



# **ISUZU COMMERCIAL TRUCK FORWARD TILTMASER**

## **SERVICE MANUAL S1000 TRANSMISSION**

**2002 FRR  
2002 WT5500**

**SECTION 7**  
**TRANSMISSION AND CLUTCH**  
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# SECTION 7A2

# DIAGNOSIS

# (S1000 TRANSMISSION)

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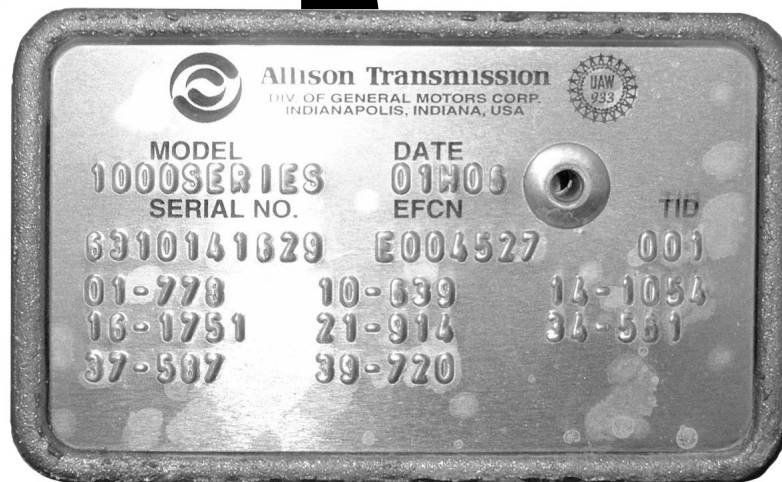
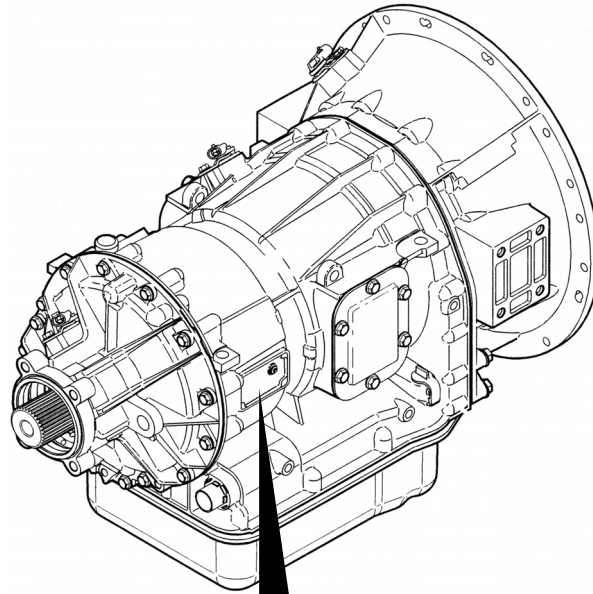
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## 7A2-2 DIAGNOSIS

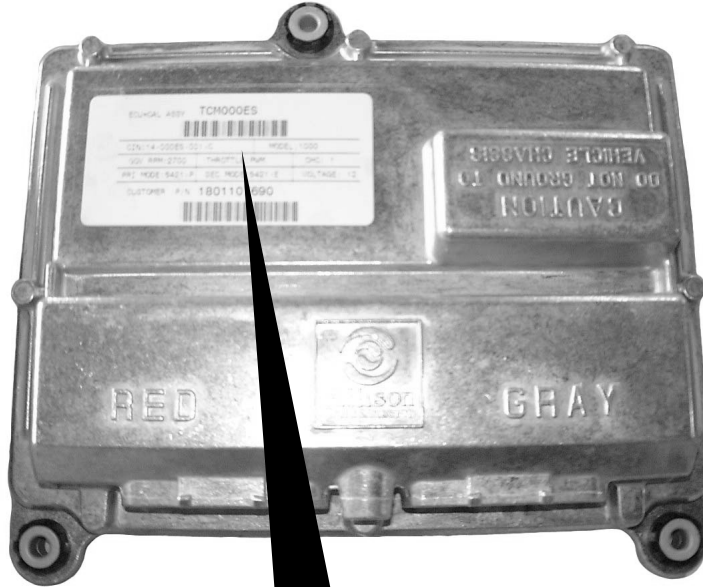
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# IDENTIFICATION OF TRANSMISSION



