



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)

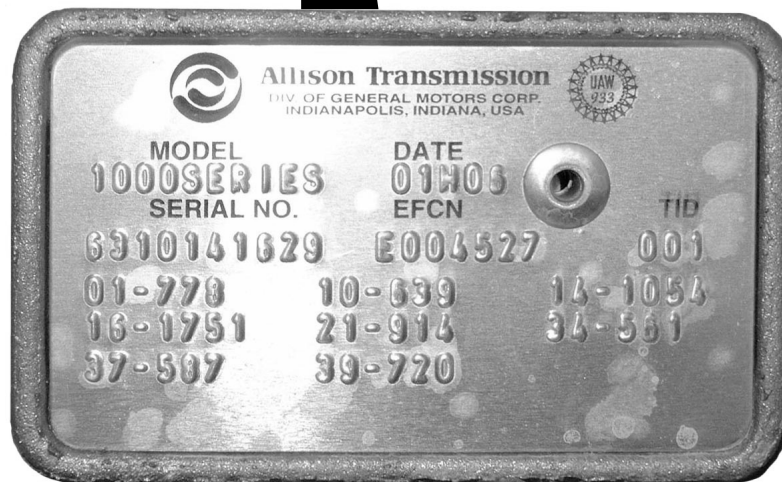
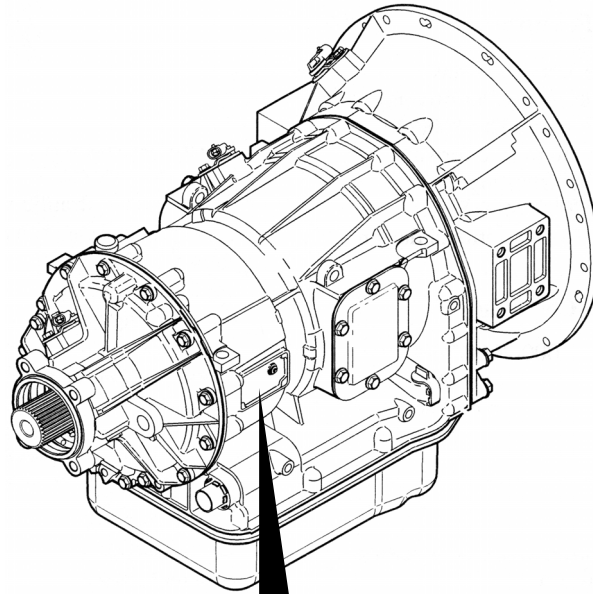
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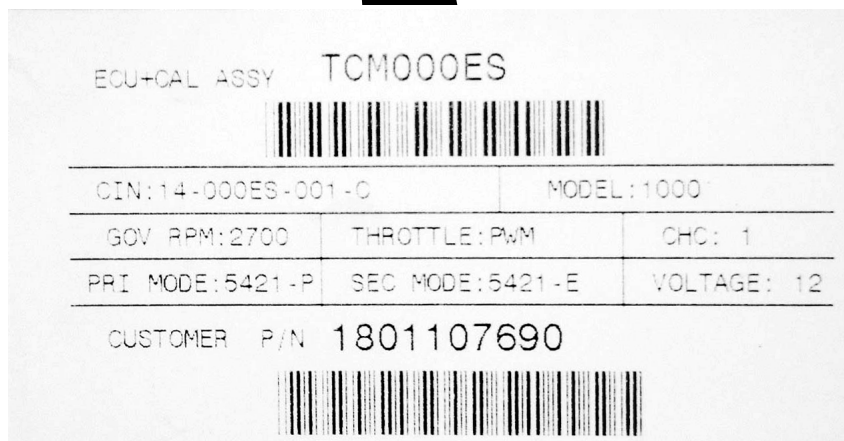
