Section 7

SECTION 7
TRANSMISSION

TRANSMISSION OVERVIEW

Workhorse chassis come standard with automatic transmissions. Workhorse utilizes two types of transmissions depending on the series of the chassis. The P Series chassis utilized the Hydra-Matic 4L80-E 4-speed automatic transmission on all chassis in the 1999-2002 model year chassis. In the 2003 model year WCC introduced the 4L85-E Hydra-Matic transmission, a heavy-duty version of the 4L80-E. The 4L85-E became standard in all P Series chassis with the 8.1L engine.The W Series 20,700 lband 22,000 lb. GVWR chassis use the Allison LCT 1000 5-speed automatic transmission. The W Series 24,000 lb. GVWR chassis use the Allison 2100MH 5-speed automatic transmission. All of which are electronically controlled rear wheel drive transmissions.

The gear shifting points and shift feel are determined by electrical signals sent from the Powertrain Control Module (PCM) on the Hydra-Matic transmission, and from the Transmission Control Module (TCM) on the Allison transmission. The PCM or TCM receives input from sensors based on throttle position, vehicle speed, gear range, altitude, temperature, engine load, etc. The PCM or TCM processes this data in milliseconds; transmit a signal to the value body shift solenoids that activates the shift valves for precise shift execution.

The 4L80-E, 4L85-E, LCT 1000 and 2100MH are constructed with similar main components and consist primarily of a torque converter and three planetary gear sets. A series of multiple disc clutches, sprag and/or two roller clutches as well as bands provide the friction elements required to obtain the desired function of the planetary gear sets. A hydraulic pump and an electronically controlled valve body are used to operate the various systems within the transmission.

The torque converter contains a pump, a turbine and a clutch pressure plate splined to the turbine. The torque converter acts as a fluid coupling to smoothly transmit torque from the engine to the transmission. It also hydraulically provides additional torque multiplication when required. The clutch pressure plate, when applied, provides mechanical “direct drive” coupling of the engine to the transmission.

4L80-E/4L85-E HYDRA-MATIC TRANSMISSION – 1999-CURRENT

Type:

Four speed rear-wheel-drive, electronically controlled, automatic overdrive transmission with a torque converter clutch

Maximum Engine Torque:

440 lb-ft (4L80-E)
460 lb-ft (4L85-E)

Maximum Gearbox Torque:

885 lb-ft (1200 Nm)

Gear Ratios:

1st 2nd 3rd 4th Rev
2.482 1.482 1.000 0.750 -2.077

Transmission Weight:

Wet: 254 lb (115 kg)

Fluid Type:

Dextron® III

Fluid Capacity (Approximate):

Bottom Pan Removal: 5.0 qt (4.7L)

Pressure TapsAvailable:

Line pressure

Towing Capacity:

19,000 lb to 22,000 lb Maximum Gross Combined Vehicle Weight (Application & Axle Ratio Dependent)

Case Material:

Die Cast Aluminum

7-Position Quadrant:

P,R,N,OD,D,2,1

Maximum Gross Vehicle Weight:

7200 lb (3265 kg) to 18,000 lb (7483 kg) (application and axle ratio Dependent)

Control Systems:

Shift Pattern: (2) Two-way on/off solenoids
Shift Quality: Force motor control
Torque Converter Clutch: Pulse width modulated solenoid control

4L80-E/4L85-E HYDRA-MATIC CONTINUED

Converter Size:

310 mm (reference) (Diameter of torque converter turbine)
Dual stator torque converter for durability and increase torque multiplication

Converter Lock-up:

Torque converter lock-up at cruising speeds in 2nd, 3rd, and 4th gears
Preventing excessive heat build-up and increasing fuel mileage

Fail Safe:

Fail-safe mode puts transmission in 2nd gear and locks the converter if oil sump temperatures go above 270 degrees preventing internal transmission damage possible with overheated oil.

Transmission Coolers:

Internal radiator and external transmission oil to air fluid coolers standard.

LCT 1000/2100MH – 2001 -CURRENT

Type:

Five speed rear-wheel-drive, electronically controlled, automatic overdrive transmission with a torque converter clutch

Maximum Engine Torque:

545 lb-ft (740 Nm) gross (LCT1000)
600 lb ft (813 Nm) gross (2100MH)

Maximum Horsepower Input:

340 hp (254 kW)

Gear Ratios:

1st 2nd 3rd 4th 5th Rev

3.10 1.81 1.41 1.00 0.71 -4.49

Case Material:

Aluminum

Maximum Gross Vehicle Weight:

22,000 lb. motor home (LCT 1000)
24,000 lb. motor home (2100MH)

Transmission Weight:

Dry: 330 lb (150 kg)

Fluid Type:

Dextron® III (LCT 1000)
Dextron® III (2100MH)

Fluid Capacity (Approximate-Refill):

Bottom Pan Removal: 10.6 qt (10L)

Main circuit oil filter:

Spin-on canister

Power Takeoff:

Left or Right side

Towing Capacity:

26,000 lb (11,800 kg) Maximum Gross Combined Vehicle Weight (LCT 1000)
30,000 lb. (13,600 kg) Maximum Gross Combined Vehicle Weight (2100MH)

7-Position Quadrant:

P,R,N,OD,D,2,1 5th gear (overdrive) is controlled by a disable switch on the dash with an indicator in the instrument cluster

Control Systems:

Electronic, closed loop, adaptive with stand alone Transmission Control Module (TCM)

Transmission Coolers:

Internal radiator and external transmission oil to air fluid coolers standard.

Converter Lock-up:

Torque converter lock-up at all speeds in 2nd, 3rd, 4th and 5th gears.
Preventing excessive heat build-up, increasing fuel mileage and provide improved engine braking.

Drivetrain Interface:

Maximum output shaft speed 5000 rpm (LCT 1000), 4500 rpm (2100MH)

MAINTENANCE AND INSPECTION

The automatic transmission fluid should be checked regularly (minimum at each engine oil change). Inspect fluid for color and smell, if fluid is dark in color and has a burnt smell this would indicate overheating of the fluid and would require replacement (see Transmission Fluids in this section for more detail on overheating/oxidization). The recommended transmission service intervals, if the fluid has not been overheated, are located in the

The Maintenance Schedule is included in the vehicle owner's manual. The recommended interval for changing the fluid and filter on the 4L80-E/ 4L85-E transmissions is every 50,000 miles, Workhorse filter kit part no. 24210956. Allison recommends changing the fluid and spin-on filter every 25,000 miles or 12 months, whichever comes first. Allison also recommends replacing the spin on filter only (fluid change is not required) after the first 5,000 miles of operation, Allison/Workhorse part no. 29539579. Allison offers a synthetic fluid known as Transynd, use of this fluid will extends the service interval to 100,000 miles or 4 years, whichever comes first.

In addition, the fluid cooler lines, electrical lines, vacuum lines, control linkage, and transmission should be checked periodically for leaks, damage or deterioration.

Note: Transmission failure can occur if the vehicle is overloaded beyond the GVWR or GCWR limits. Caution must be taken when towing with the motor home not exceed the recommended GCWR.

TRANSMISSION GEAR SELECTION

Below is a chart showing acceptable speeds for the various gears of the transmission.This will apply in all driving conditions including inclines and declines. The 1000 and 2100 Series Allison 5-speed transmissions do not have speed limitations listed due to a range inhibitor function that is operated by the TCM (transmission computer).The range inhibitor will restrict shifting into certain gears if it may damage the transmission or engine.

The Allison LCT 1000 and the 2100MH five speeds are standard with manual shift via the shift lever on the steering column.There are four forward selections with the shift lever overdrive, third, second and first. Normal driving select overdrive the transmission will utilize all five forward gears. To manually select fourth, have the shift lever in overdrive and toggle the “O/D OFF” switch; an indicator light will light up on the instrument cluster indicating overdrive is disabled.

The overdrive switch is installed by the body manufacturer and generally located in close proximity of the head light switch. If replacement of the overdrive switch is required utilize Workhorse part no. W0001809.

The Allison 2100MH five speed has an optional shift by wire, Electronic Control Shifter (ECS) available. The shift selector has been designed to provide easier driver operation and features. The features include push-button operation, integrated safety features, diagnostic capabilities and solid-state construction for reliability.

The ECS has 7 selections that include “P” park, “R” reverse, “N” neutral, “D” drive, up and down arrows for manual gear selection, and the “Mode” switch (the mode switch does not have operator functions). The ECS also eliminates the “O/D” on/off dash mounted toggle switch, manual gear selection of all gears are controlled with the up and down arrows.Refer to the operation manual for additional functionality of this electronic control system.

CHECKING AND ADDING FLUID

Transmission malfunction can be traced to an incorrect fluid level or improper reading of the dipstick. A fluid level that is to high or to low can cause overheating and clutch plate damage. Fluid level should be at the “FULL HOT” mark with transmission fluid at normal operating temperature of 180 degrees F.The normal operating temperature is obtained only after at least 15 miles of highway-type driving.

CAUTION: With normal operating temperatures the dipstick will be extremely hot to the touch, use care to avoid burns.

To determine proper level, proceed as follows with transmission at normal operating temperature:

1. Park the vehicle on a level surface. Apply the parking brake and block the vehicle wheels.
2. With the gear selector in the PARK position start the engine, DO NOT RACE THE ENGINE. With brake pedal applied, move the selector through each range, pausing for about three seconds in each range.Then position the shift lever in PARK.
3. Locate the transmission dipstick in front and above the radiator.
4. Immediately check the fluid with the selector lever in PARK, engine running at SLOW IDLE.
5. Check the level by pulling out the dipstick, wiping with clean towel or rag, push dipstick back in all the way, wait three seconds, then pull it back out again, check both sides of the dipstick, and read level.
6. The fluid level on the dipstick should be at the “FULL HOT” mark.
7. If additional fluid is required, add fluid using the transmission dipstick tube (filler).
8. Add ONLY sufficient fluid to bring the dipstick level to the “FULL HOT” mark.

Note: Automatic transmissions are frequently overfilled because the fluid is checked when it is cold and the dipstick indicates fluid should be added. However, the lower reading is normal since the level will rise as fluid temperature increases. A change of over ¾ inch will occur as fluid temperature rises from room temperature (60 degrees F) to operating temperature (180 degrees F), see the adjacent diagram.

Overfilling can cause foaming and loss of fluid through the vent.With too much fluid, the rotating members churn the fluid, producing aeration that reduces the fluids cooling effectiveness. Slippage and transmission failure can result. Low level can cause transmission pump cavitations, a loss of main lubrication fluid pressure, resulting in clutch damage. It can cause slipping particular when the transmission is cold or the vehicle is on a hill.

TRANSMISSION FLUIDS

Automatic transmission fluid can provide up to 100,000 miles of service before oxidation occurs under normal operating temperatures of about 175 to 180 degrees F.

Above normal operating temperatures, the oxidation rate doubles (useful life of the fluid is cut in half) with each 20 degree increase in temperature.

Refer to the adjacent chart. Note: The adjacent chart assumes that oil temperature remains constant for the miles indicated. Temperatures that appear for short periods, such as climbing hills, etc., would need to be averaged against normal operating temperatures to determine actual life expectancy.

Oil Temperature Measured at Converter Outlet to Cooler

350 degrees F is the maximum temperature. This is the normal place to install a temperature gauge or signal. The temperature in this location will vary significantly with each vehicle start-up or hill. If the temperature reaches 350 degrees F, reduce throttle. To lower the transmission temperature with the transmission in NEUTRAL, run the engine at 1,200 RPM for 2-3 minutes to cool the oil. DO NOT allow the converter outlet temperature to exceed 350 degrees F.

Oil Temperature Measured in the Sump or Oil Pan

150 degrees F– Minimum operating temperature for continuous operation. It is possible in low ambient temperature to overcool the transmission with oil to air-type coolers; it is hard to overcool if used in conjunction with oil to water coolers, installed in most standard automotive radiators and on all Workhorse chassis motor homes.

180–200 degrees F – Proper oil level checking temperature

200 degrees F– Maximum oil level checking temperature. Beyond this, readings are not reliable because of expansion.

285 degrees F – Maximum sump/oil pan temperature for short duration, such as a long hill climb.

300 degrees F– Metal parts inside transmission begin to warp and distort in varying degrees, seals melt rapidly and transmission fluid life is extremely short due to oxidation and distress.

HYDRA-MATIC 4L80E/4L85E

SPECIFICATIONS

Temperature vs Resistance

Temperature °F	Temperature °C	Minimum Resistance Ω	Nominal Resistance Ω	Maximum Resistance Ω	Signal volts
-40	-40	90636	100707	110778	5.00
-22	-30	47416	52684	57952	4.78
-4	-20	25809	28677	31545	4.34
14	-10	14558	16176	17794	3.89
32	0	8481	9423	10365	3.45
50	10	5104	5671	6238	3.01
68	20	3164	3515	3867	2.56
86	30	2013	2237	2461	1.80
104	40	1313	1459	1605	1.10
122	50	876	973	1070	3.25
140	60	600	667	734	2.88
158	70	420	467	514	2.56
176	80	299	332	365	2.24
194	90	217	241	265	1.70
212	100	159	177	195	1.42
230	110	119	132	145	1.15
248	120	89.9	99.9	109.9	0.87
266	130	69.1	76.8	84.5	0.60
284	140	53.8	59.8	65.8	0.32
302	150	42.5	47.2	51.9	0.00

Fastener Tightening Specifications (Overhaul)

Application	Specification	
	Metric	English
Accumulator Housing to Valve Body	11 N·m	97 lb in
Case Center Support	44 N·m	32 lb ft
Control Valve Assembly to Case	11 N·m	97 lb in
Cooler Pipe Connector Nut at Case and Radiator	38 N·m	28 lb ft
Engine Rear Mount to Transmission Bolt	44 N·m	32 lb ft
Engine Rear Support Bracket to Frame Nut	44 N·m	32 lb ft
Extension Housing to Case	34 N·m	25 lb ft
Flywheel Housing Cover to Transmission	7 N·m	62 lb in
Flywheel to Converter	44 N·m	32 lb ft

Fastener Tightening Specifications (Overhaul) (cont'd)

Application	Specification	
	Metric	English
Pump Body to Cover	24 N·m	18 lb ft
Rear Servo Cover to Case	24 N·m	18 lb ft
Solenoid to Valve Body	8 N·m	71 lb in
Speed Sensor and Bracket Assembly to Case	11 N·m	97 lb in
Transmission Case to Engine	44 N·m	32 lb ft
Valve Body to Case/Lube Pipe	11 N·m	97 lb in
Valve Body to Case/PSM	11 N·m	97 lb in

Fastener Tightening Specifications (On-Vehicle)

Application	Specification	
	Metric	English
Accumulator Cover Bolts	24 N·m	18 lb ft
Auxiliary Valve Body to the Case Bolts	11 N·m	96 lb in
Cooler Line to the Oil Cooler Nut	20 N·m	15 lb ft
Crossmember to the Frame Bolts	77 N·m	56 lb ft
Detent Spring to the Valve Body Bolts	22 N·m	16 lb ft
Interior Wiring Harness Bolts	11 N·m	96 lb in
Lube Pipe Clip Bolt	11 N·m	96 lb in
Manual Shaft Nut	28 N·m	21 lb ft
Oil Cooler Bracket Bolts	6 N·m	53 lb in
Oil Cooler to the Radiator Bolts	10 N·m	89 lb in
Oil Cooler Line Nuts	45 N·m	33 lb ft
Oil Level Indicator Tube Bracket Bolt and Nut	12 N·m	9 lb ft
Oil Pan Bolts	24 N·m	18 lb ft
Torque Converter Cover to Engine Bolts	40 N·m	30 lb ft
Oil Passage Cover to the Case Bolts	11 N·m	96 lb in
Park/Neutral Position Switch Bolts	27 N·m	20 lb ft
Parking Lock Bracket Bolts	24 N·m	18 lb ft
Pressure Switch Manifold	11 N·m	96 lb in
Rear Servo Cover Bolts	24 N·m	18 lb ft
Rear Transmission Mount To Crossmember Nut	47 N·m	35 lb ft
Rear Transmission Mount Bolts	47 N·m	35 lb
Solenoid Assembly to the Pump Bolts	11 N·m	96 lb in
Shift Cable Bracket Nut	6 N·m	53 lb in
Spacer Plate Support Plate Bolts	11 N·m	96 lb in
Speed Sensor Bolts	11 N·m	96 lb in
TCC Solenoid Bolts	11 N·m	96 lb in
Torque Converter Cover Bolts	33 N·m	24 lb ft
Torque Converter to the Flywheel Bolts	55 N·m	41 lb ft
Transmission Control Lever Nut	27 N·m	20 lb ft
Transmission to the Engine Studs	50 N·m	37 lb ft
Transmission Oil Pan Bolts	11 N·m	96 lb in
Transmission to the Engine Bolts	50 N·m	37 lb ft
Valve Body to the Case Bolts	17 N·m	13 lb ft
Vent Hose Clip Bolt	10 N·m	89 lb in

Transmission Scan Tool Data Definitions

1-2 Shift Time: This parameter is the actual time of the last 1-2 shift. The shift time is based on the gear ratio change after the commanded 1-2 shift. This value is only accurate if the adaptable shift parameter indicates Yes.

1-2 Shift Time Error: Displays a range of -6.38 to +6.38 seconds. This parameter is the difference between the desired 1-2 shift time and the actual 1-2 shift time. A positive number indicates the actual shift time was longer than the desired shift time. This value is only accurate if the Adaptable Shift parameter indicates Yes.

1-2 Solenoid: Displays On or Off. These parameters are the commanded status of the 1-2 shift solenoid valves. ON represents a commanded energized state (current is flowing through the solenoid). OFF represents a non-commanded state (current is not flowing through the solenoid).

1-2 Solenoid Open/Shorted to Ground: Yes or No. This parameter indicates if an open or a short to ground exists in the feedback signal from the 1-2 shift solenoid valve to the controller.

1-2 Solenoid Shorted to Voltage: No. This parameter indicates if a short to B+ exists in the feedback signal from the 1-2 shift solenoid valve to the controller.

1-2 TAP Cell (4-16): Scan tool displays kPa or psi. This parameter displays the amount of pressure varied from a calibrated base line pressure for shifts. Each TAP cell is based on a calibrated shift torque value. Each TAP cell value is calculated from the last shift time. This cell pressure is used in addition to the calibrated base line pressure to adjust the apply of a clutch or band during the next shift.

2-3 Shift Time: Displays 0.00-6.38 seconds. This parameter is the actual time of the last 2-3 shift. The shift time is based on the gear ratio change after the commanded 2-3 shift. This value is only accurate if the adaptable shift parameter indicates Yes.

2-3 Shift Time Error: Displays a range of -6.38 to +6.38 seconds. This parameter is the difference between the desired 2-3 shift time and the actual 2-3 shift time. A positive number indicates the actual shift time was longer than the desired shift time. This value is only accurate if the Adaptable Shift parameter indicates Yes.

2-3 Solenoid: These parameters are the commanded status of the 2-3 shift solenoid valves. ON represents a commanded energized state (current is flowing through the solenoid). OFF represents a non-commanded state (current is not flowing through the solenoid).

2-3 Solenoid OpenIShorted to Ground: Yes or No. This parameter indicates if an open or a short to ground exists in the feedback signal from the 2-3 shift solenoid valve to the controller.

2-3 Solenoid Shorted to Voltage: No. This parameter indicates if a short to B+ exists in the feedback signal from the 2-3 shift solenoid valve to the controller.

2-3 TAP Cell (4-16): Scan tool displays kPa or psi. This parameter displays the amount of pressure varied from a calibrated base line pressure for shifts. Each TAP cell is based on a calibrated shift torque value. Each TAP cell value is calculated from the last shift time. This cell pressure is used in addition to the calibrated base line pressure to adjust the apply of a clutch or band during the next shift.

3-4 Shift Time: Displays 0.00-6.38 seconds. This parameter is the actual time of the last 3-4 shift. The shift time is based on the gear ratio change after the commanded 3-4 shift. This value is only accurate if the adaptable shift parameter indicates Yes.

3-4 Shift Time Error: Displays a range of -6.38 to +6.38 seconds. This parameter is the difference between the desired 3-4 shift time and the actual 3-4 shift time. A positive number indicates the actual shift time was longer than the desired shift time. This value is only accurate if the Adaptable Shift parameter indicates Yes.

3-4 TAP Cell (4-16): Scan tool displays kPa or psi. This parameter displays the amount of pressure varied from a calibrated base line pressure for shifts. Each TAP cell is based on a calibrated shift torque value. Each TAP cell value is calculated from the last shift time. This cell pressure is used in addition to the calibrated base line pressure to adjust the apply of a clutch or band during the next shift.

4WD: Displays Enabled or Disabled. This parameter indicates whether the vehicle is currently in a four-wheel drive mode.

4WD Low: This parameter is the signal state of the four-wheel drive low circuit. Enabled indicates a 0 voltage signal requesting 4WD low. Disabled indicates a B+ voltage signal which does not request 4WD low.

A/C Clutch: Displays ON or OFF. Represents the commanded state of the A/C clutch control relay. The clutch should be engaged whenever ON is displayed. The controller compensates for the additional engine load that is accompanied with the AC clutch engaged.

Adaptable Shift: The scan tool displays Yes or No. Yes indicates that the proper operating conditions (TP sensor, engine torque, vehicle speed data, engine vacuum, shift delay, etc.) were all within the proper operating range during the last shift and the shift time was accurate. This shift information is then used through the adaptive function to update the adapt cells. No indicates that not all of the operating conditions were met in order to enable this function and that the adapt cells were not updated.

Current TAP (Transmission Adaptive Pressure) Cell: Displays a torque based cell range of 0-1 6. This parameter indicates the current cell used for line pressure modification (adaptation).

Current TAP Memory: +110 kPa (-16 to +16 psi). This parameter is the amount of pressure that is added to base line pressure to adjust the holding effort of a clutch or a band, while shifting.

ECT (Engine Coolant Temperature): Displays -40°C to 151°C (-40°F to 304°F). This parameter is the input signal of the engine coolant temperature sensor. Engine coolant temperature is high when the signal voltage is low (0 volts), and engine coolant temperature is low when the signal voltage is high (5 volts).

Engine Run Time: Displays a range of O:OO:OO-18:12:15 Hr/Min/Sec. This parameter measures how long the engine has been operating. When you turn the ignition switch OFF, the value resets to zero.

Engine Speed: This parameter indicates the rotational speed of the engine expressed as revolutions per minute.

Engine Torque:

This parameter is a calculated value based on engine load, throttle position, mass air flow, and other engine and transmission inputs. This parameter is accurate to within 15 Wlb of actual measured engine torque.

Gear Ratio: Displays a range of 0.00 to 8.00:l. This parameter is the actual gear ratio of the current commanded gear. In the current gear of R, D3, D2, and D1, it is calculated by dividing the input speed by the output speed. In the current gear of D4 with TCC lock up, the gear ratio is calculated by dividing the turbine speed by the output speed.

Hot Mode: Displays On or Off. This parameter monitors the transmission fluid temperature. YES indicates that the transmission fluid temperature has exceeded 135°C (275°F).

IAT (Intake Air Temperature): Displays a range of -40°C to 215°C (-40°F to 419°F). The IAT sensor is a thermistor used to monitor the temperature of the air entering the intake manifold. The controller applies 5 volts to the sensor on a 5 volt reference circuit. When the air is cool, the resistance in the sensor is high. If the air is warm, the sensor resistance is low and the controller senses a low voltage signal. The controller converts the signal of the IAT sensor to degrees Celsius. Intake air temperature is used by the controller to adjust fuel delivery and spark timing.

Ignition Voltage: Displays 0.0-25.5 volts. This parameter represents the system voltage measured by the controller at its ignition feed.

Last TAP: Displays psi. This parameter indicates the amount of pressure that was added to base line pressure in order to adjust the apply effort of a clutch or a band during the last adapting shift.

Latest Shift: This parameter is the actual shift time of the last upshift. This value is only accurate if the adaptable shift parameter indicates YES.

Maximum Tap (Transmission Adaptive Pressure): This parameter indicates when line pressure modification (adaptation) has reached its limit. Yes indicates the limit has been reached. No indicates the limit has not been reached.

PC (Pressure Control) Solenoid Act. (Actual) Current: Dispalys the actual current of the pressure control solenoid circuit at the control module. Zero amp (no current flow) indicates an actual higher line pressure. A reading of 1.1 amp (high current flow) indicates an actual lower line pressure.

PC (Pressure Control) Solenoid Duty Cycle: Displays the commanded state of the pressure control solenoid expressed as a percentage of energized ON time. A reading of 0% indicates zero ON time (non energized), or no current flow. Approximately 60% at idle indicates maximum ON time (energized), or high current flow.

PC (Pressure Control) Solenoid Ref. (Reference) Current: Displays the the commanded current of the pressure control solenoid circuit at the control module. Zero amp (no current flow) indicates a commanded higher line pressure. A reading of 1.1 amp (high current flow) indicates a commanded lower line pressure.

Power Take-Off: Displays Yes or No. This parameter indicates when the Power Take Off (PTO) is engaged. PTO mode disables all transmission diagnostics.

Shift Torque: Displays a range of 0-510 (0-406 ft).

This parameter is the torque value which is used in the commanded pressure calculation during shift. This parameter indicates the last shift torque.

Speed Ratio:

The scan tool displays a range of 0.00:1-8.00:1. This parameter indicates engine speed divided by transmission output speed.

Standard TAP (Transmission Adaptive Pressure): Displays Yes or No. The standard TAP is an amount of pressure that is added to the base line pressure. If the shift requires standard TAP to achieve the shift, the scan tool displays Yes. If the shift requires more or less than the standard TAP to achieve the shift, the scan tool displays No. This reading indicates that the TAP is out of the standard range.

TAP Gear 1: Range: 0-876 kPa (0-127). This display indicates a pressure modification which is added to the line pressure in 1st gear when the PCM detects a worn or slipping component.

TAP Gear 2: Range: 0-876 kPa (0-127). This display indicates a pressure modification which is added to the line pressure in 2nd gear when the PCM detects a worn or slipping component.

TAP Gear 2 TCC: Range: 0-876 kPa (0-127). This display indicates a pressure modification which is added to the line pressure in 2nd gear with TCC applied when the PCM detects a worn or slipping component.

TAP Gear 3: Display indicates a pressure modification which is added to the line pressure in 3rd gear when the PCM detects a worn or slipping component. TAP Gear 3 TCC: Range: 0-876 kPa (0-127). This display indicates a pressure modification which is added to the line pressure in 3rd gear with TCC applied when the PCM detects a worn or slipping component.

TAP Gear 4: Range: 0-876 kPa (0-127). This display indicates a pressure modification which is added to the line pressure in 4th gear when the controller detects a worn or slipping component.

TAP Gear 4 TCC: Range: 0-876 kPa (0-127). This display indicates a pressure modification which is added to the line pressure in 4th gear with TCC applied when the controller detects a worn or slipping component.

TAP Gear Reverse: This display indicates a pressure modification which is added to the line pressure in Reverse gear when the PCM detects a worn or slipping component.

TCC Duty Cycle: This parameter is the commanded Percentage of ON time of the TCC PWM solenoid. 90% represents an ON (energized) commanded state. 0% represents an OFF (non-energized) commanded state.

TCC Duty Cycle Open/Shorted to Ground: This parameter indicates if an open or a short to ground exists in the feedback signal from the TCC PWM solenoid valve to the controller.

TCC Duty Shorted to Voltage: Displays Yes or No. This parameter indicates if a short to B+ exists in the feedback signal from the TCC PWM solenoid valve to the Controller.

TCC Mode: Dispalys a range of 0 through 5. (0), or Off Mode, indicates that the controller commands the TCC OFF at a calibrated minimum throttle. The calibrated minimum throttle is different at low vehicle speeds than it is at high vehicle speeds. Off Mode is also active when the transmission is in the wrong gear range, the engine or the transmission is cold, the brake input indicates that the brakes are ON, a downshift or upshift is initiated, the engine is at idle, the transmission is in Hot Mode or a misfire is detected. One (l), or release Mode, indicates that the controller commands the release of the TCC. Two (2), or Apply Mode, indicates that the controller commands the apply of the TCC. Apply pressure varies based on normal or performance operations, hot conditions or if the cruise control is active. Apply Mode is used under normal driving conditions. All apply pressure is dependent on throttle position and vehicle speed. The TCC applies with an average 65% duty cycle. Three (3), or Apply Enable Mode, indicates that enabling conditions are met for applying the TCC (enabling conditions include: vehicle speed, gear selection, transmission temperature, throttle angle, brake switch status, etc.). Four (4), or Locked Mode, indicates that the controller commands full capacity of the TCC when the transmission is in fourth gear and the vehicle speed is greater than a calibrated value. When variable TCC apply pressure stops (apply mode), maximum TCC pressure is used. Five (5), or Coast Mode, indicates that the controller commands apply of the TCC when the transmission is in fourth gear and the throttle, and vehicle speed, are not high enough to enable Apply Mode, but high enough to keep the TCC applied. When Coast Mode is active, TCC apply pressure is set to a predetermined amount.

TCC (To rque Converter Clutch) Slip Speed: Displays -4080 to +4079 RPM. This parameter is the difference between transmission input speed and engine speed. A negative value indicates that the engine speed is less than the input speed (deceleration). A positive value indicates that the engine speed is greater than the input speed (acceleration). A value of zero indicates that the engine speed is equal to the input speed (TCC is applied).

TFP Switch A/B/C: Displays On/Off, On/Off, On/Off. These parameters are the three inputs from the automatic transmission fluid pressure manual valve position switch Assembly. ON represents a 0 voltage signal. OFF represents a B+ voltage signal.

TFT (Transmission Fluid Temperature) Sensor: Displays 0.00-5.00 volts. When the transmission fluid is cold, the sensor resistance is high and the controller senses a high signal voltage. As the transmission fluid temperature warms to normal operating temperature, the sensor resistance becomes less and the voltage decreases to about 1.5-2.0 volts.

TP (Throttle Position) Angle: Displays a range of 0-100%. The TP angle is computed by the VCM from TP voltage. The TP angle should display 0% at idle and 100% at wide open throttle (WOT). Displays a range of 0 through 5.

TP (Throttle Position) Sensor: Scan tool displays a range of 0.00-5.00 volts. The VCM uses the TP sensor in order to determine the amount of throttle demanded by the driver. Voltage is below 1 volt at idle. Voltage is above 4 volts at wide open throttle (WOT).

Trailer Mode: Displays a range of 0-20. Zero indicates normal line pressure and shift operation, where 20 indicates high line pressure and a modified shift feel pattern for towing and hauling.

Transfer Case Ratio: The scan tool displays a range of 0.00-3.88:1. This parameter indicates the ratio of the transfer case calculated by input speed divided by transmission output speed based on

transmission commanded gear.

Trans. Fluid Temp. (TFT): Displays -40°C to 151°C (-40°F to 304°F). This parameter is the input signal of the transmission fluid temperature sensor. Transmission fluid temperature is high when the signal voltage is low (0 volts), and transmission fluid temperature is low when the signal voltage is high (5 volts).

Transmission ISS (Input Shaft Speed): 0-8192 RPM. This parameter measures the rotational speed of the input shaft expressed as revolutions per minute.

Transmission OSS (Output Shaft Speed): 0-8192 RPM. This parameter indicates the rotational speed of the transmission output shaft expressed as revolutions per minute. On four-wheel drive applications, the transfer case output shaft speed is measured.

Turbine Speed:parameter indicates the rotational speed of the torque converter turbine shaft expressed as revolutions per minute. In commanded gears 1,2, and 3, the turbine speed equals the input speed. In commanded gear 4, the turbine speed equals 3/4 of the input speed.

Vehicle Speed: Displays 0-255 km/h (0- 158 mph).

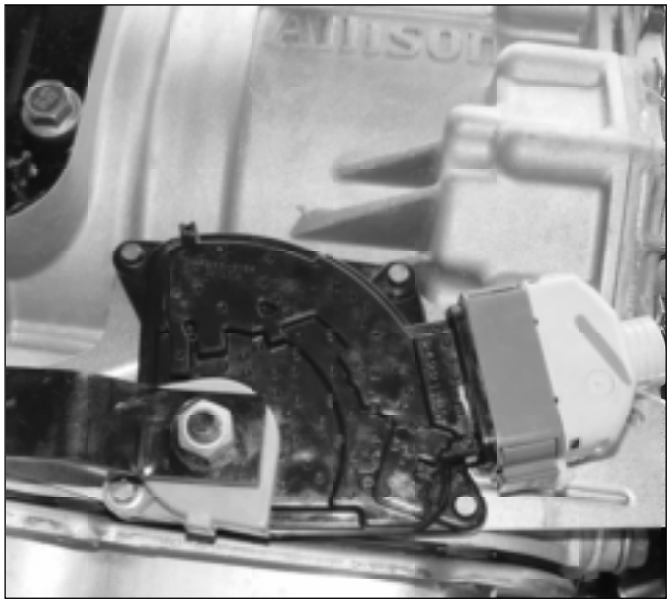


Fig. 7-1. Redesigned NSBU switch.

HYDRA-MATIC 4L80E/4L85E DIAGNOSIS

Diagnostics for the Hydra-matic transmission remains unchanged from MY2003. Refer to the appropriate service publications for detailed diagnostic information.

Changes in the PNP connector and wire pin assignments is detailed in Section 8 Wiring Diagrams.

ALLISON LCT 1000/2100MH SERIES

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Oil Drain Plug	35 N·m	26 lb ft
Speed Sensor Mounting Bolt	12 N·m	108 lb in
Transmission to Transmission Mount Bolts	41 N·m	30 lb ft
Transmission to Transmission Mount Nuts	41 N·m	30 lb ft
Transmission Support to Transmission Mount Nuts	45 N·m	33 lb ft
Transmission Support to Frame Bolts and Nuts	110 N·m	81 lb ft
Torque Converter to Flywheel Bolts	60 N·m	44 lb ft
Transmission to Engine Mounting Bolts and Studs	50 N·m	37 lb ft
Park Brake Bracket to Case Bolt	34 N·m	25 lb ft
Shift Cable Bracket to Transmission Mounting Bolts	25 N·m	18 lb ft

Transmission General Specifications

Description	Specification
Name	Allison LCT 1000
RPO Code	M74
First Range Ratio	3.10:1
Second Range Ratio	1.81:1
Third Range Ratio	1.41:1
Fourth Range Ratio	1.00:1
Fifth Range Ratio	0.71:1
Reverse Range Ratio	– 4.49:1
Transmission Fluid Type	DEXRON III
Maximum Engine Torque	520 lb ft
Maximum Gross Vehicle Weight (GVW)	19,850 lb (W19) 22,000 lb (W22)

Approximate Fluid Capacities

Application	Specification	
	Metric	English
Fill After Rebuild		
With Standard Oil Pan	17.9 L	19 qt
With Shallow Oil Pan	17.1 L	18 qt
Fill After Fluid and Filter Change		
With Standard Oil Pan	7.0 L	7.4 qt
With Shallow Oil Pan	6.2 L	6.4 qt

This parameter is the input signal from the OSS sensor.

TRANSMISSION GENERAL DESCRIPTION

The Allison LCT 1000/2100MH Transmissions are torque converter driven, fully automatic, transmission systems. They have up to five forward speeds, neutral, and reverse. The fifth range has an overdrive ratio for increased fuel economy and reduced engine wear. These transmissions incorporate a variety of standard and optional design features. These design features include:

- Direct mount to engine block
- Flexplate drive
- Torque converter with a torque converter clutch (TCC) and an internal vibration damper
- Three constant-mesh, planetary gear sets with helical cut gears
- Five multiple disk clutches (two rotating and three stationary)
- Common hydraulic system for all transmission functions
- Two transmission fluid filtration systems
- Electro-hydraulic control valve assembly
- Electronically controlled automatic gear selection and clutch apply
- Provision for remote transmission fluid cooler
- Fill tube/dipstick provision on both sides of transmission
- Parking pawl
- Power takeoff (PTO) provision on both sides of transmission
- Variety of output yokes or flanges

ELECTRONIC COMPONENT DESCRIPTION

Transmission Control Module

A microcomputer controls the transmission by receiving and processing signals from various switches and sensors. The microcomputer determines shift sequences, shift timing, and clutch apply and release characteristics. The microcomputer is an independent controller and is referred to a Transmission Control Module (TCM). TCMs are available in 12V configurations to match the configuration of the vehicle electrical system. The Pressure Switch Manifold (PSM) and Park/Neutral Position (PNP) Switch provide operator input to the TCM. Other data sent to the TCM include throttle position; engine, turbine, and output speeds; and sump temperature. Any active special function, such as anti-lock brakes or power takeoff, is also an input to the TCM. The TCM process these data to determine proper shift points, to monitor the current range, to perform ratio tests, and to compile diagnostic data. The TCM is programmed to protect the transmission and other vehicle driveline components by inhibiting actions such as full throttle neutral-to-range shifts and high-speed direction changes. The TCM determines if a system malfunction exists and stores diagnostic codes related to the malfunction. The codes, accessed by the service mechanic, are used in diagnosing persistent or intermittent trouble in the system.

Throttle Position/Torque Management

The TCM receives input on throttle position/torque management from a signal transmitted by the engine electronic controls. The engine electronic controls communicate directly to the transmission electronic controls over an SAE J 1850 or J 1939 Serial Communication Interface (SCI) data link. The transmission TCM must be calibrated to receive these signals.

Speed Sensors

Important: Do not rotate the sensor in its retaining bracket. Changing the sensor/bracket orientation may cause improper operation.

There are three speed sensors typically required for use with LCT 1000/2100MH series transmissions; the engine speed sensor, the turbine speed sensor, and the output speed sensor. 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. Hydraulic problems are detected by comparing the speed sensor information stored in the TCM memory. The speed sensors are variable reluctance devices that 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 that is mounted adjacent to a rotating ferrous member.

