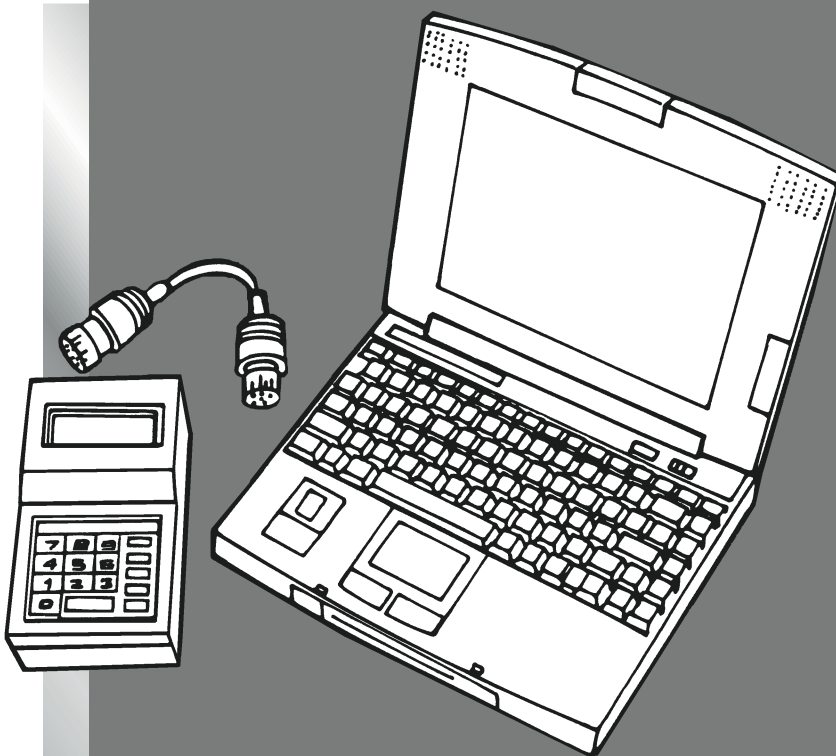
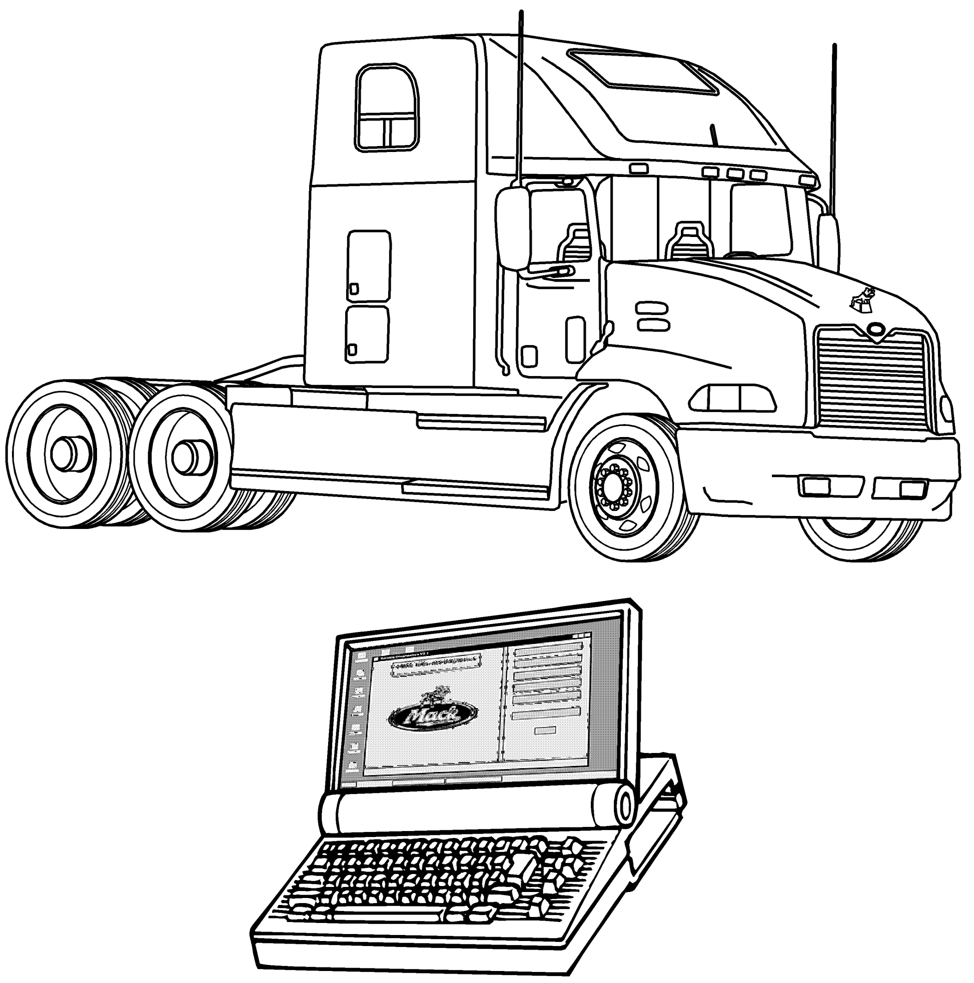


V-MAC® III

SERVICE MANUAL

OCTOBER 2008
(REVISED)
8-211

V-MAC® III SERVICE MANUAL



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V-MAC III Diagnostic Equipment

OCTOBER 2008
(REVISED — SUPERSEDES ISSUE DATED JULY 2006)

8-211

ATTENTION

The information in this manual is not all inclusive and cannot take into account all unique situations. Note that some illustrations are typical and may not reflect the exact arrangement of every component installed on a specific chassis.

The information, specifications, and illustrations in this publication are based on information that was current at the time of publication.

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NOTES

INTRODUCTION

SAFETY INFORMATION

Advisory Labels

Cautionary *signal words* (Danger-Warning-Caution) may appear in various locations throughout this manual. Information accented by one of these signal words must be observed to minimize the risk of personal injury to service personnel, or the possibility of improper service methods which may damage the vehicle or cause it to be unsafe. Additional Notes and Service Hints are used to emphasize areas of procedural importance and provide suggestions for ease of repair. The following definitions indicate the use of these advisory labels as they appear throughout the manual:

D A N G E R

Activities associated with* Danger *indicate that death or serious personal injury may result from failing to heed the advisory. Serious personal injury may be equated to career-ending injury.

W A R N I N G

Activities associated with *Warning* indicate that personal injury may result from failing to heed the advisory. In this case, personal injury is not equated to career-ending injury, but results in possible change in quality of life.

C A U T I O N

Activities associated with **Caution** *indicate that product damage may result from failing to heed the advisory. Caution is not used for personal injury.*

N O T E

A procedure, practice, or condition that is essential to emphasize.

S E R V I C E H I N T

A helpful suggestion that will make it quicker and/or easier to perform a procedure, while possibly reducing service cost.

Service Procedures and Tool Usage

Anyone using a service procedure or tool not recommended in this manual must first satisfy himself thoroughly that neither his safety nor vehicle safety will be jeopardized by the service method he selects. Individuals deviating in any manner from the instructions provided assume all risks of consequential personal injury or damage to equipment involved.

Please note that particular service procedures may require the use of a special tool(s) designed for a specific purpose. These special tools must be used in the manner described, whenever specified in the instructions.

WARNING

1. **Before starting a vehicle always be seated in the driver's seat, place the transmission in Neutral, be sure that parking brakes are set, and disengage the clutch (if equipped).**
2. **Before working on a vehicle, place the transmission in Neutral, set the parking brakes, and block the wheels.**
3. **Before towing the vehicle, place the transmission in Neutral and lift the rear wheels off the ground, or disconnect the driveline to avoid damage to the transmission during towing.**

DANGER

Engine-driven components such as Power Take-Off (PTO) units, fans and fan belts, driveshafts and other related rotating assemblies can be very dangerous. Do not work on or service engine-driven components unless the engine is shut down. Always keep body parts and loose clothing away from these components to prevent serious personal injury. Be aware of PTO engagement or non-engagement status. Always disengage the PTO when not in use.

REMEMBER,
SAFETY ... IS NO ACCIDENT!

Clean Air Act

The federal government expressly prohibits individuals and facilities from removing, modifying, or bypassing any component or design element that affects a vehicle's exhaust emission levels. Any individual who removes, modifies, or bypasses any vehicle emission controls is subject to a fine of up to $2500. Any repair facility that removes, modifies, or bypasses any vehicle emission controls is subject to a fine of up to $25,000.

ABOUT THIS MANUAL

This Manual is intended to provide the technician with the information necessary to diagnose and repair the V-MAC III (Vehicle Management and Control) System on the CH, CL, CV, CX, DM, LE, MR, RB and RD models. Although every effort has been made to ensure that all the information is as accurate as possible, due to our product upgrades, some information may not be applicable to all chassis. Not all chassis are equally equipped, and care should be taken to determine exactly what equipment is installed on the vehicle.

Please pay particular attention to the Notes, Cautions and Warnings which are placed throughout the manual. These are intended to call attention to specific procedures which must be followed.

Please take the time to familiarize yourself with the contents of this manual before attempting to work on a vehicle. Make sure you completely understand the instructions for performing a test before beginning the test procedure. Do not attempt to save time by skipping steps or using procedures other than those listed in this manual.

NOTE

References in this manual to ASET™ IEGR engines include the AI and AMI model engines. References to ASET™ CEGR engines include the AC models.

NOTE

Many of the electrical schematic diagrams in this manual show multiple occurrences of the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU). The diagrams are formatted in this way for clarity and ease of use, and do not imply that more than one VECU or EECU is installed on any vehicle.

DESCRIPTION AND OPERATION

V-MAC III SYSTEM OVERVIEW

The V-MAC III System uses two electronic control modules; the Engine Electronic Control Unit (EECU), and the Vehicle Electronic Control Unit (VECU). Together, the two modules operate and communicate through the J1939 high speed serial data line to control a variety of engine and vehicle cab functions. The Engine Electronic Control Unit (EECU) primarily controls fuel timing and delivery, fan operation, engine protection functions and engine brake operation. On ASET™ CEGR engines, the EECU also controls the EGR valve and the turbocharger vane position. The Vehicle Electronic Control Unit (VECU) controls engine speed, cruise control functions, accessory relay controls and idle shutdown functions. The Vehicle Electronic Control Unit also performs the trip recorder functions. Both the EECU and the VECU have the capability to communicate over the J1587 low speed data lines to provide data to the Co-Pilot display, Vehicle Information Profiler (VIP™), scan tools and other electronic modules.

In addition to their control functions, both modules have on-board diagnostic capabilities. The on-board diagnostics are designed to detect faults or abnormal conditions that are not within normal operating parameters. When the system detects a fault or abnormal condition, the fault will be logged in one or both of the modules' memory, and the vehicle operator will be advised that a fault has occurred by illumination of the Electronic Malfunction Lamp (EML). The module will also initiate the engine shutdown procedure if the system determines that the fault will severely damage the engine.

In some situations when a fault is detected, the system will enter the 'limp home' mode. The limp home mode allows continued vehicle operation but the system may substitute a sensor or signal value that may result in poor performance. In some instances, the system will continue to function but engine power may be limited to protect the engine and vehicle. Fault codes logged in the system memory can later be read, to aid in diagnosing the faults, with a diagnostic computer or by counting the blink code from the Electronic Malfunction Lamp (EML). Faults read using the blink code method are always active faults, meaning the fault is occurring presently. When diagnosing an intermittent code or condition, it is necessary to use a diagnostic computer connected to the Serial Communication Port. Additional data and diagnostic tests are available when a diagnostic computer is connected to the Serial Communication Port.

The Vehicle Electronic Control Unit (VECU) is mounted on a panel underneath the dashboard directly in front of the passenger seat on conventional models. On the LE, the VECU is located under the left side floor panel. On the MR, the VECU is mounted under the tunnel cover. The VECU is a microprocessor based controller programmed to perform several functions, these include:

- Controlling the cruise control and engine speed
- Providing output signals to the speedometer and tachometer
- Controlling the Electronic Malfunction Lamp (EML) Operation
- Operating the Engine Shutdown and Driver Alarm
- Broadcasting data on the serial data lines
- Trip recorder functions
- Diagnostic fault logging and password processing

The VECU performs these functions by monitoring the signals from sensors and switches, and data received over the serial data lines from the EECU. The VECU receives input signals from seven sensors. They are:

- Exhaust Temperature (ET) Sensor
- Fuel Level (FL) Sensor
- Front Drive Axle Oil Temperature (FAOT) Sensor
- Rear Drive Axle Oil Temperature (RAOT) Sensor
- Transmission Oil Temperature (TOT) Sensor
- Throttle Position (TP) Sensor
- Vehicle Speed (MPH) Sensor (VSS)

The VECU also monitors the position or state of a number of switches to perform its control and diagnostic functions. They are:

- Clutch Switch
- Engine Brake Switches
- Fan Override Switch
- Ignition Key Switch
- PTO Switches (if equipped)
- Service and Park Brake Switches
- Speed Control Switches (Set/Decel, Resume/Accel)
- Torque Limit Switch

Two different configurations of the Mack ASET™ engine are currently in production. The ASET™ IEGR (Internal Exhaust Gas Recirculation) engine is similar in design to previous Mack E-Tech engines in that they share common appearance, hardware, and sensors. The ASET™ CEGR (Cooled Exhaust Gas Recirculation) engine has many new features including a redesigned Engine Electronic Control Unit (EECU), a cooled EGR system, and a Variable Turbine Geometry (VTG) Turbocharger system.

The Engine Electronic Control Unit (EECU) is bolted to a fuel cooled mounting plate which is on the left side of the engine on the air intake manifold. The EECU is a microprocessor based controller programmed to perform fuel injection quantity and timing control, diagnostic fault logging, and password processing and to broadcast data to other modules. The fuel quantity and injection timing to each cylinder is precisely controlled to obtain optimal fuel economy and reduced exhaust emissions in all driving situations.

The EECU on the ASET™ IEGR engine controls the operation of the Electronic Unit Injection Pumps, Engine Brake Solenoids, and Fan Control Solenoid based on input information it receives over the serial data lines and from the following sensors:

- A/C Pressure Sensor (if equipped)
- Ambient Air Temperature (AAT) Sensor
- Barometric Pressure (BP) Sensor (inside the EECU)
- Boost Air Pressure (BAP) Sensor
- Engine Coolant Level (ECL) Sensor
- Engine Coolant Temperature (ECT) Sensor
- Engine Oil Level (EOL) Sensor (if equipped)
- Engine Oil Pressure (EOP) Sensor
- Engine Oil Temperature (EOT) Sensor (if equipped)
- Engine Position (EP) Sensor
- Engine Speed (RPM/TDC) Sensor
- Fuel Temperature (FT) Sensor (if equipped)
- Intake Manifold Temperature (IMT) Sensor

The EECU on the ASET™ CEGR engine controls the operation of the Electronic Unit Pumps (EUPs), engine brake solenoids, EGR valve, turbocharger vanes, and cooling fan clutch based on input information it receives over the serial data lines and from the following sensors:

- A/C Pressure Sensor (if equipped)
- Aftercooler Outlet Temperature (AOT) Sensor
- Ambient Air Temperature (AAT) Sensor
- Barometric Pressure (BP) Sensor (inside the EECU)
- Boost Air Pressure (BAP) Sensor
- Compressor Discharge Temperature (CDT) Sensor
- Cooling Fan Speed (CFS) Sensor
- EGR Mass Air Flow (EGRMAF) Sensor
- Engine Coolant Level (ECL) Sensor
- Engine Coolant Temperature (ECT) Sensor
- Engine Oil Level (EOL) Sensor (if equipped)
- Engine Oil Pressure (EOP) Sensor
- Engine Oil Temperature (EOT) Sensor (if equipped)
- Engine Position (EP) Sensor
- Engine Speed (RPM/TDC) Sensor
- Fuel Temperature (FT) Sensor (if equipped)
- Intake Air Temperature and Humidity (IATH) Sensor

- Intake Manifold Temperature (IMT) Sensor
- Turbocharger Wheel Speed (TWS) Sensor
- Variable Turbine Geometry (VTG) Position Sensor

The Vehicle Electronic Control Unit (VECU) and Engine Electronic Control Unit (EECU) are dependent on each other to perform their specific control functions. In addition to switch and sensor data the broadcast of data between modules also includes various calculations and conclusions each module has developed, based on the input information it has received.

Sensors

AFTERCOOLER OUTLET TEMPERATURE (AOT) SENSOR

The Aftercooler Outlet Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the inlet air temperature increases.

The Aftercooler Outlet Temperature Sensor is located on the EGR mixer. The sensor signal is used to control fuel injection timing and quantity.

AMBIENT AIR TEMPERATURE (AAT) SENSOR

The Ambient Air Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the ambient air temperature increases.

The Ambient Air Temperature Sensor is located toward the front of the chassis. The sensor may be mounted in several locations including the front cross member, hood hinge, spring bracket, grill guard, and behind the bumper. The ambient air temperature signal is used to validate the intake air temperature sensor signal to prevent the formation of white smoke when the engine is started after hot soak.

BAROMETRIC PRESSURE (BP) SENSOR

The Barometric Pressure Sensor contains a pressure sensitive diaphragm and an electrical amplifier. Mechanical pressure applied to the diaphragm causes the diaphragm to deflect and the amplifier to produce an electrical signal proportional to the deflection.

The Barometric Pressure Sensor is built into the Engine Electronic Control Unit (EECU).

BOOST AIR PRESSURE (BAP) SENSOR

NOTE

On vehicles equipped with an electronic gauge panel, the Boost Pressure Sensor provides input to the EECU. On vehicles equipped with a standard gauge panel, the Boost Pressure Sensor provides input directly to the gauge panel.

The Boost Air Pressure Sensor contains a pressure sensitive diaphragm and an electrical amplifier. Mechanical pressure applied to the diaphragm causes the diaphragm to deflect and the amplifier to produce an electrical signal proportional to the deflection.

On ASET™ CEGR engines, the Boost Air Pressure (BAP) Sensor is located on the EGR mixer. The sensor monitors the pressure of the air leaving the charge air cooler. The Engine Electronic Control Unit (EECU) uses the pressure signal to optimize EGR valve and turbocharger vane position.

On ASET™ IEGR engines the Boost Air Pressure Sensor is threaded into the top of the intake manifold on the left side of the engine.

COMPRESSOR DISCHARGE TEMPERATURE (CDT) SENSOR

The Compressor Discharge Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the inlet air temperature increases.

The Compressor Discharge Temperature Sensor is located in the air intake pipe between the turbocharger and the charge air cooler. The sensor signal is used for turbocharger protection.

COOLING FAN SPEED (CFS) SENSOR

On ASET™ CEGR engines with an electronically controlled viscous fan drive, the electronic fan drive contains a Hall effect speed sensor. When the engine is running, a series of vanes in the the fan drive housing rotates past a magnet in the the fan drive solenoid generating a pulsed voltage signal. The Engine Electronic Control Unit (EECU) monitors the status of the engine brake solenoids and the air conditioning system and signals from the Engine Coolant Temperature (ECT) Sensor, the Engine Oil Temperature (EOT) Sensor, and the Engine Speed/Timing (RPM/TDC) Sensor and calculates the optimal cooling fan speed. The EECU transmits a pulse width modulated signal to the fan drive solenoid which opens and closes a valve in the primary drive plate, allowing fluid to fill or drain from the fan drive housing until the target fan speed is achieved.

The Cooling Fan Speed Sensor is located in the fan drive on the front of the engine.

EGR MASS AIR FLOW (EGRMAF) SENSOR

The EGR Mass Air Flow (EGRMAF) Sensor consists of an exhaust gas temperature probe, a heater probe, and a dedicated electronic processor. The EGR Electronic Control Unit (EGR ECU) supplies the heater probe with a 12 volt power source. The EGR ECU then monitors the amount of current required to maintain the heater probe at 752°F (400°C). The EGR ECU also monitors the exhaust gas temperature signal from the temperature probe and uses this signal and the heater current signal to calculate EGR flow. The EGR ECU transmits error messages and EGR Mass Air Flow data to the Engine Electronic Control Unit (EECU) over the J1939 serial data lines.

The EGR Mass Air Flow Sensor is located in the outlet of the EGR cooler at the front of the engine. The sensor signal is used to monitor the quantity and temperature of the exhaust gas being introduced into the air intake system.

ENGINE COOLANT LEVEL (ECL) SENSOR

The Engine Coolant Level (ECL) Sensor is a continuity device with two measuring probes. The sensor measures continuity through the engine coolant in the reservoir. If engine coolant level falls below a calibrated point the sensor will not sense continuity between the two measuring probes and the sensor will warn the driver.

The Engine Coolant Level (ECL) Sensor is located in the upper radiator tank or in the cooling system overflow tank.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

The Engine Coolant Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as coolant temperature increases.

The Engine Coolant Temperature Sensor is usually located in the rear of the water manifold. The sensor will indicate a high coolant temperature caused by problems like radiator blockage, thermostat failure, heavy load, or high ambient temperatures. This sensor is also used for cold start enhancement and for fan clutch engagement.

ENGINE OIL PRESSURE (EOP) SENSOR

The Engine Oil Pressure Sensor contains a pressure sensitive diaphragm and a electrical amplifier. Mechanical pressure applied to the diaphragm causes the diaphragm to deflect and the amplifier to produce an electrical signal proportional to the deflection.

The Engine Oil Pressure Sensor is located on top of the oil filter assembly. The sensor monitors engine oil pressure to warn of lubrication system failure.

ENGINE OIL TEMPERATURE (EOT) SENSOR

NOTE

On vehicles equipped with an electronic gauge panel, the Engine Oil Temperature Sensor provides input to the EECU. On vehicles equipped with a standard gauge panel, the Engine Oil Temperature Sensor provides input directly to the gauge panel.

The Engine Oil Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the engine oil temperature increases.

For vehicles with the Engine Electronic Control Unit (EECU) mounted on the right side of the engine, on the air intake manifold, the Engine Oil Temperature Sensor is located in the left side of the engine oil pan. For vehicles with the EECU mounted on the left side of the engine, the Engine Oil Temperature Sensor is located on the oil filter pedestal, above the Engine Oil Pressure Sensor.

ENGINE POSITION (EP) SENSOR

The Engine Position (EP) Sensor is located in the front face of the timing gear cover. It uses magnetic induction to generate a pulsed electrical signal. It senses the passage of seven (7) timing holes on the face of the cam gear. Six of the holes correspond to the phasing of the electronic unit injectors, while the seventh hole indicates the top dead center position.

ENGINE SPEED (RPM/TDC) SENSOR

The Engine Speed (RPM/TDC) Sensor uses magnetic induction to generate a pulsed electrical signal. When the flywheel ring gear teeth pass close to the sensor, electric pulses result.

The Engine Speed Sensor also indicates when the crankshaft is at the top dead center position. The sensor does this by recognizing two “missing” teeth on the ring gear which correspond to top dead center.

EXHAUST TEMPERATURE (ET) SENSOR (PYROMETER)

NOTE

On vehicles equipped with an electronic gauge panel, the Exhaust Temperature Sensor provides input to the VECU. On vehicles equipped with a standard gauge panel, the Exhaust Temperature Sensor provides input directly to the gauge panel.

The Exhaust Temperature Sensor is a Type K thermocouple. The voltage produced by the sensor changes as the vehicle exhaust temperature changes. A circuit inside the Vehicle Electronic Control Unit (VECU) produces a reference voltage. The temperature of the exhaust gas is calculated by comparing the sensor voltage to the reference voltage.

The Exhaust Temperature Sensor is located in the exhaust pipe, just downstream from the turbocharger.

FRONT DRIVE AXLE OIL TEMPERATURE (FAOT) SENSOR

NOTE

On vehicles equipped with an electronic gauge panel, the Front Drive Axle Oil Temperature Sensor provides input to the VECU. On vehicles equipped with a standard gauge panel, the Front Drive Axle Oil Temperature Sensor provides input directly to the gauge panel.

The Front Drive Axle Oil Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the axle oil temperature increases.

The Front Drive Axle Oil Temperature Sensor is located in the axle housing near the differential carrier.

FUEL LEVEL (FL) SENSOR

NOTE

On vehicles equipped with an electronic gauge panel, the Fuel Level (FL) Sensor provides input to the VECU. On vehicles equipped with a standard gauge panel, the Fuel Level (FL) Sensor provides input directly to the gauge panel.

The Fuel Level (FL) Sensor is a potentiometer that has the sweeper arm mechanically linked to a float. The sensor resistance changes as the fuel level (and therefore the float height) changes.

The Fuel Level (FL) Sensor is typically located in the left fuel tank.

FUEL TEMPERATURE (FT) SENSOR

The Fuel Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the fuel temperature increases.

The Fuel Temperature Sensor is located on the right side of the engine, below Electronic Unit Pump (EUP) #3. The Engine EECU monitors the voltage drop across the sensor and uses the signal, along with other signals, to calculate the fuel injection quantity.

INTAKE AIR TEMPERATURE AND HUMIDITY (IATH) SENSOR

The Intake Air Temperature and Humidity (IATH) Sensor contains a thermistor and a capacitive sensor. The resistance of the thermistor varies inversely to temperature. The output of the capacitive sensor increases as the humidity of the surrounding air increases. By monitoring the signals from both portions of the sensor, the Engine Electronic Control Unit (EECU) calculates the temperature and humidity of the air passing through the air filter housing.

The Intake Air Temperature and Humidity (IATH) Sensor is located in the air intake tube just downstream from the air filter canister.

INTAKE MANIFOLD TEMPERATURE (IMT) SENSOR

The Intake Manifold Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the inlet air temperature increases.

The Intake Manifold Temperature Sensor is located in the intake manifold. The sensor signal is used to control engine timing to prevent the formation of white smoke during engine warm-up. Intake air temperature information is also used to prevent misfire under light load conditions.

REAR DRIVE AXLE OIL TEMPERATURE (RAOT) SENSOR

NOTE

On vehicles equipped with an electronic gauge panel, the Rear Drive Axle Oil Temperature Sensor provides input to the VECU. On vehicles equipped with a standard gauge panel, the Rear Drive Axle Oil Temperature Sensor provides input directly to the gauge panel.

The Rear Drive Axle Oil Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the axle oil temperature increases.

The Rear Drive Axle Oil Temperature Sensor is located in the axle housing near the differential carrier.

THROTTLE POSITION (TP) SENSOR

The Throttle Position Sensor is a potentiometer that is mechanically linked to the accelerator pedal. A potentiometer is a variable resistor whose resistance will change as the pedal is pressed. As the resistance changes, the signal voltage of the sensor changes indicating the accelerator pedal position.

The Throttle Position Sensor replaces the mechanical linkage for fuel control. The sensor is located under the accelerator pedal. The “drive by wire” pedal is designed to provide a system that “feels” similar to the standard type of accelerator pedal and mechanical linkage. The sensor is designed to improve the driver’s control by reducing sensitivity to chassis motion. This sensor provides the driver’s fuel request input to the VECU.

TRANSMISSION OIL TEMPERATURE (TOT) SENSOR

NOTE

On vehicles equipped with an electronic gauge panel, the Transmission Oil Temperature Sensor provides input to the VECU. On vehicles equipped with a standard gauge panel, the Transmission Oil Temperature Sensor provides input directly to the gauge panel.

The Transmission Oil Temperature Sensor is a thermistor whose resistance varies inversely to temperature. The sensor has a negative temperature coefficient, which means the sensor resistance will decrease as the transmission oil temperature increases.

The transmission oil temperature sensor is located in the transmission case on the right side of the transmission or in the transmission oil cooler elbow at the transmission.

TURBOCHARGER WHEEL SPEED (TWS) SENSOR

The Turbocharger Wheel Speed (TWS) Sensor uses magnetic induction to generate a pulsed voltage signal. When the turbocharger vanes pass close to the sensor, a pulsed voltage signal is generated. The Engine Electronic Control Unit (EECU) uses this signal in conjunction with the VTG position sensor signal to control the speed of the turbocharger and therefore optimize the intake manifold pressure.

The Turbocharger Wheel Speed (TWS) Sensor is mounted in the center of the turbocharger.

VARIABLE TURBINE GEOMETRY (VTG) POSITION SENSOR

The Variable Turbine Geometry (VTG) Position Sensor is a linear induction position sensor. The position sensor is mechanically linked to the actuating element of the turbocharger. The sensor is positioned within a magnetic field and produces a voltage that varies in proportion to its position in the magnetic field. When this voltage is compared to a reference voltage, the position of the turbocharger actuator can be calculated by the EECU.

The Variable Turbine Geometry (VTG) Position Sensor is built into the mechanical VTG actuator.

VEHICLE SPEED (MPH) SENSOR (VSS)

The Vehicle Speed Sensor uses magnetic induction to generate a pulsed voltage signal. It senses the passage of a series of teeth on a gear mounted on the transmission output shaft. Vehicle speed is the primary parameter used for cruise control or road speed limiting.

Cab and Dashboard Switches

CLUTCH SWITCH

The clutch switch is normally closed with the clutch engaged (pedal released). When properly adjusted, the clutch switch opens after one half inch of pedal travel, as the clutch is depressed. This switch is located above the clutch pedal, under the dashboard.

NOTE

On vehicles equipped with non-electronic automatic transmissions, the Clutch Switch is replaced by a transmission-mounted torque converter lock-up switch.

ENGINE BRAKE SWITCH

The engine brake switch is located on the dashboard. The switch allows the driver to disable the engine brake or to enable low (one bank) or high (both banks) engine braking.

FAN OVERRIDE SWITCH

The fan override switch is located on the dashboard. The switch allows the driver to manually engage the fan clutch while the vehicle is moving. If the vehicle is parked, the fan override switch is used to increase fan engagement time (reduce clutch cycling) while the driver is resting.

PARKING BRAKE SWITCH

The parking brake switch is a normally closed switch and is open when the parking brake is released.

PTO SWITCHES

The PTO switches are located on the dashboard. These switches are used to engage PTOs. Requirements for PTO engagement are programmed in the Customer Data section of the Vehicle Electronic Control Unit (VECU).

SERVICE BRAKE SWITCH

The service brake switch is a normally open, pneumatic switch. When the brakes are applied, air pressure closes the switch and the brake lamps illuminate. The service brake switch closes at 3 to 6 psi of air pressure.

SHUT-DOWN OVERRIDE SWITCH

The shutdown override switch is located on the dashboard. The switch allows a short period (approximately 30 seconds) of operation after the engine has been shutdown due to a problem detected by the V-MAC III system or pre-programmed idle limitations. The shutdown override switch allows the driver to move the vehicle to a safe parking place, if necessary. Continuously pressing the override switch WILL NOT provide additional running time.

SPEED CONTROL SWITCHES

The speed control switches allow the driver to set and control speed functions. These switches are located on the dashboard. In addition to a Speed Control ON/OFF Switch, a second switch combines the SET/DECEL and RESUME/ACCEL functions. The switch can be reprogrammed to be used as a SET/ACCEL and RESUME/DECEL Switch. Speed control functions are explained in the Speed Control section of the Operators Guide.

TORQUE LIMITING SWITCH

The torque limiting switch (not on all vehicles) is located in the transmission. The switch reduces engine torque to protect driveline components when it senses the transmission is in a very low gear (or reverse in some transmissions).

SERIAL COMMUNICATION PORT

The serial communication port is a six or nine pin connector used to access the system diagnostics and reprogramming functions. This connector conforms to the SAE standards and is located under the dashboard to the left of the steering column.