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|---|---------|
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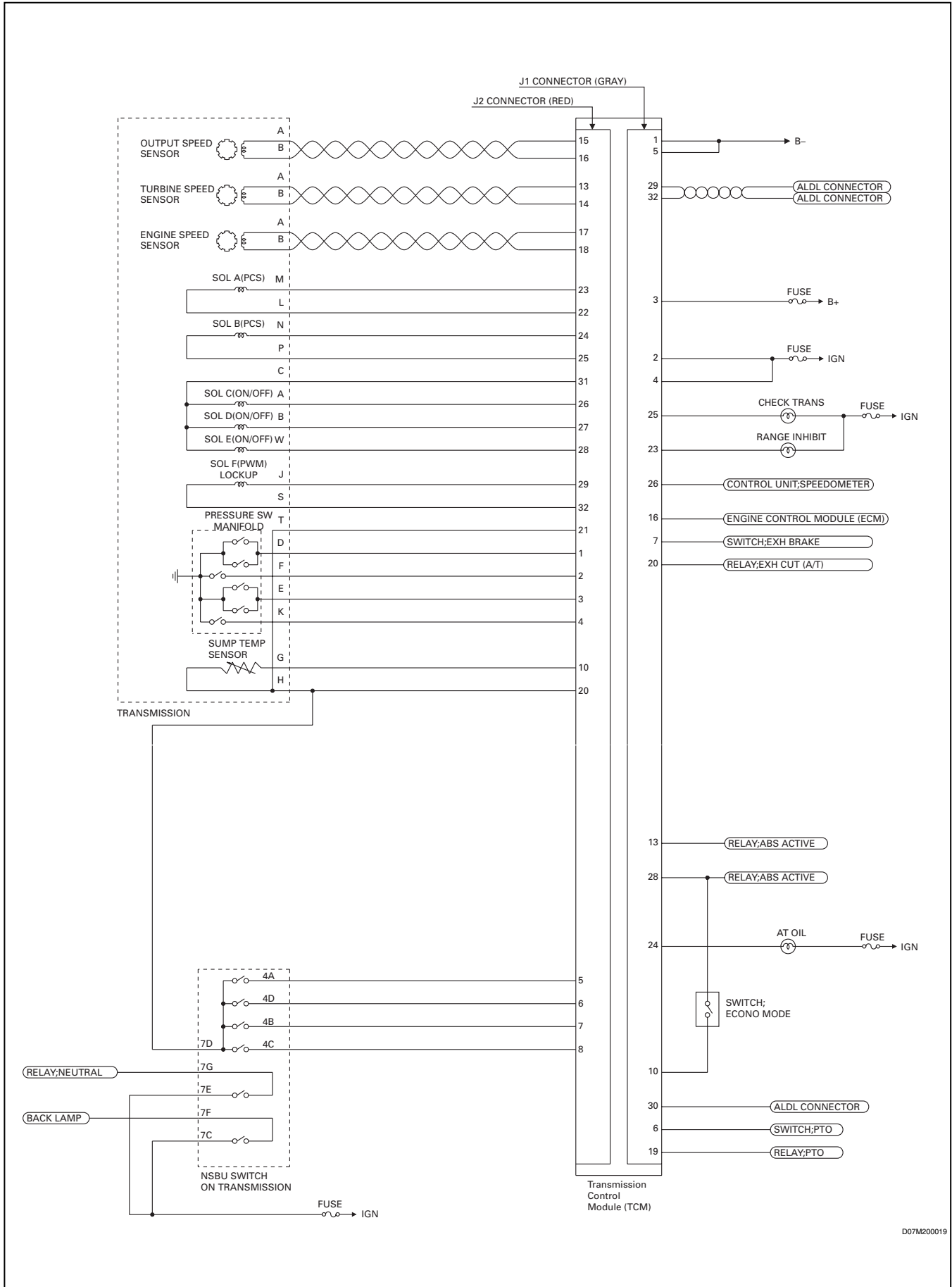
IDENTIFICATION OF TRANSMISSION