Column Shift Selector Equipped Chassis

The chassis is equipped with a column-type shift selector. In addition to the column shifter provided for the operator, another component associated with the shift selector is the Park/Neutral Position (PNP) switch mounted on the selector shaft. The PNP switch transmits selector position information to the TCM. The PNP 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 TCM so that certain vehicle control functions can be coordinated with the position of the shift controls. The PNP switch has redundant circuitry to alert the TCM in the event of a single wire or switch failure. The neutral signal output of the PNP switch is typically used as confirmation that the transmission is in Neutral before the engine starter is engaged. The PNP 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. The operator chooses the transmission range by moving the selector lever to the appropriate gate position.

When properly adjusted, the standard 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. The TCM shift calibration determines the available forward ranges for each selector position. Although specific ranges vary, typical selector positions for the LCT 1000/2100MH series are:

P – Park: Parking pawl is engaged. The transmission is in neutral. This position is not available on all shift selectors. When available, may be used when starting the engine and for stationary operations.

R – Reverse: Selected to move vehicle backward

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

D – Drive: The highest forward range, used for normal driving. The transmission shifts into first range for starting, and then automatically upshifts through the ranges (as operating conditions permit) until the highest range is attained.

4, (3), 2, 1 – Forward Range: There are four forward range selector positions. The first position after N (Neutral) is D (Drive) where all five forward ranges are available. Another position is first range hold. There are three choices for the next two positions. These choices are 1–4, 1–3, and 1–2 which describe the ranges available in that position. Workhorse Custom Chassis chooses the two positions that best fit the vocation for which the vehicle is intended.

Internal Components

Several components of the LCT 1000/2100MH electrical control system are located within the transmission as part of the main control valve body. These components include three types of solenoids for controlling the hydraulic action of the valves, the pressure switch manifold and an internal wiring harness that links the internal components with the TCM.

Solenoids

The LCT 1000's control valve body contains both normally closed (N.C.) and normally open (N.O.) solenoids. A normally closed solenoid remains closed until a signal from the TCM energizes the solenoid. A normally open solenoid remains open until the TCM energizes the solenoid. When a solenoid valve is in the closed position, the valve blocks flow. When a solenoid valve is in the open position, flow is permitted through the valve. The pulse width modulated F and the ON/OFF shift valve solenoids C, D, and E, are normally closed (N.C.). Both solenoid types have an orifice, electrical windings, an iron core, and a steel check ball. The solenoids used in the LCT 1000/2100MH Series differ in their ability to control flow or fluid pressure. The solenoids may operate in the open or closed state with no modulation capacity (C, D, and E solenoids), an intermediate flow and resultant pressure based on duty cycle (F solenoid) or produce pressure proportional to current (A and B solenoids). Shift solenoids C, D, and E provide the necessary logic to distribute fluid to the correct clutches. The shift solenoids provide either full control main pressure or exhaust to the head of each of the corresponding shift valves, C, D, and E. Since the valve states (stroked or unstroked) are critical to providing the correct transmission range, each shift valve has a pressure switch (located in the pressure switch manifold) which provides feedback to the computer as to the valve's position.

Trim solenoids A and B are used to control oncoming, offgoing, and holding pressure to the five clutches. These solenoids are referred to as Pressure Proportional to Current (PPC) solenoids since the output hydraulic pressure supplied by these solenoids is proportional to the controlled current command.

Pressure Switch Manifold

The pressure switch manifold (PSM) is a multiple-switch assembly made up of three normally open pressure switches and one normally closed switch. Normally open switches correspond to shift valves C, D, and E. Fluid pressures are fed from shift valves C, D, and E and the manual selector valve to the switches based on the positions of the valves and shift selector. The shift valve fluid pressures

reflect the logic condition at the corresponding solenoids. This logic indicates the current transmission operating range to the TCM. The three fluid pressure switches corresponding to the shift valves are normally open (contacts not touching) when no fluid pressure is present, so that electrical current is stopped at that switch. When fluid pressure is routed to the switch, it moves the diaphragm and upper contact so that the contact element touches both the positive and the ground contacts. This closes the circuit and allows current to flow from the positive contact through a switch.

The pressure switch corresponding to reverse is normally closed, since fluid pressure is always present unless the selector valve is moved to Reverse. The PSM also contains a temperature sensor thermistor for sump temperature. Changes in sump fluid temperature are indicated by changes in sensor resistance (for example, increasing temperature causes decreased sensor resistance). The resistance value is then relayed to the TCM as an input for shift control.

Internal Wiring Harness

The internal wiring harness has connectors for the shift solenoids C, D, and E. Connectors go to clutch trim solenoids A and B. A connector goes to the torque converter clutch solenoid (F).There is also a connector for the pressure switch manifold. All of these connectors go to the main electrical connector. The transmission main electrical connector transports signals from these connectors to the TCM via the external harness.

SHIFT-BY-WIRE ELECTRONIC CONTROLLED SHIFTER

System Overview

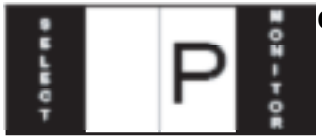
The Arens Controls' Shift-by-Wire System (SBW) is a state of the art control developed for use with Allison 1000/2000/2400 Series Transmissions. This shift selector has been designed to provide for easier driver operation, and features:

- Push-button operation
- Integrated safety features
- Diagnostic capabilities
- Solid state construction for reliable, extended life operation

The system consist of two major components:

1. Push Button Shift Selector is a compact, solid-state shift selector available for PARK and NON-PARK transmission applications. The shift selector is mounted in a convenient location near the vehicle operator.The shift selector is a self-contained electronic control that contains the push button system, Interface Control Module, and Actuator Control Module. The push button pad provides quick, easy operation of the system functions. The Interface Module communicates electronically with Allison TCM and NSBU switch. The Actuator Control communicates with the Arens 12VDC actuator and the integrated Position Sensor.
2. The Shift by Wire Actuator is a 12VDC powered shift actuator mounted on the Allison transmission. The actuator shifts the transmission as directed by commands from the shiftselector and within the operating guidelines of the Allison transmission.The Arens SBW system works in conjunction with the Allison "adaptive shifting" electronic control system to provide optimized shift quality.The SBW system components also have a unique redundant electronic system, which prevents single point electrical failures in the system and ensures long life, trouble free operation of the SBW system and the Allison transmission.

Fig. 7-2. Electronic Control Shifter control panel.



Control Panel Operation

This button shifts the transmission into Neutral and engages the Park Pawl [in 1000 and 2400 transmissions only]. (See the Allison Transmission's Operator's Manual regarding information for the Park Pawl.) Park or Neutral are used to start the vehicle.

WARNING: If Park is selected, and "P" does not display on the Monitor, the Parking Brake must be set to prevent the vehicle from moving unexpectedly. The system should be checked and serviced.

WARNING: On Park equipped transmissions, if the ignition is turned off without shifting to Park; a buzzer will sound and the display panel will illuminate and show the gear currently engaged. Shifting to "P" will engage Park and turn off the display and buzzer.

Note: On PARK equipped transmissions, if the vehicle engine is off, the ignition on, and the Park Pawl is not engaged (see Allison Transmission's Operator's Manual for Park Pawl information), the MONITER will display "N" and a buzzer will sound regardless of the operator's selection. Shifting to "P" will engage Park and turn off the system.

This button shifts the transmission into Reverse.

This button shifts the transmission to Neutral. Neutral can be used to start the vehicle.

WARNING: If the transmission is in "N" and the operator leaves the driver's station, the vehicle parking brake must be set to prevent the vehicle from rolling.

This button shifts the transmission into Drive and allows the transmission to automatically shift through the full range of 1st through 5th gears. When Drive is initially selected, the Select and Monitor displays read "D1" indicating that Drive has been selected and the transmission is in 1st gear. As the transmission automatically upshifts or downshifts, the Select/ Monitor Display will show which gear the transmission is actually in – D1, D2, D3, D4, or D5.

MANUAL GEAR SELECTOR- DOWN-

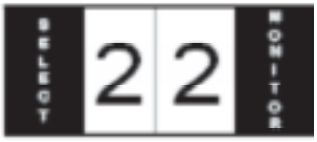
When the transmission is in DRIVE, the down-arrow button allows the operator to manually downshift one gear at a time, 5th through 1st.The Select Display will show what gear range has been selected; the Monitor Display will show the actual gear range the transmission is in.

Note: The transmission will not upshift beyond the gear range selected. When DRIVE is selected the full range automatic shift capability is restored.

Note: Selecting DRIVE at any time during the downshift sequence cancels the manual-shifting function and allows the transmission to shift automatically.

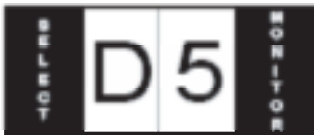
MANUAL GEAR SELECTOR-UP-

When the transmission is in 1 1, 2 2, 3 3, or 4 4, depressing the up-arrow button manually upshifts the transmission one gear at a time until D is selected. The Selector Display shows what gear has been selected, the Monitor Display will show what gear the transmission is actually in.



Note: The transmission will not upshift beyond the gear range selected. When DRIVE is selected the full range automatic shift capability is restored.

Note: Selecting DRIVE at any time during the upshift sequence cancels the manual shifting function and allows the transmission to shift automatically.



MODE

The MODE button activates the function identified by the label above it and may vary from vehicle to vehicle. A light will illuminate in the corner of the button when the MODE is on. (This function is optional.)

SERVICE

If the SERVICE display illuminates there is a fault in the SBW system. A qualified technician should inspect the system as soon as possible.

WARNING: Operation with the Service light illuminated may indicate a loss of safety back-up systems, and the operator should use extra caution when shifting to insure that the transmission is performing properly.

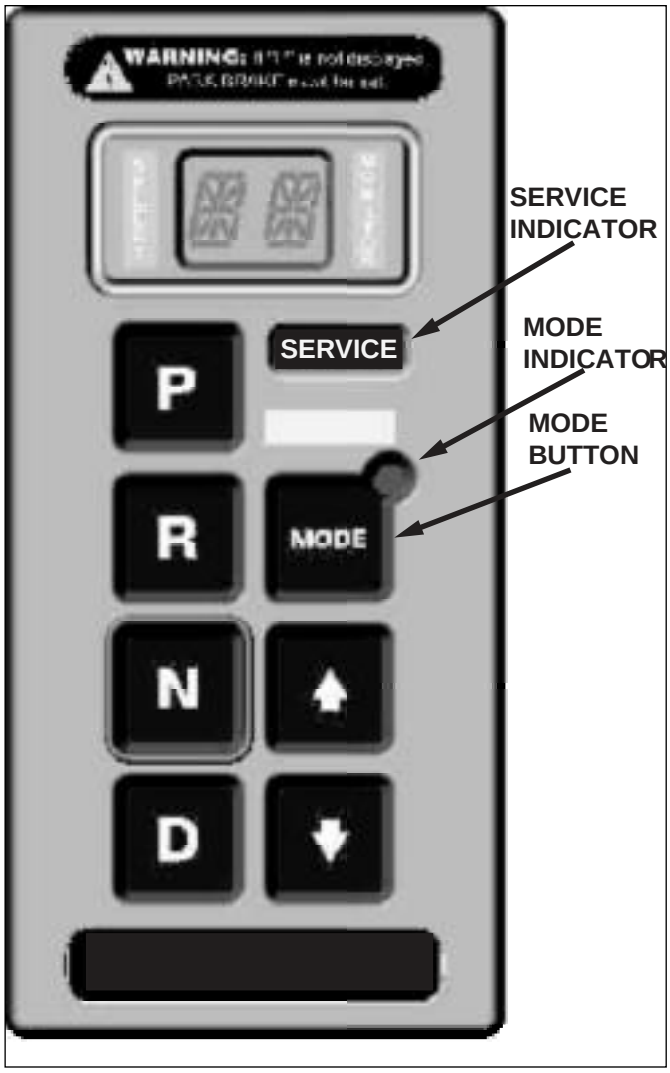


Fig. 7-3. Service Indicator, Mode Button, and Mode Indicator.

ADDITIONAL SYSTEM FEATURES:

FLASHING DISPLAY

This indicates that the transmission [rather than the SBW] has inhibited the selected transmission operation; this could occur for a variety of reasons. Refer to the Allison Transmission's Operator's Manual for more information.

MONITOR AND BUZZER SOUNDING

This indicates that the engine was shut-off without shifting the transmission to Park. (Park-Equipped Transmissions Only). The display will stay illuminated and show the gear it is currently in. In addition, a warning buzzer will sound. Selecting Park will turn off the panel and engage Park.

WARNING: Operation with the Service light illuminated may indicate a loss of safety back-up systems and the operator should use extra caution when shifting to insure that the transmission is performing properly.

EMERGENCY REMOVAL FROM PARK

In the event that a vehicle must be towed, and the SBW system cannot be activated to move the vehicle's transmission out of Park, the following must be done.

- Connect tow vehicle to disabled vehicle in such a manner that the disabled vehicle cannot move in either direction when it is removed from Park.
- Set the tow vehicle's brakes.
- Chock the tow vehicle's wheels.
- Set the disabled vehicle's brakes.
- Chock the disable vehicle's wheels.
- Remove plug from rear of SBW actuator.
- Insert a 3/16" hex key (allen wrench) into the rear of the SBW actuator and turn in a clockwise direction until the transmission comes out of park.
- Be sure to replace the moisture protection plug.

Note: Vehicle can be returned to Park with this feature.

Warning: When performing this operation all of the above must be done in the proper order to prevent possible injury from unexpected movement of the tow or disabled vehicles.

Note: Refer to the Allison service information for complete information on towing the chassis.

SHIFT BY WIRE (SBW) ACTUATOR INSTALLATION INSTRUCTION PROCEDURE

Installation Procedure:
This is the Initial Installation Procedure for a new SBW (Shift By Wire) Actuator. Note: If this is not a "first time" installation of a new actuator, please refer to Arens Controls "*AES-123-C, Re-Calibration Procedure*."

WARNING – If the transmission is installed in a chassis, do the following. Park the vehicle on level ground. Set the emergency brake and chock/block the tires to prevent the vehicle from moving unexpectedly. Turn off the engine.

2. Place the transmission manual shaft in the Neutral position. This can be done one of two ways.

A. Line-up the flats on the Selector Shaft with the figure cast into the side of the transmission (Figure #1 and reference illustration #1). This figure will be behind the NSBU (Neutral Start Back-Up) Switch. Do not remove the NSBU switch. Removal of the NSBU switch may result in loss of its calibration. If either of the flats on the selector shaft or the NEUTRAL figure that is cast into the side of the transmission is not visible, use step "B" to place the transmission into Neutral. Figure 7-4 (shown with NSBU switch removed for clarity).

B. Using an adjustable end wrench (Crescent Wrench) turn the selector shaft clock-wise until it stops. Do not force the selector shaft when it reaches the end of its travel. This could damage the transmission. The transmission is now in PARK. Next, slowly and carefully rotate the selector shaft back counterclockwise 2 detents. The transmission is now in NEUTRAL.

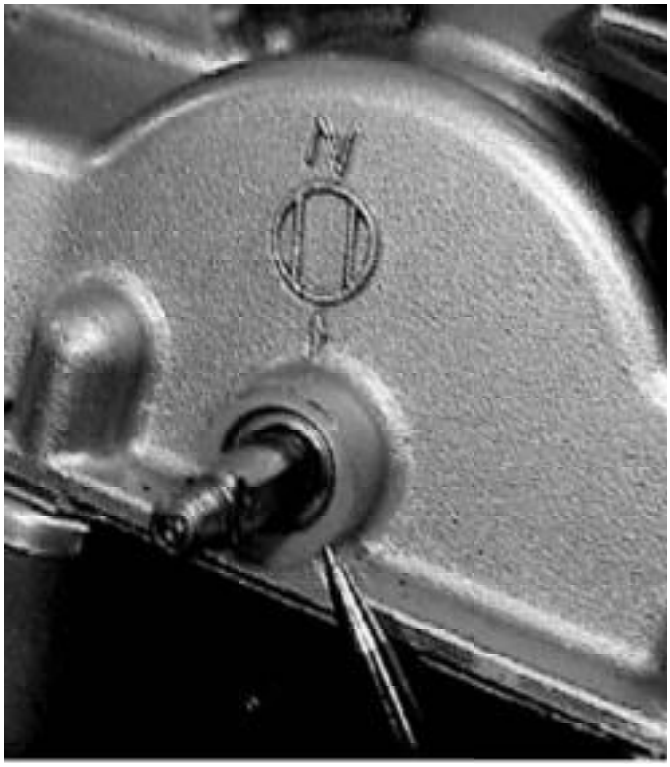


Fig. 7-4. NBSU alignment marks.

IMPORTANT - When moving the selector shaft in the counterclockwise direction from PARK, the tendency is to move it too fast. This may result in moving past the NEUTRAL (the 2 detents) position.

The transmission MUST be in NEUTRAL for proper installation. A simple check that the NEUTRAL position has been correctly obtained on operational vehicles and/or chassis's is to try and start the vehicle. If the vehicle is in NEUTRAL it will start, if it is not in NEUTRAL it will not start.

CAUTION:

When performing this check, make sure that the vehicle's emergency brake is set, the wheels are chocked, and foot pressure is maintained on the service brake pedal. Failure to do so may result in injury or death.

DEFINITION: Throughout this document, reference will be made to **HORIZONTALLY** mounted Actuators and **VERTICALLY** mounted Actuators. Figures 7-5 and 7-6 illustrates the difference between the two: HORIZONTALLY Mounted Actuator VERTICALLY Mounted Actuator

3. For Horizontally mounted actuators remove the 2 lower left-hand bolts from the rear transmission cover. For Vertically mounted actuators remove the 2 upper left-hand bolts from the rear transmission cover.

Fig. 7-5. Horizontally mounted actuator.

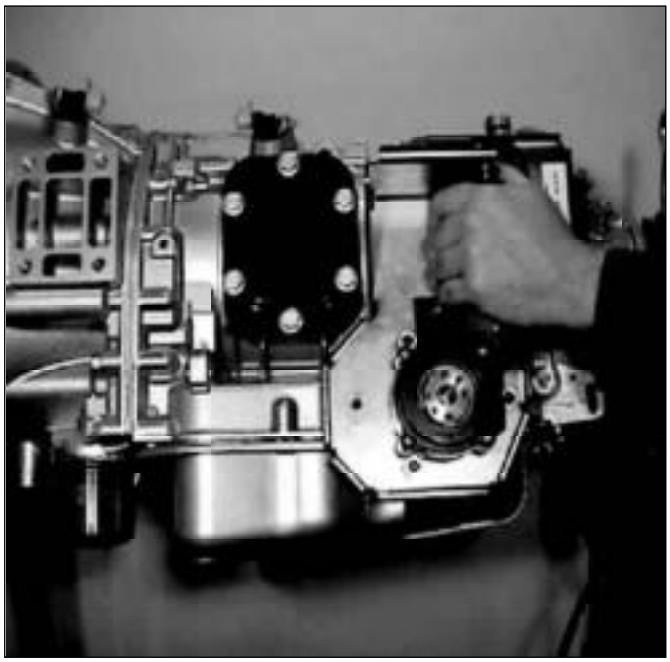


Fig. 7-6. Service Indicator, Mode Button, and Mode Indicator.

Note: These 2 bolts are not adjacent to each other.

4. Check to insure that the rear NSBU switch mounting bolt is tight.
5. Carefully remove the front NSBU switch mounting bolt. This Allison bolt will be replaced with an Arens supplied bolt. Be sure not to disturb the switch's position.
6. For Horizontally mounted actuator, place the Shift-by-Wire SBW actuator and bracket assembly on the Allison transmission,
7. Loosely install the 2 rear cover bolts removed in step 3.

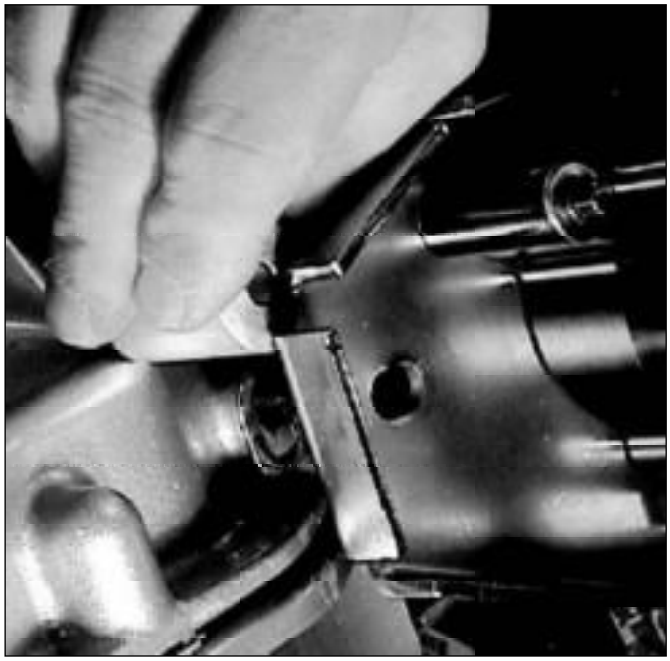


Fig. 7-7. Install round spacer.

8. For both the horizontally and vertically mounted actuators, place the Round Spacer, MT1246 (supplied with Actuator) between the actuator bracket and the front NSBU mount; again do not disturb the NSBU switch's position. See Figure 7-7.
9. Place the Flat Washer, WA984 (M8 WASHER, 24 mm O.D.) on to the M8 x 55mm hex bolt, SC508. See reference figure 7-8. For Vertically Mounted Actuators, be sure that the M8 x 55mm hex bolt is used here, not the M8 x 60mm, flanged head, thread forming bolt; they are very similar.
10. Place the washer and hex bolt through the front slot in the actuator bracket, spacer, front NSBU bracket and thread into the transmission. Tighten to Allison

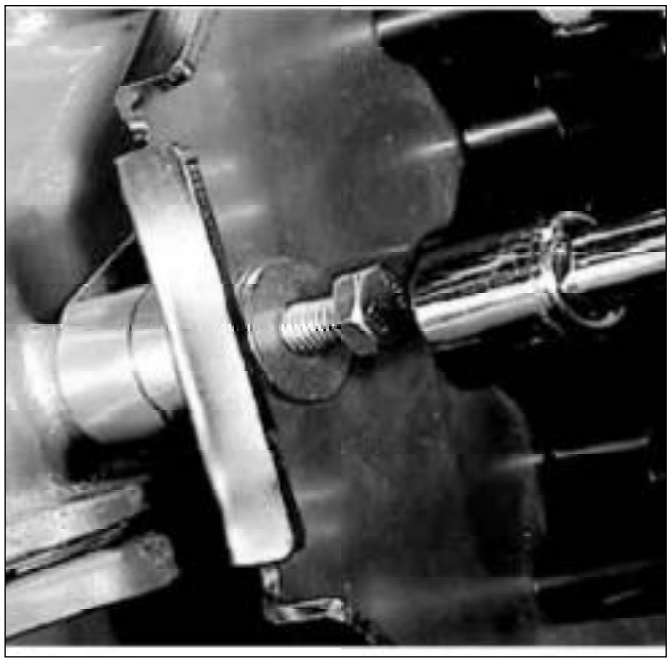


Fig. 7-8. Install M8 X 55 bolt.

Fig. 7-9. Install hex spacer.

specifications (see Allison manual for proper tightening torque). This M8 x 55mm hex bolt replaces the

11. For Vertically mounted actuators only, install the Hexagon Spacer, M8 x 60mm, flanged head, thread forming bolt and M8 washer as shown in Figure 7-9. Be sure that the M8 x 60mm, flanged head, thread forming bolt is used here not the M8 x 55mm hex bolt; they are very similar.Tighten the top M8 thread forming bolt to 20 to 28 pound-feet (27Nm to 38 Nm).
12. Tighten rear cover bolts that were loosely installed in step 7.
13. Align the witness marks on the shift shaft adapter with the witness marks on the actuator housing. For Horizontally mounted Actuators use the single groove witness mark on the Shift Shaft Adapter as shown in Figure 7-10. For Vertically mounted Actuators use the double groove witness mark on the Shift Shaft Adapter as shown in Figure 7-11. Place the shift shaft adapter into the center of the actuator. Be sure that the Shift Shaft Adapter properly engages the end of elector Shaft of the transmission.
14. For both Horizontally and Vertically mounted Actuators, insert the 4 - #10-32 x ½" long S.H.C.S. into the Shift Shaft Adapter.
15. Place your thumb over the center of the shift shaft adapter. Press the shift shaft adapter inward while tightening all 4 screws that secure the shift shaft adapter to 20 lbs.-in.
15. **IMPORTANT**– Place the Cap Nut through the Shift Shaft Adapter nd thread on to the end of the Transmission Selector Shaft.Tighten to 18 lbs.-in. Holding the cap nut with a wrench, tighten the socket head cap screw that goes through the center of the cap nut to 5 lbs.-ft., figure 7-12.

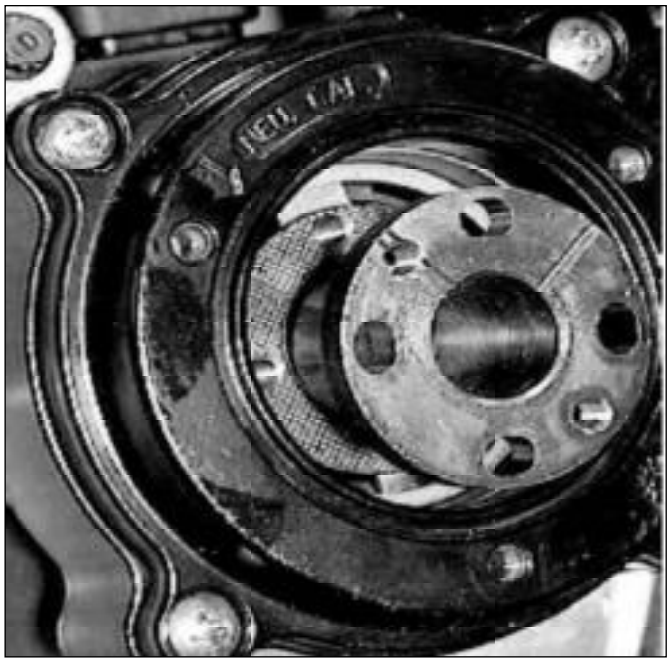


Fig. 7-11 . Vertical witness mark alignment.

16. Attach the Cover Plate with the 3 Cover Plate Screws.Tighten the 3 screws to 5 lbs.-ft.Figure 7-13.

System Checks:

CAUTION:

When performing the following system checks, make sure that the vehicle's emergency brake is set, the wheels are chocked, and foot pressure is maintained on the service brake pedal. Failure to do so may result in injury or death.

Fig. 7-12 . Tighten cap nut.

- The installation of the SBW system was done with the transmission in NEUTRAL; as such, the transmission should still be in NEUTRAL. To confirm this, power-up the system with the ignition switch without starting the engine. The "Monitor" side (right hand side) of the display should indicate "N" for NEUTRAL. If it does not, select NEUTRAL by depressing the "N" button on the PBSS (Push Button Shift Selector). The display should now show "NN" for NEUTRAL. Attempt to start the engine. If the installation was done correctly the engine should start. Turn OFF the engine and proceed to the next system check.

- If chassis/vehicle is equipped with PARK, power-up the system with the ignition switch without starting the engine. Select "P" for PARK. The "Monitor" side (right hand side) of the display should indicate "P" for PARK. Attempt to start the engine. If the installation was done correctly the engine should start.

Turn OFF the engine and proceed to the next system check. - Power-up the system with the ignition switch without starting the engine. Select DRIVE, the SBW (Shift By Wire) system will place the transmission in the DRIVE position. The display should indicate "DN" for CAN equipped vehicles or "DD" for non-CAN equipped vehicles for DRIVE position.

NOTE: With the ignition ON, and the engine not running, the CAN message from the Allison TCM (Transmission Control Module) to the Arens Controls PBSS (Push Button Shift Selector) will result in an "N" indication on the "Monitor" side of the display for any gear (e.g.: DRIVE, REVERSE, etc.). This is normal. Once the engine is running the Display for DRIVE will indicate "D1" through "D5", depending on the vehicles speed, or "DD" if CAN is not utilized; for REVERSE the display will indicate "RR". Attempt to start the engine. If the installation was done correctly the engine should NOT start. If any of these checks fail to function as described, see the Troubleshooting Section section of this section.

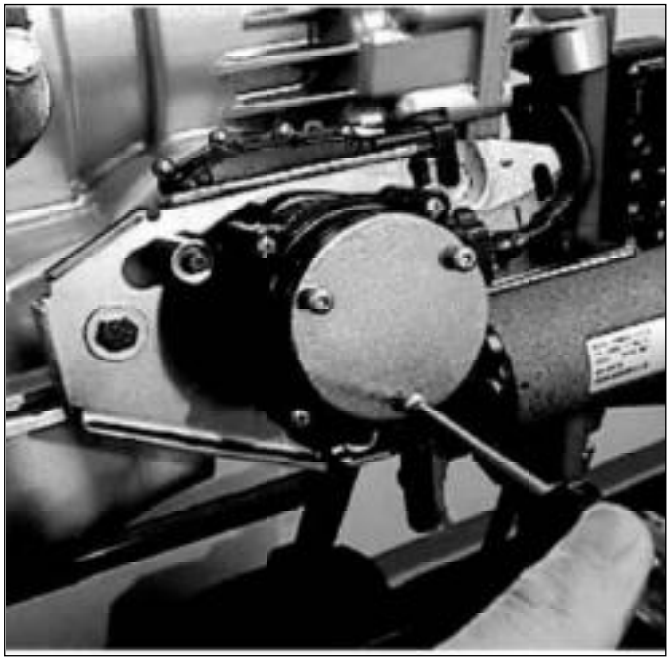


Fig. 7-13 . Install cover screws.

Shifter Calibration

This is the SBW Calibration Procedure for actuators that are already installed onto vehicles:

WARNING - Park the vehicle on level ground. Set the emergency brake and chock/block the tires to prevent the vehicle from moving unexpectedly.

1. Remove the 3 screws (shown previously in figure 7-13) that hold the cover plate on.
2. Loosen but don't remove the socket head cap screw that goes down through thecenter of the cap nut.
3. Loosen and remove the cap nut.
4. Notice the shift shaft adapter. If it looks like the one in figure 7-14 - "Figure A", proceed to Step 6. If it looks like the one in "Figure B", proceed to Step 18.

Calibration Using Shift Shaft Adapter A

5. Turn the ignition ON, and select NEUTRAL
6. Turn the Ignition OFF.The Shift Selector will stay ON supplying power to the Actuator, holding it in NEUTRAL. This is the desired condition.
7. Loosen (but do not remove) the 4 Socket Head Cap Screwsthat hold the shift shaft adapter in place, figure 7-15.
8. Remove 2 of the 4 socket heads crews in Step 7.
9.. Place 2 long (1" to 1-1/2" long) #10-32 screws in to the 2 threaded holes of the removed screws.
10. Pull out away from the transmission, putting the actuator into the "calibration" position.
11. Using the push button shift selector (PBSS), cycle the actuator (with the Shift Shaft Adapter Bolts Loose) in the following sequence:
    - from N (Neutral) into R (Reverse),
    - from R (Reverse), into D (Drive),
    - from D (Drive) back into N (Neutral).
12. Remove the 2 long #10-32 Socket Head Cap Screws used to pull the actuator into the "calibration" position.

Fig. 7-15 . Loosen the four socket head cap screws..

13. Replace the 2 - #10-32 x _" long that were removed in Step 9.
14. Tighten all 4 of the screws that secure the shift shaft adapter to 20 inch-pounds.
15. Put Loctite on the female threads of the cap nut.
17. **IMPORTANT** – Replace the cap nut and tighten. As this cap nut is being tightened, the center portion of the actuator will move inward (from the calibration position into the operation position). This is normal. Back the cap nut off 1/16 to 1/8 of a turn. Holding the cap nut with a wrench, tighten the socket head cap screw that goes through the center of the cap nut to 20 inch-pounds.
17. Replace the cover plate with the 3 cover plate screws. Torque to 5 lbs.-ft.

At this point the actuator assembly is calibrated to the transmission.

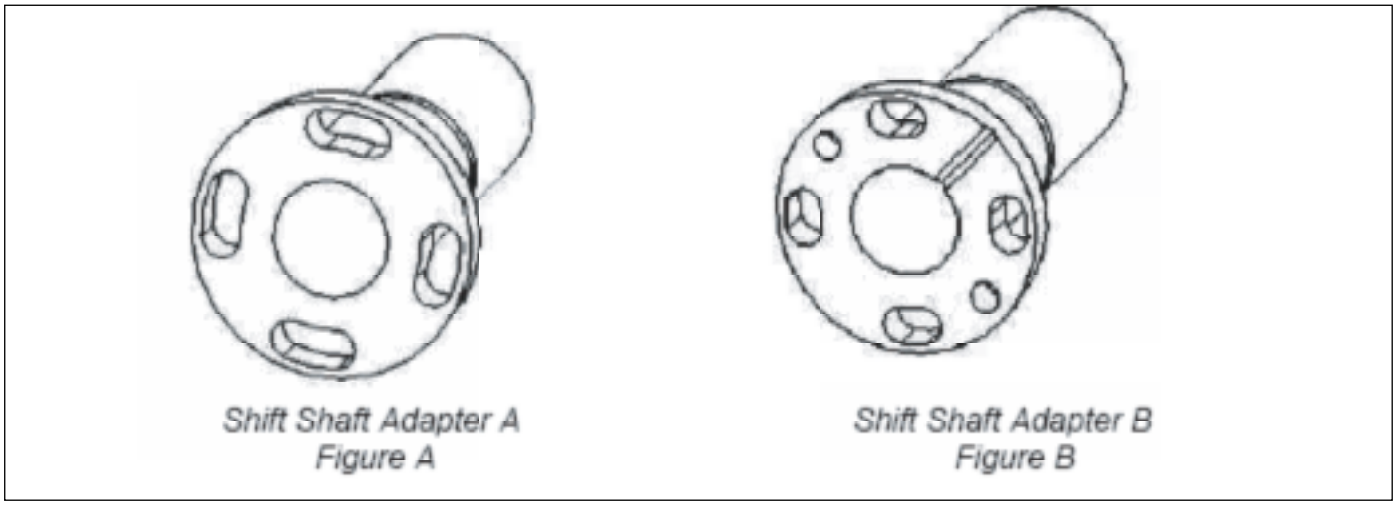


Fig. 7-14 . Adapter Type "A" and Type "B" shown.

Fig. 7-16 . Remove the shift adapter.

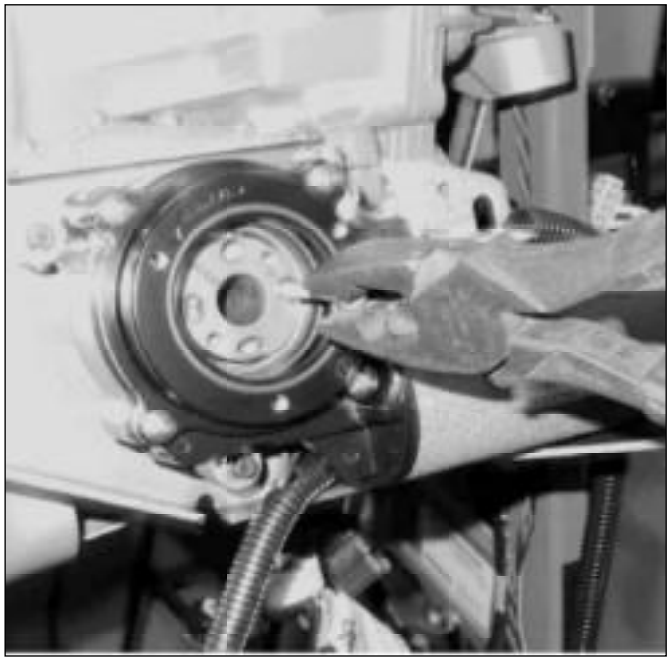


Fig. 7-17. Pull the lost motion wheel outward.

Calibration Using Shift Shaft Adapter B

18. Turn the ignition ON, and select NEUTRAL
19. Turn the Ignition OFFThis should turn off engine but not the Shift Selector. The shift selector will stay ON supplying power to the Actuator, holding it in NEUTRAL. This is the desired condition.
20. Remove the 4 Socket Head Cap Screws that hold the Shift Shaft Adapter in place, figure 7-15.
21. Place 2 long (1-3/4" to 2-1/2") #10-32 screws in the 2 threaded holes (not the slot) of the Shift Shaft Adapter.
22. **IMPORTANT** – The following steps are to confirm that the transmission is truly in NEUTRAL. Performing these steps incorrectly will result in calibrating the transmission in a position other than NEUTRAL.
    A. Using a long substantial screwdriver wedged between the 2 long screws, rotate the shift shaft adapter clockwise.Do not force the sel ector shaft when it reaches the end of its travel. This could damage the transmission. The transmission is now in PARK.
    B. Next, slowly and carefully rotate the selector shaft back counterclockwise 2 detents.

The transmission is now in NEUTRAL.

IMPORTANT - When moving the selector shaft in the counterclockwise direction from PARK, the tendency is to move it too fast.This may result in moving past the NEUTRAL (the 2 detents) position.The transmission MUST be in NEUTRAL for proper calibration

23. Remove the shift shaft adapter from the actuator, figure 7-16.
24. Place a #10-32 screw partially into 1 of the 4 holes in the lost motion wheel. Grasp the head of the socket head cap screw with a pair of pliers and pull the lost motion wheel outward, figure 7-17. This places the actuator into the "calibration" position.
25 . While in calibration position press "R" then "N" on the Push Button Shift Selector.
26. Replace the shift shaft adapter and the 4 - #10-32 x 1" long S.H.C.S. that were removed in step 21.
27. Place your thumb over the center of the shift shaft adapter. Press the shift shaft adapter inward while tightening all 4 screws that secure the shift shaft adapter to 20 inch-pounds.
28. **IMPORTANT** – Replace the cap nut and tighten to 18 lbs.-in. Holding the cap nut with a wrench, tighten the socket head cap screw that goes through the center of the cap nut to 5 lbs.-ft.
29. Replace the cover plate with the 3 cover plate screws. Torque to 5 lbs.-ft.

At this point the actuator assembly is calibrated to the transmission.

