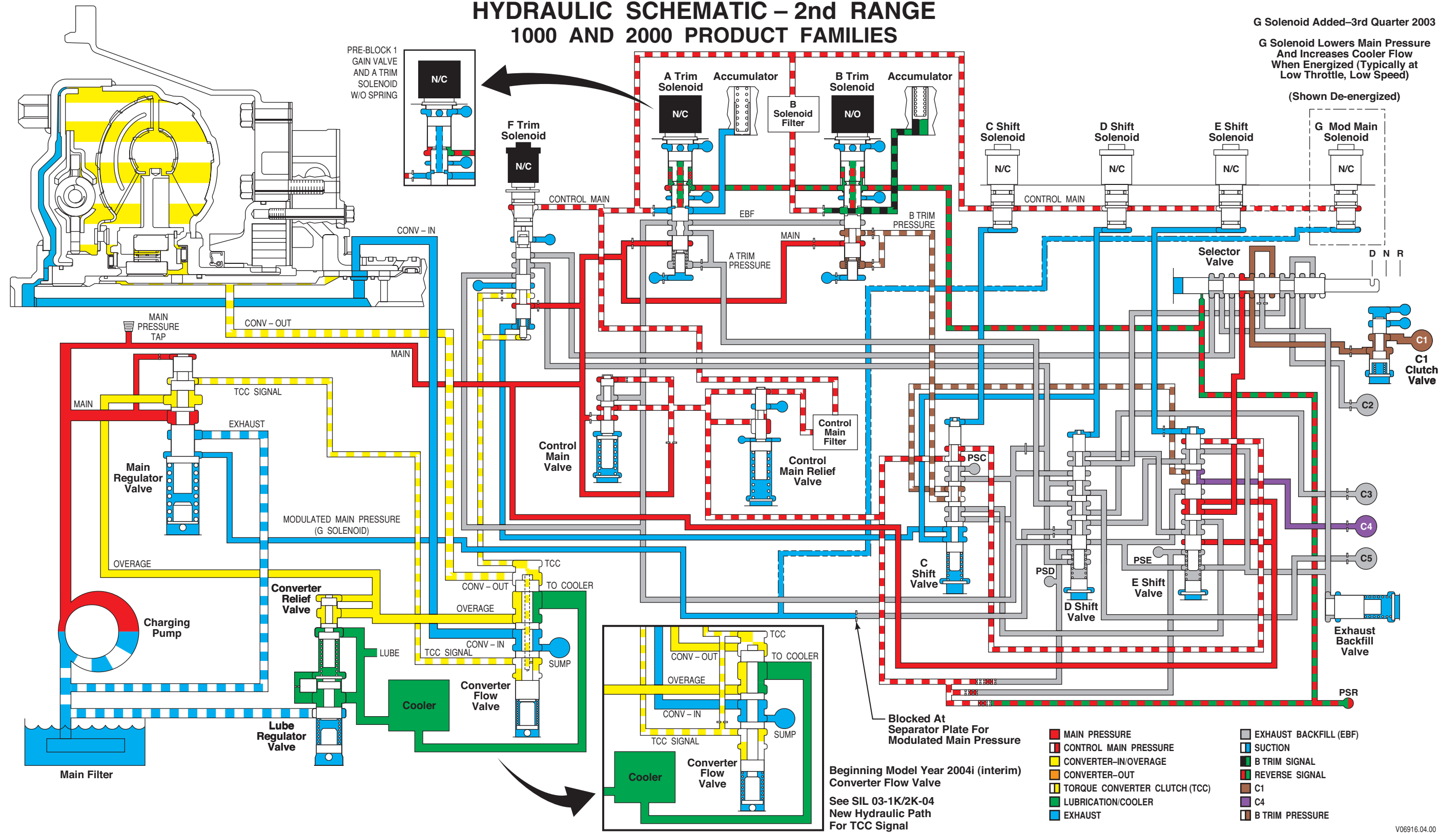


Figure H-5. Hydraulic Schematic — 2nd Range

APPENDIX H—HYDRAULIC SCHEMATICS

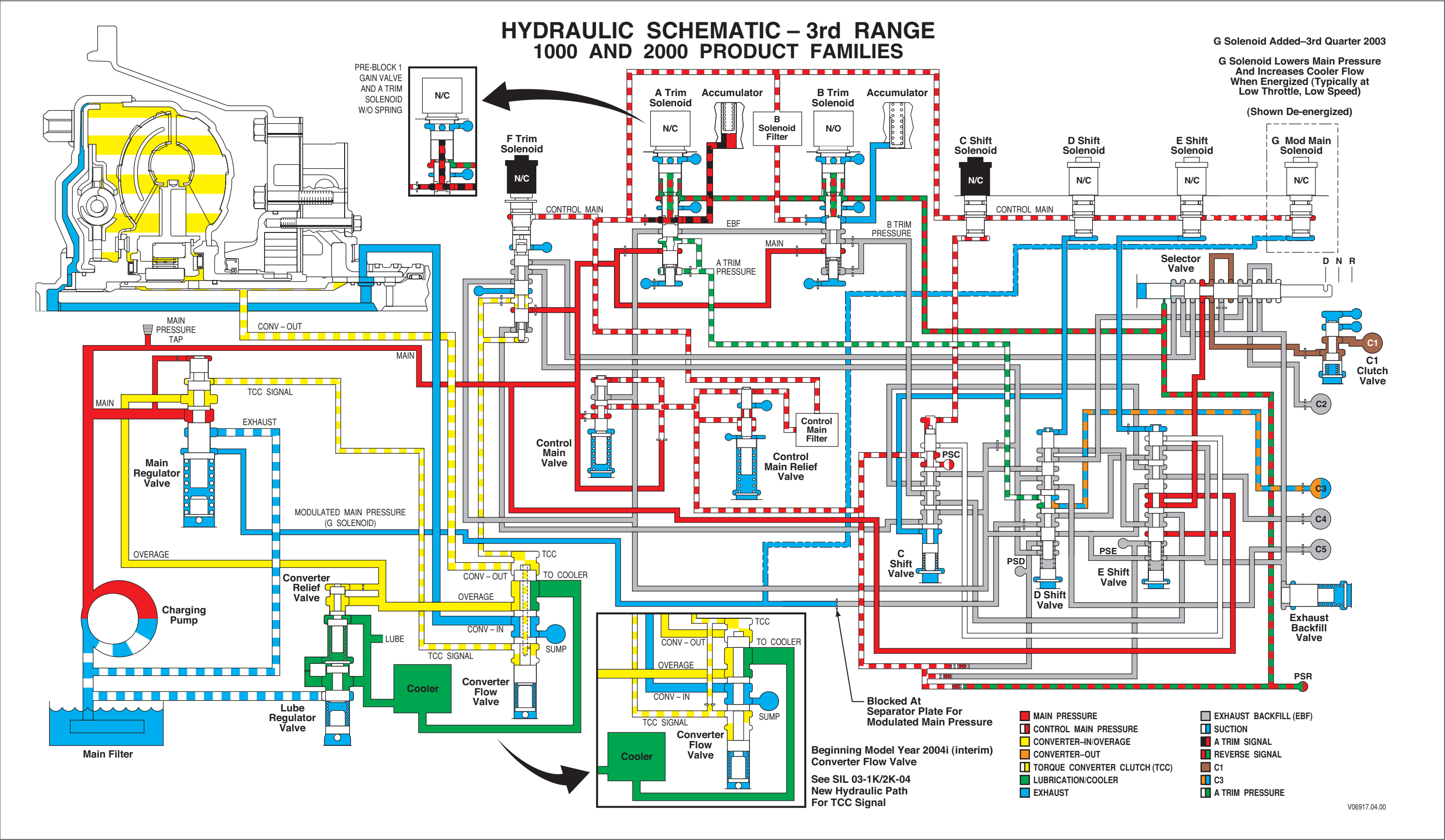


Figure H-6. Hydraulic Schematic — 3rd Range

APPENDIX H—HYDRAULIC SCHEMATICS

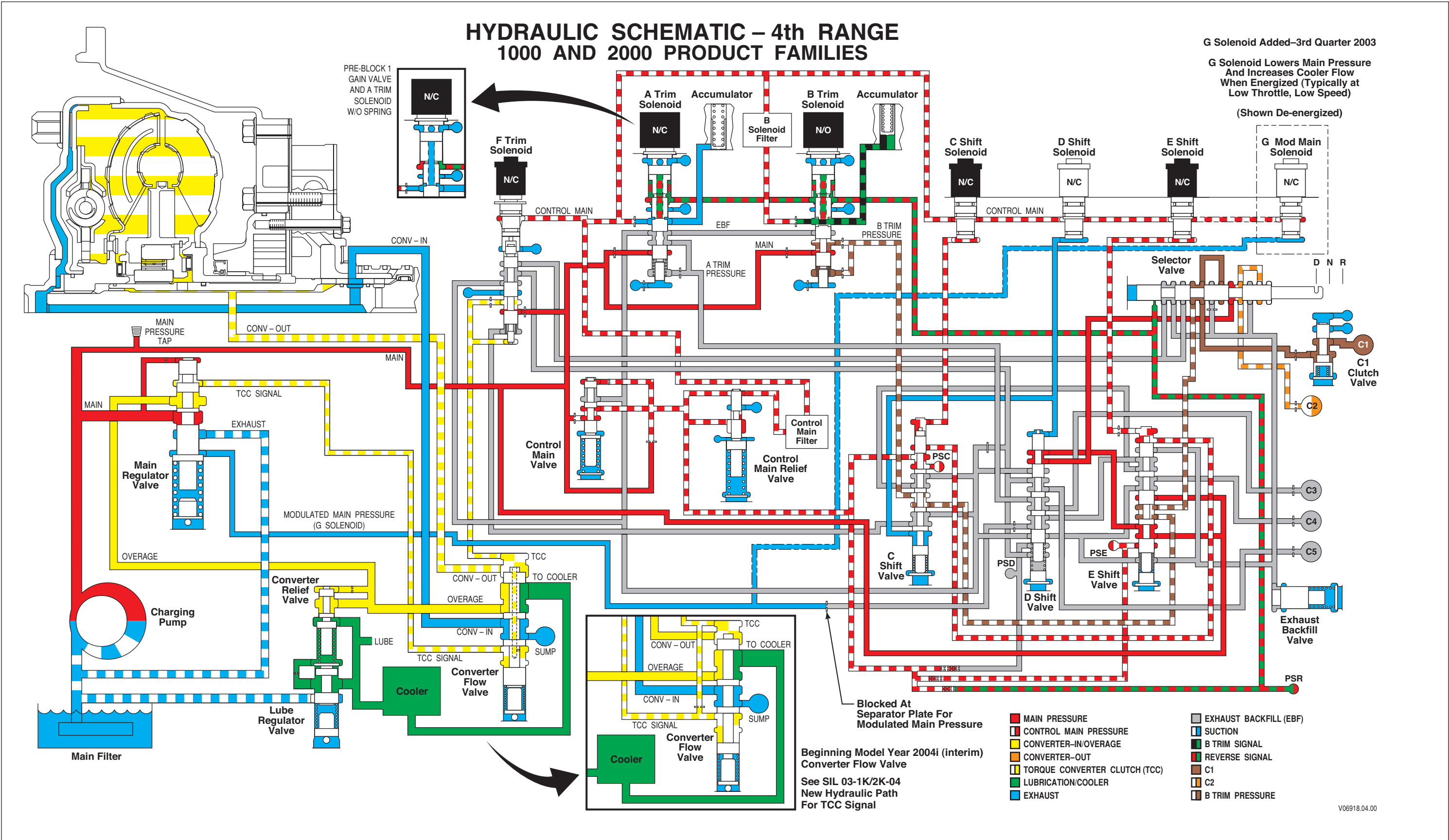


Figure H-7. Hydraulic Schematic — 4th Range

APPENDIX H—HYDRAULIC SCHEMATICS

HYDRAULIC SCHEMATIC – HYDRAULIC DEFAULT FORWARD (3rd RANGE "LIMP HOME") 1000 AND 2000 PRODUCT FAMILIES