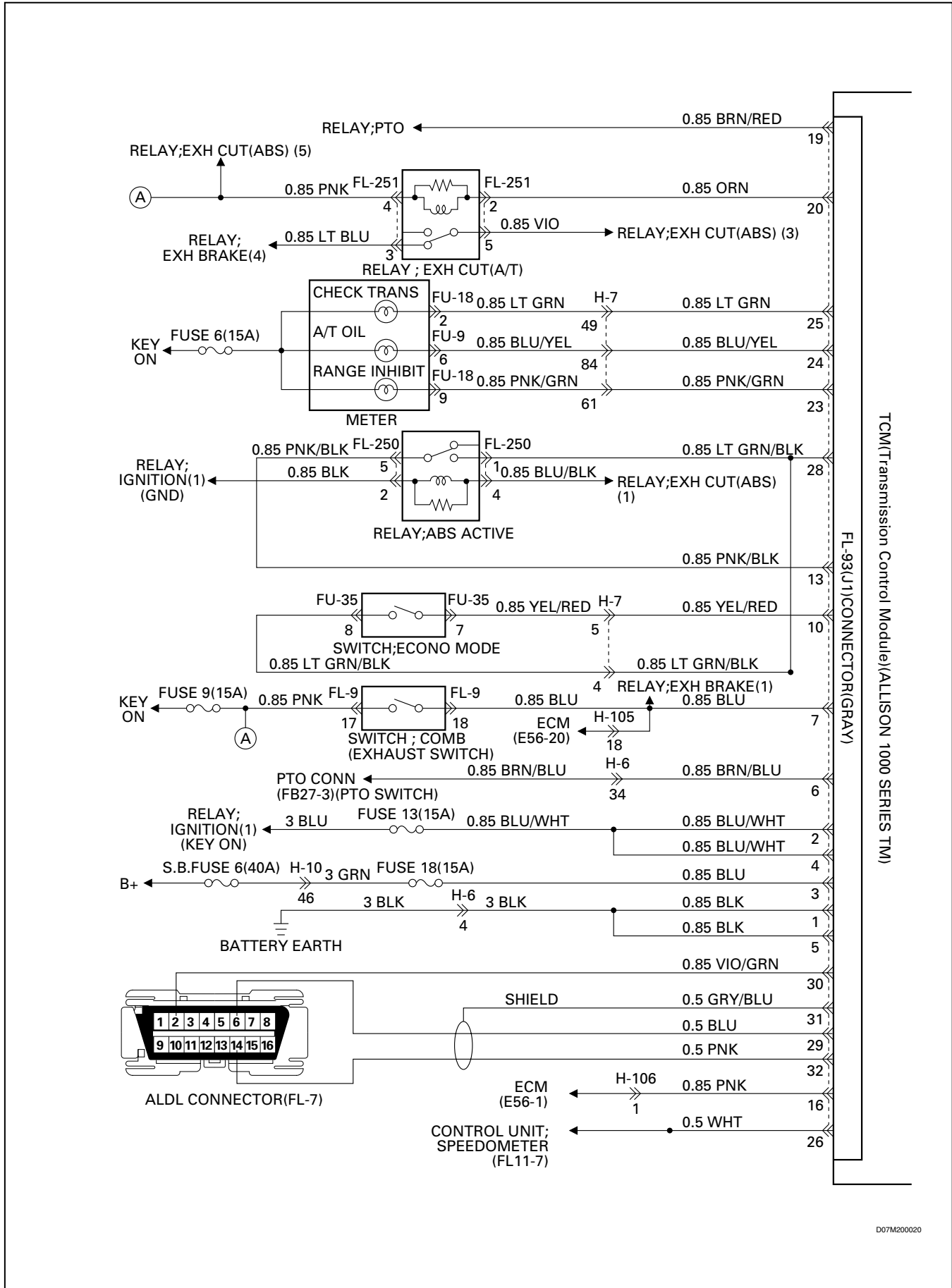
IDENTIFICATION OF TRANSMISSION CONTROL MODULE (TCM)