ALLISON TRANSMISSIONDIAGNOSTICS

It is critical that the Workhorse technician be able to accurately diagnose whether a perceived transmission problem is actually in the transmission or transmission control module (TCM) or a problem in the chassis wiring or other components.The intent of this section is to provide the information necessary to make an accurate diagnosis of any transmission related problem. Refer to previous service publications for more information.

The Tech 2 is used to diagnose problems with the transmission electrical and electronic control system.

Allison Diagnostic Procedures

The following section contains Allison specific diagnostic information to be used as a guideline when diagnosing problems in the transmission system.

ALLISON TRANSMISSION

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.

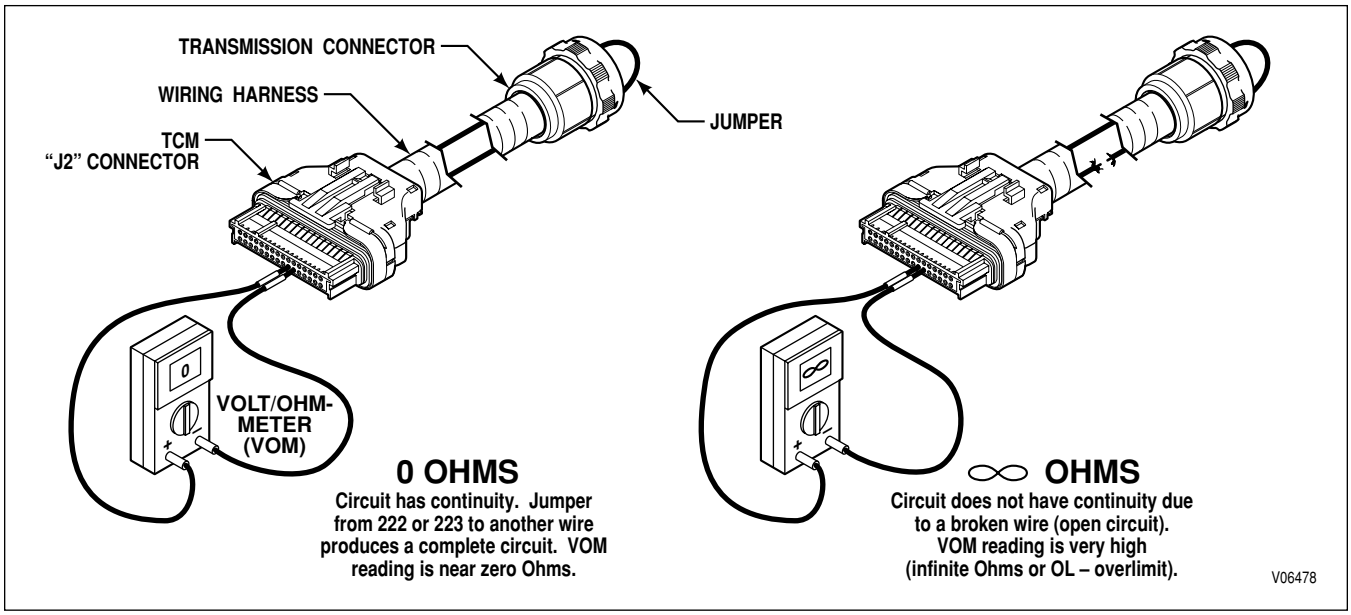


Figure 4–1. Checking Continuity (External Harness)

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.

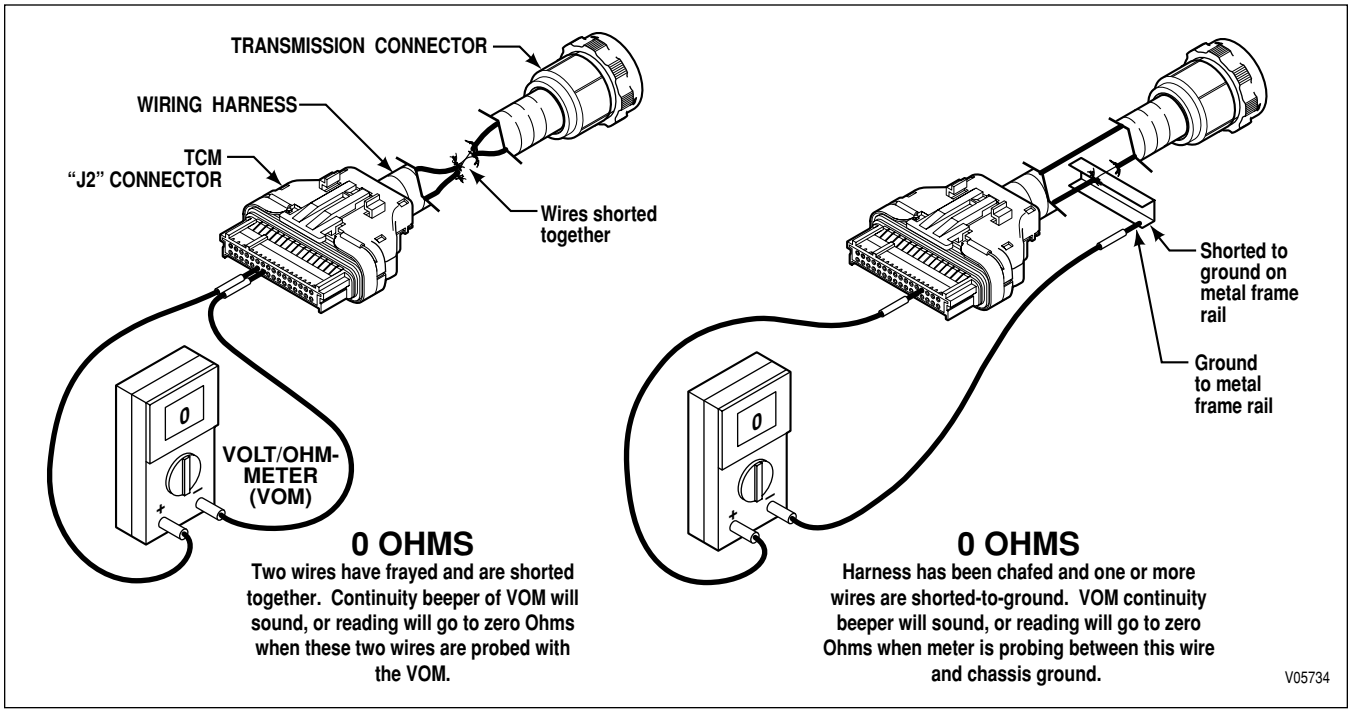


Figure 4–2. Short Between Wires and to Ground (External Harness)

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.

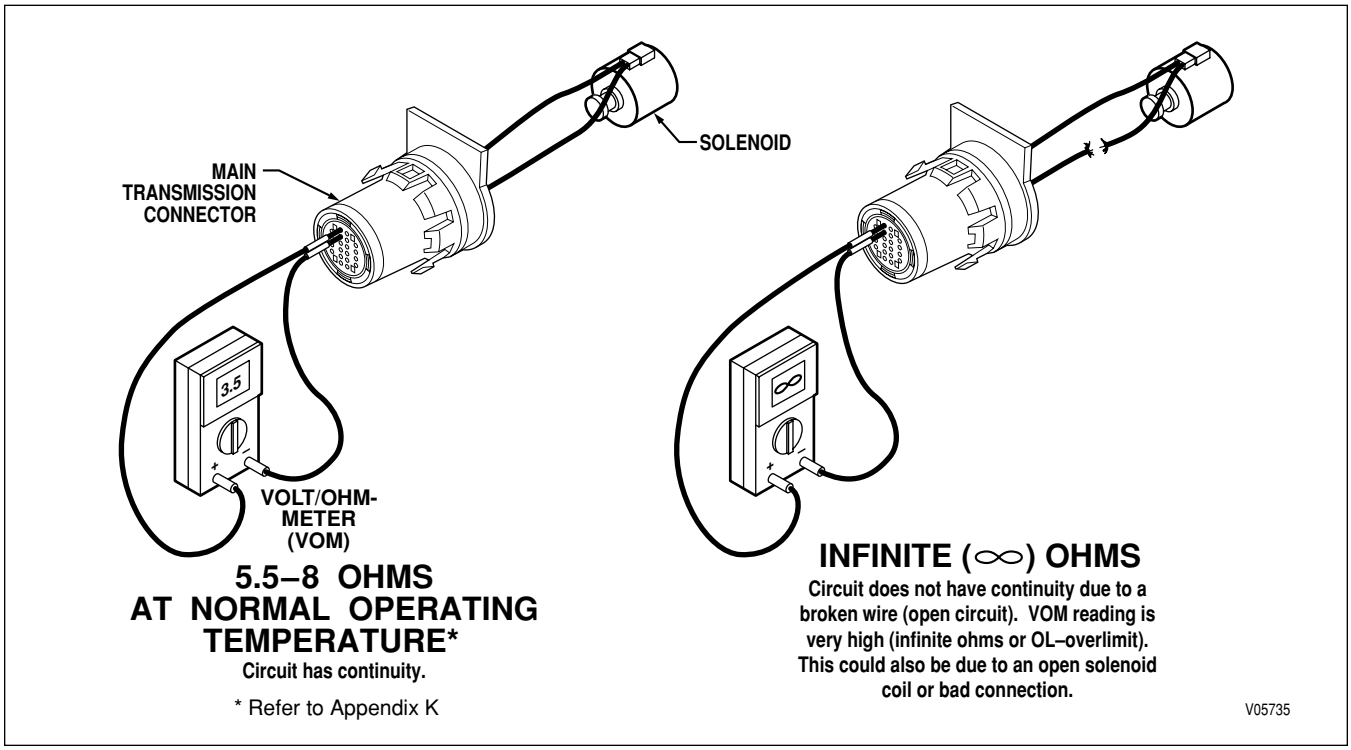


Figure 4–3. Checking Continuity (Internal Harness)

   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

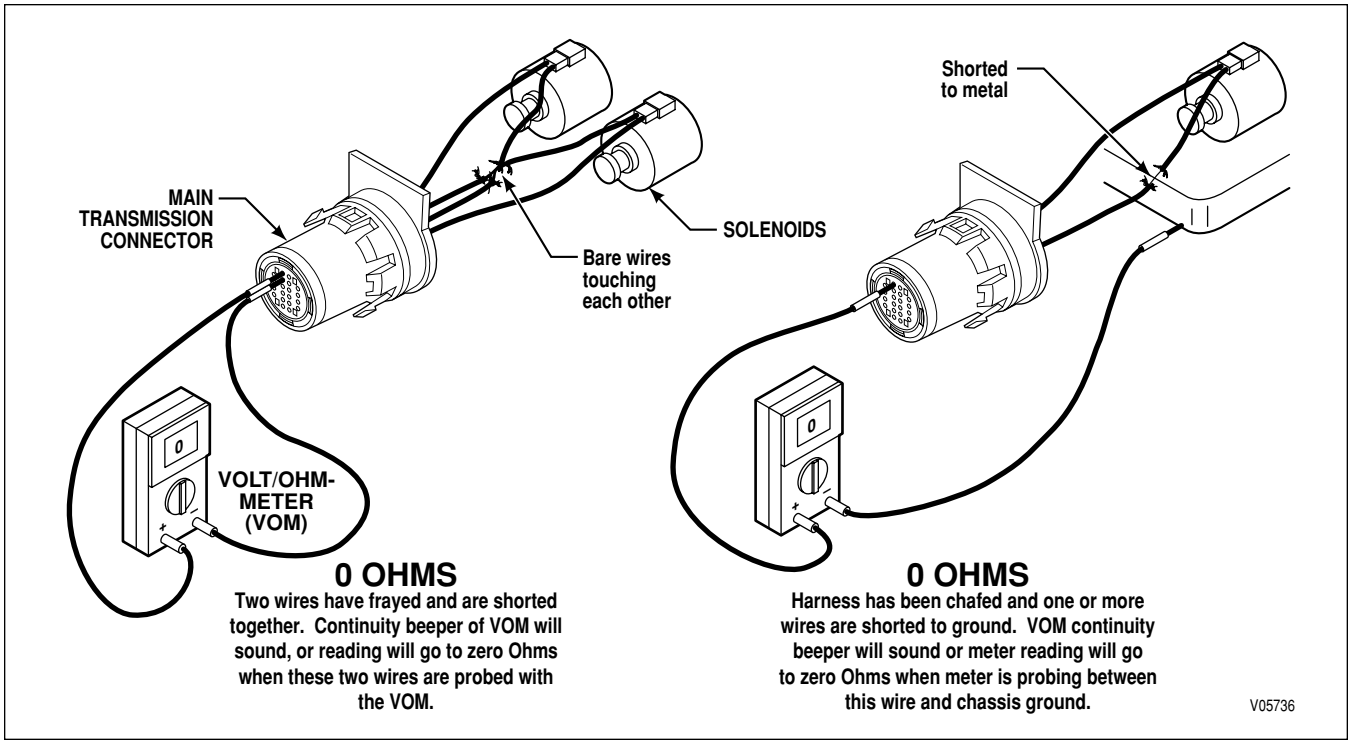


Figure 4–4. Short Between Wires and to Ground (Internal Harness)

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 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
	Connectors not properly seated on NSBU switch*	Properly install connector
CHECK TRANS LIGHT WILL NOT GO OUT AT START-UP	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	Repair J1939 backbone
	Faulty wiring harness	Repair wiring harness (refer to Section 4 and Appendix E)
	Faulty TCM	Replace the TCM
CHECK TRANS LIGHT FLASHES INTERMITTENTLY	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 **N**eutral 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 *(cont'd)*	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 *(cont'd)*	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) *(cont'd)*	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 *(cont'd)*	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 — TRANSMISSON 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 — TRANSMISSON OUTPUT *(cont'd)*	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)
	Leak in suction circuit*	Check suction circuit for leaking seal, gasket, or mating surface
B. Low Main Pressure in Specific Ranges, Normal Pressure in Other Ranges		See transmission Service Manual

* See Inhibit Section 2–5

GENERAL TROUBLESHOOTING OF PERFORMANCE COMPLAINTS

NOTES

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)

5–5. DIAGNOSTIC TROUBLE CODES (DTCs)

DTC LIST AND DESCRIPTION INDEX

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 cals	Yes	5–215
P0877†	Transmission Reverse Pressure Switch Circuit Stuck Closed (Previously P1715) Not production enabled/could be in development cals	N/A	
P0878†	Transmission Reverse Pressure Switch Circuit High (Previously P1716) Not production enabled/could be in development cals	N/A	
P0880	TCM Supply Voltage (Previously P1760)	No	5–220
P0960†	Pressure Control Solenoid Control Circuit Not production enabled/could be in development cals	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	5–243
U0032	J1850 (Class 2) Serial Data Communication Link High (Previously U1301)	No	5–246
U0073	CAN Bus Reset Counter Overrun (Previously U2104)	Yes	5–249
U0100	CAN Bus ECM Error (Previously U2105)	Yes	5–252
U1000	Class 2 Loss of Serial Data Communication		5–255
U1016	J1850 (Class 2) Powertrain Controller State of Health Failure	No *	5–255
U1041	J1850 (Class 2) ABS Controller State of Health Failure	No *	5–255
U1064	J1850 (Class 2) TBC Controller State of Health Failure	No *	5–255
U1096	J1850 (Class 2) IPC Controller State of Health Failure	No *	5–255
U1300	See DTC U0031		5–243
U1301	See DTC U0032		5–246
U2104	See DTC U0073		5–249
U2105	See DTC U0100		5–252

* Enabled for MY2001 Non-OBD 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 Series™ Gear Ratio	2000 Series™/2400 Series™ 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	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	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 OpenN/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 OpenN/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

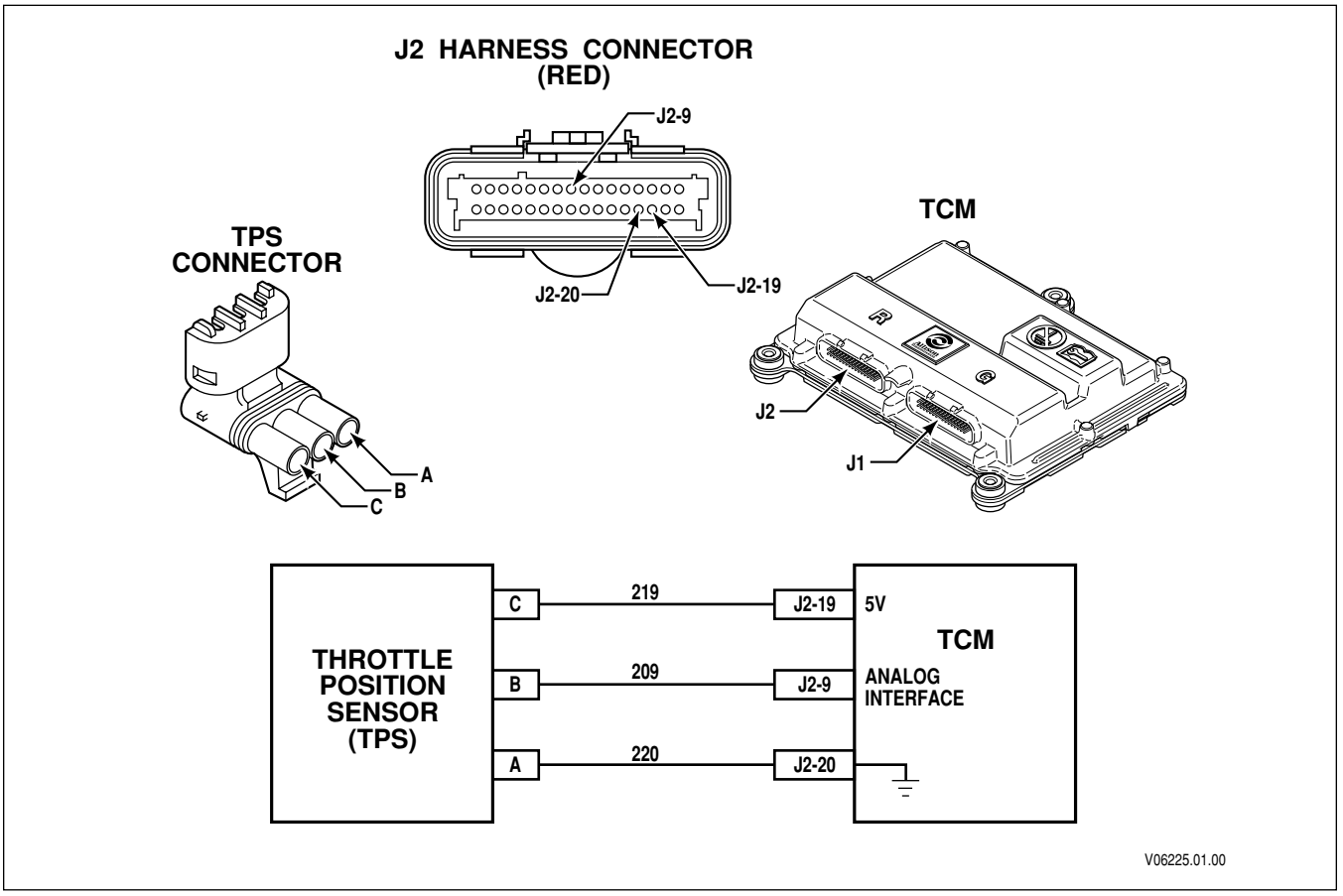
Range — Clutches Applied	C1 Failure	C2 Failure	C3 Failure	C4 Failure	C5 Failure
***Reverse** / C3 and C5			N_T > 0 in 3rd and 5th		N_T > 0 in 1st only
First / C1 and C5	N_T > 0 in 1st and 4th				N_T > 0 in 1st only
Second / C1 and C4	N_T > 0 in 1st and 4th			N_T > 0 in 4th only	
Third / C1 and C3	N_T > 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



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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Refer to Appendix F to check for proper TPS adjustment. Is the TPS adjusted properly?	—	*Go to Step 3*	*Adjust TPS to proper setting. Go to Step 11*

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 ATD distributors and dealers are not covered by ATD 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*	—

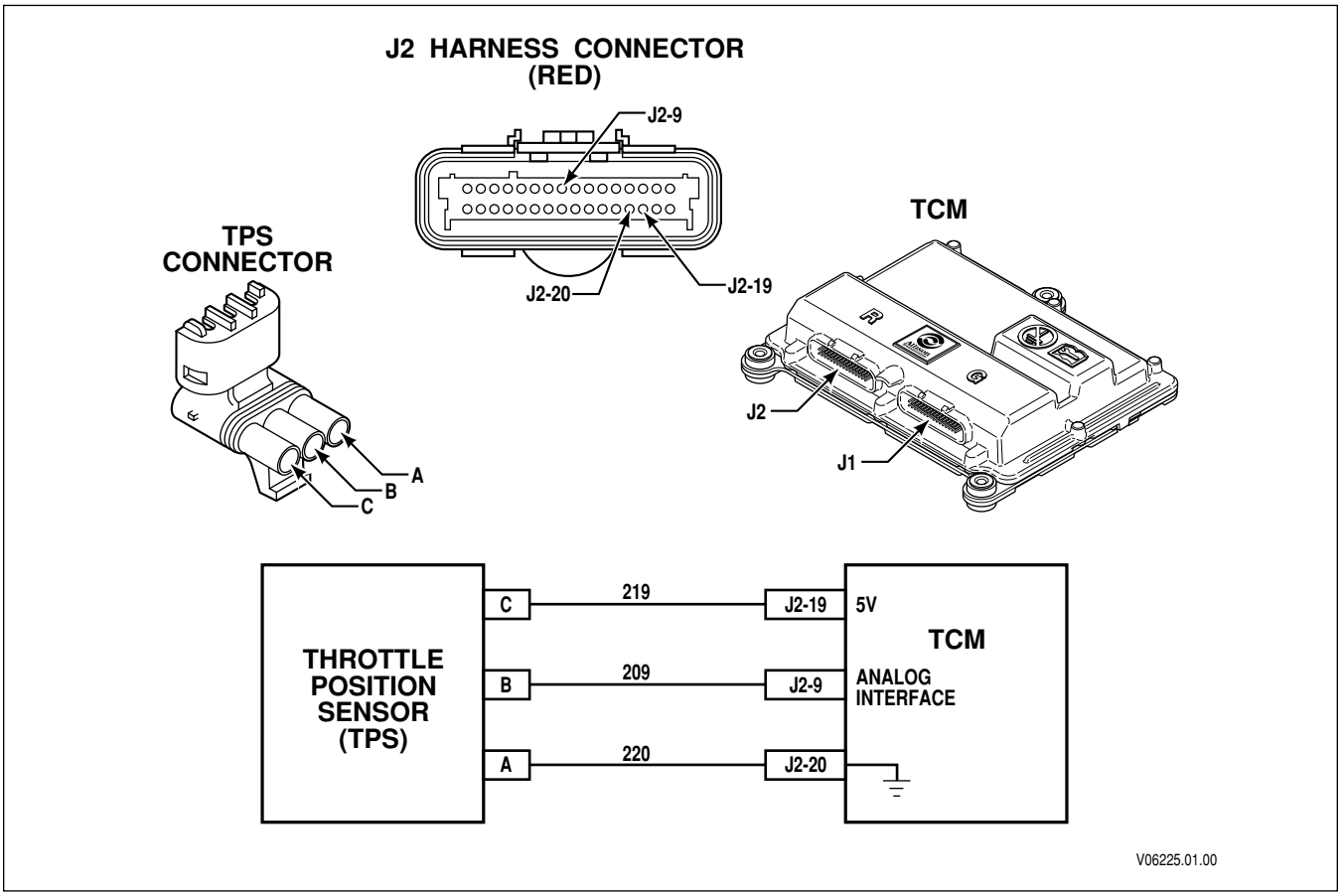
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Refer to Appendix F to check for proper TPS adjustment. Is the TPS adjusted properly?	—	*Go to Step 3*	*Adjust TPS to proper setting. Go to Step 11*

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 ATD distributors and dealers are not covered by ATD 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*	—

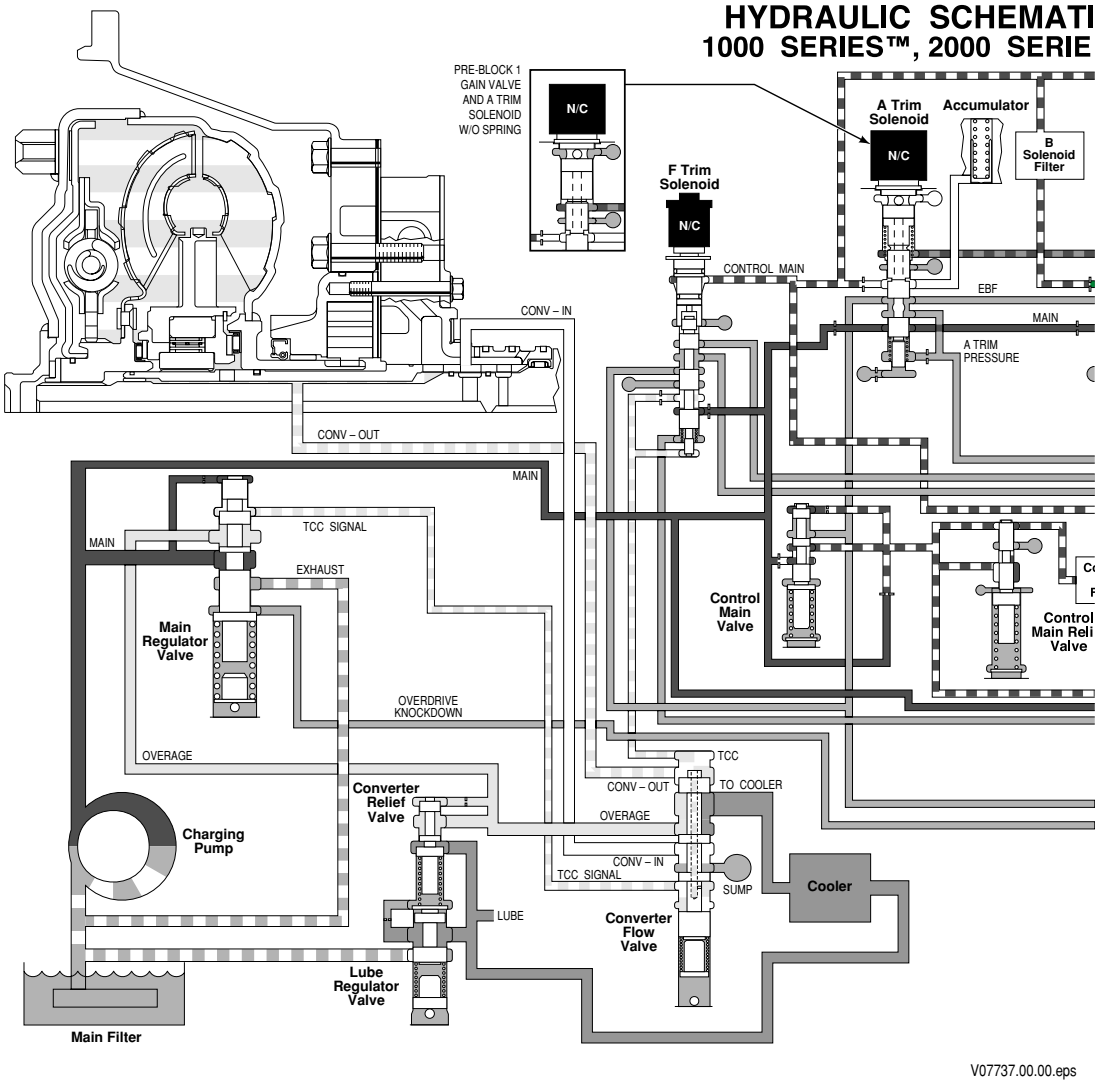
DIAGNOSTIC TROUBLE CODES (DTC)

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?	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*

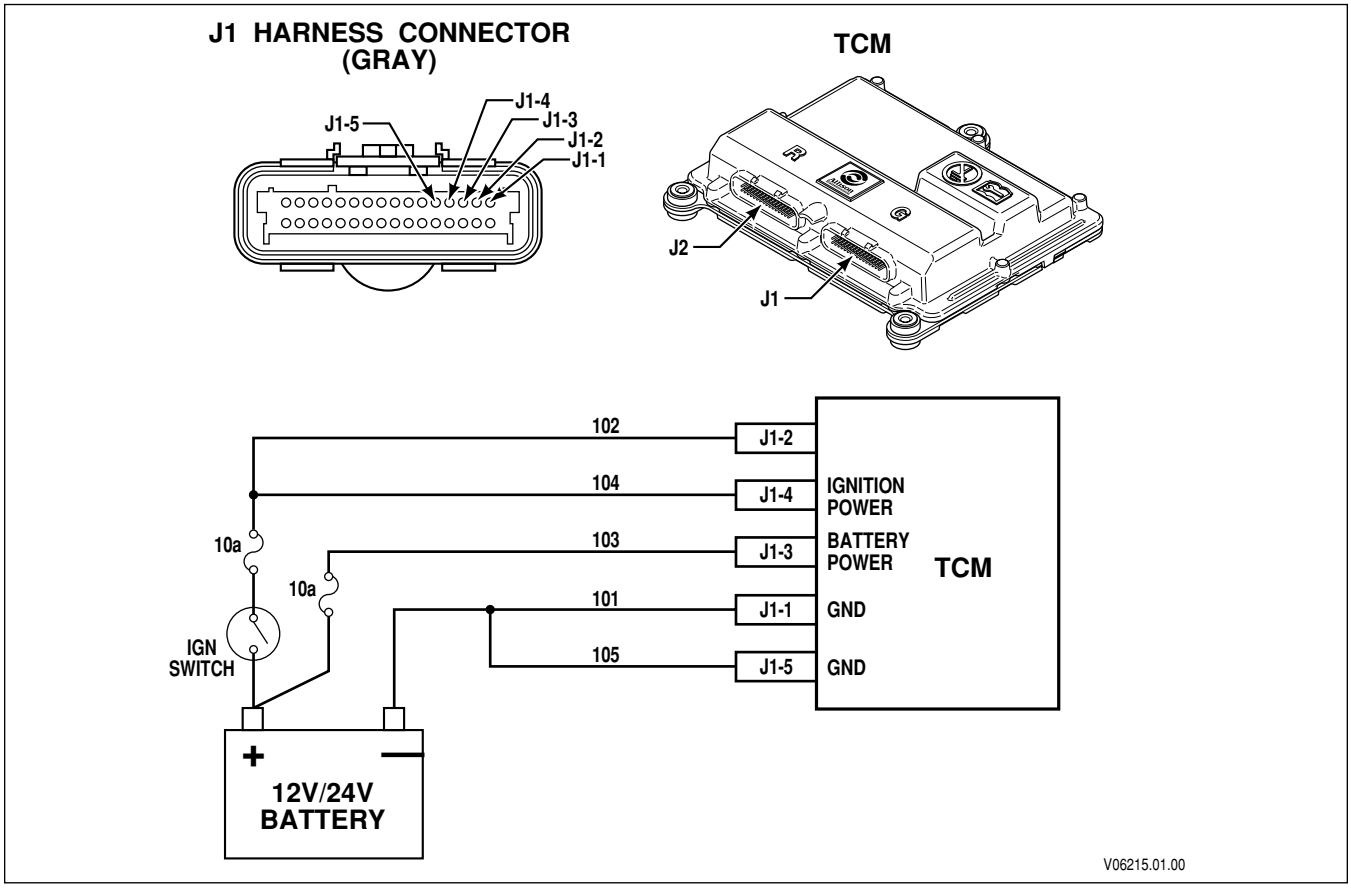
DIAGNOSTIC TROUBLE CODES (DTC)

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?	*Go to Step 3*	*Go to A/T Fluid Checking Procedure. (Appendix P)*
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?	*Go to Step 6*	*Go to Step 4*
4	Perform the Main Pressure Check Procedure. Refer to Appendix B. Did you find and correct a pressure problem?	*Go to Step 6*	*Go to Step 5*
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?	*Go to Step 6*	*Go to General Troubleshooting (Section 7)*
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?	*Begin the diagnosis again.* *Go to Step 1*	*System OK*

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?		*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*

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 ATD distributors and dealers are not covered by ATD 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*

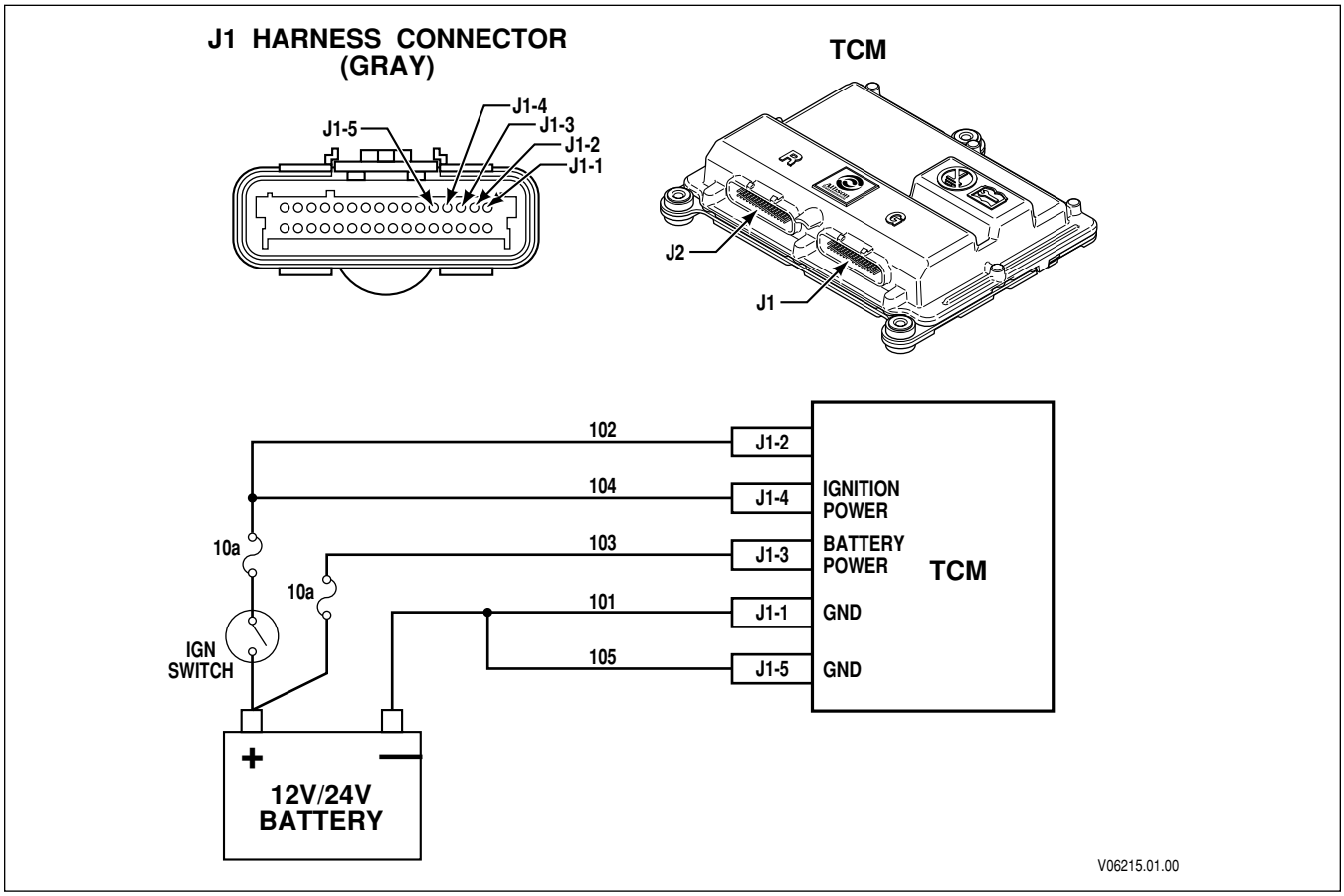
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*

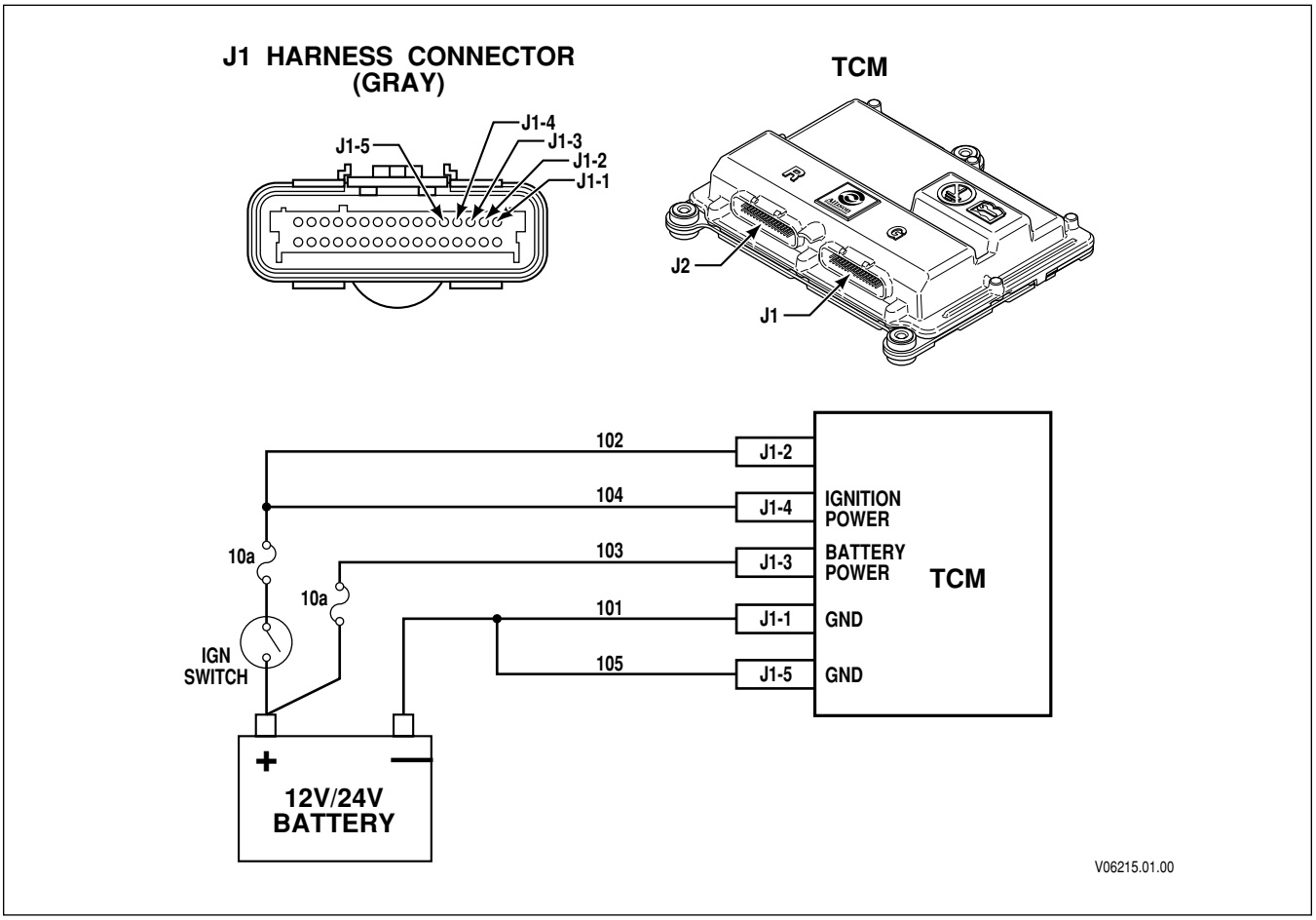
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*

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?	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	1. Install the Scan Tool. 2. If DTC P0602 is present, the TCM must be recalibrated. Is recalibration complete?	*Go to Step 4*	—
3	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6).*** Replace the TCM. Is replacement complete?	*Go to Step 4*	—
4	1. Install the Scan Tool. 2. Start the vehicle. Did the DTC return?	*Go to Step 3*	*System OK*

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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	If a DTC U2105 is present, troubleshoot and resolve before going to the next step. Is a DTC U2105 present?	—	*Go to DTC U2105 and resolve before proceeding to Step 7*	*Go to Step* 3
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?	*Scan Tool indicates with Yes or No Answer*	*Go to Step 4*	*Go to Step 5*
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?	—	*Go to Step 7*	—
5	Using Scan Tool, refer to the engine torque rating display. Is the torque rating displayed as acceptable?	*Scan Tool indicates with Yes or No Answer*	*Go to Step 7*	*Go to Step 6*
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?	—	*Go to Step 7*	—
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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

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.