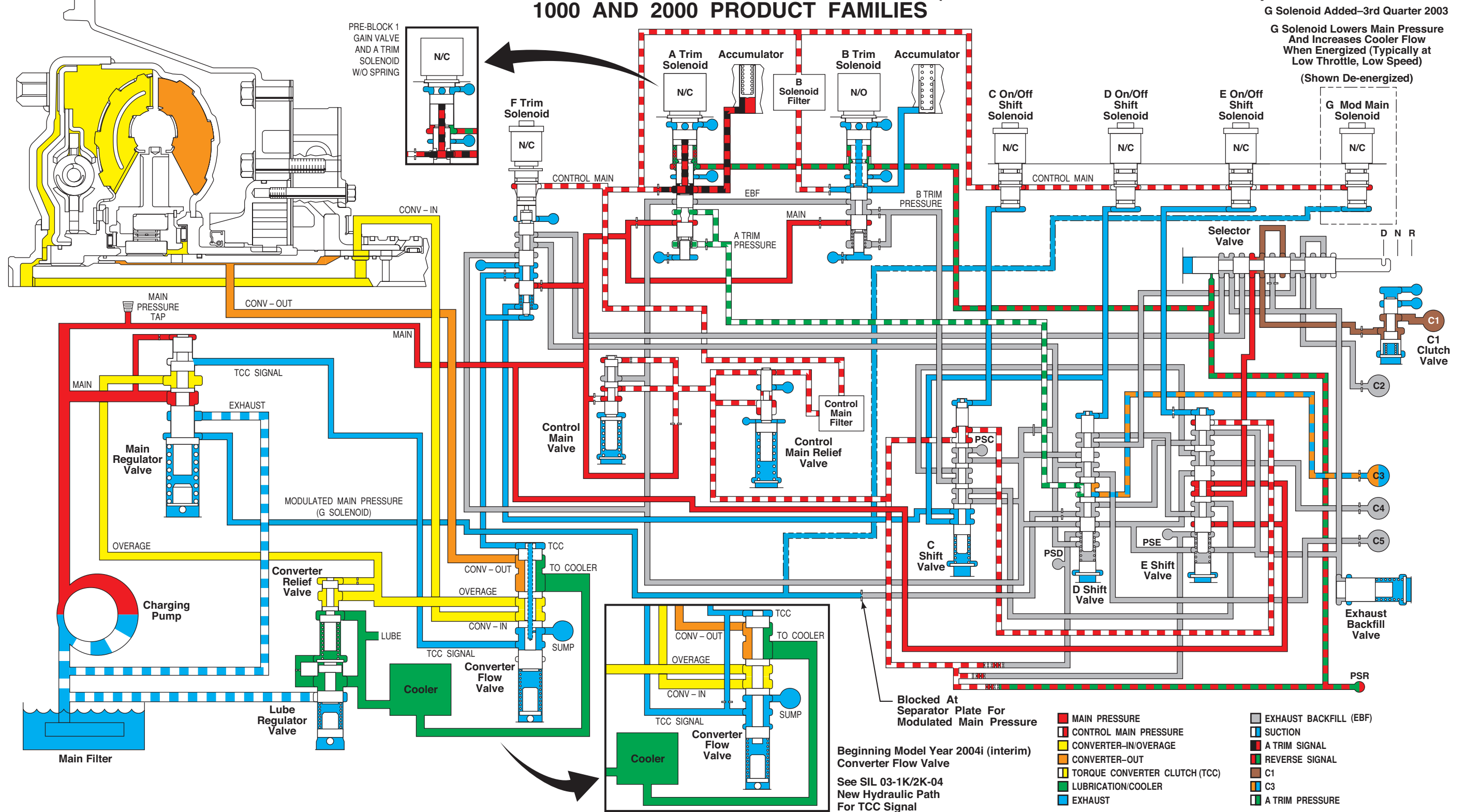


Figure H–9. Hydraulic Schematic — Hydraulic Default Forward

APPENDIX H—HYDRAULIC SCHEMATICS

HYDRAULIC SCHEMATIC – HYDRAULIC DEFAULT REVERSE ("LIMP HOME") 1000 AND 2000 PRODUCT FAMILIES

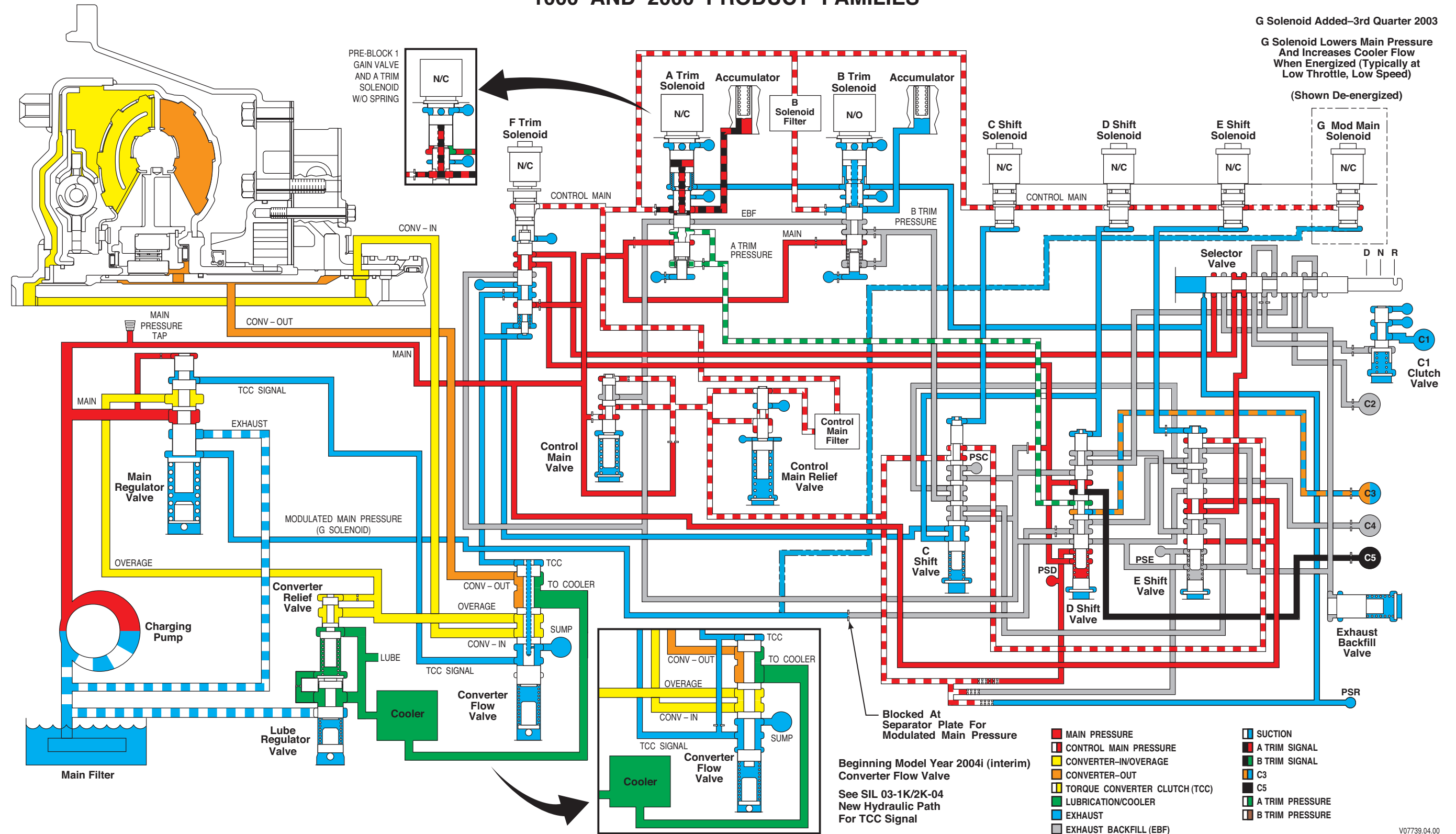


Figure H-10. Hydraulic Schematic — Hydraulic Default Reverse

APPENDIX J — WIRING SCHEMATICS

1000 AND 2000 PRODUCT FAMILIES WIRING SCHEMATIC

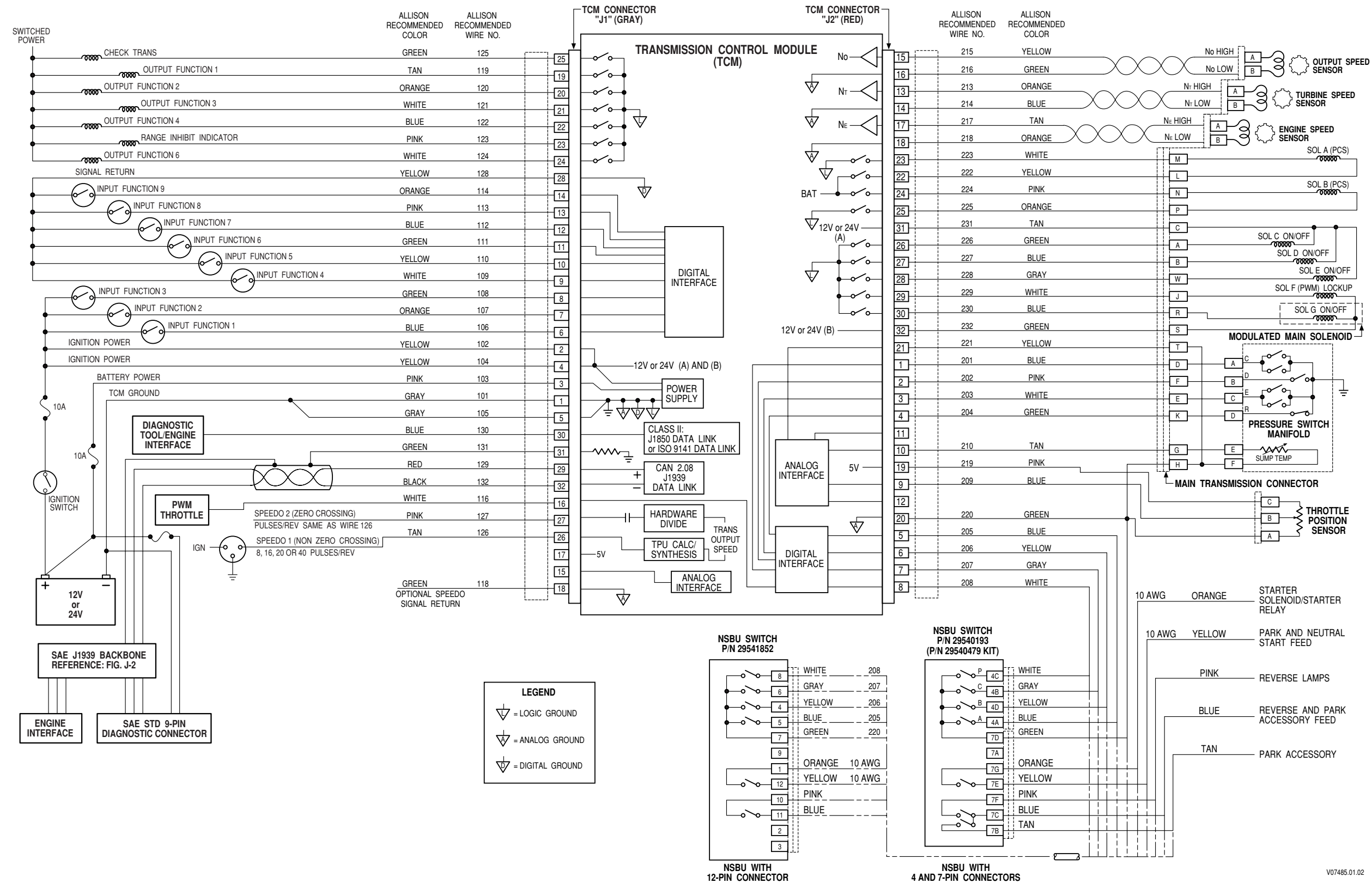
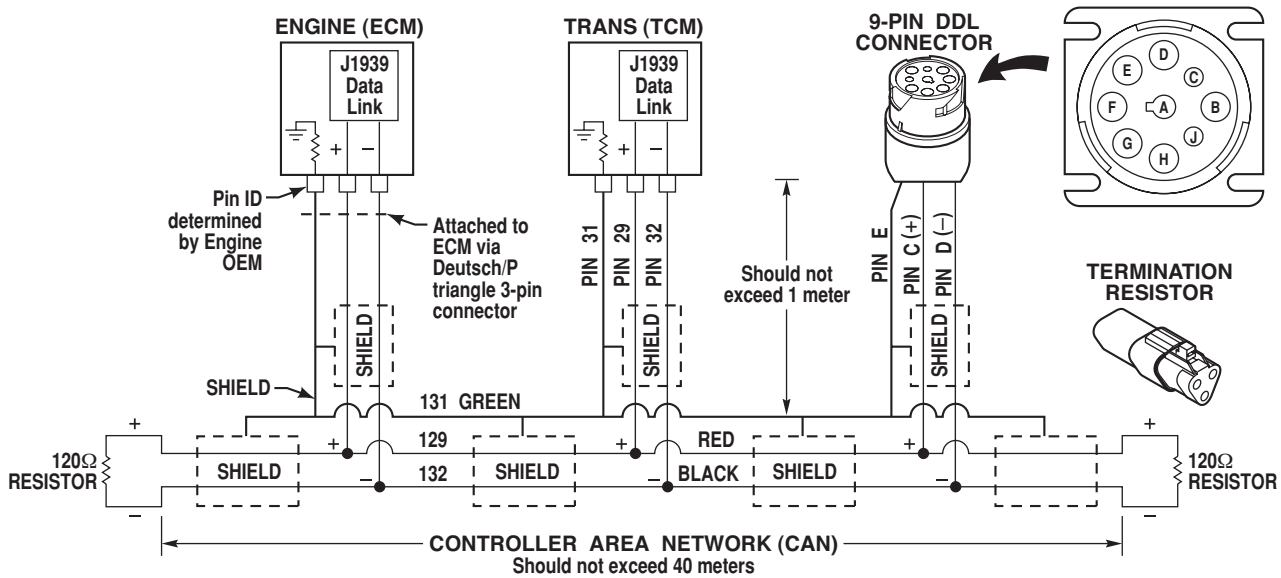


