2014 ACCESSORIES AND EQUIPMENT

Electronic Control Modules - Service Information - Compass & Patriot

STANDARD PROCEDURE

FLASH PROGRAMMING

NOTE: The wiTECH diagnostic application is the preferred method for flashing ECUs.

NOTE: Help using the wiTECH diagnostic application for flashing an ECU is available by selecting "Help" then "Help Contents" at the top of the wiTECH diagnostic application window.

NOTE: The wiTECH software level must be at the latest release to perform this procedure.

NOTE: The StarMobile Desktop Client may also be used to perform this flash procedure.

STANDARD PROCEDURE - SKREEM PROGRAMMING

When a Powertrain Control Module (PCM) for a gasoline engine, or an Engine Control Module (ECM) for a diesel engine and the Sentry Key Remote Entry Module (SKREEM) (also known as the Wireless Control Module/WCM) on vehicles equipped with the Sentry Key Immobilizer System (SKIS) are replaced at the same time, perform the following steps in order:

NOTE: If the PCM and the SKREEM are replaced at the same time, program the PCM VIN into the PCM first.

1. If applicable first replace the PCM/ECM with the original WCM still connected to the vehicle.
2. Using the appropriate service information program the new PCM/ECM. (This will ensure the Secret Key Transfer from the original WCM into the new PCM/ECM).
3. Now replace and program the WCM. This will retain the Secret Key from the PCM/ECM back into the new WCM.

4. With the scan tool, select Miscellaneous Functions, WCM/Wireless Control Module. Then select the desired procedure and follow the display on the scan tool.
5. If the vehicle is equipped with Tire Pressure Monitoring System program the Placard Pressure Values into the WCM/SKREEM.
6. Ensure all the customer's keys have been programmed into the new module if necessary.

NOTE: If the original keys do not successfully program to the new SKREEM after the proper procedures are followed correctly, programming new keys will be necessary.

NOTE: Before replacing the ECU for a failed driver, control circuit or ground circuit, be sure to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most ECM driver/control circuit failures are caused by internal component failures (i.e. relay and solenoids) and shorted circuits (i.e. pull-ups, drivers and switched circuits). These failures are difficult to detect when a double fault has occurred and only one DTC has set.

PROGRAMMING THE SKREEM

The SKIS Secret Key is an ID code that is unique to each SKREEM/WCM. This code is programmed and stored in the SKREEM/WCM, the PCM/ECM, and each ignition key transponder chip. When the PCM/ECM or SKREEM/WCM is replaced, it is necessary to program the Secret Key into the new module using a diagnostic scan tool. Follow the programming steps outlined in the diagnostic scan tool for **PCM REPLACED** , **ECM REPLACED** , **WCM REPLACED** , or **GATEWAY REPLACED** under **MISCELLANEOUS FUNCTIONS** for the **WIRELESS CONTROL MODULE/WCM** menu item as appropriate.

NOTE: Programming the PCM/ECM or SKREEM is done using a diagnostic scan tool and a PIN to enter secure access mode. If three attempts are made to enter secure access mode using an incorrect PIN, secure access mode will be locked out for one hour. To exit this lockout mode, turn

the ignition to the RUN position for one hour then enter the correct PIN. Be certain that all accessories are turned OFF. Also monitor the battery state and connect a battery charger if necessary.

ECM/SKIM/WCM PROGRAMMING

When a ECM and the SKIM are replaced at the same time perform the following steps in order:

1. Program the new SKIM
2. Program the new ECM
3. Replace all ignition keys and program them to the new SKIM.

ECM/SKIM/WCM PROGRAMMING

When an ECM (Bosch) and the SKIM are replaced at the same time perform the following steps in order:

1. Program the new SKIM
2. Program the new ECM (Bosch)
3. Replace all ignition keys and program them to the new SKIM.

PROGRAMMING THE SKIM

CAUTION: Read all notes and cautions for programming procedures.

1. Connect a battery charger to the vehicle.
2. Connect the StarSCAN®.

CAUTION: If the ECM/PCM and SKREEM/WCM are replaced at the same time, the ECM/PCM MUST be programmed before the SKREEM/WCM.

3. Select "ECU View".
4. Select "WCM Wireless Control Module".
5. Select "Miscellaneous Functions".
6. Select WCM replaced.

7. Enter the PIN when prompted.
8. Verify the correct information.

NOTE: If the ECM and the SKIM are replaced at the same time, all vehicle keys will need to be replaced and programmed to the new SKIM.

PROGRAMMING IGNITION KEYS TO THE SKREEM

Each ignition key transponder also has a unique ID code that is assigned at the time the key is manufactured. When a key is programmed into the SKREEM/WCM, the transponder ID code is learned by the module and the transponder acquires the unique Secret Key ID code from the SKREEM/WCM. To program ignition keys into the SKREEM/WCM, follow the programming steps outlined in the diagnostic scan tool for **PROGRAM IGNITION KEYS OR KEY FOBS** under **MISCELLANEOUS FUNCTIONS** for the **WIRELESS CONTROL MODULE/WCM** menu item.

NOTE: If the original keys do not successfully program to the new SKREEM after the proper procedures are followed correctly, programming new keys will be necessary.

NOTE: A maximum of eight keys can be learned to each SKREEM. Once a key is learned to a SKREEM, that key has acquired the Secret Key for that SKREEM and cannot be transferred to any other SKREEM or vehicle.

If ignition key programming is unsuccessful, the scan tool will display one of the following error messages:

- **PROGRAMMING NOT ATTEMPTED** - The scan tool attempts to read the programmed key status and there are no keys programmed into SKREEM memory.
- **PROGRAMMING KEY FAILED (POSSIBLE USED KEY FROM WRONG VEHICLE)** - SKREEM is unable to program an ignition key transponder due to one of the following:
-
    A. The ignition key transponder is ineffective.

B. The ignition key transponder is or has been already programmed to another vehicle.

- **8 KEYS ALREADY LEARNED, PROGRAMMING NOT DONE** - The SKREEM transponder ID memory is full.
- **LEARNED KEY IN IGNITION** - The ID for the ignition key transponder currently in the ignition lock cylinder is already programmed into SKREEM memory.

VEHICLE SCAN AND CONFIGURATION REPORTS

	A multimedia supplement to the instructions contained in this article is available. To view the multimedia example of the condition described go to; **http://www.youtube.com/user/Mitchell1Tips then type, "A00612709.vid1" into the "Search Channel" box.**

COMMUNICATION

DESCRIPTION

DESCRIPTION

The primary on-board communication network between microprocessor-based electronic control modules in this vehicle is the Controller Area Network (CAN) data bus system. A data bus network minimizes redundant wiring connections; and, at the same time, reduces wire harness complexity, sensor current loads and controller hardware by allowing each sensing device to be connected to only one module (also referred to as a node). Each node reads, then broadcasts its sensor data over the bus for use by all other nodes requiring that data. Each node ignores the messages on the bus that it cannot use.

The CAN bus is a two-wire multiplex system. Multiplexing is any system that enables the transmission of multiple messages over a single channel or circuit. The CAN bus is used for communication between most vehicle nodes. However, in addition to the CAN bus network, certain nodes may also be equipped with a Local Interface Network (LIN) data bus. The LIN data bus is a single wire low-speed (9.6 Kbps) serial link bus used to provide direct communication between a LIN master module and certain switch or sensor inputs.

There are actually three separate CAN bus systems used in the vehicle. They are designated: the CAN-B, the CAN-C and the Diagnostic CAN-C. The CAN-B and CAN-C systems provide on-board communication between all nodes in the vehicle. The CAN-C is the faster of the two systems providing near real-time communication (500 Kbps), but is less fault tolerant than the CAN-B system. The CAN-C is used typically for communications between more critical nodes, while the slower (83.3 Kbps), but more fault tolerant CAN-B system is used for communications between less critical nodes. The CAN-B fault tolerance comes from its ability to revert to a single wire communication mode if there is a fault in the bus wiring.

The added speed of the CAN data bus is many times faster than previous data bus systems. This added speed facilitates the addition of more electronic control modules or nodes and the incorporation of many new electrical and electronic features in the vehicle.

The Diagnostic CAN-C bus is also capable of 500 Kbps communication, and is sometimes informally referred to as the CAN-D system to differentiate it from the other high speed CAN-C bus. The Diagnostic CAN-C is used exclusively for the transmission of diagnostic information between the Totally Integrated Power Module/Central GateWay (TIPM or TIPMCGW) and a diagnostic scan tool connected to the industry-standard 16-way Data Link Connector (DLC) located beneath the instrument panel on the driver side of the vehicle.

The TIPM is located in the engine compartment near the battery. The central CAN gateway or hub module integral to the TIPM is connected to all three CAN buses. This gateway physically and electrically isolates the CAN buses from each other and coordinates the bi-directional transfer of messages between them.

OPERATION

OPERATION

The Controller Area Network (CAN) data bus allows all electronic modules or nodes connected to the bus to share information with each other. Regardless of whether a message originates from a module on the lower speed CAN-B bus or on the higher speed CAN-C or CAN-D bus, the message structure and layout is similar, which allows the Totally Integrated Power Module/Central GateWay (TIPM or TIPMCGW) to process and transfer messages between the CAN buses. The TIPM also stores a Diagnostic Trouble Code (DTC) for certain bus network faults.

All modules (also referred to as nodes) transmit and receive messages over one of these buses. Data exchange between nodes is achieved by serial transmission of encoded data messages. Each node can both send and receive serial data simultaneously. Each digital bit of a CAN bus message is carried over the bus as a voltage differential between the two bus circuits which, when strung together, form a message. Each node uses arbitration to sort the message priority if two competing messages are attempting to be broadcast at the same time.

The ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab Compartment Node/CCN) is the Local Interface Network (LIN) master module in this vehicle and it gathers information from the compass module, the instrument panel switch bank, the Steering Control Module (SCM), and the Heated Seat Module (HSM) through the LIN data bus. There is also LIN bus communication between the individual Tire Pressure Monitor (TPM) transponders and the Sentry Key REmote Entry Module (SKREEM) (also known as the Wireless Control Module/WCM). Both the EMIC and the SKREEM either act directly upon the information received through the LIN data bus, relay the information to other nodes in the vehicle using electronic messages placed on the CAN bus, or both.

The voltage network used to transmit messages requires biasing and termination. Each module on the CAN bus network provides its own biasing and termination. There are two types of nodes used in the CAN bus network. On the CAN-C bus, a dominant node has a 120 ohm termination resistance, while a non-dominant (or recessive) node has about a 2500 to 3000 ohm (2.5 to 3.0 kilohm) termination resistance. The dominant nodes on the CAN-C bus are the TIPM and the Powertrain Control Module (PCM).

The termination resistance of two dominant nodes is combined in parallel to provide a total of about 60 ohms. This resistance value may vary somewhat by application, depending upon the number of non-dominant nodes on the CAN-C bus. On the CAN-D bus (or Diagnostic CAN-C) all of the 60 ohm termination resistance is present in the Central GateWay (TIPMCGW).

NOTE: All measurement of termination resistance is done with the vehicle battery disconnected.

NOTE: Termination resistance of a CAN-B node cannot be verified with a Digital Multi-Meter (DMM) or Digital Volt-Ohm Meter (DVOM). The transceiver of each CAN-B node connects to termination resistors internally. When the vehicle battery is disconnected, the internal connections of all CAN-B node transceivers are switched open, disconnecting the termination resistors. Therefore, the total bus resistance measured under these conditions will be extremely high or infinite, which does not accurately reflect the actual termination resistance of the CAN-B bus.

The communication protocol being used for the CAN data bus is a non-proprietary, open standard adopted from the Bosch CAN Specification 2.0b. The CAN-C is the faster of the two primary buses in the CAN bus system, providing near real-time communication (500 Kbps).

The CAN bus nodes are connected in parallel to the two-wire bus using a twisted pair, where the wires are wrapped around each other to provide shielding from unwanted electromagnetic induction, thus preventing interference with the relatively low voltage signals being carried through them. The twisted pairs have between 33 and 50 twists per meter (yard). While the CAN bus is operating (active), one of the bus wires will carry a higher voltage and is referred to as the CAN High or CAN bus (+) wire, while the other bus wire will carry a lower voltage and is referred to as the CAN Low or CAN bus (-) wire. Refer to the CAN Bus Voltages table.