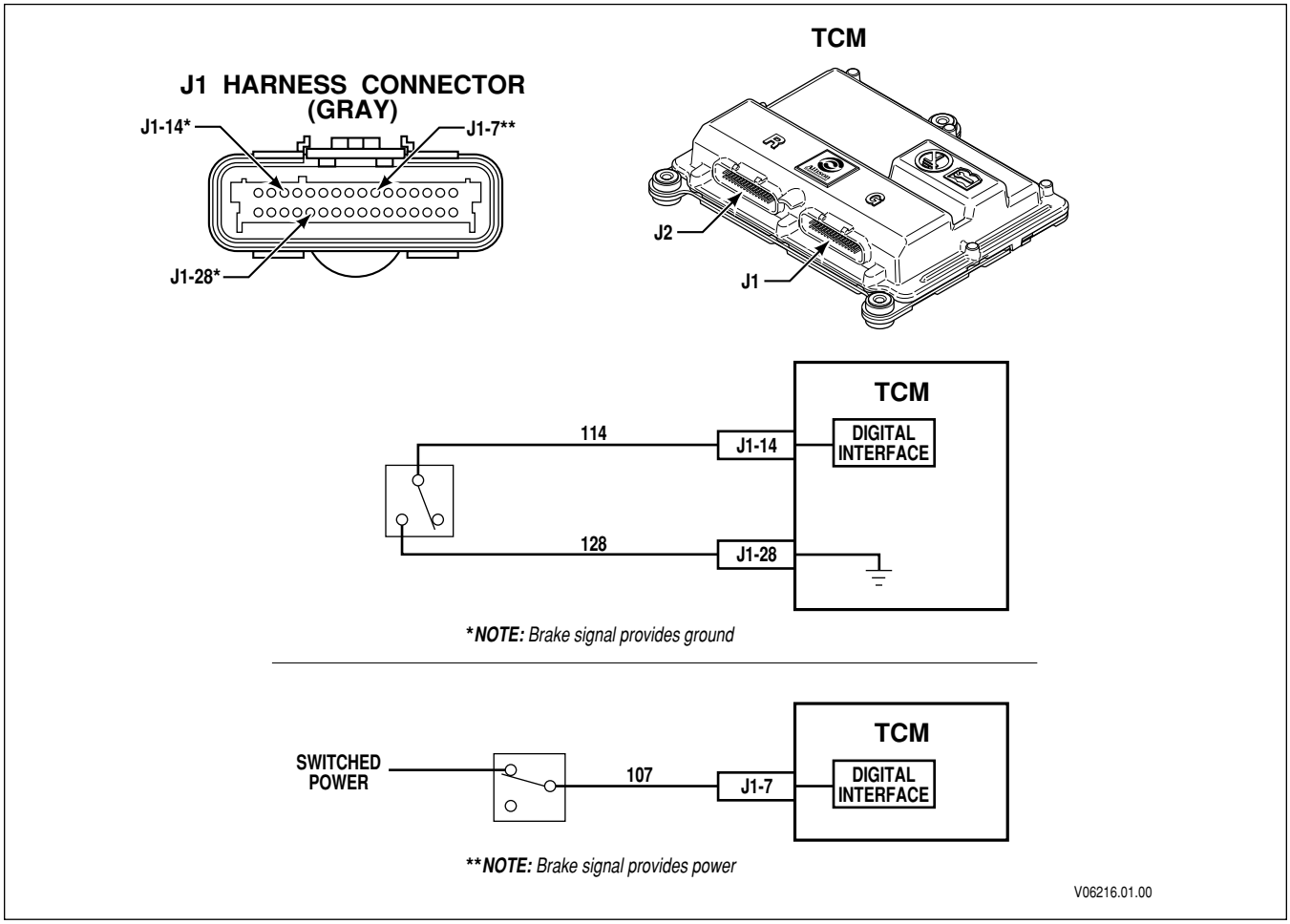
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0701 Transmission Control System Performance

Step	Action	Yes	No
1	Was the **Beginning The Troubleshooting Process** (Paragraph 5–4A) performed?	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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?	*Go to Step 3*	*Go to Step 4*
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?	*Go to Step 7*	*Go to Step 5*
4	Add fluid to the proper level. Is the fluid at the appropriate level?	*Go to Step 5*	—
5	Check main pressure (refer to Main Pressure Check Procedure — Appendix B). Is the pressure within the specified value?	*Go to Step 7*	*Go to Step 6*
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?	*Go to Step 7*	*Go to General Troubleshooting (Section 7)*
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?	*Go to Step 1*	*System OK*

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?		*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4a)*
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?		*Go to Diagnostic Aids*	*Go to Step 3*
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 +	*Go to Step 8*	*Go to Step 4*
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 +	*Go to Step 6*	*Go to Step 5*

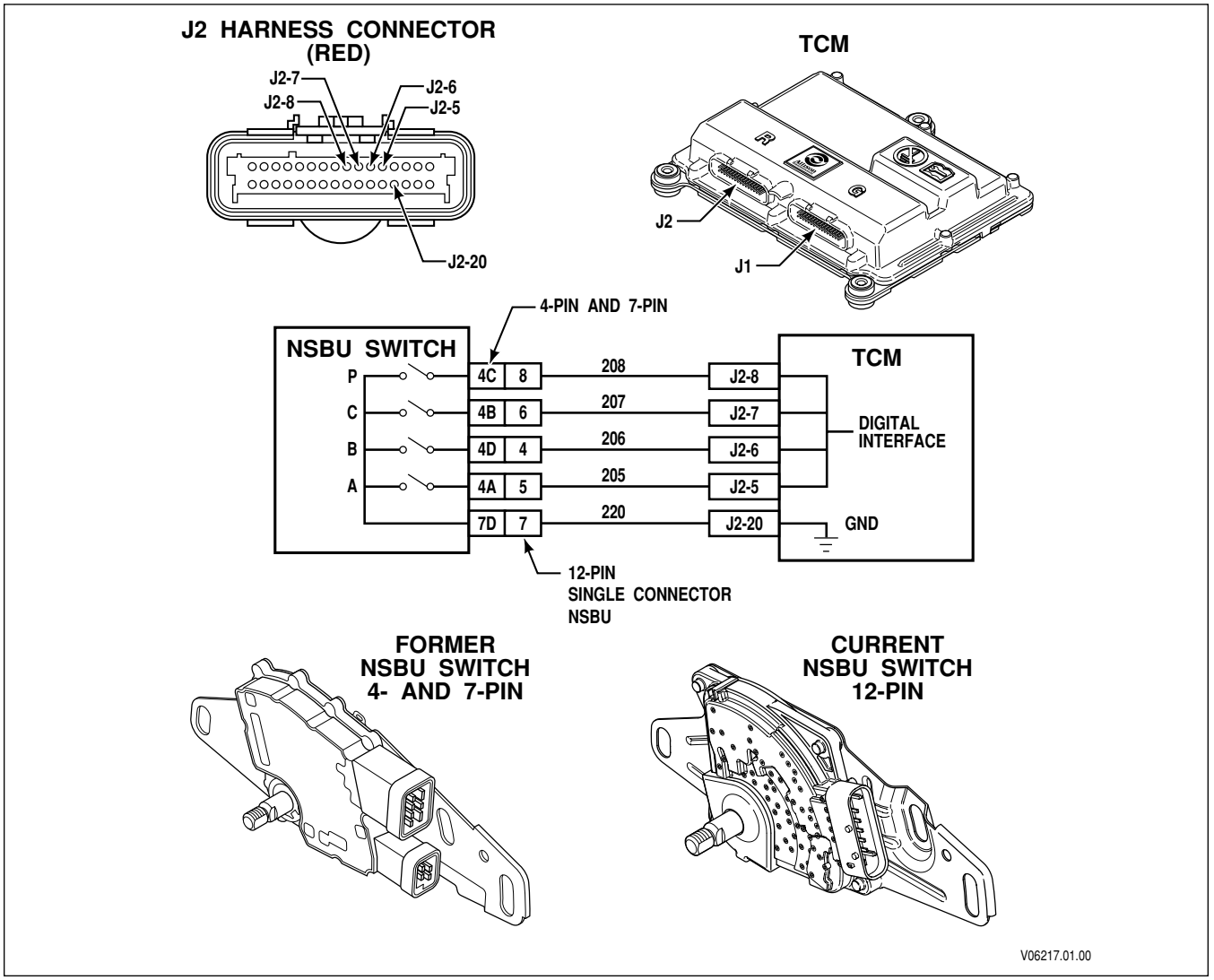
DIAGNOSTIC TROUBLE CODES (DTC)

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?		*Go to Step 7*	*Resolve voltage problem*
6	Replace the TCC Brake Switch/Cruise Control harness. Is repair complete?		*Go to Step 9*	
7	Repair or replace the Stop Lamp Switch assembly. Is repair complete?		*Go to Step 9*	
8	***NOTE: In most cases, the TCM is not at fault. Investigate thoroughly before replacing the TCM. Refer to TCM Replacement Procedure (Section 3–6).*** Replace the TCM. Is the replacement complete?		*Go to Step 9*	
9	In order to verify your repair: 1. Clear the DTC. 2. Drive the vehicle making at lease 10 accelerations and decelerations cycles. Did the test run and pass?		*Begin the diagnosis again. Go to Step 1*	*System OK*

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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Is the NSBU switch and shift linkage properly adjusted?	—	*Go to Step 3*	*Go to Mechanic's Tips*
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?	*Refer to NSBU Switch Table (Page 5–9)*	*Go to Diagnostic Aids*	*Go to Step 4*
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	*Go to Step 5*	*Go to Step 10*
5	Inspect the NSBU switch connector assembly. Does the NSBU have two connectors—a seven pin and four pin connector?		*Go to Step 6*	*Go to Step 7*
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	*Go to Step 8*	*Go to Step 9*

DIAGNOSTIC TROUBLE CODES (DTC)

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

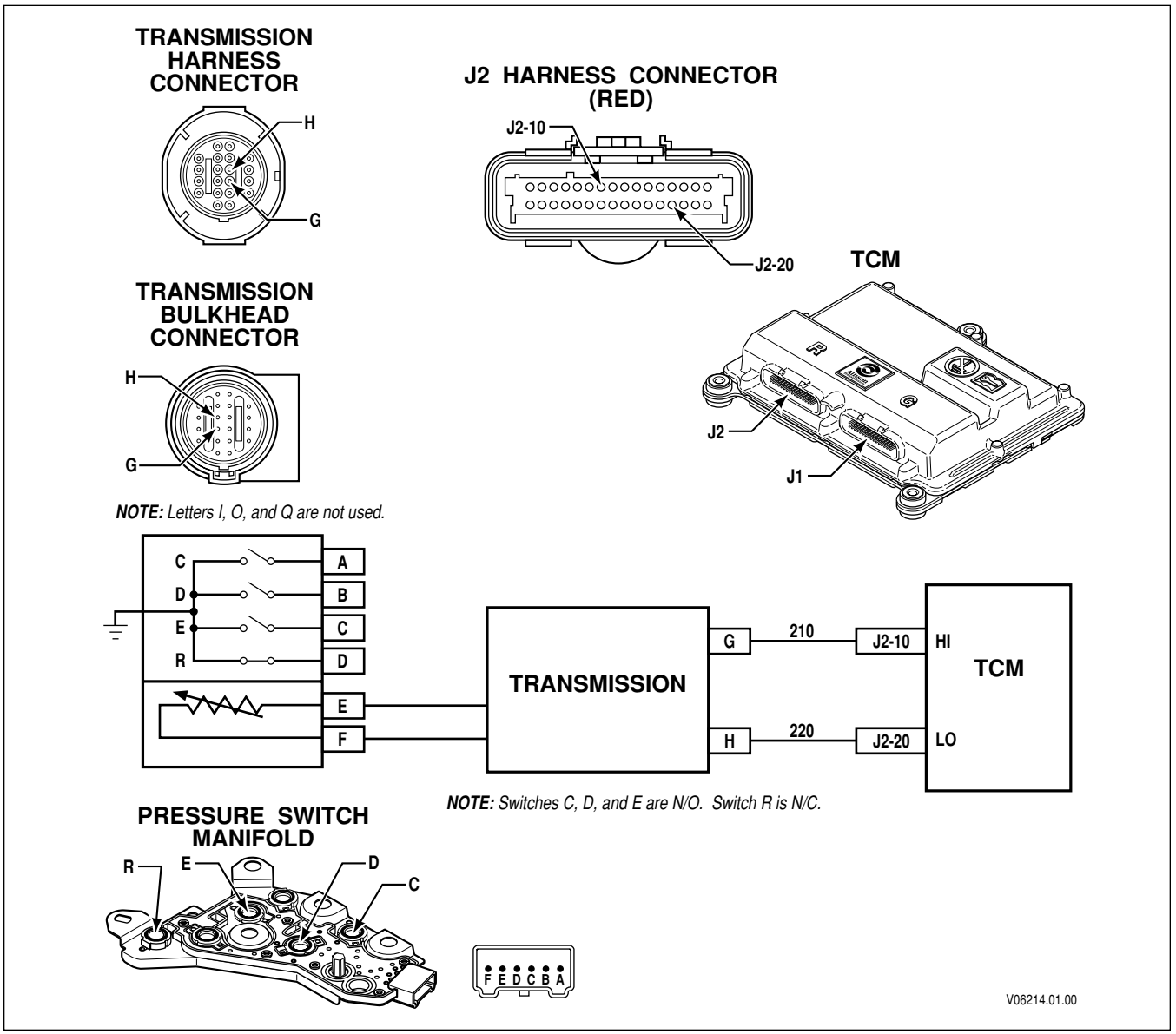
Step	Action	Value(s)	Yes	No
7	1. Turn the ignition OFF. 2. Reconnect J2 connector to the TCM. 3. At the NSBU connector in sequence, connect pins 4, 5, 6, and 8 to pin 7** at the 12 pin connector. 4. Monitor the switch status on the Scan Tool. Does the Scan Tool indicate the proper switch status for each 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 ATD distributors and dealers are not covered by ATD 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



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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Perform the A/T Fluid Checking Procedure (Appendix P). Is the transmission fluid level correct?	—	*Go to Step 4*	*Go to A/T Fluid Checking Procedure (Appendix P)*
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	*Go to Step 4*	*Go to Step 11*
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)	*Go to Step 5*	*Go to Diagnostic Aids*
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) *Refer to TFT Sensor Resistance Table Page 5–13)*	*Go to Step 6*	*Go to Step 8*
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) *Refer to TFT Sensor Resistance Table Page 5–13)*	*Go to Diagnostic Aids*	*Go to Step 7*

DIAGNOSTIC TROUBLE CODES (DTC)

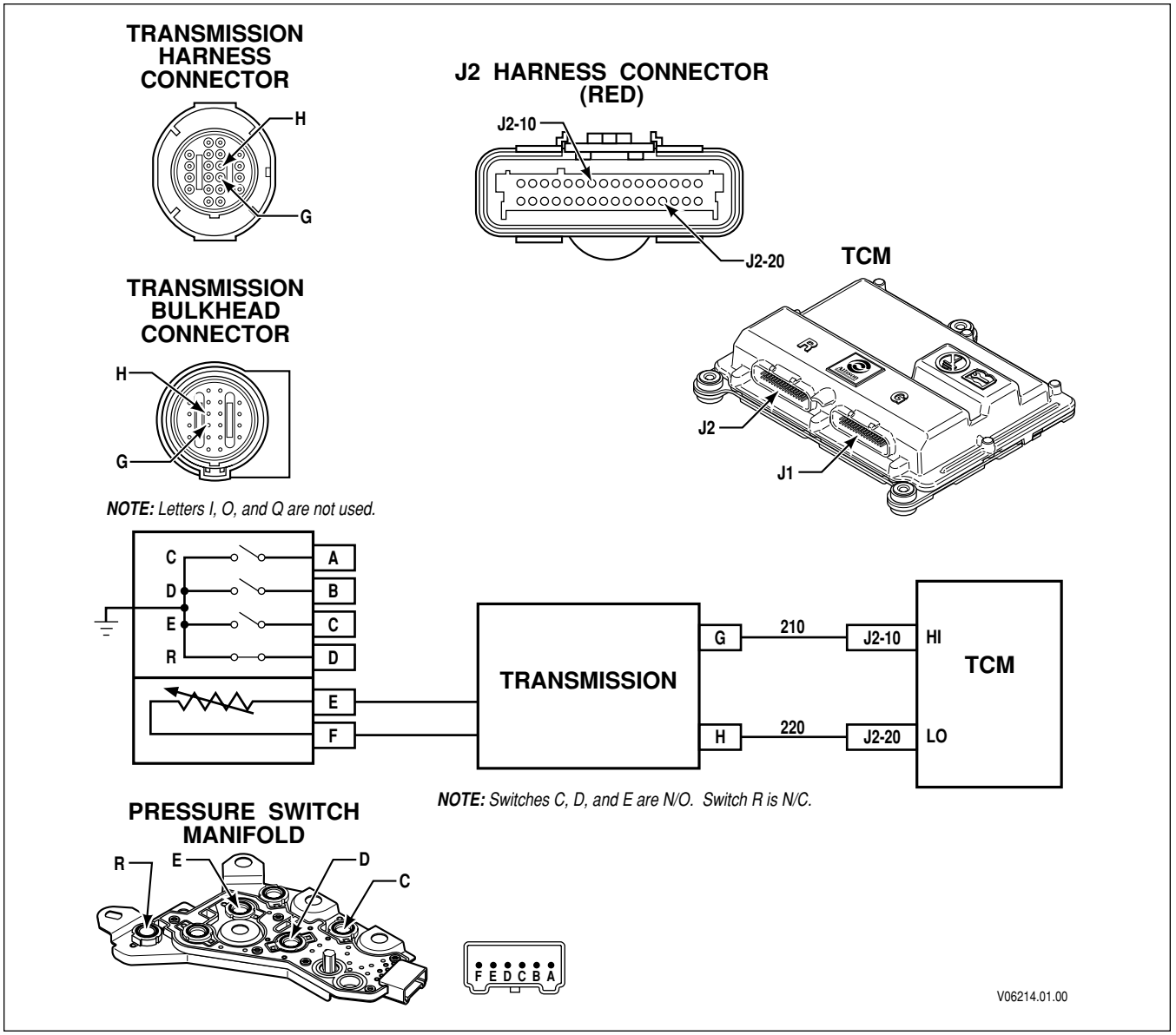
DTC P0711 Transmission Fluid Temperature Sensor Circuit Performance *(cont'd)*

Step	Action	Value(s)	Yes	No
7	***NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by ATD distributors and dealers are not covered by ATD 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)



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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Perform the A/T Fluid Checking Procedure (Appendix P). Is the transmission fluid level correct?	—	*Go to Step 3*	*Go to A/T Fluid Checking Procedure (Appendix P)*
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	*Go to Step 4*	*Go to Step 11*
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)	*Go to Step 5*	*Go to Diagnostic Aids*
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) *Refer to TFT Sensor Resistance Table Page 5–13)*	*Go to Step 6*	*Go to Step 8*
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) *Refer to TFT Sensor Resistance Table Page 5–13)*	*Go to Diagnostic Aids*	*Go to Step 7*

DIAGNOSTIC TROUBLE CODES (DTC)

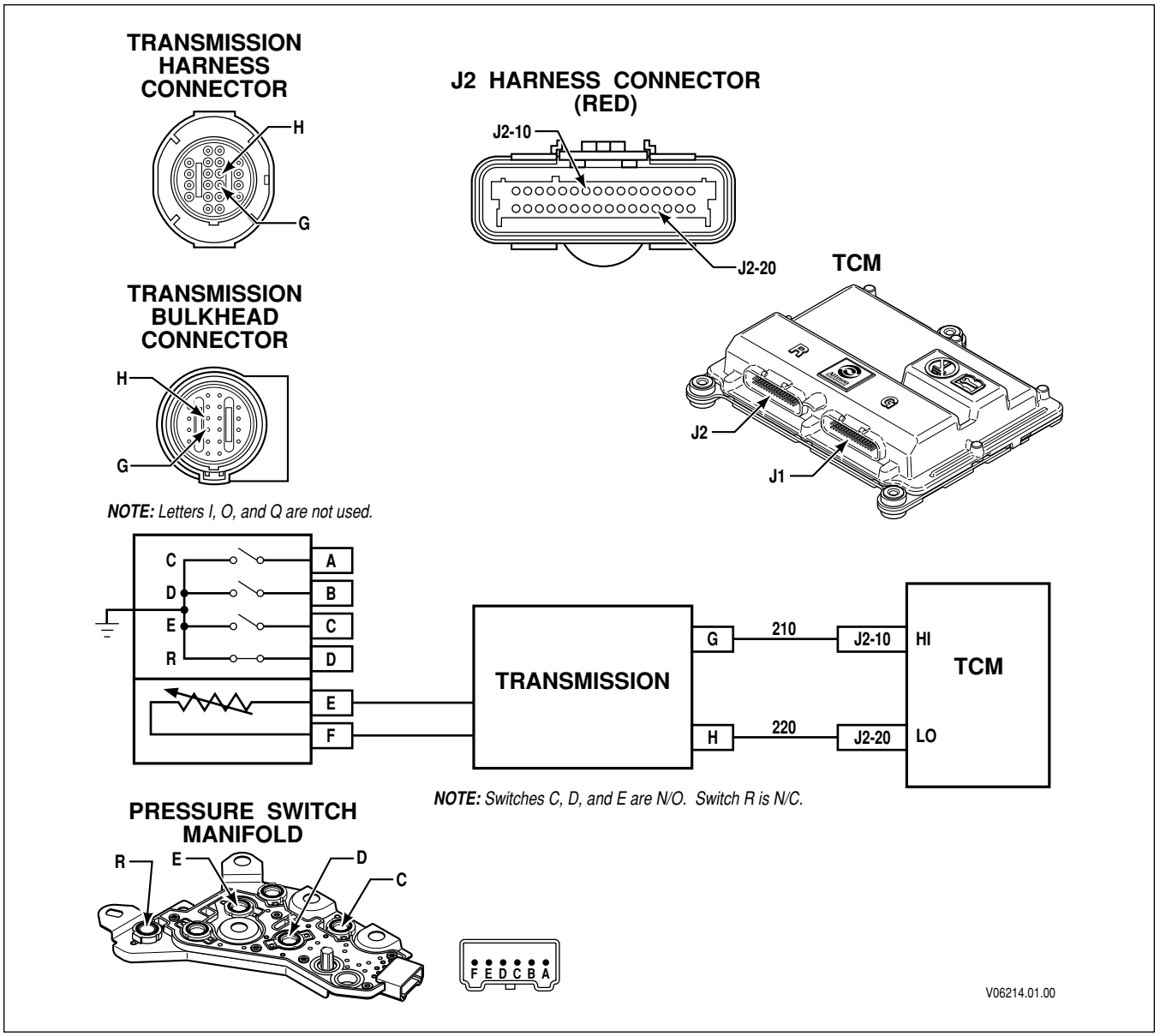
DTC P0712 Transmission Fluid Temperature Sensor Circuit Low Input (High Temperature) *(cont'd)*

Step	Action	Value(s)	Yes	No
7	***NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by ATD distributors and dealers are not covered by ATD 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)



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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Perform the A/T Fluid Checking Procedure (Appendix P). Is the transmission fluid level correct?	—	*Go to Step 3*	*Go to A/T Fluid Checking Procedure (Appendix P)*
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	*Go to Step 4*	*Go to Step 11*
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)	*Go to Step 5*	*Go to Diagnostic Aids*
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) *Refer to TFT Sensor Resistance Table Page 5–13)*	*Go to Step 6*	*Go to Step 8*
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) *Refer to TFT Sensor Resistance Table Page 5–13)*	*Go to Diagnostic Aids*	*Go to Step 7*

DIAGNOSTIC TROUBLE CODES (DTC)

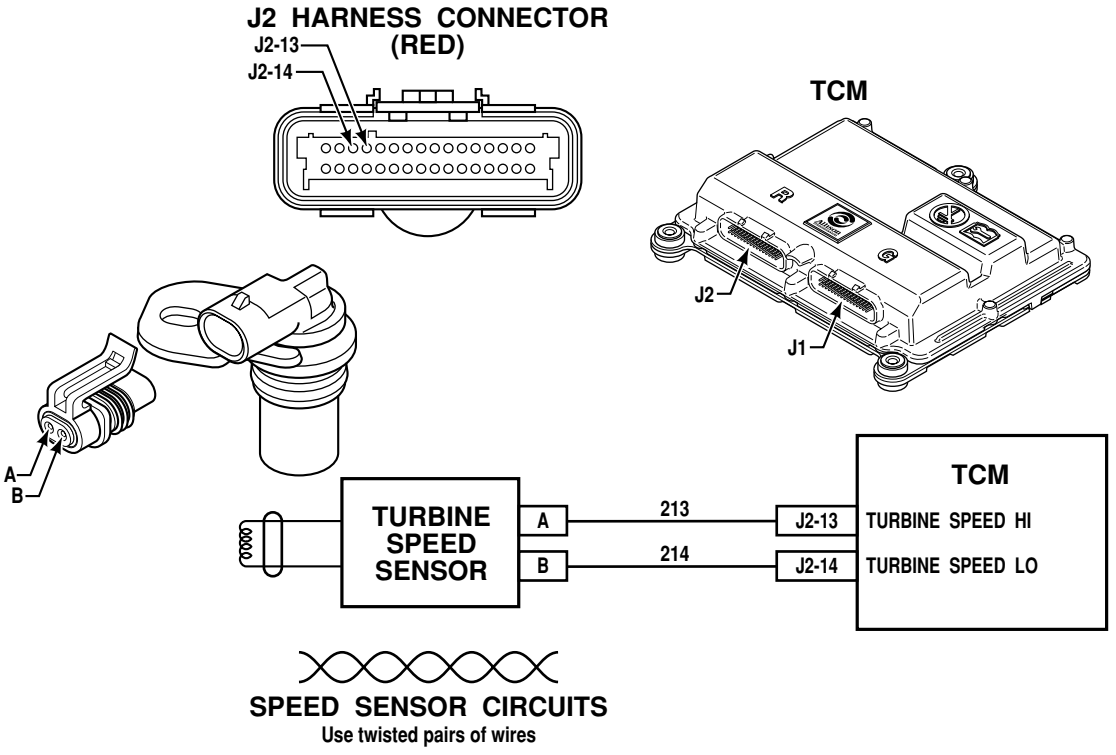
DTC P0713 Transmission Fluid Temperature Sensor Circuit High Input (Low Temperature) *(cont'd)*

Step	Action	Value(s)	Yes	No
7	***NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by ATD distributors and dealers are not covered by ATD 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) *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 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



NOTE: *Typical speed sensor resistance 2304 Ω – 2815 Ω at 20° C (68° F)*

V06219.01.00

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.

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.

DIAGNOSTIC TROUBLE CODES (DTC)

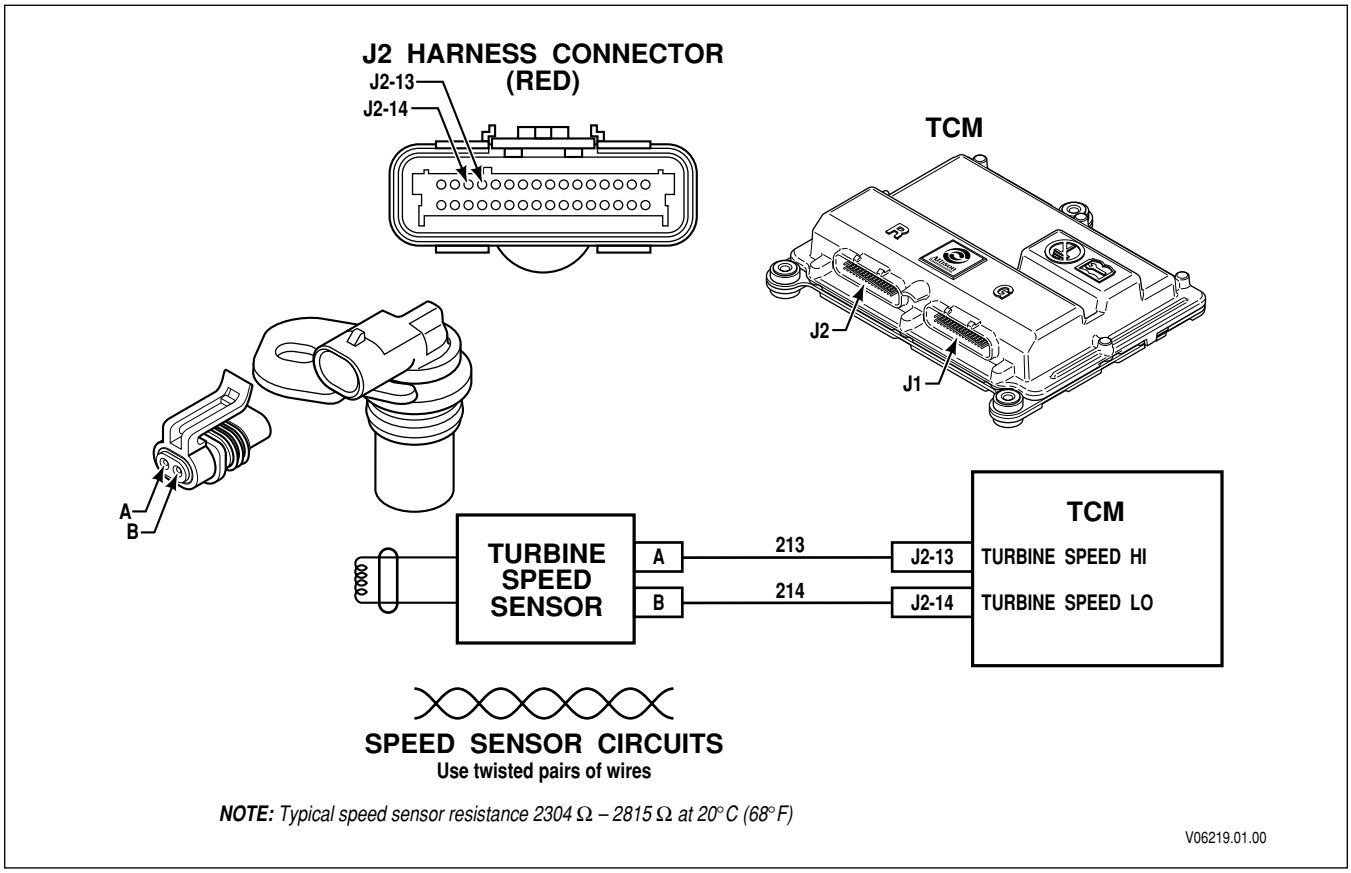
DTC P0716 Turbine Speed Sensor Circuit Performance

Step	Action	Value(s)	Yes	No
1	Was the **Beginning The Troubleshooting Process** (Paragraph 5–4A) performed?	—	*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 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?	*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 turbine speed sensor. 2. Using a DVOM, check the resistance between 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 ATD distributors and dealers are not covered by ATD 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 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?	—	*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 13 and 14. 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 turbine 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 ATD distributors and dealers are not covered by ATD warranty.*** Repair the vehicle wiring harness. Is the repair complete?	—	*Go to Step 7*	—

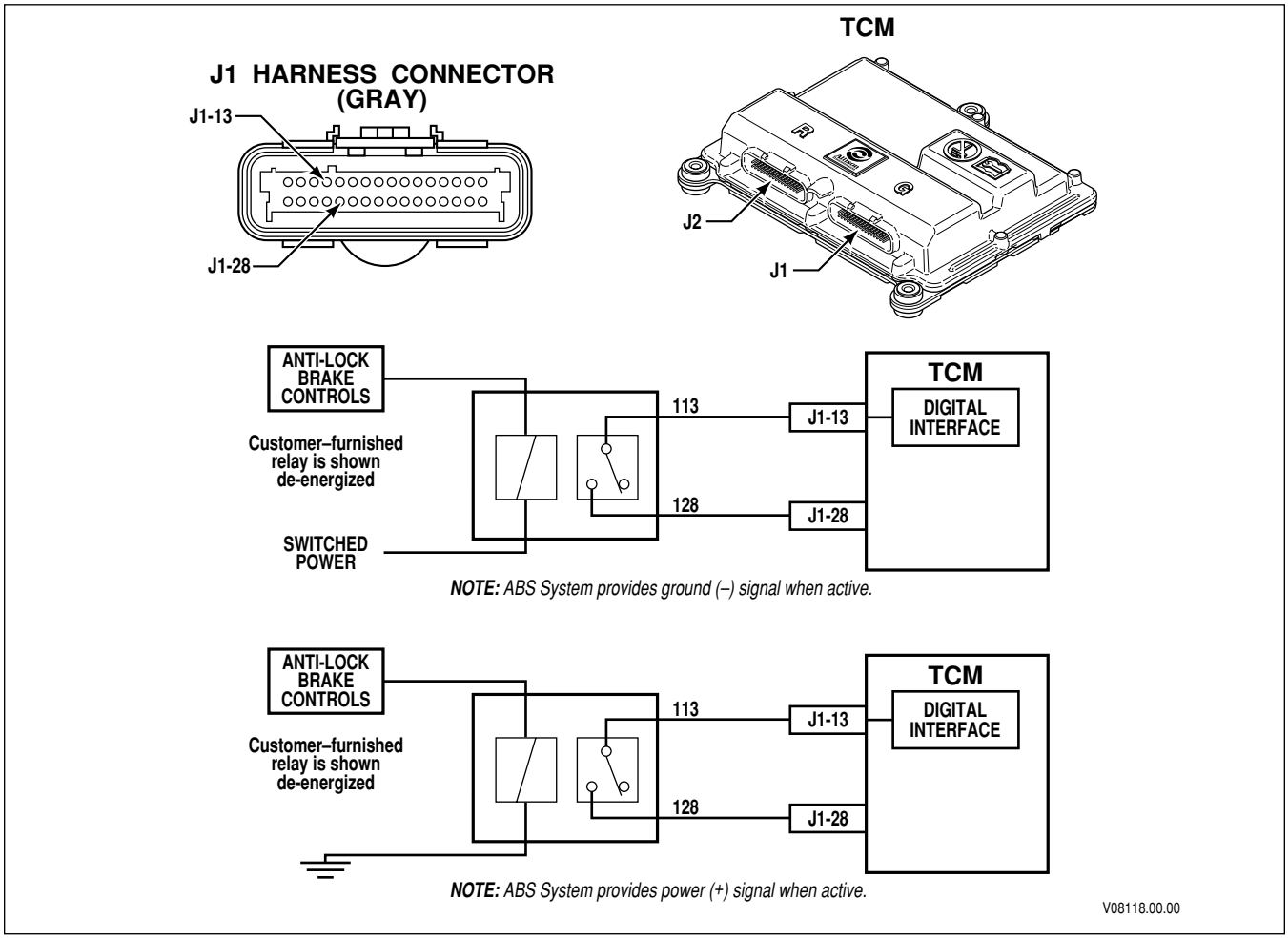
DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
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