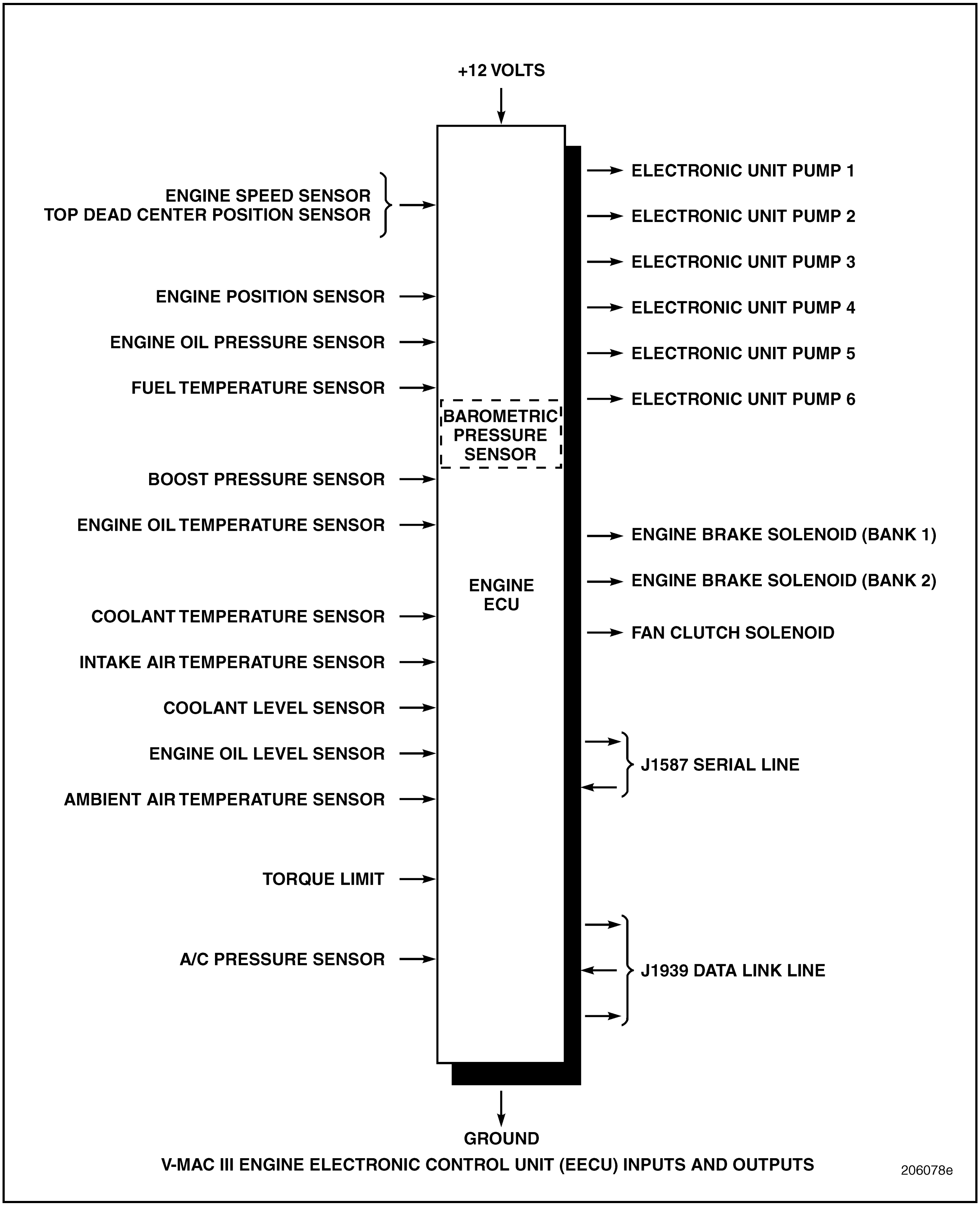

Figure 1 — Engine Electronic Control Unit (ASET™ IEGR Inputs and Outputs)

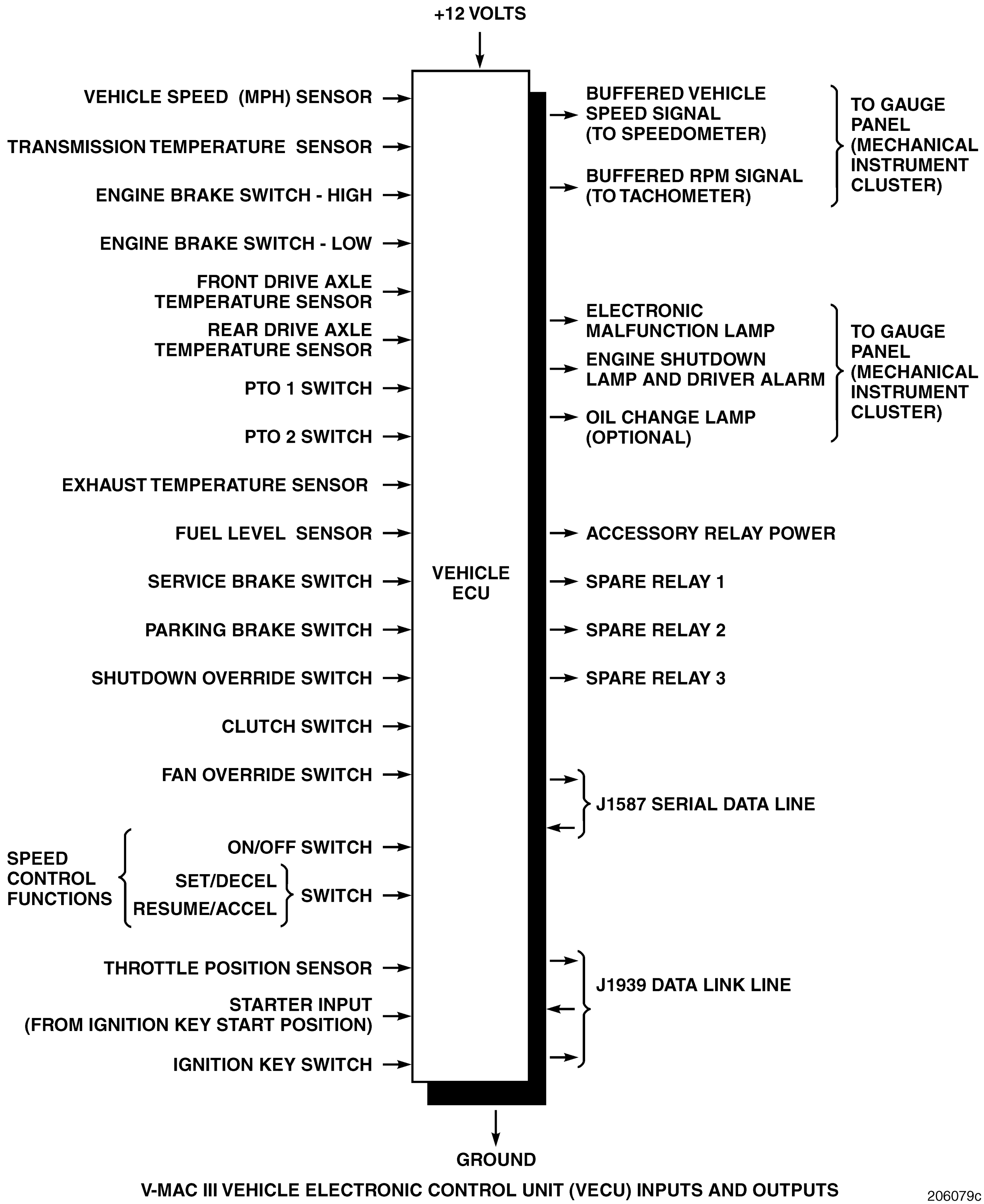

Figure 2 — Vehicle Electronic Control Unit (ASET™ IEGR Inputs and Outputs)

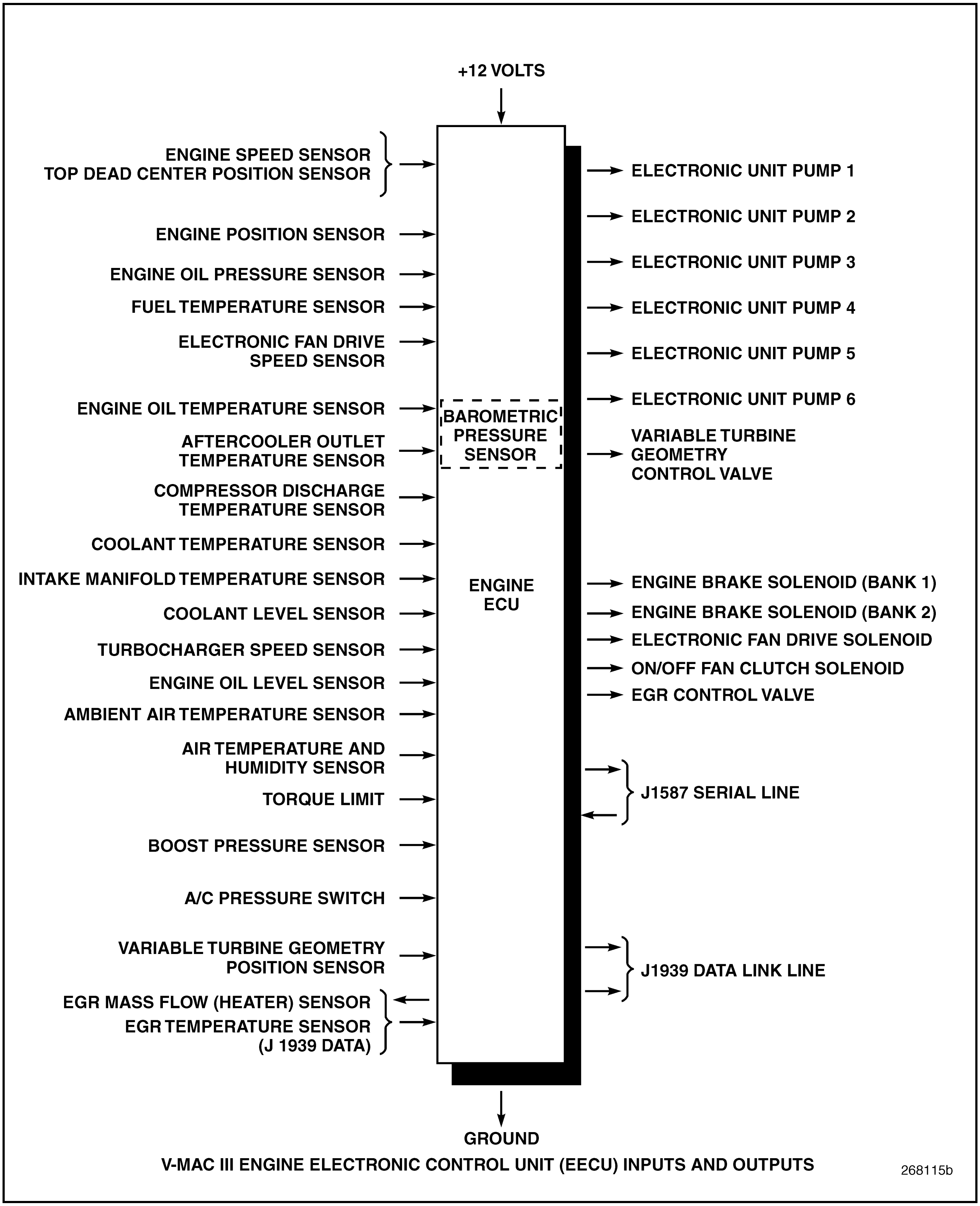

Figure 3 — Engine Electronic Control Unit (ASET™ CEGR Inputs and Outputs)

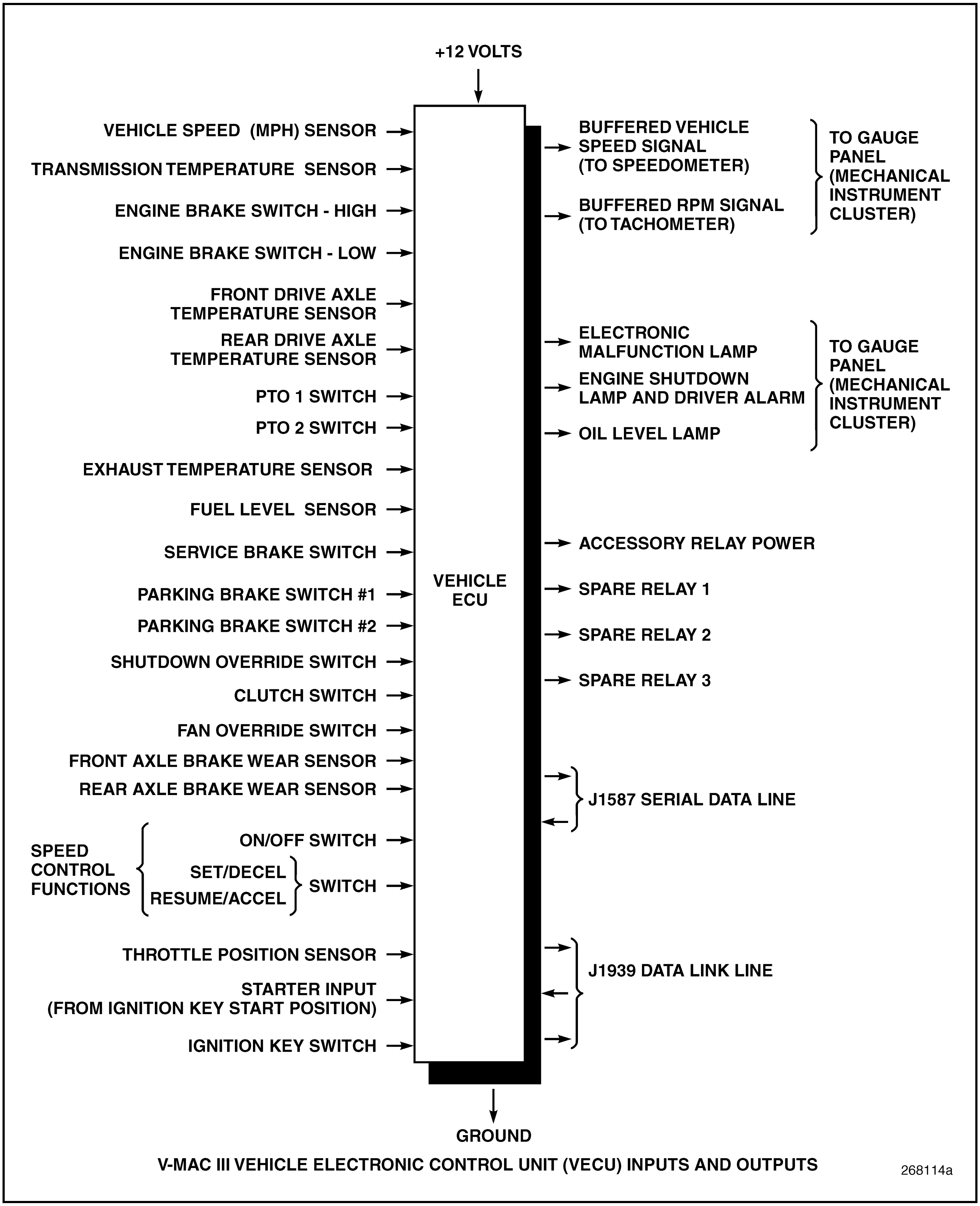

Figure 4 — Vehicle Electronic Control Unit (ASET™ CEGR Inputs and Outputs)

V-MAC III MAJOR FUNCTIONS

Function	Inputs	Backup	Effect If Input Fails	Blink Code
FUEL CONTROL	Throttle Position Sensor* — Signal line open, short to ground, or short to voltage — Reference line open or grounded	None	Increase low idle speed to 900 RPM. 900 RPM isochronous governor. VSC and Cruise Control still work.	5-1
	— Reference line short to 12 volts		All of the above at throttle greater than the 0% position.	5-1
	Engine Speed Sensor*	Engine Position Sensor	Correct RPM reading on service tools. If both sensors fail, the engine stalls. Power reduction to 90% if code 3-2 is active.	3-2
	Engine Position Sensor*	Engine Speed Sensor	Smooth transition to backup. Correct RPM reading on service tool. If both sensors fail, the engine stalls. Power reduction to 90% if code 3-4 is active.	3-4
	Electronic Unit Pump Solenoid*	None	Rough running, reduced power for single failure. Shutdown for failure of all 6 injectors or major electrical problem.	8-1 through 8-6
	Intake Manifold Temperature Sensor	None	Fault on PC screen.	2-3
	Ambient Air Temperature Sensor	None	Fault on PC screen. White smoke after hot soak start up.	1-4
	Coolant Temperature Sensor	None	Fault on PC screen. A low temperature reading will increase low idle speed.	2-1
	Ignition Key Switch	None	If switch turns off or fails open, the fuel turns off immediately. If switch fails closed, the engine will not stop with the key.	
	J1939 Communications Line	J1587 (limited)	Increase low idle speed to 900 RPM. 900 RPM isochronous governor. VSC and cruise control will not function. Truck may not start if theft deterrence is enabled.	6-4
	J1587	J1939	No loss in functionality. Engine will not start if both 6-3 and 6-4 are active or if 6-5 is active.	6-3
TIMING CONTROL	Engine Speed Sensor	Engine Position Sensor	Correct timing will be approximated. Power reduction to 90% if code 3-2 is active.	3-2
	Engine Position Sensor	Engine Speed Sensor	Correct timing will be approximated. Power reduction to 90% if code 3-4 is active.	3-4
	Intake Manifold Temperature Sensor	None	Light load timing retarded. Possible white smoke.	2-3
	Ambient Air Temperature Sensor	None	Fault on PC screen. White smoke after hot soak start up.	1-4
	Coolant Temperature Sensor	None	Light load timing retarded. Possible white smoke.	2-1

Function	Inputs	Backup	Effect If Input Fails	Blink Code
SPEED CONTROL CRUISE CONTROL	Speed Control ON/OFF SET/RESUME	None	Cannot set speed control. Cannot set or resume speed control.	
	Throttle Position Sensor	None	See "FUEL CONTROL."	5-1 5-2
	Vehicle Speed Sensor	None	Speed control functions (cruise, VSC, ESC) are canceled. Reduced power (customer selectable).	4-1
	Clutch Switch	None	No speed control if switch is open. Speed control will not cancel if switch is closed.	
	Service Brake Switch	None	No cruise if switch is closed. No VSC, and possibly no SSC, if switch goes from open to closed with park brake off.	7-1
	Park Brake Switch	None	No cruise if switch is closed. No VSC/SSC if switch goes from open to closed.	
	PTO Switch 1 & 2	None	Cannot set SSC if switches are open. Engine speed will be limited if closed.	
	J1939 Communications Line	None	Increase low idle speed to 900 RPM. 900 RPM isochronous governor. VSC and cruise control will not function.	6-4
ROAD SPEED LIMITING	Vehicle Speed Sensor	None	Reduced power (customer selectable). No speedometer output.	4-1
	J1939	None	Engine speed limited to 900 RPM. 900 RPM isochronous governor. VSC and cruise control will not function.	6-4
ENGINE PROTECTION/ SHUTDOWN	Engine Oil Pressure Sensor	None	Protection/shutdown inactive for oil pressure.	1-1
	Engine Coolant Temperature Sensor	None	Protection/shutdown inactive for coolant temperature.	2-1
	Engine Coolant Level Sensor	None	Open sensor indicates low level. Harness open/short could cause protection/shutdown, or make protection/shutdown inactive for coolant level.	1-7
	Engine Oil Temperature Sensor	None	Protection/shutdown inactive for engine oil temperature.	2-7
	Exhaust Temperature Sensor	None	Protection/shutdown inactive for exhaust temperature.	3-1
	Front Drive Axle Oil Temperature Sensor	None	Protection/shutdown inactive for front drive axle oil temperature.	2-5
	Rear Drive Axle Oil Temperature Sensor	None	Protection/shutdown inactive for rear drive axle oil temperature.	2-6
	Transmission Oil Temperature Sensor	None	Protection/shutdown inactive for transmission oil temperature.	2-4
	Shutdown Override Switch	None	Override cannot be performed.	
	J1939 Communications Line	None	Communications with engine control lost. No engine warning or shutdown.	6-4

Function	Inputs	Backup	Effect If Input Fails	Blink Code
IDLE SHUTDOWN	Throttle Position Sensor	None	If vehicle is not moving, shutdown will occur at proper time.	5-1 5-2
	Shutdown Override Switch	None	Override cannot be performed.	
	Vehicle Speed Sensor	None	Idle shutdown will occur if the Throttle Position Sensor position is constant if the vehicle is moving.	4-1
	Ambient Air Temperature Sensor	None	Idle sleeper mode will be enabled at all temperatures if the Ambient Air Temperature Sensor is open or shorted internally.	1-4
	Coolant Temperature Sensor	None	Shutdown occurs after the warm-up and shutdown times have expired, even if the engine has not yet reached the warm-up temperature.	2-1
	J1939 Communications Line	None	Communications with engine control lost. No idle shutdown.	6-4
ACCESSORY RELAY CONTROL	Ignition Key Switch	None	If switch turns off or fails, relay turns off 6 seconds later.	
	Starter Input	None	If signal is lost, system will not reset after a shutdown by engaging the starter — cycle power instead.	1-6
ON/OFF OR ELECTRONIC VISCOUS FAN CONTROL	Coolant Temperature Sensor	None	Fan will remain engaged at all times.	2-1
	Intake Air Temperature Sensor (IEGR)	None	Fan will remain engaged at all times.	2-3
	Aftercooler Outlet Temperature Sensor (CEGR)	None	Fan will remain engaged at all times.	9-3
	12 Volt Supply	None	Loss of 12 volts engages the fan.	
	A/C Pressure Switch	None	If the A/C pressure switch is open, the fan will engage due to high refrigerant pressure. If the A/C pressure switch is closed, the fan will disengage if no other fan request exists.	
	Override Switch	None	Fan cannot be manually overridden.	
	J1939 Communications Line	None	Fan cannot be overridden with the switch.	6-4

* Indicates erratic engine speed or power may occur if this input is intermittent

TROUBLESHOOTING

SYSTEM DIAGNOSTICS

The V-MAC® III system contains a variety of standard integrated software packages which allow for detection, logging and retrieval of diagnostic information about the V-MAC® III system. The diagnostic software is an integral part of the V-MAC® III system which continually performs the task of plausibility testing and validity checking on all system inputs. The purpose of the diagnostic software is to aid in troubleshooting the V-MAC® III system.

The diagnostic software performs the task of monitoring all the inputs and detecting the cases where the input is out of the allowable range, or in an invalid state. Upon the detection of an unusual condition, the V-MAC® III software begins a timer to allow the state of this input/sensor to stabilize to the normal state. If the condition does not clear within the settling time of that sensor, then a fault will be assumed. The fault recognition periods have been selected according to the safety factor of the sensor. These time periods have been specified to reduce the risk of detecting false faults, while maintaining engine and vehicle safety.

After a failure is detected, the diagnostic software performs the following functions.

1. The Electronic Malfunction Lamp (EML), located on the dashboard, will illuminate. This light will remain ON for active faults, and go OFF when there are no longer any active faults present in the system.
2. A fault message will be sent in a standard format on the J1587 serial line to alert other devices of the failure. A similar message will be transmitted when the fault is cleared.
3. The normally transmitted data on the J1587 serial line for this sensor will be replaced with a “Bad Data” indicator. This signals the other devices on the serial line to ignore the data for this sensor.
4. The V-MAC® III system updates the fault table in internal memory. This Vehicle Electronic Control Unit (VECU) fault table contains an occurrence count of the number of times the fault has occurred. Additionally, the VECU fault table logs the date, time, odometer reading, and operating parameters when any fault occurs. The occurrence count is limited to 15. The stored codes remain in memory until cleared by an off-board diagnostic computer, or until the information is no longer useful for diagnostic purposes.
5. A default or customer programmable value will be assumed for circuit failures. This value provides a means of allowing the engine/vehicle to operate even though the V-MAC® III system does not have any information from that particular circuit.

Most failures in the V-MAC® III system are recoverable. This means that if the unusual state of an input changes to normal for a continuous period of time, the fault will be cleared and the fault lamp will go OFF. However, the fault occurrence count will be kept in order to allow for later troubleshooting of this inactive fault.

The V-MAC® III diagnostic software provides an easy means of troubleshooting the system, since a complete fault history can be retrieved through the J1587 serial line with an off-board diagnostic tool (Diagnostic PC).

For standard terminology, see “Electrical Terms” on page 25.

Diagnostic Tools

To utilize the diagnostic capabilities of the V-MAC® III system, several diagnostic tools are available. These tools are:

DIAGNOSTIC COMPUTER

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Figure 5 — Diagnostic Computer

The Diagnostic Computer is the most advanced of the diagnostic tools available for troubleshooting the V-MAC® III system. This unit will allow for enhanced diagnostics of the system, and also reprogramming of Mack proprietary data.

A J1708 Serial Data Link Adaptor is required for the Diagnostic Computer to communicate with the vehicle. The minimum system requirements for the Diagnostic Computer are a Pentium® processor with 32 Mb of RAM and Windows 95/98.

6-PIN SERIAL LINK JUMPER

The 6-Pin Serial Link Jumper can be used with the J1708 Serial Data Link Adaptor. The jumper provides the ability to energize the V-MAC® III system without using the ignition key. This is not only convenient for programming, but also important for diagnostic troubleshooting.

If a 6-Pin Serial Link Jumper is not available and the diagnostic instructions require connecting the Serial link jumper into the Serial Communications Port, connect a wire between Serial Communications Port pins C and D.

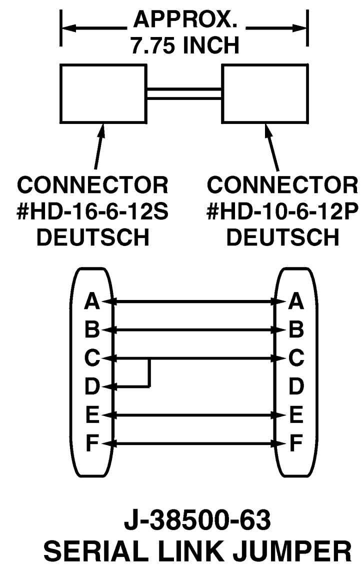

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Figure 6 — 6-Pin Serial Link Jumper

9-PIN SERIAL LINK JUMPER

The 9-Pin Serial Link Jumper can be used with the J1708 Serial Data Link Adaptor. The jumper provides the ability to energize the V-MAC® III system without using the ignition key. This is not only convenient for programming, but also important for diagnostic troubleshooting.

If a 9-Pin Serial Link Jumper is not available and the diagnostic instructions require connecting the Serial link jumper into the Serial Communications Port, connect a wire between Serial Communications Port pins B and H.

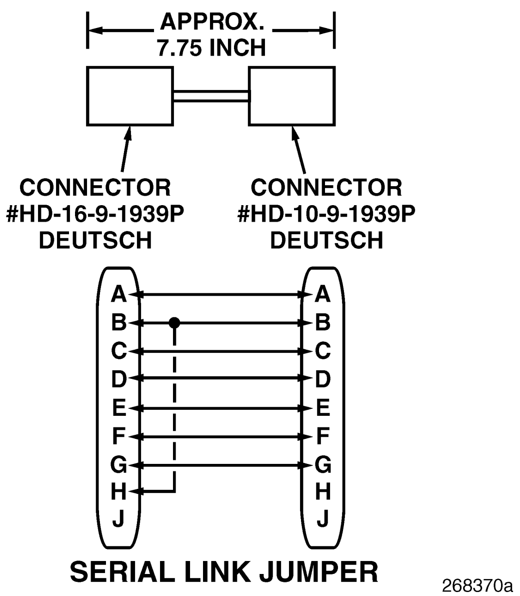


Figure 7 — 9-Pin Serial Link Jumper

DIGITAL MULTIMETER

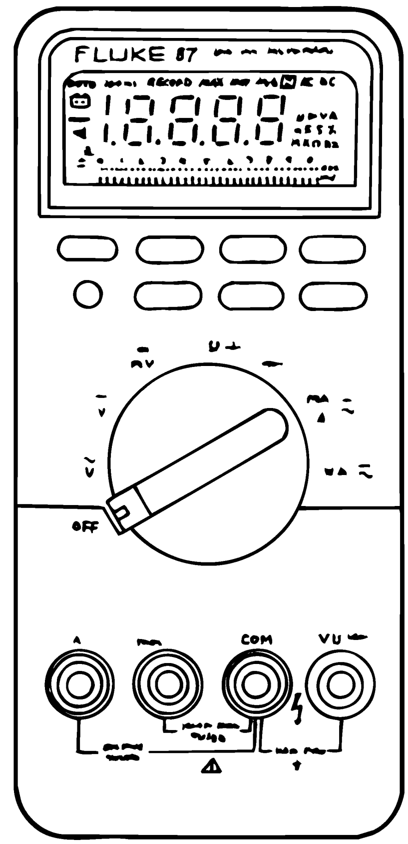


Figure 8 — Digital Multimeter

The Digital Multimeter is used to make the required measurements in the diagnostic testing procedures. These tests will include measuring voltage and resistance, and checks for short circuits and open circuits.

Since there are many types of digital multimeters available, specific instructions are not given here. Knowledge of the operation of the multimeter is assumed.

NOTE

Never use a test light, whether self-powered or not, to troubleshoot electrical problems on any V-MAC® equipped vehicle. Damage to the electronic control modules may result.

ELECTRICAL SCHEMATIC DIAGRAMS

Electrical schematic diagrams are simplified wiring diagrams that show the electrical connectivity of the circuit that is being diagnosed. The schematic diagrams provide the technician quick access to useful information such as component connector and terminal numbers, and circuit identification numbers.

NOTE

Many of the electrical schematic diagrams in this manual show multiple occurrences of the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU). The diagrams are formatted in this way for clarity and ease of use, and do NOT imply that more than one VECU or EECU is installed on any vehicle.

Electrical Terms

To achieve successful diagnostic results, understanding of the following terms is important.

Voltage (volts) is the electric potential or potential difference expressed in volts.

Resistance (ohms) is the opposition offered by a component to the passage through it of a steady electric current, expressed in ohms.

Current (amps) is the term for the strength of the flow of electricity, expressed in amps.

Short Circuit (short) is a connection of comparatively low resistance accidentally or intentionally made between points in a circuit where the resistance is normally much greater.

Open Circuit (open) is any situation where the normally closed or continuous flow of electricity has been interrupted. For example: a broken wire.

Troubleshooting Procedures

To accurately diagnose a problem, this troubleshooting procedure should be followed. Failure to follow the troubleshooting procedure outlined may result in an incorrect diagnosis, replacement of good components and loss of time.

STEP 1: VERIFY THE COMPLAINT

Before beginning any testing procedure, make sure that a problem actually exists. If possible, talk to the driver or the person who noticed the problem. Try to obtain as much information as possible. In some cases, there will only be a verbal complaint instead of a fault registered by the system.

STEP 2: REVIEW THE V-MAC® III TEST PRECAUTIONS

Before proceeding with any diagnostic testing on the V-MAC® III system, the technician should be familiar with test precautions outlined in this book. Periodic review of the test precautions may save time and expense.

STEP 3: CHECK FOR FAULT CODES

Check for fault codes with a diagnostic computer. If a fault code is a currently active code, proceed to the diagnostic procedures in this manual. Be sure to follow the step by step test procedures in the order they are given to avoid a misdiagnosis.

If a code is not an active code or is intermittent, try to set the code by moving or flexing the connectors and wires associated with the suspect system or component. If the code cannot be induced to set, perform the associated step by step test procedures while moving the connectors and wires associated with the suspect system or component. Keep in mind that most intermittent problems are caused by poor terminal connections and are not due to failed components. Be sure to carefully inspect the connector terminals for deformities caused by voltmeter probes.

Use of the J 38581 or J 38581 A (Kent-Moore) Electronic Connector Test Adaptor Kit is highly recommended when making test measurements and for checking both sides of a connection for deformity and tightness. The table below identifies which test adapter leads are used to test various system components.

CONNECTOR TEST ADAPTORS FOR ASET™ IEGR ENGINES		
Device	**Adapter for Device Side**	**Adapter for Harness Side**
Ambient Air Temperature (AAT) Sensor	Purple Female	Purple Male
Boost Air Pressure (BAP) Sensor	Gray Female	Gray Male
Bulkhead Connectors	Red Female	Red Male
Engine Coolant Level (ECL) Sensor	Purple Female	Purple Male
Engine Coolant Temperature (ECT) Sensor	Gray Female	Gray Male
Engine Electronic Control Unit (EECU)	DO NOT Test at EECU Terminals	Purple or Gray Male (depends on terminal)
Engine Oil Pressure (EOP) Sensor	Gray Female	Gray Male
Engine Oil Temperature (EOT) Sensor (in oil pan)	Purple Female	Purple Male
Engine Oil Temperature (EOT) Sensor (on oil filter pedestal)	Gray Female	Gray Male
Engine Position (EP) Sensor	Purple Female	Purple Male
Engine Speed (RPM/TDC) Sensor	Purple Female	Purple Male
Front Drive Axle Oil Temperature (FAOT) Sensor	Gray Female	Gray Male
Fuel Temperature (FT) Sensor	Gray Female	Gray Male
Intake Air Temperature (IAT) Sensor	Gray Female	Gray Male
Rear Drive Axle Oil Temperature (RAOT) Sensor	Gray Female	Gray Male
Throttle Position (TP) Sensor (at sensor)	Gray Female	Gray Male
Throttle Position (TP) Sensor (at Mack harness)	Purple Female	Purple Male
Vehicle Electronic Control Unit (VECU)	DO NOT Test at VECU Terminals	Purple Male
Vehicle Speed (MPH) Sensor (VSS)	Purple Female	Purple Male

CONNECTOR TEST ADAPTORS FOR ASET™ CEGR ENGINES		
Device	**Adapter for Device Side**	**Adapter for Harness Side**
Aftercooler Outlet Temperature (AOT) Sensor	Purple Female	Purple Male
Ambient Air Temperature (AAT) Sensor	Purple Female	Purple Male
Boost Air Pressure (BAP) Sensor	Gray Female	Gray Male
Bulkhead Connectors	Red Female	Red Male
Compressor Discharge Temperature (CDT) Sensor	Purple Female	Purple Male
EGR Mass Flow (EGRMAF) Sensor System	Purple Female	Purple Male
Electronic Variable Speed Fan Drive	Orange Male	Orange Female
Engine Coolant Level (ECL) Sensor	Purple Female	Purple Male
Engine Coolant Temperature (ECT) Sensor	Gray Female	Gray Male
Engine Electronic Control Unit (EECU)	DO NOT Test at EECU Terminals	Brown, Purple, or Gray Male (depends on terminal)
Engine Oil Pressure (EOP) Sensor	Gray Female	Gray Male
Engine Oil Temperature (EOT) Sensor	Gray Female	Gray Male
Engine Position (EP) Sensor	Purple Female	Purple Male
Engine Speed (RPM/TDC) Sensor	Purple Female	Purple Male
Front Drive Axle Oil Temperature (FAOT) Sensor	Gray Female	Gray Male
Fuel Temperature (FT) Sensor	Gray Female	Gray Male
Intake Air Temperature and Humidity (IATH) Sensor	Gray Female	Gray Male
Intake Manifold Temperature (IMT) Sensor	Purple Female	Purple Male
Rear Drive Axle Oil Temperature (RAOT) Sensor	Gray Female	Gray Male
Throttle Position (TP) Sensor (at sensor)	Gray Female	Gray Male
Throttle Position (TP) Sensor (at Mack harness)	Purple Female	Purple Male
Turbocharger Wheel Speed (TWS) Sensor	Purple Female	Purple Male
Variable Turbine Geometry (VTG) Position Sensor	Purple Female	Purple Male
Vehicle Electronic Control Unit (VECU)	DO NOT Test at VECU Terminals	Purple Male
Vehicle Speed (MPH) Sensor (VSS)	Purple Female	Purple Male

STEP 4: PERFORM A VISUAL CHECK

One of the most important checks that must be done before any diagnostic activity, is a careful visual inspection of suspect wiring and components. This can lead to fixing a problem without further steps. Be sure to inspect related wiring for disconnects, burned or chafed spots, pinched wires, or contact with sharp edges or hot exhaust components. The visual inspection is very important and must be done carefully and thoroughly.

STEP 5: PERFORM A SYSTEM CHECK

Check if all the features of the improperly working system are not working correctly. A system check can help to define what the problem is not. It may also help identify a condition or factor (engine warm, occurs only with cruise on, etc.) that may be contributing to the malfunction. This step is similar to step 1, verifying the complaint.

STEP 6: PERFORM THE REPAIR

Once the suspect component has been isolated to be the source of a problem, carefully disconnect the old component and inspect its connections. Clean and repair the component connections and then reconnect the component to verify the problem was the component and not the connection.

STEP 7: CLEAR CODES

Clear any codes stored in the system.

STEP 8: VERIFY THE REPAIR

After the repair has been made, confirm that the problem was corrected. Perform a complete system check of the repaired system under a variety of conditions. Check that all other systems are operating properly as well.

Reading Diagnostic Fault Codes

There are two methods of obtaining codes from the V-MAC® III system, the blink code method using the Electronic Malfunction Lamp (EML) and reading the codes via the serial data line using diagnostic computer.

BLINK CODE METHOD

The V-MAC® III system is capable of flashing a two digit blink code for each detectable active fault in the V-MAC® III system. These codes are displayed on the Electronic Malfunction Lamp (EML) which is located on the dashboard. The primary reason for the blink code is to allow quick diagnosis of active faults in the system without requiring an expensive troubleshooting tool.

To properly activate and use the blink codes, follow the steps listed below.

1. Turn the key ON and wait until the Electronic Malfunction Lamp's two second power-up test is finished.
2. There must be an active fault for the lamp to remain ON after the two second power-up test.
3. With the Speed Control ON/OFF Switch in the OFF position, press and hold the SET/DECEL Switch until the malfunction lamp goes OFF.
4. The malfunction lamp will remain OFF for approximately one second.
5. Immediately after the wait time, the Vehicle Electronic Control Unit (VECU) will begin to flash a two digit blink code. The two digits of the code will be separated by a one second idle time (malfunction lamp OFF).
6. Each digit of the blink code may consist of up to nine ON/OFF flashes. The ON and OFF time between each flash will be one quarter second.

7. The ON flashes of the malfunction lamp must be counted in order to determine the two digit blink code.
8. Only one active fault will be blinked per request. There must be a separate request for each active fault, where there are multiple active faults present in the system. To request another fault be displayed, hold in the SET/DECEL Switch until the malfunction lamp goes OFF. The blinking sequence will begin again after a one second delay.
9. If a fault blinking request is made while the Vehicle Electronic Control Unit (VECU) is in the process of blinking an active fault, that sequence will stop and the next active fault will be blinked.
10. If an active fault is cleared while the Vehicle Control Unit (VECU) is blinking that fault, the procedure will not stop.
11. After every complete blinking sequence, the malfunction lamp will return to normal. It will remain ON for active faults and OFF for inactive faults.
12. The Vehicle Electronic Control Unit (VECU) will provide blink codes for active faults registered by both the Vehicle Electronic Control Unit (VECU) and Engine Electronic Control Unit (EECU).

The software will not provide codes for inactive faults. Accessing the Inactive Fault Tables of the Vehicle Electronic Control Unit (VECU) and Engine Electronic Control Unit (EECU) requires using a diagnostic computer.