CAN BUS VOLTAGES TABLE

CAN Bus Voltages (Normal Operation)								
CAN-C Bus Circuits	**Sleep**	**Recessive (Bus Idle)**	**Dominant (Bus Active)**	**CAN-L Short to Ground**	**CAN-H Short to Ground**	**CAN-L Short to Battery**	**CAN-H Short to Battery**	**CAN-H Short to CAN-L**
CAN-L (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5V	Battery Voltage	Battery Voltage Less	2.45 V

							0.75 V	
CAN-H (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

CAN-B Bus Circuits	**Key-Off (Bus Asleep)**	**Key-On (Bus Active)**	**CAN-L Short to Ground**	**CAN-H Short to Ground**	**CAN-L Short to Battery**	**CAN-H Short to Battery**	**CAN-H Short to CAN-L**
CAN-L (-)	10.99 V	4.65 - 4.98 V	0 V	4.5 - 4.7 V	Battery Voltage	4.5 - 4.7 V	0.3 - 0.7 V
CAN-H (+)	0.0 V	0.39 - 0.46 V	0.3 - 0.7 V	0 V	0.3 - 0.7 V	Battery Voltage	0.3 - 0.7 V

Notes

All measurements taken between node ground and CAN terminal with a standard DVOM.

DVOM will display average network voltage.

Total resistance of CAN-C network can also be measured (60 ohms). Cannot measure total resistance of CAN-B network.

In order to minimize the potential effects of Ignition-OFF Draw (IOD), the CAN-B network employs a sleep strategy. However, a network sleep strategy should not be confused with the sleep strategy of the individual nodes on that network, as they may differ. For example: The CAN-C bus network is awake only when the ignition switch is in the ON or START positions; however, the TIPM, which is on the CAN-C bus, may still be awake with the ignition switch in the ACCESSORY or UNLOCK positions. The integrated circuitry of an individual node may be capable of processing certain sensor inputs and outputs without the need to utilize network resources.

The CAN-B bus network remains active until all nodes on that network are ready for sleep. This is determined by the network using tokens in a manner similar to polling. When the last node that is active on the network is ready for sleep, and it has already received a token indicating that all other nodes on the bus are ready for sleep, it broadcasts a **bus sleep acknowledgment** message that causes the network to sleep. Once the CAN-B bus network is asleep, any node on the bus can awaken it by transmitting a message on the network. The TIPM will keep either the CAN-B or the CAN-C bus awake for a timed interval after it receives a diagnostic message for that bus over the Diagnostic CAN-C bus.

In the CAN system, available options are configured into the TIPM at the assembly plant, but additional options can be added in the field using the diagnostic scan tool. The configuration settings are stored in non-volatile memory. The TIPM also has two 64-bit registers, which track each of the **as-built** and **currently responding** nodes on the CAN-B and CAN-C buses. The TIPM stores a Diagnostic Trouble Code (DTC) in one of two caches for any detected active or stored faults in the order in which they occur. One cache stores powertrain (P-Code), chassis (C-Code) and body (B-Code) DTCs, while the second cache is dedicated to storing network (U-Code) DTCs.

If there are intermittent or active faults in the CAN network, a diagnostic scan tool connected to the Diagnostic CAN-C bus through the 16-way Data Link Connector (DLC) may only be able to communicate with the TIPM. To aid in CAN network diagnosis, the TIPM will provide CAN-B and CAN-C network status information to the scan tool using certain diagnostic signals. In addition, the transceiver in each node on the CAN-C bus will identify a **bus off hardware failure** , while the transceiver in each node on the CAN-B bus will identify a **general bus hardware failure** . The transceivers for some CAN-B nodes will also identify certain failures for both CAN-B bus signal wires.

CONNECTOR, DATA LINK

DESCRIPTION

DESCRIPTION

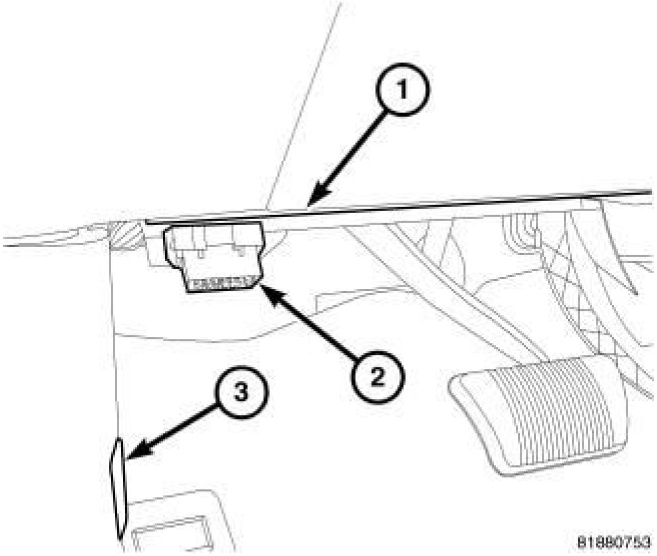

Fig. 1: Locating Data Link Connector
Courtesy of CHRYSLER GROUP, LLC

The Data Link Connector (DLC) (2) is a 16-way molded plastic connector insulator on a dedicated take out of the instrument panel wire harness. This connector is located at the lower edge of the instrument panel, outboard of the steering column. The connector insulator is retained by integral snap features within a rectangular cutout in the instrument panel lower structural support (1) just below the lower instrument panel base trim and just outboard of the instrument panel steering column opening cover and inboard of the inside hood release (3) on the inner cowl side trim.

OPERATION

OPERATION

The Data Link Connector (DLC) is an industry-standard 16-way connector that permits the connection of a diagnostic scan tool to the Controller Area Network (CAN) data bus for interfacing with, configuring, and retrieving Diagnostic Trouble Code (DTC) data from the electronic modules that reside on the data bus network of the vehicle.

MODULE, ALL WHEEL DRIVE CONTROL

DESCRIPTION

DESCRIPTION

The All Wheel Drive (AWD) Control Module controls the Electronically

Controlled Coupling (ECC) mounted on the rear axle. It is located in the left kick panel area and gets signals over the vehicle bus.

OPERATION

OPERATION

NOTE: The Electronic Stability Control (ESC) may also be referred to as Electronic Stability Program (ESP) depending on the vehicle model year and configuration. Certain components may also reference ESP, ESC, or use the traction control symbol.

The all-wheel-drive system requires no driver input or control. Under most driving conditions, it is passive and power is transmitted to the front wheels alone. Unlike all-wheel drive systems that rely on pumps or viscous fluids to transfer torque, this system requires no front-to-rear slippage for activation. This allows the system to transfer torque solely in response to accelerator pedal position. If the driver is asking for a lot of power, the system immediately starts clamping the electronically controlled coupling (ECC), transferring a high percentage of power to the rear wheels. This avoids front wheel slippage, as power to propel the car is transmitted through all four tires. This mode of operation is called open-loop operation in that there is no feedback to affect the torque transfer.

A second, closed loop, operating mode uses feedback from the wheel-speed sensors to determine the appropriate torque transfer. When the front wheels slip, the All Wheel Drive (AWD) Control Module tells the ECC to start clamping, sending power to the rear wheels. Attempting the same aggressive launch described above with the front wheels on ice and the rear wheels on dry pavement, the ECC sends even more torque to the rear wheels to minimize slippage and launch the vehicle. Both modes are always active with the closed loop mode layered on top of open loop mode to increase torque to the rear wheels when needed to maintain traction in extreme cases.

Power to the rear wheels is modulated under the following conditions:

- Slipping on ice while backing up will send a lot of power to the rear axle
- Loss of traction while traveling at freeway speeds, for example hydroplaning on a puddle of water, will send very little power to the rear

wheels because the controller knows at those speeds a lot of power is not needed at the rear wheels

- A third condition, which is independent of the others, uses wheel speed differences to determine when the vehicle is turning in a tight circle. This condition, which is indicated by a large discrepancy in side-to-side wheel speeds, causes the electronic control module to reduce torque to the rear wheels to prevent binding in the driveline. The electronic control module is always checking for this condition as well.
- A fourth condition that is unique to this system is to influence vehicle dynamics. Other systems limit AWD to aiding traction or providing off-road capability. The primary focus is on launching the vehicle or going off road at speeds up to about 25 mph (40 km/hr). Above that speed range, they use it to limit wheel slip for traction. On this system, additional ECM calibration controls torque to the rear wheels for improved handling in the 25-65 mph (40-105 km/hr) range. In this speed range, the system increases torque to the rear wheels during cornering with the throttle open to make the car turn more easily - make the handling more neutral. This is more readily accomplished with an electronically controlled system, than with viscous-coupling or gerotor systems that require some degree of front-to-rear slip to transfer torque to the rear wheels. Above 70 mph (113 km/hr), the control strategy provides minimal torque to the rear wheels under normal driving conditions to aid fuel economy.

The control module also interfaces with the Electronic Stability Control (ESC) and traction control systems. The interface allows the ESC system to use the ECC to help gain control of the vehicle. For this purpose, torque transmitted to the rear wheels by the ECC can be reduced. This system is not traction control. It only works on situations where front-to-rear traction varies, for instance, front wheels on ice, rear wheels on dry pavement or climbing steep grades. AWD does not aid side-to-side traction. ESC does that through brake intervention on this system.

REMOVAL

REMOVAL

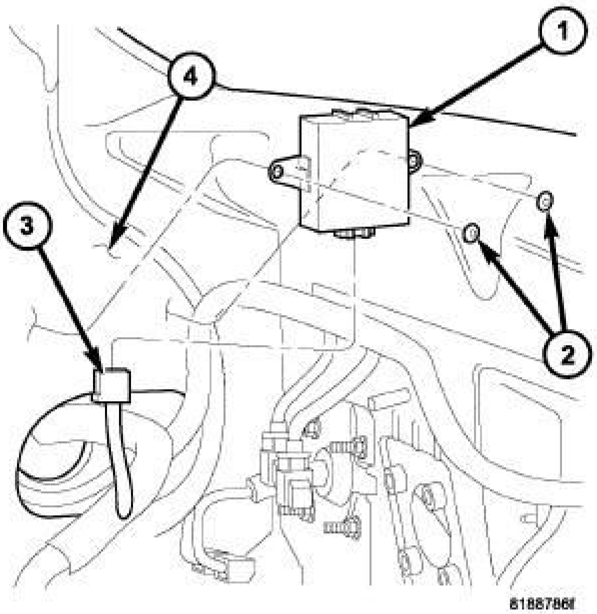

Fig. 2: ECC Control Module
Courtesy of CHRYSLER GROUP, LLC

1. Remove the left front kick panel. Refer to **PANEL, COWL TRIM, SIDE, REMOVAL** .
2. Remove module retaining bolts (2).
3. Remove electrical connector (3).
4. Remove ECC module (1).

INSTALLATION

INSTALLATION

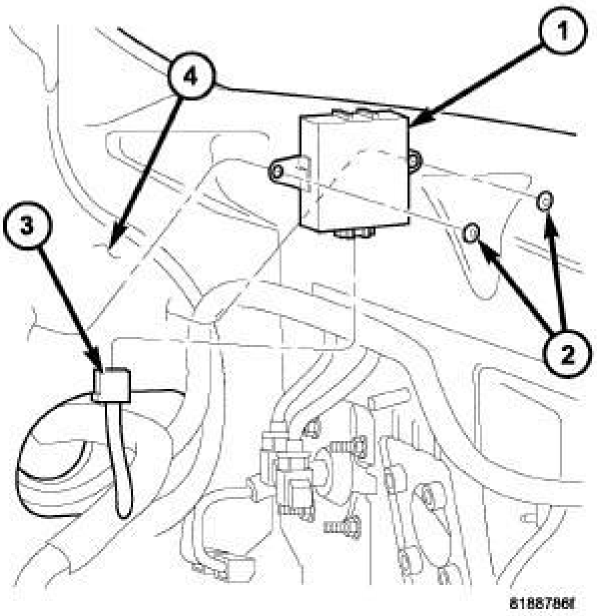

Fig. 3: ECC Control Module
Courtesy of CHRYSLER GROUP, LLC

1. Plug ECC module in (3).
2. Move into place, install bolts (2) and tighten to 11 N.m (97 in. lbs.).
3. Install the left front kick panel. Refer to **PANEL, COWL TRIM, SIDE, INSTALLATION** .