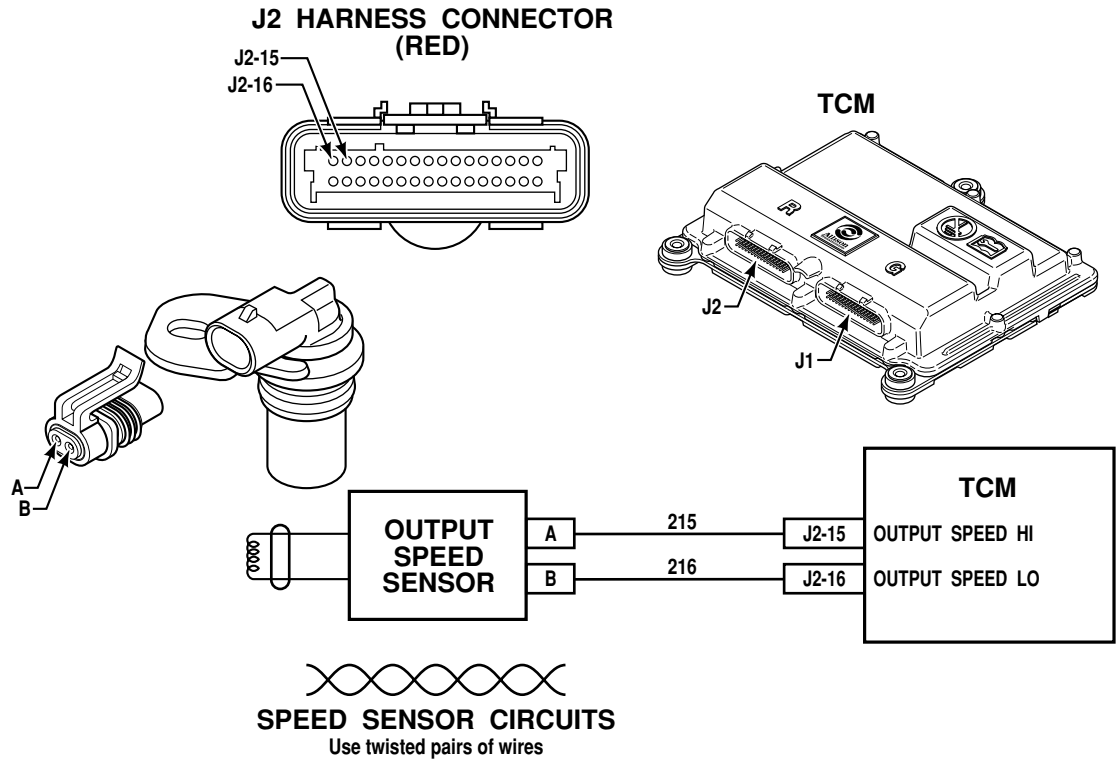
- Inspect the wiring for poor electrical connections at the TCM. Look for the following conditions:
  - — A bent terminal.
  - — A backed-out terminal.
  - — A damaged terminal.
  - — Poor terminal tension.
  - — A chafed wire.
  - — A broken wire inside the insulation.
- When diagnosing for an intermittent 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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Remove ABS input wire (113) from J1 connector. Clear code and test-drive vehicle. Did the code return?	—	*Go to Step 4*	*Go to Step 3*
3	Return vehicle to OEM for troubleshooting of wiring leading to ABS controller. Was the problem found and corrected?	—	*Go to Step 5*	—
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?	—	*Go to Step 5*	—
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?	—	*Begin the diagnosis again. Go to Step 1.*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

DTC P0721 Output Speed Sensor Circuit Performance



NOTE: *Typical speed sensor resistance 2304 Ω – 2815 Ω at 20° C (68° F)*

V06220.01.00

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?	—	*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 15 and 16. Is resistance within the specified values?	*Refer to Speed Sensor Resistance Table Page 5–13)*	*Go to Go to Diagnostic Aids*	*Go to Step 4*
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) *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 ATD distributors and dealers are not covered by ATD 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*	—

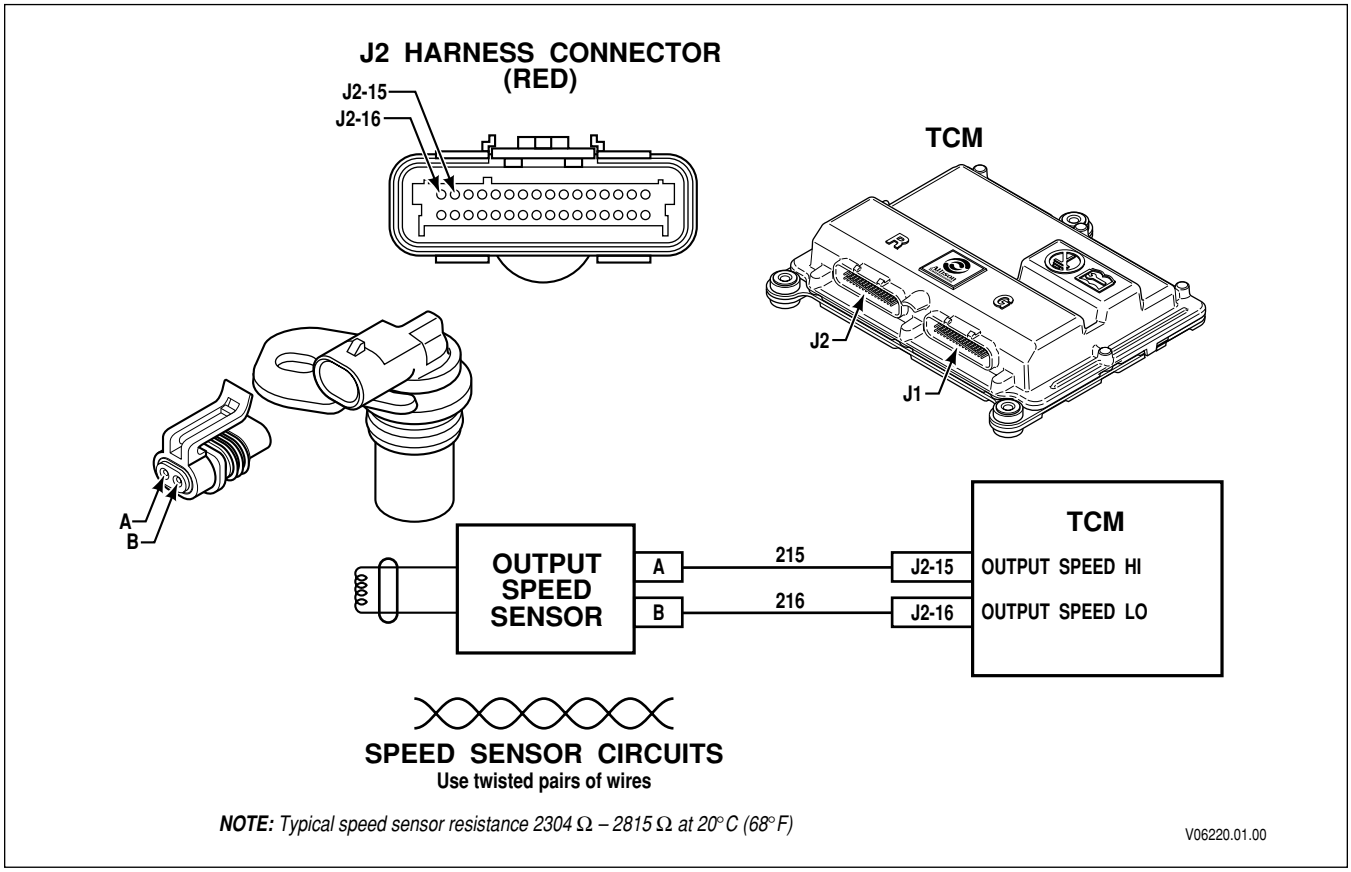
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*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 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?	—	*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 15 and 16. 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 output 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 ATD distributors and dealers are not covered by ATD warranty.*** Repair the vehicle wiring harness. Is the repair complete?	—	*Go to Step 7*	—

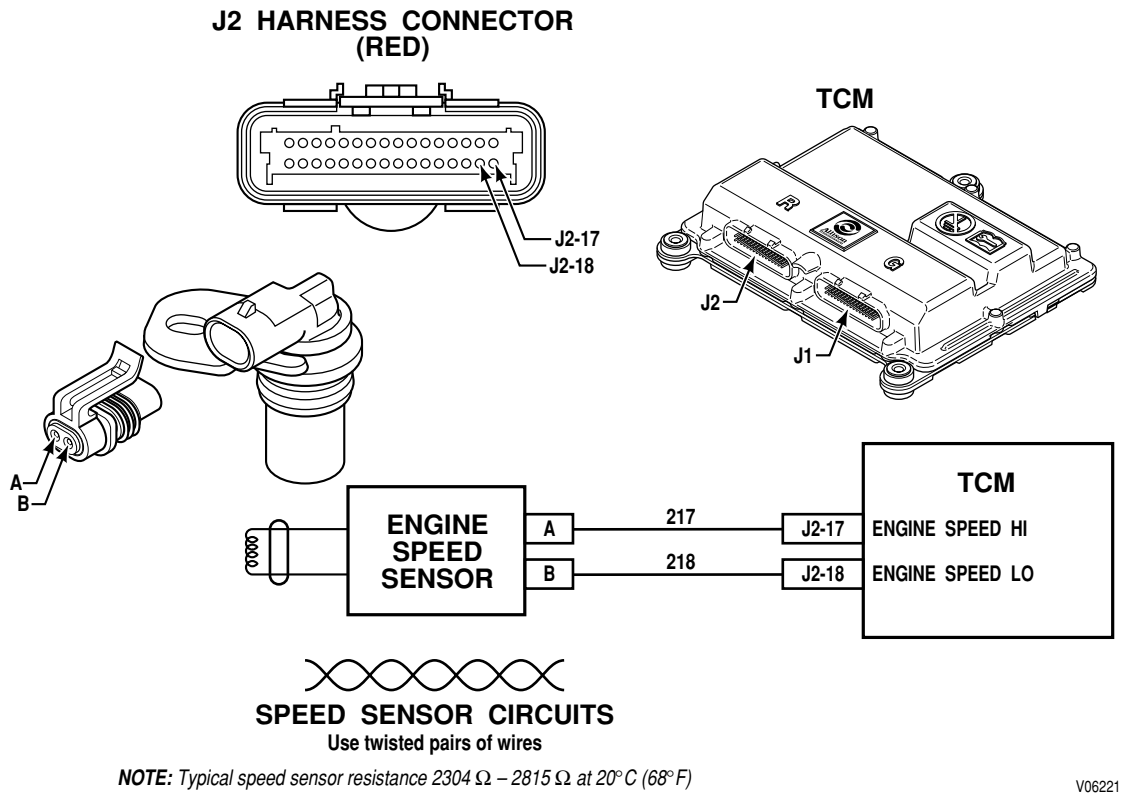
DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
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)

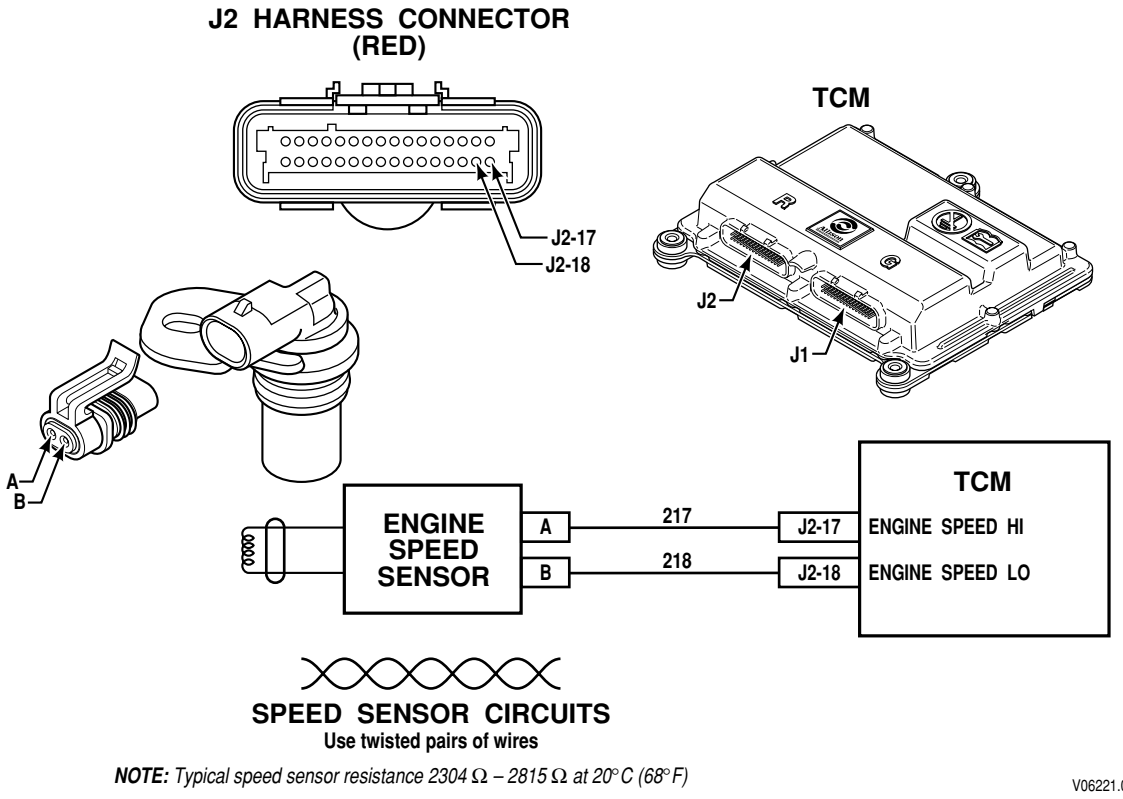
DTC P0726 Engine Speed Input Circuit Performance

Step	Action	Value(s)	Yes	No
1	Was the **Beginning The Troubleshooting Process** (Paragraph 5–4A) performed?	—	*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 ATD distributors and dealers are not covered by ATD 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 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 ATD distributors and dealers are not covered by ATD 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 series (there are different gear ratios for the 1000 Series™ and 2000 Series™/ 2400 Series™ 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?	—	*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. 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)	*Go to Step 4*	*Resolve voltage problem (Refer to DTC P0562 and P0563)*
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	*Go to Step 5*	*Go to Diagnostic Aids*
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?	—	*Go to the appropriate speed sensor DTC*	*Go to Step 6*

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 series (there are different gear ratios for the 1000 Series™ and 2000 Series™/ 2400 Series™ 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?	—	*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. 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)	*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. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	*Go to appropriate speed sensor DTC*	*Go to Step 5*

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 series (there are different gear ratios for the 1000 Series™ and 2000 Series™/ 2400 Series™ 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?	—	*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. 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)	*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. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	*Go to appropriate speed sensor DTC*	*Go to Step 5*

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?	—	*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. 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)	*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. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	*Go to appropriate speed sensor DTC*	*Go to Step 5*

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 series (there are different gear ratios for the 1000 Series™ and 2000 Series™/ 2400 Series™ 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?	—	*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. 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)	*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. 2. Using the Scan Tool, monitor engine, turbine, and output speed readings. Is speed sensor data erratic or are signal dropouts detected?	—	*Go to appropriate speed sensor DTC*	*Go to Step 5*

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?	—	*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. 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)	*Go to Step 4*	*Resolve voltage problem (Refer to DTC P0562 and P0563)*
4	Using the Scan Tool, monitor the reverse gear ratio. Is the gear ratio correct for the transmission series that is installed in the vehicle?	4.49 for 1000; 5.09 for 2000/ 2400	*Go to Step 5*	*Go to Diagnostic Aids*
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?	—	*Go to appropriate speed sensor DTC*	*Go to Step 6*

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*	—

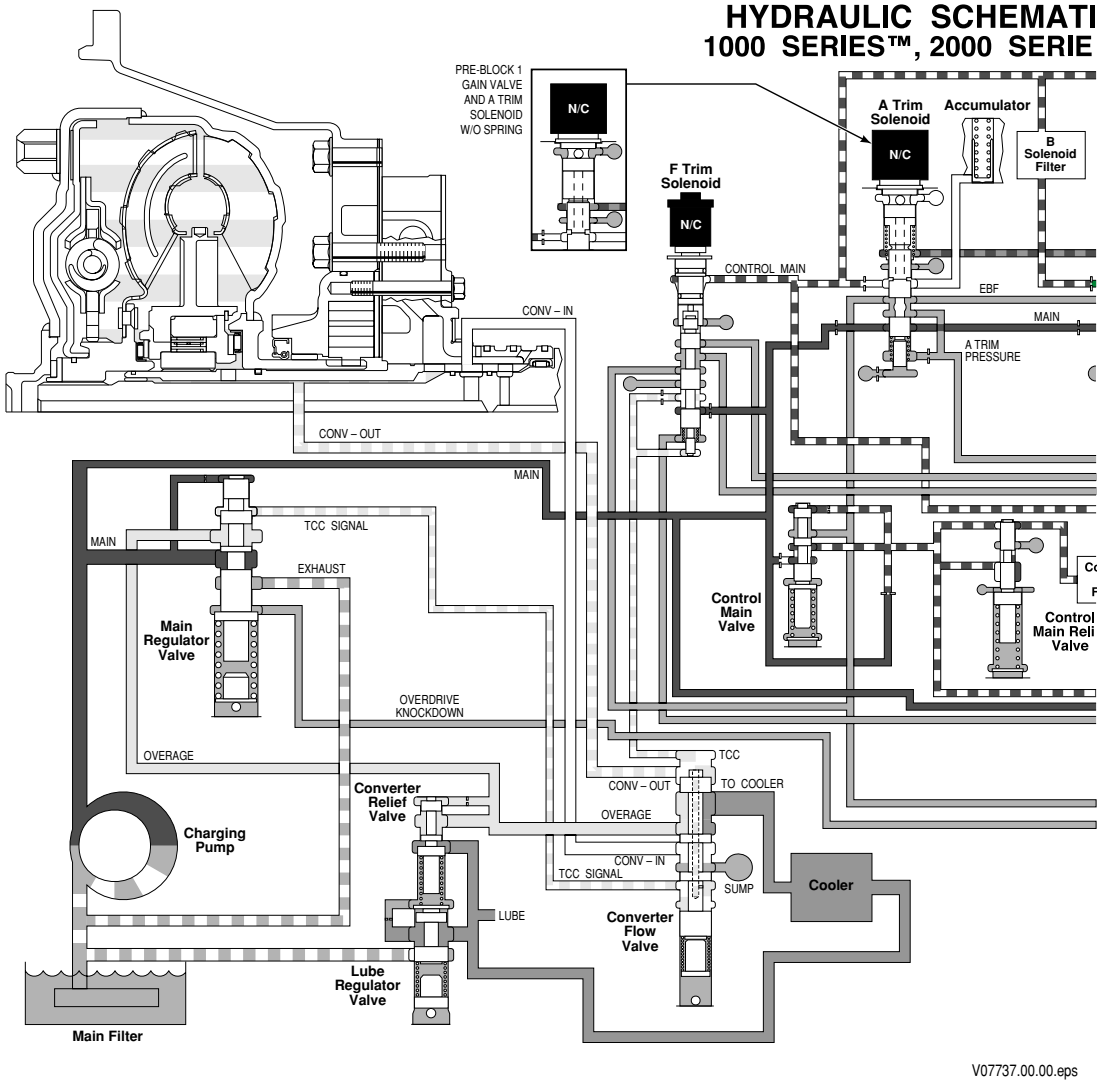
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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	*Go to Step 3*	*Go to Diagnostic Aids*

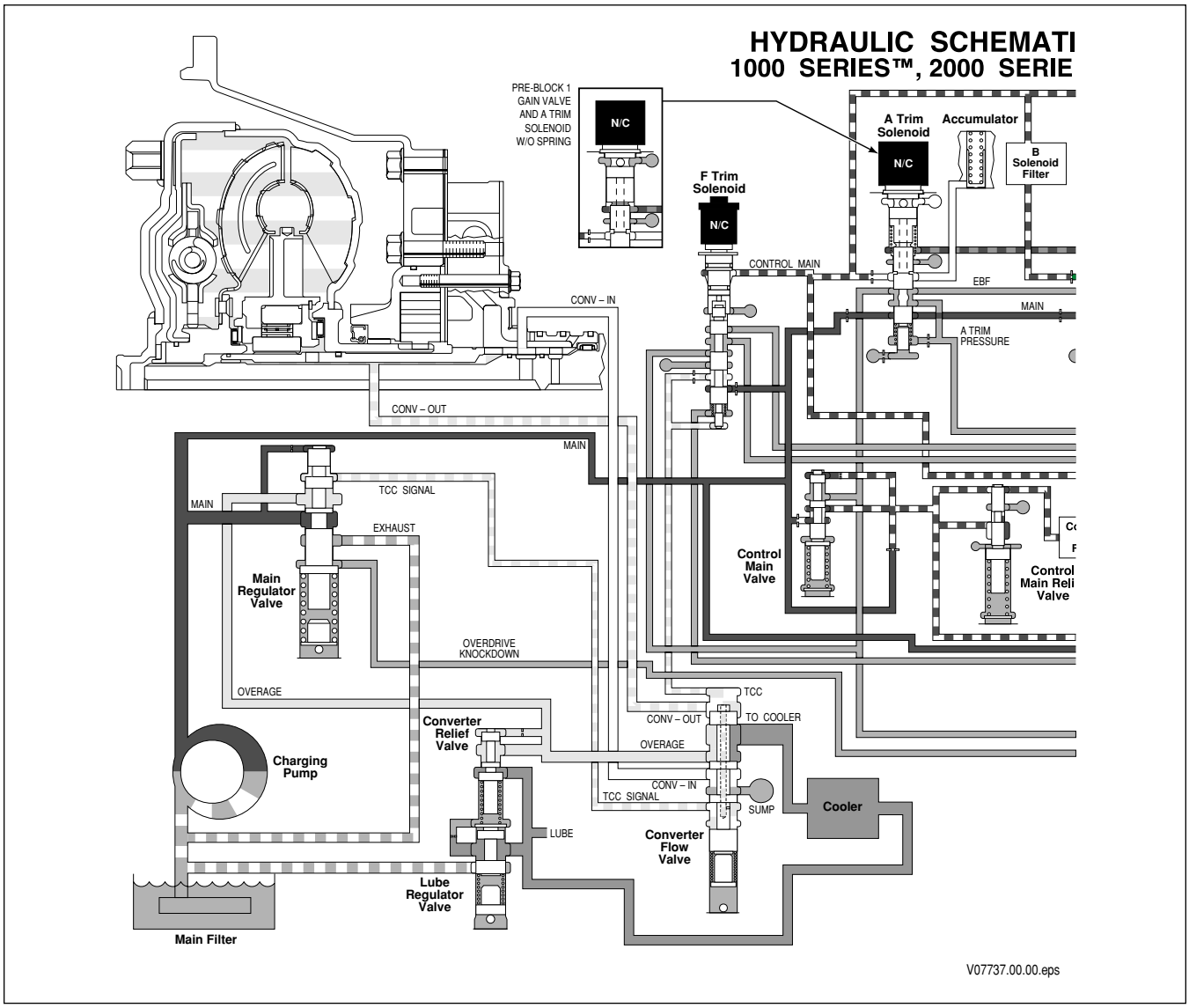
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*Go to Step 4*	—
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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

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.

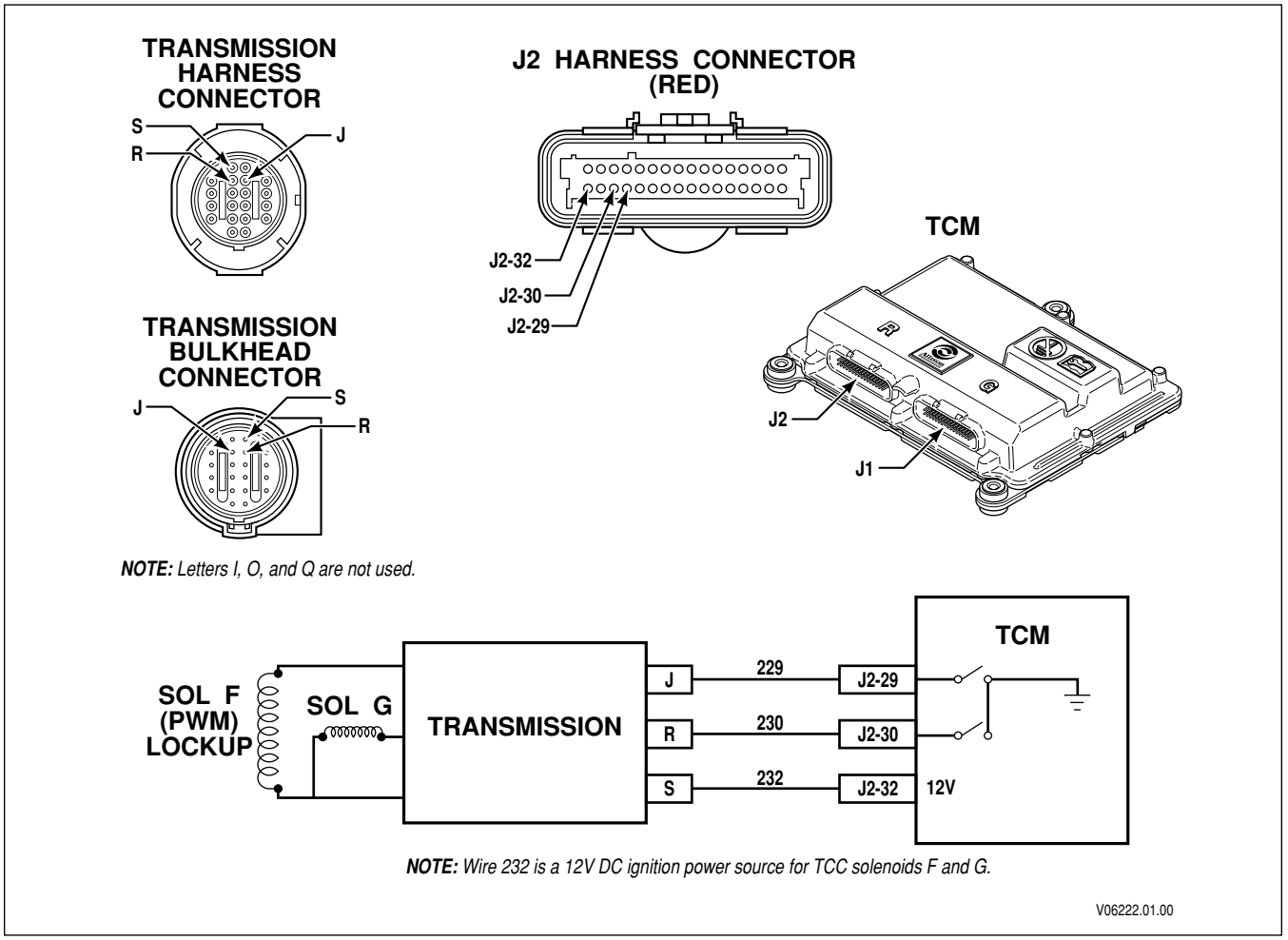
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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	*Go to Step 3*	*Go to Diagnostic Aids*
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?	—	*Go to Step 6*	—
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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

DIAGNOSTIC TROUBLE CODES (DTC)

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



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 ATD distributors and dealers are not covered by ATD 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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

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?	—	*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 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)	*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 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?	—	*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 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)	*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*

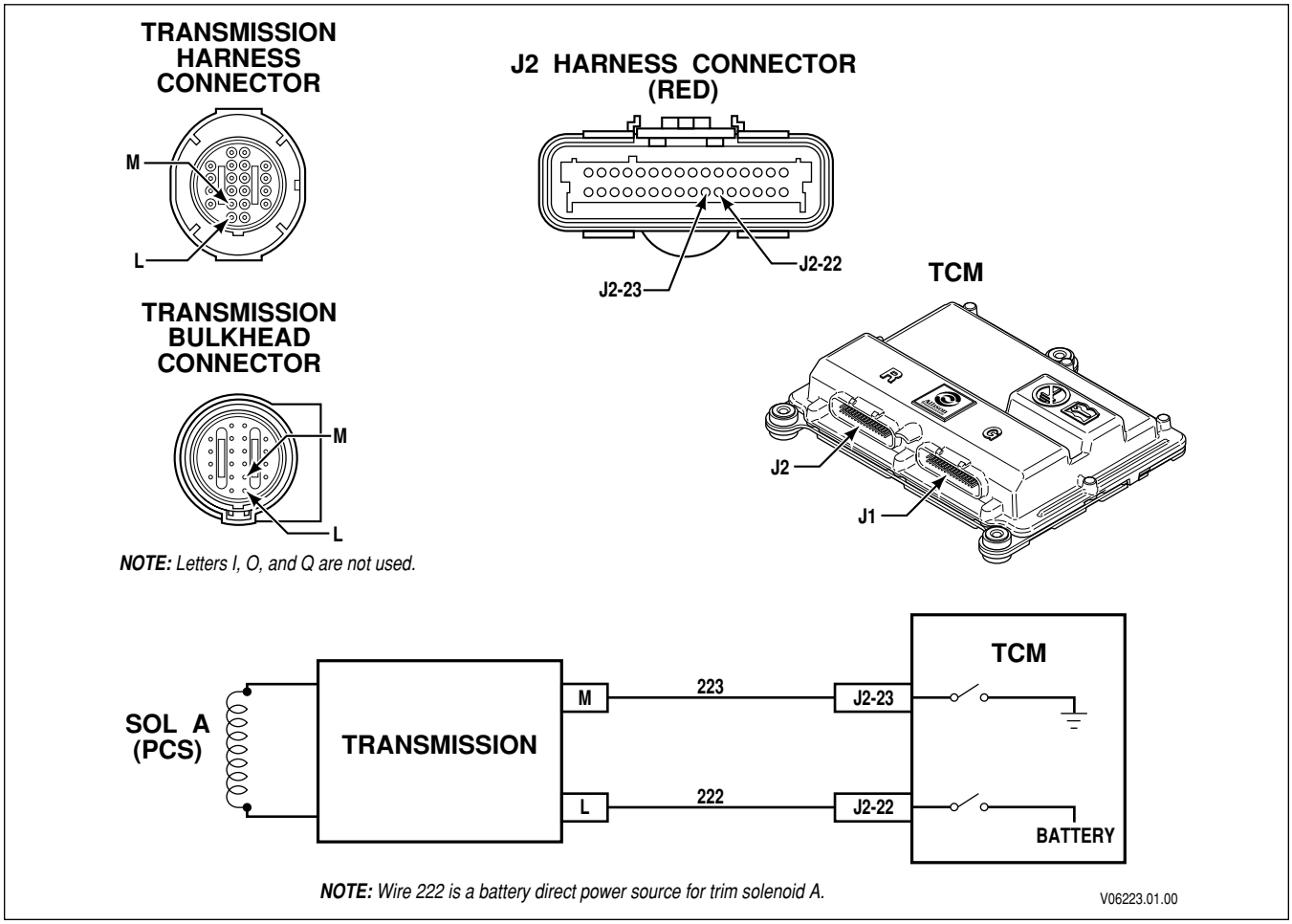
DIAGNOSTIC TROUBLE CODES (DTC)

DTC 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?	—	*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. 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.	*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. 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?	*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*

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 ATD distributors and dealers are not covered by ATD 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*	—

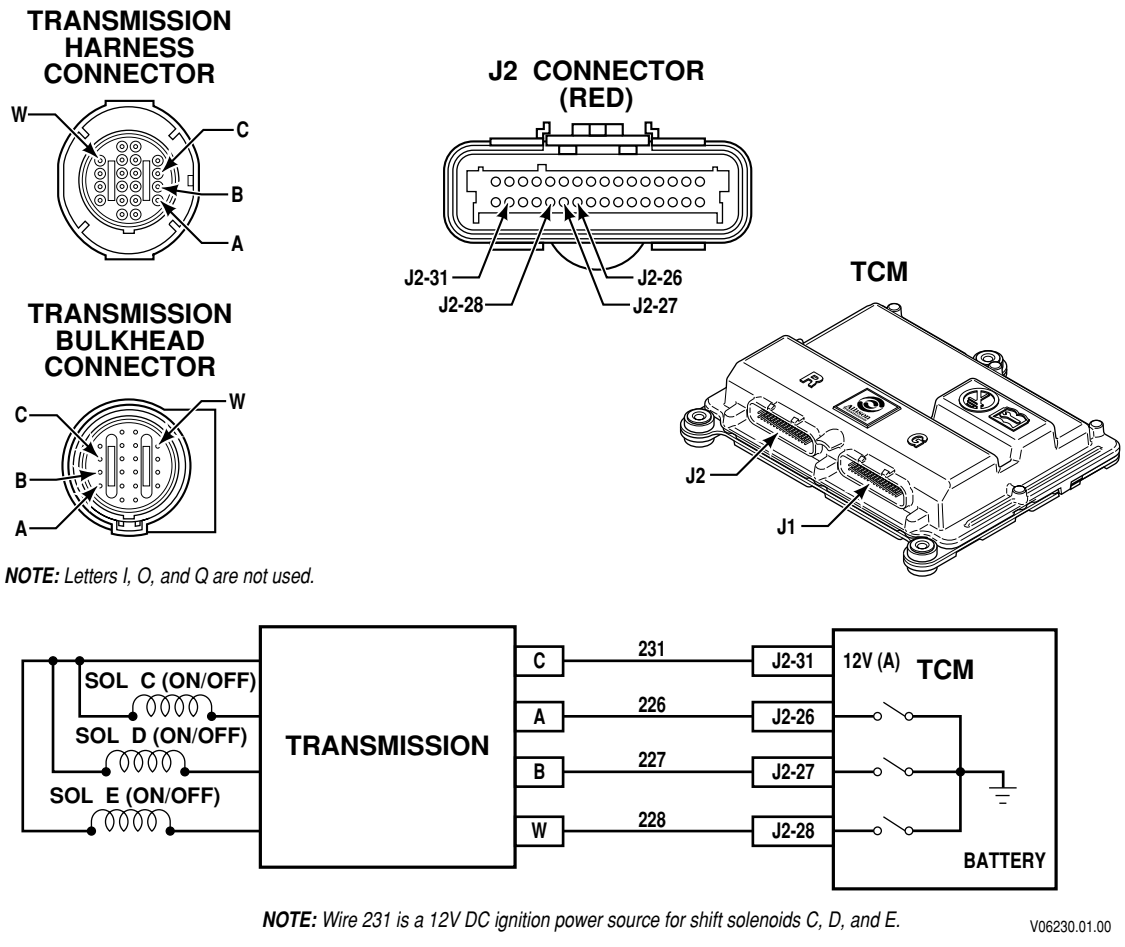
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

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?	—	*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 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	*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 26 5. Measure the resistance of the circuit. Is the resistance within the specified value?	22 Ohms at 68°F *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*

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 *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 ATD distributors and dealers are not covered by ATD 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 *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 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*	—

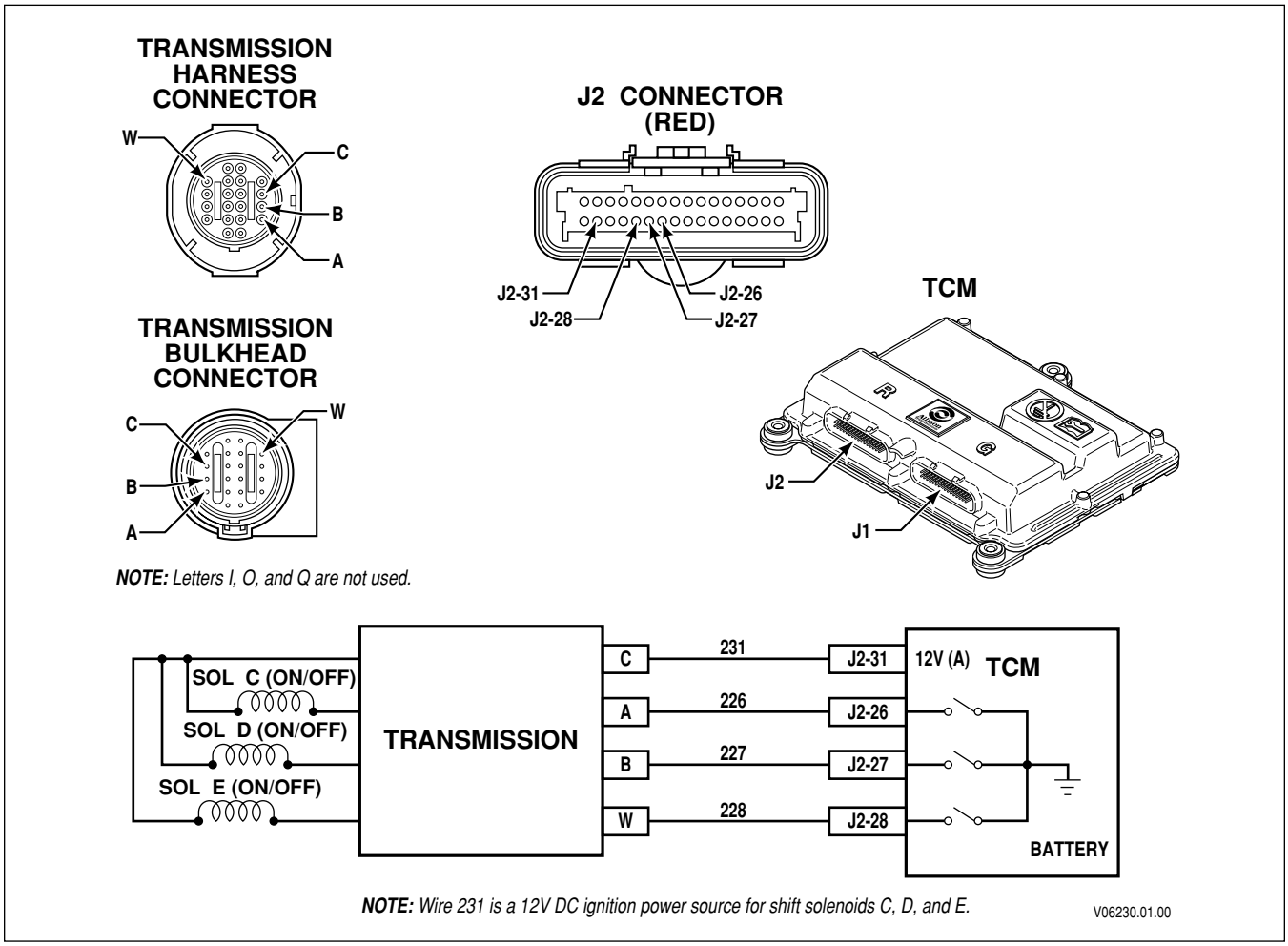
DIAGNOSTIC TROUBLE CODES (DTC)

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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

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 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 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 *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*

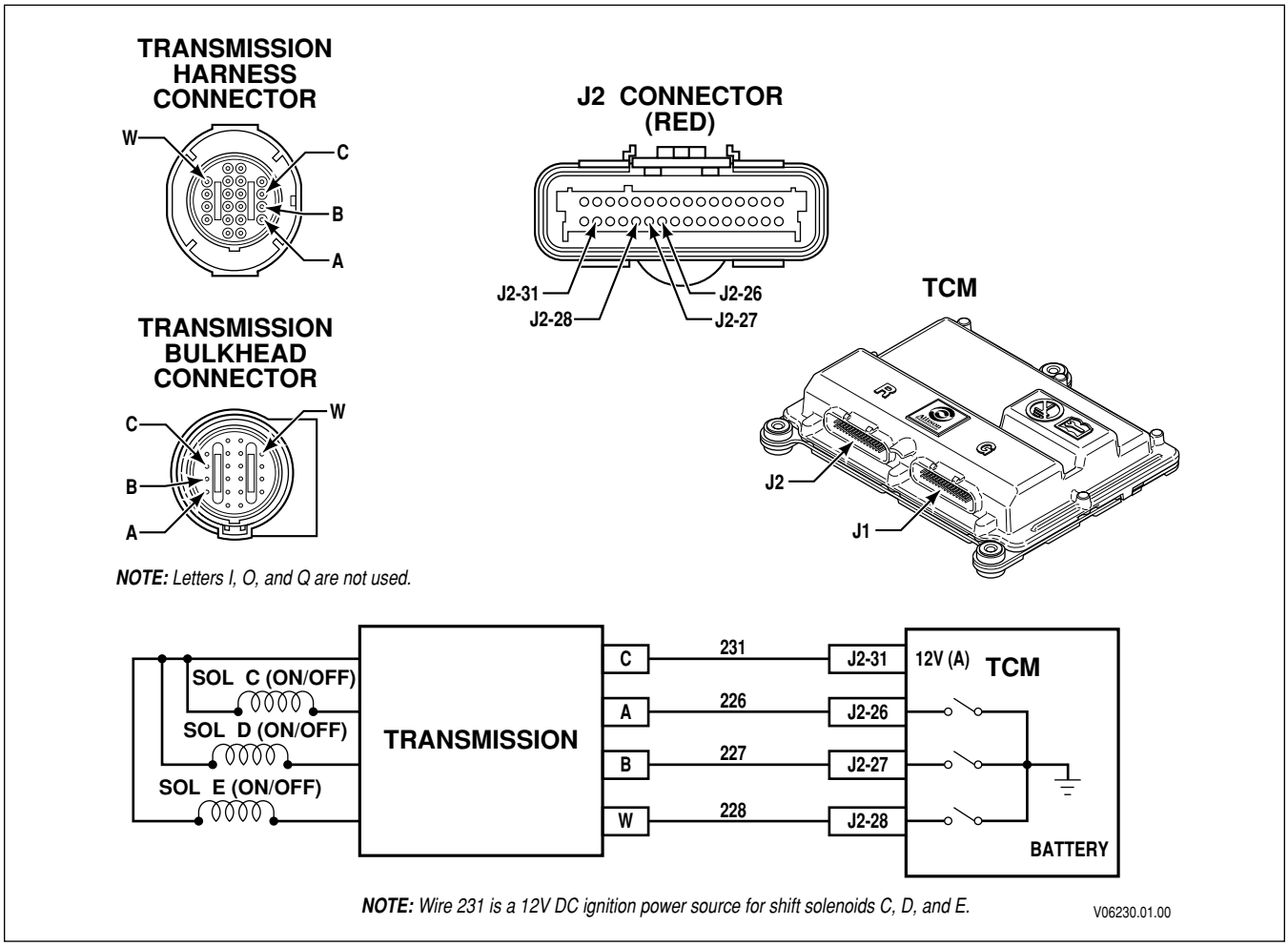
DIAGNOSTIC TROUBLE CODES (DTC)

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 *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 ATD distributors and dealers are not covered by ATD 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 *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 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 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 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 *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*

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 *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 ATD distributors and dealers are not covered by ATD 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 *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 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.