Figure J-1. 1000 and 2000 Product Families Wiring Schematic

APPENDIX J—WIRING SCHEMATICS



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Figure J-2. J1939 Backbone (CAN Bus)

APPENDIX J—WIRING SCHEMATICS

NOTES

APPENDIX K—RESISTANCE VS. TEMPERATURE

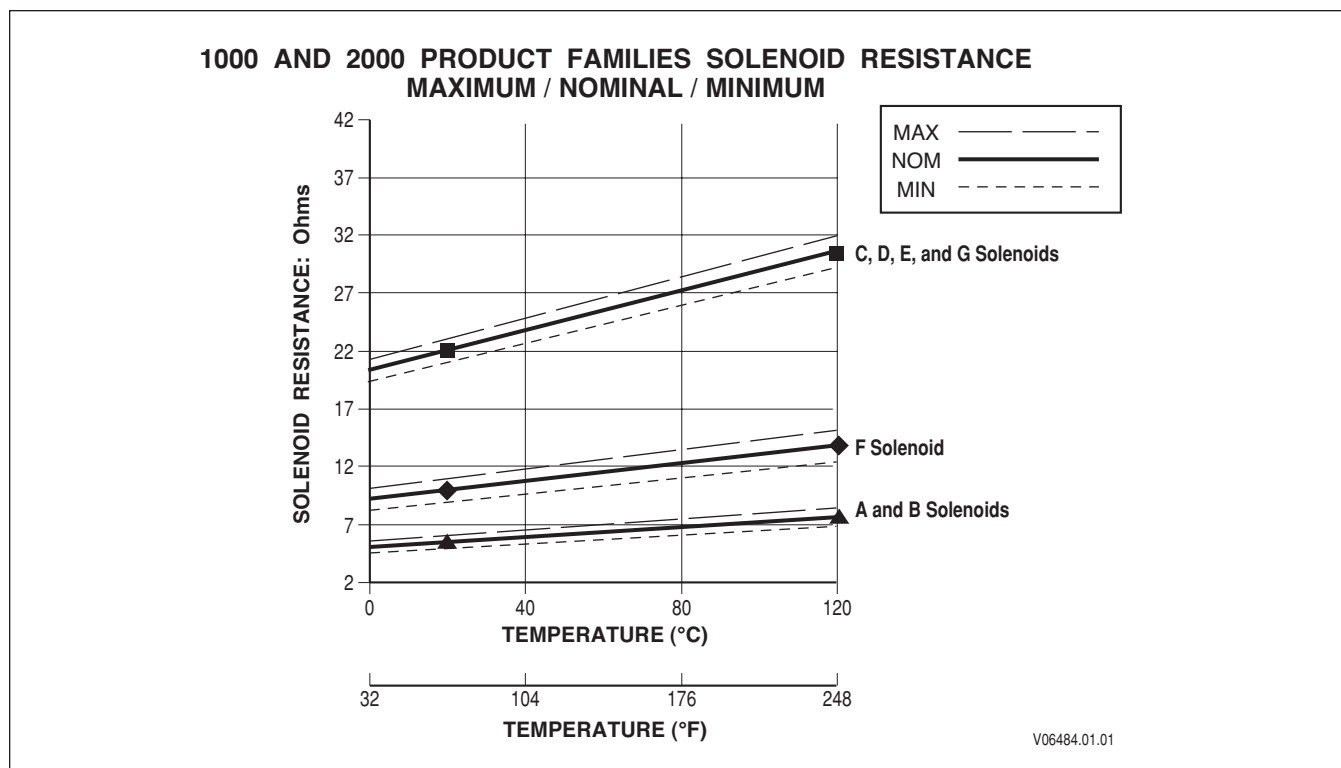


Figure K-1. Solenoid Resistance vs. Temperature Graph

Table K-1. Solenoid Resistance vs. Temperature

Sump Temperature		Solenoid A, B Resistance	Solenoid C, D, E, G Resistance	Solenoid F Resistance
(°C)	(°F)	(Ω)	(Ω)	(Ω)
0	32	4.5	20.0	9.5
20	68	5.5	22.0	10.5
40	104	6.5	24.5	11.5
80	176	7.5	27.0	12.5
120	248	8.5	29.5	13.5

APPENDIX K—RESISTANCE VS. TEMPERATURE

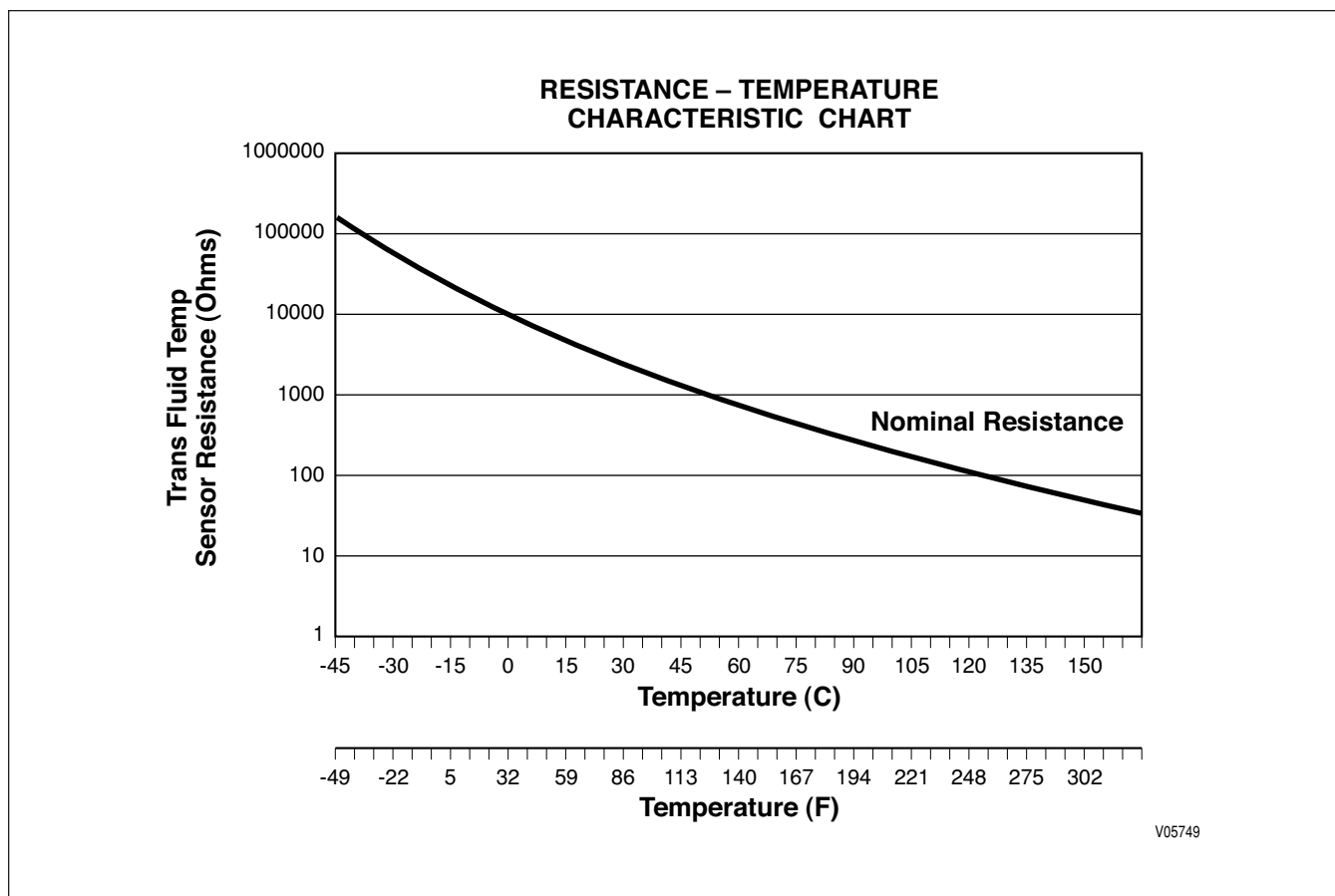


Figure K-2. Transmission Fluid Temperature Sensor Resistance vs. Sump Temperature Graph

NOTE: Look carefully at the graph. The scale for the resistance (on the left side) is not constant (linear). It is logarithmic which means it can display a great range of values within a small space. Each section of the graph is ten units, but the units vary from 1 to 100 000 Ohms.

Table K-2. Transmission Fluid Temperature Sensor Resistance vs. Temperature

Temperature (°C)	Temperature (°F)	Minimum Resistance (Ω)	Nominal Resistance (Ω)	Maximum Resistance (Ω)
-45	-49	128 565	141 951	155 338
-40	-40	95 826	100 735	105 644
-35	-31	68 952	72 315	75 679
-30	-22	50 153	52 480	54 807
-25	-13	36 854	38 478	40 103
-20	-4	27 345	28 488	29 631
-15	5	20 476	21 286	22 097
-10	14	15 467	16 045	16 624
-5	23	11 781	12 197	12 612
0	32	9045	9345	9646
5	41	6998	7219	7441

APPENDIX K—RESISTANCE VS. TEMPERATURE

Table K-2. Transmission Fluid Temperature Sensor Resistance vs. Temperature (*cont'd*)

Temperature (°C)	Temperature (°F)	Minimum Resistance (Ω)	Nominal Resistance (Ω)	Maximum Resistance (Ω)
10	50	5458	5623	5787
15	59	4291	4413	4536
20	68	3398	3490	3582
25	77	2710	2779	2849
30	86	2173	2228	2282
35	95	1754	1797	1840
40	104	1424	1459	1493
45	113	1163	1191	1218
50	122	955.0	977.1	999.2
55	131	788.6	806.5	824.5
60	140	654.7	669.3	683.9
65	149	546.3	558.3	570.2
70	158	458.1	467.9	477.8
75	167	385.9	394.1	402.2
80	176	326.6	333.3	340.1
85	185	277.5	283.2	288.9
90	194	236.5	241.6	246.7
95	203	202.4	206.9	211.5
100	212	173.8	177.9	182.0
105	221	149.8	153.6	157.3
110	230	129.7	133.0	136.4
115	239	112.6	115.6	118.7
120	248	98.17	100.88	103.6
125	257	85.87	88.29	90.71
130	266	75.35	77.52	79.69
135	275	66.34	68.27	70.21
140	284	58.58	60.31	62.04
145	293	51.88	53.42	54.97
150	302	46.08	47.46	48.84
155	311	41.04	42.27	43.50
160	320	36.65	37.74	38.84