MODULE, ANTI-LOCK BRAKE SYSTEM

DESCRIPTION

DESCRIPTION

NOTE: The Electronic Stability Control (ESC) may also be referred to as Electronic Stability Program (ESP) depending on the vehicle model year and configuration. Certain components may also reference ESP, ESC, or use the traction control symbol.

The Antilock Brake Module (ABM) is a microprocessor-based device which monitors the antilock brake system (ABS) during normal braking and controls it when the vehicle is in an ABS stop or when in a traction control or Electronic Stability Control (ESC) situation. The ABM utilizes a 47-way electrical connector on the vehicle wiring harness. The power source for the ABM is through the ignition switch in the RUN or ON position.

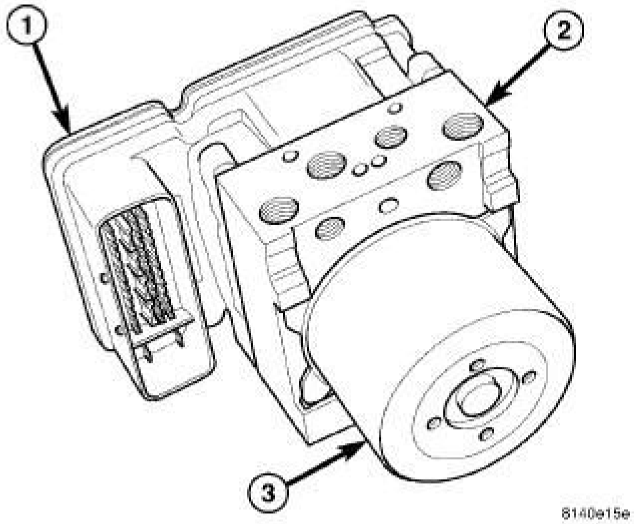

Fig. 4: Integrated Control Unit
Courtesy of CHRYSLER GROUP, LLC

1 - ANTILOCK BRAKE MODULE (ABM) 2 - HYDRAULIC CONTROL UNIT (HCU) 3 - PUMP/MOTOR

The ABM (1) is mounted to the HCU (2) as part of the Integrated Control Unit (ICU). The ICU is located in the engine compartment on the inboard side of the right body frame rail behind the strut tower. For information on the ICU, refer to **INTEGRATED CONTROL UNIT (ICU), DESCRIPTION** .

OPERATION

OPERATION

NOTE:	**The Electronic Stability Control (ESC) may also be referred to as Electronic Stability Program (ESP) depending on the vehicle model year and configuration. Certain components may also reference ESP, ESC, or use the traction control symbol.**

The primary functions of the Antilock Brake Module (ABM) are to:

- Monitor the Antilock Brake System (ABS) and Electronic Stability Control

(ESC) for proper operation.

- Detect wheel locking or wheel slipping tendencies by monitoring the speed of all four wheels of the vehicle.
- Control fluid modulation to the wheel brakes while the system is in ABS or traction control mode.
- Modulates fluid pressure to the wheel brakes to control vehicle yaw rate in ESC mode.
- Store diagnostic information.
- Provide communication to the scan tool while in diagnostic mode.
- Illuminate the amber ABS indicator in the instrument cluster.
- Illuminate the yellow ESC/BAS indicator in the instrument cluster (if equipped).

The ABM constantly monitors the ABS and ESC (if equipped) for proper operation. If the ABM detects a fault, it will turn on the amber ABS and yellow ESC/BAS indicators and disable the ABS or ESC if so equipped. The normal base braking system will remain operational at that time.

The ABM continuously monitors the speed of each wheel through the signals generated by the wheel speed sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the ABM commands the ABM solenoid coils to actuate. The coils then open and close the valves in the HCU that modulate brake fluid pressure in some or all of the hydraulic circuits. The ABM continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present.

REMOVAL

REMOVAL

Due to packaging and limited space it is necessary to remove and disassemble the Integrated Control Unit (ICU) to service the Antilock Brake Module (ABM) on this vehicle. Refer to **INTEGRATED CONTROL UNIT (ICU), REMOVAL** .

INSTALLATION

INSTALLATION

Due to packaging and limited space it is necessary to install the Antilock Brake

Module (ABM) on the Hydraulic Control Unit (HCU), then install the Integrated Control Unit (ICU) on the vehicle as an assembly. Refer to **INTEGRATED CONTROL UNIT (ICU), ASSEMBLY** .

MODULE, COMPASS

DESCRIPTION

DESCRIPTION

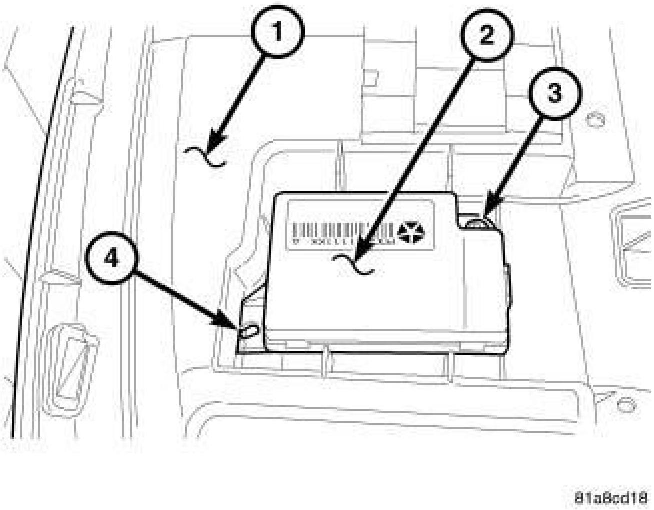

Fig. 5: View Of Remote Compass Module (Rcm)
Courtesy of CHRYSLER GROUP, LLC

On vehicles **Not** equipped with a Navigational (NAV) Radio, the Remote Compass Module (RCM) (2) is a separate stand alone module mounted to the top of the instrument panel (1). Vehicles equipped with a Navigational (NAV) Radio, the compass feature is an integral part of the NAV system and does not require calibration or adjustment, and is only serviced as an assembly with the radio. For more information on the NAV Radio, refer to **DESCRIPTION** .

For information on diagnosis and testing or programming of the RCM, refer to **MODULE, COMPASS, DIAGNOSIS AND TESTING** and **MODULE, COMPASS, STANDARD PROCEDURE** .

REMOVAL

REMOVAL

WARNING: Disable the airbag system before attempting any

steering wheel, steering column, or instrument panel component diagnosis or service. Disconnect and isolate the negative battery (ground) cable, then wait two minutes for the airbag system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the airbag system. Failure to follow these instructions may result in accidental airbag deployment and possible serious or fatal injury.

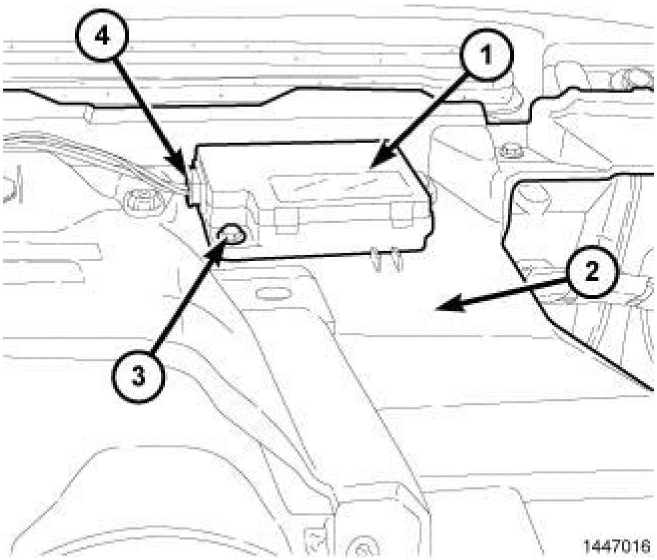

Fig. 6: Identifying Remote Compass Module (RCM), Instrument Panel, Screws & Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect and isolate the battery negative cable.
2. Remove the instrument panel top cover. Refer to **COVER, INSTRUMENT PANEL, REMOVAL** .
3. Remove the screws (3) securing the Remote Compass Module (RCM) (1) to the instrument panel (2).
4. Disconnect the electrical connector (4) and remove the RCM from the vehicle.

INSTALLATION

INSTALLATION

NOTE: The Remote Compass Module (RCM) must be calibrated after installation.

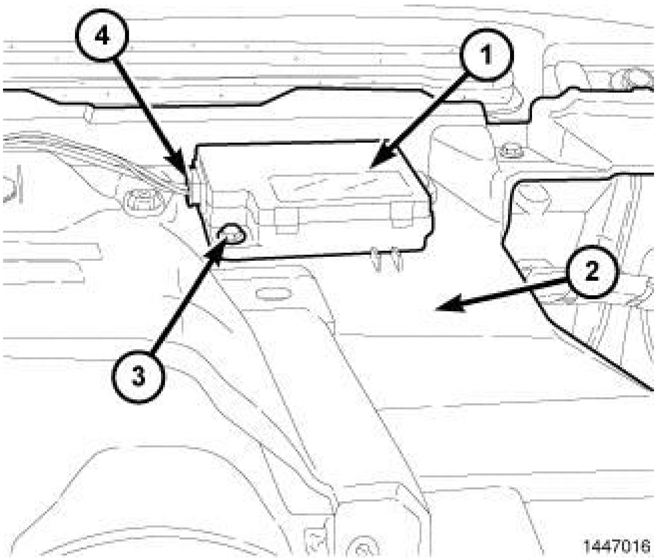

Fig. 7: Identifying Remote Compass Module (RCM), Instrument Panel, Screws & Electrical Connector
Courtesy of CHRYSLER GROUP, LLC

1. Position the RCM (1) on top of the instrument panel (2).
2. Install the screws (3) that secure the RCM to the instrument panel.
3. Connect the electrical connector (4).
4. Install the instrument panel top cover. Refer to **COVER, INSTRUMENT PANEL, INSTALLATION** .
5. Reconnect the negative battery cable.
6. Calibrate the compass module.

MODULE, HANDS FREE

DESCRIPTION

DESCRIPTION

Refer to **MODULE, HANDS FREE (HFM), DESCRIPTION** .

OPERATION

OPERATION

Refer to **MODULE, HANDS FREE (HFM), OPERATION** .

REMOVAL

REMOVAL

Refer to **MODULE, HANDS FREE (HFM), REMOVAL** .

INSTALLATION

INSTALLATION

Refer to **MODULE, HANDS FREE (HFM), INSTALLATION** .

MODULE, HEATED SEAT

DESCRIPTION

DESCRIPTION

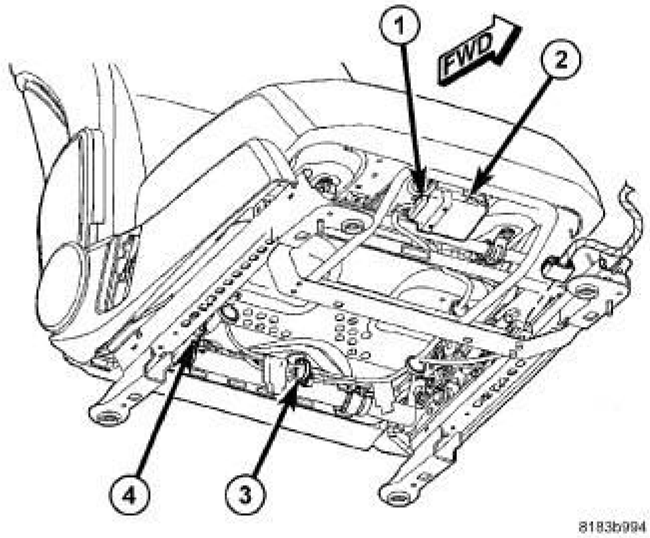

Fig. 8: Heated Seat Module
Courtesy of CHRYSLER GROUP, LLC

The heated seat module (2) is located under the left front seat. It has a single electrical connector (1) and a push pin style retainer that secures it to the seat pan. The module can be accessed from under the front left seat with the seat in the full back position.

The heated seat module is a microprocessor designed to use the Local Interface Network (LIN) data bus messages from the instrument cluster also known as the Cabin Compartment Node (CCN). The CCN receives inputs from the heated seat switches and in turn signals the heated seat module to operate the heated seat elements for both front seats.