3. This step tests the ignition voltage.
4. This step tests speed sensor readings.
5. This step tests for internal hydraulic leakage.
6. 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?	—	*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 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)	*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*

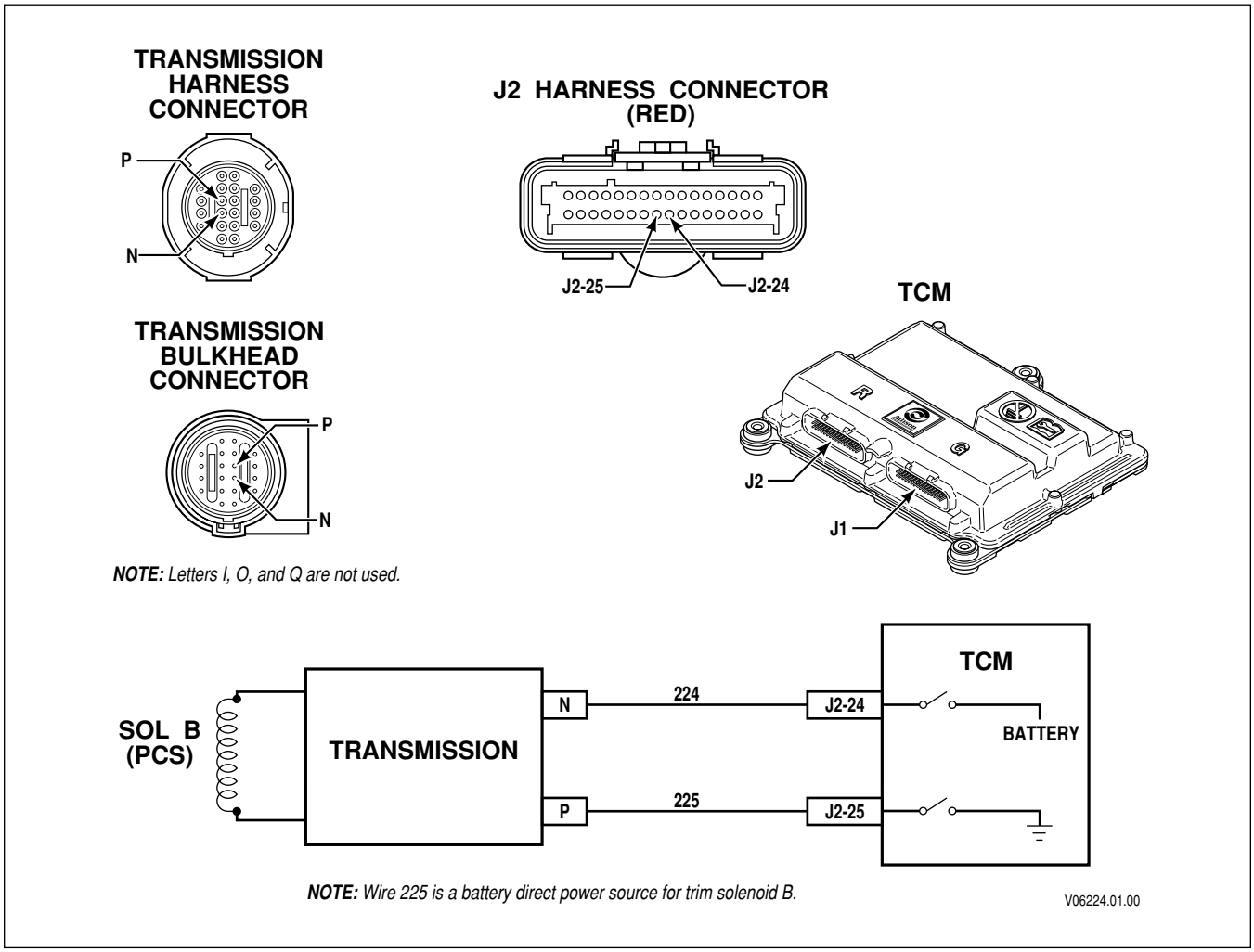
DIAGNOSTIC TROUBLE CODES (DTC)

DTC 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.

2. This step tests for proper ignition voltage.
3. This step tests the command signal from the TCM and tests the external wiring harness for shorts or opens.
4. This step tests for the proper resistance at the OEM vehicle harness.
5. This step tests for the proper resistance value at the main transmission connector.
8. 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?	—	*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. 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.	*Go to Step 4*	*Go to Step 10*

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 ATD distributors and dealers are not covered by ATD 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*

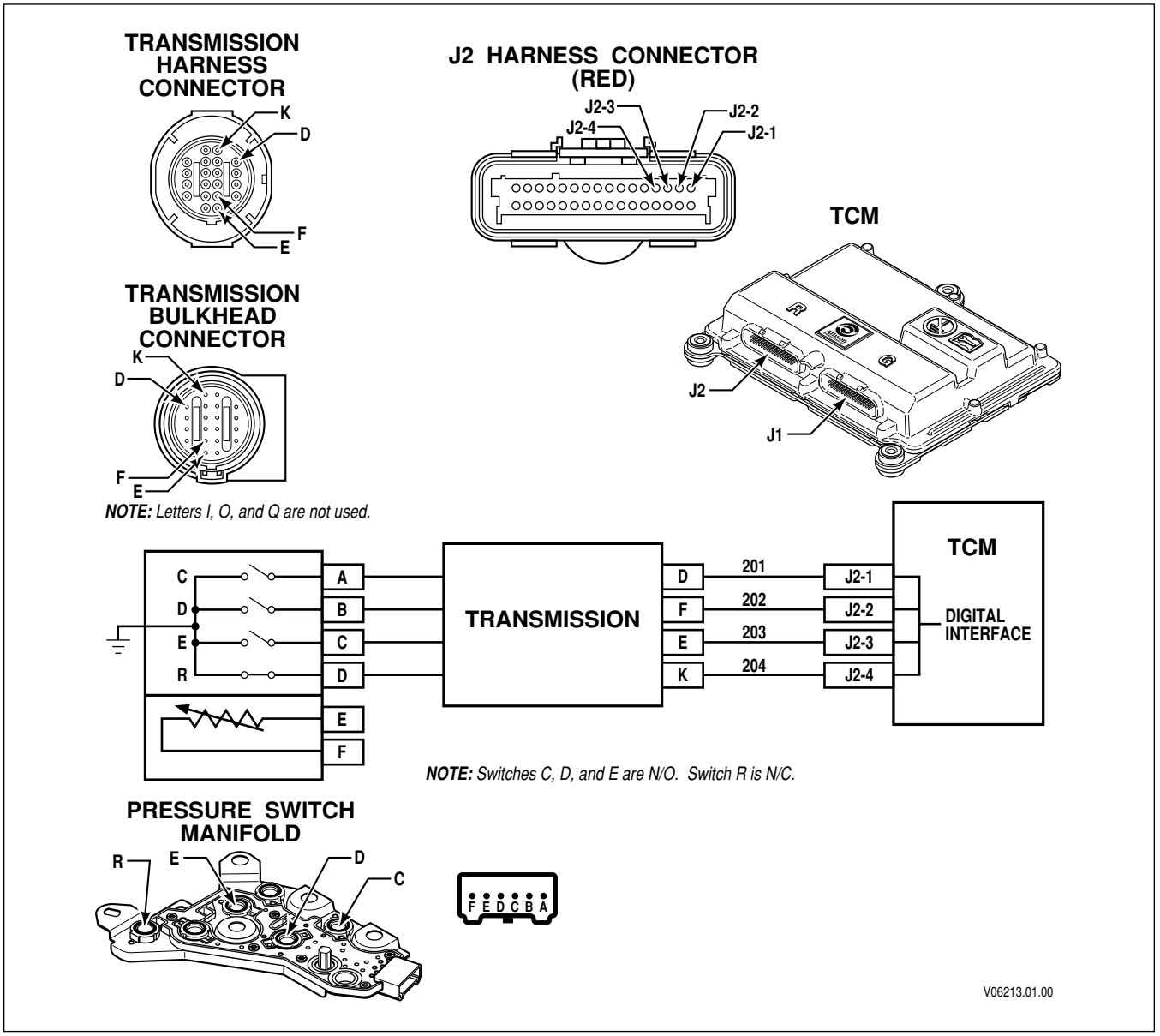
DIAGNOSTIC TROUBLE CODES (DTC)

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



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 destroked 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 destroked.
- 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 destroked 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?	—	*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 indicates that a short circuit condition may exist in the OEM harness, the internal transmission wiring harness, or the PSM.*** Did DTC P0840 return?	—	*Go to Step 5*	*Go to Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 12*
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?	—	*Go to Step 7*	*Go to Step 11*
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?	—	*Go to Step 8*	*Go to Step 10*
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?	—	*Go To Diagnostic Aids*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—

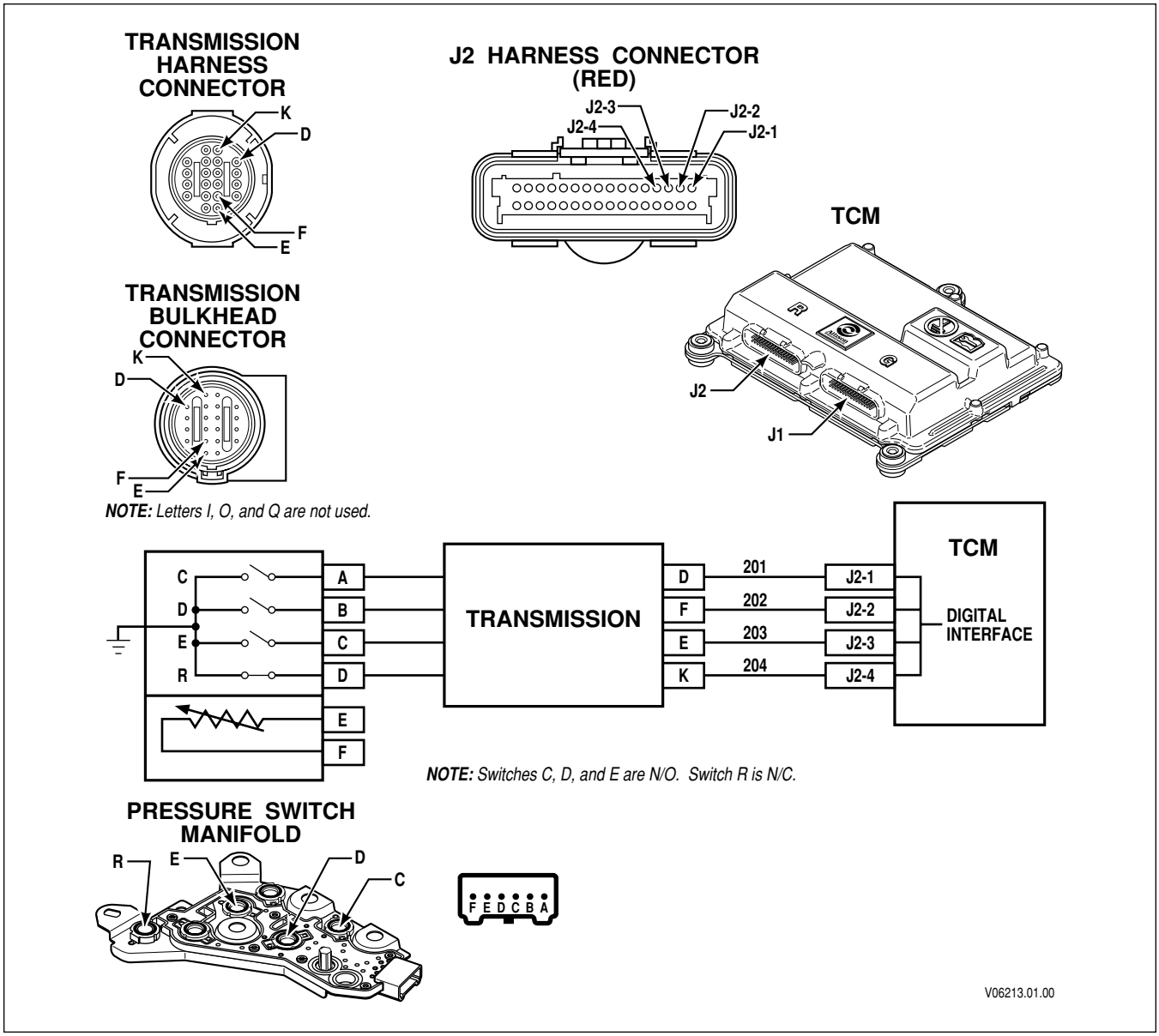
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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)

DTC P0841 Transmission Pressure Switch Solenoid C 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 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 destroked 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 ON (stroked) position.

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 destroked 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 destroked 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 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, mechanically failed solenoid, open in switch circuit, or defective PSM.*** Did DTC P0841 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 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?	—	*Go to Step 7*	*Go to Step 14*
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?	—	*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 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?		*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 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*	—

DIAGNOSTIC TROUBLE CODES (DTC)

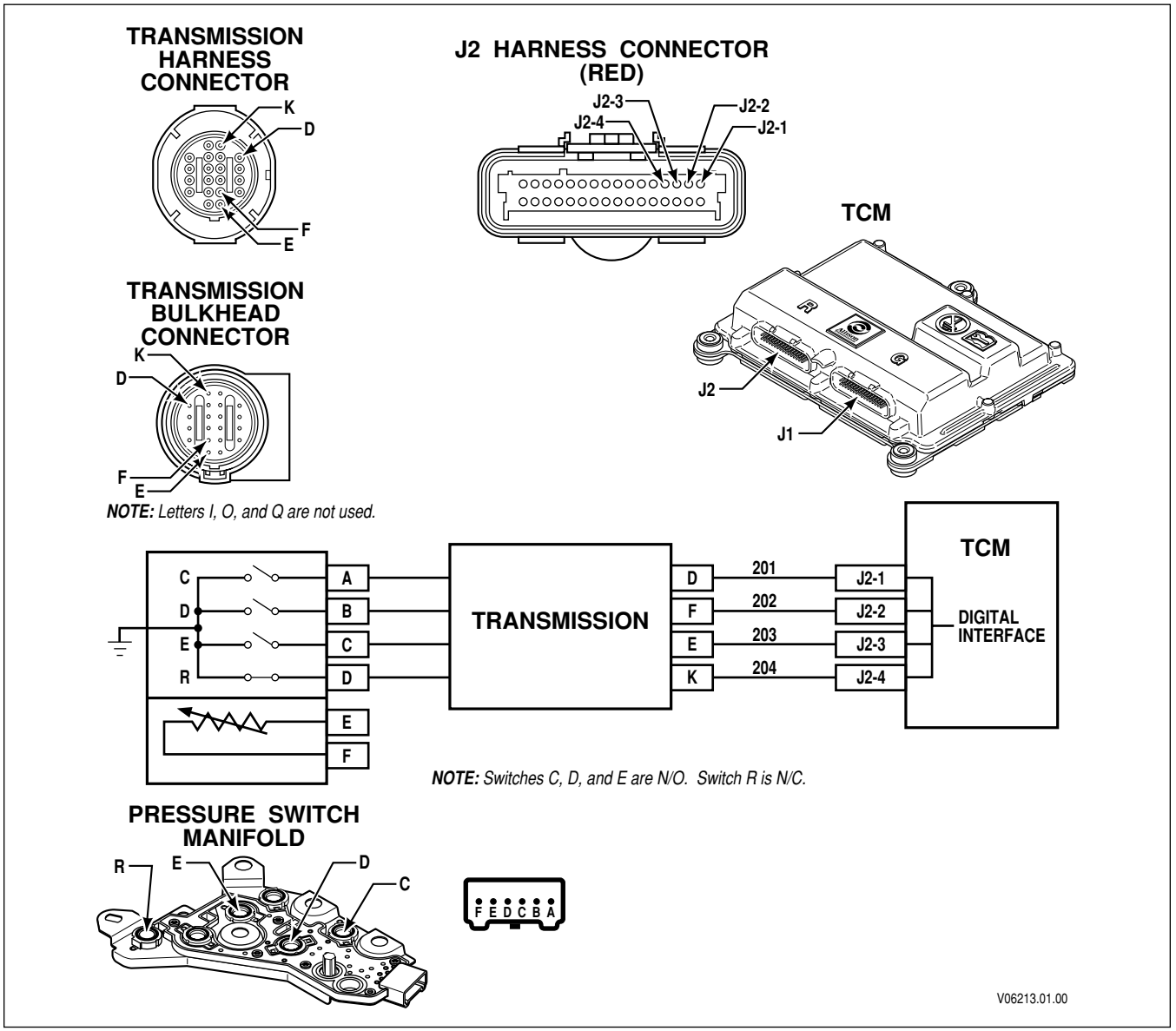
DTC P0841 Transmission Pressure Switch Solenoid C Circuit Stuck Open *(cont'd)*

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 ATD distributors and dealers are not covered by ATD 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 destroked 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 (destroked) 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.

DIAGNOSTIC TROUBLE CODES (DTC)

8. This step tests the PSM switch function.

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?	—	*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, mechanically failed solenoid, short to ground in the switch circuit, or a defective PSM.*** Did DTC P0842 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 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 P0842 Transmission Pressure Switch Solenoid C Circuit Stuck Closed *(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) 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?	—	*Go to Step 7*	*Go to Step 14*
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*	

DIAGNOSTIC TROUBLE CODES (DTC)

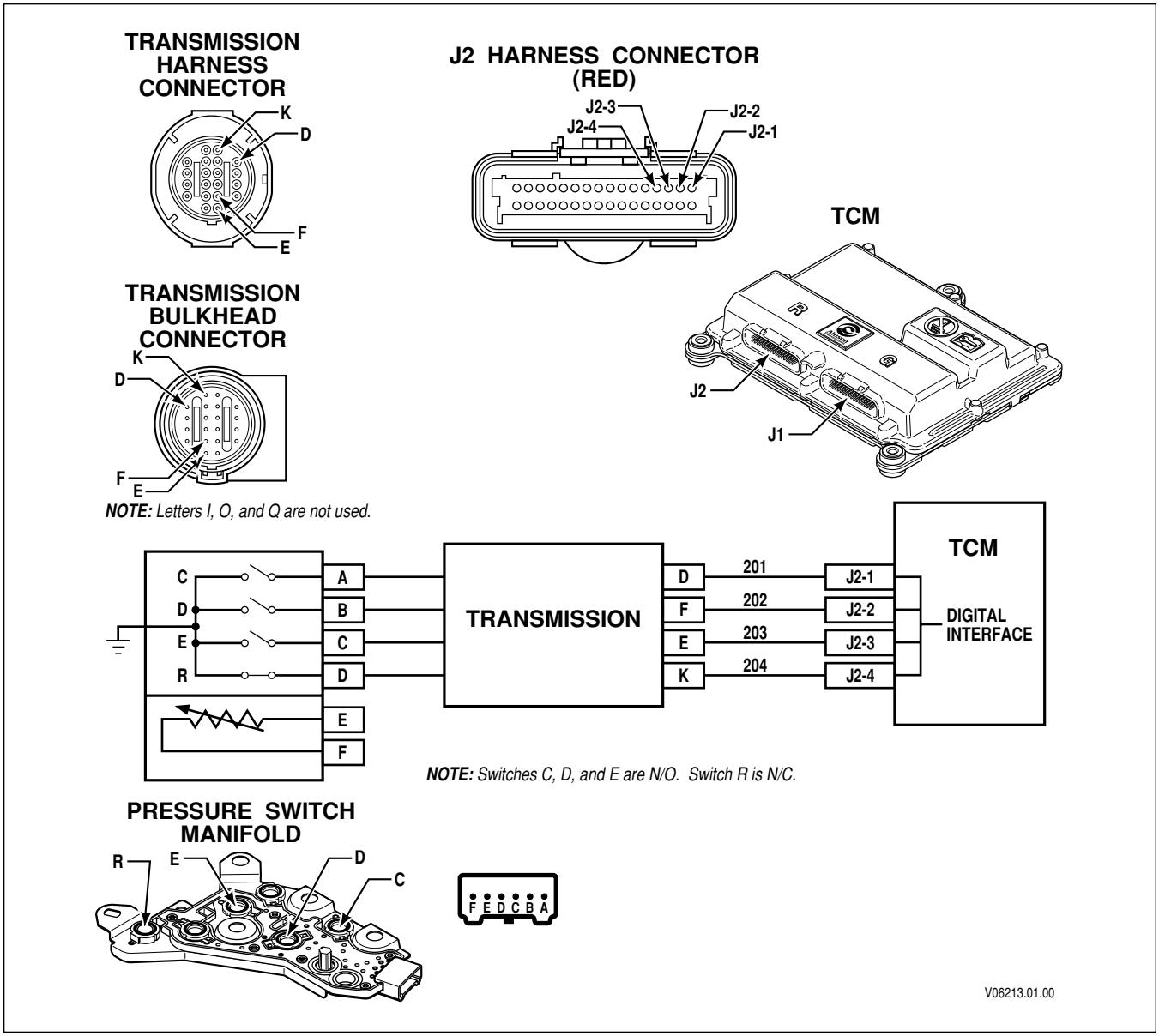
DTC P0842 Transmission Pressure Switch Solenoid C Circuit Stuck Closed *(cont'd)*

Step	Action	Value(s)	Yes	No
12	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*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 ATD distributors and dealers are not covered by ATD 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 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 destroked 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 destroked (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 destroked 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?	—	*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 indicates an open circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM.*** Did DTC P0843 return?	—	*Go to Step 5*	*Go to Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 12*
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?	—	*Go to Step 7*	*Go to Step 11*
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?	—	*Go to Step 8*	*Go to Step10*
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 Diagnostic Aids*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—

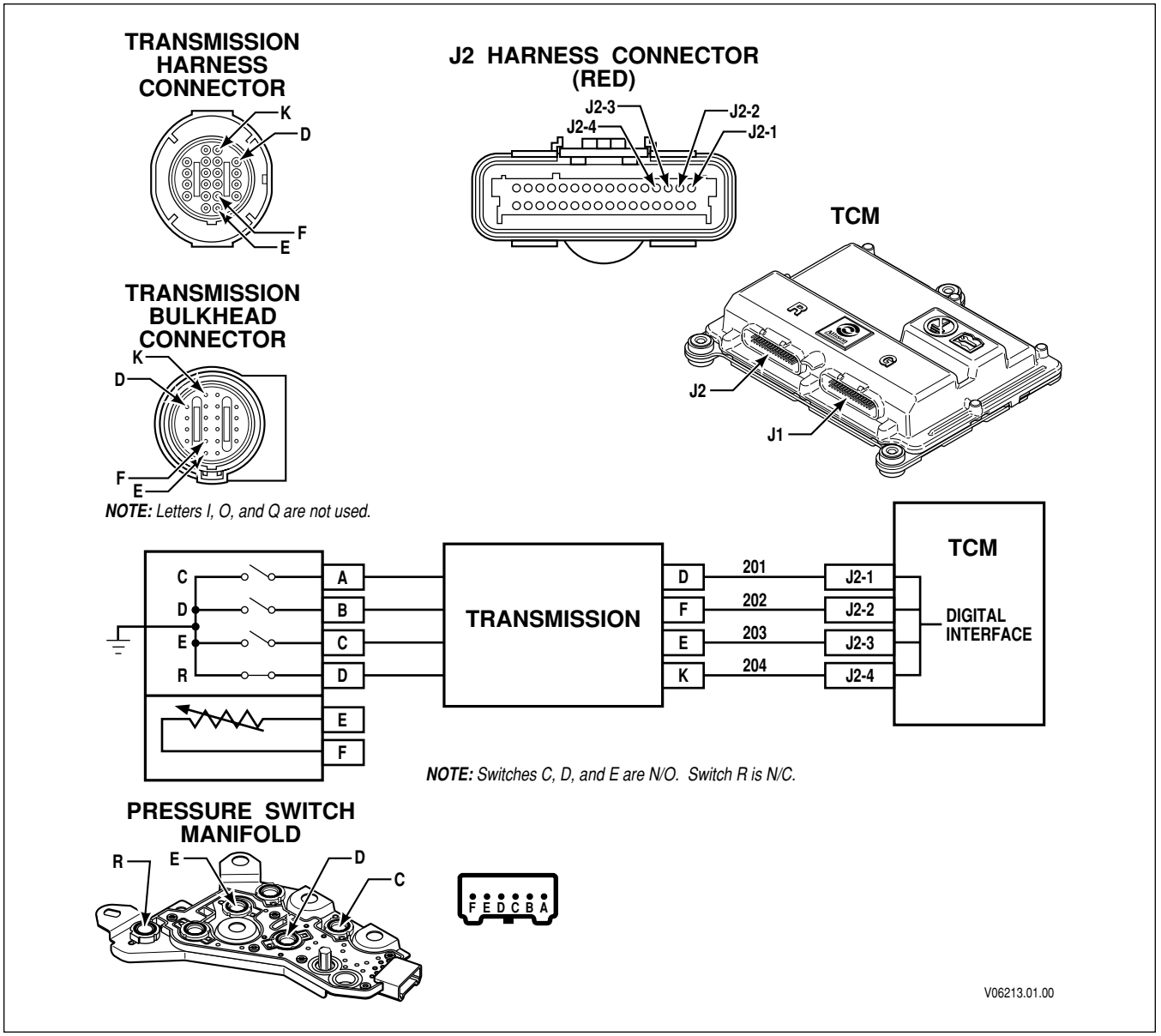
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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



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 destroked 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 (destroked) 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 destroked 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?	—	*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 indicates a short circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM.*** Did DTC P0845 return?	—	*Go to Step 5*	*Go to Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 12*
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?	—	*Go to Step 7*	*Go to Step 11*
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 10*
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 Diagnostic Aids*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—

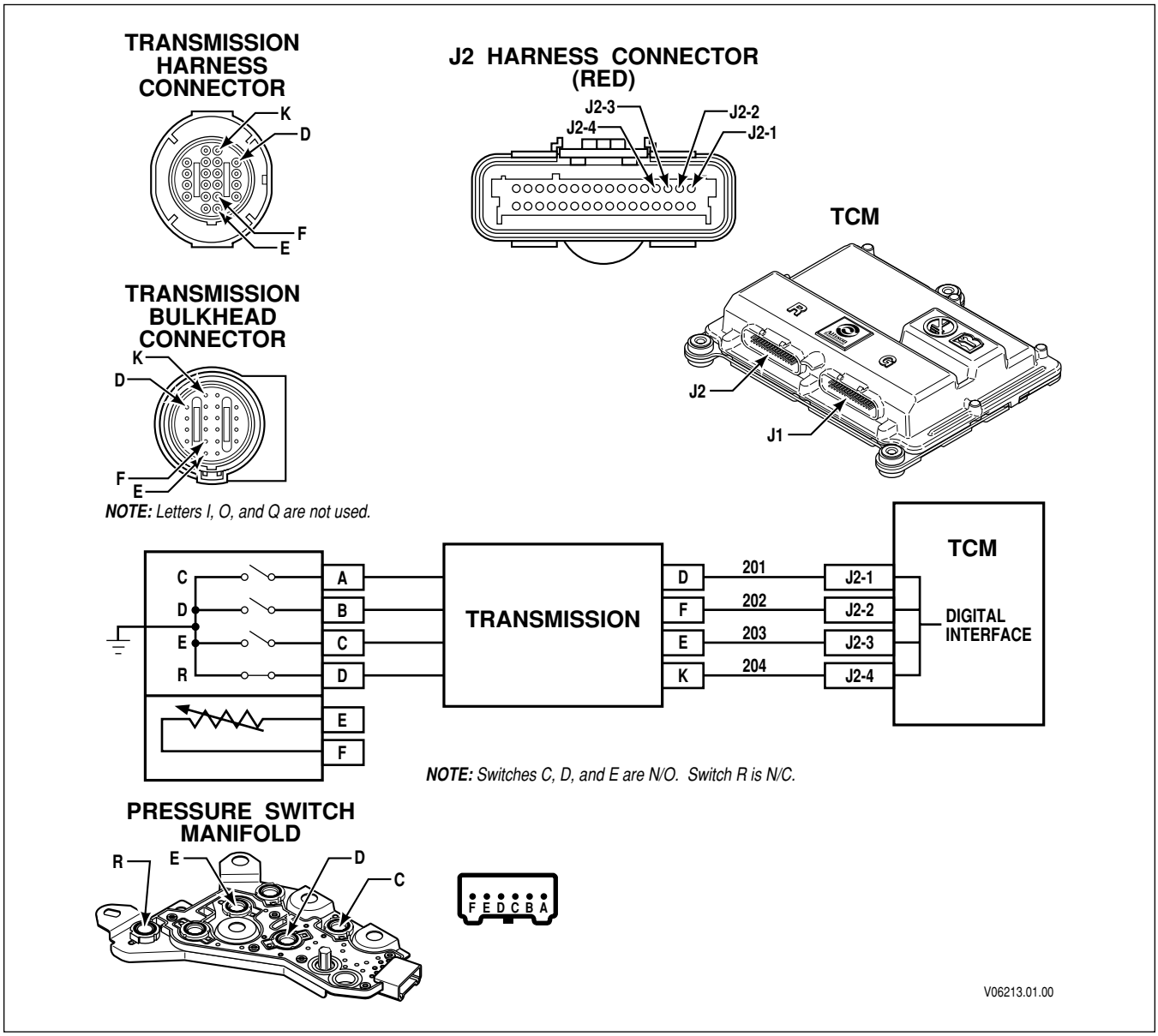
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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)

DTC P0846 Transmission Pressure Switch Solenoid D 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 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 destroked 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 ON (stroked) position.