DIAGNOSTIC COMPUTER

A computer is required, to change certain proprietary data, such as engine horsepower. The computer also allows information specific to the vehicle to be entered and stored in both of the V-MAC® III modules' memory tables, and it provides extended flexibility in password selection. Any 100% IBM compatible computer with 32 Mb of RAM and Windows 95/98 or newer operating system will work with the system. In order to connect a computer to the vehicle, a serial link interface is required. The J1708 Serial Data Link Adaptor is used as the interface device. The Service Diagnostic Software package is available from Mack Trucks Service Publications Department, through the normal Branch and Distributor Parts Ordering Network.

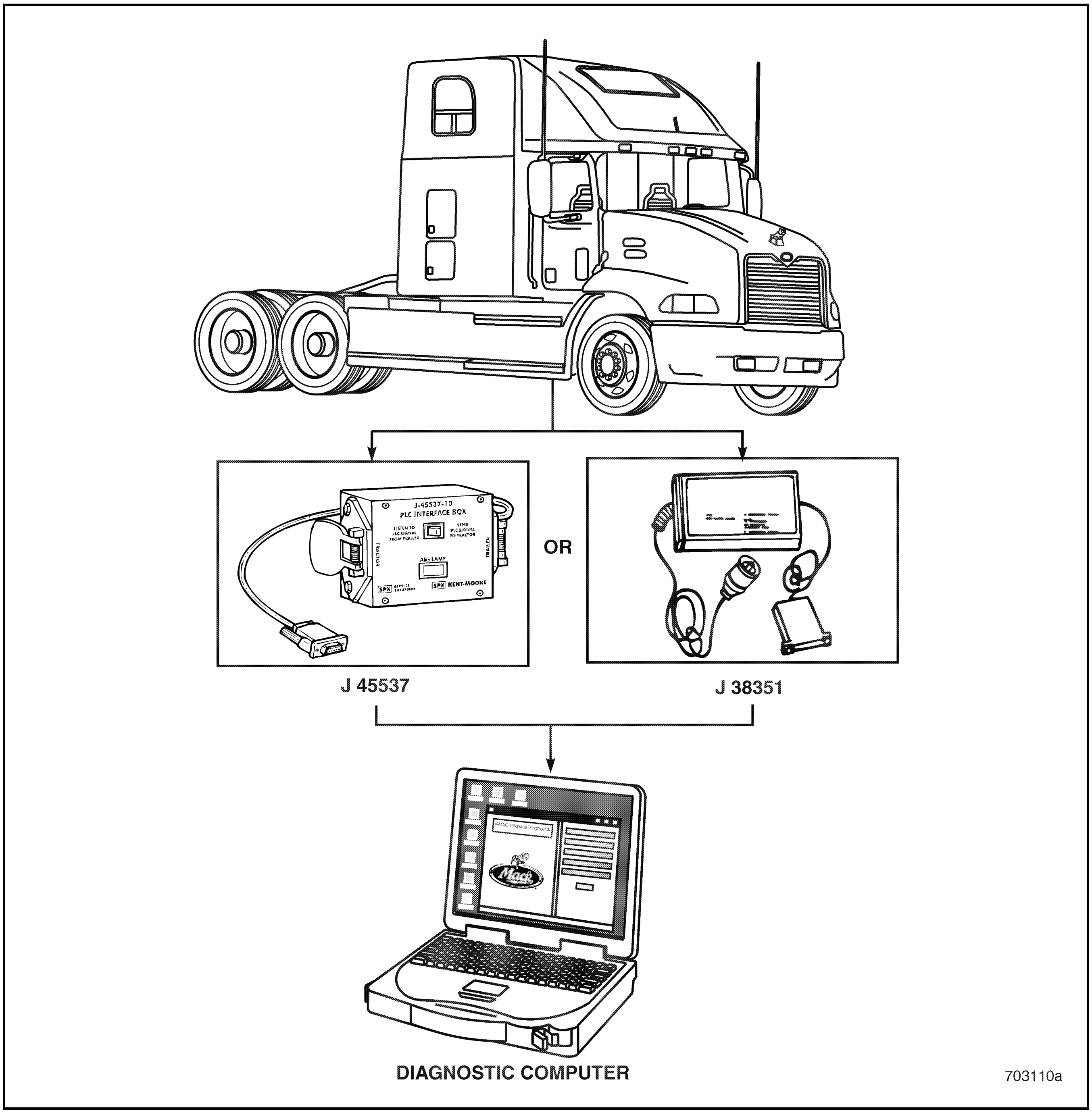


Figure 9 — Interface Devices

The software package contains complete instructions for installing and running the program. Follow the instructions completely.

CAUTION

In any of the test procedures where the instructions are to disconnect a harness connector from the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU), the ignition key must be in the OFF position, and the Accessory Relay must be OFF (do NOT have the Serial Link Jumper installed). Failure to follow this warning will cause internal electrical damage to the electronic control units.

NOTE

In any of the test procedures requiring insertion of a test probe into a connector, do not force the probe into the connector. The connector may be damaged, resulting in a poor connection. In any test requiring a check for continuity or voltage from one pin to all others, this means one at a time, not all at the same time.

Before replacing components, retest the system to confirm an active fault still exists. Unless otherwise specified, the word replace means to install a new component.

In any of the test procedures requiring disconnecting a connector, visually inspect both sides of the connector for debris, broken, bent or missing pins, or broken connector housings.

Following the hints listed above may save considerable time and effort.

NOTE

In any of the diagnostic test procedures where the instructions call for replacing the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU), **do not reprogram the replacement module until you are certain that the problem has been solved.** If replacing the control unit does solve the problem, it is essential that the module be programmed with the vehicle operating parameters. Failure to program the replacement module will result in reduced system performance. To program the module with vehicle and customer data, follow the instructions that are supplied with the PC Diagnostic Software Package. It is essential that the module be reprogrammed with the proper Mack Data files (see your Mack Dealer).

CAUTION

***DO NOT** program a replacement Vehicle Electronic Control Unit (VECU) or Engine Electronic Control Unit (EECU) with MACK DATA until it is confirmed that the new control unit has fixed the problem. MACK DATA reprogramming executes the password protection function which assigns a new password to the vehicle. If the old control unit is not the problem and it is reinstalled on the vehicle it must be re-flashed, using Dealer Programming software to erase the password, before it is programmed with MACK DATA.*

CAUTION

The ASET™ CEGR Engine Electronic Control Unit (EECU) uses special connectors that require careful removal and installation techniques. Failure to properly remove and install the EECU connectors can cause costly damage to the connector pins as well as the EECU. When disconnecting or connecting the EECU harness connectors, the harness strain relief clamps that hold the harnesses to the bracket MUST be removed. Failure to remove the strain relief clamps may cause the connectors to be removed and installed at an angle, possibly causing connector pin damage, as well as an improper fit of the watertight connector seals. Keep the connectors straight when disconnecting or connecting them to or from the EECU.

Do not use excessive force when connecting the harness connectors to the EECU, and do not attempt to force the locking levers closed. If resistance if felt when the connector is being connected or when the locking lever is being moved to the locked position, remove the connector from the EECU and determine the cause.

Fault Codes

MACK BLINK CODE IDENTIFICATION TABLE

Blink Code	Assignment Listing	PID	MID	FMI	Failure
1-1	Engine Oil Pressure Sensor	100	128	4	Voltage Low/Open
				3	Voltage High
N/A	Engine Oil Pressure Sensor	100	142	1	Valid Low
1-2	Barometric Pressure Sensor	108	128	4	Voltage Low/Open
				3	Voltage High
1-3	Fuel Temperature Sensor	174	128	4	Voltage Low
				3	Voltage High
				5	Current Low/Open
1-4	Ambient Air Temperature Sensor	171	128	4	Voltage Low
				3	Voltage High
				5	Current Low/Open
1-6	Starter Input	S237	142	3	Voltage High
1-7	Engine Coolant Level – Warning	111	128	3	Voltage High/Open
	Engine Coolant Level			2	Data Incorrect
1-8 (ASET™ CEGR & IEGR with 1MS375 Software)	Estimated % Fan Speed	26	128	3	Voltage High
				4	Voltage Low
				0	Valid High
				1	Valid Low
1-10	Aux. Cooling Relay Output	S275	128	4	Voltage Low
2-1	Engine Coolant Temperature Sensor	110	128	4	Voltage Low
				3	Voltage High
				5	Current Low/Open
				10	Abnormal Rate of Change
N/A	Engine Coolant Temperature	110	142	0	Valid High
2-2 (ASET™ IEGR)	Boost Air Pressure Sensor	102	128	4	Voltage Low/Open
				3	Voltage High
2-2 (ASET™ CEGR)	Boost Air Pressure	439	128	4	Voltage Low/Open
				3	Voltage High
2-3	Intake Air Temperature Sensor	105	128	4	Voltage Low
				3	Voltage High
				5	Current Low/Open
				2	Data Intermittent
2-4	Transmission Oil Temperature Sensor	177	142	4	Voltage Low/Open
				3	Voltage High
N/A	Transmission Oil Temperature Sensor	177	142	0	Valid High
2-5	Front Drive Axle Oil Temperature Sensor	77	142	4	Voltage Low/Open
				3	Voltage High

Blink Code	Assignment Listing	PID	MID	FMI	Failure
2-6	Rear Drive Axle Oil Temperature Sensor	78	142	4	Voltage Low/Open
				3	Voltage High
2-7	Engine Oil Temperature Sensor	175	128	4	Voltage Low
				3	Voltage High
				5	Current Low/Open
2-8 (ASET™ CEGR & IEGR with 1MS375 Software)	Combustion Air Temperature	172	128	4	Voltage Low
				3	Voltage High
				5	Open
2-9 (ASET™ CEGR & IEGR with 1MS375 Software)	Combustion Air Humidity	274	128	4	Voltage Low
				3	Voltage High
3-1	Exhaust Temperature Sensor	173	142	4	Voltage Low/Open
				3	Voltage High
N/A	Exhaust Temperature Sensor	173	142	0	Valid High
3-2	Engine Speed Sensor	S22	128	2, 8	Data Erratic, Intermittent Or Incorrect
				3	Voltage High
				4	Voltage Low
				5	Open
N/A	Engine Speed Sensor	190	142	0	Valid High
			128	2	Data Erratic
3-3	Redundant Engine Speed	190	128	2	Data Erratic
3-4	Engine Position Sensor	S21	128	2, 8	Data Erratic, Intermittent Or Incorrect
				3	Voltage High
				4	Voltage Low
				5	Open
3-5	Engine Brake Output #1	S79	128	4	Voltage Low
				5	Current Below Normal or Open Circuit
3-6	Engine Brake Output #2	S80	128	4	Voltage Low
				5	Current Below Normal or Open Circuit
3-8	Transmission Splitter Position	S32/S 152	142	7	Mechanical System Not Responding
				8	Abnormal Frequency
3-10 (ASET™ CEGR)	Engine Brake Output #3	S82	128	4	Voltage Low
				5	Current Below Normal or Open Circuit
4-1	Vehicle Speed Sensor (VSS)	84	142	2	Data Invalid
				2	Data Invalid
				4	Voltage Low
				3	Voltage High
				5	Current Below Normal or Open Circuit
				8	Abnormal Frequency Pulse Width Or Period
				11	Mode Not Identifiable
N/A	Road Speed	84	142	0	Road Speed High

Blink Code	Assignment Listing	PID	MID	FMI	Failure
4-2	Fan Clutch Output	S33	128	5	Current Low/Open
				4	Voltage Low
				3	Voltage High
				2	Data Erratic
				8	Abnormal Signal
4-3	Auxiliary Output #1	S10	142	4	Voltage Low
				3	Voltage High
4-4	Auxiliary Output #2	S11	142	4	Voltage Low
				3	Voltage High
4-5 (ASET™ IEGR)	Wastegate Output	S32	128	2	Data Erratic
				5	Voltage Low/Open
				7	Mechanical System Not Responding
4-5 (ASET™ CEGR)	VTG Position Sensor	S269	128	4	Voltage Low
				3	Voltage High
				7	Mechanical System Not Responding
4-6	Tachometer Output	S6	142	4	Voltage Low
				3	Voltage High
4-7	Speedometer Output	S7	142	4	Voltage Low
				3	Voltage High
4-8	Customer Defined Statement	S151	142	1	Below Normal
				0	Above Normal
				8	Abnormal Frequency
4-9 (ASET™ CEGR)	EGR Valve Mechanism	S146	128	4	Voltage Low
				3	Voltage High
				5	Open
				7	Mechanical System Not Responding
4-10 (ASET™ IEGR)	Parallel Fan Circuit	S153	128	4	Voltage Low
				3	Voltage High
				5	Open
5-1	Throttle Position Sensor	91	142	4	Voltage Low/Open
				3	Voltage High
5-2	Throttle Position Sensor Reference Voltage	S232	142	4	Voltage Low
				3	Voltage High
5-3	Engine Shutdown Lamp/Alarm	S238	142	4	Voltage Low/Open
				3	Voltage High
5-5	Electronic Malfunction Lamp	S239	142	4	Voltage Low/Open
				3	Voltage High
5-6	Spare Relay #3	S12	142	4	Voltage Low/Open
				3	Voltage High
5-7	Engine Oil Level	98	128	4	Voltage Low/Open
				3	Voltage High

Blink Code	Assignment Listing	PID	MID	FMI	Failure
5-8 (ASET™ CEGR)	EGR Temperature	142	128	4	Voltage Low
				3	Voltage High
				5	Open
				9	Data Missing
				12	Failed Device
				0	Valid High
5-9 (ASET™ CEGR)	EGR Mass Flow	S277	128	4	Voltage Low
				3	Voltage High
				5	Open
				9	Data Missing
				12	Failed Device
6-1	Fuel Level	96	142	4	Voltage Low
				3	Voltage High
6-2 (ASET™ CEGR)	Turbocharger Speed	103	128	0	Valid Low
				1	Valid High
				8	Abnormal Frequency Pulse Width Or Period
				3	Voltage High
				4	Voltage Low
				5	Open
6-3	J1708/J1587 Link	S250	142	8	Abnormal Frequency Pulse Width Or Period
			128		
6-4	J1939 Link	S231	142	8	Abnormal Frequency Pulse Width Or Period
			128		
6-5	All Communications Lost — Engine Shutdown	S254	128	8	Failed Drive
6-6	Fuel Control Module	S233	128	12	Failed Device
6-7	Power Relay	S236	128	2	Data Erratic or Abnormal
				4	Voltage Low
				8	Abnormal
6-8	J1939 Link	S231	142	14	Lost Contact With Allison HD Transmission
6-9	Other ECU Affecting Operation	S216	142	12	Possible Eaton Vorad Failure
7-1	Service Brake Switch	S246	142	4	Voltage Low/Open
7-2	Parking Brake Switch	S235	142	3	Voltage High
7-3	Speed Control SET Switch	S243	142	3	Voltage High
7-4	Speed Control RESUME Switch	S242	142	3	Voltage High
7-5	Battery Voltage	168	142	1	Valid Low
7-5	Alternator Voltage	167	142	1	Valid low
				0	Valid High
7-6	Switched Voltage	158	128	4	Voltage Low/Open
7-7	Exhaust Temperature Reference	S254	142	12	Failed Device

Blink Code	Assignment Listing	PID	MID	FMI	Failure
7-9 (ASET™ CEGR)	VTG Actuator	S27	128	3	Voltage High
				4	Voltage Low
				5	Open
8-1	Electronic Unit Pump (EUP) #1	S1	128	4	Voltage Low
				3	Voltage High
				5	Open
				6	Current High
				2, 8	Data Erratic or Abnormal
8-2	Electronic Unit Pump (EUP) #2	S2	128	4	Voltage Low
				3	Voltage High
				5	Open
				6	Current High
				2, 8	Data Erratic or Abnormal
8-3	Electronic Unit Pump (EUP) #3	S3	128	4	Voltage Low
				3	Voltage High
				5	Open
				6	Current High
				2, 8	Data Erratic or Abnormal
8-4	Electronic Unit Pump (EUP) #4	S4	128	4	Voltage Low
				3	Voltage High
				5	Open
				6	Current High
				2, 8	Data Erratic or Abnormal
8-5	Electronic Unit Pump (EUP) #5	S5	128	4	Voltage Low
				3	Voltage High
				5	Open
				6	Current High
				2, 8	Data Erratic or Abnormal
8-6	Electronic Unit Pump (EUP) #6	S6	128	4	Voltage Low
				3	Voltage High
				5	Open
				6	Current High
				2, 8	Data Erratic or Abnormal
8-9	Solenoid Boost Voltage	S151	128	4	Voltage Low
				3	Voltage High
9-1	Transport Protocol	S254	142	14	Programming Failure
9-2	Power Reset Without Key Switch	S254	142	4	Power Failure
			128		
9-3 (ASET™ CEGR)	Aftercooler Outlet Temperature	S272	128	4	Voltage Low
				3	Voltage High
				5	Open
				2	Data Intermittent

Blink Code	Assignment Listing	PID	MID	FMI	Failure
9-5 (ASET™ CEGR)	Compressor Discharge Temperature	S270	128	4	Voltage Low
				3	Voltage High
				5	Open
				2	Data Intermittent
				0	Valid High
9-8 (ASET™ CEGR)	Auxiliary Output Device #1	S26	128	4	Voltage Low
				3	Voltage High
9-9 (ASET™ CEGR)	Auxiliary Output Device #2	S40	128	4	Voltage Low
				3	Voltage High
9-10 (ASET™ CEGR)	Auxiliary Output Device #3	S51	128	4	Voltage Low
				3	Voltage High
10-1 (ASET™ CEGR)	Internal Sensor Voltage	S221	128	4	Voltage Low
				3	Voltage High
10-2 (ASET™ CEGR)	5 Volt Supply	S232	128	4	Voltage Low
				3	Voltage High
10-3 (ASET™ CEGR)	Sensor Supply Voltage #1	S212	128	4	Voltage Low
				3	Voltage High
10-4 (ASET™ CEGR)	Sensor Supply Voltage #2	S211	128	4	Voltage Low
				3	Voltage High
10-5 (ASET™ CEGR)	Fuel Filter Differential Pressure	95	128	4	Voltage Low
				3	Voltage High
10-6 (ASET™ CEGR)	Fuel Delivery Pressure	94	128	4	Voltage Low
				3	Voltage High
10-7 (ASET™ CEGR)	Odometer Save Area Failure	S253	142	2	Data Incorrect
10-8 (ASET™ CEGR)	GPS Position Data not Received	P239	142	2	Missing Data
10-9 (ASET™ CEGR)	VECU Watchdog Timer Reset	S254	142	11	Special Instructions
10-10 (ASET™ CEGR)	EECU Watchdog Timer Reset	S152	128	3	Voltage High

SAE Message Descriptions

V-MAC® III communicates with other devices, including service tools, using SAE J1587 and J1708 Communications Standards. These standards define the method by which various electronic devices can communicate with one another.

When a truck leaves the factory, the Vehicle Electronic Control Unit (VECU) and Engine Electronic Control Unit (EECU) are often the only modules using the serial communications line. In some cases a truck may leave the factory with other controllers, such as ABS/ATC and Automatic Transmission controllers, installed. However, many other devices can be connected to the serial communications line in the aftermarket. Some service tools and Driver Information Displays will not only display the messages sent out by the V-MAC® system, but by these other devices as well.

The following table represents message types that are most likely to be available on the serial data lines if aftermarket devices are installed. For a complete listing, contact the Society of Automotive Engineers.

Message Identifier (MID)	Description
128	Engine Electronic Control Unit
130	Transmission
136	Brakes — Antilock/Traction Control
137–139	Brakes — Antilock, Trailer 1, 2, 3
140	Instrument Cluster
141	Trip Recorder
142	Vehicle Management System (Vehicle Electronic Control Unit)
143	Fuel System (FIC MID on early V-MAC® systems)
162	Vehicle Navigation
163	Vehicle Security
165	Communication Unit — Ground
171	Driver Information System (Co-Pilot, Driver Information Display, VIP)
172	Diagnostic Tool
178	Vehicle Sensors to Data Converter
181	Communication Unit — Satellite
219	Headway Controller

Parameter Identifier (PID)	Description
26	Fan Speed
65	Service Brake Switch
70	Parking Brake Switch
77	Front Drive Axle Oil Temperature
78	Rear Drive Axle Oil Temperature
83	Road Speed Limit Status
84	Road Speed
85	Speed Control Status
91	Percent Accelerator Pedal Position
92	Percent Engine Load
96	Fuel Level
98	Engine Oil Level

Parameter Identifier (PID)	Description
100	Engine Oil Pressure
102	Boost Pressure
105	Intake Manifold Temperature
106	Air Inlet Pressure
108	Barometric Pressure
110	Engine Coolant Temperature
111	Coolant Level
113	Governor Droop
158	Switched Voltage
166	Engine Rated Power
167	Alternator Voltage
168	Battery Voltage
170	Cab Interior Temperature
171	Ambient Air Temperature
173	Exhaust Temperature
174	Fuel Temperature
175	Engine Oil Temperature
177	Transmission Oil Temperature
182	Trip Fuel
183	Fuel Rate
184	Instantaneous MPG
185	Average MPG
189	Engine Rated Speed
190	Engine Speed
234	Software Version No.
235	Total Idle Hours
236	Total Idle Fuel Used
244	Trip Distance
245	Total Vehicle Distance
246	Total Vehicle Hours
247	Total Engine Hours
248	Total PTO Hours
249	Total Engine Revolutions
250	Total Fuel Used
254	Proprietary Message
367	Headway Controller
412	EGR Temperature
439	Boost Pressure (Extended Range #1)

Subsystem Identifiers (SID) Common to all MIDs	Description
151	System Diagnostic #1
211	Sensor Supply Voltage #2
212	Sensor Supply Voltage #1
216	Other ECU Affecting Operation
221	Internal Sensor Voltage
224	Driver Alarm
231	J1939 Link
232	Reference Voltage
233	Fuel Control Module
235	Parking Brake
236	Power Relay
237	Starter
238	Engine Shutdown Alarm
239	Electronic Malfunction Lamp
242	Cruise Control Resume Switch
243	Cruise Control Set Switch
244	Cruise Control Enable Switch
245	Clutch Pedal Switch
246	Service Brake
248	Proprietary Data Link
250	SAE J1708 (J1587) Data Link
254	Vehicle Control Module

Subsystem Identifiers (SID) for MID 128	Description
1	Injector Cylinder #1
2	Injector Cylinder #2
3	Injector Cylinder #3
4	Injector Cylinder #4
5	Injector Cylinder #5
6	Injector Cylinder #6
7	Injector Cylinder #7
8	Injector Cylinder #8
21	Engine Position Sensor
22	Timing Sensor
26	Auxiliary Output Device #1
27	VTG Actuator #1
32	Wastegate Output Driver
33	Fan Clutch Output Driver
40	Output Device #2
51	Output Device #3

Subsystem Identifiers (SID) for MID 128	Description
79	Engine Brake #1
80	Engine Brake #2
81	Exhaust Brake
146	EGR Valve Mechanism #1
151	System Diagnostic
269	VTG Position Sensor
270	Compressor Discharge Temperature
271	Charge Air Cooler Bypass
272	Aftercooler Outlet Temperature
274	Combustion Air Humidity
277	EGR Mass Flow

Subsystem Identifiers (SID) for MID 143	Description
1	Injector Cylinder #1
2	Injector Cylinder #2
3	Injector Cylinder #3
4	Injector Cylinder #4
5	Injector Cylinder #5
6	Injector Cylinder #6
7	Injector Cylinder #7
8	Injector Cylinder #8
20	Timing Actuator
21	Engine Position Sensor
22	Timing Sensor
23	Rack Actuator
24	Rack Position Sensor
26	Auxiliary Output Device
27	Fan Clutch
28	Engine Brake #1
29	Engine Brake #2
30	Exhaust Brake
33	Fan Clutch

Subsystem Identifiers (SID) for MID 142	Description
1	Timing Sensor
2	Timing Actuator
3	Rack Position Sensor
4	Rack Actuator
5	Oil Level Lamp
6	Tachometer Output
7	Speedometer Output
10	Auxiliary Output #1
11	Auxiliary Output #2
12	Spare Relay #3
32/37	Mechanical System Not Responding
151	Custom Defined Statistic
152	Transmission Splitter Position

Subsystem Identifiers (SID) for MID 130	Description
1–6	C1–C6 Solenoid Valves
7	Lockup Solenoid Valve
8	Forward Solenoid Valve
9	Low Signal Solenoid Valve
10	Retarder Enable Solenoid Valve
11	Retarder Modulation Solenoid Valve
12	Retarder Response Solenoid Valve
13	Differential Lockout Solenoid Valve
14	Engine/Transmission Match
15	Retarder Modulation Request Sensor
16	Neutral Start Output
17	Turbine Speed Sensor
18	Primary Shift Selector
19	Secondary Shift Selector
20	Special Function Inputs
21–26	C1–C6 Clutch Pressure Indicators
27	Lockup Clutch Pressure Indicator
28	Forward Range Pressure Indicator
29	Neutral Range Pressure Indicator
30	Reverse Range Pressure Indicator
31	Retarder Response System Pressure Indicator
32	Differential Lock Clutch Pressure Indicator
33	Multiple Pressure Indicators

Subsystem Identifiers (SID) for MID 136-139	Description
1	Wheel Sensor ABS Axle 1 Left
2	Wheel Sensor ABS Axle 1 Right
3	Wheel Sensor ABS Axle 2 Left
4	Wheel Sensor ABS Axle 2 Right
5	Wheel Sensor ABS Axle 3 Left
6	Wheel Sensor ABS Axle 3 Right
7	Pressure Modulation Valve ABS Axle 1 Left
8	Pressure Modulation Valve ABS Axle 1 Right
9	Pressure Modulation Valve ABS Axle 2 Left
10	Pressure Modulation Valve ABS Axle 2 Right
11	Pressure Modulation Valve ABS Axle 3 Left
12	Pressure Modulation Valve ABS Axle 3 Right
13	Retarder Control Relay
14	Relay Diagonal 1
15	Relay Diagonal 2
16	Mode Switch — ABS
17	Mode Switch — Traction Control
18	DIF 1 — Traction Control Valve
19	DIF 2 — Traction Control Valve
22	Speed Signal Input
23	Warning Light Bulb
24	Traction Control Light Bulb
25	Wheel Sensor, ABS Axle 1 Average
26	Wheel Sensor, ABS Axle 2 Average
27	Wheel Sensor, ABS Axle 3 Average
28	Pressure Modulator, Drive Axle Relay Valve
29	Pressure Transducer, Drive Axle Relay Valve
30	Master Control Relay

Subsystem Identifiers (SID) for MID 162	Description
1	Dead Reckoning Unit
2	Loran Receiver
3	Global Positioning System (GPS)
4	Integrated Navigation Unit

Subsystem Identifiers (SID) for MID 190	Description
1	Refrigerant Charge
2	Refrigerant Moisture Level
3	Non-Condensable Gas in Refrigerant
4	Refrigerant Control Solenoid
5	Low Side Refrigerant Pressure Switch
6	Compressor Clutch Circuit
7	Evaporator Thermostat Circuit
8	Refrigerant Flow

Failure Mode Identifiers (FMI)	Description
0	Data valid but greater than normal operating range
1	Data valid but less than normal operating range
2	Data erratic, intermittent or incorrect
3	Voltage greater than normal or shorted high
4	Voltage less than normal or shorted low
5	Current less than normal or open circuit
6	Current greater than normal or grounded circuit
7	Mechanical system not responding properly
8	Abnormal frequency, pulse width, or period
9	Abnormal update rate
10	Abnormal rate of change
11	Failure mode not identifiable
12	Bad intelligent device or component
13	Out of Calibration
14	Special Instructions

BLINK CODE 1-1 — ENGINE OIL PRESSURE (EOP) SENSOR (ASET™ IEGR ENGINE)

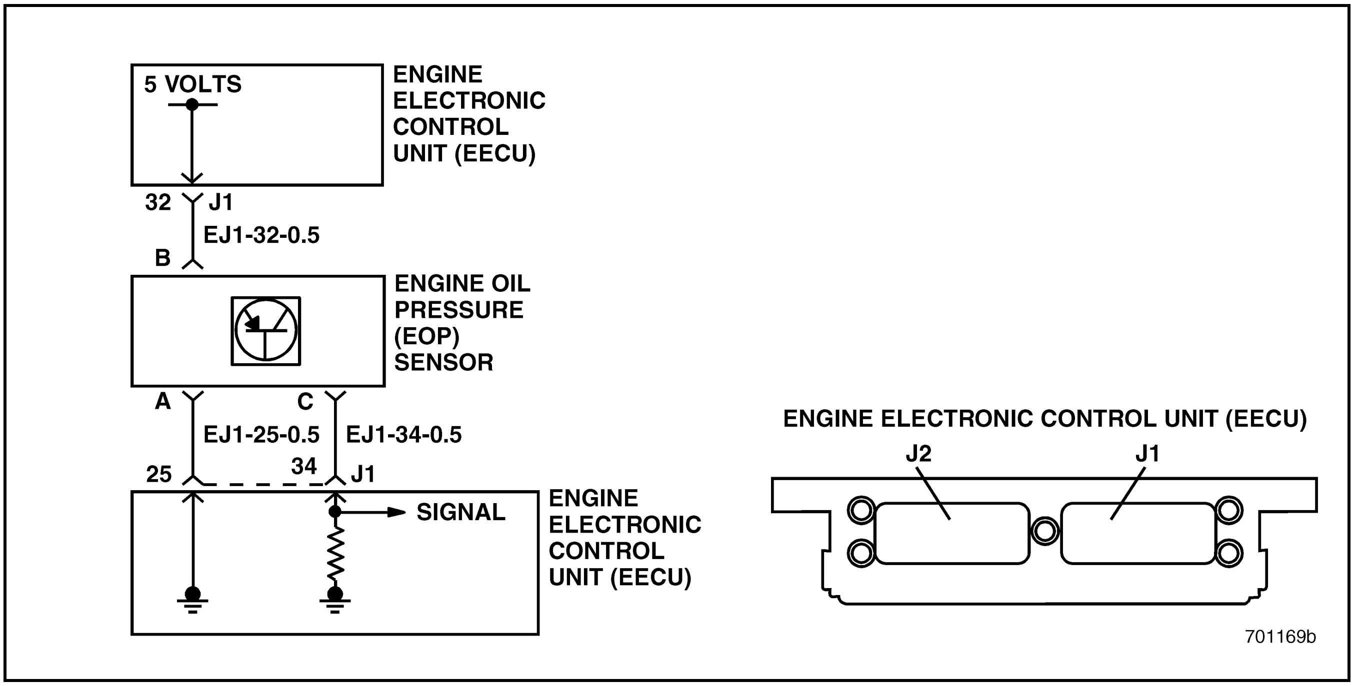


Figure 10 — Engine Oil Pressure Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): P100

Message Identification (MID): 128

Circuit Description: The Engine Oil Pressure (EOP) Sensor is used to detect engine lubrication system failures. The sensor consists of a pressure sensitive diaphragm and amplifier. Engine oil pressure causes the sensor's diaphragm to deflect and produce an electrical signal proportional to the pressure. The diaphragm deflection signal is amplified in the sensor. The sensor's signal is monitored by the Engine Electronic Control Unit (EECU). The EECU will set a fault code if the sensor signal is not within predetermined limits.

Location: The Engine Oil Pressure (EOP) Sensor is located on the left side of the engine on the rear, of the oil filter assembly. The Engine Electronic Control Unit (EECU) is mounted on a fuel cooled mounting plate on the air intake manifold, on the left side of the engine.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 1-1 will set when the EOP Sensor's signal line voltage is less than 0.4 volts or greater than 4.9 volts for 1 second. If the signal line voltage returns to between 0.4 volts and 4.9 volts for 1 second, the fault will become inactive.

Normal EOP Sensor Parameters: Not applicable.

NOTE

See Test 128 for Engine Oil Pressure (EOP) Sensor testing procedure.

Test 1 — Check for Code 1-1

1. Verify that code 1-1 is set.

   If code 1-1 is set, go to test "Test 2 — Checking Code 1-1 Failure Mode Identifier (FMI)" on page 47.

   If code 1-1 is not set, wiggle the harness and connectors to try and set the code.

Test 2 — Checking Code 1-1 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (voltage low or open), go to test "Test 4 — Checking the EOP Sensor Reference Voltage Line" on page 47.

   If the FMI is 3 (voltage high), go to test "Test 5 — Checking Code 1-1 Failure Mode Identifier (FMI) with the EOP Sensor Disconnected" on page 47.

Test 4 — Checking the EOP Sensor Reference Voltage Line

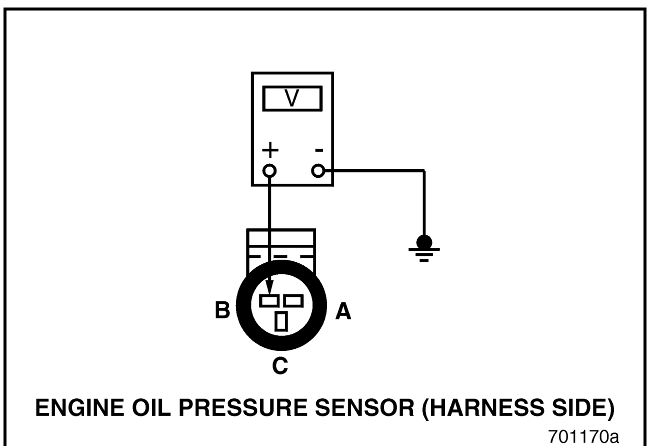


Figure 11

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between EOP Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 11).

   If the measured voltage is greater than 4.75 volts, go to test "Test 8 — Checking the EOP Sensor Signal Line for a Short to Ground" on page 48.

   If the measured voltage is less than 4.75 volts, go to test "Test 9 — Checking the Harness for Continuity in the EOP Sensor Reference Voltage Line" on page 48.

Test 5 — Checking Code 1-1 Failure Mode Identifier (FMI) with the EOP Sensor Disconnected

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI code 3 (voltage high) changed to FMI code 4 (voltage low or open), go to test "Test 10 — Checking the EOP Sensor Reference Voltage Line" on page 49.

   If the FMI code did NOT change, go to test "Test 11 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Signal Line" on page 49.

Test 8 — Checking the EOP Sensor Signal Line for a Short to Ground

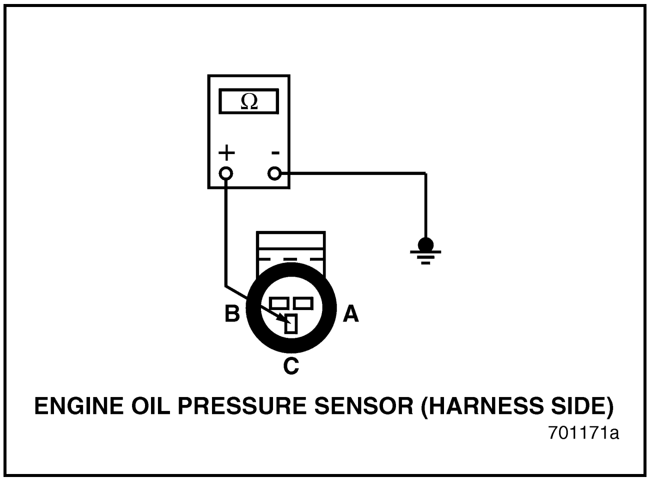


Figure 12

1. Turn the ignition key OFF.
2. Check for continuity between Engine Oil Pressure (EOP) Sensor harness connector pin C (signal line) and a good ground (see Figure 12).

   If there is NO continuity, go to test “Test 16 — Checking for Continuity in the EOP Sensor Signal Line” on page 50.

   If continuity exists, locate and repair the short to ground.