OPERATION

OPERATION

The heated seat module operates on fused battery current received from the ignition switch. The module is grounded to the body at all times through the electrical connector. Inputs to the module include Local Interface Network (LIN) data bus messages and standard hardwired 12 volt power and ground. In response to the LIN inputs the heated seat module will control the battery current to the appropriate heated seat elements.

When a heated seat switch LIN data bus signal is received by the heated seat module, the module energizes the selected heated seat element. The Low heat set point is about 38° C (100.4° F), and the High heat set point is about 42° C (107.6° F).

In addition to operating the heated seat elements, the heated seat module sends LED illumination messages to the CCN via the LIN data bus. The CCN then sends the LED illumination message to the accessory switch bank so that the appropriate LEDs are illuminated for any given heating level. Pressing the switch once will select high-level heating. Pressing the switch a second time will select low-level heating. Pressing the switch a third time will shut the heating elements off.

If the heated seat module detects a heated seat element OPEN or SHORT circuit, it will record and store the appropriate diagnostic trouble code (DTC).

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - HEATED SEAT MODULE

In order to obtain conclusive testing, the heated seat system and the Local Interface Network (LIN) data bus circuit must be checked. **Any diagnosis of the heated seat system should begin with, the use of a scan tool and the appropriate diagnostic Service Information.**

Refer to the appropriate wiring information for complete circuit schematic or connector pin-out information.

NOTE: Vehicles equipped with the heated seat option utilize a

low voltage cut-off feature. This feature turns off power to the heated seat system anytime vehicle voltage is below 11.7v or above 15.5v. Be certain to check the vehicle electrical system for proper voltage anytime the power seat system appears inoperative.

Before any testing of the heated seat system is attempted, the battery should be fully-charged.

REMOVAL

REMOVAL

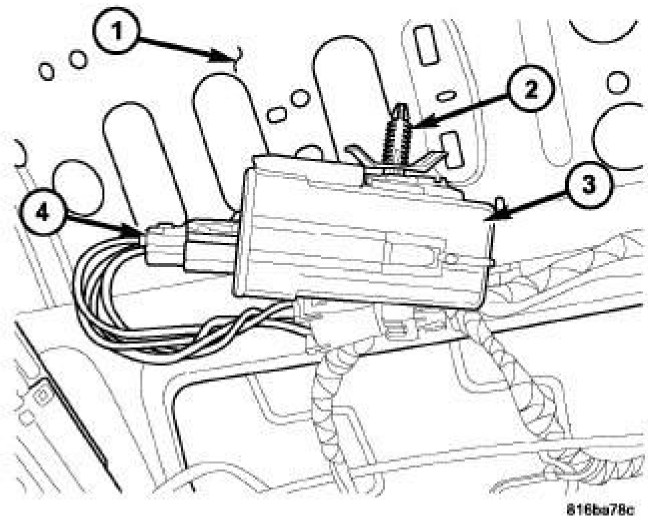

Fig. 9: Locating Heated Seat Module
Courtesy of CHRYSLER GROUP, LLC

CAUTION: The Heated Seat Module mounting tab can be damaged during module removal and installation. Use care to properly align tab to prevent binding that could result in tab breakage.

1. Position the left front seat to the full rearward position.
2. Disconnect and isolate the battery negative cable.
3. Disconnect the wire harness connector (4) from the heated seat module (3).
4. Unsnap the heated seat module retaining tab (2) from the seat pan (1).
5. Remove the heated seat module (3) from the vehicle.

INSTALLATION

INSTALLATION

CAUTION: The Heated Seat Module mounting tab can be damaged during module removal and installation. Use care to properly align tab to prevent binding that could result in tab breakage.

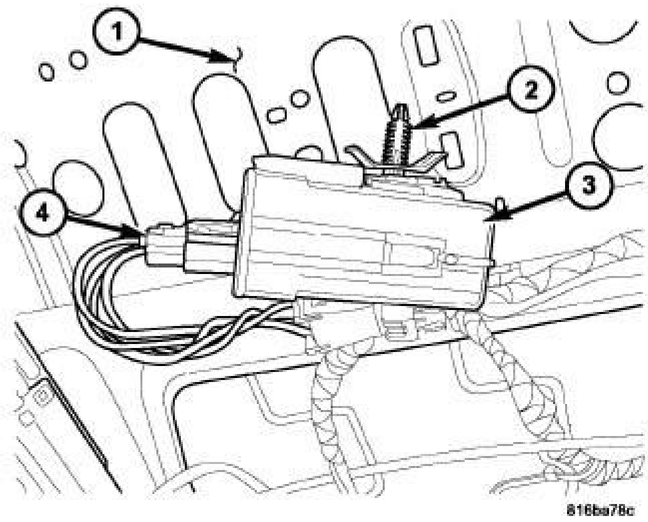

Fig. 10: Locating Heated Seat Module
Courtesy of CHRYSLER GROUP, LLC

1. Install the heated seat module (3) into the vehicle.
2. Position the retaining tab (2) with the mounting hole in the seat pan (1). Firmly apply even pressure to the module (3) until the mounting tab is fully seated.
3. Connect the wire harness connector (4) to the heated seat module (3).
4. Connect the battery negative cable.
5. Check for proper heated seat system operation.

MODULE, INTRUSION TRANSCEIVER

DESCRIPTION

DESCRIPTION

Refer to **MODULE, INTRUSION, DESCRIPTION** .

OPERATION

OPERATION

Refer to **MODULE, INTRUSION, OPERATION** .

REMOVAL

REMOVAL

Refer to **MODULE, INTRUSION, REMOVAL** .

INSTALLATION

INSTALLATION

Refer to **MODULE, INTRUSION, INSTALLATION** .

MODULE, POWERTRAIN CONTROL

DESCRIPTION

DESCRIPTION

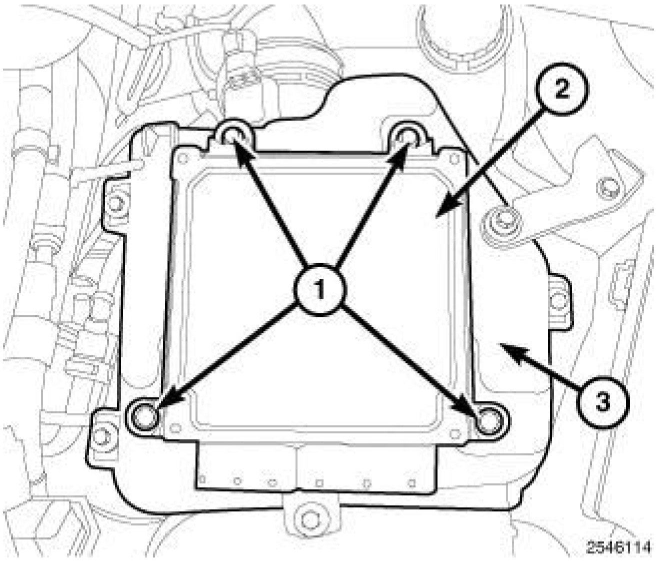

Fig. 11: Identifying Powertrain Control Module Components
Courtesy of CHRYSLER GROUP, LLC

The Powertrain Control Module (PCM) is located in the left side of engine compartment and is attached to the top of air cleaner housing (2).

PCM GROUND

Ground is provided through multiple pins of the PCM connector. Depending on the vehicle there may be as many as two different ground pins. There are power grounds and sensor grounds.

The power grounds are used to control the ground side relays, solenoids, ignition coil or injectors. The signal ground is used for any input that uses sensor return for ground, and the ground side of any internal processing component.

The PCM case is shielded to prevent RFI and EMI. The PCM case is grounded and must be firmly attached to a good, clean body ground.

Internally all grounds are connected together, however there is noise suppression on the sensor ground. For EMI and RFI protection the housing and cover are also grounded separately from the ground pins.

SENSOR RETURN - PCM INPUT

The sensor return circuit provides a low electrical noise ground reference for all of the systems sensors. The sensor return circuit connects to internal ground circuits within the Powertrain Control Module (PCM).

OPERATION

OPERATION

The Powertrain Control Module (PCM) has been programmed to monitor different circuits of the diesel fuel injection system. This monitoring is called on-board diagnostics. Certain criteria must be met for a diagnostic trouble code to be entered into the PCM memory. The criteria may be a range of: engine RPM, engine temperature, time or other input signals to the PCM. If all of the criteria for monitoring a system or circuit are met, and a problem is sensed, then a Diagnostic Trouble Codes (DTC) will be stored in the PCM memory. It is possible that a DTC for a monitored circuit may not be entered into the PCM memory, even though a malfunction has occurred. This may happen when the monitoring criteria have not been met. The PCM compares input signal voltages from each input device with specifications (the established high and low limits of the input range) that are programmed into it for that device. If the input voltage is not within the specifications and other trouble code criteria are met, a DTC will be stored in the PCM memory.

The PCM supplies two regulated 5 volts supplies - a 5V primary and a 5V secondary (auxiliary) to the following sensors:

- 1. Camshaft Position Sensor (5V secondary)
- 2. Crankshaft Position Sensor (5V primary)
- 3. EGR Position feedback sensor (5V secondary) (if equipped)
- 4. Engine coolant temperature sensor (connected to 5V internal via a pullup resistor)
- 5. Inlet Air Temperature Sensor (connected to 5V internal via a pullup resistor)
- 6. Knock sensor (connected to 5V internal via a pullup resistor)
- 7. Manifold absolute pressure sensor (5V secondary)
- 8. Oil Pressure Switch (connected to 5V internal via pullup resistor)
- 9. Pedal Value Sensor #1 (5V Primary)
- 10. Pedal Value Sensor #2 (5V Secondary)
- 11. SRV Position Feedback Sensor (5V Secondary)
- 12. Throttle Position Sensors (5V Primary)
- 13. Variable Line Pressure Sensor (5V Secondary)

PCM OPERATING MODES

As input signals to the PCM change, the PCM adjusts its response to the output devices. For example, the PCM must calculate a different fuel quantity and fuel timing for engine idle condition than it would for a wide open throttle condition. There are several different modes of operation that determine how the PCM responds to the various input signals.

IGNITION SWITCH ON (ENGINE OFF)

When the ignition is turned on, the PCM activates the glow plug relay for a time period that is determined by engine coolant temperature, atmospheric temperature and battery voltage.

ENGINE START-UP MODE

The PCM uses the engine temperature sensor and the crankshaft position sensor (engine speed) inputs to determine fuel injection quantity.

NORMAL DRIVING MODES

Engine idle, warm-up, acceleration, deceleration and wide open throttle modes are controlled based on all of the sensor inputs to the PCM. The PCM uses these sensor inputs to adjust fuel quantity and fuel injector timing.

LIMP-IN MODE

If there is a fault detected with the accelerator pedal position sensor, the PCM will set the engine speed at 1100 RPM.

OVERSPEED DETECTION MODE

If the PCM detects engine RPM that exceeds 5200 RPM, the PCM will set a DTC in memory and illuminate the MIL until the DTC is cleared.

AFTER-RUN MODE

The PCM transfers RAM information to ROM and performs an Input/Output state check.

MONITORED CIRCUITS

The PCM is able to monitor and identify most driveability related trouble conditions. Some circuits are directly monitored through PCM feedback circuitry. In addition, the PCM monitors the voltage state of some circuits and compares those states with expected values. Other systems are monitored indirectly when the PCM conducts a rationality test to identify problems. Although most subsystems of the engine control module are either directly or indirectly monitored, there may be occasions when diagnostic trouble codes are not immediately identified. For a trouble code to set, a specific set of conditions must occur and unless these conditions occur, a DTC will not set.

DIAGNOSTIC TROUBLE CODES

Each diagnostic trouble code (DTC) is diagnosed by following a specific procedure. The diagnostic test procedure contains step-by-step instruction for determining the cause of the DTC as well as no trouble code problems. For more information, refer to the appropriate Diesel Powertrain Diagnostic Information .

HARD CODE

A DTC that comes back within one cycle of the ignition key is a hard code. This means that the problem is current every time the PCM/SKIM checks that circuit or function. Procedures in this Service Information verify if the DTC is a hard code at the beginning of each test. When the fault is not a hard code, an intermittent test must be performed. NOTE: If the scantool displays faults for multiple components (i.e. ECT, VSS, IAT sensors) identify and check the shared circuits for possible problems before continuing (i.e. sensor grounds or 5-volt supply circuits). Refer to the appropriate schematic to identify shared circuits. For more information, refer to the appropriate Diesel Powertrain Diagnostic Information .