# IDENTIFICATION OF TRANSMISSION CONTROL MODULE (TCM)



ECU+CAL ASSY    TCM000ES

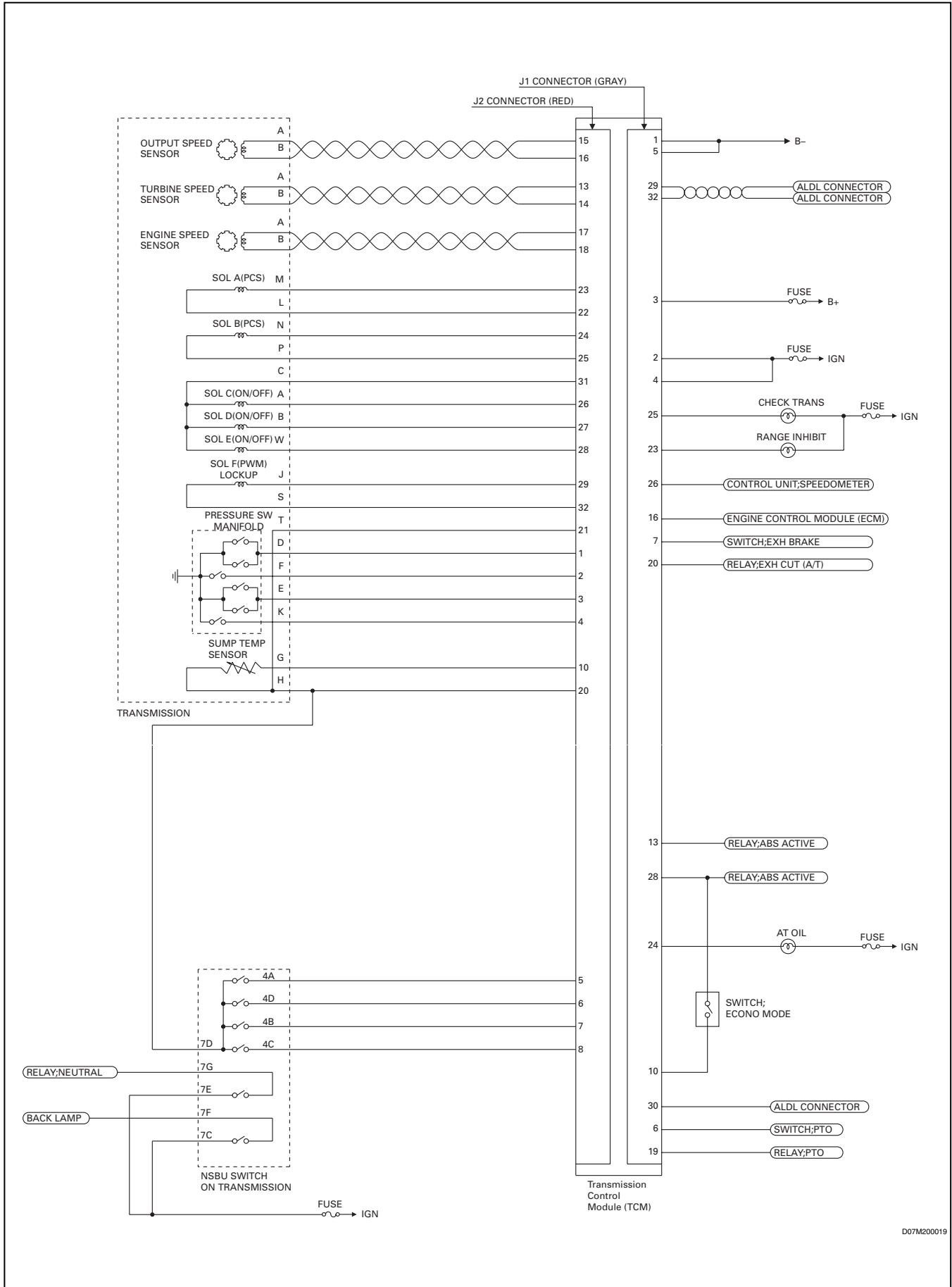
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CIN:14-000ES-001-C	MODEL:1000	
GOV RPM:2700	THROTTLE:PWM	CHC: 1
PRI MODE:5421-P	SEC MODE:5421-E	VOLTAGE: 12

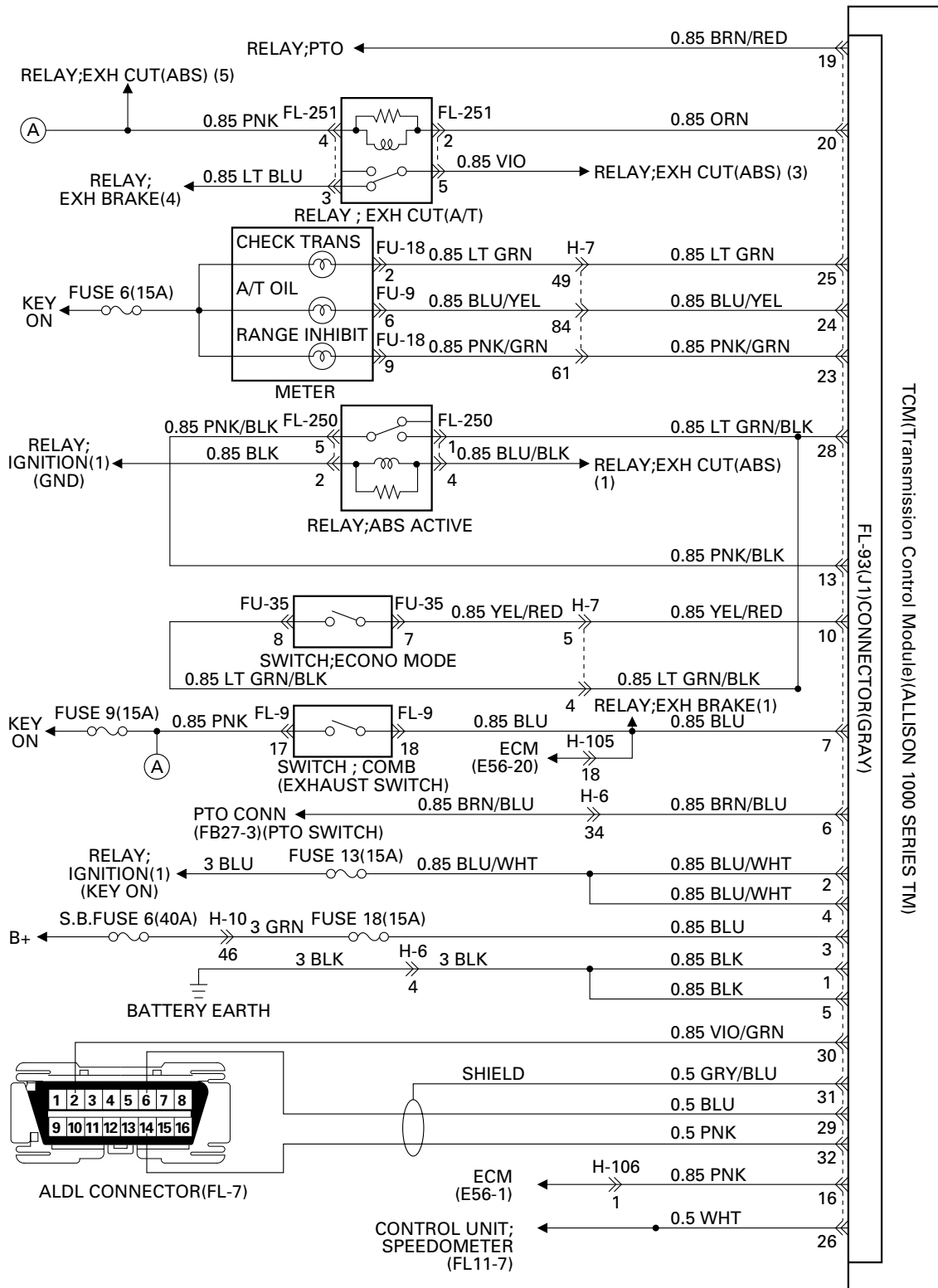
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SYSTEM DIAGRAM