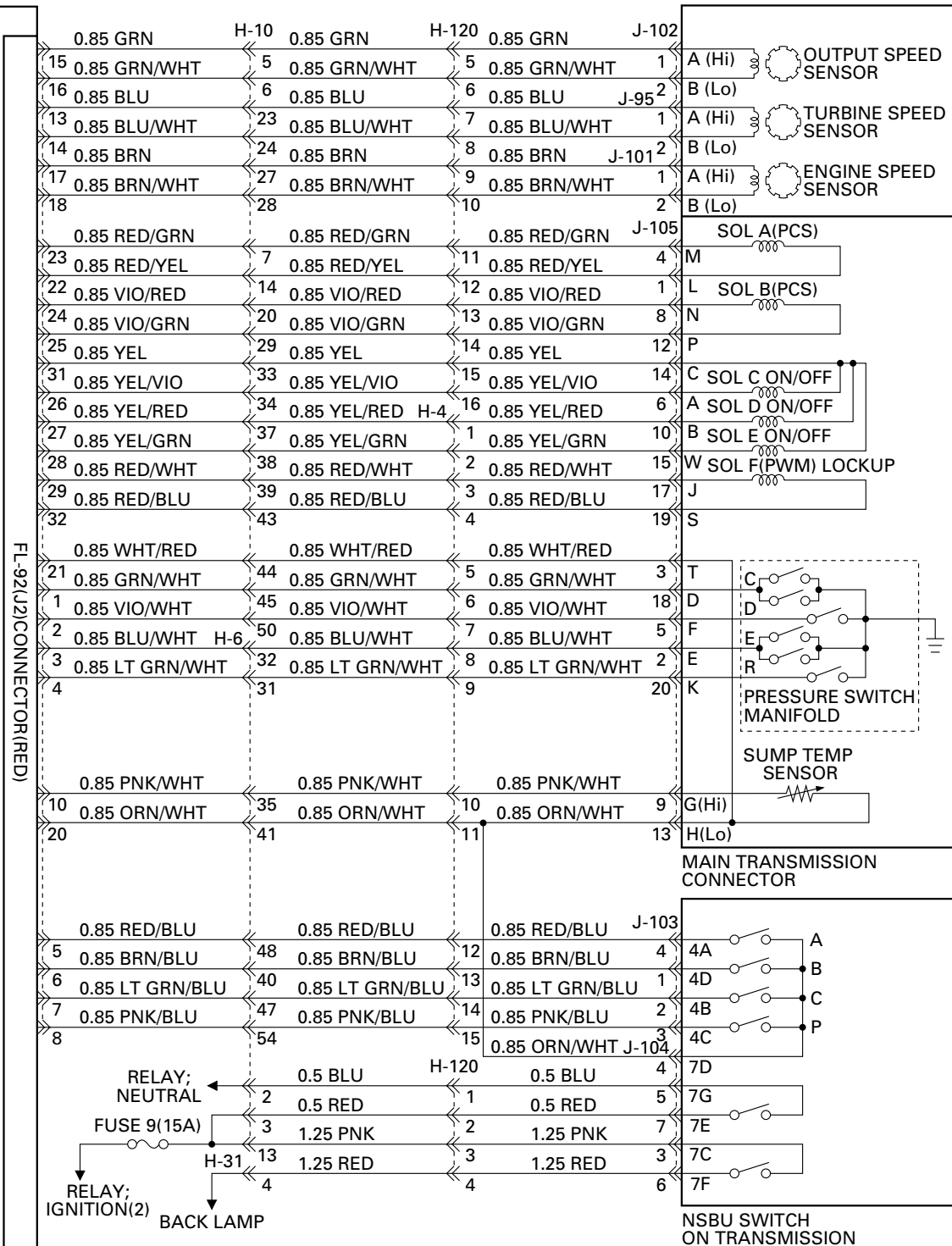
SYSTEM DIAGRAM



CIRCUIT DIAGRAM



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



NOTE; CONNECTOR No. — WIRE SIZE (mm²)
 — WIRE COLOR
 — FEMALE SIDE CONNECTOR
 — MALE SIDE CONNECTOR
 — TERMINAL No.

ABBREVIATIONS

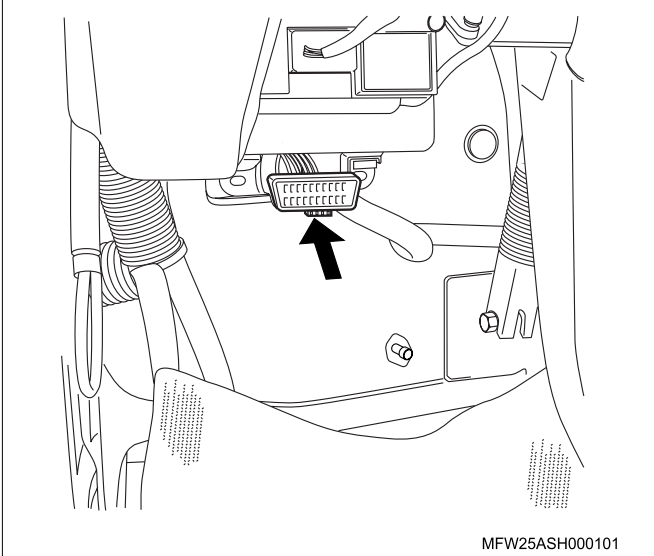
| | |
|-------------|--|
| A/N | Assembly Number |
| ABS | Anti-lock Brake System |
| Amp | Unit of electrical current. |
| CAN | Controller Area Network – A network for all SAE J1939 communications in a vehicle (engine, transmission, diagnostics, ABS, etc.) |
| CT | Closed Throttle |
| DNA | Does Not Adapt – Adaptive shift control is disabled. |
| DNS | DO NOT SHIFT – Refers to the DO NOT SHIFT diagnostic response during which the CHECK TRANS light is illuminated and the transmission will not shift and will not respond to the Shift Selector. |
| DTC | 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. |