INTERMITTENT CODE

A DTC that is not current every time the PCM/SKIM checks the circuit or function is an intermittent code. Most intermittent DTCs are caused by wiring or connector problems. Problems that come and go like this are the most difficult to diagnose; they must be looked for under specific conditions that cause them. **NOTE: Electromagnetic (radio) interference can cause an intermittent system malfunction.** This interference can interrupt communication between the ignition key transponder and the SKIM.

The following checks may assist you in identifying a possible intermittent problem:

- Visually inspect the related wire harness connectors. Look for broken, bent, pushed out or corroded terminals.
- Visually inspect the related wire harness. Look for chafed, pierced or partially broken wire.
- Refer to hotlines or technical service bulletins that may apply.

PCM DIAGNOSTIC TROUBLE CODES

NOTE:	**Before replacing the PCM for a failed driver, control circuit or ground circuit, be sure to check the related component/circuit integrity for failures not detected due to a double fault in the circuit. Most PCM driver/control circuit failures are caused by internal failures to components (i.e. relays and solenoids) and shorted circuits (i.e. sensor pull-ups, drivers and ground circuits). These faults are difficult to detect when a double fault has occurred and only one DTC has set. If the scan tool displays faults for multiple components (i.e.VSS, ECT, Batt Temp, etc.) identify and check the shared circuits for**

possible problems before continuing (i.e. sensor grounds or 5-volt supply circuits). Refer to the appropriate wiring diagrams to identify shared circuits. For more information, refer to the appropriate Diesel Powertrain Diagnostic Information .

POWERTRAIN CONTROL MODULE

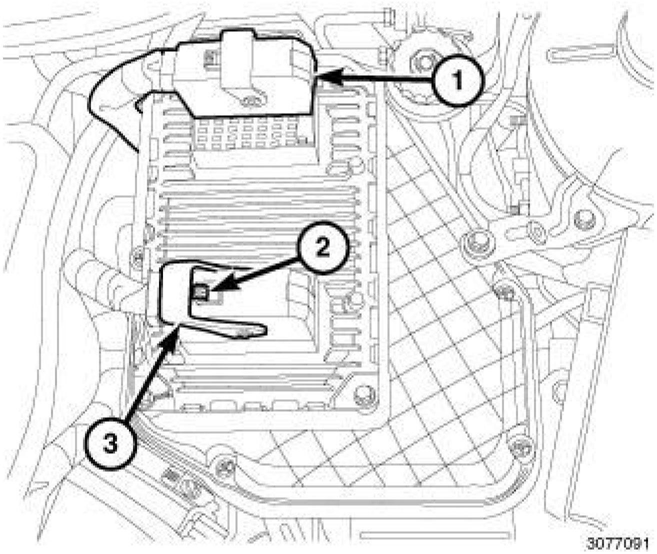

Fig. 12: Powertrain Control Module connectors
Courtesy of CHRYSLER GROUP, LLC

The PCM receives input signals from various switches and sensors that are referred to as PCM Inputs. Based on these inputs, the PCM adjusts various engine and vehicle operations through devices that are referred to as PCM Outputs.

NOTE: PCM Inputs:

- Air Conditioning Controls
- Battery Voltage
- Brake Switch
- Camshaft Position Sensor
- Clutch Upstop Switch
- Clutch Interlock
- Crankshaft Position Sensor
- Engine Coolant Temperature Sensor

- Fuel Level Sensor (Bus message)
- Ignition Switch
- Intake Air Temperature Sensor
- Knock Sensor
- Evaporative System Integrity Monitor
- Manifold Absolute Pressure (MAP) Sensor
- Oil Pressure Switch
- Oxygen Sensors
- Power Steering Pressure Switch
- Speed Control Switches
- Vehicle Speed Sensor (MTX-equipped models)

NOTE: PCM Outputs:

- Air Conditioning Clutch Relay
- Charging Indicator Lamp (Bus Message)
- Proportional Purge Solenoid
- Fuel Injectors
- Generator Field
- Ignition Coils
- Malfunction Indicator (Check Engine) Lamp (Bus Message)
- Manifold Flow Valve
- Oxygen Sensors Heater Controls
- Variable Valve Timing
- Vehicle Speed (Manual Transmission)

Based on inputs it receives, the PCM adjusts fuel injector pulse width, idle speed, ignition spark advance, ignition coil dwell and EVAP canister purge operation. The PCM also determines the appropriate transmission shift schedule and shift points, depending on the present operating conditions and driver demand. The PCM regulates the cooling fan, air conditioning and speed control systems. The PCM changes generator charge rate by adjusting the generator field. The PCM also performs diagnostics.

The PCM adjusts injector pulse width (air-fuel ratio) based on the following inputs.

- Battery voltage
- Coolant temperature
- Exhaust gas content (oxygen sensor)
- Engine speed (crankshaft position sensor)
- Intake air temperature
- Manifold absolute pressure
- Throttle position

The PCM adjusts ignition timing based on the following inputs.

- Coolant temperature
- Engine speed (crankshaft position sensor)
- Knock sensor
- Manifold absolute pressure
- Throttle position
- Transmission gear selection (park/neutral switch)
- Intake air temperature

The PCM also adjusts engine idle speed through the idle air control motor based on the following inputs.

- Air conditioning sense
- Battery voltage
- Brake switch
- Coolant temperature
- Engine speed (crankshaft position sensor)
- Engine run time
- Manifold absolute pressure
- Power steering pressure switch
- Throttle position
- Transmission gear selection (park/neutral switch)
- Vehicle distance (speed)

The camshaft position sensor and crankshaft position sensor signals are sent to the PCM. If the PCM does not receive the signal within approximately 1 second of engine cranking, it deactivates the fuel pump. When these are deactivated, power is shut off to the fuel injectors, ignition coils, oxygen sensor heating elements and fuel pump.

The PCM contains a voltage converter that changes battery voltage to a regulated 5 volts direct current to power the camshaft position sensor, crankshaft position sensor, manifold absolute pressure sensor, throttle position sensor, A/C pressure switch, A/C pressure transducer, and vehicle speed sensor.

STANDARD PROCEDURE

OBTAINING DIAGNOSTIC TROUBLE CODES

BULB CHECK

Key on: Bulb illuminated until vehicle starts, as long as all once per trip (readiness) monitors completed. If monitors have **not** been completed, then: Key on: bulb check for about 5 to 8 seconds, lamp then flashes if once per trip (readiness) monitors have **not** been completed until vehicle is started, then MIL is extinguished.

OBTAINING DTC'S USING SCAN TOOL

1. Connect the scan tool to the data link (diagnostic) connector. This connector is located in the passenger compartment; at the lower edge of instrument panel; near the steering column.
2. Turn the ignition switch on and access the "Read Fault" screen.
3. Record all the DTC's and "freeze frame" information shown on the scan tool.
4. To erase DTC's, use the "Erase Trouble Code" data screen on the scan tool.**Do not erase any DTC's until problems have been investigated and repairs have been performed.**

PINION FACTOR SETTING

NOTE: This procedure must be performed if the PCM has been replaced with a NEW or replacement unit. Failure to perform this procedure will result in an inoperative or improperly calibrated speedometer.

The vehicle speed readings for the speedometer are taken from the output speed sensor. The PCM must be calibrated to the different combinations of equipment (final drive and tires) available. Pinion Factor allows the technician to set the Powertrain Control Module initial setting so that the speedometer readings will be correct. To properly read and/or reset the Pinion Factor, it is necessary to use a scan tool.

1. Plug the scan tool into the diagnostic connector located under the instrument panel.
2. Select the Transmission menu.
3. Select the Miscellaneous menu.
4. Select Pinion Factor. Then follow the instructions on the scan tool screen.

STANDARD PROCEDURE - PCM/ECM REPROGRAMMING - GAS

Refer to **STANDARD PROCEDURE** and perform the PCM/TCM PROGRAMMING procedure.

STANDARD PROCEDURE - PCM/ECM REPROGRAMMING - DIESEL

Refer to **STANDARD PROCEDURE** and perform the PCM/ECM / TCM PROGRAMMING procedure.

REMOVAL

REMOVAL - PCM

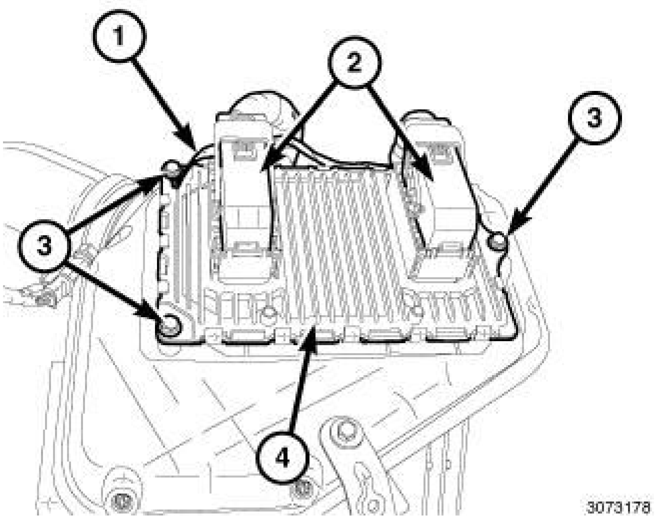

Fig. 13: Electrical Connectors, PCM, Three Mounting Bolts & Ground Wire
Courtesy of CHRYSLER GROUP, LLC

USE THE SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE CODE (DTC) MAY BE SET.

To avoid possible voltage spike damage to PCM, ignition key must be off, and negative battery cable must be disconnected before unplugging PCM connectors.

1. Disconnect and isolate the negative battery cable.
2. Unlock and disconnect the electrical connectors (2) from the PCM (4).
3. Remove the three mounting bolts (3) and ground wire (1).
4. Remove the PCM (4) from the air cleaner body cover.

PCM DIESEL

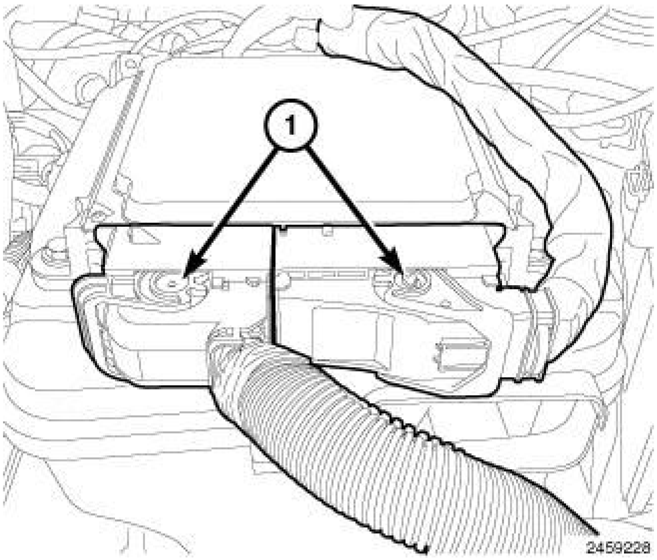

Fig. 14: PCM Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

1. Disconnect negative battery cable.
2. Disconnect the Powertrain Control Module (PCM) harness connectors (1).

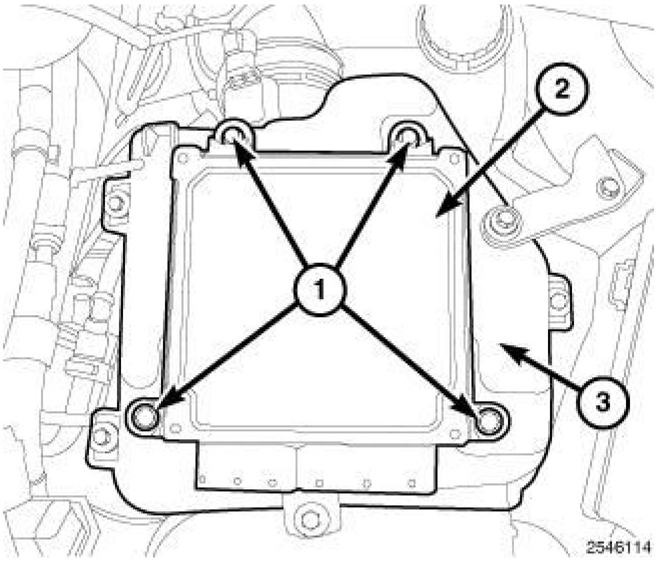

Fig. 15: Identifying Powertrain Control Module Components
Courtesy of CHRYSLER GROUP, LLC