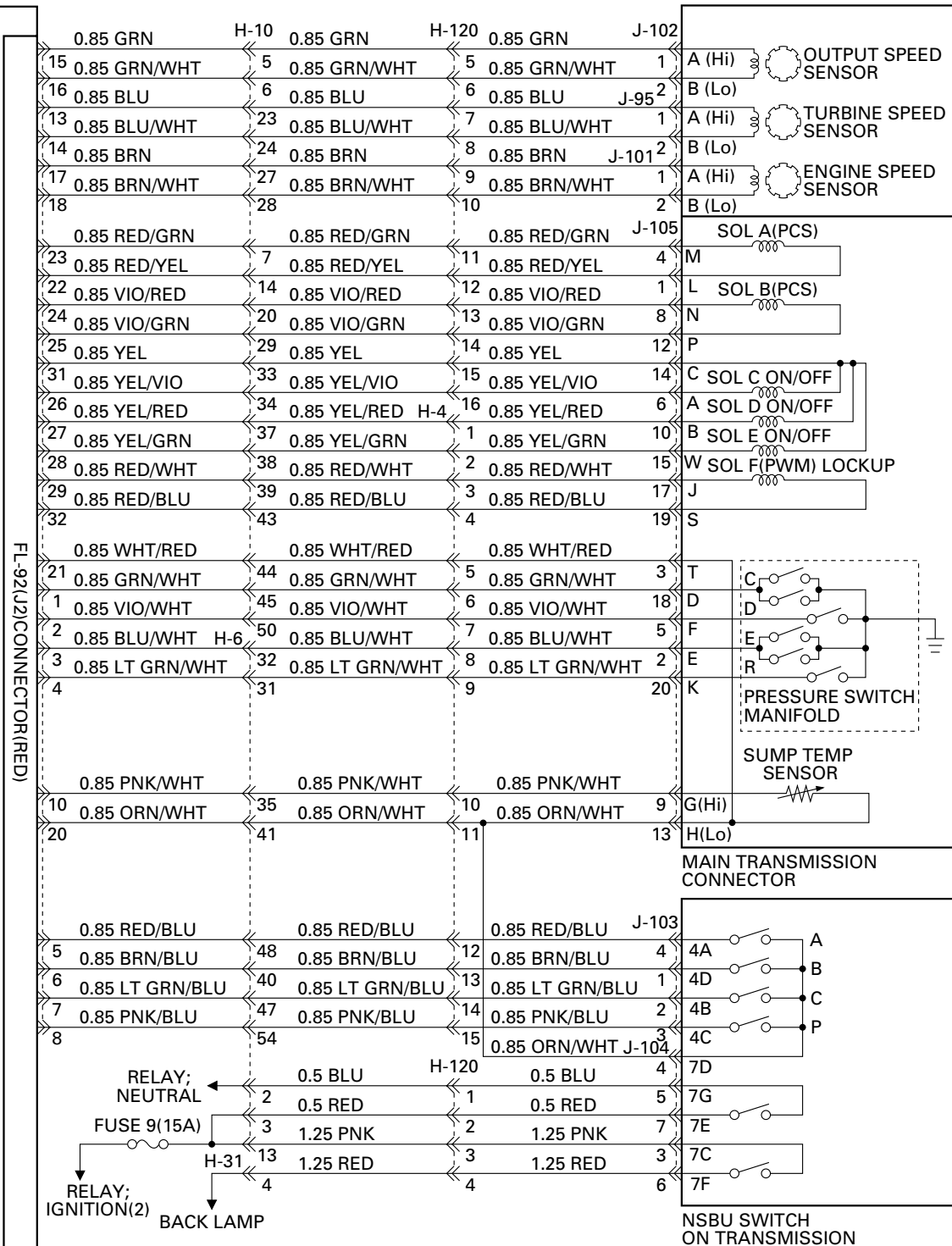


### CIRCUIT DIAGRAM





TCM(Transmission Control Module)(ALLISON 1000 SERIES TM)



NOTE; CONNECTOR No. — WIRE SIZE (mm<sup>2</sup>)  
 — WIRE COLOR  
 — FEMALE SIDE CONNECTOR  
 — MALE SIDE CONNECTOR  
 — TERMINAL No.

### ABBREVIATIONS

A/N	Assembly Number
ABS	Anti-lock Brake System
Amp	Unit of electrical current.
CAN	Controller Area Network – A network for all SAE J1939 communications in a vehicle (engine, transmission, diagnostics, ABS, etc.)
CT	Closed Throttle
DNA	Does Not Adapt – Adaptive shift control is disabled.
DNS	DO NOT SHIFT – Refers to the <b>DO NOT SHIFT</b> diagnostic response during which the <b>CHECK TRANS</b> light is illuminated and the transmission will not shift and will not respond to the Shift Selector.
DTC	Diagnostic Trouble Code
DVOM	Digital volt/ohmmeter
ECM	Engine Control Module – Available on electronically-controlled engines – provides some relevant data to TCM.
GPI	General Purpose Input – Input signal to the TCM to request a special operating mode or condition.
GPO	General Purpose Output – Output signal from the TCM to control vehicle components (such as PTOs, backup lights, etc.) or allow a special operating mode or condition.
J1939	High-speed vehicle serial data communications link.
LED	Light-Emitting Diode – Electronic device used for illumination.
NNC	Neutral No Clutches – Neutral commanded with no clutches applied.
NSBU Switch	Neutral Start Backup Switch
NVL	Neutral Very Low – The TCM has sensed turbine speed below 150 rpm. This is usually caused by a dragging C1 or C3 clutch or a failed turbine speed sensor. When attained, the C4 and C5 clutches are applied to lock the transmission output.
OBD II	On Board Diagnostics Second generation. EPA mandated specification for vehicle diagnostics.
Ohm	Unit of electrical resistance.
PCCS	Production Calibration Configuration System
PPC	Pressure Proportional to Current solenoid. Solenoid control of clutch pressure is proportional to the current being supplied to the solenoid.
PROM	Programmable Read Only Memory
PSM	Pressure Switch Module – Part of transmission control system located inside the oil pan.