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 destroked 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 destroked 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?	—	*Go to Step 7*	*Go to Step 14*
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 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*	—

DIAGNOSTIC TROUBLE CODES (DTC)

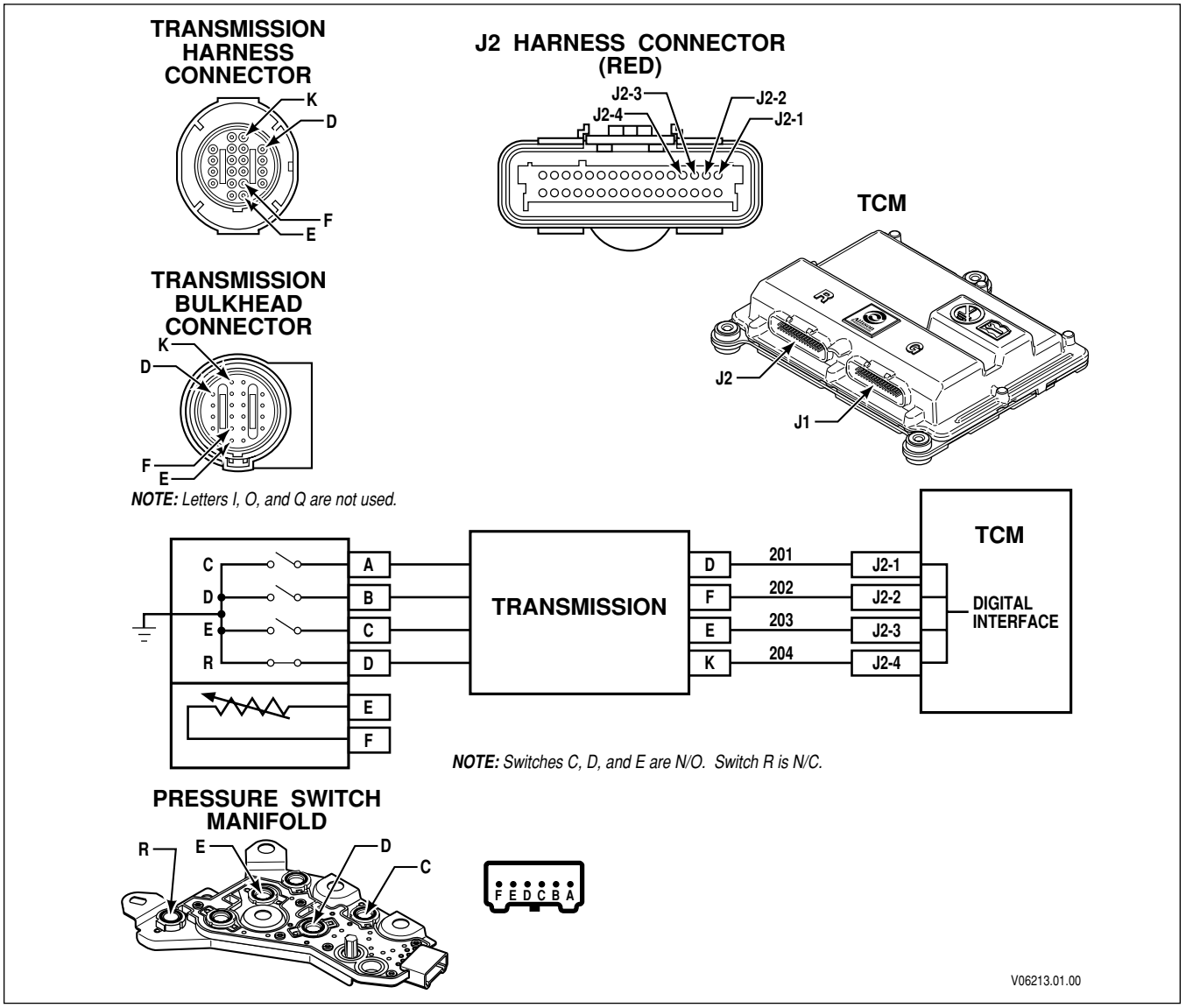
DTC P0846 Transmission Pressure Switch Solenoid D Circuit Stuck Open *(cont'd)*

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 ATD distributors and dealers are not covered by ATD 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 destroked 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 (destroked) 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?	—	*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, a short to ground in the switch circuit, or a defective PSM.*** Did DTC P0847 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*
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?	—	*Go to Step 7*	*Go to Step 14*

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 ATD distributors and dealers are not covered by ATD warranty.*** Repair the vehicle wiring harness. Is the repair complete?	—	*Go to Step 16*	—

DIAGNOSTIC TROUBLE CODES (DTC)

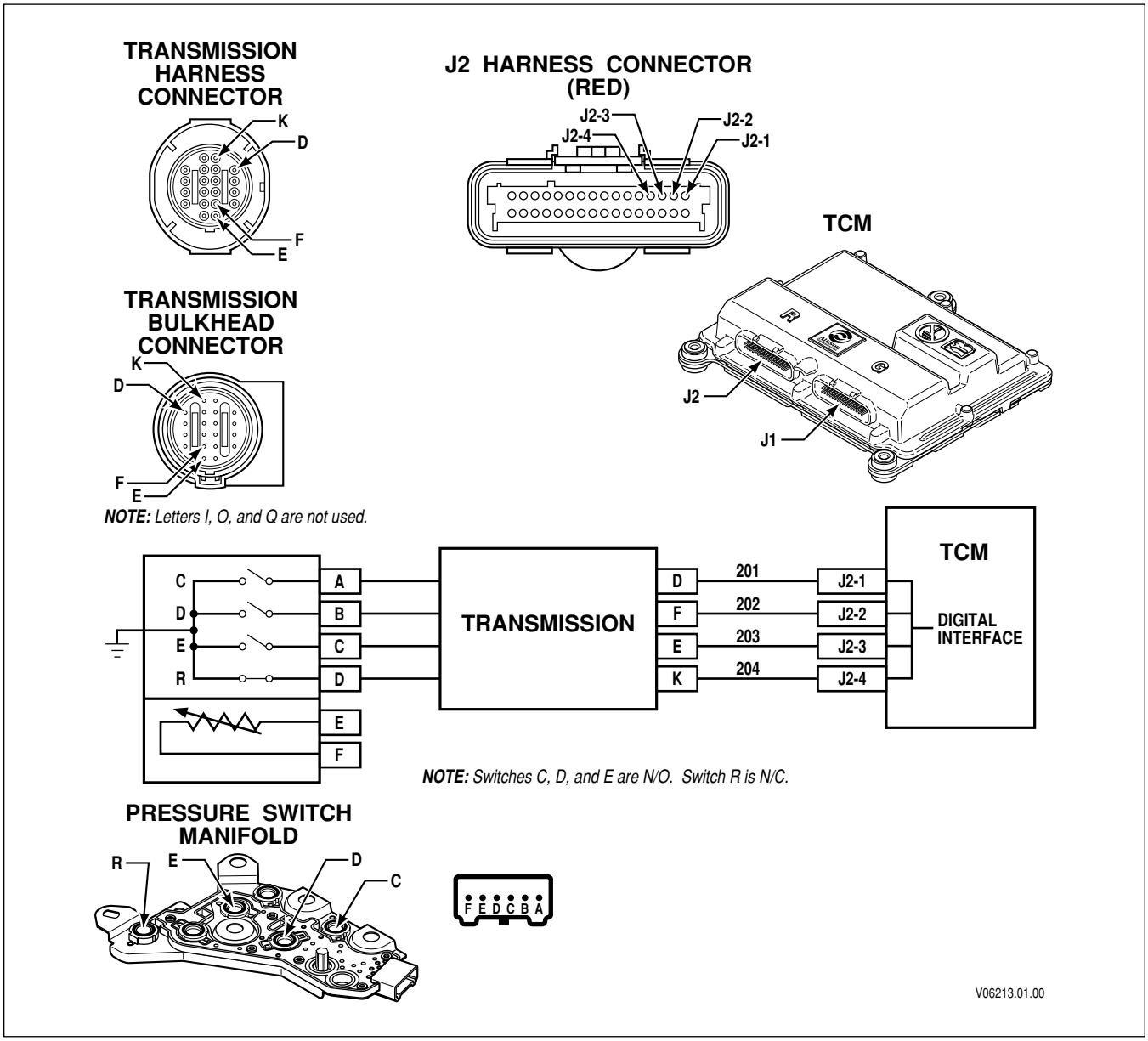
DTC P0847 Transmission Pressure Switch Solenoid D Circuit Stuck Closed *(cont'd)*

Step	Action	Value(s)	Yes	No
15	***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 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 destroked 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 destroked (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 destroked 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?	—	*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 indicates an open circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM.*** Did DTC P0848 return?	—	*Go to Step 5*	*Go to Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 12*
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?	—	*Go to Step 7*	*Go to Step 11*
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 10*
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 Diagnostic Aids*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—

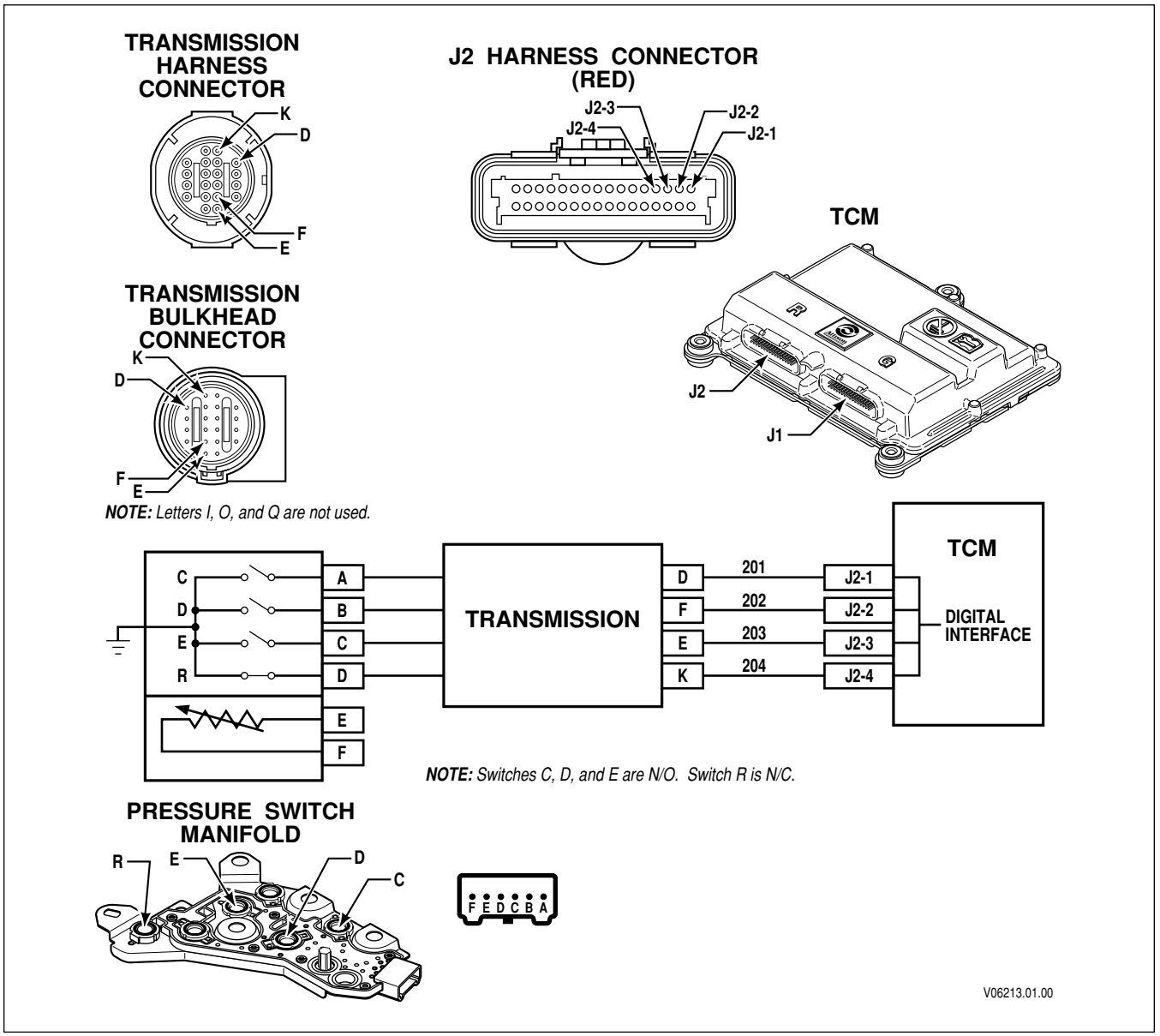
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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 destroked 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 (destroked) 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 destroked 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?	—	*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 indicates a short circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM.*** Did DTC P0870 return?	—	*Go to Step 5*	*Go to Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 12*
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?	—	*Go to Step 7*	*Go to Step 11*
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?	—	*Go to Step 8*	*Go to Step 10*
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?	—	*Go to Diagnostic Aids*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—

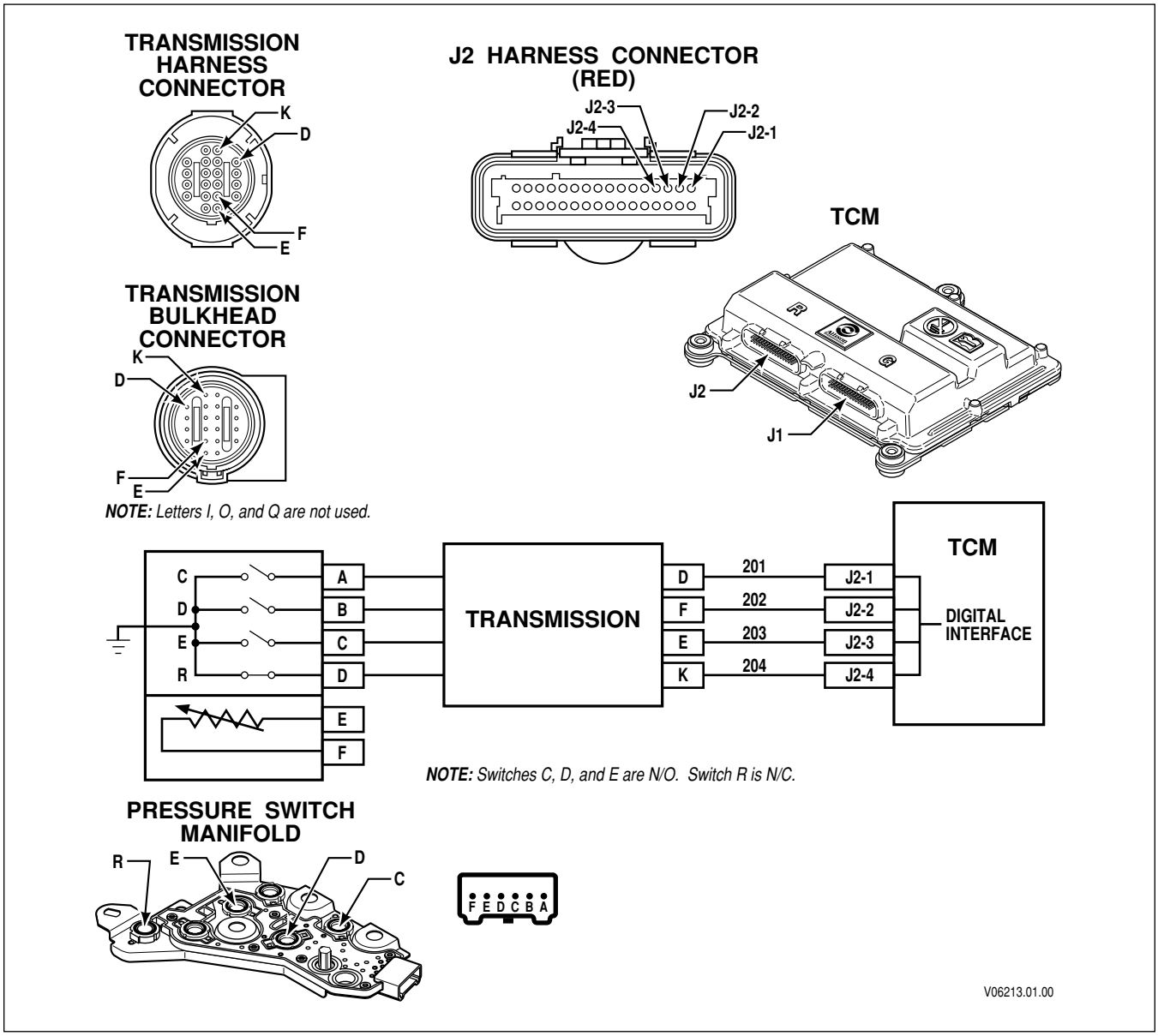
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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 destroked 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 destroked 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 destroked 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?	—	*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 P0871 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 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?	—	*Go to Step 6*	*Go to Step 15*

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?	—	*Go to Step 7*	*Go to Step 14*
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?	—	*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 E membrane. Does the Scan Tool indicate pressure switch E 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 E shift valve. Refer to Service Manual or Mechanic's Tips. Was the E shift valve stuck or sticking?	—	*Go to Step 11*	*Go to Step 10*
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?	—	*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*	—

DIAGNOSTIC TROUBLE CODES (DTC)

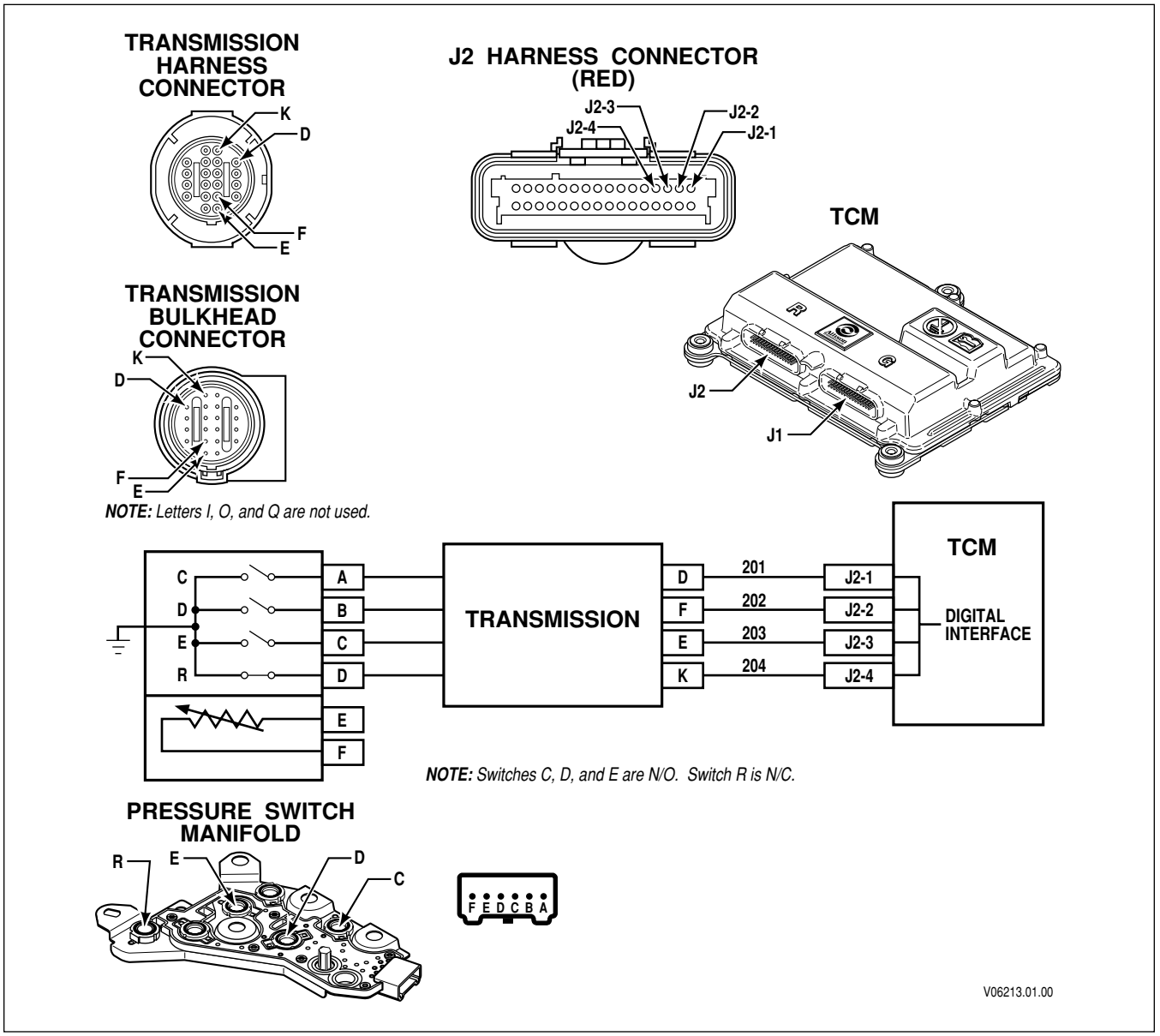
DTC P0871 (Previously P1710) Trans Pressure Switch Solenoid E Circuit Stuck Open *(cont'd)*

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 ATD distributors and dealers are not covered by ATD 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



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 destroked 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 (destroked) 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?	—	*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, a short to ground in the switch circuit, or a defective PSM.*** Did DTC P0872 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 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?	—	*Go to Step 6*	*Go to Step 15*

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?	—	*Go to Step 7*	*Go to Step 14*
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?	—	*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 E membrane. Does the Scan Tool indicate pressure switch E 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 E shift valve. Refer to Service Manual or Mechanic's Tips. Was the E shift valve stuck or sticking?	—	*Go to Step 11*	*Go to Step 10*
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?	—	*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*	—

DIAGNOSTIC TROUBLE CODES (DTC)

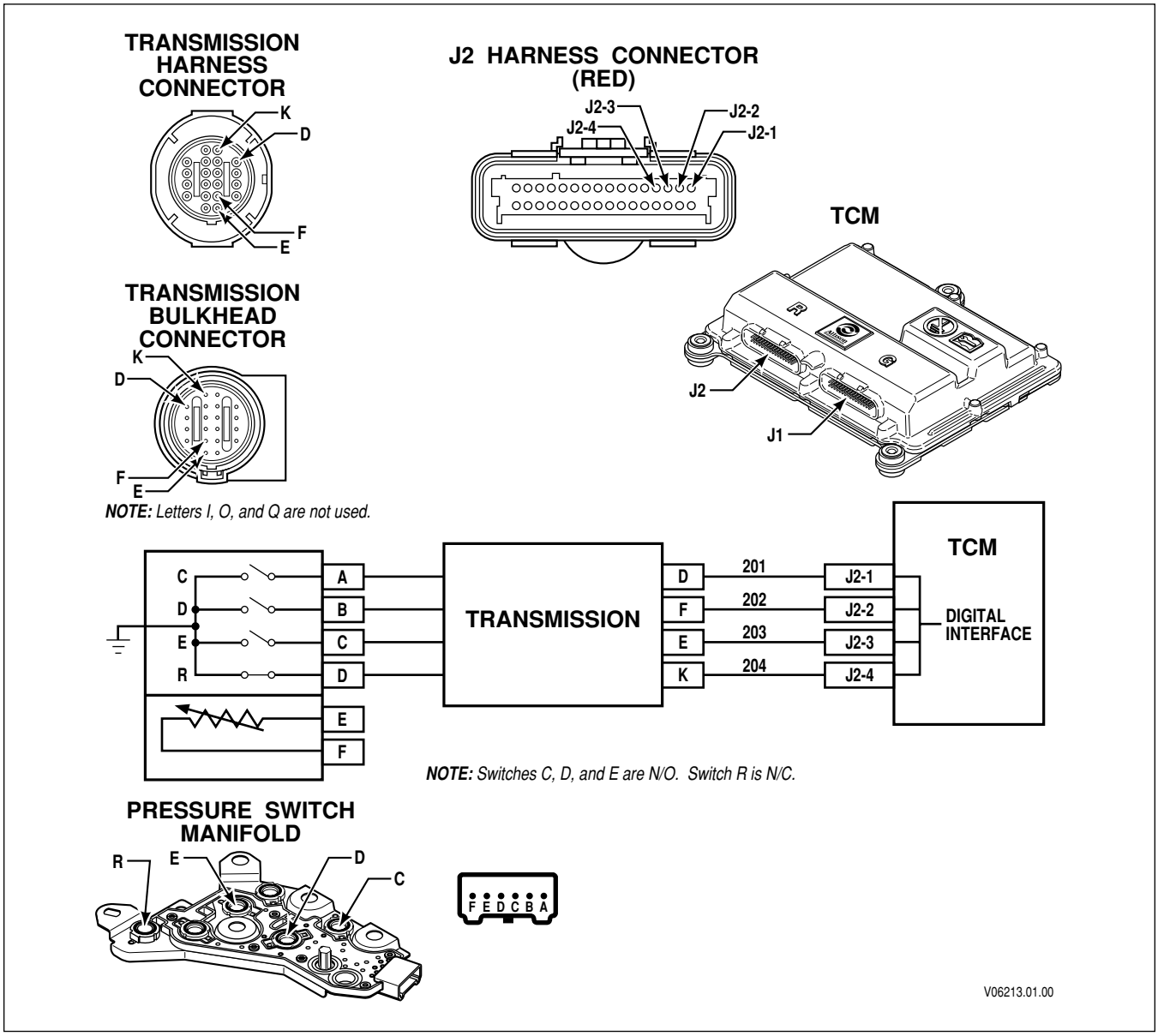
DTC P0872 (Previously P1711) Trans Pressure Switch Solenoid E Circuit Stuck Closed *(cont'd)*

Step	Action	Value(s)	Yes	No
12	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*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 ATD distributors and dealers are not covered by ATD 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 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?	—	*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 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 destroked 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 destroked (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 destroked 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?	—	*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 indicates an open circuit condition may exist in the OEM wiring harness, the internal transmission wiring harness, or the PSM.*** Did DTC P0873 return?	—	*Go to Step 5*	*Go to Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 12*
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?	—	*Go to Step 7*	*Go to Step 11*
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?	—	*Go to Step 8*	*Go to Step 10*
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?	—	*Go to Diagnostic Aids*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—
10	Replace the internal wiring harness. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 13*	—

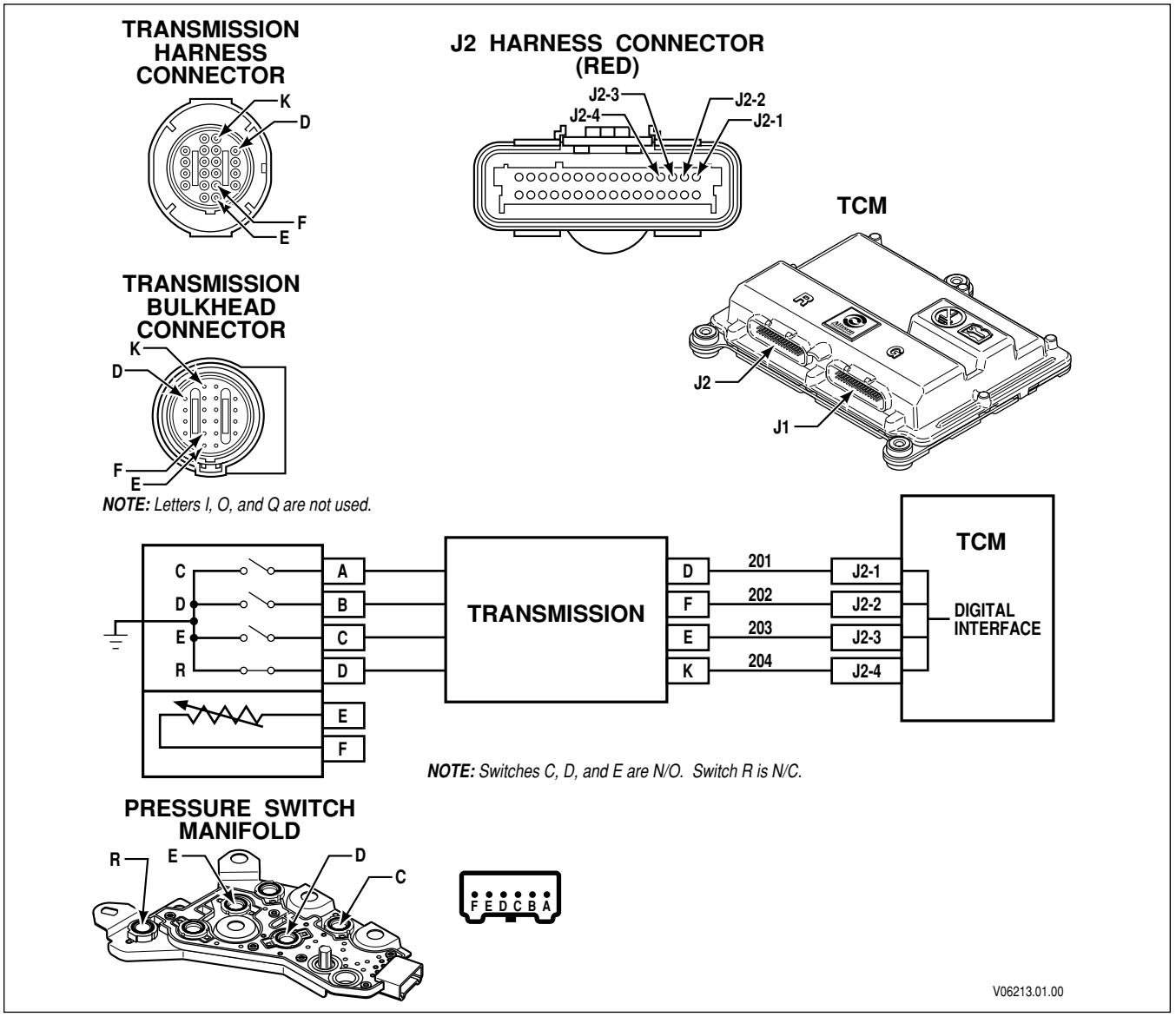
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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



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 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 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 Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 13*
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?	—	*Go to Step 7*	*Go to Step 12*
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?	—	*Go to Step 8*	*Go to Step 11*
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?	—	*Go to Step 10*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 14*	—

DIAGNOSTIC TROUBLE CODES (DTC)

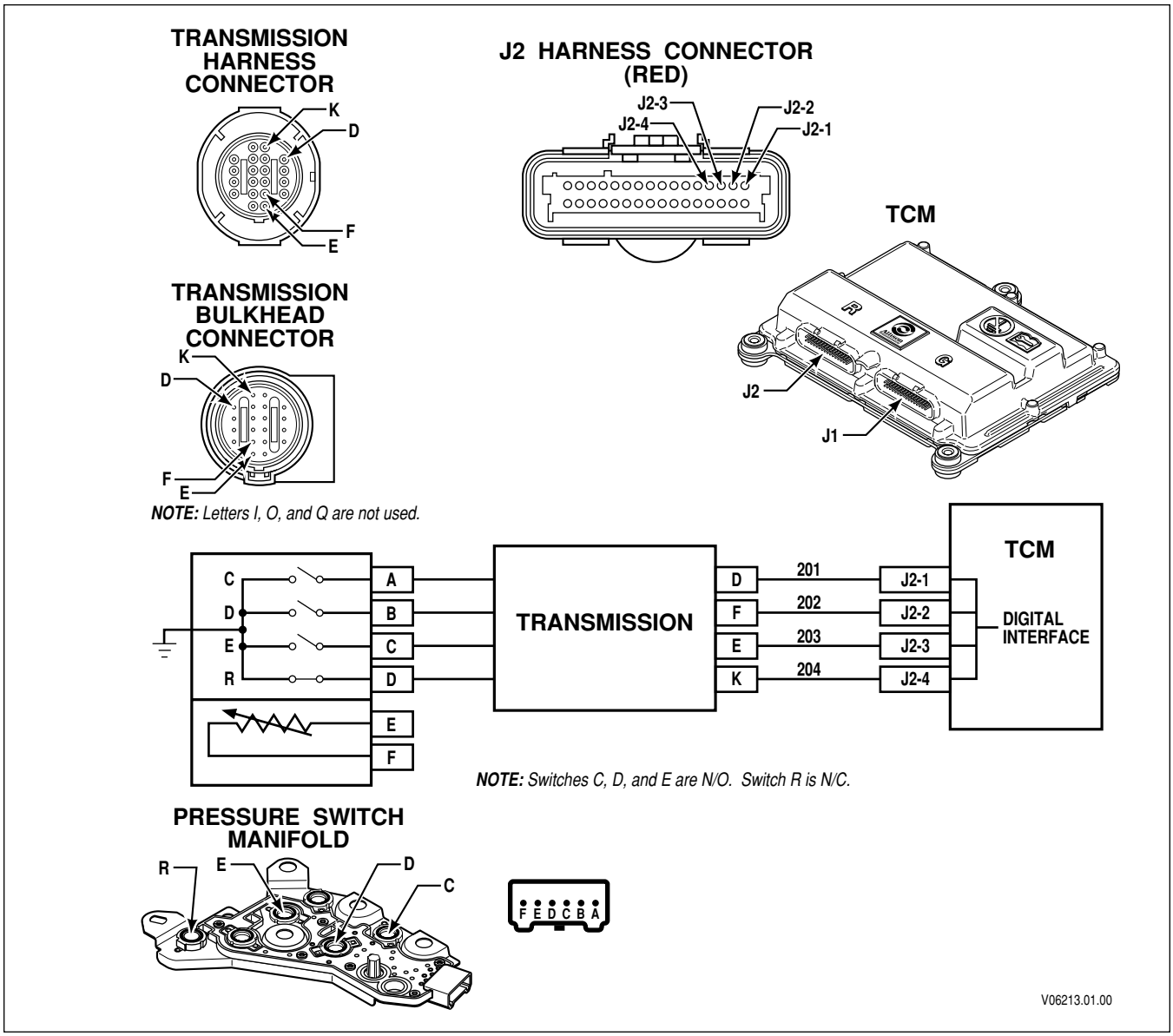
DTC P0875 (Previously P1713) Reverse Pressure Switch Circuit Malfunction *(cont'd)*

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 ATD distributors and dealers are not covered by ATD 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?	—	*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 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?	—	*Go to Step 5*	*Go to Diagnostic Aids*

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?	—	*Go to Step 6*	*Go to Step 13*
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?	—	*Go to Step 7*	*Go to Step 12*
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?	—	*Go to Step 8*	*Go to Step 11*
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?	—	*Go to Step 10*	*Go to Step 9*
9	Replace the PSM. Refer to Service Manual or Mechanic's Tips. Is the replacement complete?	—	*Go to Step 14*	—

DIAGNOSTIC TROUBLE CODES (DTC)

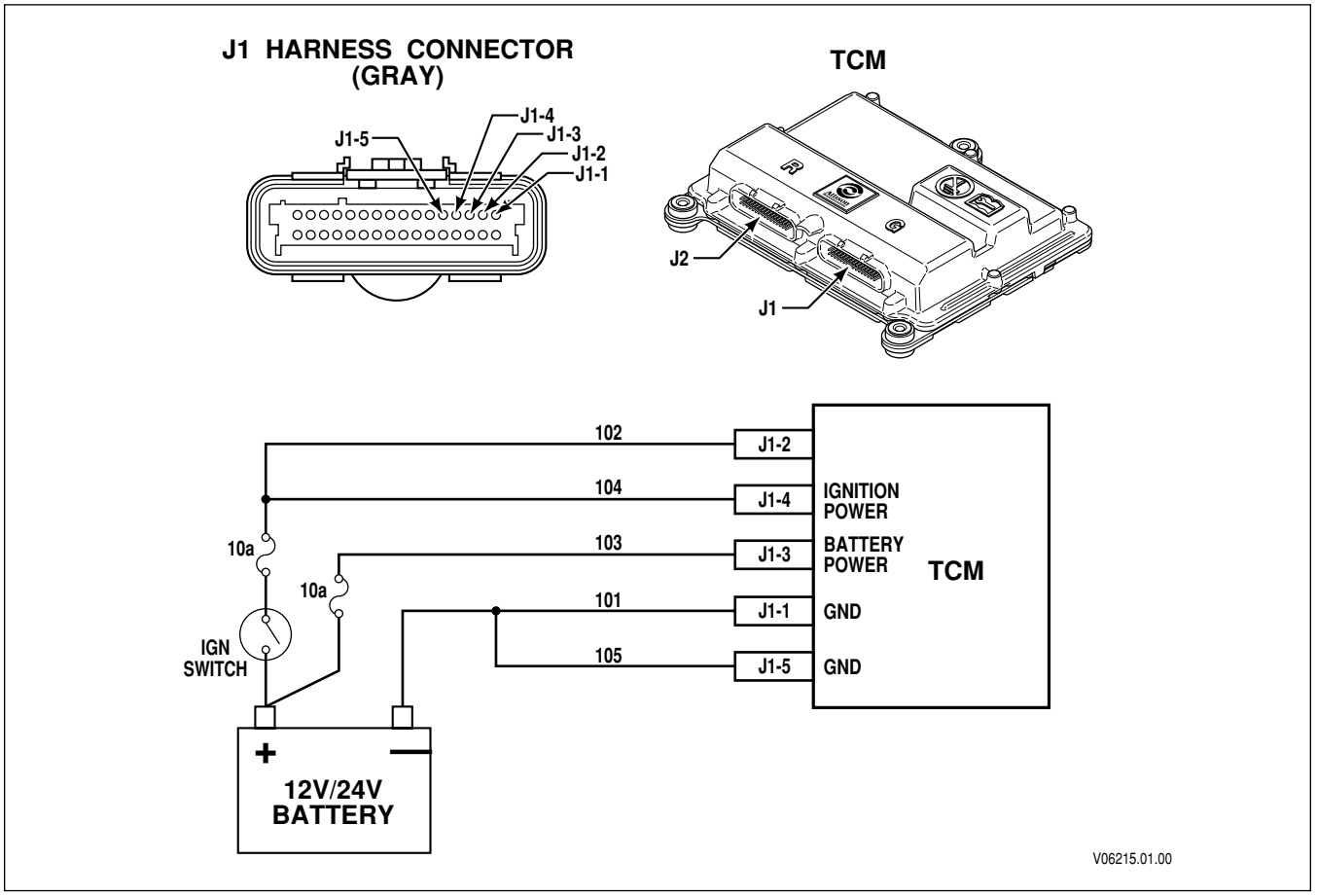
DTC P0876 (Previously P1714) Reverse Pressure Switch Circuit Stuck Open *(cont'd)*

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 ATD distributors and dealers are not covered by ATD 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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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)	*Go to Step 4*	*Resolve battery problem*
3	Start the engine and warm to normal operating temperature. Is the Alternator/Check Engine lamp ON?	—	*Repair charging system*	*Go to Step 4*
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)	*Go to Step 5*	*Repair charging system*

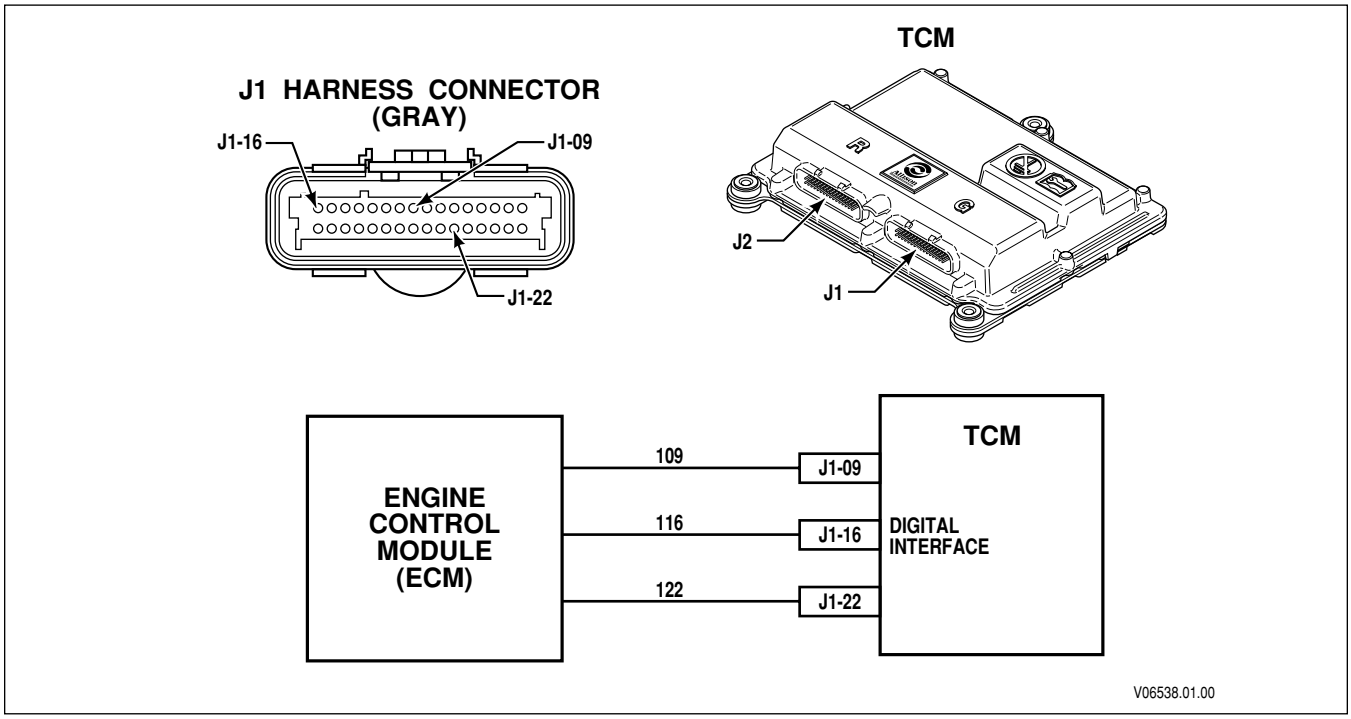
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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

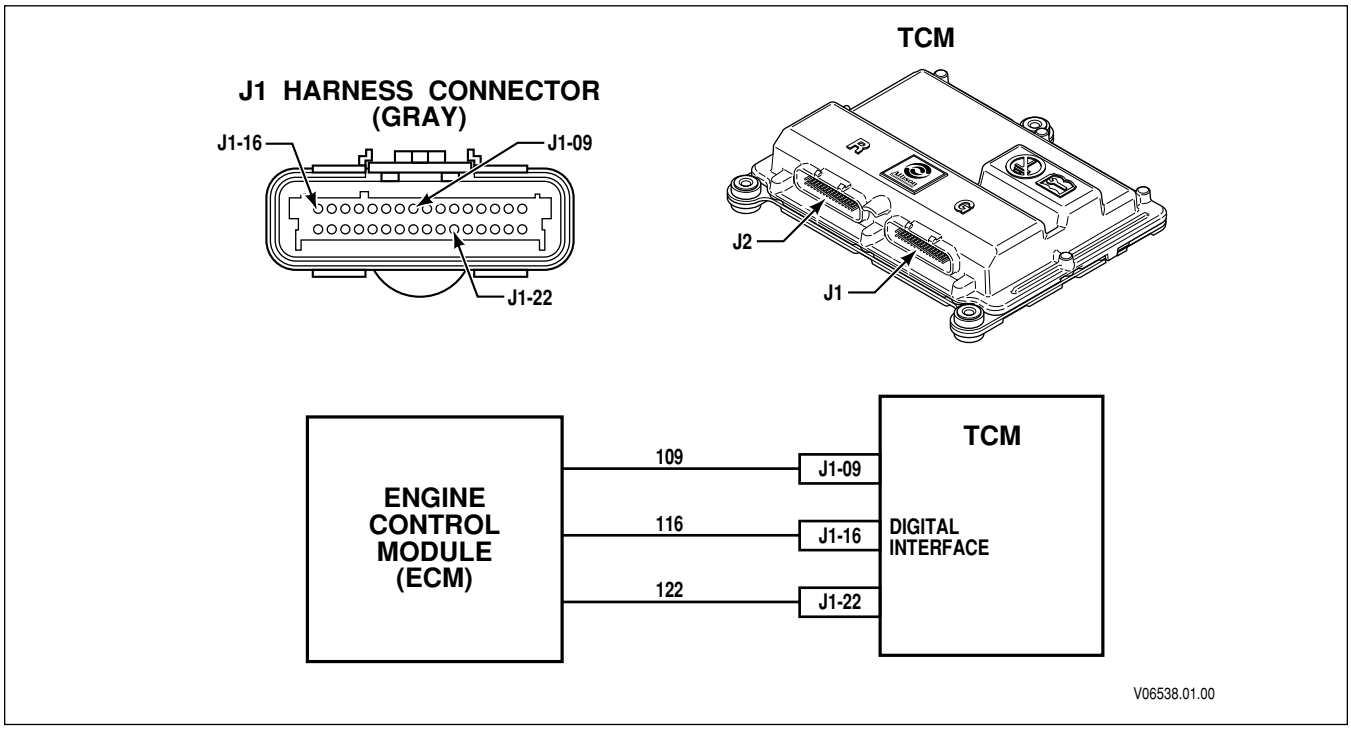
An Intermittent condition may be the cause of the problem. Return the vehicle to the OEM for further troubleshooting.