3. Remove bolts (1) and the PCM (2) from the air cleaner housing (3).

INSTALLATION

INSTALLATION - PCM

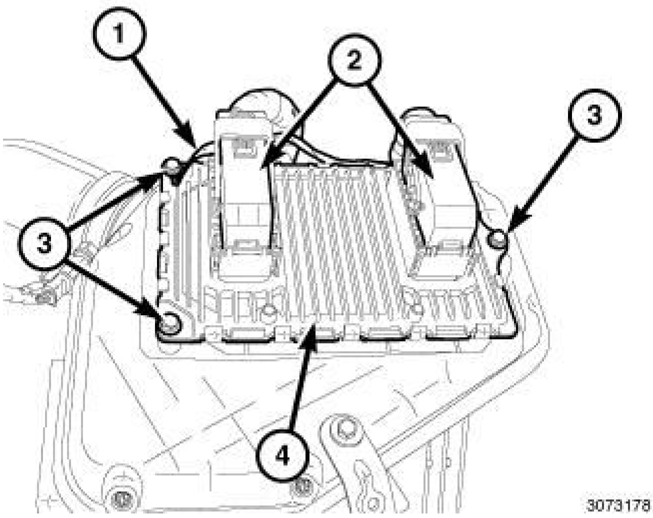

Fig. 16: Electrical Connectors, PCM, Three Mounting Bolts & Ground Wire
Courtesy of CHRYSLER GROUP, LLC

USE THE SCAN TOOL TO REPROGRAM THE NEW POWERTRAIN CONTROL MODULE (PCM) WITH THE VEHICLES ORIGINAL IDENTIFICATION NUMBER (VIN) AND THE VEHICLES ORIGINAL MILEAGE. IF THIS STEP IS NOT DONE, A DIAGNOSTIC TROUBLE

CODE (DTC) MAY BE SET.

1. Position the PCM (4) on the air cleaner body cover.
2. Install three mounting bolts (3) with one ground wire (1) and tighten to 10 N.m (89 in. lbs.).
3. Check pins in electrical connectors for damage. Repair as necessary.
4. Connect and lock the electrical connectors (2).
5. Connect the negative battery cable and tighten nut to 5 N.m (45 in. lbs.).
6. Use the scan tool to reprogram new PCM with vehicles original Identification Number (VIN) and original vehicle mileage.

PCM DIESEL

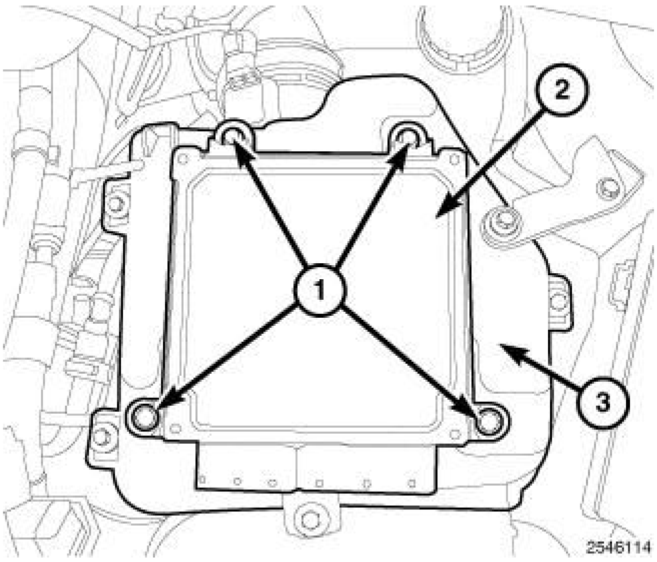

Fig. 17: Identifying Powertrain Control Module Components
Courtesy of CHRYSLER GROUP, LLC

1. Install Powertrain Control Module (PCM) onto the air cleaner housing. Tighten bolts to 11 N.m (97 in. lbs.).

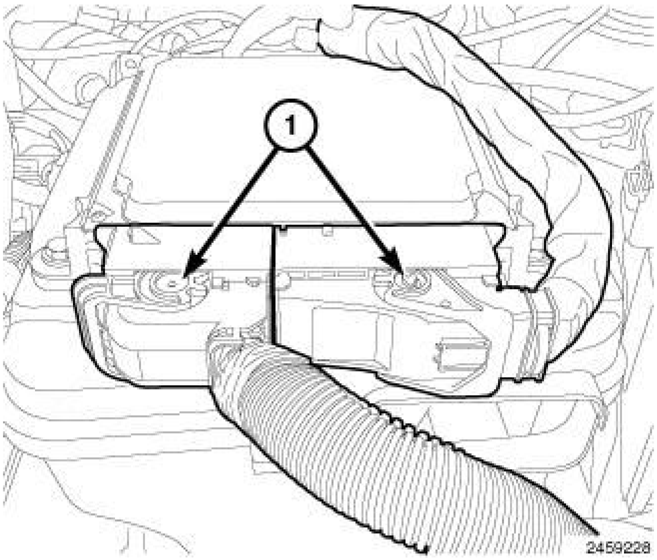

Fig. 18: PCM Harness Connectors
Courtesy of CHRYSLER GROUP, LLC

2. Connect both PCM (2) harness connectors.
3. Connect negative battery cable.
4. Reprogram the PCM. Refer to **MODULE, POWERTRAIN CONTROL, STANDARD PROCEDURE**.

MODULE, STEERING COLUMN

DESCRIPTION

DESCRIPTION

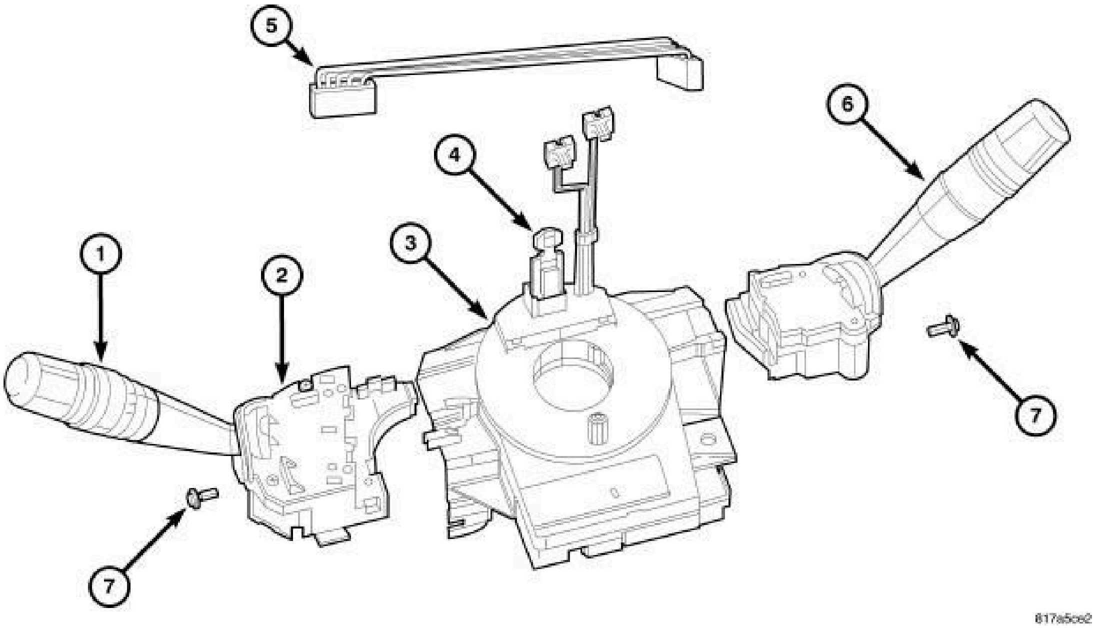

Fig. 19: Steering Control Module
Courtesy of CHRYSLER GROUP, LLC

This vehicle is equipped with a Steering Control Module (SCM) that is internal to the left multifunction switch housing (2). The left (lighting) multifunction switch is located on the left side of the steering column, just below the steering wheel. This switch is the primary control for the interior and exterior lighting systems. The only visible components of the switch are the control stalk (1), control knob and control sleeve that extend through the steering column shrouds on the left side of the column. The remainder of the switch including its mounting provisions and electrical connections are concealed beneath the shrouds.

The switch housing and controls are constructed of molded black plastic. A single screw (7) through a mounting tab integral to the back of the switch housing, and a slide tab integral to the bottom of the switch housing secure the switch to the mounting bracket integral to the clockspring (3). A connector receptacle containing seven terminal pins is integral to the inboard end of the switch housing and connects the SCM through a jumper wire harness (5) directly to the right (wiper) multifunction switch (6). A second connector receptacle containing four terminal pins is integral to the back of the switch housing and connects the SCM to the vehicle electrical system through a dedicated takeout and connector of the instrument panel wire harness.

The SCM cannot be adjusted or repaired. If ineffective or damaged the entire left multifunction switch must be replaced. Refer to **SWITCH, MULTIFUNCTION, LEFT, REMOVAL** . The clockspring (with the multifunction switch mounting bracket), the left multifunction switch (with the SCM), the right multifunction switch and the jumper wire harness are each available for separate service replacement.

OPERATION

OPERATION

The microprocessor-based Steering Control Module (SCM) utilizes integrated circuitry to monitor hard wired analog and multiplexed inputs from both the right and left multifunction switches. In response to those inputs, the internal circuitry of the SCM allow it to transmit electronic message outputs to the ElectroMechanical Instrument Cluster (EMIC) (also known as the Cab

Compartment Node/CCN) over the Local Interface Network (LIN) data bus.

In response to the SCM inputs the internal circuitry and programming of the EMIC, which is also the LIN master module in the vehicle, allow it to control and integrate many electronic functions and features of the vehicle through both hard wired outputs and the transmission of electronic message outputs to other electronic modules in the vehicle over the Controller Area Network (CAN) data bus. Refer to **COMMUNICATION, DESCRIPTION**.

The SCM is connected to both a fused B(+) circuit and a fused ignition switch output (run-start) circuit. It receives a path to ground at all times. These connections allow it to remain functional regardless of the ignition switch position. Any input to the SCM that controls a vehicle system function that does not require that the ignition switch be in the ON position such as turning on the lights, prompts the SCM to wake up and transmit on the LIN data bus.

The hard wired circuits between components related to the SCM may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the SCM or the electronic controls and communication between modules and other devices that provide some features of the SCM. The most reliable, efficient and accurate means to diagnose the SCM or the electronic controls and communication related to SCM operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

DIAGNOSIS AND TESTING

DIAGNOSIS AND TESTING - STEERING COLUMN MODULE

WARNING: **To avoid serious or fatal injury on vehicles equipped with airbags, disable the Supplemental Restraint System (SRS) before attempting any steering wheel, steering column, airbag, seat belt tensioner, impact sensor or instrument panel component diagnosis or service. Disconnect and**

isolate the battery negative (ground) cable, then wait two minutes for the system capacitor to discharge before performing further diagnosis or service. This is the only sure way to disable the SRS. Failure to take the proper precautions could result in accidental airbag deployment.

The hard wired circuits between components related to the Steering Control Module (SCM) may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin out information and location views for the various wire harness connectors, splices and grounds.