APPENDIX K—RESISTANCE VS. TEMPERATURE

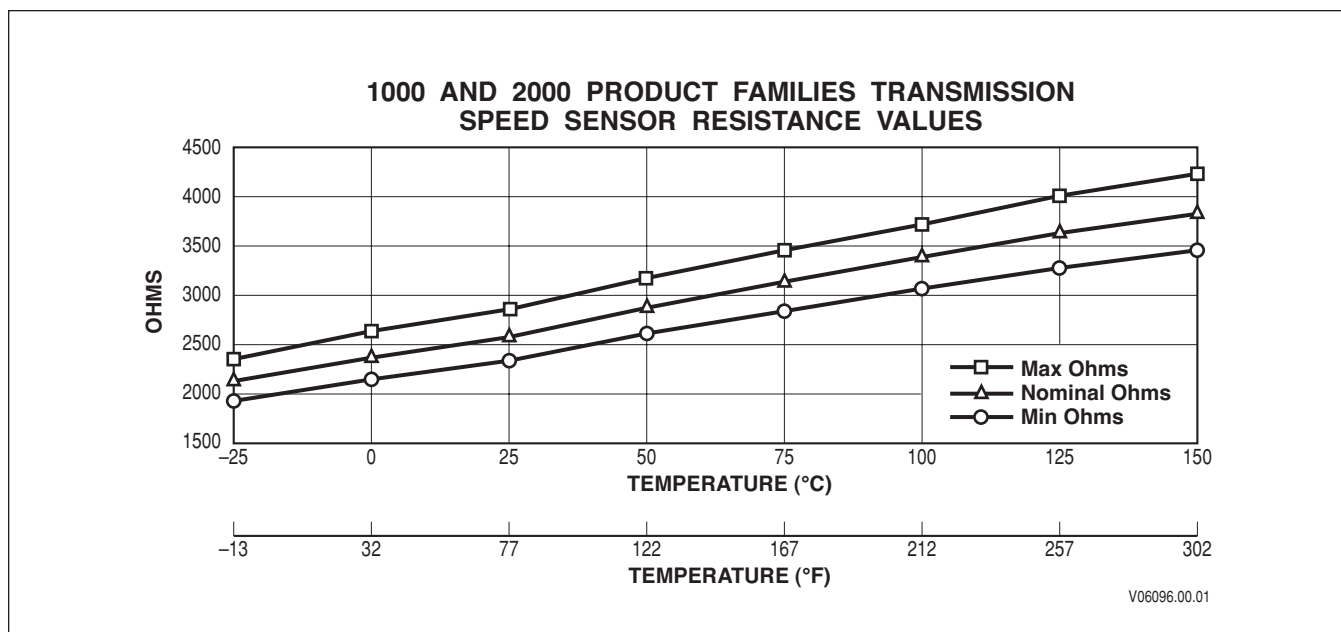


Figure K-3. Speed Sensor Resistance vs. Temperature Graph

Table K-3. Speed Sensor Resistance vs. Temperature

Temperature (°C)	Temperature (°F)	Minimum Resistance (Ω)	Nominal Resistance (Ω)	Maximum Resistance (Ω)
-25	-13	1929	2143	2358
0	32	2157	2397	2637
25	77	2340	2600	2860
50	122	2614	2904	3195
75	167	2842	3158	3474
100	212	3071	3412	3753
125	257	3299	3666	4032
150	302	3483	3870	4257

APPENDIX L—ELECTRONIC INTERFERENCE

1–1. ELECTROMAGNETIC INTERFERENCE (EMI)/RADIO FREQUENCY INTERFERENCE (RFI)

All electrical and electronic systems generate electromagnetic fields that can interfere with other electronic systems. Allison Transmission electronic transmission controls comply with Federal Communications Commission (FCC) regulations and other guidelines concerning emitted radio frequency interference for transportation electronics. The position of Allison Transmission Division of General Motors is that manufacturers and installers of Electromagnetic Interference (EMI)/Radio Frequency Interference (RFI) emitting equipment are responsible for adhering to FCC regulations and other guidelines concerning emitted radio frequency interference for transportation electronics.

Some radio-telephone or two-way communication radios (land-mobile radio), or the manner in which they are installed, can adversely affect vehicle operation or be affected by other vehicle components. Expenses incurred to protect vehicle-related systems from EMI/RFI emissions by radio-telephone or two-way communications radios (land-mobile radio) or to integrate such devices into vehicles are not the responsibility of Allison Transmission.

1–2. GENERAL GUIDELINES FOR RADIO EQUIPMENT INSTALLATION

The following general guidelines for installing radio-telephone or two-way communications radios (land-mobile radio) in a vehicle supplement, but DO NOT replace, detailed instructions provided by the radio equipment manufacturer. Detailed installation instructions are the sole responsibility of the radio equipment manufacturer.

Experience has shown that most EMI/RFI problems can be prevented or eliminated by following the guidelines. If EMI/RFI problems persist after following the guidelines and after ensuring the installation conforms to the guidelines, contact the vehicle and radio equipment manufacturers for additional installation or equipment operation instructions.

A. Transmitter Installation

1. Locate remote radio transmitters as far away from other electronic devices and as near to the side of the vehicle body as possible.
2. Mount transceivers (transmitter and receiver in one box) under the dash so as not to interfere with vehicle controls or passenger movement.

B. Antenna Installation

Each vehicle and body style reacts differently to radio frequency energy. When dealing with an unfamiliar vehicle, test various antenna locations by using a magnetic mount antenna and checking for adverse effects. Antenna location is a major factor in EMI/RFI problems.

C. Antenna Cable Routing

1. Use high quality, 95 percent shield coverage, coaxial (coax) cable. Route the coax well away from any electronic components.
2. Route antenna cables as far away from vehicle wiring as possible to reduce the likelihood of the vehicle wiring acting as an antenna for interference.

D. Radio Wiring and Connector Location

1. Connect transmitter power leads directly to the battery.
2. For transceivers (transmitter and receiver in one box) with ignition control, place a 12V power contactor at the vehicle battery. Drive the contactor coil, through an appropriate in-line fuse, from an ignition circuit not powered during engine cranking.
3. Any negative lead from a handset or control unit must return to battery negative.
4. Connect the positive lead from a handset or control unit directly to battery.
5. Fuse handset or control unit positive and negative leads separately from the transceiver negative and positive leads. Use correctly rated fuses.

APPENDIX L—ELECTRONIC INTERFERENCE

E. Power and Ground Wire Routing

Route radio power and ground wires as far away as possible from electronic control modules.

F. Troubleshooting

The following are common causes of EMI/RFI problems:

- Power leads connected to points other than the battery
- Improper antenna location
- Poor shielding or connections to antenna cable
- Transmitter or transceiver wiring too close to vehicle electronics

1–3. EXTERNALLY-GENERATED SPEED SENSOR SIGNALS

A. Checking for Externally-Generated Speed Sensor Signals

Use the following procedures to determine if speed sensor signals generated by a source external to the transmission or wiring harness are present:

1. Turn the ignition ON.
2. Keep the engine OFF.
3. If the TCM is ON, connect the Allison DOC™ For PC diagnostic tool.

NOTE: *If false speed signals were present at the previous shutdown, the TCM might still be “ON” even though the ignition is “OFF”. The Allison DOC™ For PC diagnostic tool is powered by ignition power so the ignition must be “ON” to use the Allison DOC™ For PC to read the speed signals.*

4. Read the speed sensor signals.
5. If a speed sensor signal is other than one (1), then there is a short to another circuit that is carrying an AC or PWM signal.
6. Check resistance of the sensor.
7. Check for shorts to other circuits within the harness or transmission connector.
8. Check to ensure there is no conductive material inside the connector.
9. Check to be sure the speed sensor circuit wires are a twisted pair.
10. Check to ensure a properly grounded drain wire.
11. Check for the presence of a strong external AC signal.
12. Repair or replace parts as required.

APPENDIX M — ALLISON DOC™ DIAGNOSTIC TOOL

NOTE: *Refer to the Allison DOC™ For PC User Guide GN3433EN for Allison DOC™ For PC instructions.*

APPENDIX M — ALLISON DOC™ DIAGNOSTIC TOOL

NOTES

APPENDIX N—INPUT/OUTPUT FUNCTIONS

The schematics which follow were taken from the Tech Data Book for the 1000 and 2000 Product Families. These schematics provide detail information needed to correctly perform input and output function connections. For an overview of Input/Output Functions, refer to Section 6 of this manual.

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

A. SECONDARY SHIFT SCHEDULE

USES: Provides for operator selection of primary or secondary shift schedules. Can be used for performance/economy, loaded/empty, or other shift schedule combinations.

VARIABLES TO SPECIFY: None

VOCATIONS: No vocational restrictions

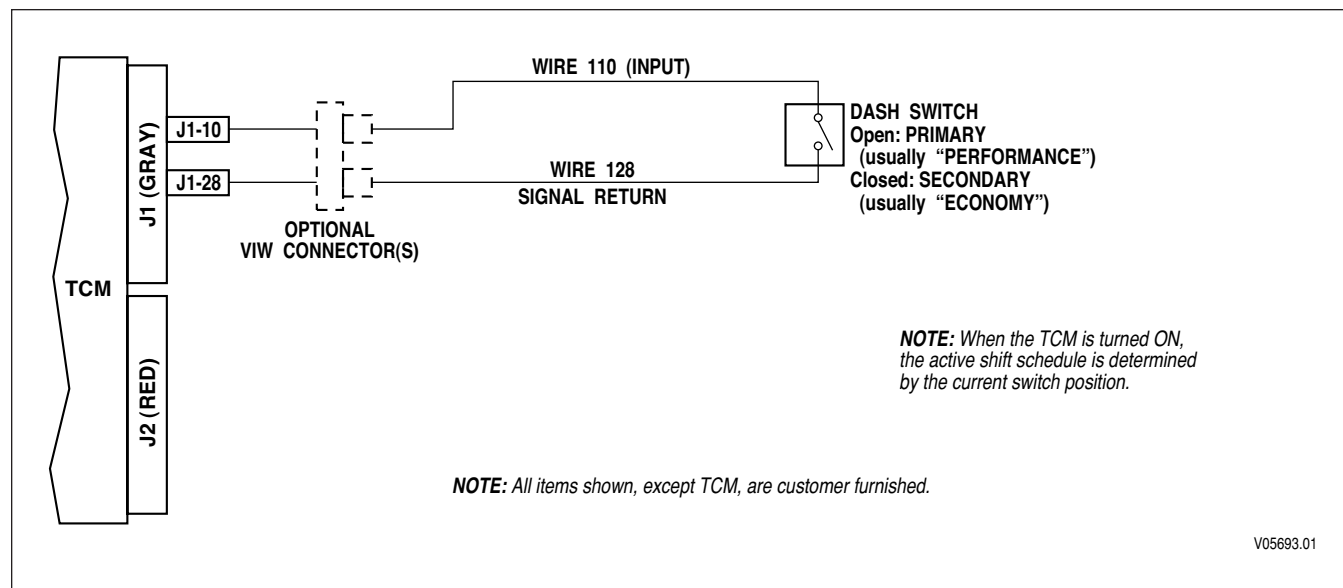


Figure N-1. Secondary Shift Schedule

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

C. PTO ENABLE

USES: Permits the PTO to be engaged only when calibration-defined conditions are met. Also automatically disengages the PTO if specified speeds are exceeded.

VARIABLES TO SPECIFY: Maximum engine speed for engagement, maximum engine speed for allowable operation, maximum output speed for engagement, maximum output speed for allowable operation, and neutral lockup ON shift speed.

VOCATIONS: Various (with usage of PTO)

CAUTION:

When the PTO is disengaged due to overspeed, it will be automatically re-engaged at the “Max. Engine Speed for PTO Engagement” speed (a User Specified Variable), which is typically set at a relatively low speed. The resultant re-engagement shock could cause damage to a high-inertia PTO system.

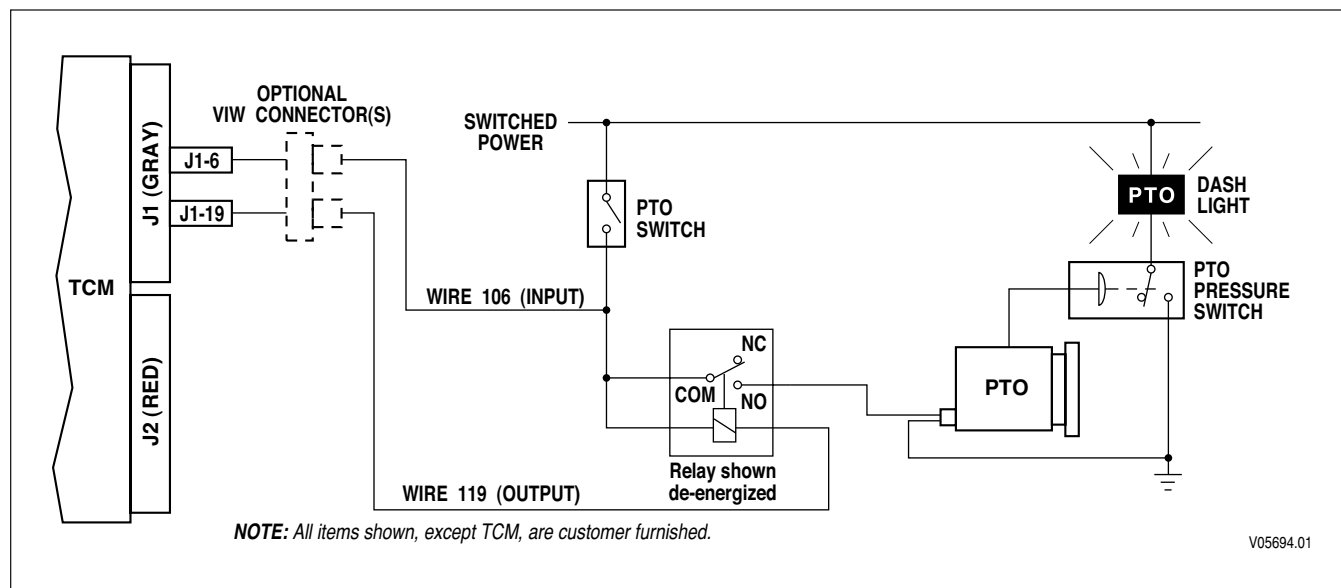


Figure N-2. PTO Enable

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

E. AUXILIARY FUNCTION RANGE INHIBIT

USES: Prevents inadvertent range selection when auxiliary equipment (e.g. wheelchair lift) is operating. May also be used to prevent neutral-to-range shifts unless the brake pedal is depressed.