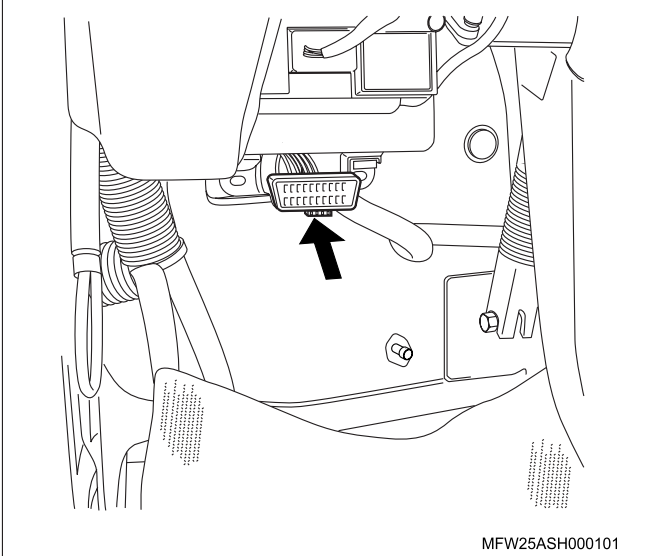
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PTO	<b>Power Takeoff</b>
PWM Solenoid	<b>Pulse Width Modulated Solenoid</b> – Solenoids are controlled by pulse width modulation. Solenoid control of clutch pressures is based on the solenoid's duty cycle. Duty cycle is determined by the ratio of solenoid's on-time to off-time.
RPR	<b>Return to Previous Range</b> – Diagnostic response is which the transmission is commanded to return to previously commanded range.
SOL OFF	All <b>SOL</b> enoids <b>OFF</b>
ST	<b>Scan Tool</b>
TCM	<b>Transmission Control Module</b> (also commonly referred to at the “computer”)
TFT	<b>Transmission Fluid Temperature</b> – Data provided by thermistor that is part of the PSM.
TID	<b>TransID</b> – A feature which allows the TCM to know the transmission configuration and provide the corresponding calibration required.
TPS	<b>Throttle Position Sensor</b> – Potentiometer for signaling the position of the engine fuel control lever.
V	<b>Version</b> – Abbreviation used in describing TCM software levels.
VDC	<b>Volts Direct Current (DC)</b>
VIW	<b>Vehicle Interface Wiring</b> – Interfaces TCM programmed input and output functions with the vehicle wiring.
Volt	Unit of electrical force.
VOM	<b>Volt/ohmmeter</b>
WOT	<b>Wide Open Throttle</b>
∞	<b>Infinity</b> – Condition of a circuit with higher resistance than can be measured, effectively an open circuit.

## DIAGNOSIS BY USING SCAN TOOL

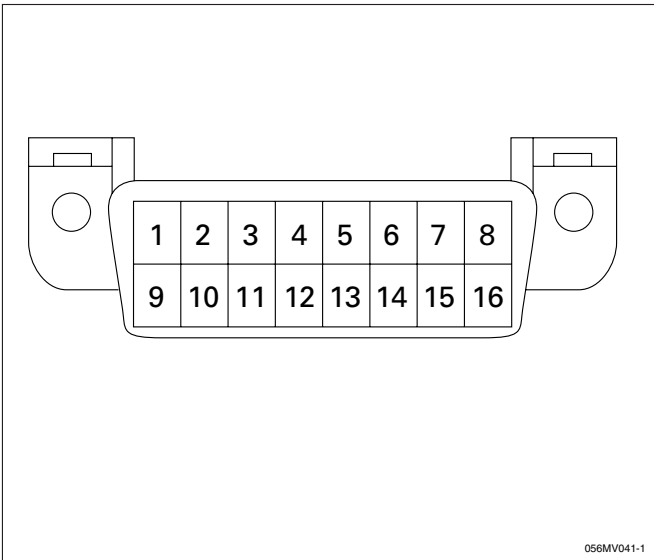
### Data Link Connector (DLC)

The provision for communication with the control module is the Data Link Connector (DLC). It is located at the lower left of the instrument panel behind a small square cover.



The DLC is used to connect to a scan tool. Some common uses of the scan tool are listed below:

- Identifying stored Diagnostic Trouble Codes (DTCs).
- Clearing DTCs.
- Performing output control tests.
- Reading serial data.



### Verifying Vehicle Repair

Verification of vehicle repair will be more comprehensive for vehicles with OBD system diagnostic. Following a repair, the technician should perform the following steps:

1. Review and record the Fail Records for the DTC which has been diagnosed.
2. Clear DTC(s).
3. Operate the vehicle within conditions noted in the Fail Records.
4. Monitor the DTC status information for the specific DTC which has been diagnosed until the diagnostic test associated with that DTC runs.

Following these steps are very important in verifying repairs on OBD systems. Failure to follow these steps could result in unnecessary repairs.

### Reading Diagnostic Trouble Codes Using A Tech 2 or Other Scan Tool

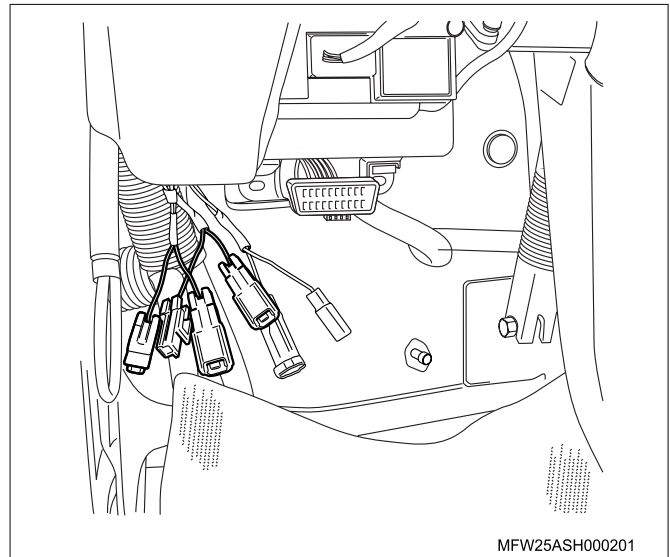
The procedure for reading diagnostic trouble code(s) is to use a diagnostic scan tool. When reading DTC(s), follow instructions supplied by tool manufacturer.

### Clearing Diagnostic Trouble Codes

**IMPORTANT: Do not clear DTCs unless directed to do so by the service information provided for each diagnostic procedure. When DTCs are cleared, the Failure Record data which may help diagnose an intermittent fault will also be erased from memory.**

To clear Diagnostic Trouble Codes (DTCs), use the diagnostic scan tool "clear DTC information" function. When clearing DTCs follow instructions supplied by the tool manufacturer.