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the SCM or the electronic controls and communication between modules and other devices that provide some features of the SCM. The most reliable, efficient and accurate means to diagnose the SCM or the electronic controls and communication related to SCM operation requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

MODULE, TRANSMISSION CONTROL

DESCRIPTION

DESCRIPTION

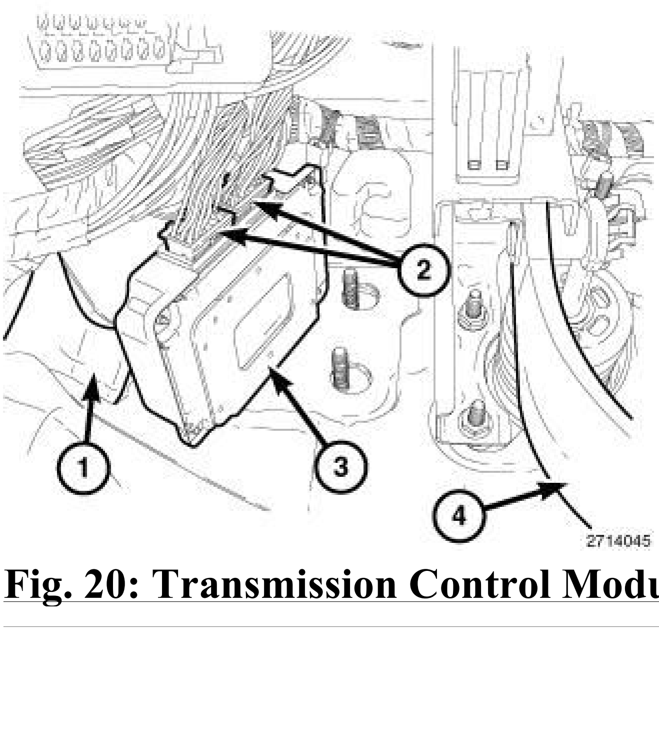

Fig. 20: Transmission Control Module (TCM)

Courtesy of CHRYSLER GROUP, LLC

The transmission control module (TCM) (3) is inside the car, behind the instrument panel to the right of the left kick panel (1) where the clutch pedal would be located. New controllers are shipped with generic software but need to be initialized for the vehicle into which it is installed. Refer to **MODULE, TRANSMISSION CONTROL, STANDARD PROCEDURE**.

OPERATION

OPERATION

SHIFT CONTROL

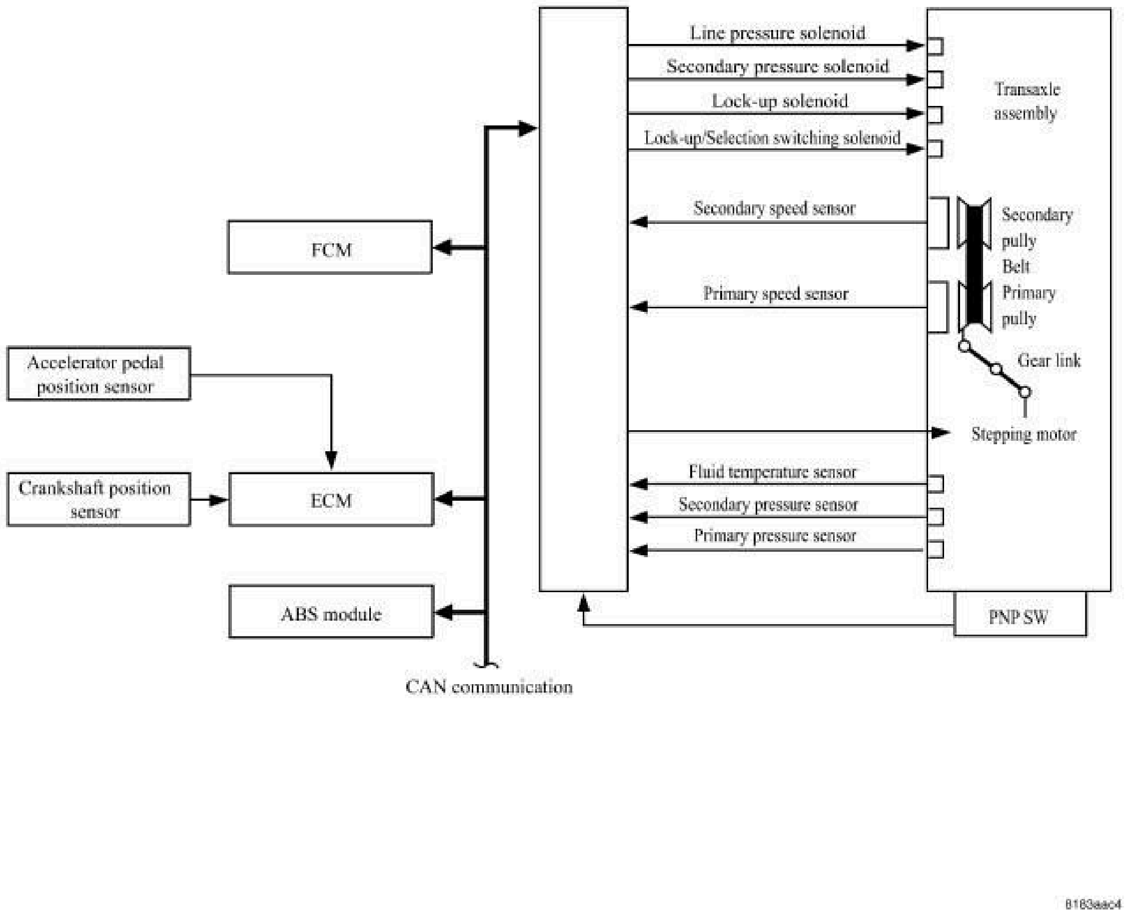

Fig. 21: CAN Communication Schematic
Courtesy of CHRYSLER GROUP, LLC

In order to select the gear ratio which can obtain the driving force in accordance with driver's intention and the vehicle condition, TCM monitors the driving conditions, such as the vehicle speed and the throttle position and selects the optimum gear ratio, and determines the gear change steps to the gear ratio. Then it sends the command to the stepping motor, and controls the flow-in/flow-out of line pressure to/from the primary pulley to determine the position of the moving-pulley and control the gear ratio.

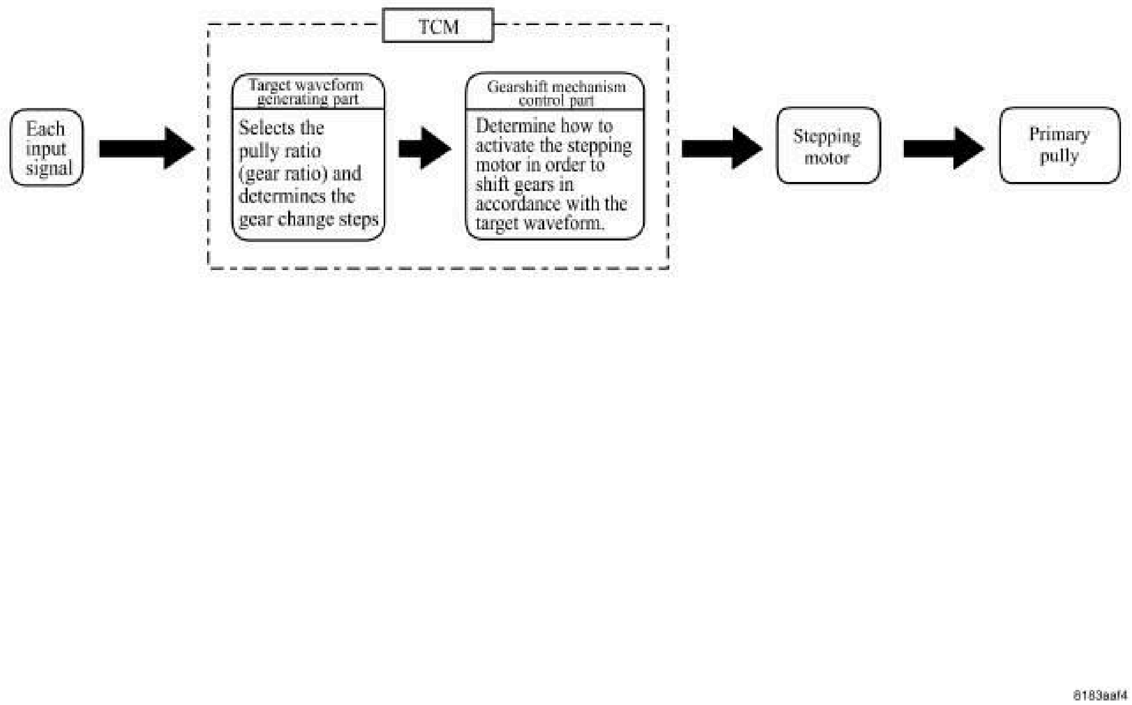

Fig. 22: Gear Ratio
Courtesy of CHRYSLER GROUP, LLC

Selection of the gear ratio is set for every position separately.

"DRIVE" POSITION

Shifting is available over all the ranges of gear ratios from the lowest to the highest.

WHEN USING THE MANUAL MODE (VEHICLES WITH THE MANUAL MODE)

When the manual mode switch is turned ON, the fixed changing gear line is set. By moving the switch to + side or - side, shift change is like a M/T and selects from a range of 6 pre-programmed gear ranges.

By limiting the shift to the area nearest the low side of the gear ratio, a larger driving force and engine brake are secured.

DOWNHILL ENGINE BRAKE CONTROL

When a downhill condition is detected while the accelerator pedal is released, the engine brake will be increased by downshifting so as to limit acceleration of the vehicle. Also, if uphill is detected, acceleration performance is improved by limiting the shift area on the highest side of the gear ratio.

ACCELERATION CONTROL

According to vehicle speed and a increase of accelerator pedal angle, driver's request for acceleration as well as driving conditions are measured. At the time of starting or acceleration while moving, this function improves in acceleration feeling by making the engine speed proportionate to the vehicle speed. Even at the time of slower acceleration, a shift map which can gain a larger driving force is chosen for compatibility of mileage with driveability.

LINE PRESSURE AND SECONDARY PRESSURE CONTROL

Control of line pressure and secondary pressure with a high degree of accuracy has reduced friction and improved fuel economy.

NORMAL FLUID PRESSURE CONTROL

The line pressure and the secondary pressure are optimized depending on driving conditions, on the basis of the throttle position, the engine speed, the primary pulley (input) revolution speed, the secondary pulley (output) revolution speed, the stop lamp SW signal, the PNP switch signal, the lock-up signal, the voltage, the target gear ratio, the fluid temperature, and the fluid pressure.

SECONDARY PRESSURE FEEDBACK CONTROL

When controlling the normal fluid pressure or the fluid pressure at the time of selection, the secondary pressure can be set more accurately by using the fluid pressure sensor to detect the secondary pressure and performing the feedback control.

LOCK-UP CONTROL

The lock-up applied gear range has been expanded by locking up the torque converter at a lower vehicle speed than conventional A/T models.

SELECTION CONTROL

When selecting between N (P) and D (R) position, the optimum operating pressure is set on the basis of the throttle position, the engine speed, and the secondary pulley (output) revolution speed to lessen the select shock.

CAN COMMUNICATION

Real-time communications (signal exchanges) are maintained among the control units such as the CVT, C/U, ECM, combination meter etc. Each unit is controlled optimally depending on vehicle driving conditions while sharing information and in cooperating with the other control units.

In CAN (Controller Area Network) communication, control units are connected with two communication lines (CAN-H line, CAN-L line) allowing a high rate of information to be transmitted by fewer wirings. Each control unit transmits/receives data but selectively reads required data only.

INPUTS AND OUTPUTS

Item		Shift Control	Line Pressure Control	Selection Control	Lock-up Control	CAN Communication Control	Fail-sa Functi (Note
	Engine speed signal		X	X	X	X	X
	Accelerator pedal position signal	X	X	X	X	X	X
	Closed throttle position	X			X	X	

Input	signal						
	Stop lamp SW signal	X	X		X	X	X
	Primary pressure sensor		X				
	Secondary pressure sensor		X	X			X
	Fluid temperature sensor	X	X	X	X		X
	Primary speed sensor	X	X		X		X
	Secondary speed sensor	X	X	x	X		X
	PNP switch	X	X	X	X		X
Output	Line pressure solenoid value		X	x			X
	Secondary pressure solenoid value		X	X			X
	Lock-up solenoid value			X	X		X
	Lock-up/Selection switching solenoid value			X	X		X
	Stepping motor	X					X

ENGINE/CVT INTEGRATION CONTROL (CAN COMMUNICATION CONTROL)

In order to improve gearshift feeling and to perform controls such as prevention of engine slowdown, engine power control signals are intercommunicated between the engine ECM and the TCM, and real-time cooperative controls depending on vehicle driving conditions are performed.

TCM sends information such as fast slowdown signals, lock-up signals, torque down request signals to ECM, while receiving information such as torque down permission/prohibition signals, lock-up permission/prohibition signals, throttle position from ECM.

FAIL-SAFE FUNCTION

If an unexpected signal is sent from any sensor, switch, solenoid etc., this function controls the CVT to make driving as smooth as possible.

SECONDARY SPEED SENSOR

The shift pattern is changed in accordance with throttle position when an unexpected signal is sent from the output speed sensor (secondary speed sensor) to the TCM. The manual mode position or the sports mode position is inhibited, and the transaxle is put in "D".