VARIABLES TO SPECIFY: None

VOCATIONS: Various. Not for use in emergency equipment.

Typical Uses: School bus — brake pedal input
 Special service bus— wheelchair lift interlock
 Motorhome — “Door Ajar” interlock

WARNING!

If this function is enabled in the shift calibration, the function **MUST** be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it **MUST** be disabled in the calibration.

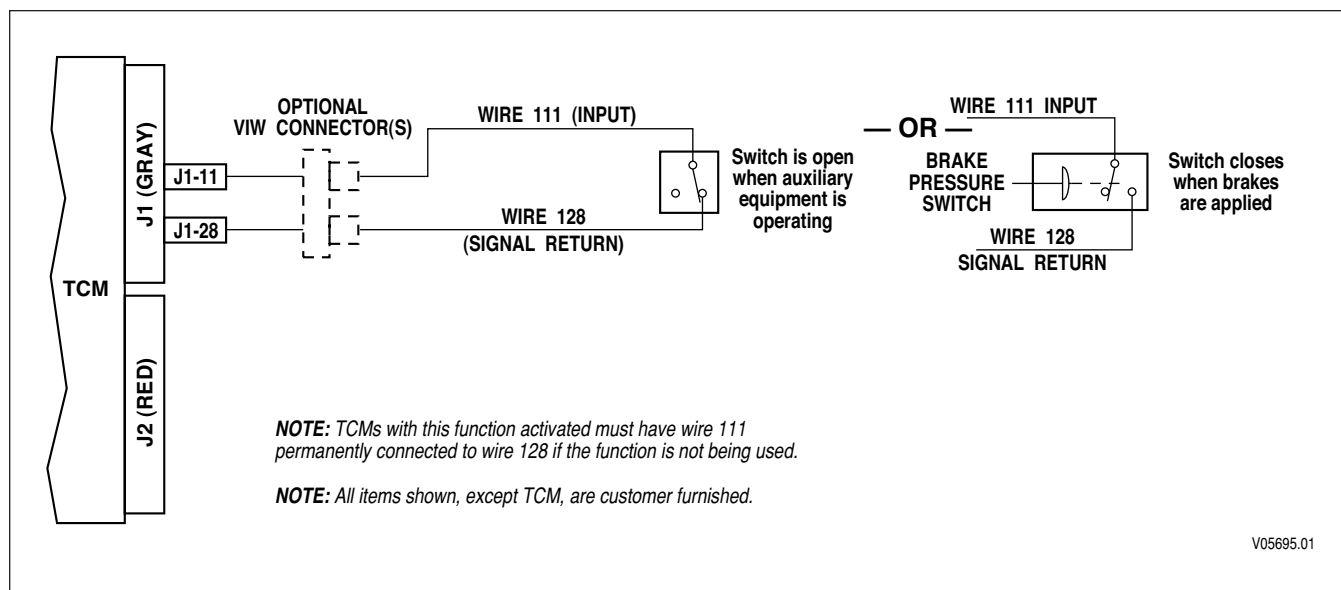


Figure N-3. Auxiliary Function Range Inhibit

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

H. EXHAUST BRAKE/PRESELECT REQUEST, PLUS EXHAUST BRAKE ENABLE (STANDARD)

USES: Signals the TCM that the engine exhaust-type brake is active. By automatically preselecting a lower transmission range when the brake is enabled, this function creates increased braking and/or maintains engine water and transmission fluid flows at elevated levels. Also prevents engagement of the exhaust brake if throttle > 0 or if the TCC is disengaged.

VARIABLES TO SPECIFY: Preselect range (standard value is third range)
“Lowered” or “Standard” preselect downshift schedule.

VOCATIONS: No vocational restrictions

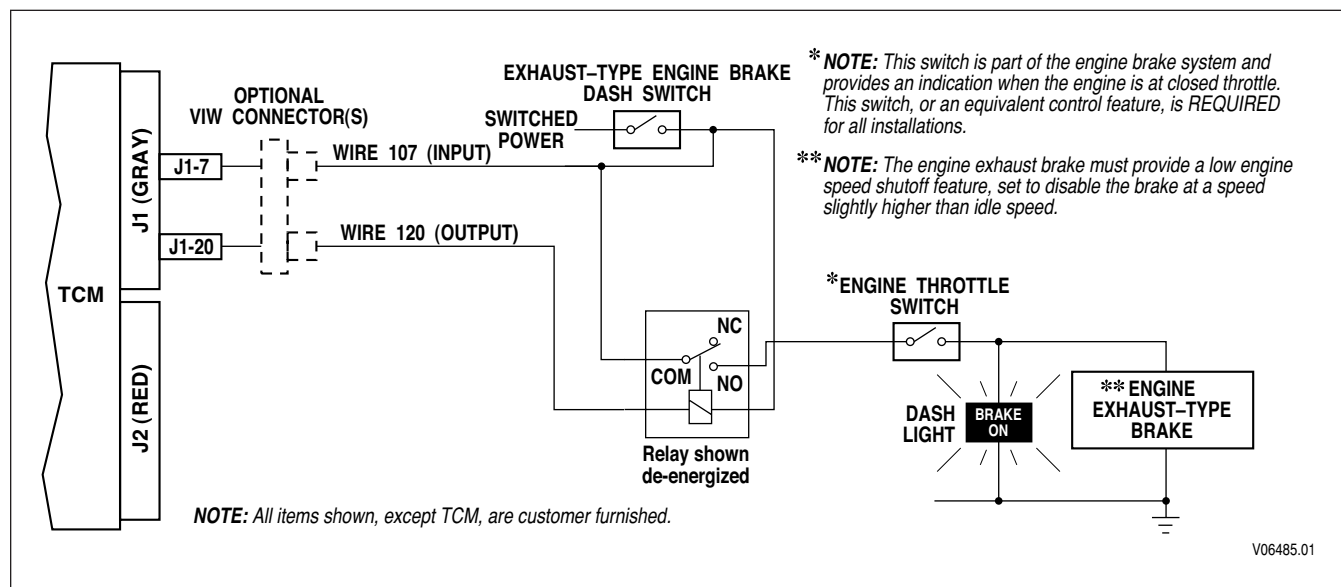


Figure N-4. Exhaust Brake/Preselect Request, Plus Exhaust Brake Enable (Standard)

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

H. EXHAUST BRAKE/PRESELECT REQUEST, PLUS EXHAUST BRAKE ENABLE (OPTIONAL)

USES: Signals the TCM that the engine exhaust-type brake is active. By automatically preselecting a lower transmission range when the brake is enabled, this function creates increased braking and/or maintains engine water and transmission fluid flows at elevated levels. Also prevents engagement of the exhaust brake if throttle > 0 or if the TCC is disengaged.

VARIABLES TO SPECIFY: Preselect range (standard value is third range)
“Lowered” or “Standard” preselect downshift schedule.

VOCATIONS: No vocational restrictions

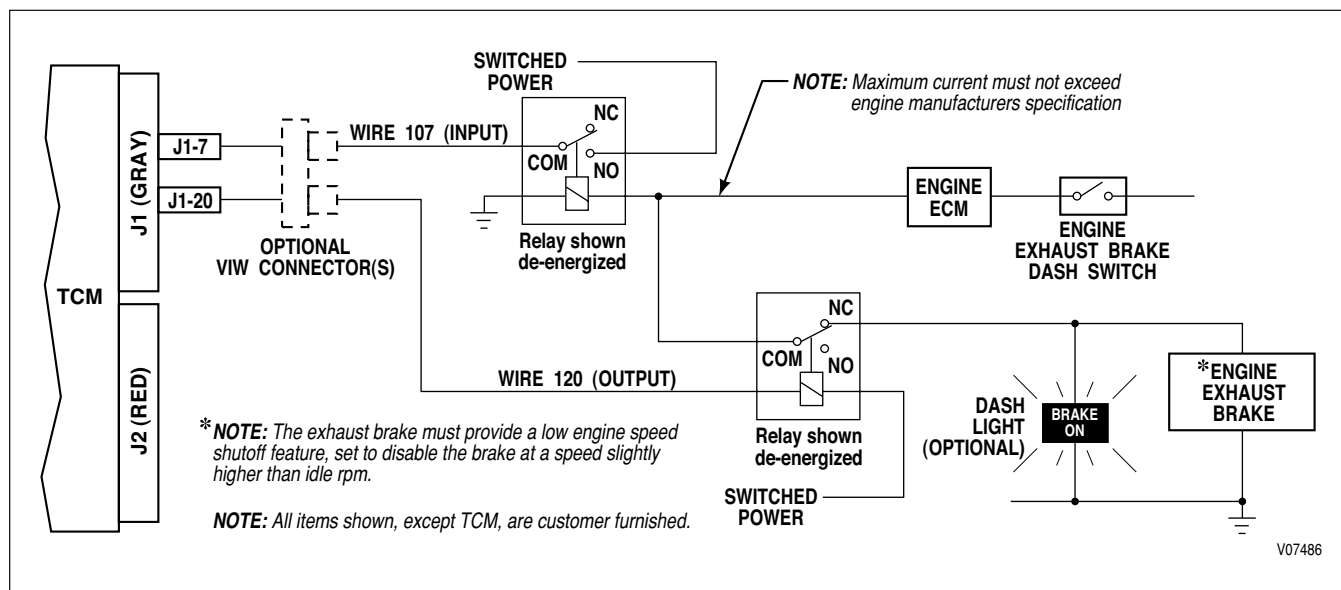


Figure N–5. Exhaust Brake/Preselect Request, Plus Exhaust Brake Enable (Optional)

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

I. EXHAUST BRAKE/PRESELECT REQUEST, PLUS ENGINE BRAKE ENABLE (SPECIAL)

USES: Signals the TCM that the engine exhaust-type brake is active. By automatically preselecting a lower transmission range when the brake is enabled, this function creates increased braking and/or maintains engine water and transmission fluid flows at elevated levels. Also prevents engagement of the exhaust brake if throttle > 0 or if the TCC is disengaged.

VARIABLES TO SPECIFY: Preselect range (standard value is third range).
“Lowered” or “Standard” preselect downshift schedule.

VOCATIONS: No vocational restrictions

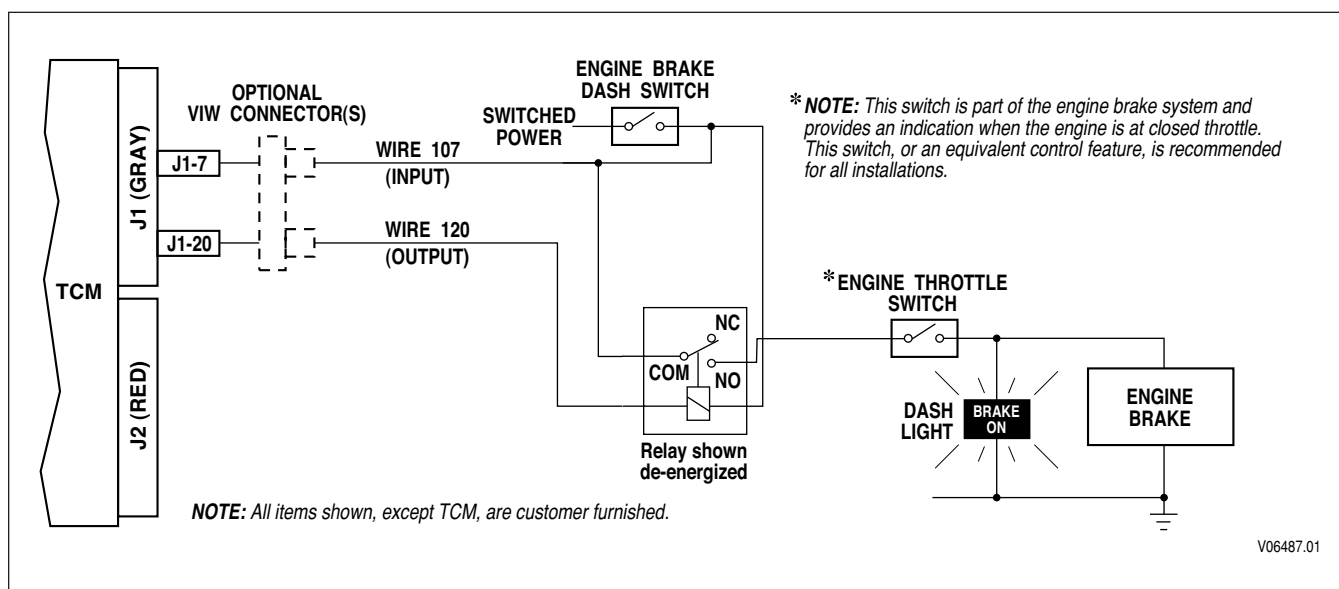


Figure N-6. Exhaust Brake/Preselect Request, Plus Engine Brake Enable (Special)

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

L. AUTOMATIC NEUTRAL FOR PTO

USES: Provides a means to automatically command **N** (Neutral) when PTO is operated. Requires the operator to re-select a range to shift out of **N** (Neutral). Frequently used in utility trucks or wrecker/recovery trucks.