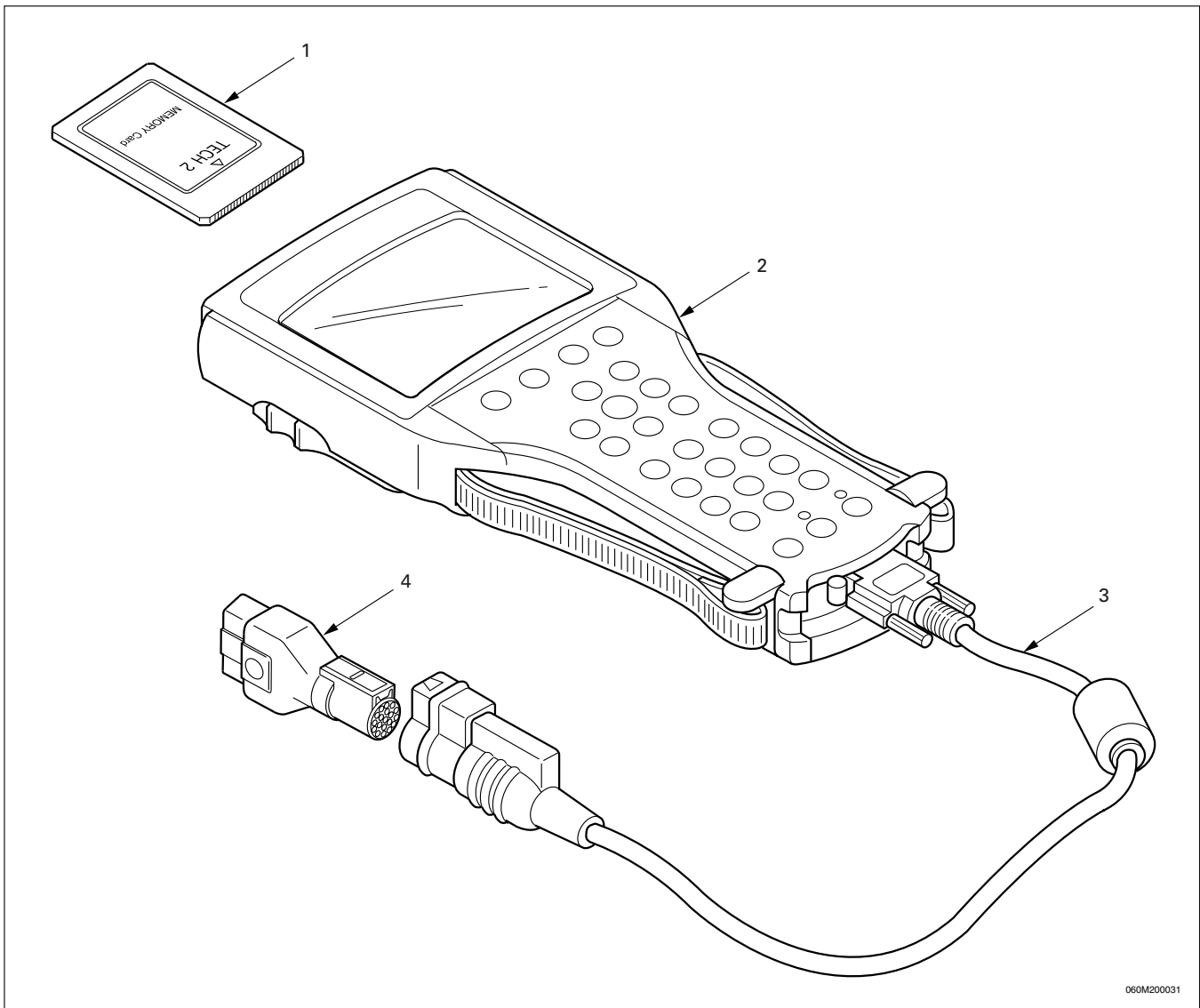
When a scan tool is not available, DTCs can also be cleared by connect the memory clear switch (Blue) one to two second then disconnect the memory clear switch (Blue).



**Tech 2 Scan Tool**

From 98 MY, Isuzu Dealer service departments are

recommended to use Tech 2. Refer to Tech 2 scan tool user guide.



060M200031

**Legend**

- (1) PCMCIA Card  
(2) Tech-2

- (3) DLC Cable  
(4) SAE 16/19 Adapter

**Tech 2 Features**

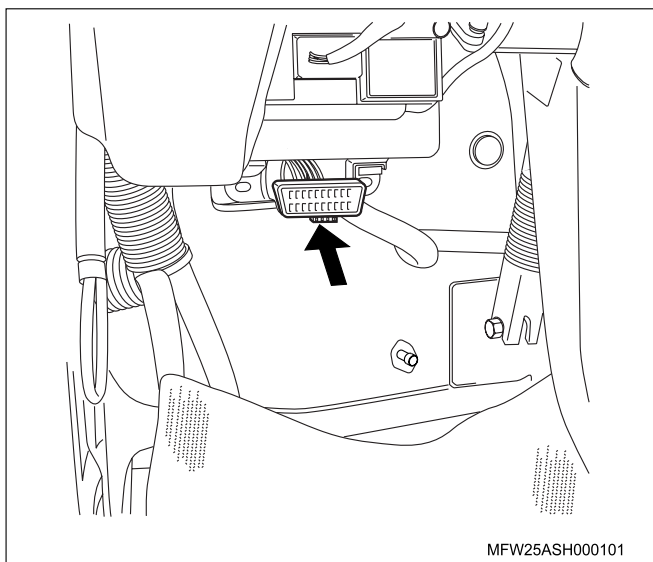
- 1 Tech 2 is a 12 volt system. Do not apply 24 volt.
2. After connecting and/or installing, the Vehicle Communications Interface (VCI) module, PCMCIA card and DLC connector to the Tech 2, connect the tool to the vehicle DLC.
3. Make sure the Tech 2 is powered OFF when removing or installing the PCMCIA card.
4. The PCMCIA card has a capacity of 10 Megabytes which is 10 times greater than the memory of the Tech 1 Mass Storage Cartridge.
5. The Tech 2 has the capability of two snapshots.
6. The PCMCIA card is sensitive to magnetism and static electricity, so care should be taken in the handling of the card.
7. The Tech 2 can plot a graph when replaying a snapshot.
8. Always return to the Main Menu by pressing the EXIT key several times before shutting down.
9. To clear Diagnostic Trouble Codes (DTCs), open Application Menu and press "F1: Clear DTC Info".

## 7A2-12 DIAGNOSIS

### Menu

- The following table shows, which functions are used the available equipment versions.