Test 9 — Checking the Harness for Continuity in the EOP Sensor Reference Voltage Line

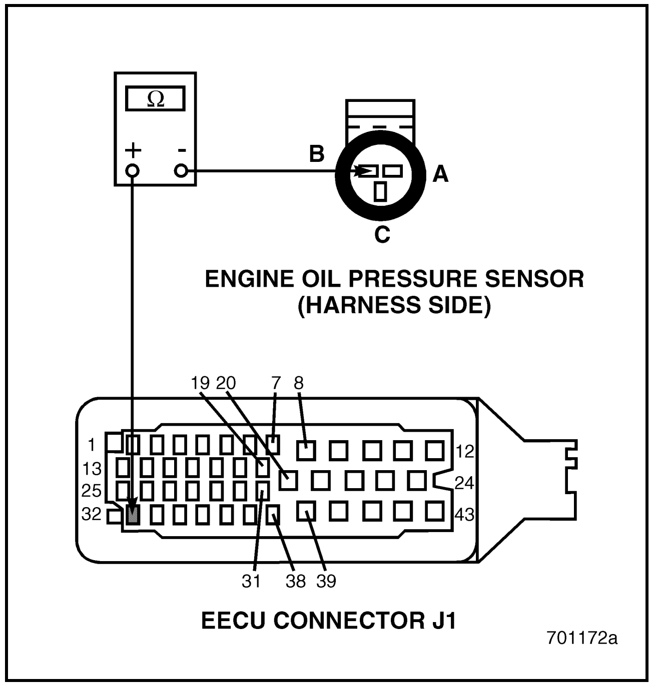


Figure 13

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Check for continuity between Engine Oil Pressure (EOP) Sensor harness connector pin B (reference voltage line) and EECU harness connector J1 pin 32 (see Figure 13).

   If continuity exists, go to test “Test 18 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line” on page 50.

   If there is NO continuity, repair the open in the harness reference voltage line.

Test 10 — Checking the EOP Sensor Reference Voltage Line

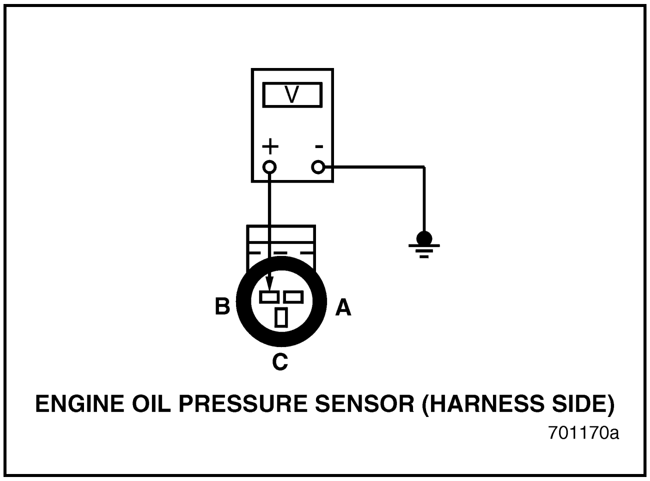


Figure 14

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Measure voltage between Engine Oil Pressure (EOP) Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 14).

   If the measured voltage is less than 5.25 volts, go to test “Test 20 — Checking the EOP Sensor Return Line for a Short Circuit” on page 51.

   If the measured voltage is greater than 5.25 volts, go to test “Test 21 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line” on page 51.

Test 11 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Signal Line

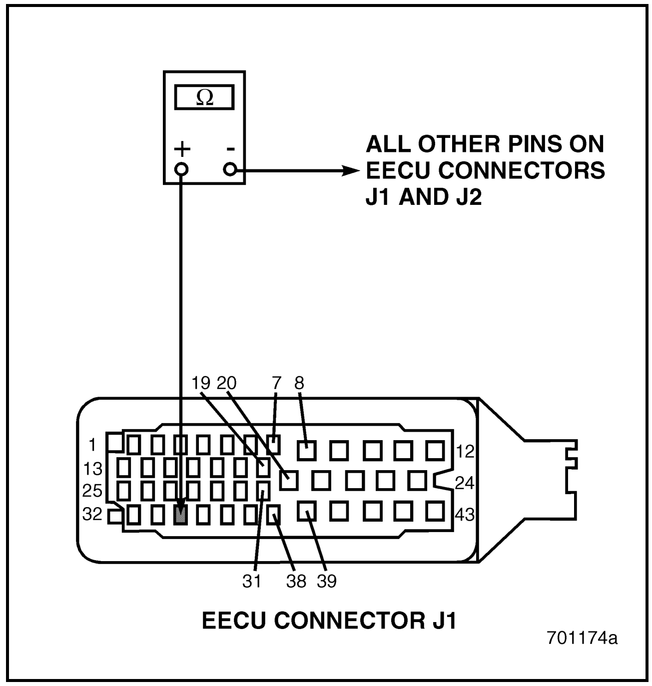


Figure 15

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 34 (signal line) and all other pins in EECU harness connectors J1 and J2 (see Figure 15).
5. Visually check EECU connector J1 pin 34 for a short.

   If continuity exists or if there is a visual short, repair the short to the signal line.

   If there is NO continuity or visual short, replace the EECU.

Test 16 — Checking for Continuity in the EOP Sensor Signal Line

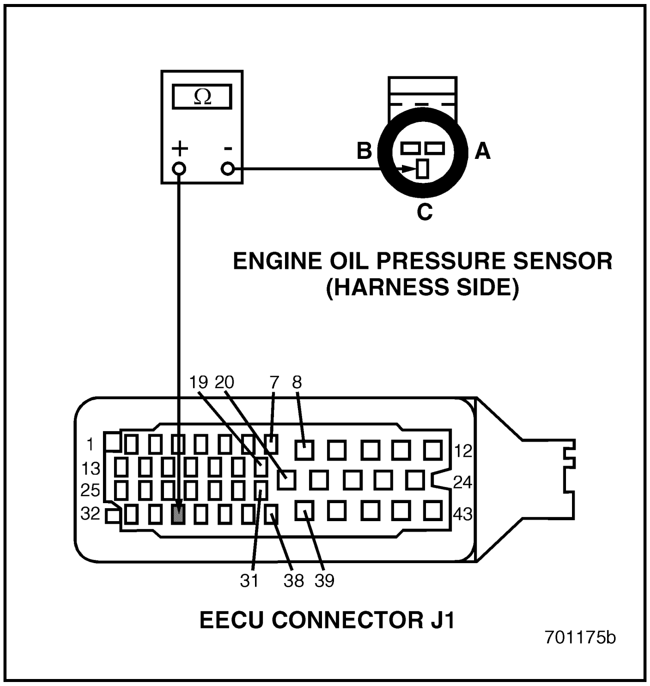


Figure 16

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J1.
4. Check for continuity between EOP sensor harness connector pin C (signal line) and EECU harness connector J1 pin 34 (see Figure 16).

   If continuity exists, go to test "Test 32 — Checking the EOP Sensor Connector" on page 52.

   If there is NO continuity, repair the open in the harness signal line.

Test 18 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line

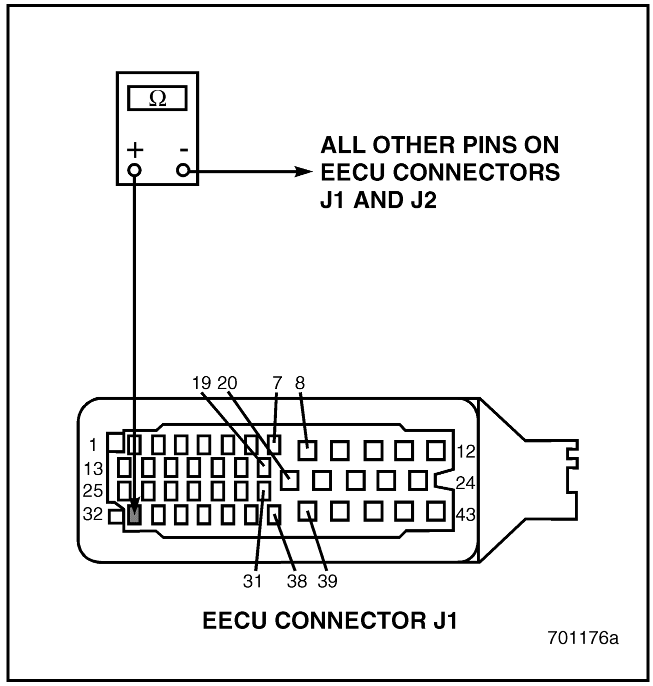


Figure 17

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 32 (reference voltage line) and all other pins in EECU harness connectors J1 and J2 (see Figure 17).
5. Visually check EECU connector J1 pin 32 for a short.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 20 — Checking the EOP Sensor Return Line for a Short Circuit

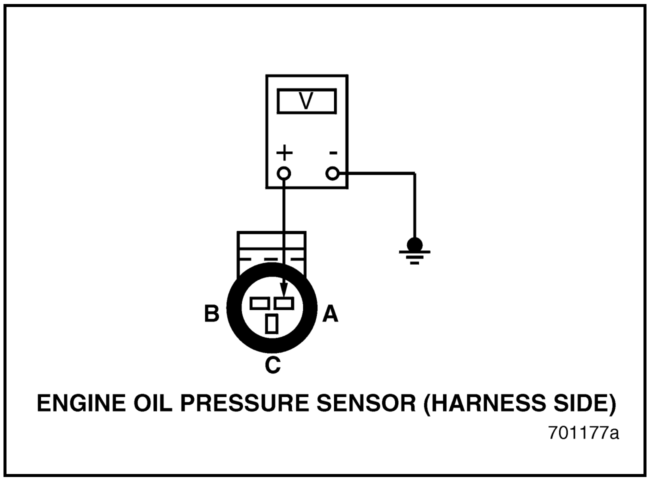


Figure 18

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Measure voltage between EOP Sensor harness connector pin A (ground line) and a good ground (see Figure 18).

   If the measured voltage is 0.5 volts or less, go to test "Test 40 — Checking the EOP Sensor Return Line for an Open Circuit" on page 52.

   If the measured voltage is greater than 0.5 volts, go to test "Test 41 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Return Line" on page 53.

Test 21 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line

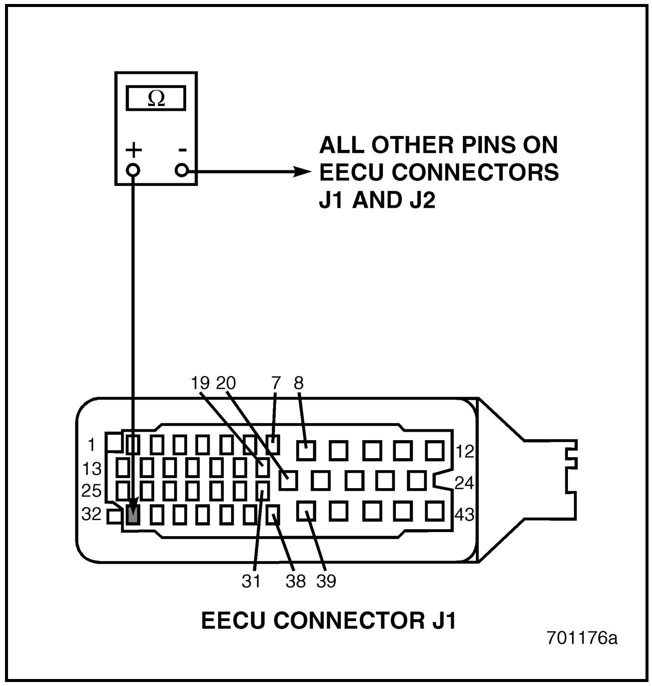


Figure 19

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Disconnect the Engine Oil Pressure (EOP) Sensor.
4. Check for continuity between EECU harness connector J1 pin 32 (reference voltage line) and all other pins in EECU harness connectors J1 and J2 (see Figure 19).
5. Visually check EECU connector J1 pin 32 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short circuit, replace the EECU.

Test 32 — Checking the EOP Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Engine Oil Pressure (EOP) Sensor connector for a repairable open.
2. Find the gray male test lead from the J 38581 V-MAC Jumper Wire Kit. Align the male test lead with one of the rectangular female pins in the EOP Sensor harness connector. Gently push the test lead into the harness connector pin. Repeat this process for the remaining two female pins (pin C is turned 90 degrees from pins A and B).

   If there is a repairable fault or any of the pins feel loose, repair or replace the connector.
3. Find the gray female test lead from the J 38581 V-MAC Jumper Wire Kit. Align the female test lead with one of the rectangular male pins in the EOP Sensor connector. Gently push the test lead over the pin. Repeat this process for the remaining two male pins (pin C is turned 90 degrees from pins A and B).

   If any of the pins feel loose, replace the EOP Sensor.

   If the pins in the connector are NOT loose, go to test “Test 64 — Checking the EECU Connector for an Open in the EOP Sensor Signal Line” on page 53.

Test 40 — Checking the EOP Sensor Return Line for an Open Circuit

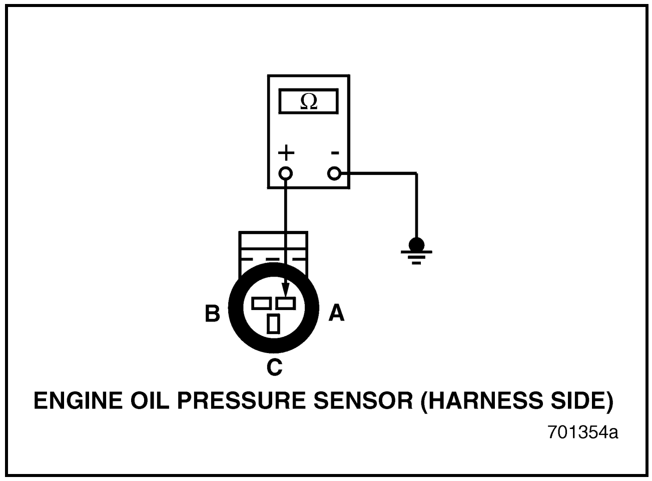


Figure 20

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Check for continuity between EOP Sensor harness connector pin A (ground line) and a good ground (see Figure 20).

   If continuity exists, go to test “Test 80 — Checking the EOP Sensor Connector” on page 53.

   If there is NO continuity, go to test “Test 81 — Checking the Harness for an Open in the EOP Sensor Return Line” on page 54.

Test 41 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Return Line

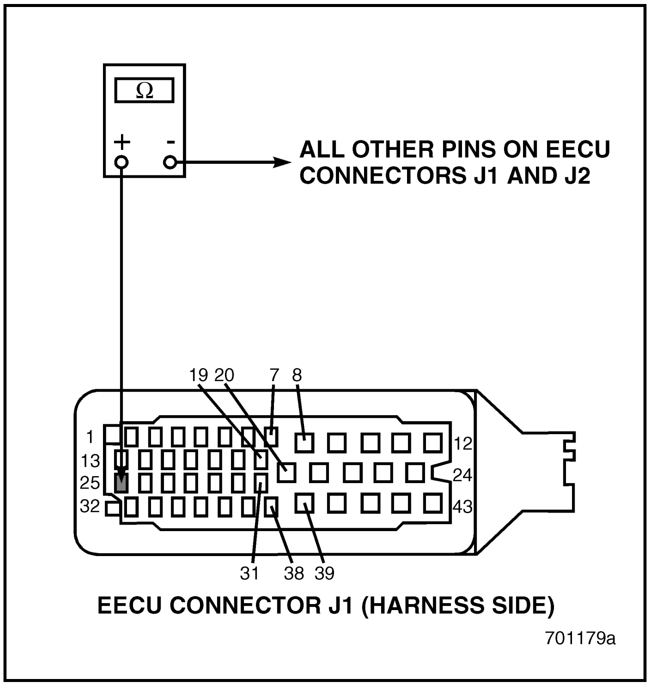


Figure 21

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Disconnect the Engine Oil Pressure (EOP) Sensor.
4. Check for continuity between EECU harness connector J1 pin 25 (ground line) and all other pins in EECU harness connectors J1 and J2 (see Figure 21).
5. Visually check EECU connector J1 pin 25 for a short circuit.

   If continuity exists or if there is a visual short circuit, repair the short to the return line.

   If there is NO continuity or visual short circuit, replace the EECU.

Test 64 — Checking the EECU Connector for an Open in the EOP Sensor Signal Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J1 pin 34 for a repairable open in the signal line.

   If a repairable open is found, repair or replace EECU harness connector J1.

   If the pin is making good contact, go to test "Test 128 — Checking the EOP Sensor for a Fault" on page 54.

Test 80 — Checking the EOP Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Engine Oil Pressure (EOP) Sensor connector for a repairable open.
2. Find the gray male test lead from the J 38581 V-MAC Jumper Wire Kit. Align the male test lead with one of the rectangular female pins in the EOP Sensor harness connector. Gently push the test lead into the harness connector pin. Repeat this process for the remaining two female pins (pin C is turned 90 degrees from pins A and B).

   If there is a repairable fault or any of the pins feel loose, repair or replace the connector.
3. Find the gray female test lead from the J 38581 V-MAC Jumper Wire Kit. Align the female test lead with one of the rectangular male pins in the EOP Sensor connector. Gently push the test lead over the pin. Repeat this process for the remaining two male pins (pin C is turned 90 degrees from pins A and B).

   If any of the pins feel loose, replace the EOP Sensor.

   If the pins in the connector are NOT loose, go to test "Test 160 — Checking the EOP Sensor for a Fault" on page 55.

Test 81 — Checking the Harness for an Open in the EOP Sensor Return Line

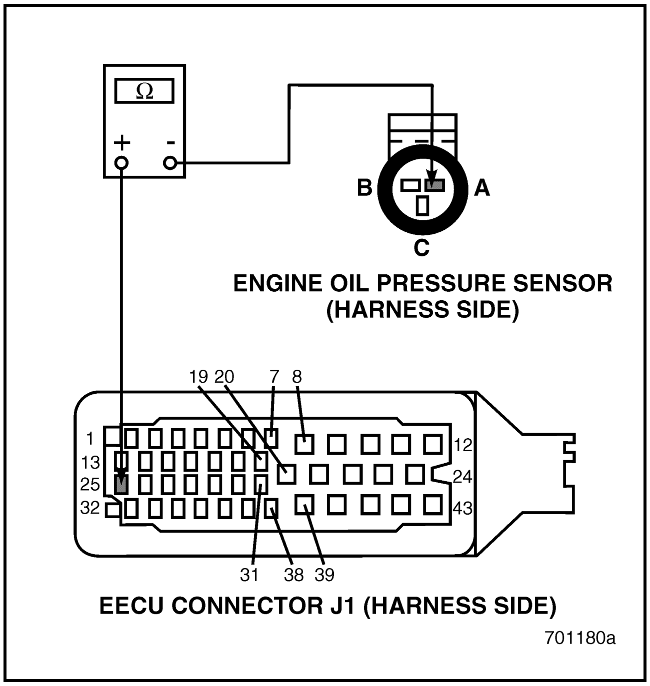


Figure 22

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J1.
4. Check for continuity between EOP Sensor harness connector pin A (ground line) and EECU harness connector J1 pin 25 (see Figure 22).

   If continuity exists, go to test "Test 162 — Checking the EECU Connector for an Open in the EOP Sensor Return Line" on page 55.

   If there is NO continuity, repair the open in the harness ground line.

Test 128 — Checking the EOP Sensor for a Fault

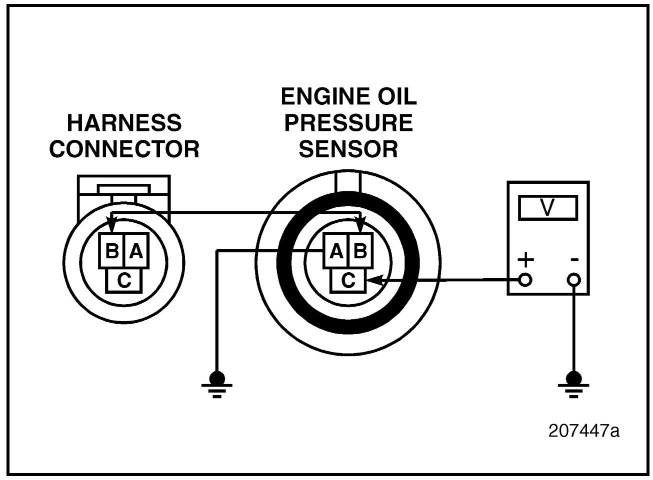


Figure 23

1. Remove the Engine Oil Pressure (EOP) Sensor from the oil filter assembly.
2. Connect the EOP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between EOP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between EOP Sensor pin A and a good ground.
5. Turn the ignition key ON.

6. Measure the voltage between EOP sensor pin C and a good ground at various pressures between 0 psi and 80 psi (see Figure 23). The correct pressure and output voltage specifications are shown in the table below.

Engine Oil Pressure	Sensor Output (5 volt input)
0 psi	.6 volts
10 psi	1.05 volts
20 psi	1.6 volts
30 psi	2.1 volts
40 psi	2.6 volts
50 psi	3.1 volts
60 psi	3.6 volts
70 psi	4.1 volts
80 psi	4.6 volts

If the EOP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the EOP Sensor output is NOT correct throughout the entire pressure range, replace the EOP Sensor and recheck the system.

Test 160 — Checking the EOP Sensor for a Fault

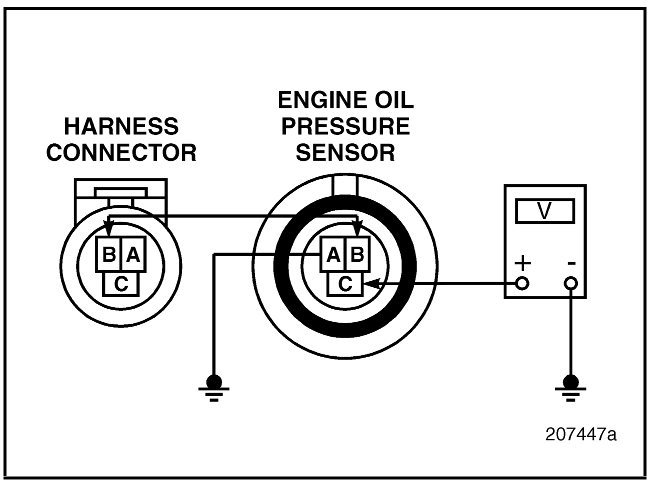


Figure 24

1. Remove the Engine Oil Pressure (EOP) Sensor from the engine.
2. Connect the EOP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between EOP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between EOP Sensor pin A and a good ground.
5. Turn the ignition key ON.
6. Measure the voltage between EOP Sensor pin C and a good ground at various pressures between 0 psi and 80 psi (see Figure 24). The correct pressure and output voltage specifications are shown in the table below.

Engine Oil Pressure	Sensor Output (5 volt input)
0 psi	.6 volts
10 psi	1.05 volts
20 psi	1.6 volts
30 psi	2.1 volts
40 psi	2.6 volts
50 psi	3.1 volts
60 psi	3.6 volts
70 psi	4.1 volts
80 psi	4.6 volts

If the EOP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the EOP Sensor output is NOT correct throughout the entire pressure range, replace the EOP Sensor and recheck the system.

Test 162 — Checking the EECU Connector for an Open in the EOP Sensor Return Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J1 pin 25 for a repairable open in the ground line.

   If a repairable open is found, repair or replace EECU harness connector J1.

   If the pin is making good contact, replace the EECU.

BLINK CODE 1-1 — ENGINE OIL PRESSURE (EOP) SENSOR (ASET™ CEGR ENGINE)

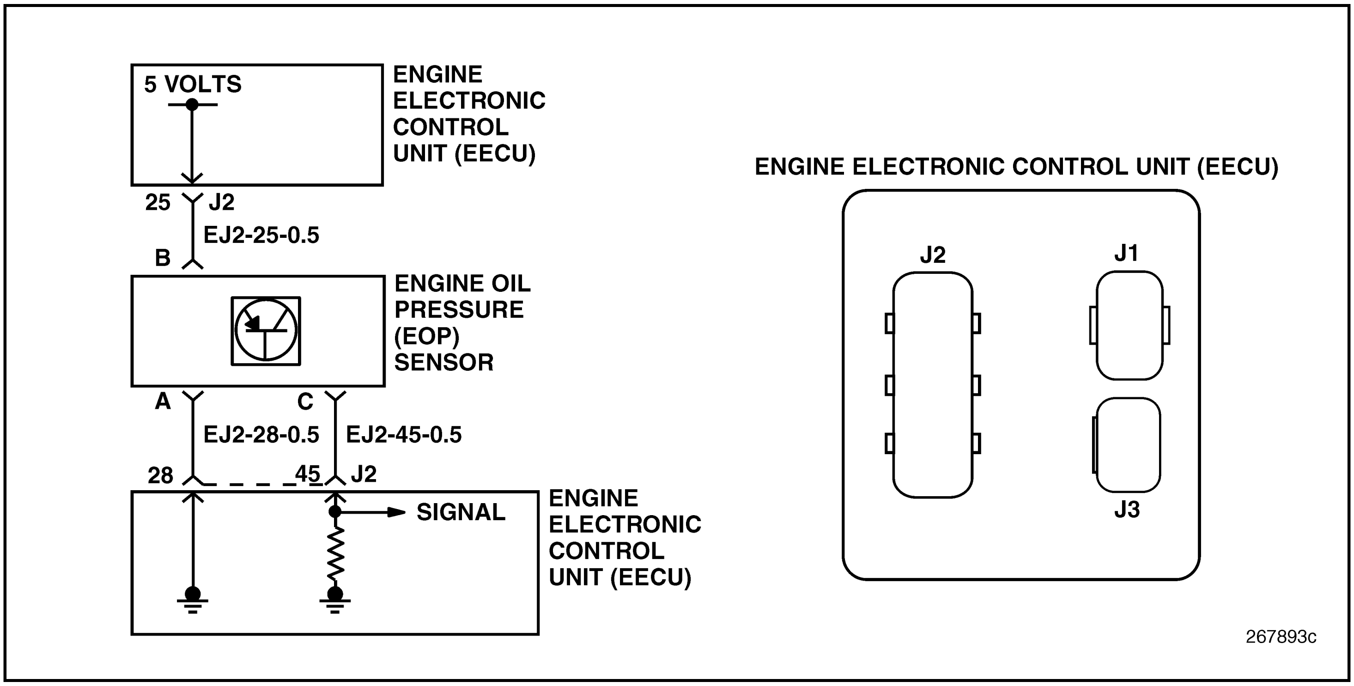


Figure 25 — Engine Oil Pressure Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): P100

Message Identification (MID): 128

Circuit Description: The Engine Oil Pressure (EOP) Sensor is used to detect engine lubrication system failures. The sensor consists of a pressure sensitive diaphragm and amplifier. Engine oil pressure causes the sensor's diaphragm to deflect and produce an electrical signal proportional to the pressure. The diaphragm deflection signal is amplified in the sensor. The sensor's signal is monitored by the Engine Electronic Control Unit (EECU). The EECU will set a fault code if the sensor signal is not within predetermined limits.

Location: The Engine Oil Pressure (EOP) Sensor is located on the left side of the engine on the rear, of the oil filter assembly. The Engine Electronic Control Unit (EECU) is mounted on a fuel cooled mounting plate on the air intake manifold, on the left side of the engine.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 1-1 will set when the EOP Sensor's signal line voltage is less than 0.15 volts or greater than 4.8 volts for 1 second. If the signal line voltage returns to between 0.15 volts and 4.8 volts for 1 second, the fault will become inactive.

Normal EOP Sensor Parameters: Not applicable.

NOTE

See Test 128 for Engine Oil Pressure (EOP) Sensor testing procedure.

Test 1 — Checking for Code 1-1

1. Verify that code 1-1 is set.

   If code 1-1 is set, go to test “Test 2 — Checking Code 1-1 Failure Mode Identifier (FMI)” on page 57.

   If code 1-1 is not set, wiggle the harness and connectors to try and set the code.

2. If codes 4-5 and 10-2 are also set, refer to the diagnostic procedures for these codes before attempting to diagnose code 1-1. Diagnose the cause of code 4-5 before attempting to diagnose code 10-2.

Test 2 — Checking Code 1-1 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (voltage low or open), go to test “Test 4 — Checking the EOP Sensor Reference Voltage Line” on page 57.

   If the FMI is 3 (voltage high), go to test “Test 5 — Checking Code 1-1 Failure Mode Identifier (FMI) with the EOP Sensor Disconnected” on page 57.

Test 4 — Checking the EOP Sensor Reference Voltage Line

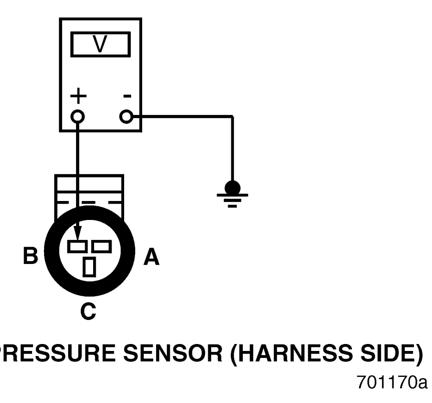


Figure 26

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between EOP Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 26).

   If the measured voltage is greater than 4.75 volts, go to test “Test 8 — Checking the EOP Sensor Signal Line for a Short Circuit to Ground” on page 58.

   If the measured voltage is less than 4.75 volts, go to test “Test 9 — Checking the Harness for Continuity in the EOP Sensor Reference Voltage Line” on page 58.

Test 5 — Checking Code 1-1 Failure Mode Identifier (FMI) with the EOP Sensor Disconnected

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI code 3 (voltage high) changed to FMI code 4 (voltage low or open), go to test “Test 10 — Checking the EOP Sensor Reference Voltage Line” on page 59.

   If the FMI code did NOT change, go to test “Test 11 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Signal Line” on page 59.

Test 8 — Checking the EOP Sensor Signal Line for a Short Circuit to Ground

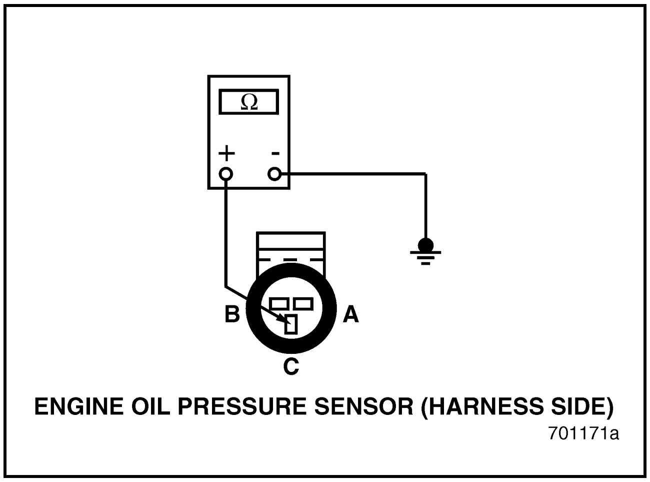


Figure 27

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Check for continuity between Engine Oil Pressure (EOP) Sensor harness connector pin C (signal line) and a good ground (see Figure 27).

   If there is NO continuity, go to test “Test 16 — Checking for Continuity in the EOP Sensor Signal Line” on page 60.

   If continuity exists, locate and repair the short circuit to ground.

Test 9 — Checking the Harness for Continuity in the EOP Sensor Reference Voltage Line

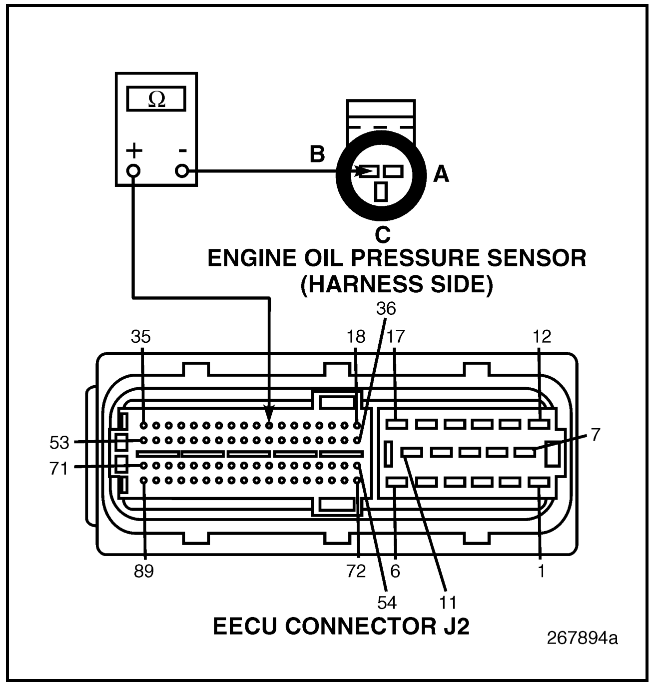


Figure 28

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Check for continuity between Engine Oil Pressure (EOP) Sensor harness connector pin B (reference voltage line) and EECU harness connector J2 pin 25 (see Figure 28).

   If continuity exists, go to test “Test 18 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line” on page 60.

   If there is NO continuity, repair the open in the harness reference voltage line.

Test 10 — Checking the EOP Sensor Reference Voltage Line

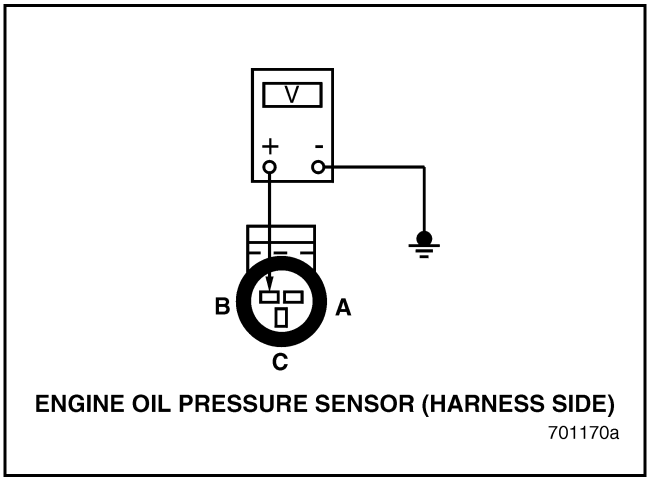


Figure 29

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Measure voltage between Engine Oil Pressure (EOP) Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 29).

   If the measured voltage is less than 5.25 volts, go to test "Test 20 — Checking the EOP Sensor Return Line for a Short Circuit" on page 61.

   If the measured voltage is greater than 5.25 volts, go to test "Test 21 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line" on page 61.

Test 11 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Signal Line

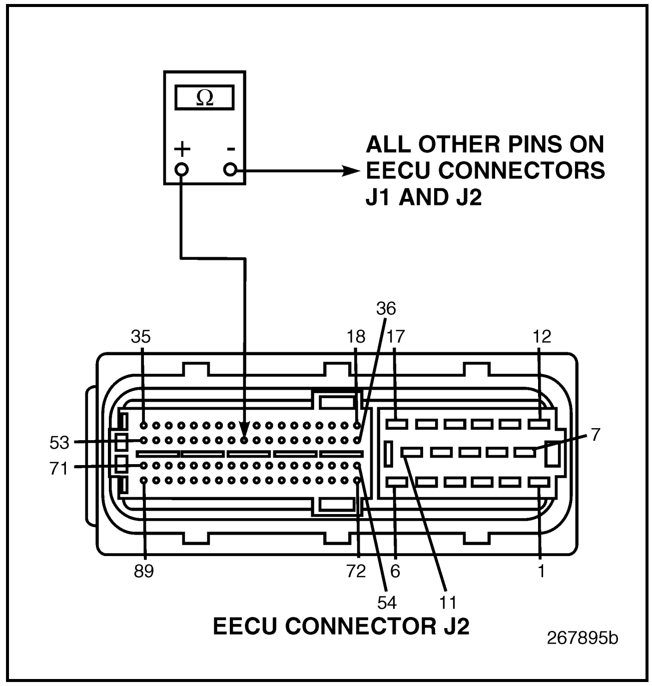


Figure 30

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 45 (signal line) and all other pins in EECU harness connectors J1 and J2 (see Figure 30).
5. Visually check EECU connector J2 pin 45 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the signal line.