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

DIAGNOSIS BY USING SCAN TOOL

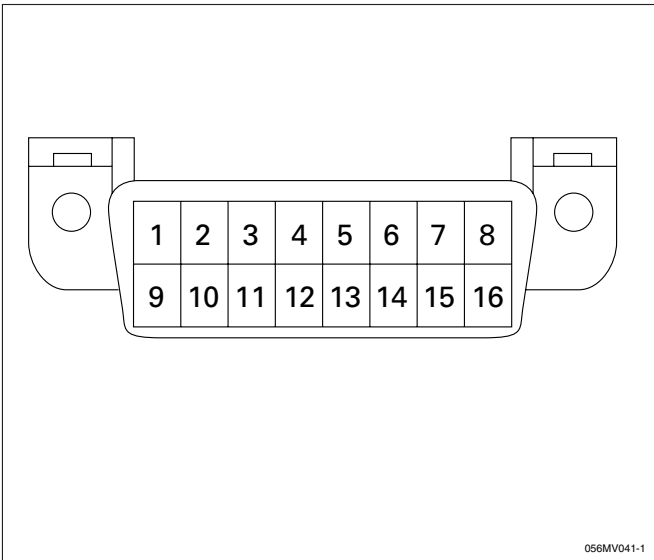
Data Link Connector (DLC)

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

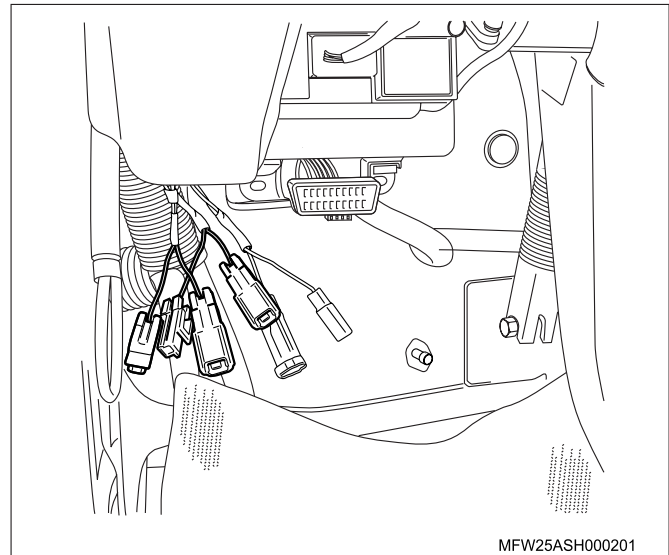
The procedure for reading diagnostic trouble code(s) is to use a diagnostic scan tool. When reading DTC(s), follow instructions supplied by tool manufacturer.

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.

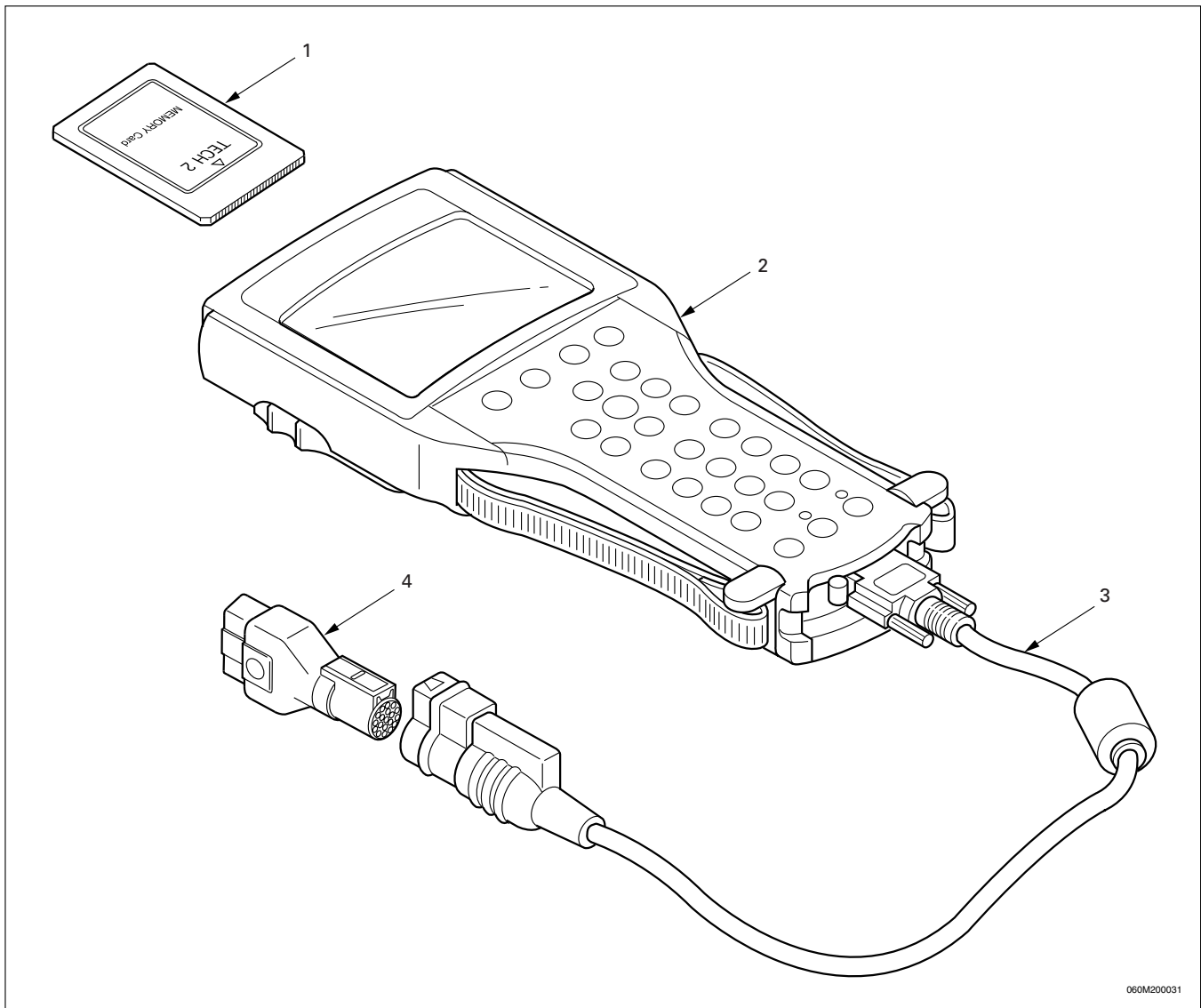
When a scan tool is not available, DTCs can also be cleared by connect the memory clear switch (Blue) one to two second then disconnect the memory clear switch (Blue).