F0:	Diagnostic Trouble Codes
F0:	DTC Information
F1:	Clear DTC Information
F1:	Data Display
F2:	Special Functions
F3:	Snapshot
F4:	ID Information



### DTC

On OBD has two options available in the Tech 2 DTC mode to display the enhanced information available. A description of the new modes, DTC Info and Clear DTC Information. After selecting DTC, the following menu appears:

- DTC Info
- Clear DTC Information

### Clear DTC Information

To clear Diagnostic Trouble Codes (DTCs), use the diagnostic scan tool "clear DTC information" function.

### Tech2 Data Display

Use the Tech 2 Data Values only after the On-Board Diagnostic System Check has been completed, no DTC(s) were noted, and you have determined that the on-board diagnostics are functioning properly. Tech 2 values from a properly-running engine may be used for comparison with the engine you are diagnosing. The Tech 2 data values represent values that would be seen on a normally-running engine.

### Getting Started

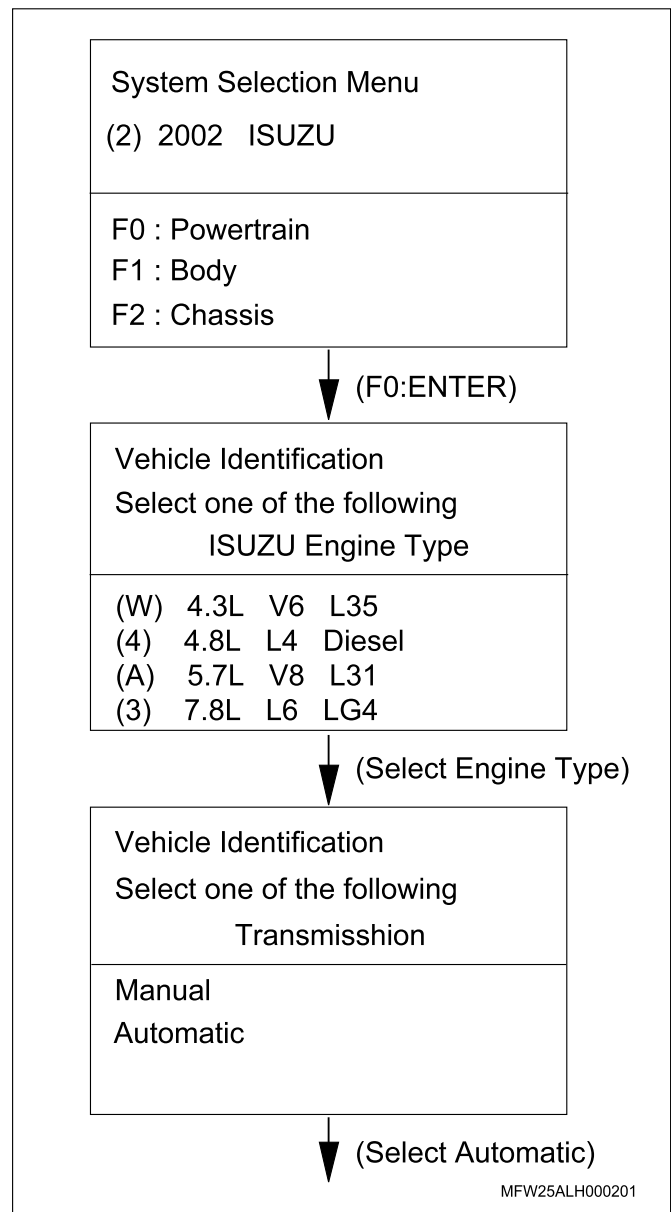
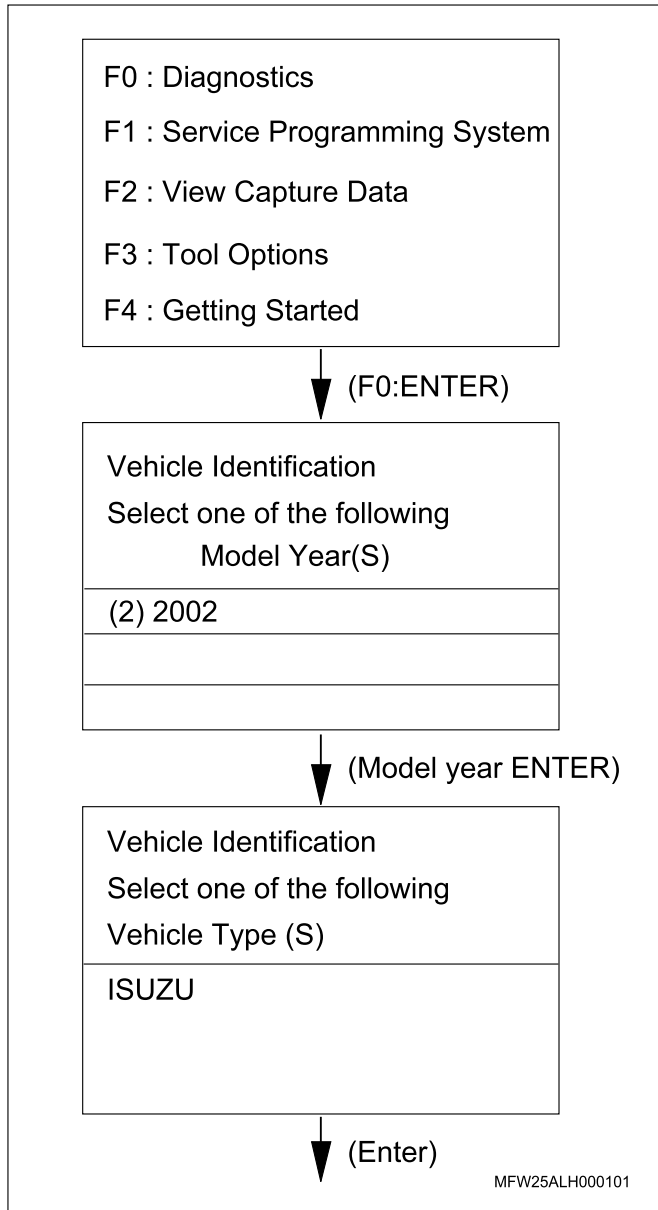
- Before operating the Isuzu PCMCIA card with the Tech 2, the following steps must be performed:
  - The Isuzu 98 System PCMCIA card (1) inserts into the Tech 2 (2).
  - Connect the SAE 16/19 adapter (4) to the DLC cable (3).
  - Connect the DLC cable to the Tech 2 (2).
  - Make sure the vehicle starter key is off.
  - Connect the Tech 2 SAE 16/19 adapter to the vehicle DLC.