   If there is NO continuity or visual short, replace the EECU.

Test 16 — Checking for Continuity in the EOP Sensor Signal Line

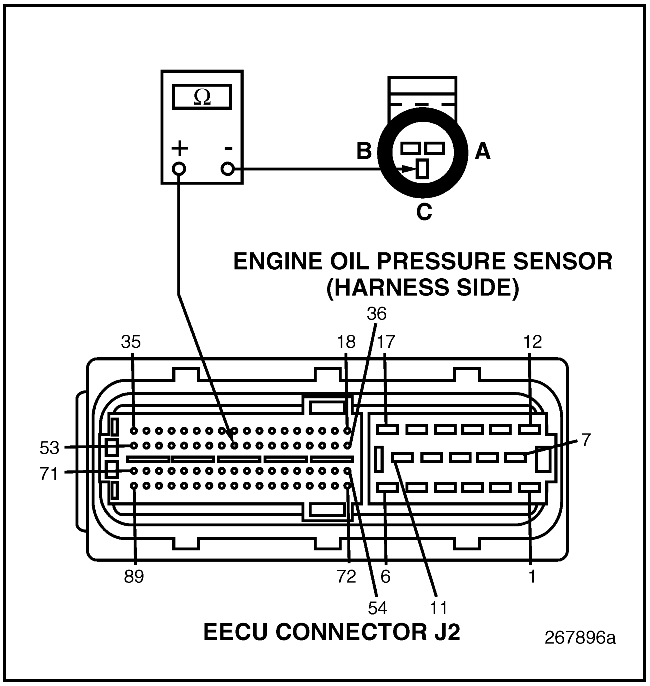


Figure 31

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between EOP sensor harness connector pin C (signal line) and EECU harness connector J2 pin 45 (see Figure 31).

   If continuity exists, go to test “Test 32 — Checking the EOP Sensor Connector” on page 62.

   If there is NO continuity, repair the open in the harness signal line.

Test 18 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line

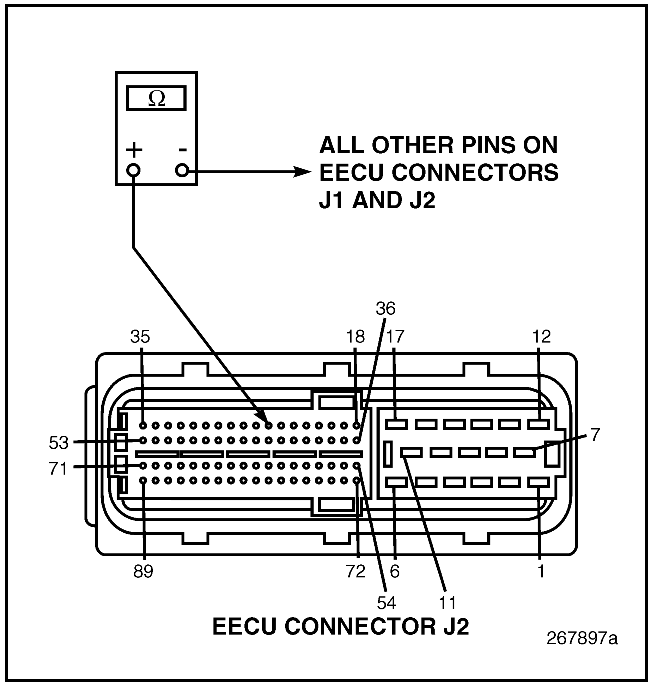


Figure 32

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 25 (reference voltage line) and all other pins in EECU harness connectors J1 and J2 (see Figure 32).
5. Visually check EECU connector J2 pin 25 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 20 — Checking the EOP Sensor Return Line for a Short Circuit

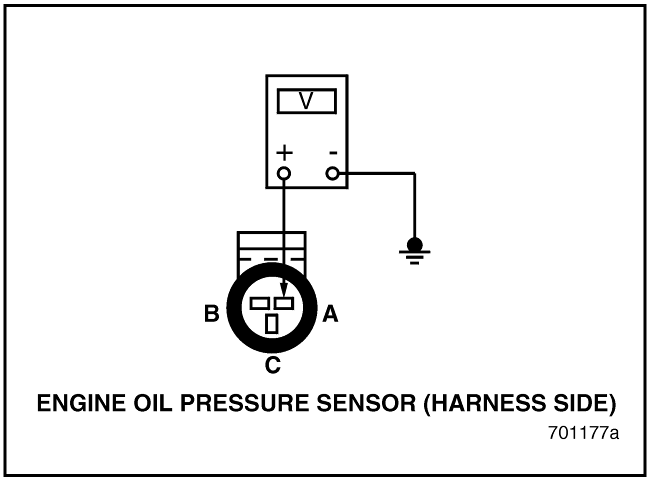


Figure 33

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Turn the ignition key ON.
4. Measure voltage between EOP Sensor harness connector pin A (ground line) and a good ground (see Figure 33).

   If the measured voltage is 0.5 volts or less, go to test “Test 40 — Checking the EOP Sensor Return Line for an Open Circuit” on page 62.

   If the measured voltage is greater than 0.5 volts, go to test “Test 41 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Return Line” on page 63.

Test 21 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Reference Voltage Line

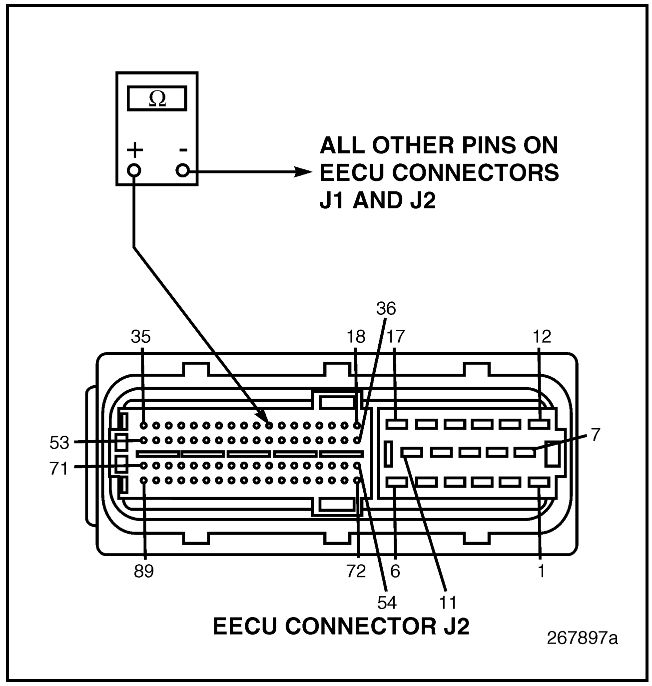


Figure 34

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Disconnect the Engine Oil Pressure (EOP) Sensor.
4. Check for continuity between EECU harness connector J2 pin 25 (reference voltage line) and all other pins in EECU harness connectors J1 and J2 (see Figure 34).
5. Visually check EECU connector J2 pin 25 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short circuit, replace the EECU.

Test 32 — Checking the EOP Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Engine Oil Pressure (EOP) Sensor connector for a repairable open.
2. Find the gray male test lead from the J 38581 V-MAC Jumper Wire Kit. Align the male test lead with one of the rectangular female pins in the EOP Sensor harness connector. Gently push the test lead into the harness connector pin. Repeat this process for the remaining two female pins (pin C is turned 90 degrees from pins A and B).

   If there is a repairable fault or any of the pins feel loose, repair or replace the connector.
3. Find the gray female test lead from the J 38581 V-MAC Jumper Wire Kit. Align the female test lead with one of the rectangular male pins in the EOP Sensor connector. Gently push the test lead over the pin. Repeat this process for the remaining two male pins (pin C is turned 90 degrees from pins A and B).

   If any of the pins feel loose, replace the EOP Sensor.

   If the pins in the connector are NOT loose, go to test “Test 64 — Checking the EECU Connector for an Open in the EOP Sensor Signal Line” on page 63.

Test 40 — Checking the EOP Sensor Return Line for an Open Circuit

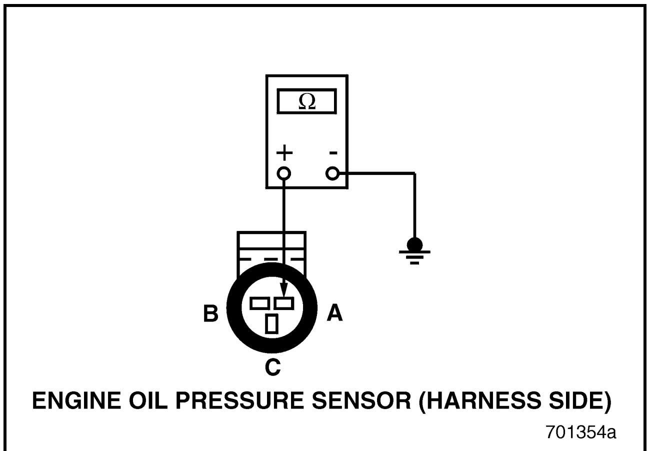


Figure 35

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Check for continuity between EOP Sensor harness connector pin A (ground line) and a good ground (see Figure 35).

   If continuity exists, go to test “Test 80 — Checking the EOP Sensor Connector” on page 63.

   If there is NO continuity, go to test “Test 81 — Checking the Harness for an Open in the EOP Sensor Return Line” on page 64.

Test 41 — Checking the Harness for a Pin to Pin Short in the EOP Sensor Return Line

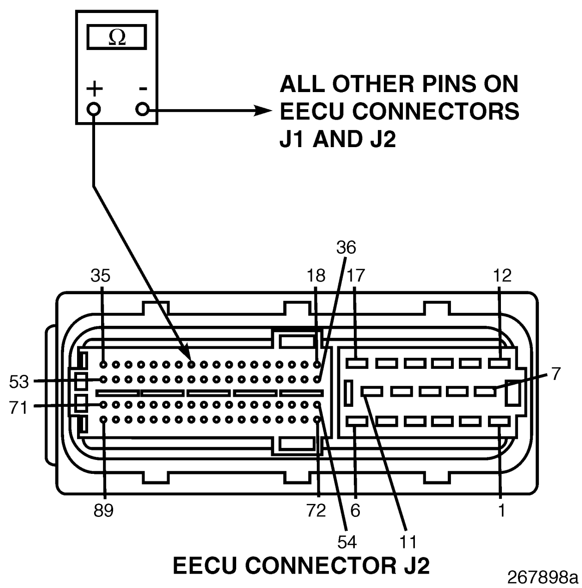


Figure 36

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Disconnect the Engine Oil Pressure (EOP) Sensor.
4. Check for continuity between EECU harness connector J2 pin 28 (ground line) and all other pins in EECU harness connectors J1 and J2 (see Figure 36).
5. Visually check EECU connector J2 pin 28 for a short circuit.

   If continuity exists or if there is a visual short circuit, repair the short to the return line.

   If there is NO continuity or visual short circuit, replace the EECU.

Test 64 — Checking the EECU Connector for an Open in the EOP Sensor Signal Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pin 45 for a repairable open in the signal line.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pin is making good contact, go to test "Test 128 — Checking the EOP Sensor for a Fault" on page 64.

Test 80 — Checking the EOP Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Engine Oil Pressure (EOP) Sensor connector for a repairable open.
2. Find the gray male test lead from the J 38581 V-MAC Jumper Wire Kit. Align the male test lead with one of the rectangular female pins in the EOP Sensor harness connector. Gently push the test lead into the harness connector pin. Repeat this process for the remaining two female pins (pin C is turned 90 degrees from pins A and B).

   If there is a repairable fault or any of the pins feel loose, repair or replace the connector.
3. Find the gray female test lead from the J 38581 V-MAC Jumper Wire Kit. Align the female test lead with one of the rectangular male pins in the EOP Sensor connector. Gently push the test lead over the pin. Repeat this process for the remaining two male pins (pin C is turned 90 degrees from pins A and B).

   If any of the pins feel loose, replace the EOP Sensor.

   If the pins in the connector are NOT loose, go to test "Test 160 — Checking the EOP Sensor for a Fault" on page 65.

Test 81 — Checking the Harness for an Open in the EOP Sensor Return Line

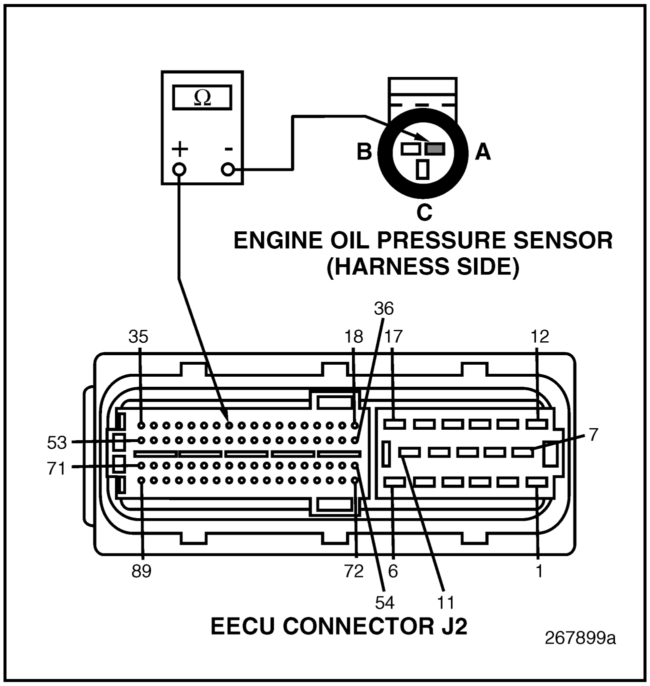


Figure 37

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Pressure (EOP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between EOP Sensor harness connector pin A (ground line) and EECU harness connector J2 pin 28 (see Figure 37).

   If continuity exists, go to test "Test 162 — Checking the EECU Connector for an Open in the EOP Sensor Return Line" on page 65.

   If there is NO continuity, repair the open in the harness ground line.

Test 128 — Checking the EOP Sensor for a Fault

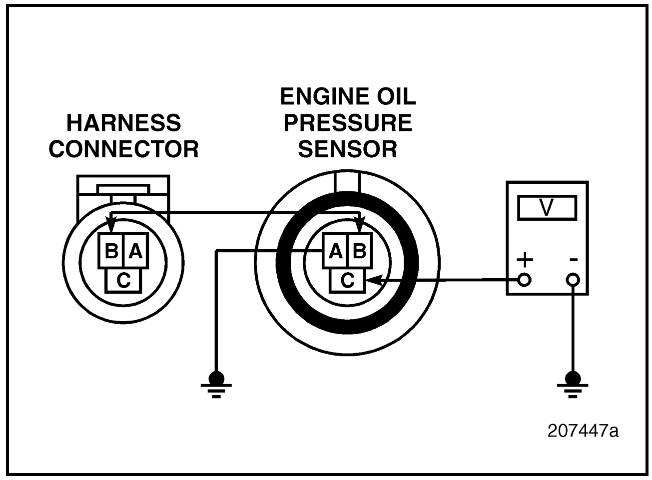


Figure 38

1. Remove the Engine Oil Pressure (EOP) Sensor from the oil filter assembly.
2. Connect the EOP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between EOP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between EOP Sensor pin A and a good ground.
5. Turn the ignition key ON.

6. Measure the voltage between EOP sensor pin C and a good ground at various pressures between 0 psi and 80 psi (see Figure 38). The correct pressure and output voltage specifications are shown in the table below.

Engine Oil Pressure	Sensor Output (5 volt input)
0 psi	.6 volts
10 psi	1.05 volts
20 psi	1.6 volts
30 psi	2.1 volts
40 psi	2.6 volts
50 psi	3.1 volts
60 psi	3.6 volts
70 psi	4.1 volts
80 psi	4.6 volts

If the EOP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the EOP Sensor output is NOT correct throughout the entire pressure range, replace the EOP Sensor and recheck the system.

Test 160 — Checking the EOP Sensor for a Fault

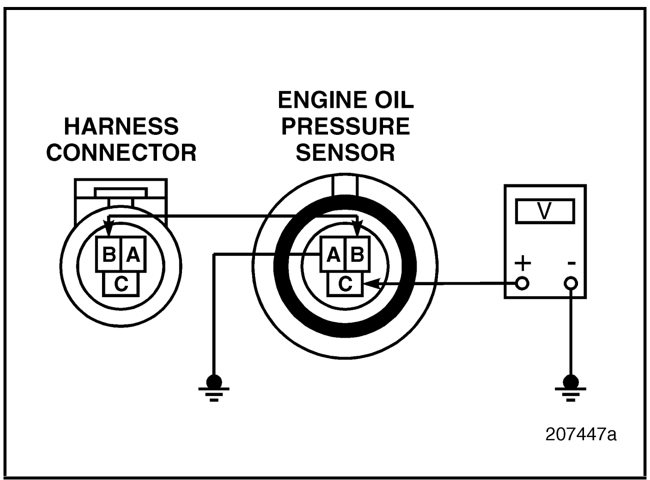


Figure 39

1. Remove the Engine Oil Pressure (EOP) Sensor from the engine.
2. Connect the EOP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between EOP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between EOP Sensor pin A and a good ground.
5. Turn the ignition key ON.
6. Measure the voltage between EOP Sensor pin C and a good ground at various pressures between 0 psi and 80 psi (see Figure 39). The correct pressure and output voltage specifications are shown in the table below.

Engine Oil Pressure	Sensor Output (5 volt input)
0 psi	.6 volts
10 psi	1.05 volts
20 psi	1.6 volts
30 psi	2.1 volts
40 psi	2.6 volts
50 psi	3.1 volts
60 psi	3.6 volts
70 psi	4.1 volts
80 psi	4.6 volts

If the EOP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the EOP Sensor output is NOT correct throughout the entire pressure range, replace the EOP Sensor and recheck the system.

Test 162 — Checking the EECU Connector for an Open in the EOP Sensor Return Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pin 28 for a repairable open in the ground line.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pin is making good contact, replace the EECU.

BLINK CODE 1-2 — BAROMETRIC PRESSURE SENSOR

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): 108

Message Identification (MID): 128

NOTE

The Barometric Pressure Sensor, inside the Engine Electronic Control Unit (EECU), is shorted to another circuit. If the code is active, attempt to clear the code from memory and check if the code resets. If blink code 1-2 resets, replace the EECU and retest the system.

BLINK CODE 1-3 — FUEL TEMPERATURE (FT) SENSOR (ASET™ IEGR ENGINE)

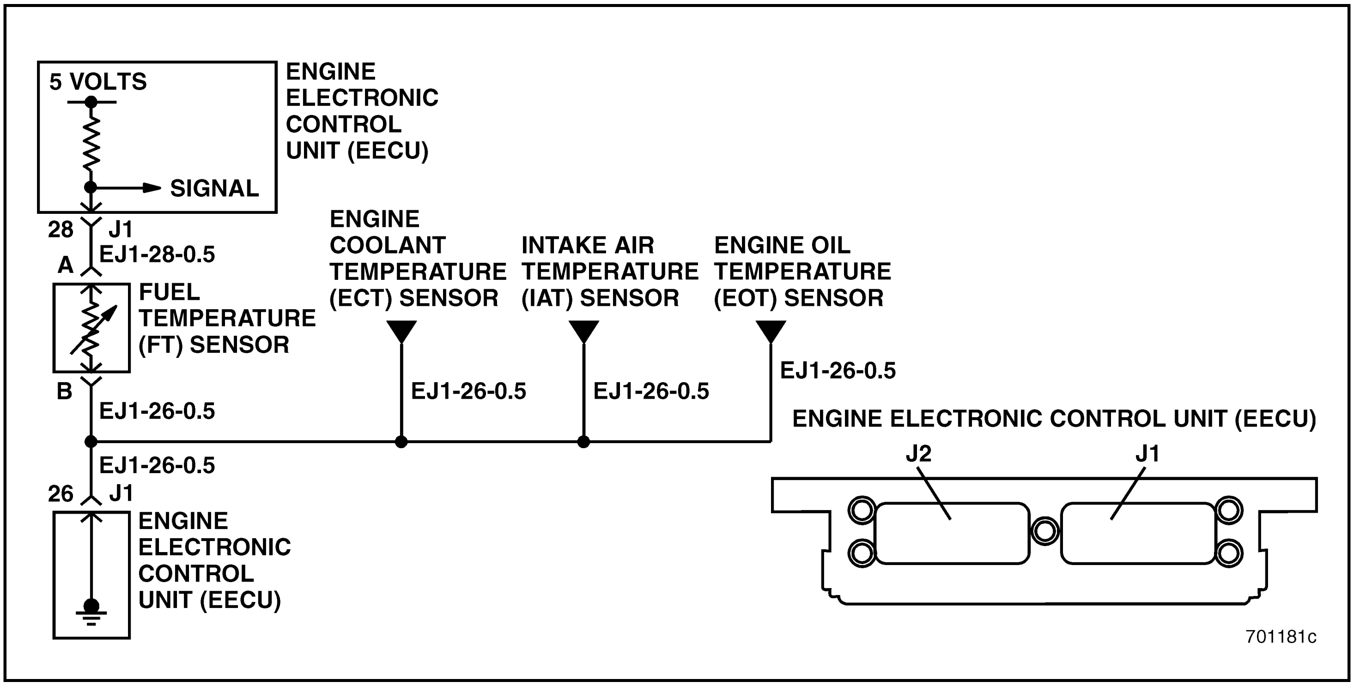


Figure 40 — Fuel Temperature Sensor Circuit (ASET™ IEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): P174

Message Identification (MID): 128

Circuit Description: The Fuel Temperature (FT) Sensor is a thermistor. The resistance of the FT Sensor changes inversely to the temperature of the fuel. When the fuel temperature is cold, the sensor resistance is high. As the temperature of the fuel increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the FT Sensor and uses the signal, along with other sensor signals, to calculate the fuel injection timing.

Location: The Fuel Temperature Sensor is located on the right side of the engine, below Electronic Unit Pump (EUP) #3.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 1-3 will set when the Engine Electronic Control Unit (EECU) senses a FT Sensor signal less than 0.2 volts or greater than 4.5 volts for 1 second. If the FT Sensor voltage returns to between 0.2 volts and 4.5 volts for more than 1 second, the fault will become inactive.

Normal FT Sensor Parameters: The Fuel Temperature (FT) Sensor has a resistance of 9300 ohms at 32°F (0°C) and 200 ohms at 194°F (90°C).

NOTE

Blink code 1-3 can be enabled and disabled in the Customer Data Section of the Engine Electronic Control Unit (EECU). If the Fuel Temperature Sensor is not installed, the diagnostic blink code should be turned OFF.

Test 1 — Checking for Code 1-3

1. Verify that code 1-3 is set.

   If code 1-3 is set, go to test “Test 2 — Checking Code 1-3 Failure Mode Identifier (FMI)” on page 68.

If code 1-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Fuel Temperature (FT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 1-3 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test “Test 4 — Checking for Other Codes” on page 68.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short to Ground in the Sensor” on page 68.

Test 4 — Checking for Other Codes

1. Is code 2-1, 2-3 or 2-7 also set?

   If code 2-1, 2-3 or 2-7 is also set, go to test “Test 8 — Checking for an Open in the FT Sensor Return Line” on page 68.

   If only code 1-3 is set, go to test “Test 9 — Checking Sensor Resistance” on page 69.

Test 5 — Checking for a Short to Ground in the Sensor

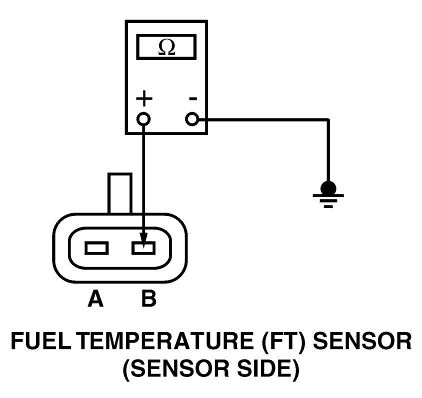


Figure 41

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor connector.
3. Check for continuity from either pin of the FT Sensor to a good ground (see Figure 41).

   If continuity exists, replace the FT Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 69.

Test 8 — Checking for an Open in the FT Sensor Return Line

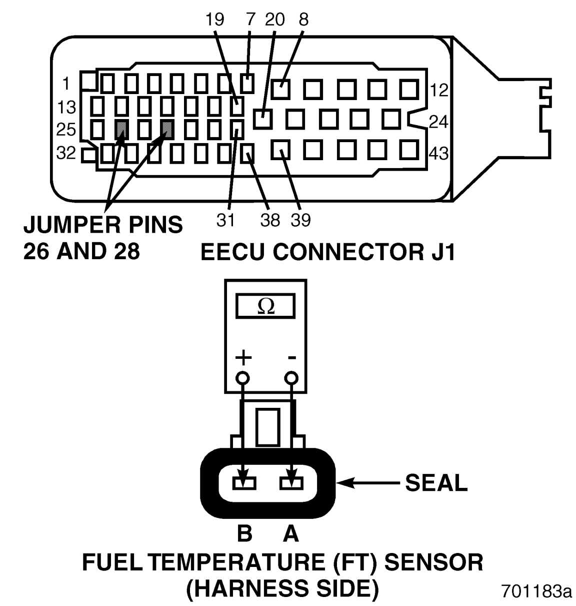


Figure 42

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between J1 pin 28 and J1 pin 26 of the EECU harness connector (see Figure 42).
5. Check for continuity between pin A and B of the FT Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 70.

   If there is NO continuity, there is an open in the ground circuit in the harness between the common ground splice of the sensors and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

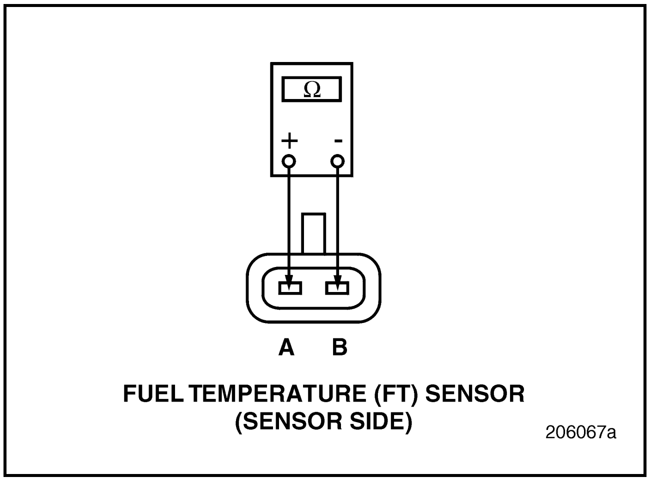


Figure 43

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor harness connector.
3. Measure the resistance across the pins of the FT Sensor with the fuel temperature between 32° and 194°F (0° and 90°C) (see Figure 43).

   If the resistance of the sensor is between 9300 and 200 ohms or if the resistance is infinite (open circuit), go to test “Test 18 — Checking Signal Line Voltage” on page 70.

   If the resistance of the sensor is not within normal operating parameters (9300 to 200 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

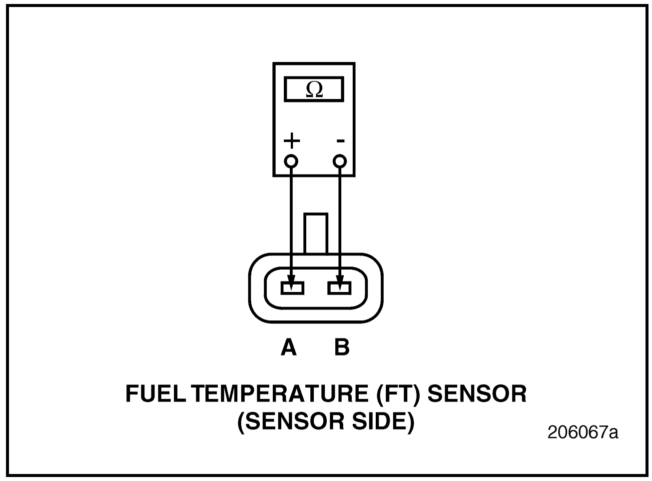


Figure 44

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor connector.
3. Measure the resistance across the pins of the FT Sensor with the fuel temperature between 32° and 194°F (0° and 90°C) (see Figure 44).

   If the resistance is between 9300 and 200 ohms, go to test “Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the FT Sensor” on page 71.

   If the resistance is less than 200 ohms, replace the FT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

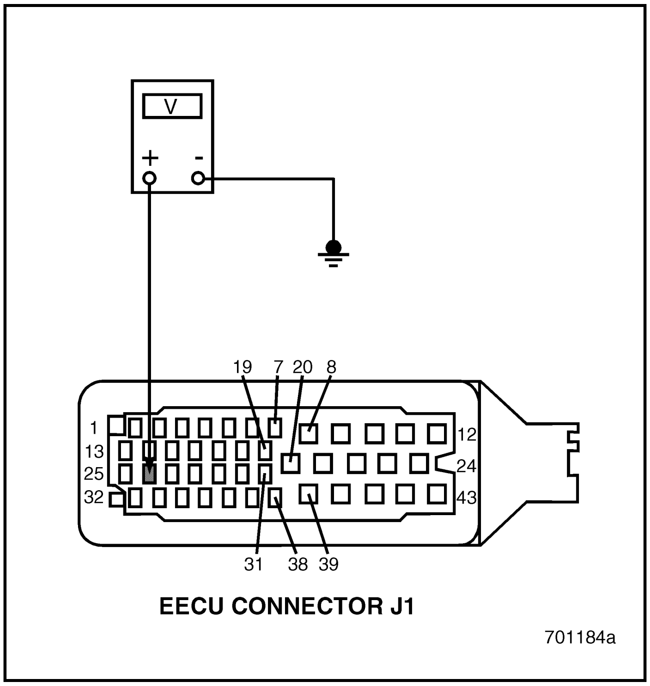


Figure 45

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor connector.
3. Disconnect connector J1 from Engine Electronic Control Unit (EECU).
4. Measure the voltage between EECU connector J1 pin 26 and a good ground (see Figure 45).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking the EECU Connector for an Open FT Sensor Return Line” on page 71.

   If the measured voltage is greater than 0.5 volts, there is a short to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking Signal Line Voltage

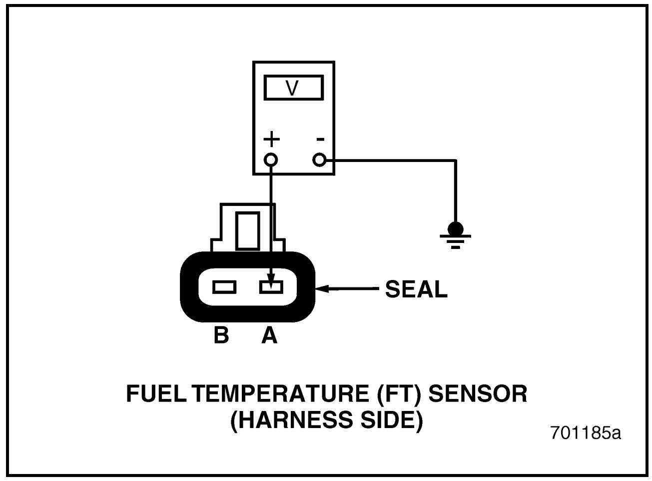


Figure 46

1. Disconnect the FT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between FT Sensor harness connector pin A and a good ground (see Figure 46).

   If the measured voltage is greater than 6 volts, the FT Sensor signal line is shorted to voltage; go to test “Test 36 — Checking for a Short to Voltage in the Signal Line” on page 71.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 9, go to test “Test 37 — Checking for an Open FT Sensor Signal Line” on page 72.

Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the FT Sensor

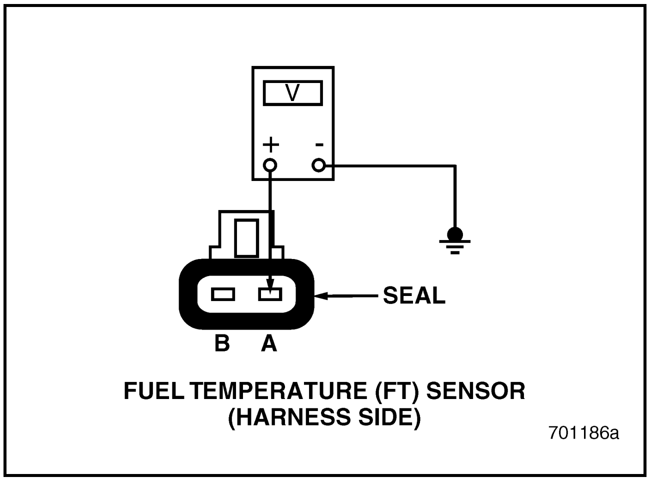


Figure 47

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin A of the FT Sensor harness connector and a good ground (see Figure 47).

   If continuity exists between pin A and ground, go to test “Test 40 — Checking for a Pin to Pin Short in the Harness” on page 72.

   If there is NO continuity, go to test “Test 41 — Checking for Proper Supply Voltage to the Sensor” on page 73.

Test 32 — Checking the EECU Connector for an Open FT Sensor Return Line

1. Visually inspect EECU harness connector J1 pin 26 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pin 26. Gently push the test lead into the harness connector pin and check for looseness.

   If a repairable open is found or the pin feels loose, repair EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pin 26, go to test “Test 64 — Checking for Blink Code 1-3” on page 73.

Test 36 — Checking for a Short to Voltage in the Signal Line

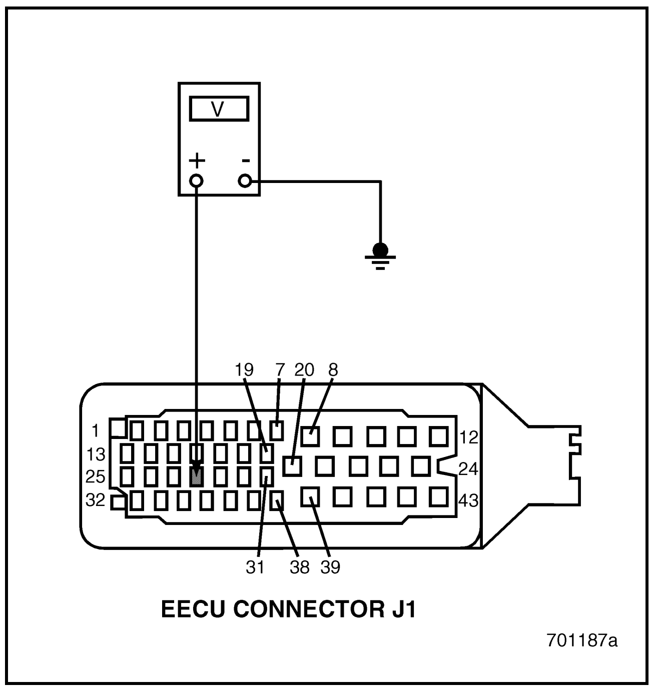


Figure 48

1. Disconnect the FT Sensor harness connector.
2. Turn the ignition key OFF.
3. Disconnect connector J1 from the EECU.
4. Turn the ignition key ON.