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

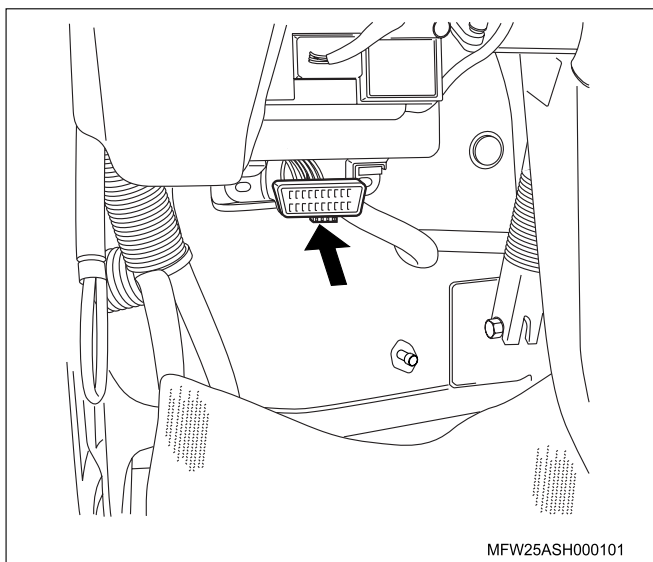
- 1 Tech 2 is a 12 volt system. Do not apply 24 volt.
2. After connecting and/or installing, the Vehicle Communications Interface (VCI) module, PCMCIA card and DLC connector to the Tech 2, connect the tool to the vehicle DLC.
3. Make sure the Tech 2 is powered OFF when removing or installing the PCMCIA 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