- The vehicle starter switch turns on.
- Verify the Tech 2 power up display.



**Operating Procedure (For example)**

The power up screen is displayed when you power up the tester with the Isuzu systems PCMCIA card. Follow the operating procedure below.



## DIAGNOSTIC TROUBLE CODES (DTC)

### DTC LIST AND DESCRIPTIONS

DTC	Description	CHECK TRANS Light
P0218	Transmission Fluid Over Temperature Condition	No
P0562	System Voltage Low	Yes
P0563	System Voltage High	Yes
P0602	TCM Not Programmed	Yes
P0705	Transmission Range Sensor Circuit (PRNDL Input)	No
P0706	Transmission Range Sensor Circuit Performance	Yes
P0708	Transmission Range Sensor Circuit High Input	Yes
P0711	Transmission Fluid Temperature Sensor Circuit - Performance	No
P0712	Transmission Fluid Temperature Sensor Circuit - Low Input (High Temperature)	No
P0713	Transmission Fluid Temperature Sensor Circuit - High Input (Low Temperature)	No
P0716	Turbine Speed Sensor Circuit Performance	Yes
P0717	Turbine Speed Sensor Circuit No Signal	Yes
P0721	Output Speed Sensor Circuit Performance	Yes
P0722	Output Speed Sensor Circuit No Signal	Yes
P0726	Engine Speed Input Circuit Performance	No
P0727	Engine Speed Input Circuit No Signal	No
P0731	Incorrect 1st Gear Ratio	Yes
P0732	Incorrect 2nd Gear Ratio	Yes
P0733	Incorrect 3rd Gear Ratio	Yes
P0734	Incorrect 4th Gear Ratio	Yes
P0735	Incorrect 5th Gear Ratio	Yes
P0736	Incorrect Reverse Ratio	Yes
P0741	Torque Converter Clutch System Stuck Off	Yes
P0742	Torque Converter Clutch System Stuck On	Yes
P0748	Pressure Control Solenoid A Electrical	Yes
P0763	Shift Solenoid C Electrical	Yes
P0768	Shift Solenoid D Electrical	Yes
P0773	Shift Solenoid E Electrical	Yes
P0778	Pressure Control Solenoid B Electrical	Yes