PRIMARY SPEED SENSOR

The shift pattern is changed in accordance with throttle position and secondary speed (vehicle speed) when an unexpected signal is sent from the primary speed sensor to the TCM. The manual mode function or the sports mode function is inhibited, and the transaxle is put in "D".

PNP SWITCH

If an unexpected signal is sent from the PNP switch to the TCM, the transaxle is put in "D".

FLUID TEMPERATURE SENSOR

If an unexpected signal is sent from the fluid temperature sensor to the TCM, the gear ratio obtained immediately before receiving the unexpected signal is maintained and the gear ratio is controlled to keep engine speed under 5, 000 rpm (approximately), depending on driving conditions.

SECONDARY PRESSURE SENSOR

If an unexpected signal is sent from the secondary pressure sensor to the TCM, the secondary pressure feedback control is stopped and the offset value obtained immediately before the non-standard condition occurs is used to control line pressure.

LINE PRESSURE SOLENOID

If an unexpected condition of the solenoid is detected by the TCM, the line pressure solenoid is turned OFF to achieve the maximum fluid pressure.

SECONDARY PRESSURE SOLENOID

If an unexpected condition of the secondary solenoid is detected by the TCM, the secondary pressure solenoid is turned OFF to achieve the maximum fluid pressure.

LOCK-UP SOLENOID

If an unexpected condition of the lock-up solenoid is detected by the TCM, the lock-up solenoid is turned OFF to cancel the lock-up.

STEPPING MOTOR

If an unexpected condition of the stepping motor is detected by the TCM, the stepping motor coil phases "A" through "D" are all turned OFF to hold the gear ratio used immediately before the unexpected condition occurred.

LOCK-UP/SELECTION SWITCHING SOLENOID

If an unexpected condition of the solenoid is detected by the TCM, the lock-up/selection switching solenoid is turned OFF to cancel the lock-up.

BACKUP POWER SUPPLY

Transaxle assembly is protected by limiting the engine torque when the memory back-up power supply for controlling from the battery is not supplied to the TCM. Normal status is restored when turning the ignition switch OFF to ON after power is normally supplied

TCM

- 1. Shift control
- 2. Line pressure control

- 3. Selection control
- 4. Lock-up control
- 5. Engine/CVT integration control [CAN communication control]
- 6. Self-diagnosis function
- 7. Fail-safe function

PRIMARY SPEED SENSOR, SECONDARY SPEED SENSOR

Primary Speed Sensor It is installed near the CVT fluid cooler in the transaxle case. It sends rotating speed of the primary pulley (input shaft) to the TCM as a pulse signal.

Secondary Speed Sensor It is installed near the output gear part in the transaxle case. It sends rotating speed of the secondary pulley (output shaft) to the TCM as a pulse signal. TCM converts the pulse signal to vehicle speed.

STANDARD PROCEDURE

STANDARD PROCEDURE - TRANSMISSION CONTROL MODULE INITIALIZATION

NOTE: Refer to the following chart when the Transmission Control Module (TCM) and/or transaxle has been replaced to determine if the TCM memory must be erased.

<table>
<tr><th>TCM</th><th>Transaxle</th><th>Erase Memory?</th></tr>
<tr><td>New Module</td><td>Not Replaced</td><td>Not Required</td></tr>
<tr><td>Not Replaced</td><td>Replaced</td><td rowspan="2">Required, Refer to RELEARN, AFTER REPLACING A TRANSAXLE.</td></tr>
<tr><td>Replaced With Used Module</td><td>N/A</td></tr>
</table>

INITIAL LEARN (BRAND-NEW MODULE, MEMORY ALREADY CLEAR)

Battery must be connected. If the Totally Integrated Power Module (TIPM) is to be configured, configure the TIPM and then turn ignition key to OFF/LOCKED briefly, then back to RUN. The shifter must be in PARK or NEUTRAL, engine not running.

1. Turn the ignition key to RUN for 4 seconds to allow reading of new values.
2. Turn ignition key to OFF/LOCKED for 2 seconds to allow storing new values in EEROM.
3. Turn the ignition key to RUN, with scan tool clear DTCs.
4. Turn ignition key to OFF/LOCKED for 2 seconds.
5. After at least 7 seconds, read DTCs.
6. If DTCs resets, refer to **DIAGNOSIS AND TESTING** .

RELEARN, AFTER REPLACING A TRANSAXLE

1. Turn ignition key to RUN.
2. Clear learning memory using the scan tool.
3. Turn the ignition key to OFF/LOCKED for 2 seconds.
4. Turn the ignition key to RUN Clear DTCs.
5. Turn the ignition key to OFF/LOCKED for 2 seconds.
6. Turn ignition key to RUN.
7. After at least 7 seconds, read DTCs.
8. If DTCs resets, refer to **DIAGNOSIS AND TESTING** .

REMOVAL

REMOVAL

NOTE: LHD model shown in illustrations. RHD model TCM located in similar area on Left side of interior.

1. Disconnect negative battery cable.

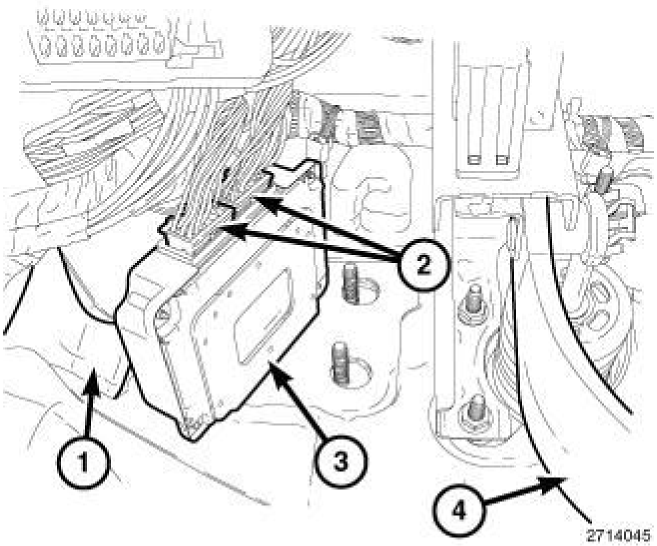

Fig. 23: Transmission Control Module (TCM)
Courtesy of CHRYSLER GROUP, LLC

NOTE: The TCM is located on the bulkhead near the left kick panel.

2. If equipped, remove silencer pad on left side.

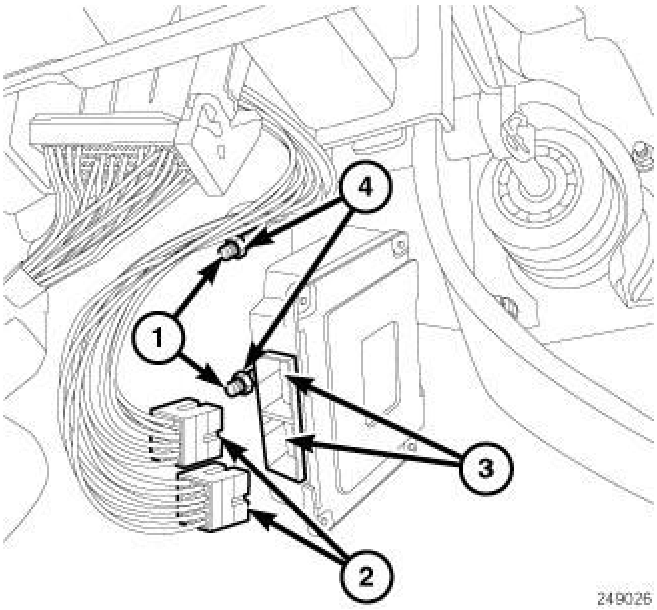

Fig. 24: TCM Unplugged
Courtesy of CHRYSLER GROUP, LLC

3. Disconnect the two electrical connectors (2) at the TCM (3).
4. Position body harness to the side to gain access to the TCM mounting studs.
5. Remove the two nuts that hold the TCM to the bulkhead.

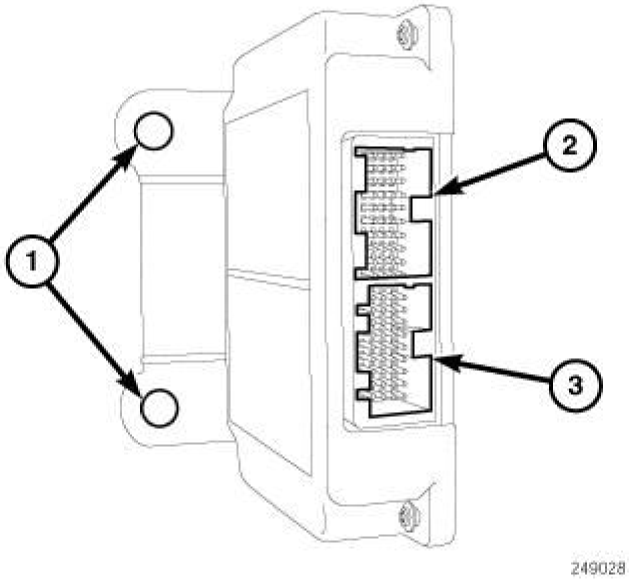

Fig. 25: TCM Out
Courtesy of CHRYSLER GROUP, LLC

6. Slide the TCM off the mounting studs (1) and remove from the vehicle.

INSTALLATION

INSTALLATION

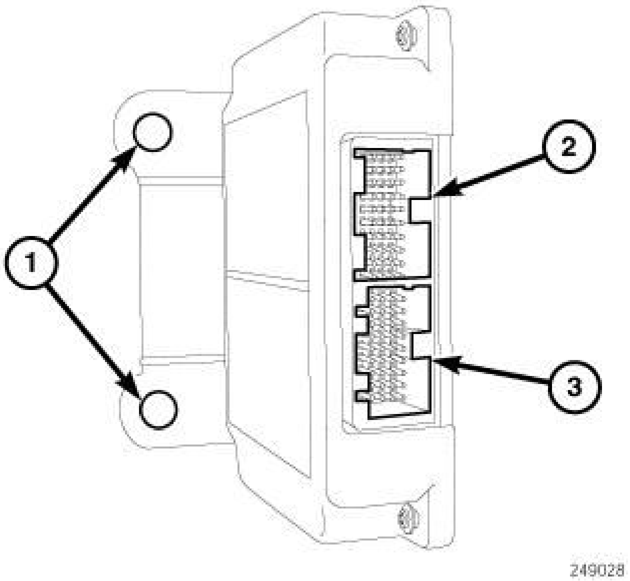

Fig. 26: TCM Out
Courtesy of CHRYSLER GROUP, LLC

1. Install the TCM mounting bracket holes (1) over the two studs on the bulkhead.

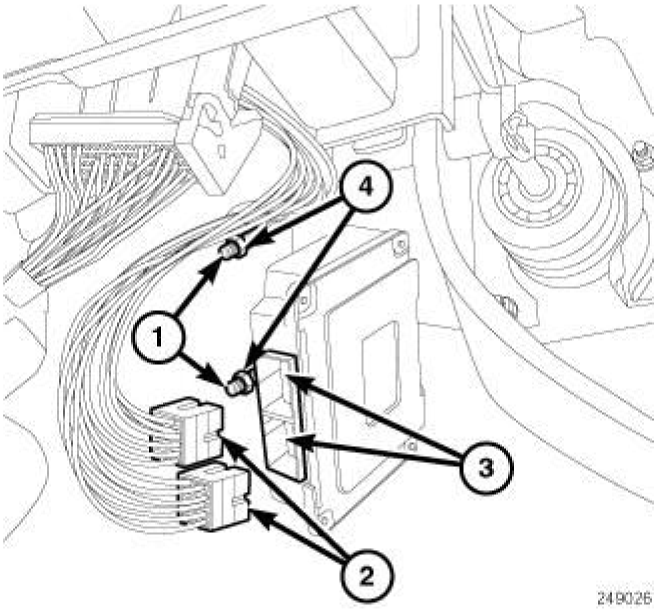

Fig. 27: TCM Unplugged
Courtesy of CHRYSLER GROUP, LLC

2. Install the two nuts (4) to mounting studs (1) on the bulkhead.
3. Position the body harness aside to gain access to the mounting studs.
4. Tighten nuts (4) to 15 N.m (133 in. lbs.).
5. Plug in electrical connectors (2) to TCM (3).
6. If a new TCM is installed a learn procedure must be performed.