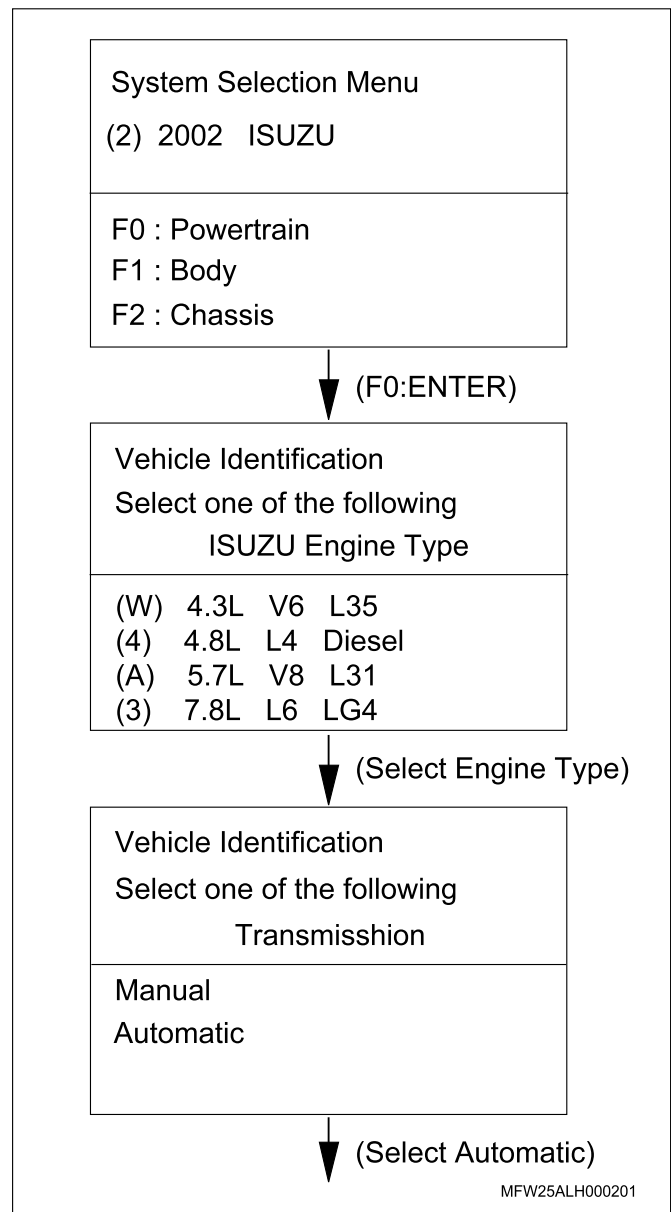
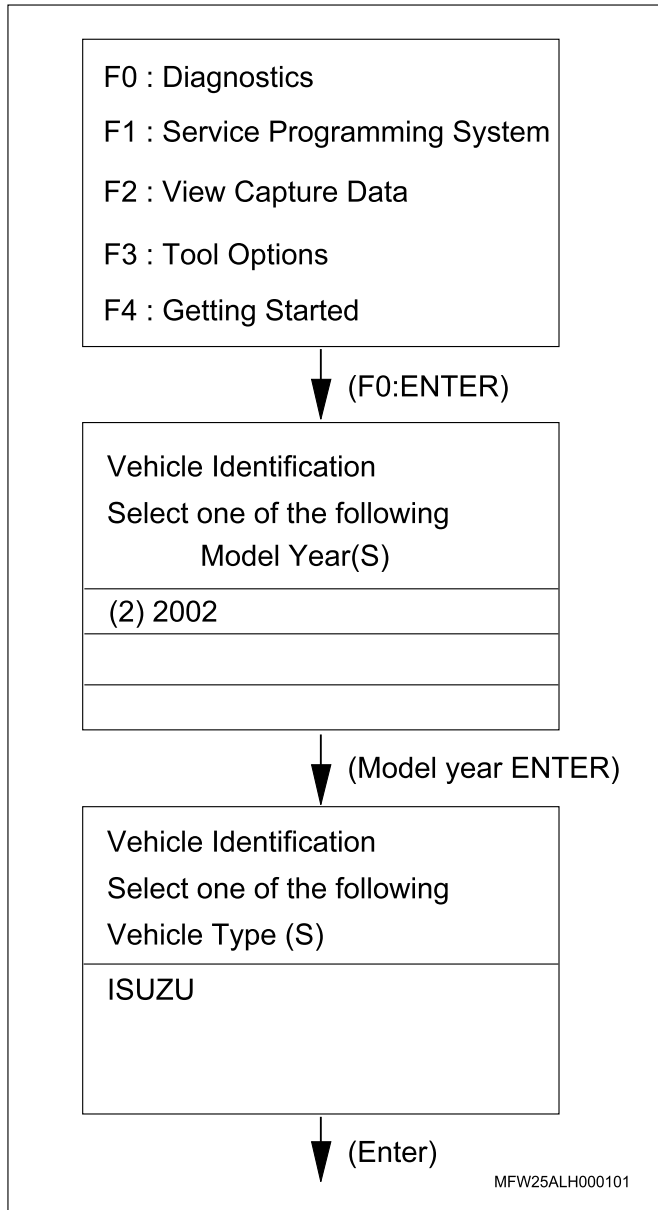
- Before operating the Isuzu PCMCIA card with the Tech 2, the following steps must be performed:
 - The Isuzu 98 System PCMCIA card (1) inserts into the Tech 2 (2).
 - Connect the SAE 16/19 adapter (4) to the DLC cable (3).
 - Connect the DLC cable to the Tech 2 (2).
 - Make sure the vehicle starter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