DTC P1688 Engine Torque Unmanaged Delivered To TCM Signal

Step	Action	Yes	No
1	Was the **Beginning The Troubleshooting Process** (Paragraph 5–4A) performed?	*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 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?	*Go to Step 3*	*Go to Diagnostic Aids*
3	Inspect the routing of wire 109 (GM wire circuit 2467) between the TCM and PCM. Was chafing or wire damage 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 ATD distributors and dealers are not covered by ATD warranty.*** Repair or replace the vehicle wiring harness. Is the repair complete?	*Go to Step 6*	—
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?	*Go to Step 6*	—
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?	*Begin the diagnosis again. Go to Step 1*	*System OK*

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

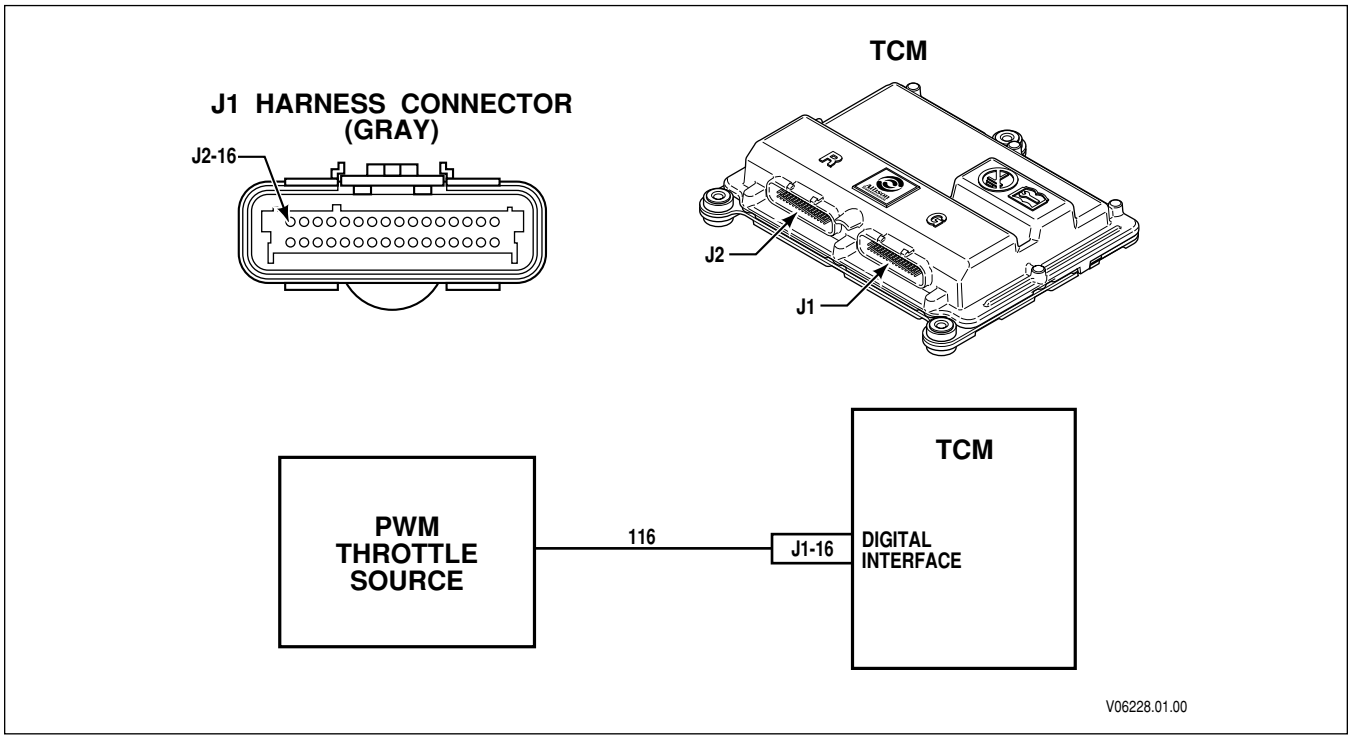
An Intermittent condition may be the cause of the problem. Return the vehicle to the OEM for further troubleshooting.

DTC P1779 Engine Torque Delivered To TCM Signal

Step	Action	Yes	No
1	Was the **Beginning The Troubleshooting Process** (Paragraph 5–4A) performed?	*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 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?	*Go to Step 3*	*Go to Diagnostic Aids*
3	Inspect the routing of wire 109 (GM wire circuit 2467) between the TCM and PCM. Was chafing or wire damage 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 ATD distributors and dealers are not covered by ATD warranty.*** Repair or replace the vehicle wiring harness. Is the repair complete?	*Go to Step 6*	—
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?	*Go to Step 6*	—
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?	*Begin the diagnosis again. Go to Step 1*	*System OK*

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?	—	*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. 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?	—	*Go to Step 4*	—
4	Check wire 116 for shorts or opens. Did you find a problem?	—	*Go to Step 5*	*Go to Step 6*

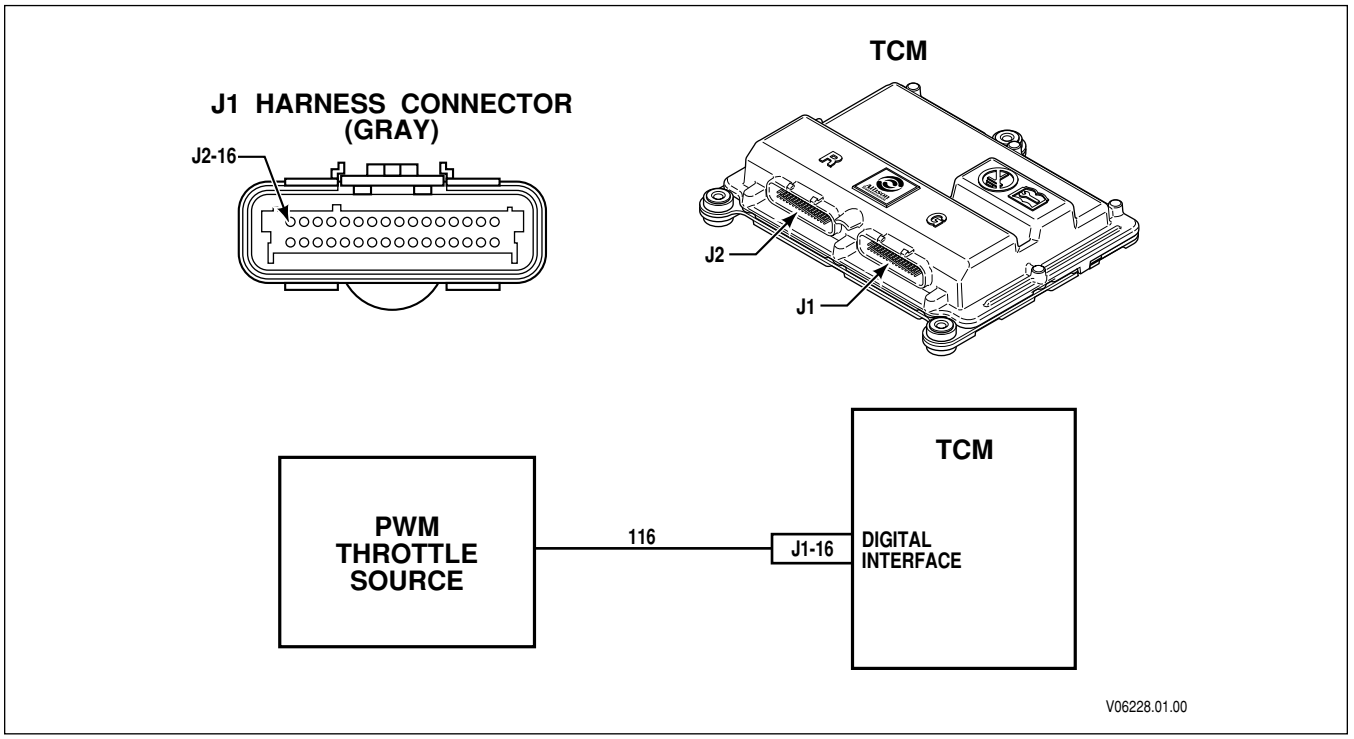
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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?	—	*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. 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?	—	*Go to Step 4*	—
4	Check wire 116 for shorts or opens. Did you find a problem?	—	*Go to Step 5*	*Go to Step 6*

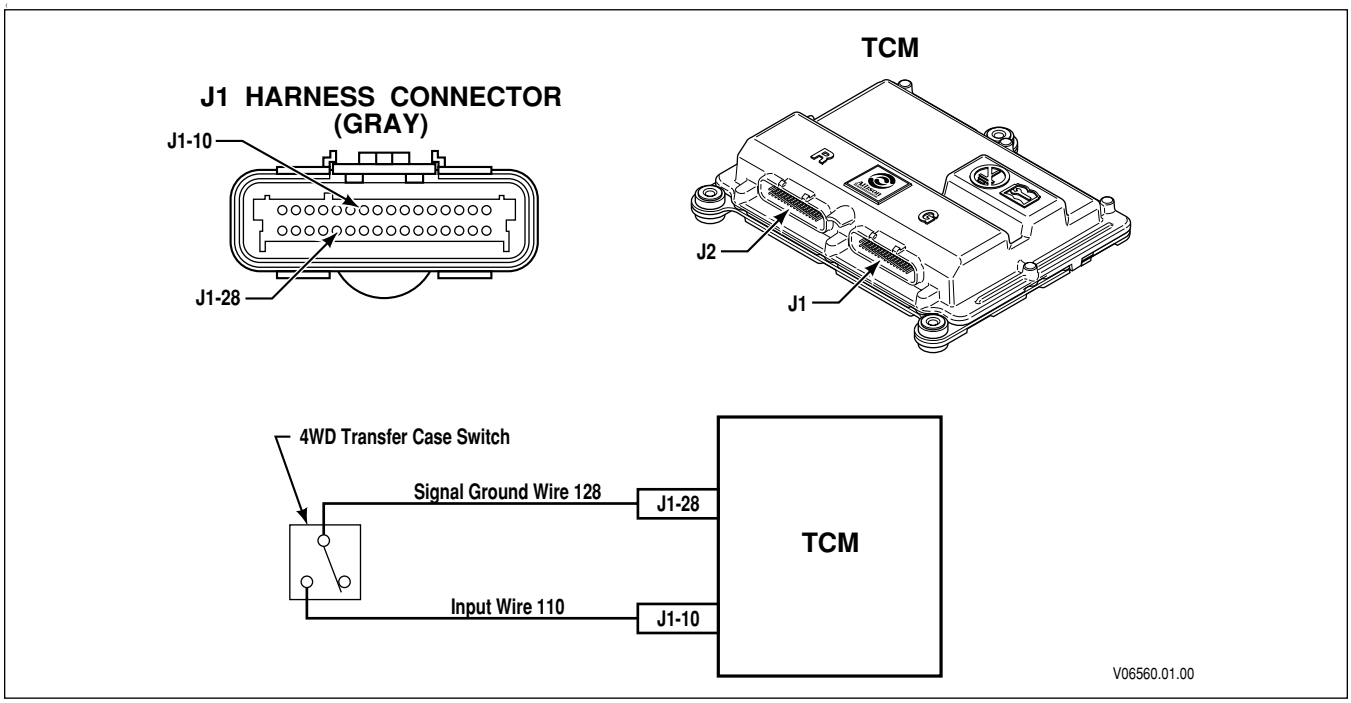
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P1892 Throttle Position Sensor (TPS) Pulse Width Modulation (PWM) Signal High Input

Step	Action	Value(s)	Yes	No
5	***NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by ATD distributors and dealers are not covered by ATD 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 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 it 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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Section 5–4A)*
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?	—	*Go to Diagnostic Aids*	*Go to Step 3*
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?	—	*Go to Step 4*	*Go to Step 9*

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?	—	*Begin the diagnosis again. Go to Step 1.*	*System OK*

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.

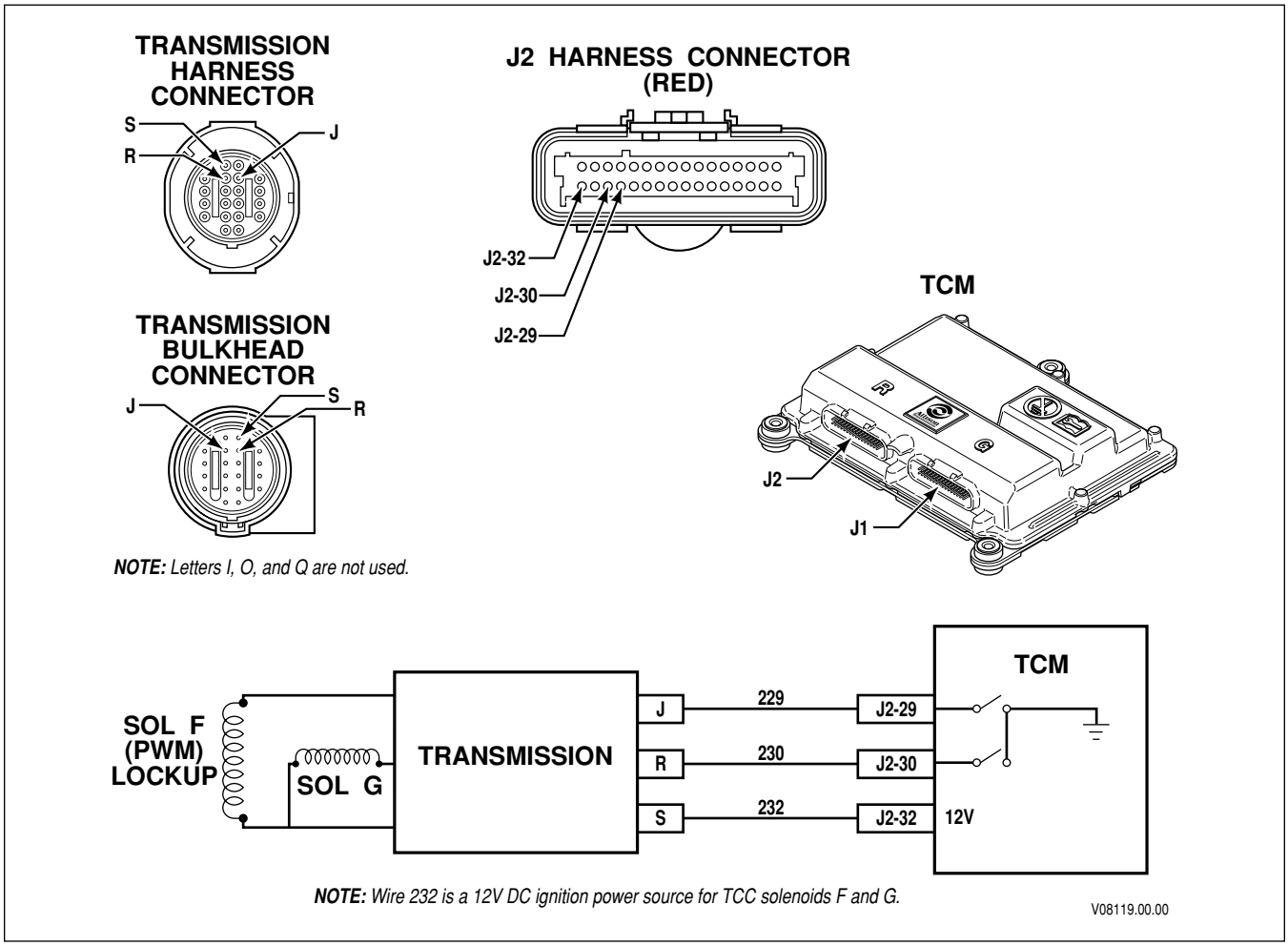
DIAGNOSTIC TROUBLE CODES (DTC)

DTC P2773 Torque Control Request Ignored — ECM/TCM

Step	Action		Yes	No
1	Was the **Beginning The Troubleshooting Process** (Paragraph 5–4A) performed?		*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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?	—	*Go to Step 5*	*Go to Step 3*
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)	*The Scan Tool shows the actual device at fault*	*Go to Step 5*	*Go to Step 4*
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?	—	*Go to Step 6*	—
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?	—	*Go to Step 6*	—
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?	—	*Begin the diagnosis again. Go to Step 1*	*System OK*

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?	—	*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 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	*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 DVOM, attach leads to J2 pins 30 and 32. 5. Measure the resistance of the circuit. Is the resistance 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*

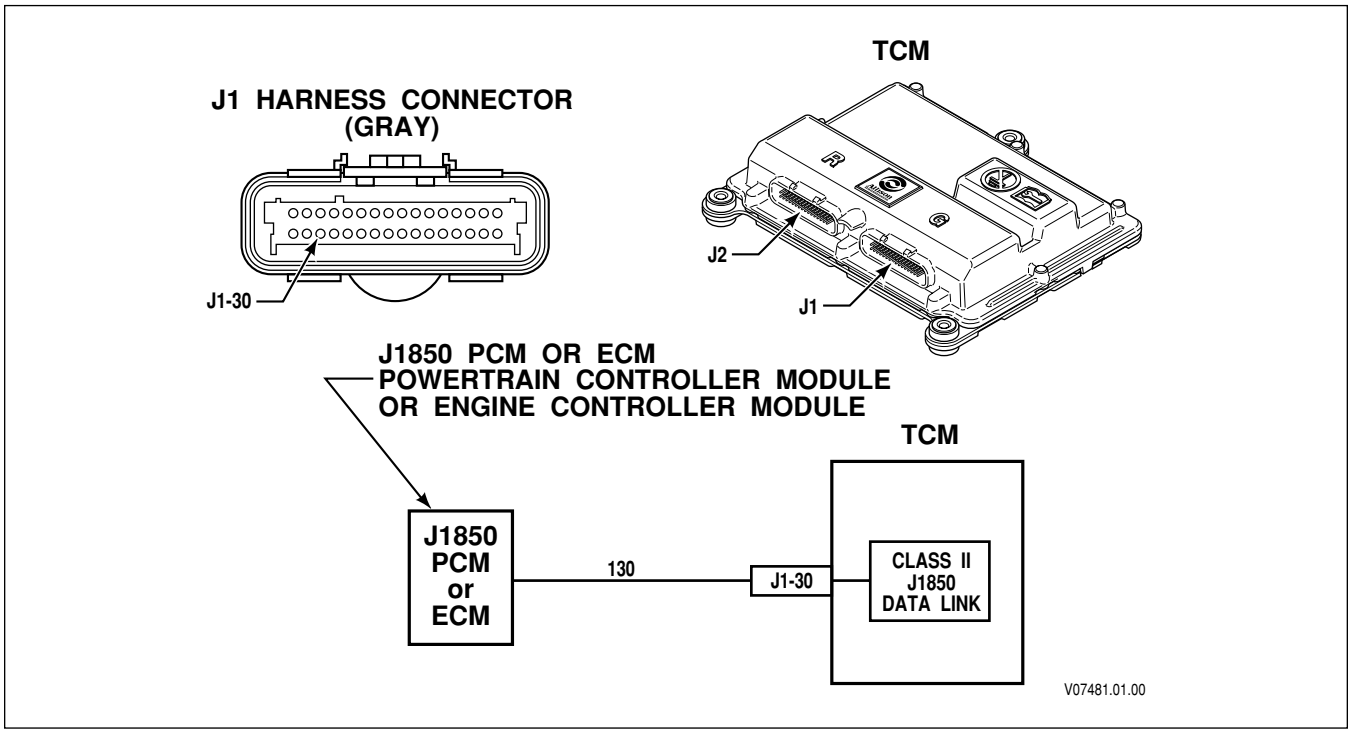
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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*	—
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 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?	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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?	*Go to Diagnostic Aids*	*Go to Step 3*
3	Inspect wire 130 for a possible short-to-ground. Did you find a problem?	*Go to Step 4*	*Go to Step 5*

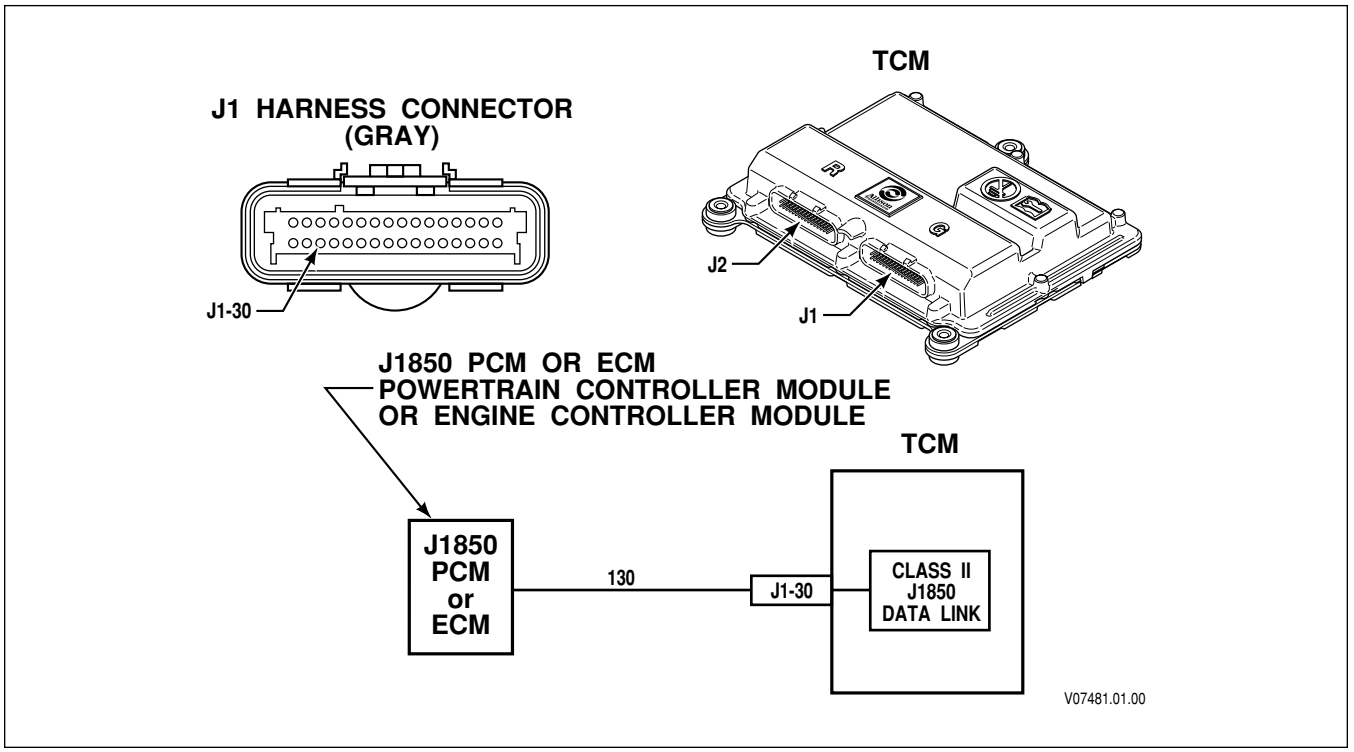
DIAGNOSTIC TROUBLE CODES (DTC)

DTC U0031 (Previously U1300) J1850 (Class 2) Serial Data Communication Link Low

Step	Action	Yes	No
4	***NOTE: The vehicle OEM has responsibility for all external wiring harness repair. Harness repairs performed by ATD distributors and dealers are not covered by ATD warranty.*** 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?	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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?	*Go to Diagnostic Aids*	*Go to Step 3*

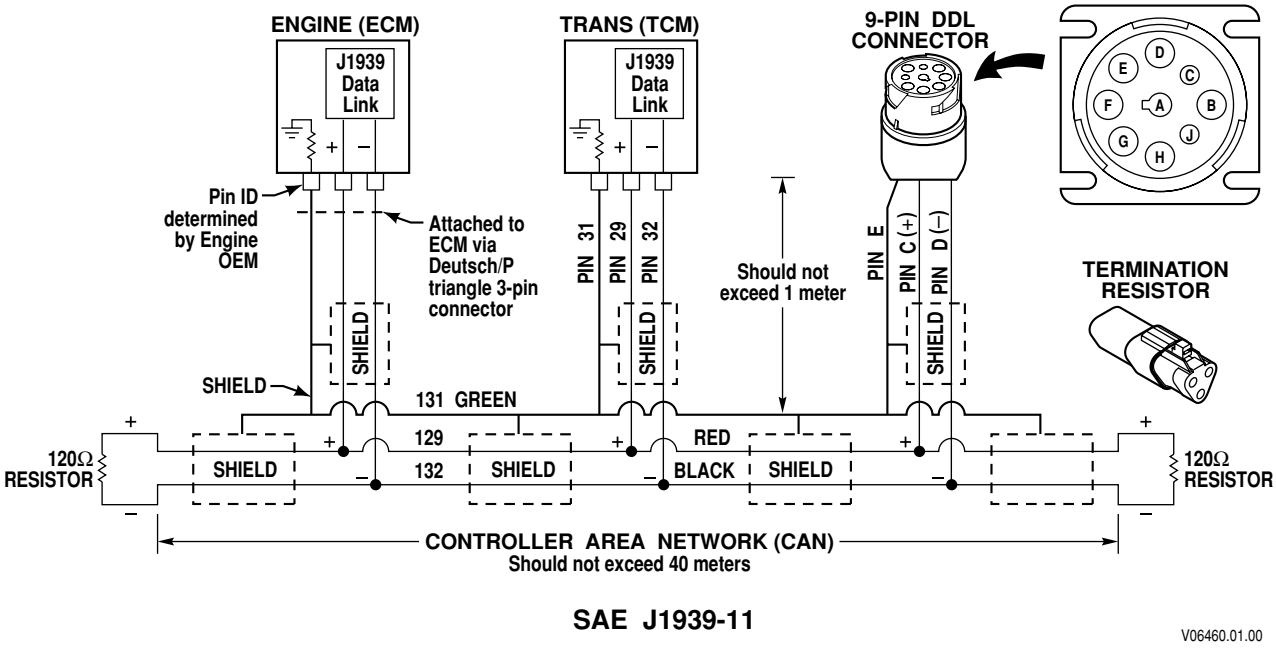
DIAGNOSTIC TROUBLE CODES (DTC)

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?	*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 ATD distributors and dealers are not covered by ATD warranty.*** 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. Inspect 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 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 1000/2000/2400 Series 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?	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
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 Diagnostic Aids*	*Go to Step 3*

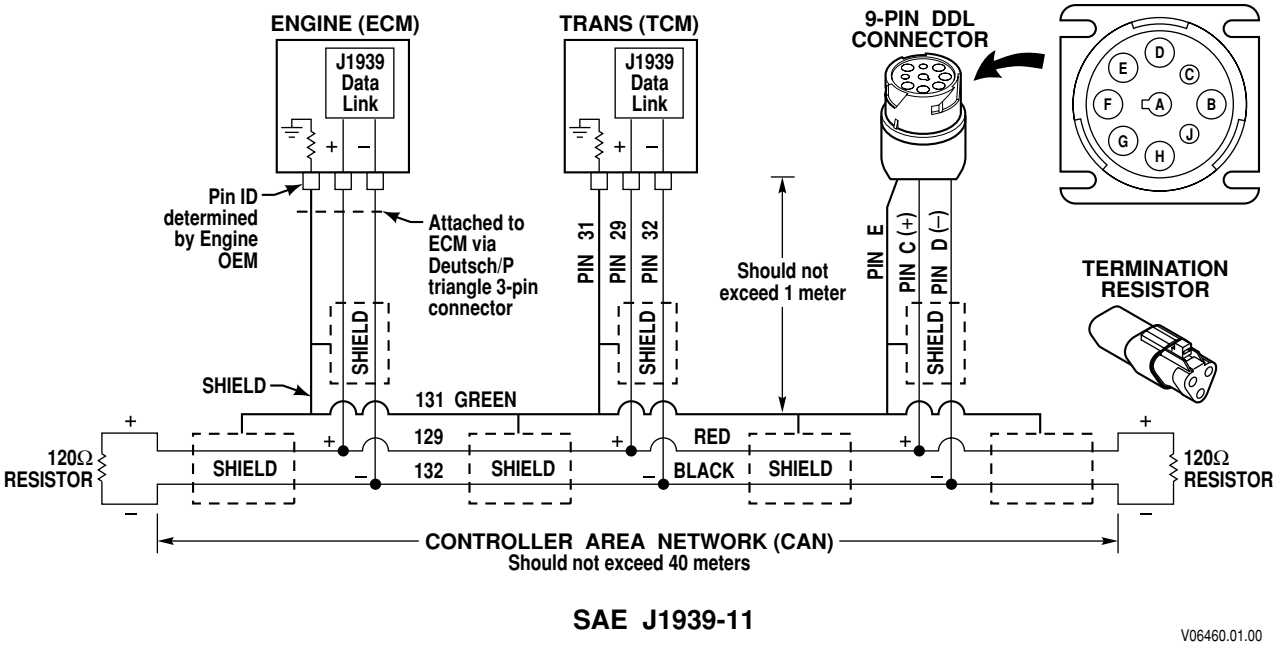
DIAGNOSTIC TROUBLE CODES (DTC)

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?	*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 ATD distributors and dealers are not covered by ATD warranty.*** Repair the vehicle J1939 CAN wiring harness. Is the repair complete?	*Go to Step 7*	*Go to Step 4*
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. 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 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 1000/2000/2400 Series 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?	—	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*

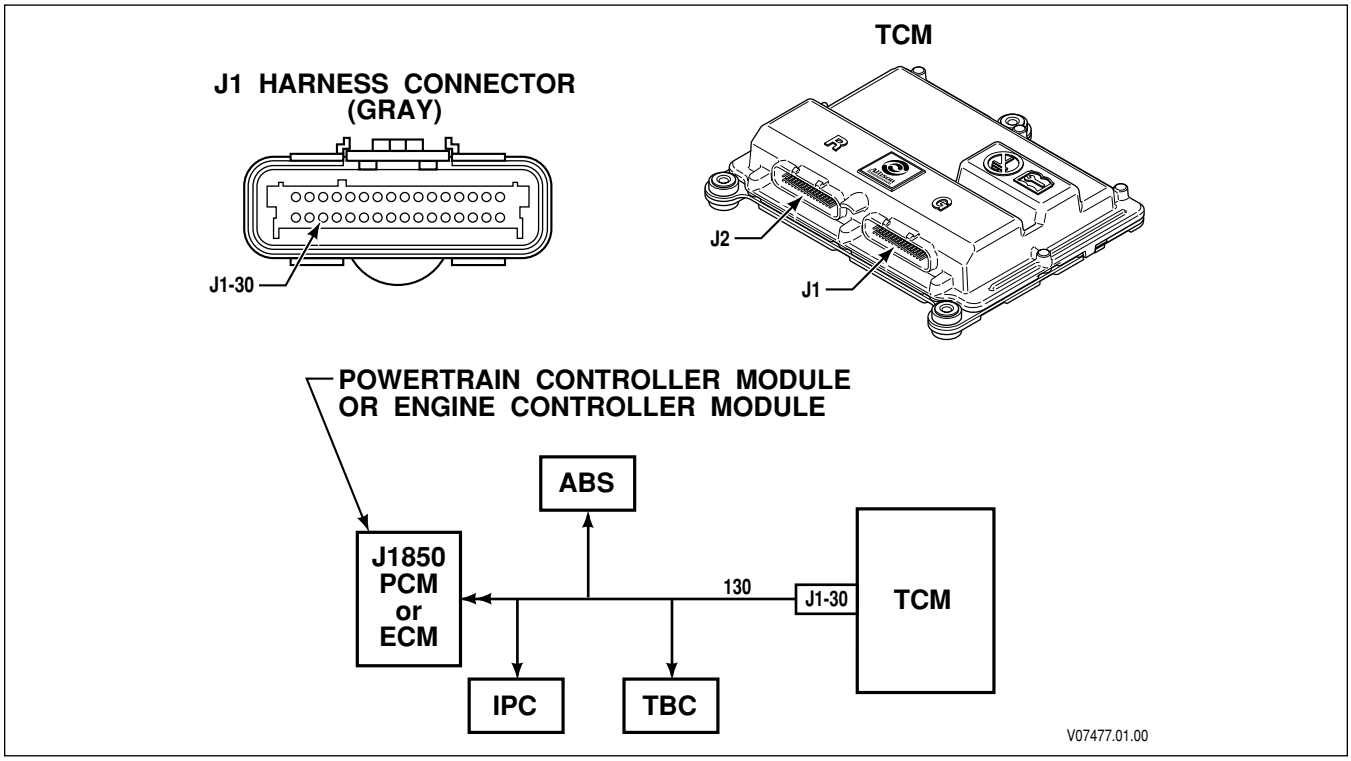
DIAGNOSTIC TROUBLE CODES (DTC)

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 ATD distributors and dealers are not covered by ATD 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

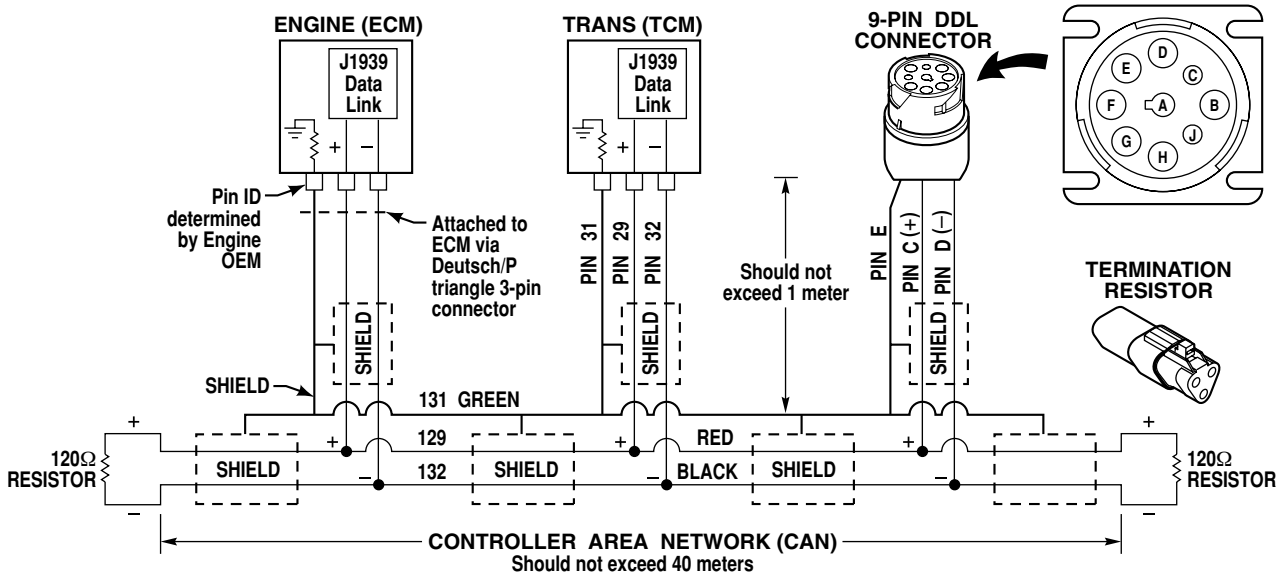
Step	Action	Yes	No
1	Was the **Beginning The Troubleshooting Process** (Paragraph 5–4A) performed?	*Go to Step 2*	*Go to Beginning The Troubleshooting Process (Paragraph 5–4A)*
2	Test the following circuits of the module for an open or a short to ground: 1. The battery positive (fuses) and ground connections 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?	*Go to Step 6*	*Go to Step 3*

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?	*Go to Step 4*	*Go to Step 5*
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 ATD distributors and dealers are not covered under ATD warranty.*** Is the repair complete?	*Go to Step 6*	—
5	Refer to troubleshooting procedures specific to the controller module indicated. Replace the module, if defective. Is replacement or repair complete?	*Go to Step 6*	—
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?	*Begin the diagnosis again. Go to Step 1*	*System OK*

APPENDIX J — WIRING SCHEMATICS



SAE J1939-11

V06460.01.00

Figure J–2. J1939 Backbone (CAN Bus)