VARIABLES TO SPECIFY: Maximum output speed for activating this function.
Range indicator = **N** (Neutral).

VOCATIONS: Various. Not for use in emergency equipment.

WARNING!

If this function is enabled in the shift calibration, the function **MUST** be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it **MUST** be disabled in the calibration.

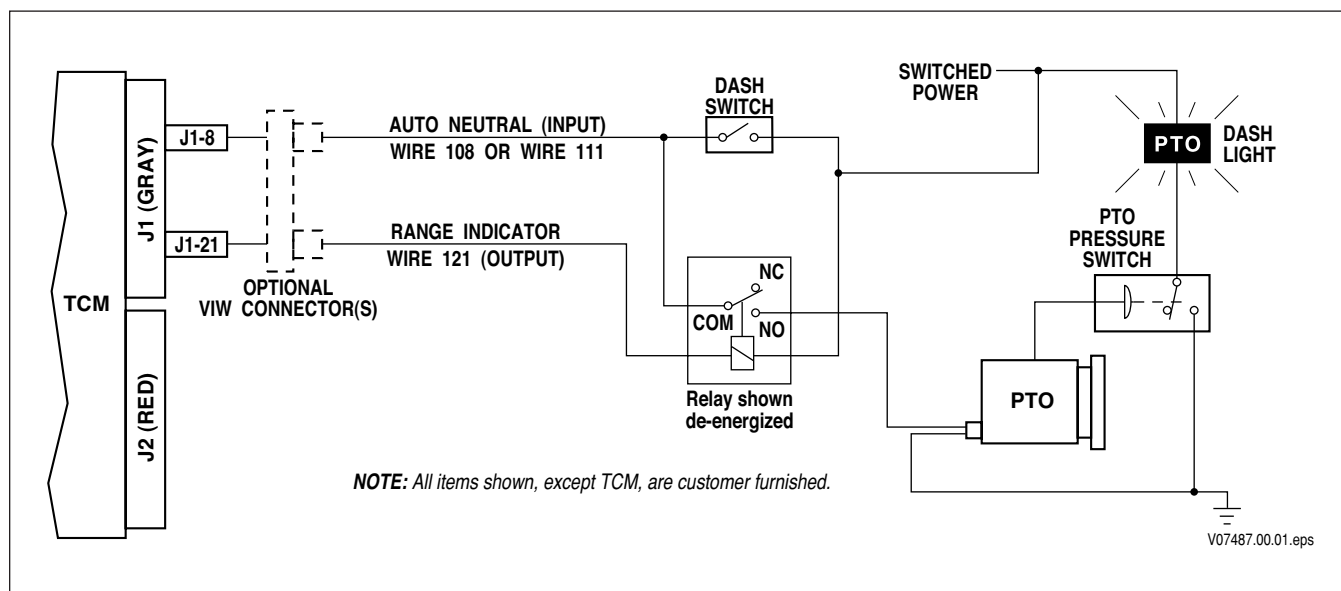


Figure N-7. Automatic Neutral for PTO

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

V. REVERSE ENABLE

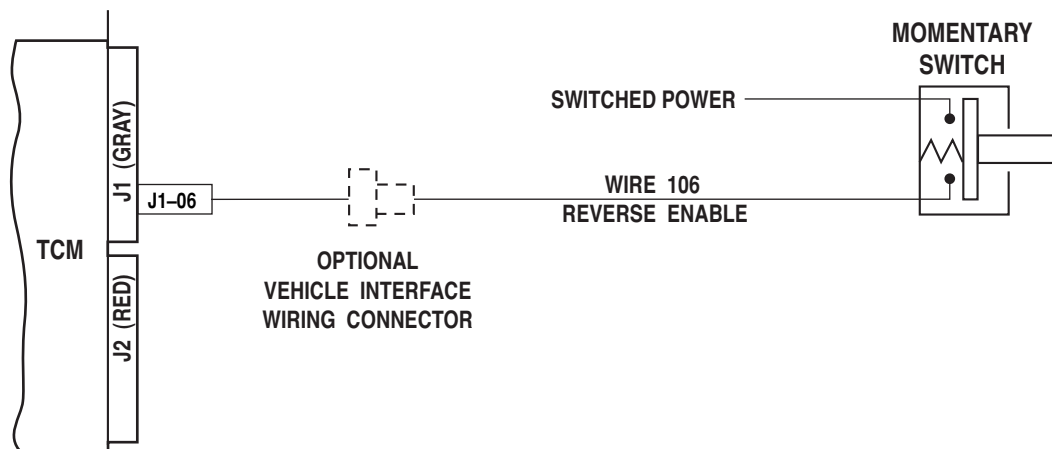
USES: This function provides for a separate instrument panel-mounted switch which must be pressed simultaneously with the **R** (Reverse) shift selector pushbutton to achieve reverse operation.

VARIABLES TO SPECIFY: None

VOCATIONS: European transit buses and tour buses.

WARNING!

If this function is enabled in the shift calibration, the function **MUST** be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it **MUST** be disabled in the calibration.



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Figure N-8. Reverse Enable

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

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AH. KICKDOWN

USES: Permits both “Economy” and “Performance” shift schedules to be used in the same operating mode. Typically used in stop-and-go duty cycles with an emphasis on fuel economy.

VARIABLES TO SPECIFY: None

VOCATIONS: No vocational restrictions

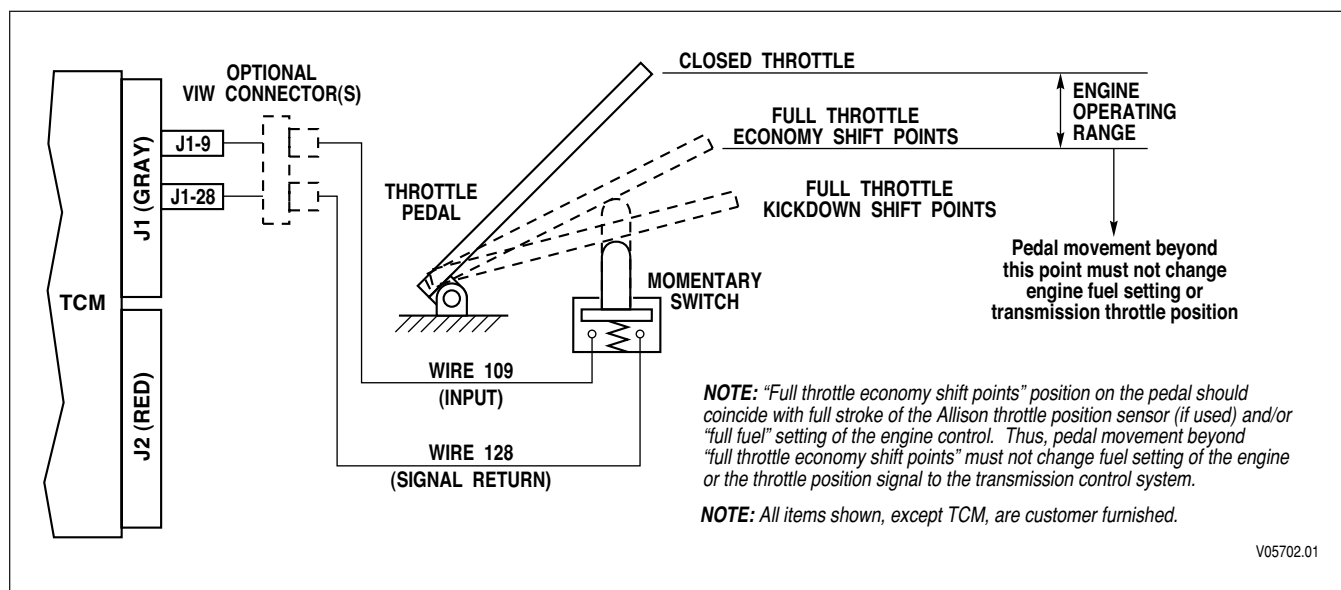


Figure N–9. Kickdown

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

AM. REFUSE PACKER STEP SWITCH

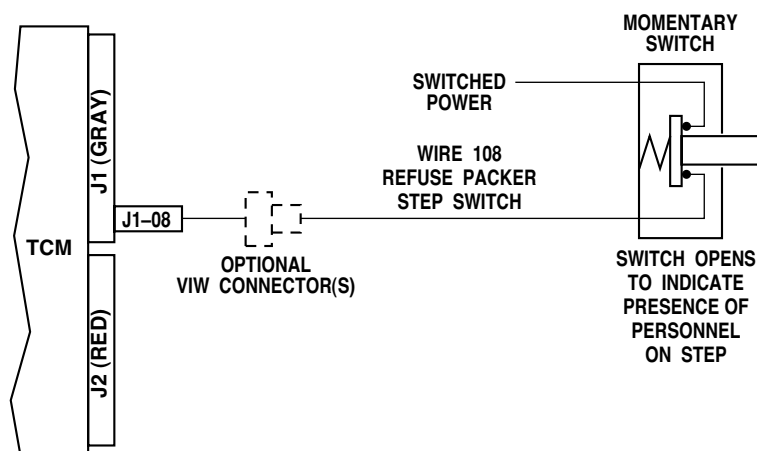
USES: This signal can be used to denote the presence of personnel who are riding on a rear platform of the vehicle (refuse packer).

VARIABLES TO SPECIFY: None

VOCATIONS: Refuse packer.

WARNING!

If this function is enabled in the shift calibration, the function **MUST** be integrated into the vehicle wiring. If the function is available in the shift calibration but will not be used in the vehicle, it **MUST** be disabled in the calibration.



Function is activated when switch is depressed. Function is de-activated when switch is released.

Switch opens to indicate presence of personnel on step.

NOTE: Transmission will shift according to preselect downshift schedule when function is activated while above 1st range.

If function is activated while in Reverse, transmission will shift to Neutral.

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Figure N-10. Refuse Packer Step Switch

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

AR. OVERDRIVE DISABLE

USES: Can be used in conjunction with a 5–3–2–1 selector configuration to permit hold selection of all forward ranges. This feature has no effect on 4-speed configurations.

VARIABLES TO SPECIFY: None

VOCATIONS: No vocational restrictions

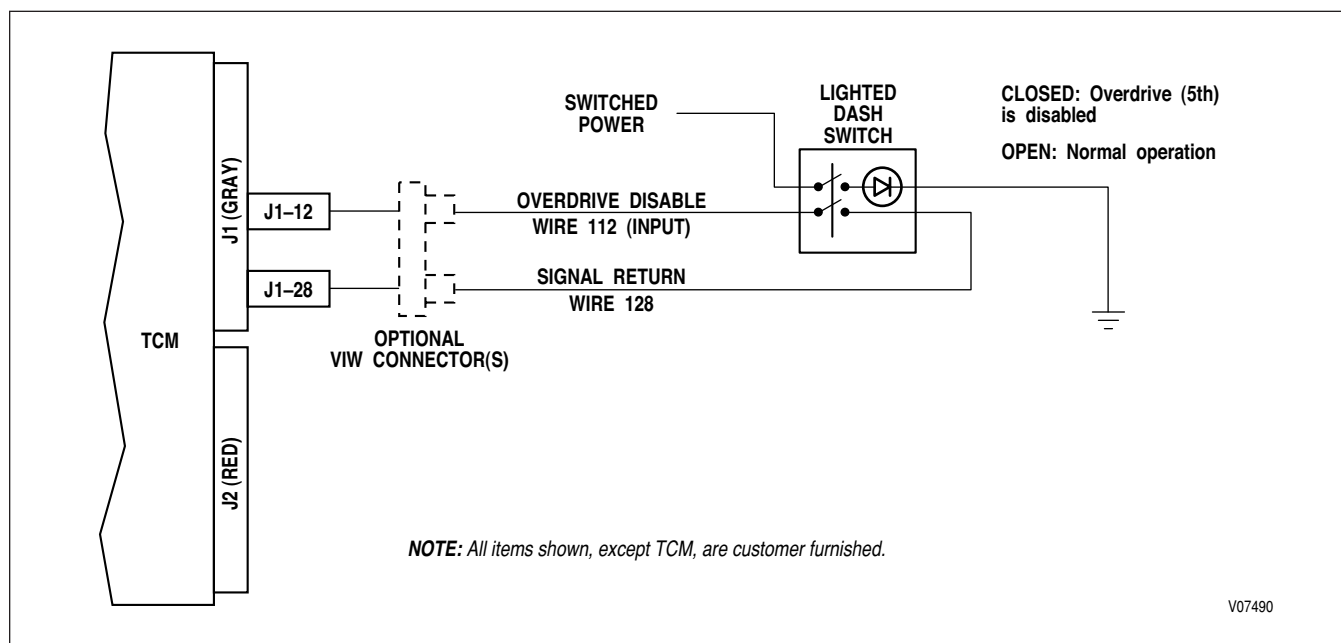


Figure N–11. Overdrive Disable

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

B. SUMP TEMPERATURE INDICATOR

USES: Provides a means to turn on a dash indicator or other alarm when transmission sump temperature has exceeded specified limits.