5. Measure the voltage from EECU harness connector J1 pin 28 to a good ground (see Figure 48).

   If there is NO voltage indicated, go to test "Test 72 — Checking for a Short at the EECU Connector" on page 73.

   If voltage is present, go to test "Test 73 — Checking for a Pin to Pin Short in the Harness" on page 73.

Test 37 — Checking for an Open FT Sensor Signal Line

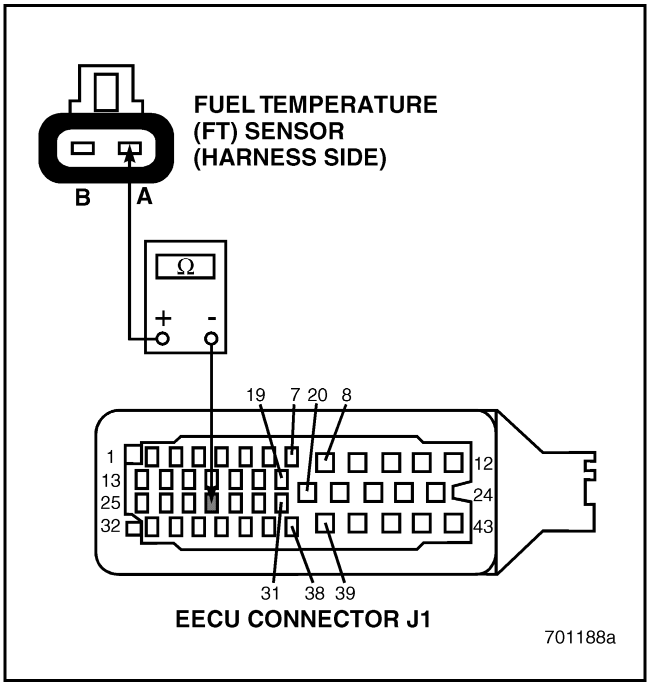


Figure 49

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Disconnect EECU connector J1.
4. Check for continuity between pin A of the FT Sensor harness connector and EECU harness connector J1 pin 28 (see Figure 49).

   If there is NO continuity, locate and repair the open in the signal line between the FT Sensor harness connector and EECU harness connector J1 pin 28.

   If continuity exists, go to test "Test 74 — Checking for an Open FT Sensor Return Circuit" on page 74.

Test 40 — Checking for a Pin to Pin Short in the Harness

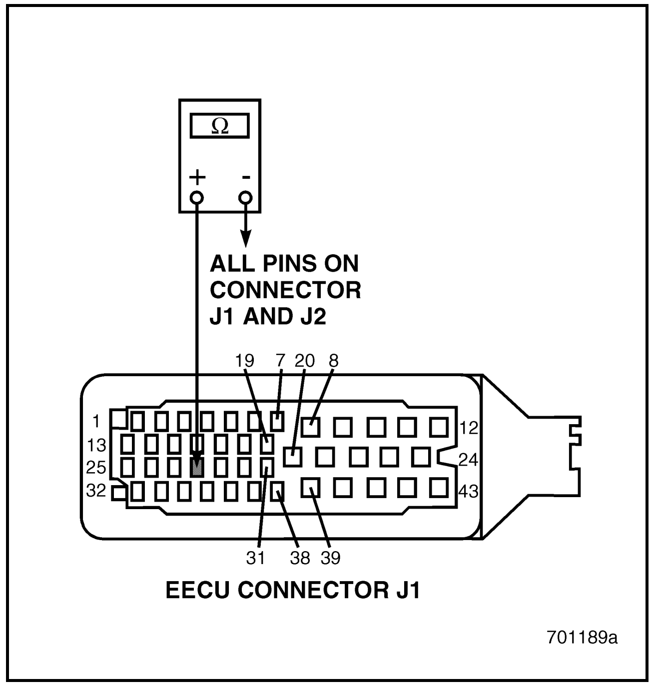


Figure 50

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 28 and all other pins on EECU connectors J1 and J2 (see Figure 50).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

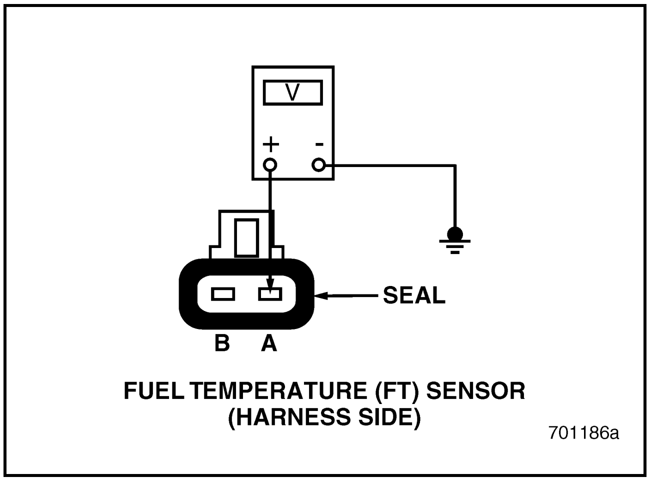


Figure 51

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor connector.
3. Connect connector J1 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin A of the FT Sensor harness connector and a good ground (see Figure 51).

   If the measured voltage is between 4.5 and 5.5 volts, check the FT Sensor harness connector for deformed pins or insufficient contact with the FT Sensor pins. If the pins are in good shape, replace the FT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 74.

Test 64 — Checking for Blink Code 1-3

1. Connect the FT Sensor harness connector.
2. Connect EECU harness connector J1 to the EECU.
3. Turn the ignition key ON.

   If blink code 1-3 is still active, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short at the EECU Connector

NOTE

If the Fuel Temperature Sensor was open in test 9, replace the sensor before retesting the circuit.

1. Turn the ignition key OFF.
2. Connect the FT Sensor harness connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-3 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short in the Harness

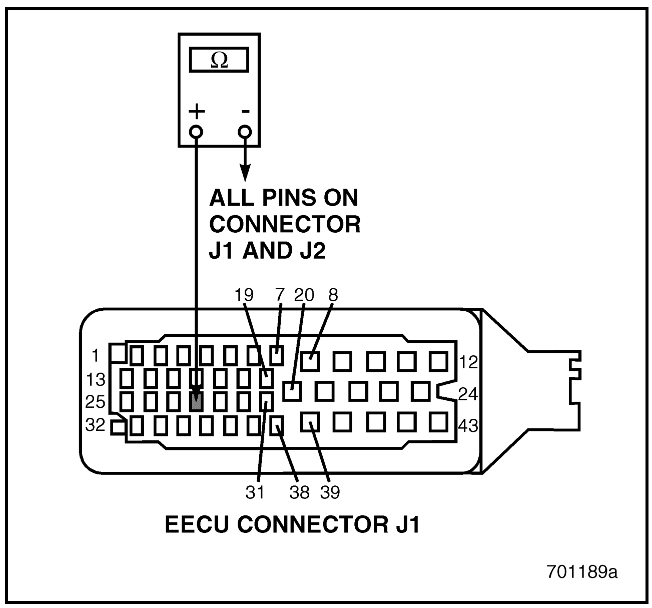


Figure 52

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.

3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 28 and all other pins on EECU connectors J1 and J2 (see Figure 52).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 74 — Checking for an Open FT Sensor Return Circuit

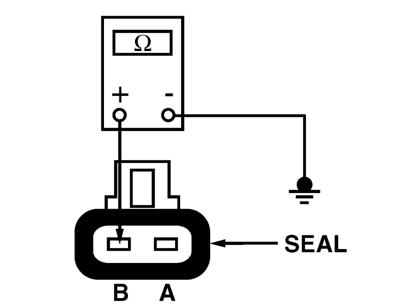


Figure 53

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Connect EECU connector J1.
4. Check for continuity between pin B of the FT Sensor harness connector and a good ground (see Figure 53).

   If there is NO continuity, locate and repair the open in the harness between the FT Sensor and the common ground with the other temperature sensors.

   If continuity exists, check the FT Sensor harness connector for damaged pins or improper mating with the FT Sensor. If the FT Sensor is OK, go to test "Test 148 — Checking the EECU Connector for an Open Circuit" on page 74.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the FT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-3 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect the EECU harness connector J1 pins 26 and 28 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pins 26 and 28. Gently push the test lead into each harness connector pin individually, and check for looseness.

   If a repairable open is found or either of the pins feels loose, repair EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pins 26 and 28, go to test "Test 296 — Checking for an Open Circuit at the EECU Connector" on page 75.

Test 296 — Checking for an Open Circuit at the EECU Connector

1. Connect the FT Sensor connector.
2. Connect connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 1-3 is still active, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 1-3 — FUEL TEMPERATURE (FT) SENSOR (ASET™ CEGR ENGINE)

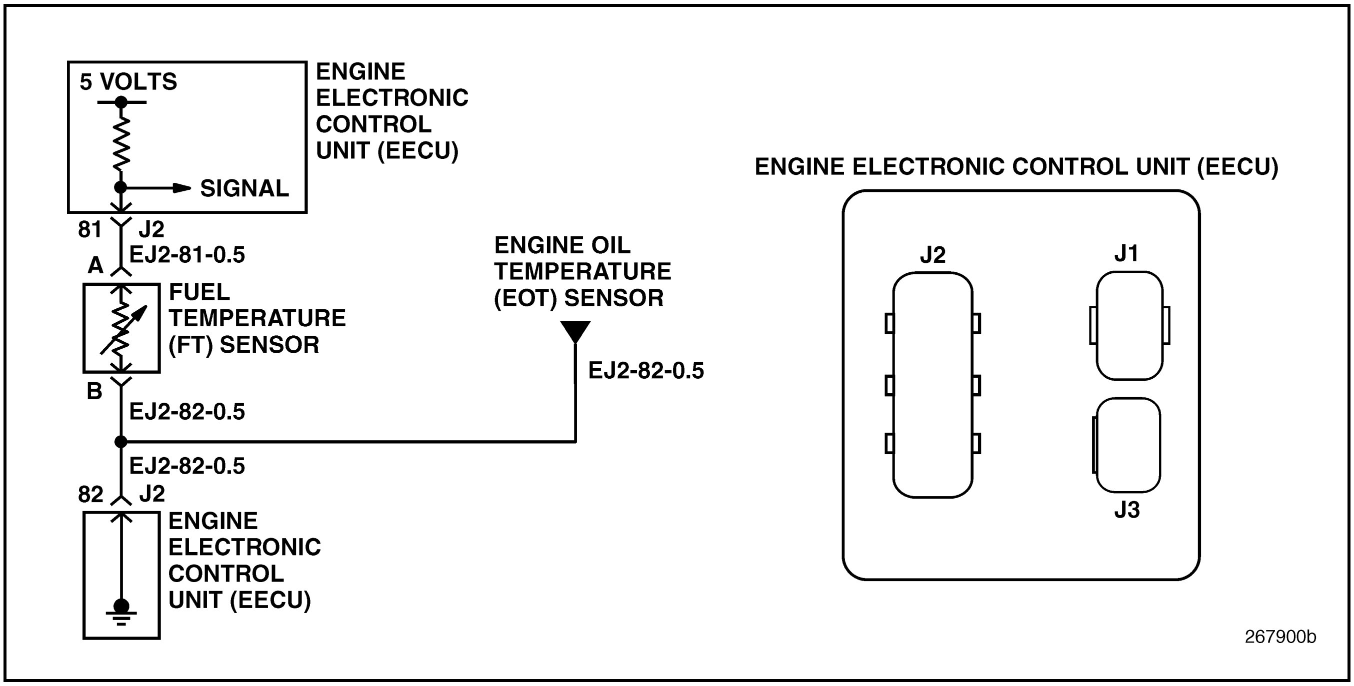


Figure 54 — Fuel Temperature Sensor Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): P174

Message Identification (MID): 128

Circuit Description: The Fuel Temperature (FT) Sensor is a thermistor. The resistance of the FT Sensor changes inversely to the temperature of the fuel. When the fuel temperature is cold, the sensor resistance is high. As the temperature of the fuel increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the FT Sensor and uses the signal, along with other sensor signals, to calculate the fuel injection timing.

Location: The Fuel Temperature Sensor is located on the right side of the engine, below Electronic Unit Pump (EUP) #3.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 1-3 will set when the Engine Electronic Control Unit (EECU) senses a FT Sensor signal less than 0.15 volts or greater than 4.525 volts for 1 second. If the FT Sensor voltage returns to between 0.15 volts and 4.525 volts for more than 1 second, the fault will become inactive.

Normal FT Sensor Parameters: The Fuel Temperature (FT) Sensor has a resistance of 9300 ohms at 32°F (0°C) and 200 ohms at 194°F (90°C).

NOTE

Blink code 1-3 can be enabled and disabled in the Customer Data Section of the Engine Electronic Control Unit (EECU). If the Fuel Temperature Sensor is not installed, the diagnostic blink code should be turned OFF.

Test 1 — Checking for Code 1-3

1. Verify that code 1-3 is set.

   If code 1-3 is set, go to test "Test 2 — Checking Code 1-3 Failure Mode Identifier (FMI)" on page 77.

   If code 1-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Fuel Temperature (FT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 1-3 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test "Test 4 — Checking for Other Codes" on page 77.

   If the FMI is 4 (voltage low), go to test "Test 5 — Checking for a Short to Ground in the Sensor" on page 77.

Test 4 — Checking for Other Codes

1. Is code 2-7 also set?

   If code 2-7 is also set, go to test "Test 8 — Checking for an Open in the FT Sensor Return Line" on page 78.

   If only code 1-3 is set, go to test "Test 9 — Checking Sensor Resistance" on page 78.

Test 5 — Checking for a Short to Ground in the Sensor

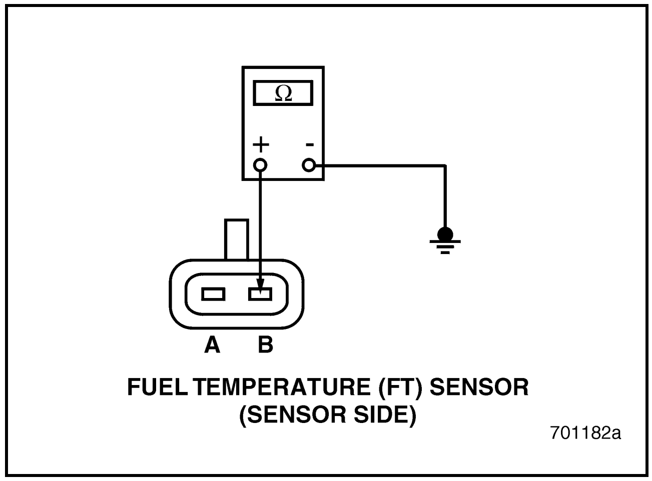


Figure 55

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor connector.
3. Check for continuity from either pin of the FT Sensor to a good ground (see Figure 55).

   If continuity exists, replace the FT Sensor.

   If there is NO continuity, go to test "Test 10 — Checking Sensor Resistance" on page 79.

Test 8 — Checking for an Open in the FT Sensor Return Line

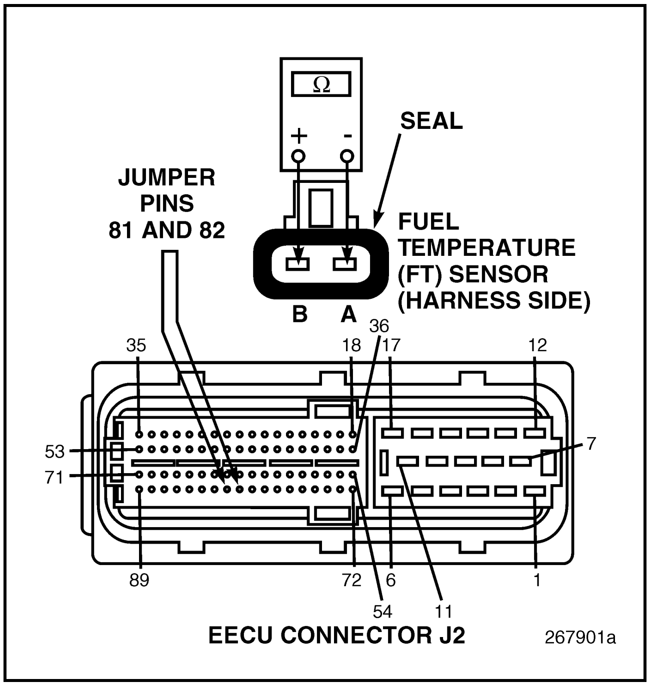


Figure 56

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between EECU harness connector J2 pins 81 and 82 (see Figure 56).
5. Check for continuity between pin A and B of the FT Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 79.

   If there is NO continuity, there is an open in the ground circuit in the harness between the common ground splice with the Engine Oil Temperature (EOT) sensor and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

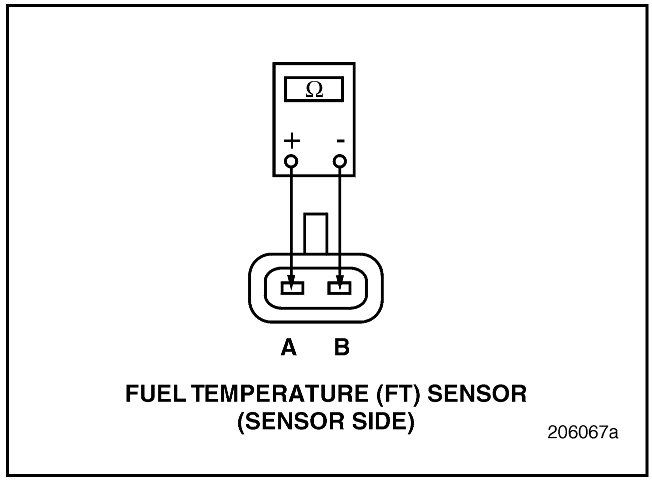


Figure 57

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor harness connector.
3. Measure the resistance across the pins of the FT Sensor with the fuel temperature between 32° and 194°F (0° and 90°C) (see Figure 57).

   If the resistance of the sensor is between 9300 and 200 ohms or if the resistance is infinite (open circuit), go to test “Test 18 — Checking Signal Line Voltage” on page 80.

   If the resistance of the sensor is not within normal operating parameters (9300 to 200 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

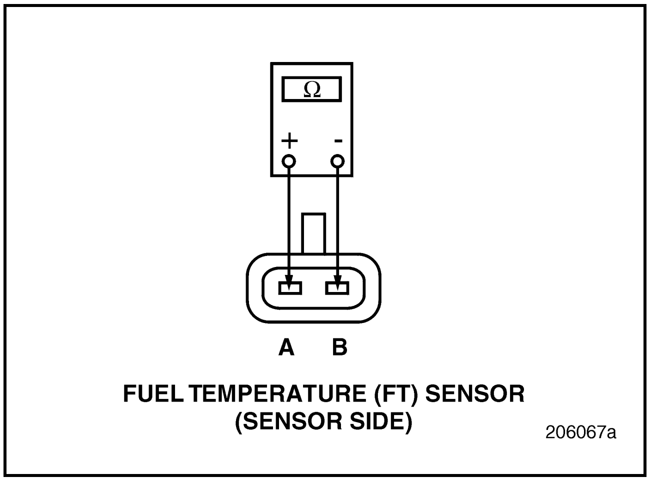


Figure 58

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor connector.
3. Measure the resistance across the pins of the FT Sensor with the fuel temperature between 32° and 194°F (0° and 90°C) (see Figure 58).

   If the resistance is between 9300 and 200 ohms, go to test “Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the FT Sensor” on page 80.

   If the resistance is less than 200 ohms, replace the FT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

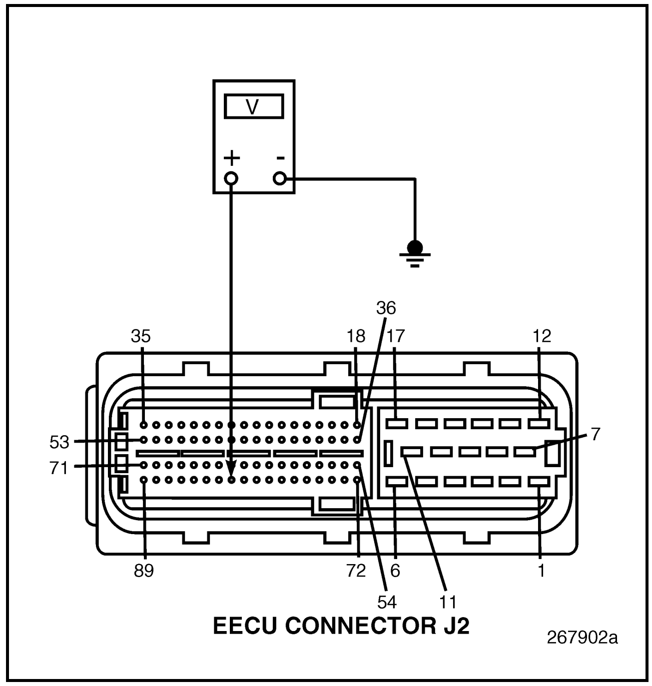


Figure 59

1. Turn the ignition key OFF.
2. Disconnect the Fuel Temperature (FT) Sensor connector.
3. Disconnect connector J2 from Engine Electronic Control Unit (EECU).
4. Measure the voltage between EECU connector J2 pin 82 and a good ground (see Figure 59).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking the EECU Connector for an Open FT Sensor Return Line” on page 80.

   If the measured voltage is greater than 0.5 volts, there is a short to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking Signal Line Voltage

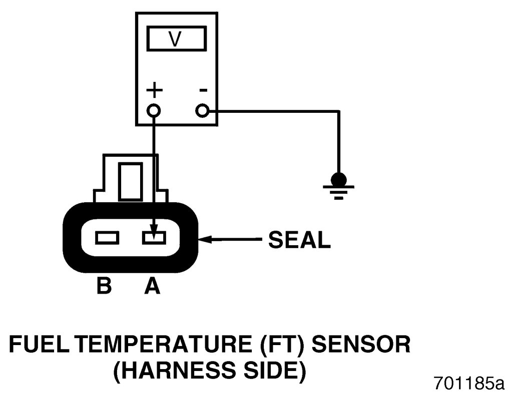


Figure 60

1. Disconnect the FT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between FT Sensor harness connector pin A and a good ground (see Figure 60).

   If the measured voltage is greater than 6 volts, the FT Sensor signal line is shorted to voltage; go to test "Test 36 — Checking for a Short Circuit to Voltage in the Signal Line" on page 81.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was NOT open in test 9, go to test "Test 37 — Checking for an Open FT Sensor Signal Line" on page 81.

Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the FT Sensor

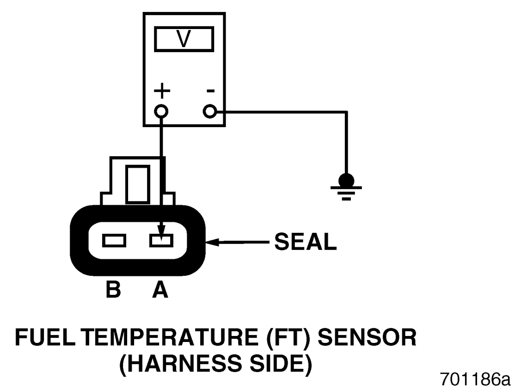


Figure 61

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin A of the FT Sensor harness connector and a good ground (see Figure 61).

   If continuity exists between pin A and ground, go to test "Test 40 — Checking for a Pin to Pin Short in the Harness" on page 82.

   If there is NO continuity, go to test "Test 41 — Checking for Proper Supply Voltage to the Sensor" on page 82.

Test 32 — Checking the EECU Connector for an Open FT Sensor Return Line

1. Visually inspect EECU harness connector J2 pin 82 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test "Test 64 — Checking for Blink Code 1-3" on page 82.

Test 36 — Checking for a Short Circuit to Voltage in the Signal Line

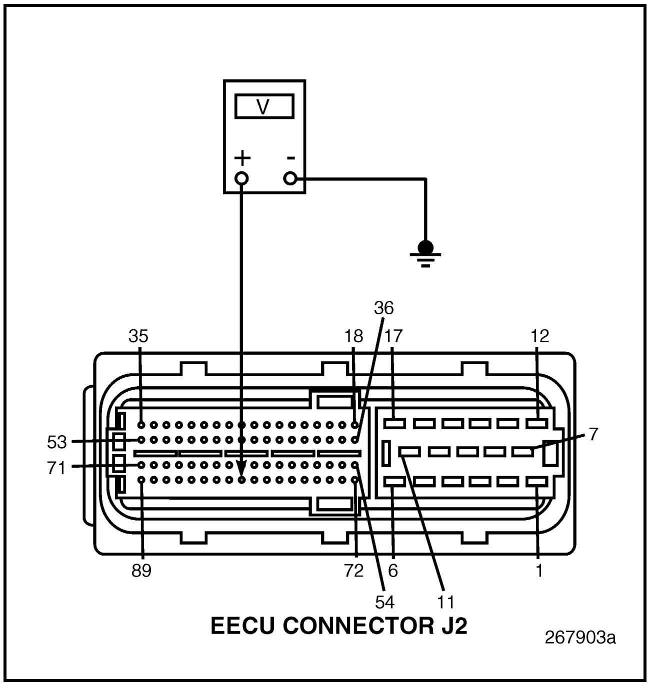


Figure 62

1. Disconnect the FT Sensor harness connector.
2. Turn the ignition key OFF.
3. Disconnect connectors J1 and J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage from EECU harness connector J2 pin 81 to a good ground (see Figure 62).

   If there is NO voltage indicated, go to test "Test 72 — Checking for a Short Circuit at the EECU Connector" on page 83.

   If voltage is present, go to test "Test 73 — Checking for a Pin to Pin Short in the Harness" on page 83.

Test 37 — Checking for an Open FT Sensor Signal Line

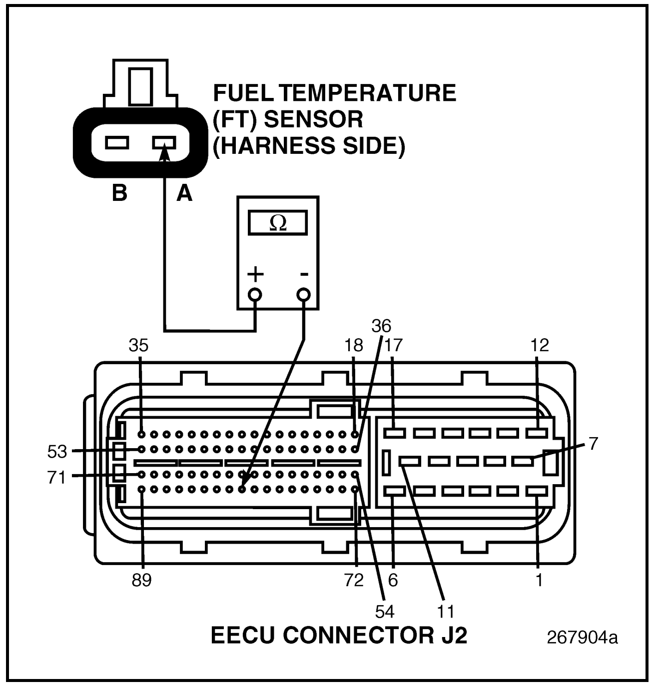


Figure 63

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin A of the FT Sensor harness connector and EECU harness connector J2 pin 81 (see Figure 63).

   If there is NO continuity, locate and repair the open in the signal line between the FT Sensor harness connector and EECU harness connector J2 pin 81.

   If continuity exists, go to test "Test 74 — Checking for an Open FT Sensor Return Circuit" on page 83.

Test 40 — Checking for a Pin to Pin Short in the Harness

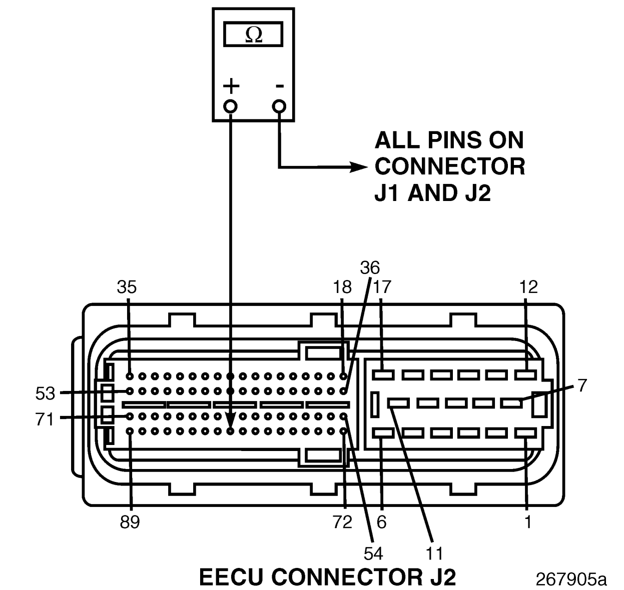


Figure 64

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 81 and all other pins on EECU connectors J1 and J2 (see Figure 64).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

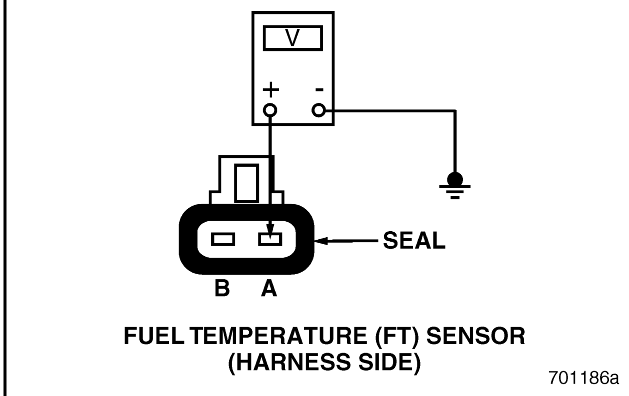


Figure 65

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin A of the FT Sensor harness connector and a good ground (see Figure 65).

   If the measured voltage is between 4.5 and 5.5 volts, check the FT Sensor harness connector for deformed pins or insufficient contact with the FT Sensor pins. If the pins are in good shape, replace the FT Sensor.

   If the measured voltage is less than 4.5 volts, go to test "Test 82 — Checking for a Short Circuit at the EECU Connector" on page 84.

Test 64 — Checking for Blink Code 1-3

1. Connect the FT Sensor harness connector.
2. Connect EECU harness connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 1-3 is still active, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Fuel Temperature Sensor was open in test 9, replace the sensor before retesting the circuit.

1. Turn the ignition key OFF.
2. Connect the FT Sensor harness connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-3 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short in the Harness

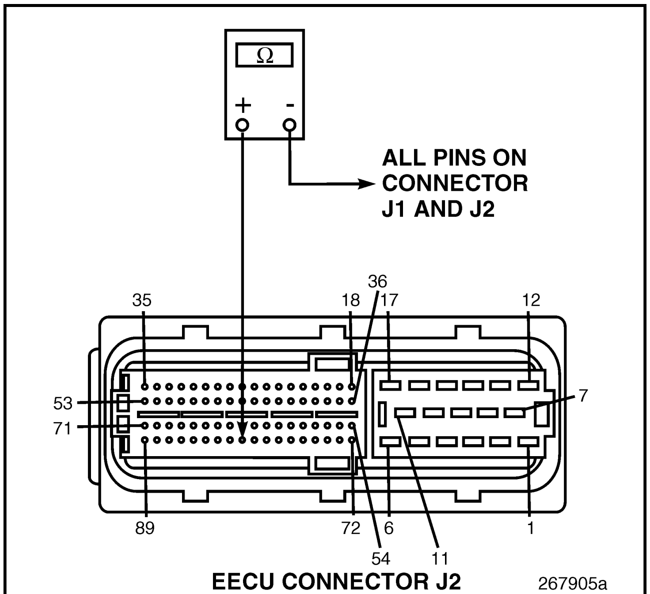


Figure 66

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 81 and all other pins on EECU connectors J1 and J2 (see Figure 66).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 74 — Checking for an Open FT Sensor Return Circuit

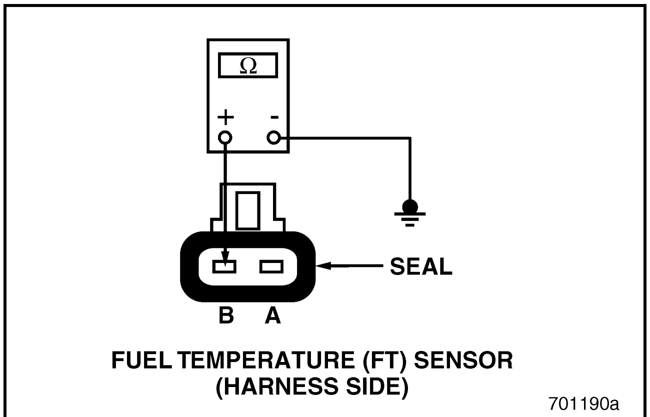


Figure 67

1. Turn the ignition key OFF.
2. Disconnect the FT Sensor harness connector.
3. Connect EECU connector J2.
4. Check for continuity between pin B of the FT Sensor harness connector and a good ground (see Figure 67).

   If there is NO continuity, locate and repair the open in the harness between the FT Sensor and the common ground with the other temperature sensors.

   If continuity exists, check the FT Sensor harness connector for damaged pins or improper mating with the FT Sensor. If the FT Sensor is OK, go to test "Test 148 — Checking the EECU Connector for an Open Circuit" on page 84.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the FT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-3 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 81 and 82 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test "Test 296 — Checking for an Open Circuit at the EECU Connector" on page 84.

Test 296 — Checking for an Open Circuit at the EECU Connector

1. Connect the FT Sensor connector.
2. Connect connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 1-3 is still active, replace the EECU and retest the system.

   If blink code 1-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 1-4 — AMBIENT AIR TEMPERATURE (AAT) SENSOR (ASET™ IEGR ENGINE)

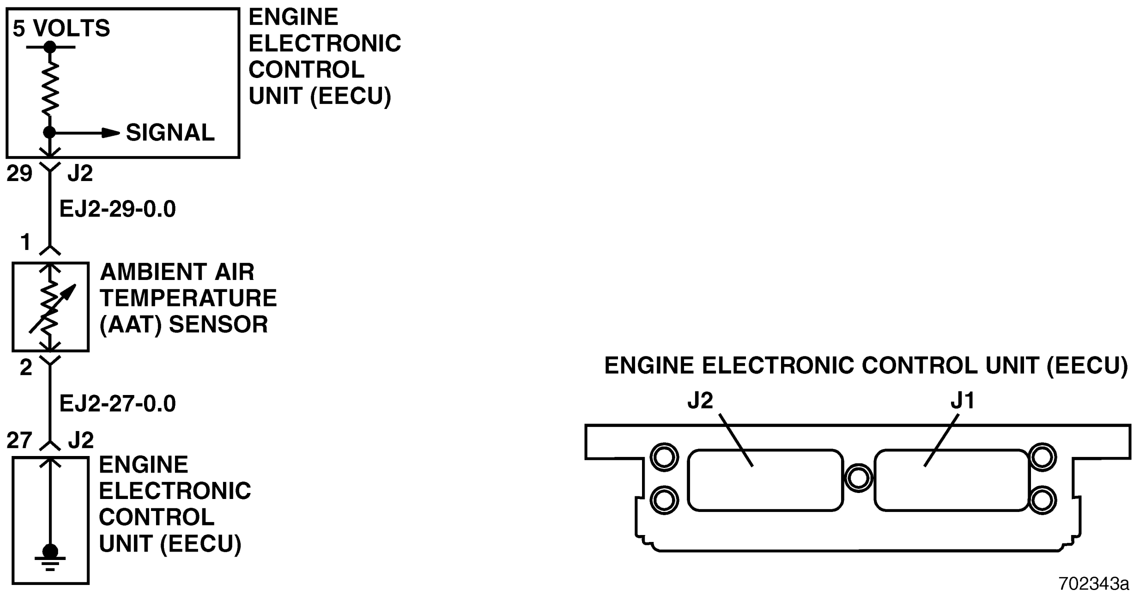


Figure 68 — Ambient Air Temperature (AAT) Sensor Circuit (ASET™ IEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): P171

Message Identification (MID): 128

Circuit Description: The Ambient Air Temperature (AAT) Sensor is a thermistor. The resistance of the AAT Sensor changes inversely to the temperature of the surrounding air. When the outside air temperature is cold, the sensor resistance is high. As the temperature of the air increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the AAT Sensor and uses the signal, along with other sensor signals, to calculate the fuel injection quantity and timing.