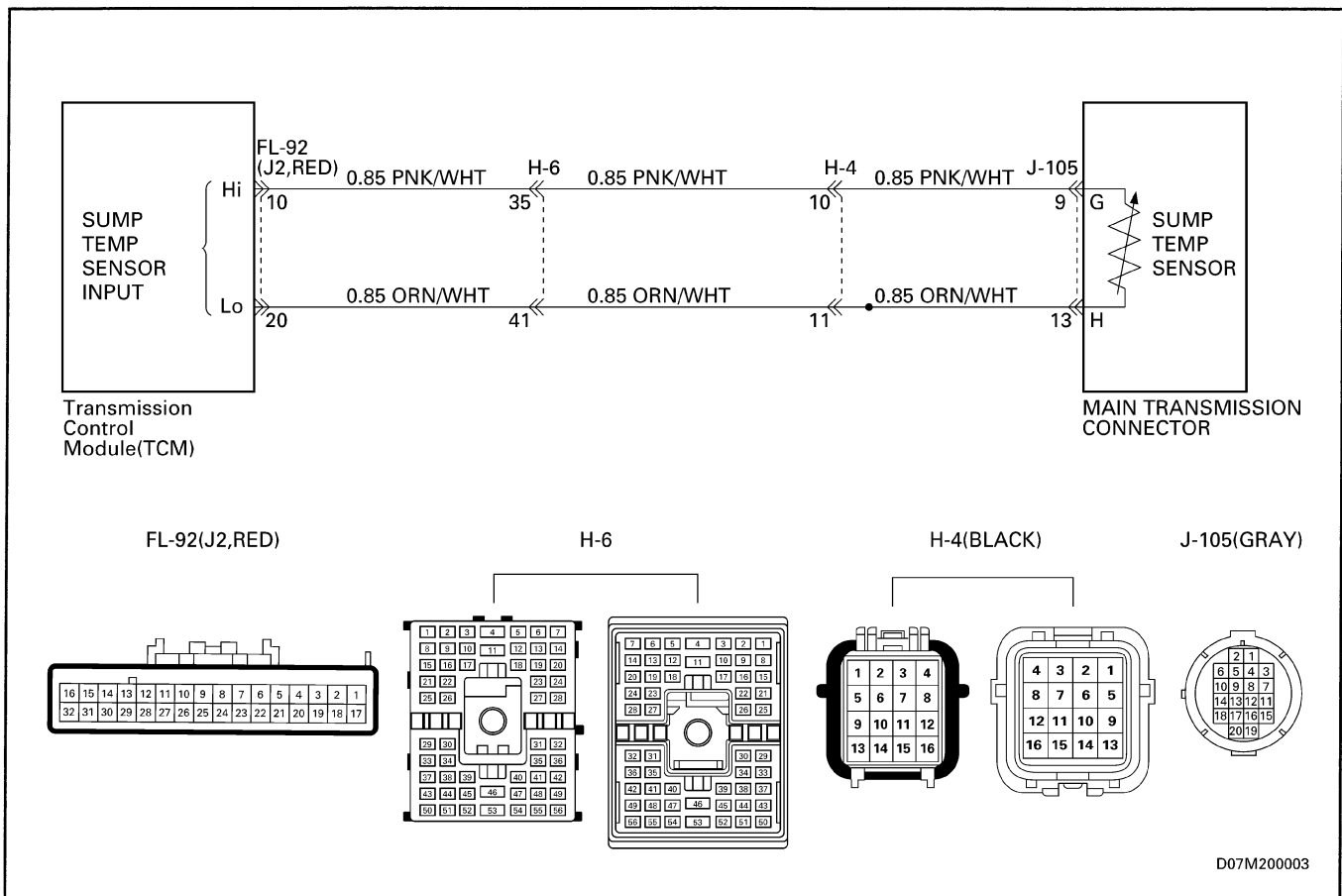
| DTC | Description | CHECK TRANS Light |
|-------|--|-------------------------|
| P0218 | Transmission Fluid Over Temperature Condition | No |
| P0562 | System Voltage Low | Yes |
| P0563 | System Voltage High | Yes |
| P0602 | TCM Not Programmed | Yes |
| P0705 | Transmission Range Sensor Circuit (PRNDL 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)**

| DTC | Description | CHECK TRANS Light |
|------------|--|--------------------------|
| 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



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"> • Under normal operating conditions. • In the specific operating mode when the over temperature condition occurred (if known). 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: • Under normal operating conditions. • In the specific operating mode where the over temperature condition occurred (if known). Did the DTC return? | — | <i>Begin the diagnosis again. Go to Step 1.</i> | <i>System OK</i> |