VARIABLES TO SPECIFY: None

VOCATIONS: No vocational restrictions

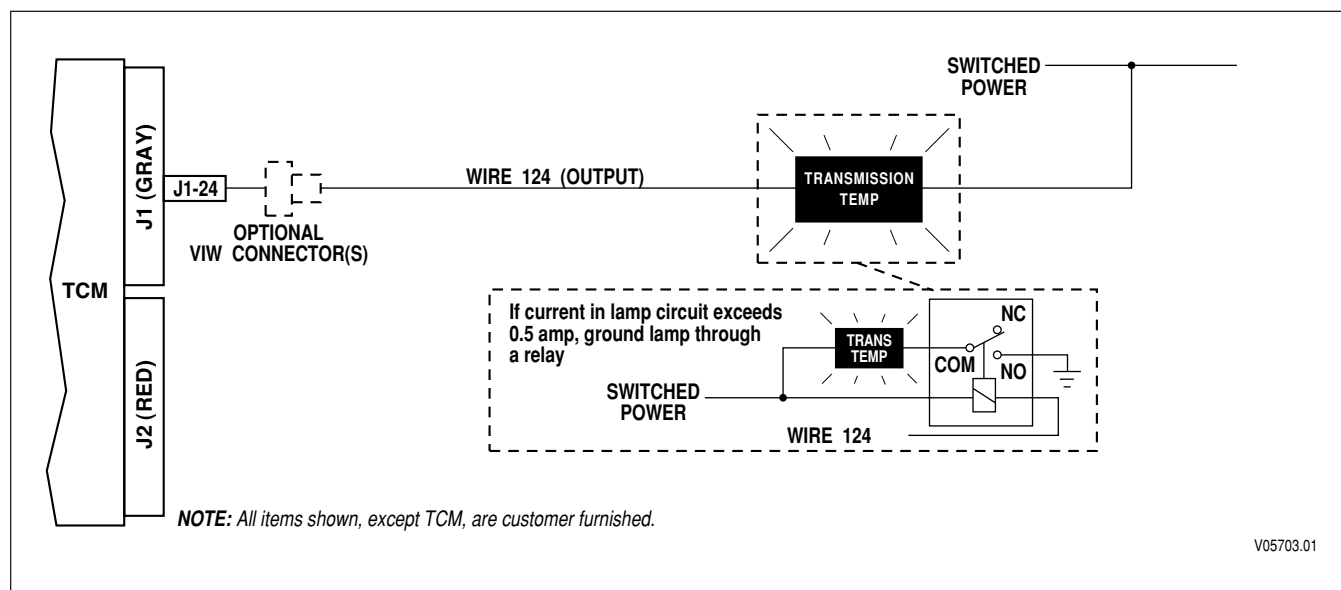


Figure N-12. Sump Temperature Indicator

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

C. RANGE INDICATOR

USES: May be used in the control system of an auxiliary vehicle system to permit its operation only when the transmission is engaged in specified gear range(s), including Neutral.

NOTE: *P (Park) can be an indicated range for a 1000 Product Family or 2000 Product Family transmission (with a park pawl). For a 2000 Product Family transmission (without a park pawl), the “P” position can be used to indicate a second NEUTRAL position.*

NOTE: *This feature is not suitable for activating a customer-furnished park brake in the second NEUTRAL position (2000 Product Family transmissions), since the indicator is active only when the engine is running.*

VARIABLES TO SPECIFY: Range or ranges to be indicated.

VOCATIONS: No vocational restrictions

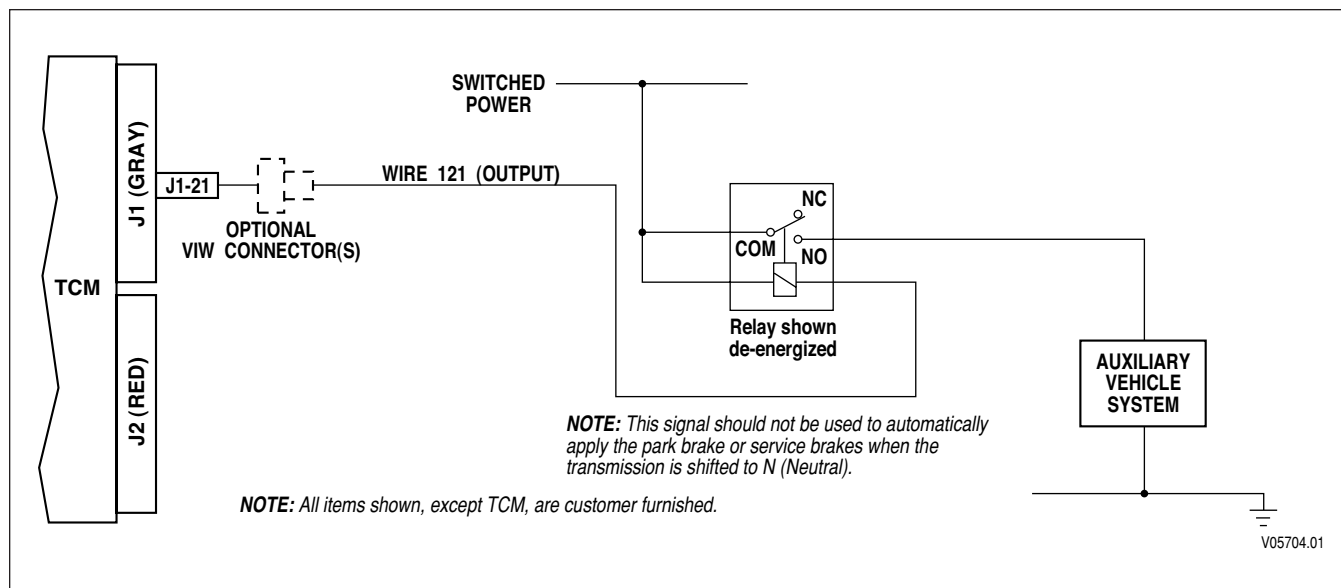


Figure N–13. Range Indicator

APPENDIX N—INPUT/OUTPUT FUNCTIONS

WARNING!

This schematic shows the intended use of the specified controls feature which has been validated in the configuration shown. Any miswiring or use of this feature which differs from that shown could result in damage to equipment or property, personal injury, or loss of life. ALLISON TRANSMISSION IS NOT LIABLE FOR THE CONSEQUENCES ASSOCIATED WITH MISWIRING OR UNINTENDED USE OF THESE FEATURES.

D. OUTPUT SPEED INDICATOR

USES: To indicate reaching a minimum or maximum operating speed to assist in the indication of and/or control of the vehicle or auxiliary equipment. Frequently used to alert the operator that output speed has exceeded a specified value.

VARIABLES TO SPECIFY: Output speed to turn indicator ON and to turn indicator OFF (ON value must be higher than the OFF value).

VOCATIONS: No vocational restrictions

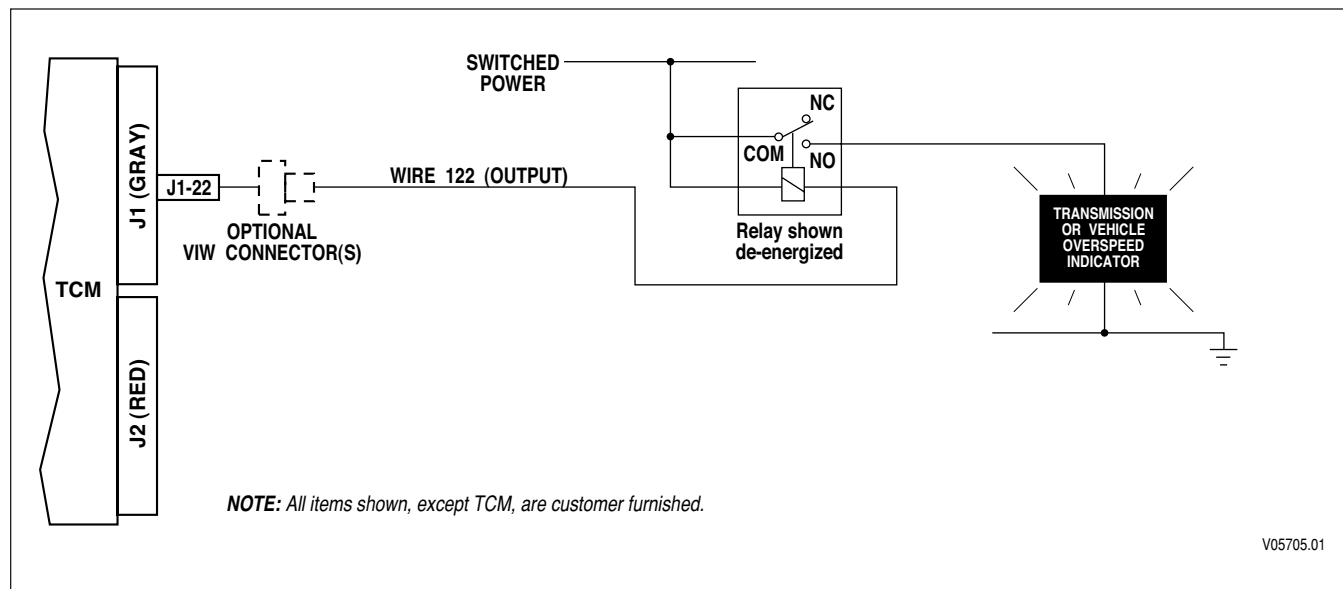


Figure N–14. Output Speed Indicator

APPENDIX P — FLUID CHECK PROCEDURE**WARNING!**

For vehicles containing 1000 Product Family and 2000 Product Family (2400 models), each time you park the vehicle or leave the operator's station with the engine running, do the following.

- Bring the vehicle to a complete stop using the service brake.
- Ensure that the engine is at low idle rpm.
- Put the transmission in P (Park).
- Engage the P (Park) range by slowly releasing the service brake.
- Apply the emergency brake and/or parking brake, if present, and make sure it is properly engaged.
- If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

WARNING!

For vehicles containing 2000 Product Family transmissions without auto-apply parking brakes, each time you park the vehicle or leave the operator's station with the engine running, do the following.

- Bring the vehicle to a complete stop using the service brake.
- Ensure that the engine is at low idle rpm.
- Put the transmission in N (Neutral).
- Apply the emergency brake and/or parking brake and make sure they are properly engaged.
- If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

WARNING!

For vehicles containing 2000 Product Family transmissions with auto-apply parking brakes, each time you park the vehicle or leave the operator's station with the engine running, do the following.

- Bring the vehicle to a complete stop using the service brake.
- Ensure that the engine is at low idle rpm.
- Put the transmission in PB (Auto-Apply Parking Brake). Make sure that the parking brake is properly engaged.
- Apply the emergency brake, if present, and make sure it is properly engaged.
- If the operator's station will be unoccupied with the engine running, chock the wheels and take any other steps necessary to keep the vehicle from moving.

If this procedure is not followed, the vehicle can move suddenly and you or others could be injured.

APPENDIX P — FLUID CHECK PROCEDURE

NOTE: To ensure accurate fluid level checks, be sure that the fill tube and dipstick meet Allison Transmission specifications. Requirements for the standard oil pan are shown in Figure P-1 and requirements for the shallow oil pan are shown in Figure P-2.

When checking a long dipstick calibration:

- Be sure the dipstick contacts the oil pan surface as shown in Figures P-1 and P-2.
- Take measurements from the end of the dipstick.

When checking a short dipstick calibration:

- Remove the oil pan.
- Take measurements from the oil pan splitline.