Location: The Ambient Air Temperature (AAT) Sensor is located near the front of the chassis. The AAT Sensor may be mounted on the front crossmember, hood hinge, body panel, spring bracket, grill guard, or behind the front bumper, depending upon chassis model.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 1-4 will set when the Engine Electronic Control Unit (EECU) senses an AAT Sensor signal less than 0.2 volts or greater than 4.5 volts for 1 second. If the AAT Sensor voltage returns to between 0.2 volts and 4.5 volts for more than 1 second, the fault will become inactive.

Normal AAT Sensor Parameters: The Ambient Air Temperature (AAT) Sensor has a resistance of 3482 ohms at 32°F (0°C) and 1485 ohms at 104°F (40°C).

NOTE

The AAT Sensor is enabled and disabled by reprogramming the Mack Data file in the EECU. Refer to the V-MAC III Users Guide for details.

Test 1 — Checking for Code 1-4

1. Verify that code 1-4 is set.

   If code 1-4 is set, go to test “Test 2 — Checking Code 1-4 Failure Mode Identifier (FMI)” on page 86.

   If code 1-4 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Ambient Air Temperature (AAT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 1-4 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test “Test 4 — Checking the Sensor Resistance” on page 86.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short Circuit to Ground in the Sensor” on page 86.

Test 4 — Checking the Sensor Resistance

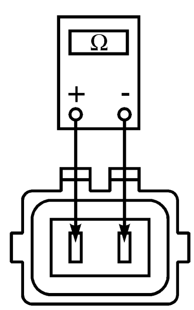


Figure 69

1. Turn the ignition key OFF.
2. Disconnect the Ambient Air Temperature (AAT) Sensor connector.
3. Measure the resistance across the pins of the AAT Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 69).

   If the resistance of the sensor is between 3422 and 1485 ohms or if the resistance is infinite (open circuit), go to test “Test 8 — Checking Signal Line Voltage” on page 87.

   If the resistance of the sensor is not within normal operating parameters (3422 to 1485 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

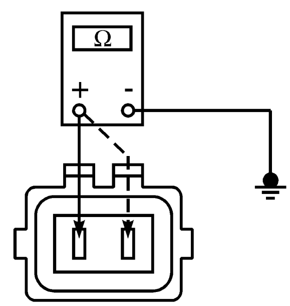


Figure 70

1. Turn the ignition key OFF.
2. Disconnect the Ambient Air Temperature (AAT) Sensor connector.
3. Check for continuity between either pin of the AAT Sensor and a good ground (see Figure 70).

   If continuity exists, replace the AAT Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 87.

Test 8 — Checking Signal Line Voltage

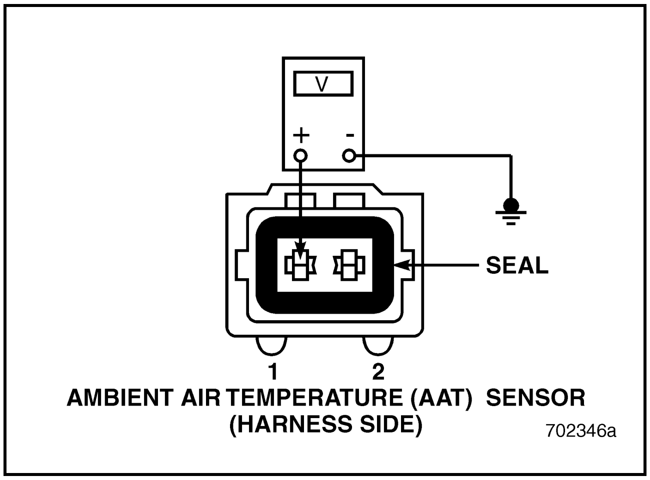


Figure 71

1. Disconnect the AAT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between AAT Sensor harness connector pin 1 and a good ground (see Figure 71).

   If the measured voltage is greater than 6 volts, the AAT Sensor signal line is shorted to voltage; go to test “Test 16 — Checking for a Short Circuit to Voltage in the Signal Line” on page 88.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 4, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was NOT open in test 4, go to test “Test 17 — Checking for an Open AAT Sensor Signal Line” on page 88.

Test 10 — Checking Sensor Resistance

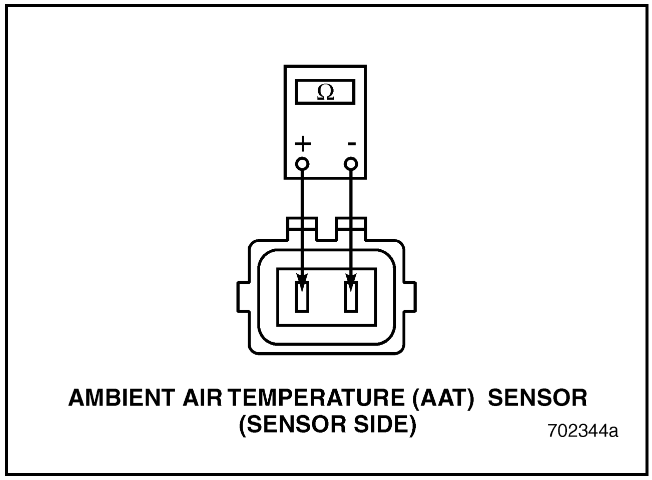


Figure 72

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Measure the resistance across the pins of the AAT Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 72).

   If the resistance is between 3422 and 1485 ohms, go to test “Test 20 — Checking for a Short Circuit in the Harness Between the EECU and the AAT Sensor” on page 89.

   If the resistance is less than 1485 ohms, replace the AAT Sensor.

Test 16 — Checking for a Short Circuit to Voltage in the Signal Line

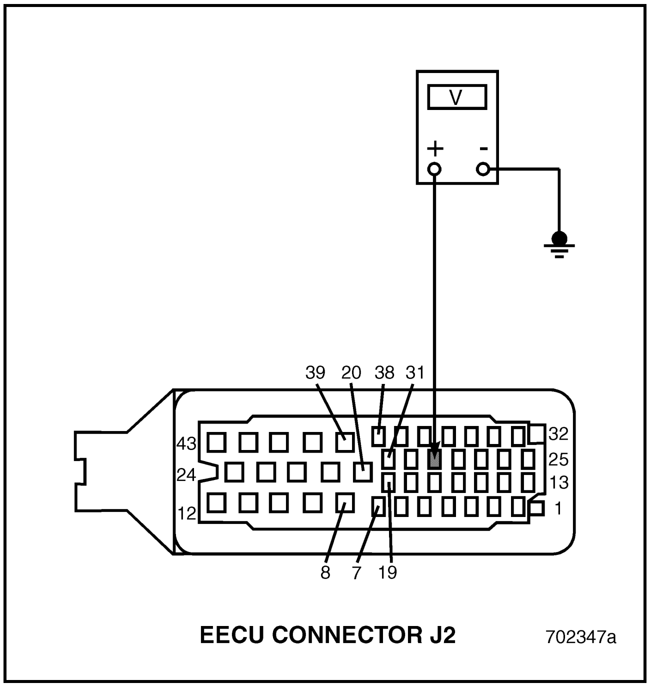


Figure 73

1. Disconnect the AAT Sensor connector.
2. Turn the ignition key OFF.
3. Disconnect connector J1 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J2 pin 29 and a good ground (see Figure 73).

   If there is NO voltage indicated, go to test “Test 32 — Checking for a Short Circuit at the EECU Connector” on page 89.

   If voltage is present, go to test “Test 33 — Checking for a Pin to Pin Short in the Harness” on page 90.

Test 17 — Checking for an Open AAT Sensor Signal Line

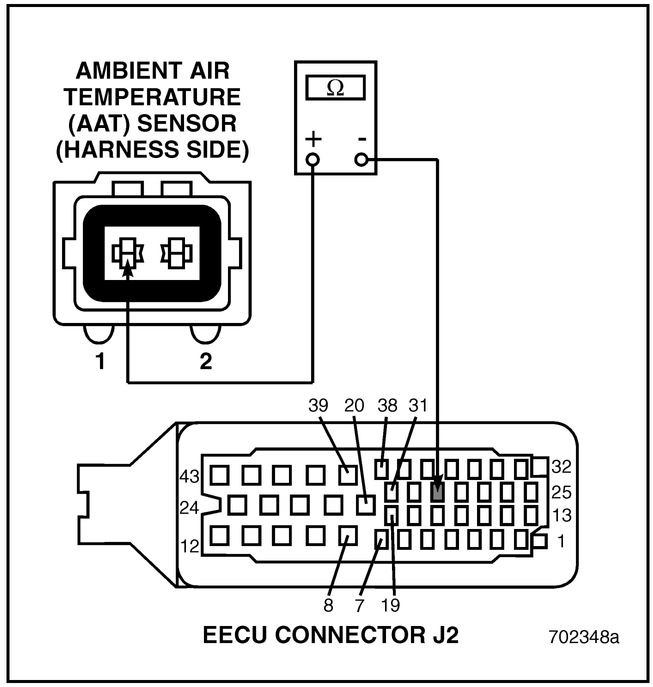


Figure 74

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin 1 of the AAT Sensor harness connector and EECU harness connector J2 pin 29 (see Figure 74).

   If there is NO continuity, locate and repair the open circuit in the signal line between the AAT Sensor harness connector and EECU harness connector J2 pin 29.

   If continuity exists, go to test “Test 34 — Checking for an Open AAT Sensor Return Circuit” on page 90.

Test 20 — Checking for a Short Circuit in the Harness Between the EECU and the AAT Sensor

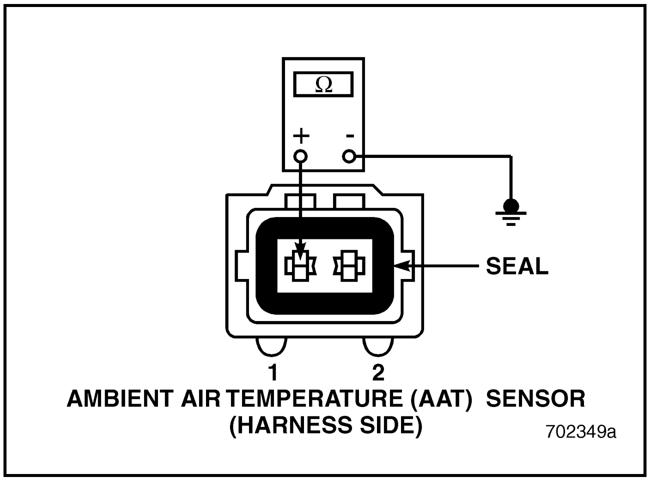


Figure 75

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 1 of the AAT Sensor harness connector and a good ground (see Figure 75).

   If continuity exists between pin 1 and ground, go to test "Test 40 — Checking for a Pin to Pin Short in the Harness" on page 91.

   If there is NO continuity, go to test "Test 41 — Checking for Proper Supply Voltage to the Sensor" on page 91.

Test 32 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Ambient Air Temperature Sensor was open in test 4, replace the sensor before retesting the circuit.

1. Turn the ignition key OFF.
2. Connect the AAT Sensor harness connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-4 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-4 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 33 — Checking for a Pin to Pin Short in the Harness

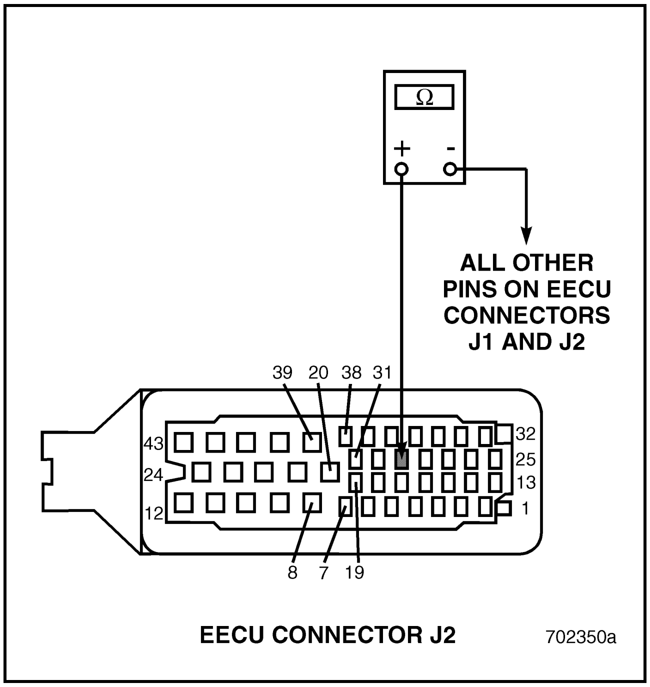


Figure 76

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 29 and all other pins on EECU connectors J1 and J2 (see Figure 76).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 34 — Checking for an Open AAT Sensor Return Circuit

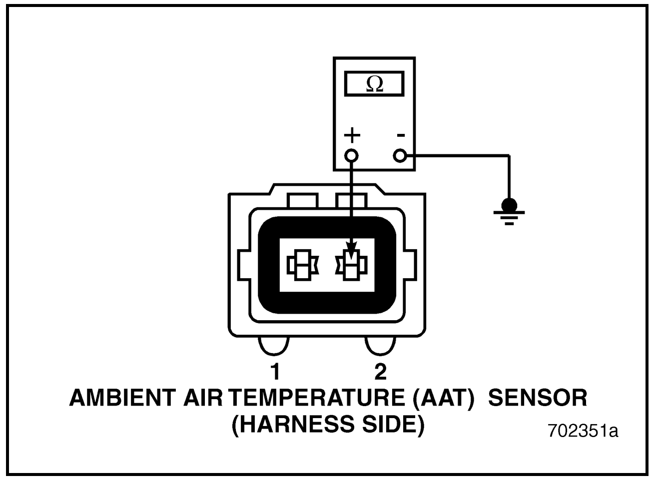


Figure 77

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Connect EECU connector J2.
4. Check for continuity between pin 2 of the AAT Sensor harness connector and a good ground (see Figure 77).

   If there is NO continuity, locate and repair the open in the harness between the AAT Sensor and EECU connector J2 pin 27

   If continuity exists, check the AAT Sensor harness connector for damaged pins or improper mating with the AAT Sensor. If the AAT Sensor is OK, go to test “Test 68 — Checking the EECU Connector for an Open Circuit” on page 92.

Test 40 — Checking for a Pin to Pin Short in the Harness

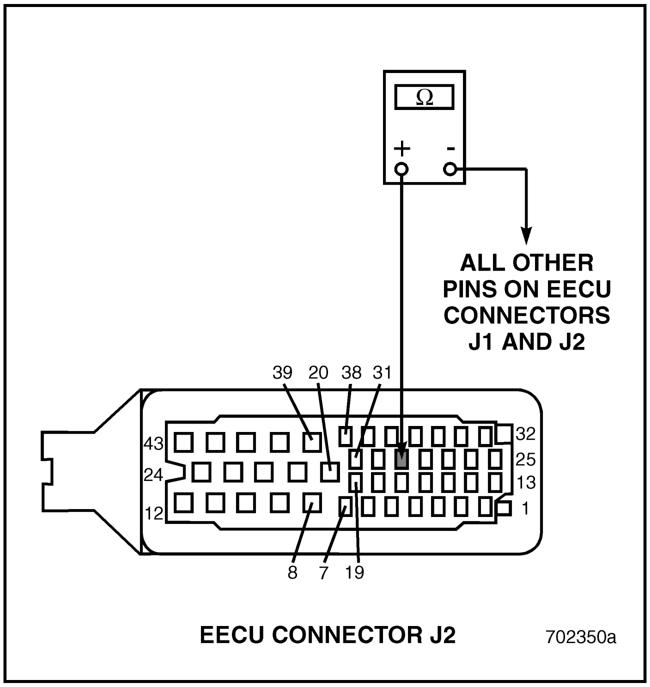


Figure 78

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 29 and all other pins on EECU connectors J1 and J2 (see Figure 78).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

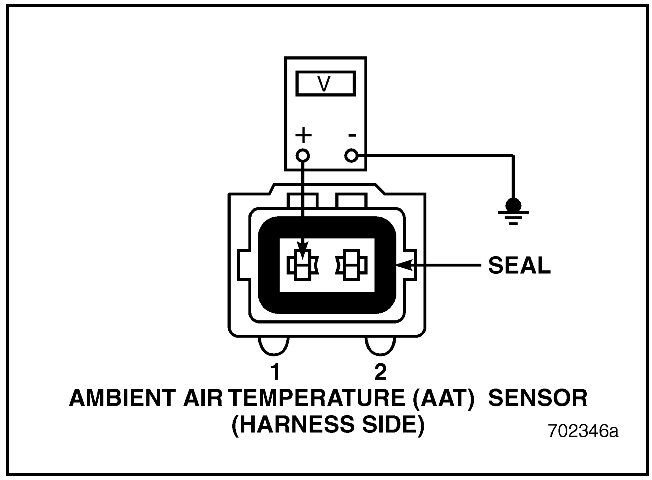


Figure 79

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin 1 of the AAT Sensor harness connector and a good ground (see Figure 79).

   If the measured voltage is between 4.5 and 5.5 volts, check the AAT Sensor harness connector for deformed pins or insufficient contact with the AAT Sensor pins. If the pins are OK, replace the AAT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 92.

Test 68 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 27 and 29 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J2 pins 27 and 29. Gently push the test lead into each harness connector pin individually, and check for looseness.

   If a repairable open is found or if either of the pins feels loose, repair EECU harness connector J2.

   If the test lead is making good contact with EECU harness connector J2 pins 27 and 29, go to test "Test 136 — Checking for an Open Circuit at the EECU Connector" on page 92.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the AAT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-4 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-4 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 136 — Checking for an Open Circuit at the EECU Connector

1. Connect the AAT Sensor connector.
2. Connect connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 1-4 is still active, replace the EECU and retest the system.

   If blink code 1-4 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 1-4 — AMBIENT AIR TEMPERATURE (AAT) SENSOR (ASET™ CEGR ENGINE)

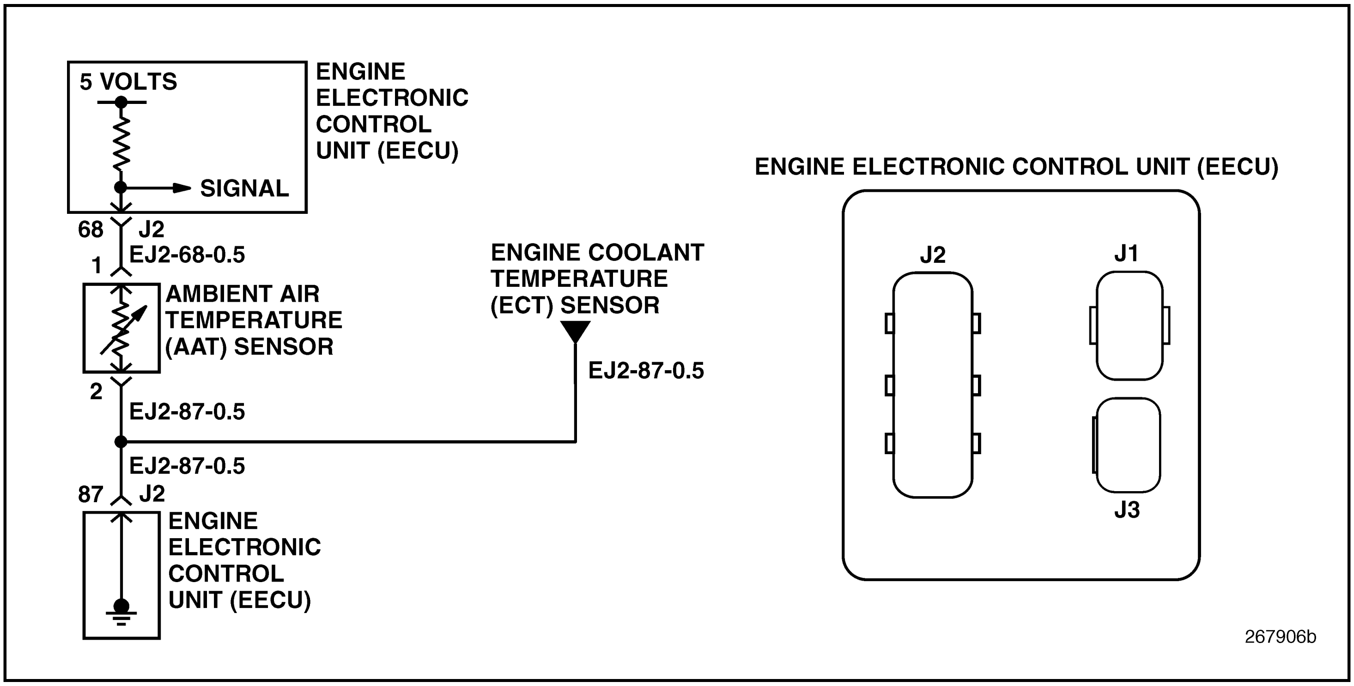


Figure 80 — Ambient Air Temperature (AAT) Sensor Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): P171

Message Identification (MID): 128

Circuit Description: The Ambient Air Temperature (AAT) Sensor is a thermistor. The resistance of the AAT Sensor changes inversely to the temperature of the surrounding air. When the outside air temperature is cold, the sensor resistance is high. As the temperature of the air increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the AAT Sensor and uses the signal, along with other sensor signals, to calculate the fuel injection quantity and timing.

Location: The Ambient Air Temperature (AAT) Sensor is located near the front of the chassis. The AAT Sensor may be mounted on the front crossmember, hood hinge, body panel, spring bracket, grill guard, or behind the front bumper, depending upon chassis model.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 1-4 will set when the Engine Electronic Control Unit (EECU) senses an AAT Sensor signal less than 0.15 volts or greater than 4.4 volts for 1 second. If the AAT Sensor voltage returns to between 0.15 volts and 4.4 volts for more than 1 second, the fault will become inactive.

Normal AAT Sensor Parameters: The Ambient Air Temperature (AAT) Sensor has a resistance of 3482 ohms at 32°F (0°C) and 1485 ohms at 104°F (40°C).

NOTE

The AAT Sensor is enabled and disabled by reprogramming the Mack Data file in the EECU. Refer to the V-MAC III Users Guide for details.

Test 1 — Checking for Code 1-4

1. Verify that code 1-4 is set.

   If code 1-4 is set, go to test “Test 2 — Checking Code 1-4 Failure Mode Identifier (FMI)” on page 94.

   If code 1-4 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Ambient Air Temperature (AAT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 1-4 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test “Test 4 — Checking the Sensor Resistance” on page 94.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short Circuit to Ground in the Sensor” on page 94.

Test 4 — Checking the Sensor Resistance

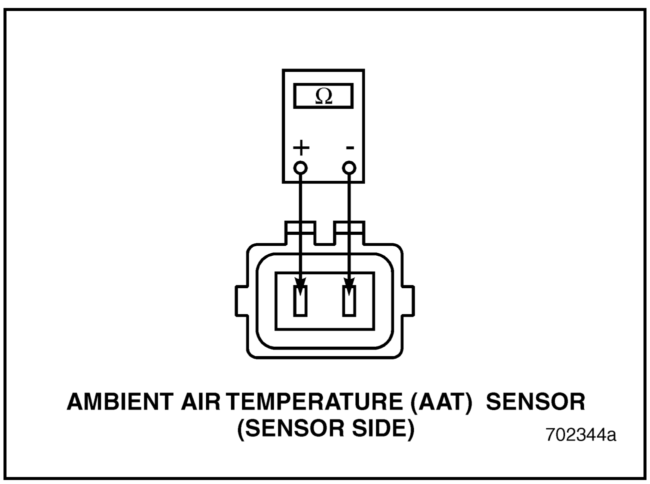


Figure 81

1. Turn the ignition key OFF.
2. Disconnect the Ambient Air Temperature (AAT) Sensor connector.
3. Measure the resistance across the pins of the AAT Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 81).

   If the resistance of the sensor is between 3422 and 1485 ohms or if the resistance is infinite (open circuit), go to test “Test 8 — Checking the Signal Line Voltage” on page 95.

   If the resistance of the sensor is NOT within normal operating parameters (3422 to 1485 ohms), but is NOT an open circuit (infinite resistance), replace the sensor.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

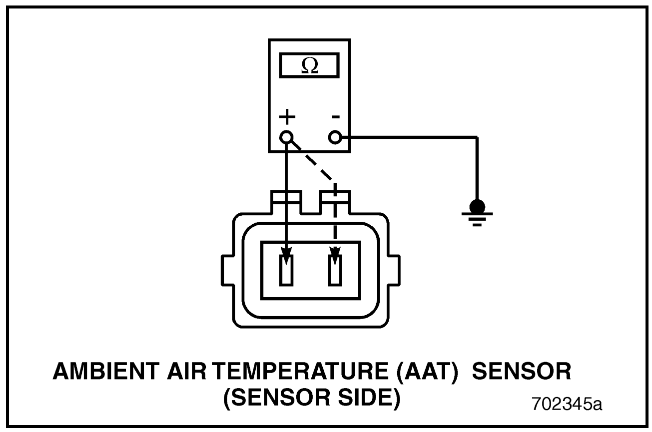


Figure 82

1. Turn the ignition key OFF.
2. Disconnect the Ambient Air Temperature (AAT) Sensor connector.
3. Check for continuity between either pin of the AAT Sensor and a good ground (see Figure 82).

   If continuity exists, replace the AAT Sensor.

   If there is NO continuity, go to test “Test 10 — Checking the Sensor Resistance” on page 95.

Test 8 — Checking the Signal Line Voltage

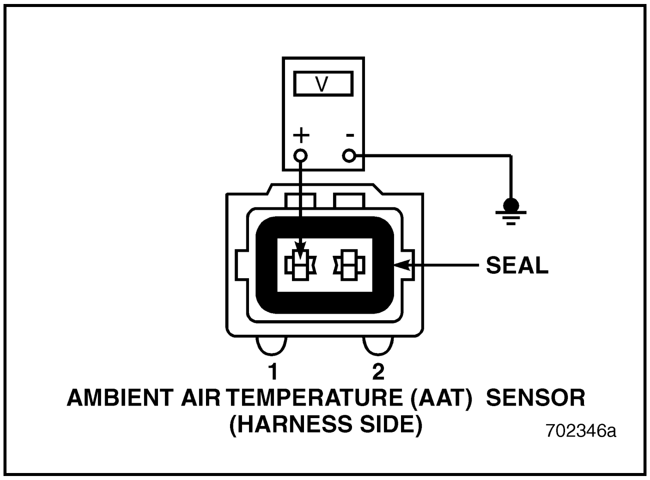


Figure 83

1. Disconnect the AAT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between AAT Sensor harness connector pin 1 and a good ground (see Figure 83).

   If the measured voltage is greater than 6 volts, the AAT Sensor signal line is shorted to voltage; go to test “Test 16 — Checking for a Short Circuit to Voltage in the Signal Line” on page 96.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 4, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was NOT open in test 4, go to test “Test 17 — Checking for an Open AAT Sensor Signal Line” on page 96.

Test 10 — Checking the Sensor Resistance

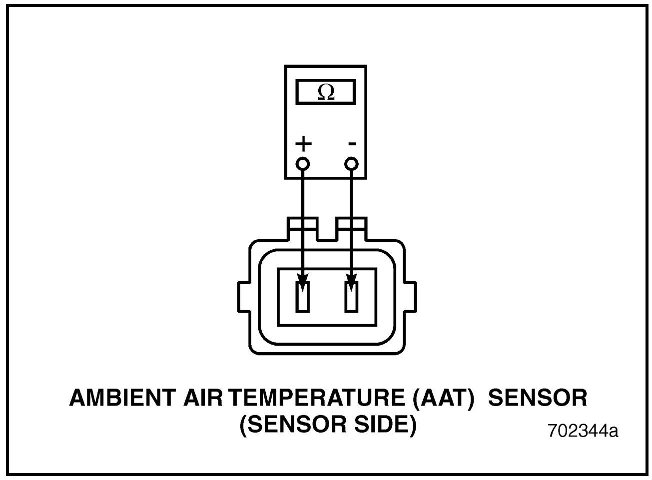


Figure 84

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Measure the resistance across the pins of the AAT Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 84).

   If the resistance is between 3422 and 1485 ohms, go to test “Test 20 — Checking for a Short Circuit in the Harness Between the EECU and the AAT Sensor” on page 97.

   If the resistance is less than 1485 ohms, replace the AAT Sensor.

Test 16 — Checking for a Short Circuit to Voltage in the Signal Line

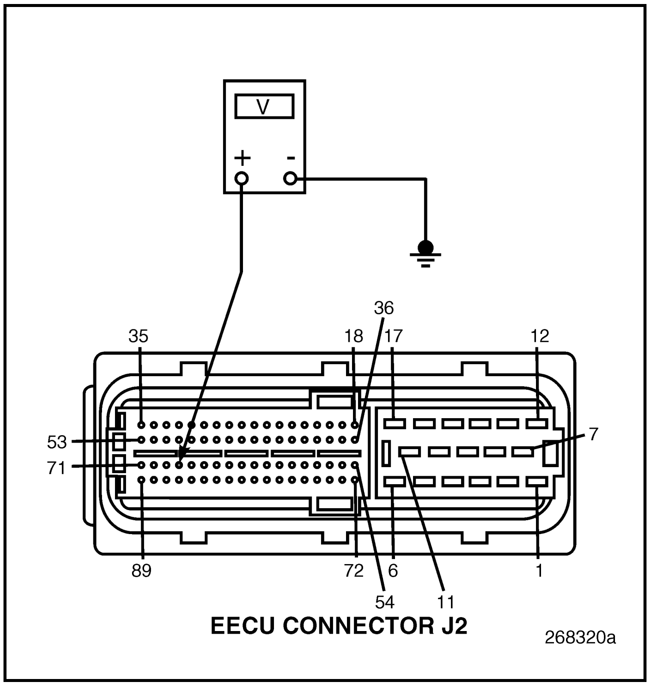


Figure 85

1. Disconnect the AAT Sensor connector.
2. Turn the ignition key OFF.
3. Disconnect connectors J1 and J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J2 pin 68 and a good ground (see Figure 85).

   If there is NO voltage indicated, go to test "Test 32 — Checking for a Short Circuit at the EECU Connector" on page 97.

   If voltage is present, go to test "Test 33 — Checking for a Pin to Pin Short in the Harness" on page 98.

Test 17 — Checking for an Open AAT Sensor Signal Line

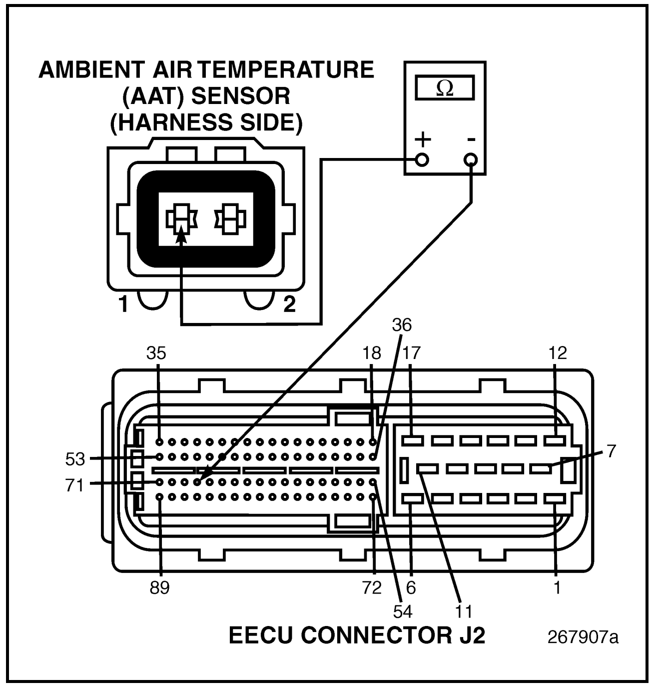


Figure 86

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin 1 of the AAT Sensor harness connector and EECU harness connector J2 pin 68 (see Figure 86).

   If there is NO continuity, locate and repair the open circuit in the signal line between the AAT Sensor harness connector and EECU harness connector J2 pin 68.

   If continuity exists, go to test "Test 34 — Checking for an Open AAT Sensor Return Circuit" on page 98.

Test 20 — Checking for a Short Circuit in the Harness Between the EECU and the AAT Sensor

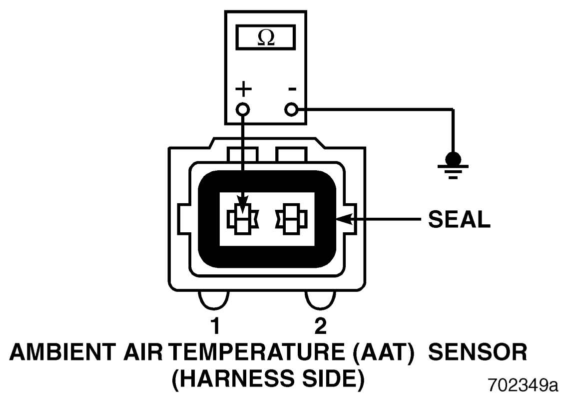


Figure 87

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 1 of the AAT Sensor harness connector and a good ground (see Figure 87).

   If continuity exists between pin 1 and ground, go to test “Test 40 — Checking for a Pin to Pin Short in the Harness” on page 99.

   If there is NO continuity, go to test “Test 41 — Checking for Proper Supply Voltage to the Sensor” on page 99.

Test 32 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Ambient Air Temperature Sensor was open in test 4, replace the sensor before retesting the circuit.

1. Turn the ignition key OFF.
2. Connect the AAT Sensor harness connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-4 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-4 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 33 — Checking for a Pin to Pin Short in the Harness

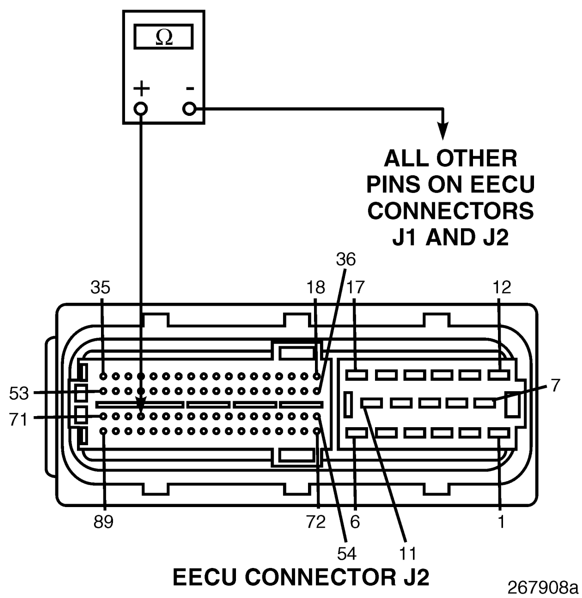


Figure 88

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 68 and all other pins on EECU connectors J1 and J2 (see Figure 88).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 34 — Checking for an Open AAT Sensor Return Circuit

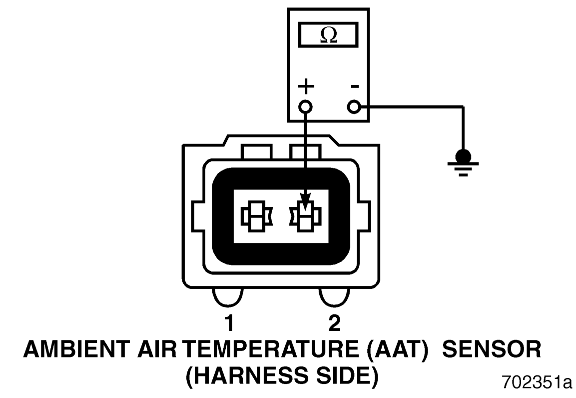


Figure 89

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Connect EECU connector J2.
4. Check for continuity between pin 2 of the AAT Sensor harness connector and a good ground (see Figure 89).