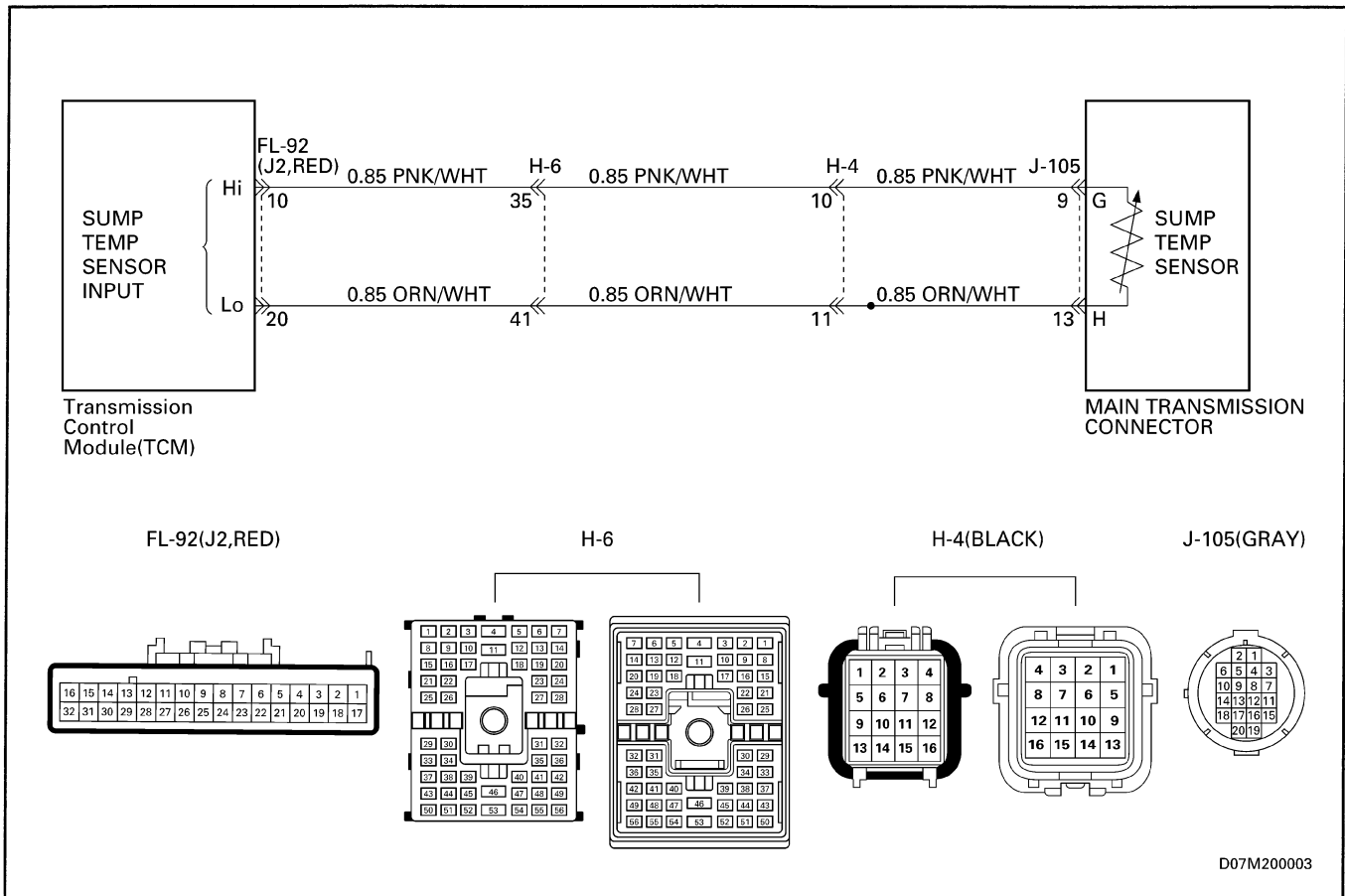


**DIAGNOSTIC TROUBLE CODES (DTC)****DTC LIST AND DESCRIPTIONS (cont'd)**

<b>DTC</b>	<b>Description</b>	<b>CHECK TRANS Light</b>
P0840	Transmission Pressure Switch Solenoid C Circuit	Yes
P0841	Transmission Pressure Switch Solenoid C Circuit Stuck Open	Yes
P0842	Transmission Pressure Switch Solenoid C Circuit Stuck Closed	Yes
P0843	Transmission Pressure Switch Solenoid C Circuit High	Yes
P0845	Transmission Pressure Switch Solenoid D Circuit	Yes
P0846	Transmission Pressure Switch Solenoid D Circuit Stuck Open	Yes
P0847	Transmission Pressure Switch Solenoid D Circuit Stuck Closed	Yes
P0848	Transmission Pressure Switch Solenoid D Circuit High	Yes
P1709	Transmission Pressure Switch Solenoid E Circuit	Yes
P1710	Transmission Pressure Switch Solenoid E Circuit Stuck Open	Yes
P1711	Transmission Pressure Switch Solenoid E Circuit Stuck Closed	Yes
P1712	Transmission Pressure Switch Solenoid E Circuit High	Yes
P1713	Transmission Pressure Switch Reverse Circuit	Yes
P1714	Transmission Pressure Switch Reverse Circuit Stuck Open	Yes
P1715	Transmission Pressure Switch Reverse Circuit Stuck Closed	Yes
P1716	Transmission Pressure Switch Reverse Circuit High	No
P1720	Solenoid A Controlled Clutch Not Engaged	Yes
P1721	Solenoid B Controlled Clutch Not Engaged	Yes
P1723	Solenoid A Controlled Clutch Not Engaged	Yes
P1724	Solenoid B Controlled Clutch Engaged	Yes
P1726	Shift Solenoid D Controlled Clutch Engaged	Yes
P1727	Shift Solenoid E Controlled Clutch Engaged	Yes
P1760	TCM Supply Voltage	No
P1860	Torque Converter Clutch Pulse Width Modulation (PWM) Solenoid Circuit - Electrical	Yes
P1891	Throttle Position Sensor Clutch Pulse Width Modulation (PWM) Signal Low Input	No
P1892	Throttle Position Sensor Clutch Pulse Width Modulation (PWM) Signal High Input	No
U1016	Class 2 Powertrain Controller State of Health Failure	No
U1300	Serial Data Communication Link Low (Class 2)	No
U1301	Serial Data Communication Link High (Class 2)	No

## DIAGNOSTIC TROUBLE CODES (DTC)

### DTC P0218 Transmission Fluid Over Temperature Condition



D07M200003

#### Circuit Description

The TCM monitors transmission sump temperature via input from the sump temperature sensor. This sensor is located in the Pressure Switch Manifold (PSM) inside the oil pan.

DTC P0218 sets when the TCM detects a transmission sump temperature greater than 121°C (250°F) for 10 seconds.

#### Conditions for Setting the DTC

- The components are powered and ignition voltage is less than 18V and greater than 9V (12V TCM).
- Engine speed is less than 7500 rpm and greater than 200 rpm for 5 seconds.

#### Action Taken When the DTC Sets

- DTC P0218 will be stored in the TCM history.

#### Conditions for Clearing the DTC/CHECK TRANS Light

A scan tool can clear the code from the TCM history.

## 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.

### DTC P0218 Transmission Fluid Over Temperature Condition

Step	Action	Value(s)	Yes	No
1	Inspect for possible cooling system problems. Did you perform the inspection and correct problems if necessary?	—	<i>Go to Step 2</i>	—
2	Perform the A/T Fluid Checking Procedure.  <i>NOTE: Transmission Fluid Temperature (TFT) sensor use a common 5 volt signal. Check other readings before proceeding.</i>  Is the transmission fluid level correct?	—	<i>Go to Step 3</i>	<i>Refer to Allison MT3190EN Mechanic's Tips</i>
3	1. Install scan tool. 2. Start engine. 3. Record DTC/Failure Record Data. 4. Using scan tool, check ignition voltage. Is the voltage within specified range?	9–18V (12V TCM)	<i>Go to Step 4</i>	<i>Resolve voltage problem (refer to DTC P0562 and P0563)</i>
4	1. Install the scan tool and turn the ignition ON. Monitor TFT and compare to ambient temperature. 2. Start the engine and drive the vehicle: <ul style="list-style-type: none"> <li>• Under normal operating conditions.</li> <li>• In the specific operating mode when the over temperature condition occurred (if known).</li> </ul> Do the TFT readings appear inconsistent or exceed the specified values?	121°C (250°F)	<i>Go to Step 5</i>	<i>Go to Diagnostic Aids</i>
5	1. Remove the wiring harness from the main transmission connector. 2. Using a DVOM, check the resistance of the TFT sensor at pins G and H. Is the resistance within the specified range?	3088–3942 Ohms at 20°C (68°F); 159–198 Ohms at 100°C (212°F)	<i>Go to Step 6</i>	<i>Go to Step 8</i>

## DIAGNOSTIC TROUBLE CODES (DTC)

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

Step	Action	Value(s)	Yes	No
6	1. Reconnect the wiring harness to the main transmission connector from the TCM. 2. Disconnect the J2 connector. 3. Using a DVOM, check the resistance of J2 pin 20 and connector J2 pin 10. Is the resistance within the specified range?	3088–3942 Ohms at 20°C (68°F); 159–198 Ohms at 100°C (212°F)	<i>Go to Step 11</i>	<i>Go to Step 7</i>
7	Repair or replace the faulty wiring. Was repair completed?	—	<i>Go to Step 12</i>	—
8	1. Remove the Pressure Switch Manifold (see Allison MT3190EN Mechanic's Tips). 2. Check the thermistor resistance across (pins E and F). Is the resistance within the specified range?	3088–3942 Ohms at 20°C (68°F); 159–198 Ohms at 100°C (212°F)	<i>Go to Step 9</i>	<i>Go to Step 10</i>
9	Replace the internal wiring harness (see Allison MT3190EN Mechanic's Tips). Is the replacement complete?	—	<i>Go to Step 12</i>	—
10	Replace the Pressure Switch Manifold (see Allison MT3190EN Mechanic's Tips). Is the replacement complete?	—	<i>Go to Step 12</i>	—
11	Replace the TCM. Is the replacement complete?	—	<i>Go to Step 12</i>	—
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: <ul style="list-style-type: none"> <li>• Under normal operating conditions.</li> <li>• In the specific operating mode where the over temperature condition occurred (if known).</li> </ul> Did the DTC return?	—	<i>Begin the diagnosis again.                      Go to Step 1.</i>	<i>System OK</i>