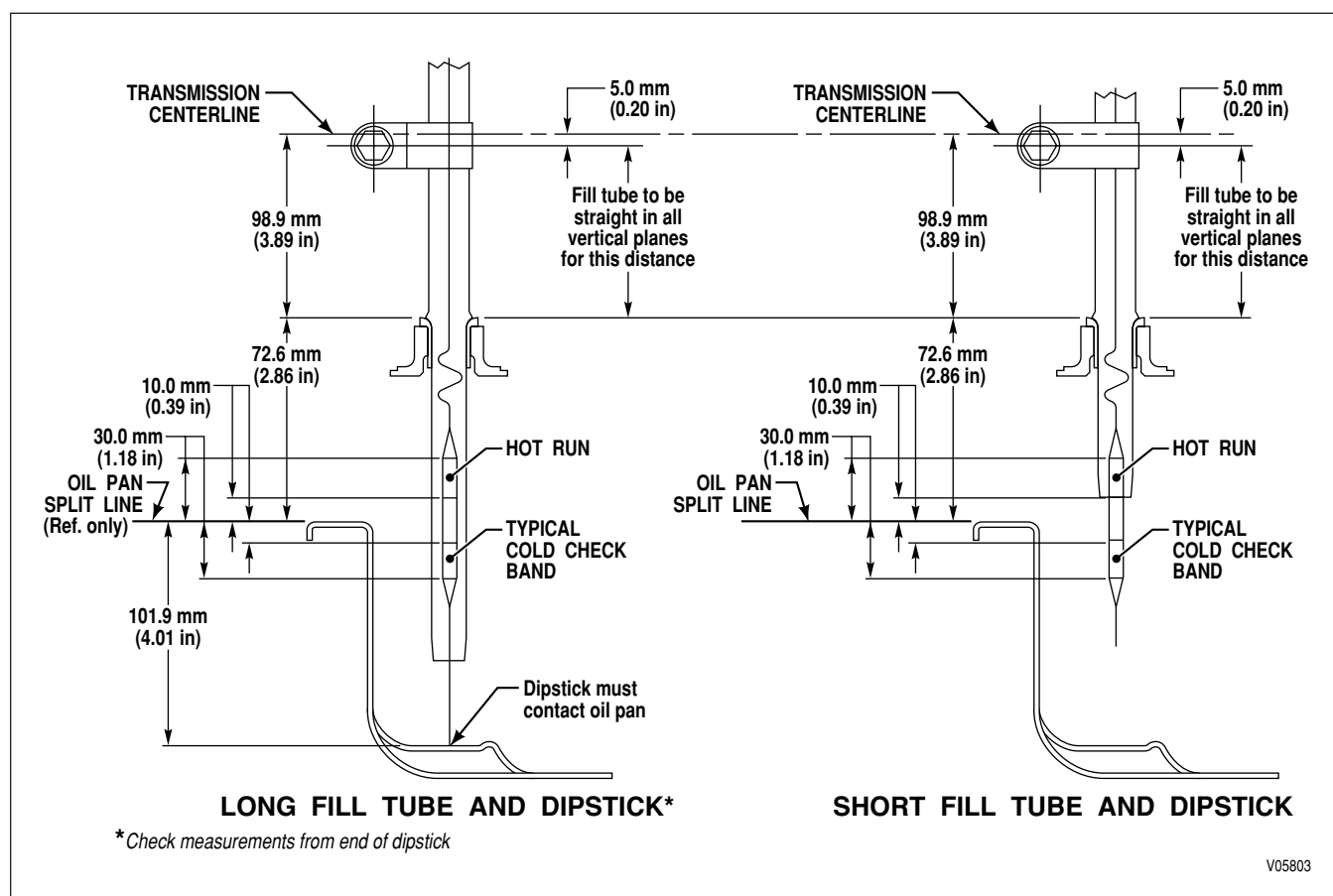


Figure P-1. Fill Tube And Dipstick Requirements (Standard Oil Pan)

APPENDIX P — FLUID CHECK PROCEDURE

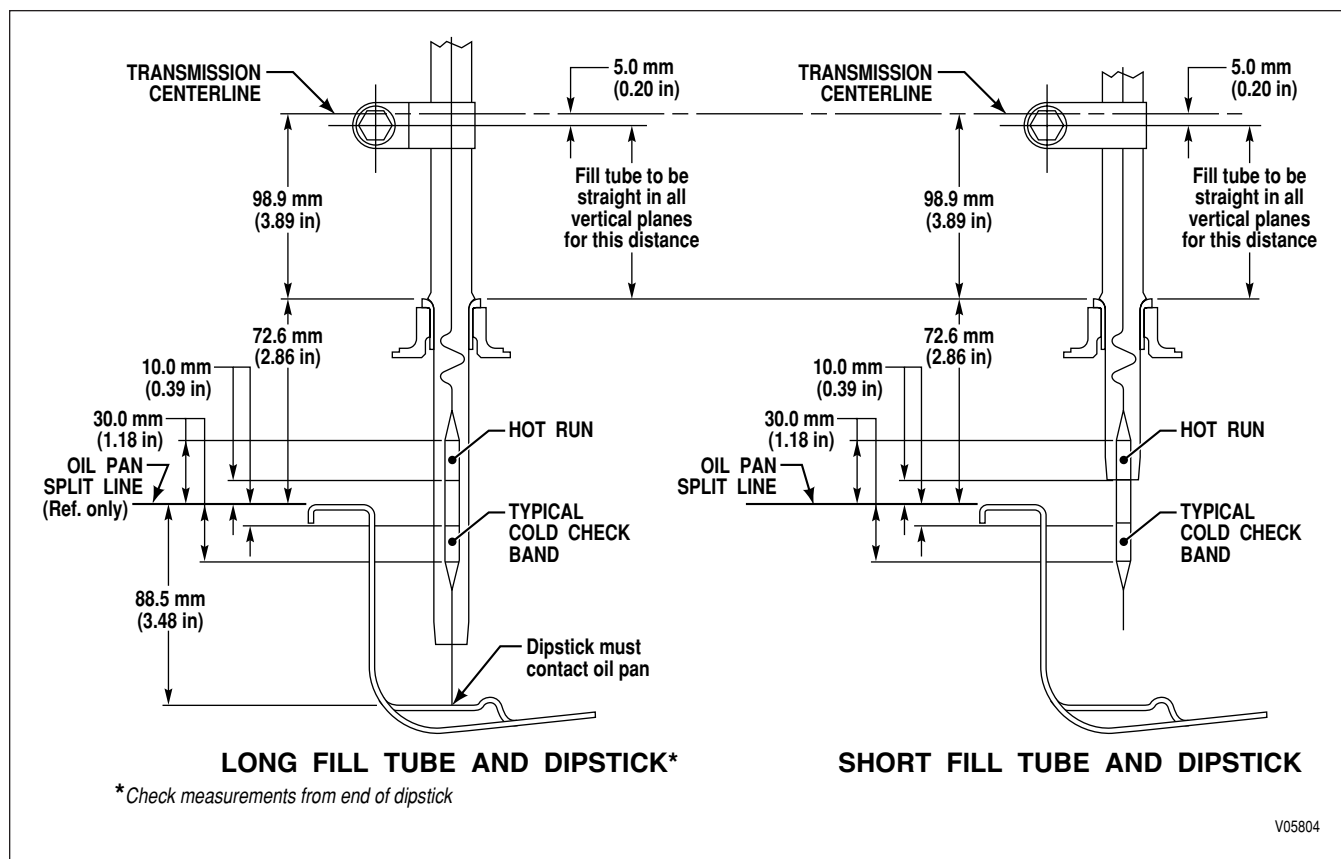


Figure P-2. Fill Tube And Dipstick Requirements (Shallow Oil Pan)

A. Manual Fluid Check Procedure

Clean all dirt from around the end of the fluid fill tube before removing the dipstick. Do not allow dirt or foreign matter to enter the transmission. Dirt or foreign matter in the hydraulic system may cause undue wear of transmission parts, make valves stick, and clog passages. Check the fluid level using the following procedure and report any abnormal fluid levels to your maintenance persons.

B. Cold Check Procedure

The purpose of the cold check is to determine if the transmission has enough fluid to be operated safely until a hot check can be made.

CAUTION:

The fluid level rises as fluid temperature increases. **DO NOT** fill above the “COLD CHECK” band if the transmission fluid is below normal operating temperatures.

- Park vehicles containing 1000 Product Family and 2000 Product Family (2400 models) as follows:
 - Bring the vehicle to a complete stop on a level surface using the service brake.
 - Ensure that the engine is at low idle rpm.
 - Put the transmission in **P** (Park).
 - Engage the **P** (Park) range by slowly releasing the service brake.
 - Apply the emergency brake and/or parking brake, if present, and make sure it is properly engaged.

APPENDIX P — FLUID CHECK PROCEDURE

- Park vehicles containing 2000 Product Family transmissions with auto-apply parking brakes as follows:
 - Bring the vehicle to a complete stop on a level surface using the service brake.
 - Ensure that the engine is at low idle rpm.
 - Put the transmission in **PB** (Auto-Apply Parking Brake). Make sure that the parking brake is properly engaged.
 - Apply the emergency brake, if present, and make sure it is properly engaged.
- Park vehicles containing 2000 Product Family transmissions without auto-apply parking brakes as follows:
 - Bring the vehicle to a complete stop on a level surface using the service brake.
 - Ensure that the engine is at low idle rpm.
 - Put the transmission in **N** (Neutral).
 - Apply the emergency brake and/or parking brake and make sure they are properly engaged.
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.
- Run the engine for at least one minute. Apply the service brakes and shift to **D** (Drive), then to **N** (Neutral), and then shift to **R** (Reverse) to fill the hydraulic system. Finally, shift to **P** (Park) or **PB** (Auto-Apply Parking Brake), if available, or **N** (Neutral) and allow the engine to idle (500–800 rpm). Slowly release the service brakes.
- With the engine running, remove the dipstick from the tube and wipe the dipstick clean.
- Insert the dipstick into the tube and remove. Check the fluid level reading. Repeat the check procedure to verify the reading.
- If the fluid level is within the “COLD CHECK” band, the transmission may be operated until the fluid is hot enough to perform a “HOT RUN” check. If the fluid level is not within the “COLD CHECK” band, add or drain as necessary to bring it to the middle of the “COLD CHECK” band.
- Perform a hot check at the first opportunity after the normal operating sump temperature of 71°C–93°C (160°F–200°F) is reached.

C. Hot Check Procedure

CAUTION:	The fluid must be hot to ensure an accurate check. The fluid level rises as temperature increases.

- Operate the transmission in **D** (Drive) range until normal operating temperature is reached:
 - sump temperature 71°C–93°C (160°F–200°F)
 - converter-out temperature 82°C–104°C (180°F–220°F)
 - If a transmission temperature gauge is not present, check fluid level when the engine water temperature gauge has stabilized and the transmission has been operated under load for at least one hour.
- Park vehicles containing 1000 Product Family and 2000 Product Family (2400 models) as follows:
 - Bring the vehicle to a complete stop on a level surface using the service brake.
 - Ensure that the engine is at low idle rpm.
 - Put the transmission in **P** (Park).
 - Engage the **P** (Park) range by slowly releasing the service brake.
 - Apply the emergency brake and/or parking brake, if present, and make sure it is properly engaged.

APPENDIX P — FLUID CHECK PROCEDURE

- Park vehicles containing 2000 Product Family transmissions with auto-apply parking brakes as follows:
 - Bring the vehicle to a complete stop on a level surface using the service brake.
 - Ensure that the engine is at low idle rpm.
 - Put the transmission in **PB** (Auto-Apply Parking Brake). Make sure that the parking brake is properly engaged.
 - Apply the emergency brake, if present, and make sure it is properly engaged.
- Park vehicles containing 2000 Product Family transmissions without auto-apply parking brakes as follows:
 - Bring the vehicle to a complete stop on a level surface using the service brake.
 - Ensure that the engine is at low idle rpm.
 - Put the transmission in **N** (Neutral).
 - Apply the emergency brake and/or parking brake and make sure they are properly engaged.
- Chock the wheels and take any other steps necessary to keep the vehicle from moving.
- With the engine running, remove the dipstick from the tube and wipe the dipstick clean.
- Insert the dipstick into the tube and remove. Check fluid level reading. Repeat the check procedure to verify the reading.

NOTE: *Safe operating level is within the “HOT RUN” band on the dipstick. See Figures P–1 and P–2. The width of the “HOT RUN” band represents approximately 1.0 liter (1.06 quart) of fluid at normal operating sump temperature.*

- If the fluid level is not within the “HOT RUN” band, add or drain as necessary to bring the fluid level to within the “HOT RUN” band.

D. Consistency of Readings

Always check the fluid level at least twice using the procedure described above. Consistency (repeatable readings) is important to maintaining proper fluid level. If inconsistent readings persist, check the transmission breather to be sure it is clean and unclogged. If readings are still inconsistent, contact your nearest Allison distributor or dealer.

APPENDIX P — FLUID CHECK PROCEDURE

NOTES