   If there is NO continuity, locate and repair the open circuit in the harness between the AAT Sensor and EECU connector J2 pin 87

   If continuity exists, check the AAT Sensor harness connector for damaged pins or improper mating with the AAT Sensor. If the AAT Sensor is OK, go to test “Test 68 — Checking the EECU Connector for an Open Circuit” on page 100.

Test 40 — Checking for a Pin to Pin Short in the Harness

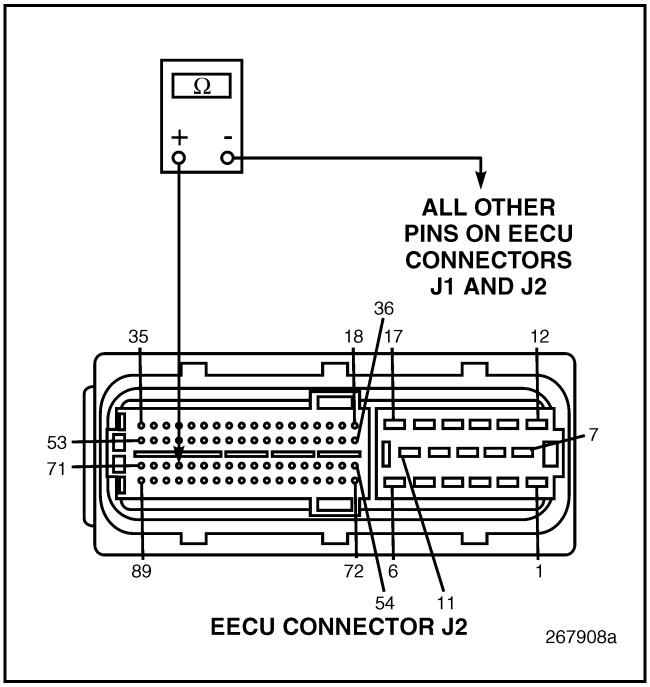


Figure 90

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J2 pin 68 and all other pins on EECU connectors J1 and J2 (see Figure 90).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

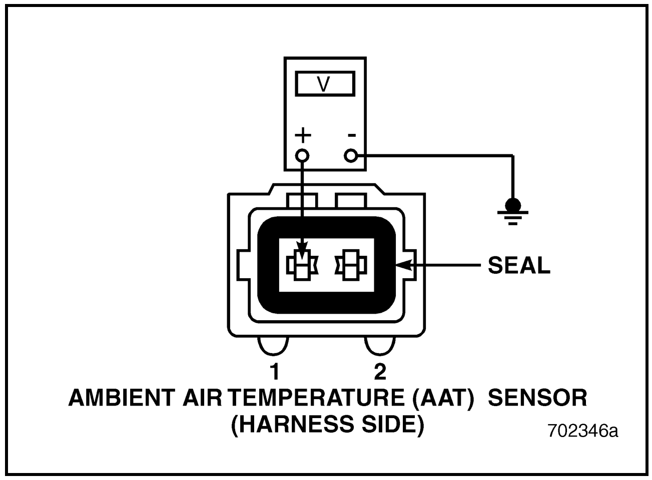


Figure 91

1. Turn the ignition key OFF.
2. Disconnect the AAT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin 1 of the AAT Sensor harness connector and a good ground (see Figure 91).

   If the measured voltage is between 4.5 and 5.5 volts, check the AAT Sensor harness connector for deformed pins or insufficient contact with the AAT Sensor pins. If the pins are OK, replace the AAT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 100.

Test 68 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 68 and 87 for dirt, loose pins or deformed contacts.
2. If a repairable open is found or if either of the pins feels loose, repair EECU harness connector J2.

   If the terminals are making good contact, go to test "Test 136 — Checking for an Open Circuit at the EECU Connector" on page 100.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the AAT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 1-4 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 1-4 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 136 — Checking for an Open Circuit at the EECU Connector

1. Connect the AAT Sensor connector.
2. Connect connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 1-4 is still active, replace the EECU and retest the system.

   If blink code 1-4 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 1-6 — STARTER ENGAGED INPUT

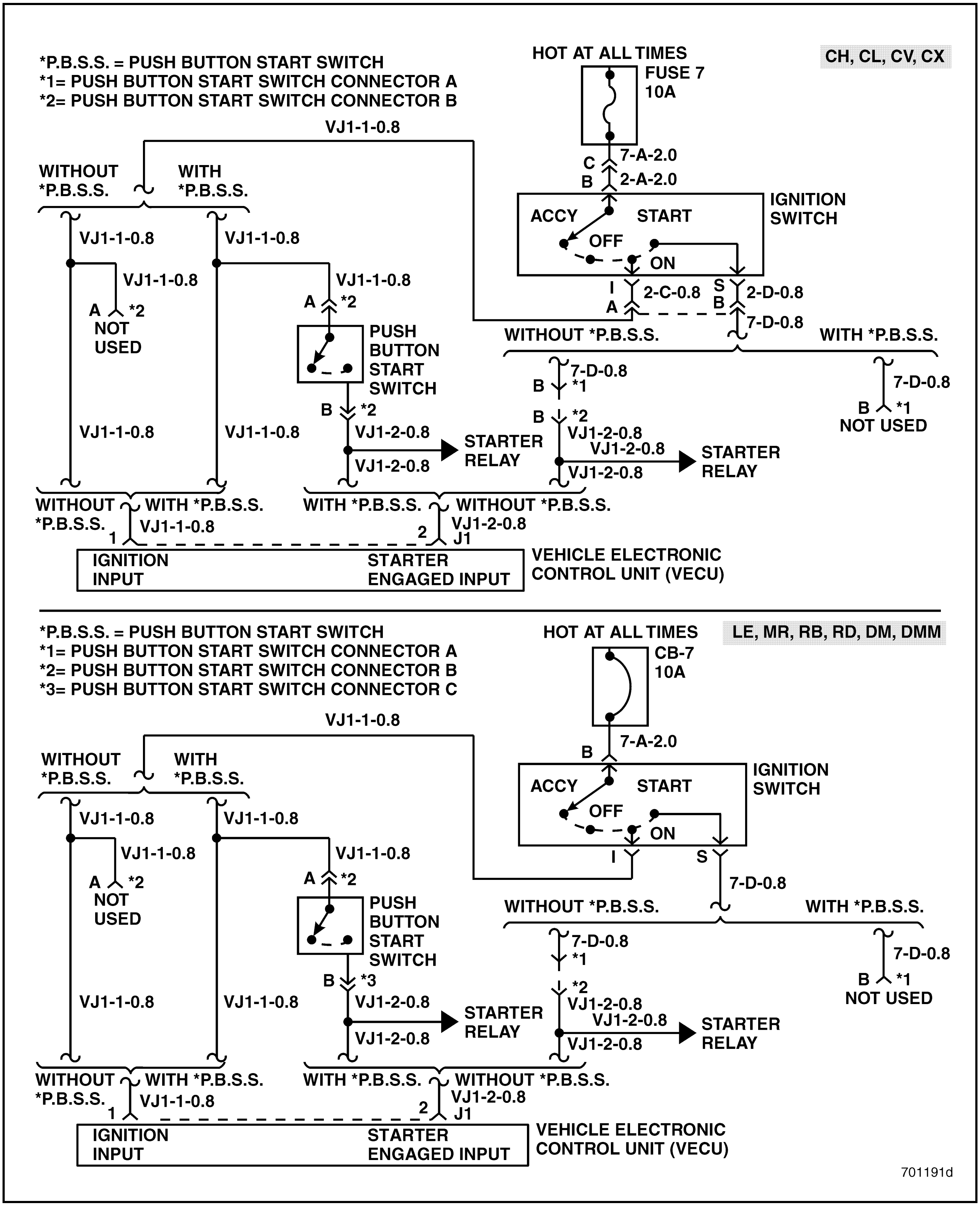


Figure 92 — Starter Engaged Input Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High)

Parameter Identification (PID): S237

Message Identification (MID): 142

Circuit Description: Without Push Button Start: With the ignition key in the ON position, battery voltage is supplied to the Vehicle Electronic Control Unit (VECU) at connector J1 pin 1 (Ignition input). With the ignition key in the START position, battery voltage is supplied to the coil of the Starter Relay and also to VECU connector J1 pin 2 (Starter engaged input). If the VECU senses battery voltage at pin 2 for more than 2 seconds with the engine running, it sets diagnostic blink code 1-6.

With Push Button Start: With the ignition key in the ON position, battery voltage is supplied to the Push Button Start Switch, and to connector J1 pin 1 (Ignition input) of the Vehicle Electronic Control Unit (VECU). When the Push Button Start Switch is pressed, battery voltage is supplied to the coil of the Starter Relay, and to connector J1 pin 2 of the VECU. If the VECU senses battery voltage at pin 2 for more than 2 seconds, with the engine running, it sets diagnostic blink code 1-6.

Code Setting Conditions: This fault becomes active if the engine is running, and the input voltage to the Starter Relay remains greater than 4.5 volts for 2 seconds. If the voltage drops to less than 4.5 volts for 2 seconds, the fault will become inactive. This fault will not become active until the engine is running. If the fault is active and the engine stops, then the fault will become inactive. This fault will not become active if the Starter Relay or drive mechanism becomes stuck in the engaged position, unless the key is also in the start position.

Test 1 — Checking for Code 1-6

1. Start the engine.
2. Verify code 1-6 is set.

   If code 1-6 is set, turn the ignition key off and go to test “Test 2 — Checking for a Short to Voltage” on page 102.

   If code 1-6 is not set, wiggle the harness and connectors to try to set the code. Visually inspect the ignition key and Push Button Start Switch (if applicable) harness connectors and wires for poor connections.

Test 2 — Checking for a Short to Voltage

1. Turn the ignition key ON.

   If the starter engages, go to test “Test 4 — Checking for a Push Button Start Switch” on page 102.

   If the starter does not engage, go to test “Test 5 — Checking Switch Status with a Service Tool” on page 102.

Test 4 — Checking for a Push Button Start Switch

If the vehicle has a Push Button Start Switch, go to test “Test 8 — Checking for a Faulty Push Button Start Switch” on page 103.

If the vehicle does not have a Push Button Start Switch, go to test “Test 9 — Checking for a Shorted Ignition Key Switch” on page 103.

Test 5 — Checking Switch Status with a Service Tool

1. Turn the ignition key ON.
2. Check the status of the starter input at VECU connector J1 pin 2, using a service tool.

   If the service tool indicates that the starter is ON, go to test “Test 10 — Checking for a Short Circuit to Voltage” on page 103.

   If the service tool indicates that the starter is OFF, go to test “Test 11 — Confirming the Fault” on page 103.

Test 8 — Checking for a Faulty Push Button Start Switch

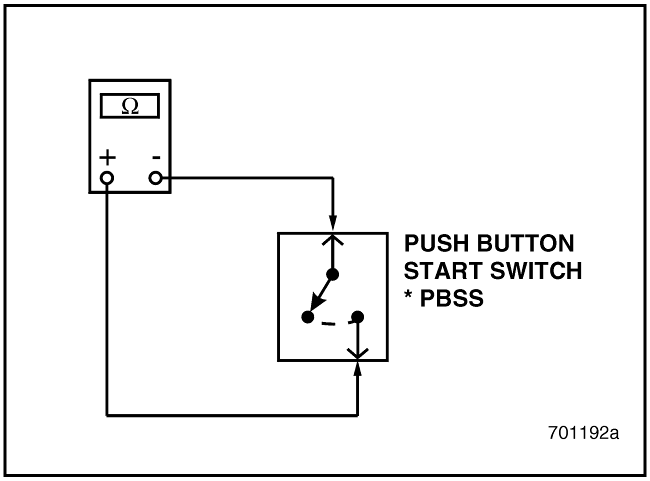


Figure 93

1. Disconnect the harness connector(s) from the Push Button Start Switch.
2. With the Push Button Start Switch in the OFF position, check for continuity between the terminals of the switch (see Figure 93).

   If continuity exists, replace the Push Button Start Switch.

   If there is NO continuity, go to test "Test 16 — Checking for a Pin to Pin Short to Voltage" on page 104.

Test 9 — Checking for a Shorted Ignition Key Switch

1. Disconnect the connector(s) for the optional Push Button Start Switch.
2. Turn the ignition key ON.
3. On the ignition key switch side of the Push Button Start Switch connector, measure the voltage between circuit 7-D-0.8 and a good ground (see Figure 92).

   If battery voltage is present, the Ignition Key Switch or wiring to the switch is shorted to voltage. Repair/replace the wiring and/or the Ignition Key Switch.

   If battery voltage is not present, go to test "Test 18 — Checking for a Short Circuit to Voltage" on page 104.

Test 10 — Checking for a Short Circuit to Voltage

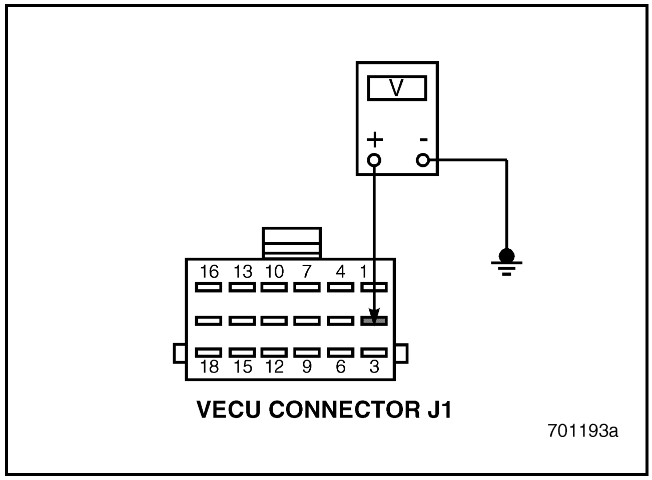


Figure 94

1. Turn the ignition key OFF.
2. Disconnect VECU connector J1.
3. Turn the ignition key ON.
4. Measure the voltage between VECU connector J1 pin 2 and a good ground (see Figure 94).

   If voltage is present pin 2 is shorted to voltage. Go to test "Test 20 — Isolating the Short Circuit to Voltage" on page 105.

   If voltage is not present, go to test "Test 21 — Checking the VECU" on page 105.

Test 11 — Confirming the Fault

1. Start the engine.

   If, after several minutes, the fault does NOT become active, then the problem cannot be diagnosed. The fault may have been caused by accidental engagement of the starter. Determine the conditions that existed when the fault became active. If possible, duplicate those conditions to try and set the code.

   If after several minutes the fault becomes active, go to test "Test 22 — Checking for an Intermittent Short Circuit" on page 105.

Test 16 — Checking for a Pin to Pin Short to Voltage

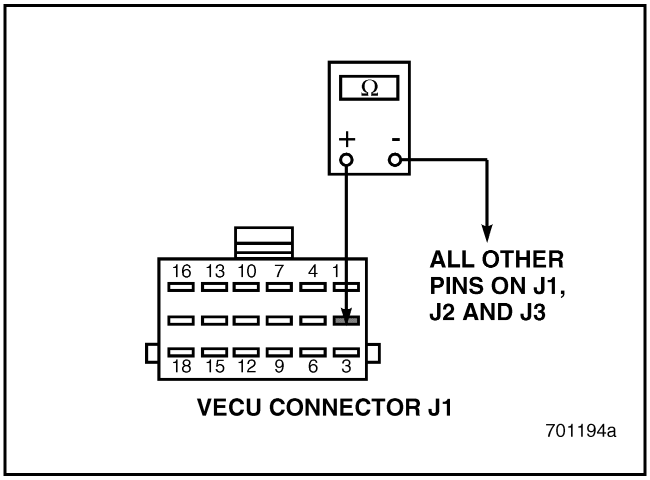


Figure 95

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Disconnect the harness connector from the Push Button Start Switch.
4. Disconnect circuit VJ1-2-08 from the Starter Relay.
5. Check for continuity between VECU connector J1 pin 2 and all other pins on VECU connectors J1, J2 and J3 (see Figure 95).

   If continuity exists, connector J1 pin 2 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the circuit is shorted to voltage somewhere else in the harness. Check the Starter Relay coil terminal lead and the Push Button Start Switch pigtail wiring (2-L-08) for a short circuit to voltage.

Test 18 — Checking for a Short Circuit to Voltage

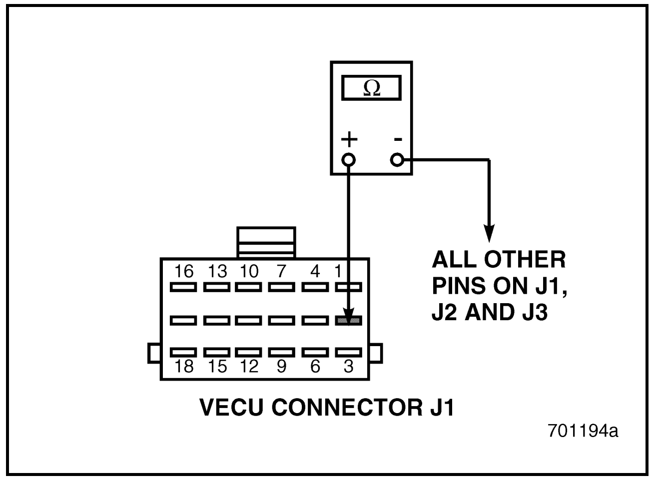


Figure 96

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Disconnect the harness connector from the optional Push Button Start Switch connector.
4. Disconnect circuit VJ1-2-0.8 from the Starter Relay.
5. Check for continuity between VECU connector J1 pin 2 and all other pins on VECU connectors J1, J2 and J3 (see Figure 96).

   If continuity exists, VECU connector J1 pin 2 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, check the Starter Relay coil terminal lead (VJ1-2-0.8) and the Ignition Key Switch wiring (2-C-08) for a short to voltage. If the wiring is OK, go to test "Test 36 — Checking the VECU for a Short Circuit" on page 105.

Test 20 — Isolating the Short Circuit to Voltage

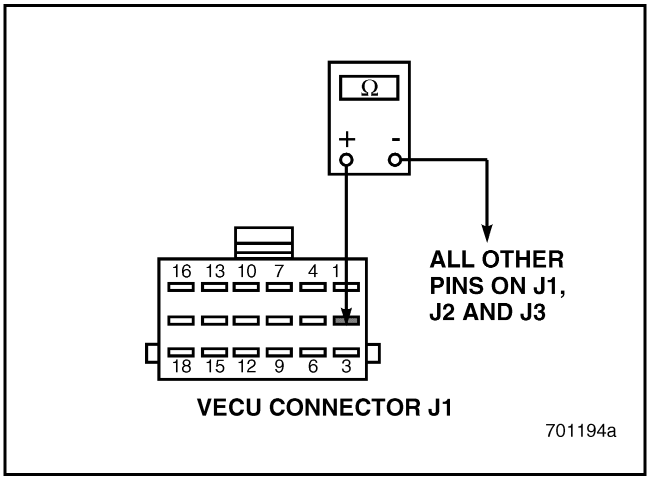


Figure 97

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Disconnect the harness connector from the optional Push Button Start Switch connector.
4. Disconnect circuit VJ1-2-08 from the Starter Relay.
5. Check for continuity between VECU connector J1 pin 2, and all other pins on VECU connectors J1, J2 and J3 (see Figure 97).

   If continuity exists, VECU connector J1 pin 2 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, check the Starter Relay coil terminal lead (VJ1-2-0.8) and the Ignition Key Switch wiring (2-C-08) for a short circuit to voltage.

Test 21 — Checking the VECU

1. Turn the ignition key OFF.
2. Connect Vehicle Control Unit (VECU) connector J1.
3. Start the engine and allow it to idle.

   If blink code 1-6 is still active, check VECU connector J1 for dirt, shorted or corroded pins, or any other repairable damage. If no problems are evident, replace the VECU and retest the system.

Test 22 — Checking for an Intermittent Short Circuit

1. With the engine running and the fault still active, flex the wiring harness between the ignition switch, the VECU, and the starter relay.

   If the fault becomes inactive, there is an intermittent short to voltage on wire VJ1-2-0.8. Locate and repair the short circuit.

   If the fault remains active, replace the VECU and retest the system.

Test 36 — Checking the VECU for a Short Circuit

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Connect circuit VJ1-2-08 to the Starter Relay.
4. Turn the ignition key ON.

   If blink code 1-6 is still active or the starter activates, check the VECU module and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If problems are NOT evident or are not repairable, replace the VECU and retest the system.

   If blink code 1-6 is not active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 1-7 — COOLANT LEVEL SENSOR (ASET™ IEGR ENGINE)

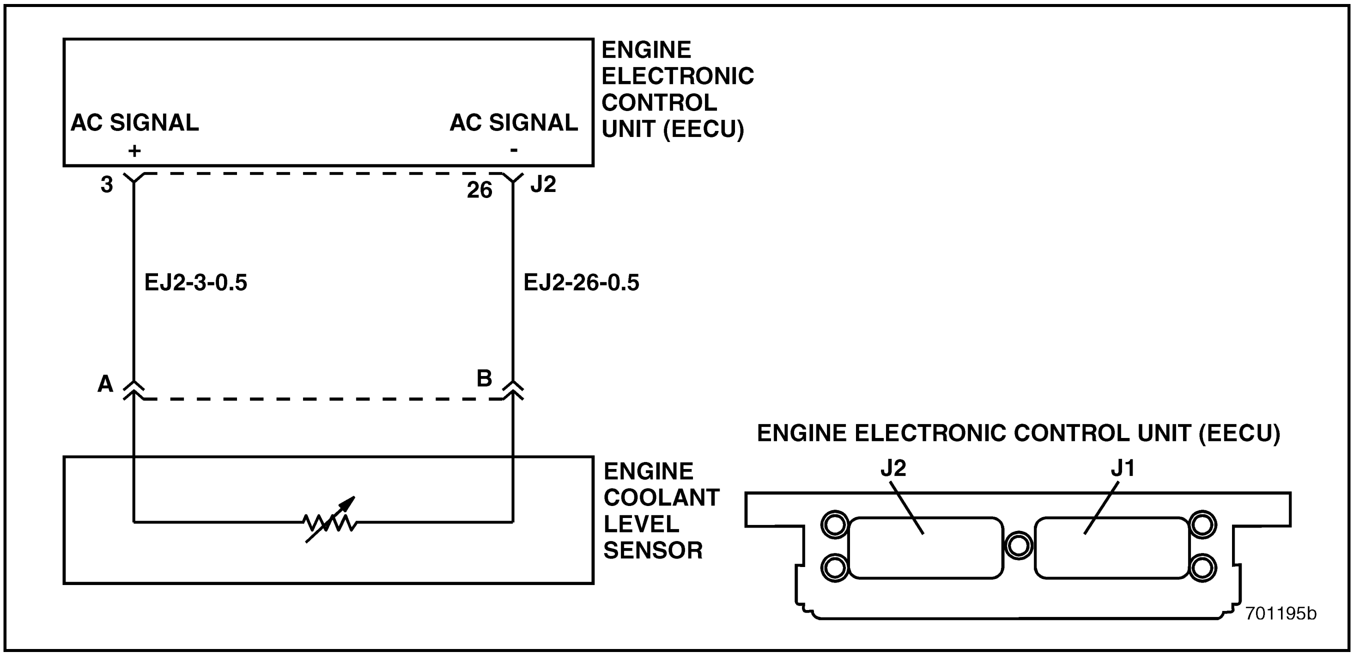


Figure 98 — Coolant Level Sensor Circuit

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High/Open)

Parameter Identification (PID): P111

Message Identification (MID): 128

Circuit Description: The Coolant Level Sensor detects the presence of coolant in the reservoir by measuring the continuity or impedance in the Coolant Level Sensor circuit. The sensor contains two electrodes, one is in the probe tip and the other in the probe base. The Coolant Level Sensor operates by applying a small AC current to the sensor probe. When the sensor is immersed in coolant, the coolant acts as a conductor between the two electrodes in the sensor. If the coolant level falls below the two electrodes on the probe, the circuit resistance will increase and the Engine Electronic Control Unit (EECU) will detect the change in circuit impedance and set fault code 1-7. The EECU signals the Vehicle Electronic Control Unit (VECU), over the serial data lines, that the coolant level is low. The VECU delays warning the driver for several seconds to account for sloshing encountered during turns and steep grades. Coolant Level Sensors are sensitive to coolant gelation and excessive coolant additives. If a vehicle has a low coolant level and no warning is experienced, inspect and clean the probe.

Location: The Coolant Level Sensor is located in the upper radiator tank or on the lower right side of the coolant reservoir.

Code Setting Conditions: If the Coolant Level Sensor signal is greater than 1.3 volts (AC) for more than 12 seconds, the Engine Electronic Control Unit (EECU) will set code 1-7 and the Electronic Malfunction Lamp (EML) will be turned on. The driver alarm will also sound when code 1-7 is set. Some vehicles may be programmed to shutdown the engine when code 1-7 is active.

Additional Symptoms: Engine overheating.

NOTE

When measuring voltage in the following tests, set the multimeter to measure AC volts.

Test 1 — Checking the Coolant Level

1. Check the coolant level.

   If the coolant is at the appropriate level, go to test “Test 2 — Checking the Voltage at the Sensor” on page 107.

   If the radiator and coolant overflow tank are NOT filled to the correct level, fill the system with coolant, check for the cause of the low coolant, and ensure that the fault is no longer active.

Test 2 — Checking the Voltage at the Sensor

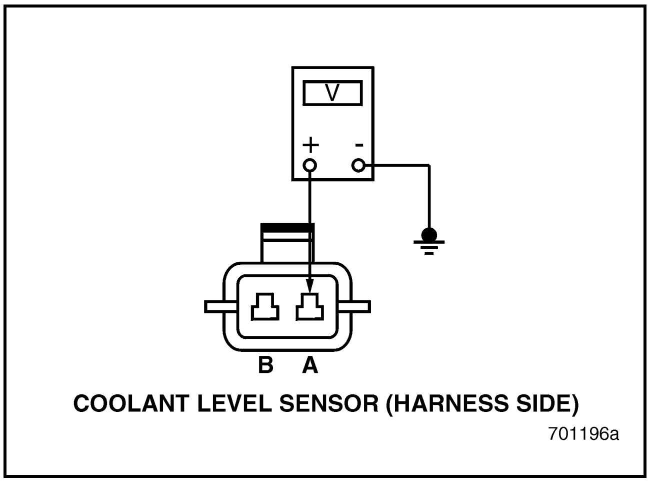


Figure 99

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Coolant Level Sensor.
3. Turn the ignition key ON.
4. Set the multimeter to measure A/C voltage.
5. Measure the voltage between pin A on the harness side of the connector and a good ground (see Figure 99).

   If the measured voltage is about 1 volt AC, go to test “Test 4 — Checking the Sensor Return Line” on page 107.

   If the measured voltage is much less than 1 volt, go to test “Test 5 — Checking for Continuity in the Harness” on page 108.

Test 4 — Checking the Sensor Return Line

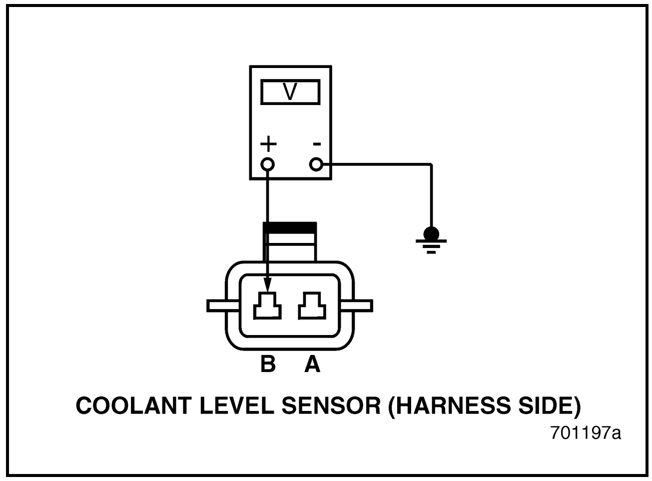


Figure 100

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Coolant Level Sensor.
3. Measure the voltage between pin B on the harness side of the connector and a good ground (see Figure 100).

   If the measured voltage is less than 0.5 volts AC, go to test “Test 8 — Checking for a Short Circuit to Voltage in the Harness” on page 108.

   If the measured voltage is much greater than 0.5 volts AC, go to test “Test 9 — Checking for Voltage on the Sensor Return Line” on page 109.

Test 5 — Checking for Continuity in the Harness

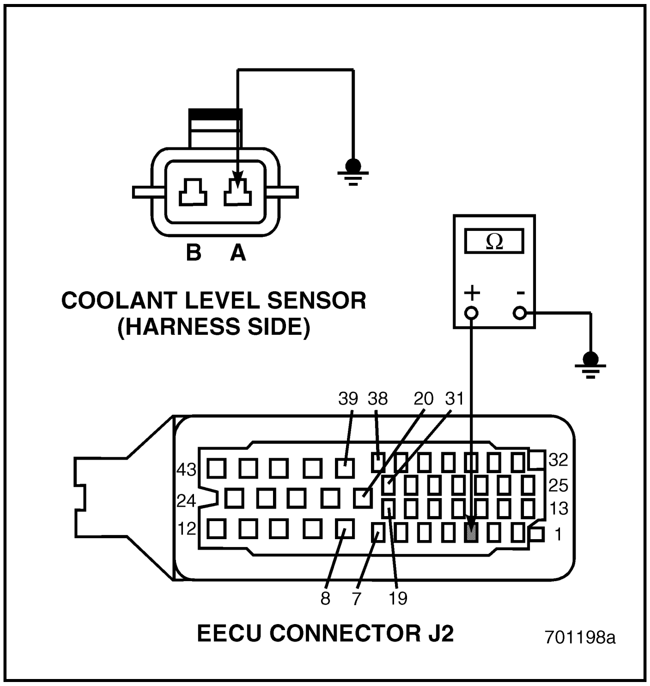


Figure 101

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect the harness connector from the Coolant Level Sensor.
4. Connect a jumper between pin A on the harness side of the Coolant Level Sensor and a known good ground (see Figure 101).
5. Check for continuity between EECU connector J2 pin 3 and a good ground.

   If continuity exists, go to test "Test 10 — Checking for a Pin to Pin Short Circuit in the Harness" on page 109.

   If there is NO continuity, there is an open circuit in the probe supply line. Repair the open circuit in the harness.

Test 8 — Checking for a Short Circuit to Voltage in the Harness

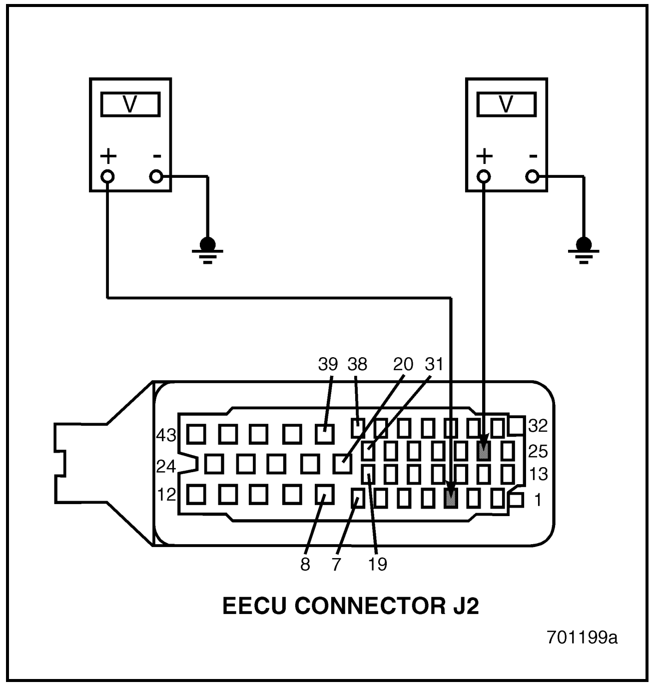


Figure 102

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 3 and a good ground (see Figure 102).
5. Measure the voltage between EECU connector J2 pin 26 and a good ground (see Figure 102).

   If the measured voltage on both lines is less than 0.5 volts AC, go to test "Test 16 — Checking for an Open Circuit" on page 110.

   If the measured voltage on EITHER line is greater than 0.5 volts AC, locate and repair the short circuit to voltage.

Test 9 — Checking for Voltage on the Sensor Return Line

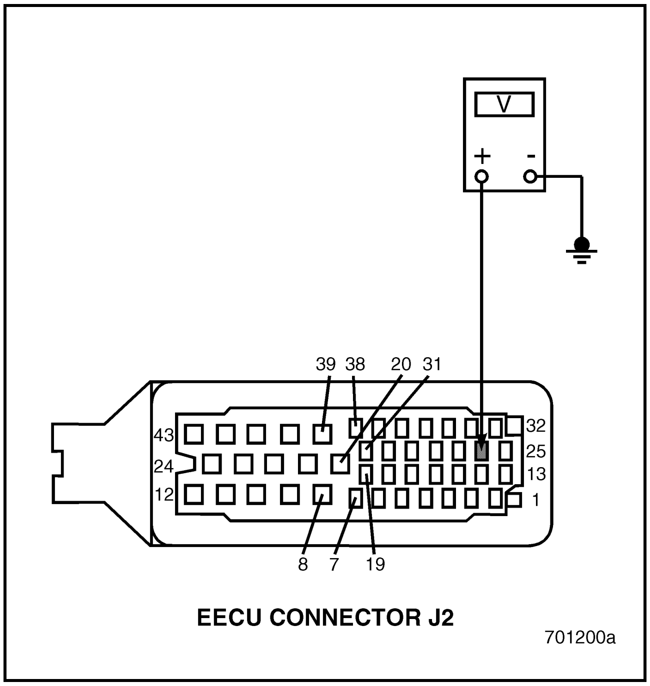


Figure 103

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Turn the ignition key ON.
4. Measure the voltage between Engine Electronic Control Unit (EECU) connector J2 pin 26 and a good ground (see Figure 103).

   If the measured voltage is less than 0.5 volts AC, inspect EECU connector J2 pin 26 for dirt, loose pins or any damage that could cause a short circuit to voltage. If repairable damage is found, repair the connector and then replace the EECU. If the damage is not repairable, replace the connector and then replace the EECU.

   If EECU connector J2 is undamaged, replace the EECU.

   If the measured voltage is greater than 0.5 volts AC, locate and repair the short circuit to voltage and replace the Engine Electronic Control Unit (EECU).

Test 10 — Checking for a Pin to Pin Short Circuit in the Harness

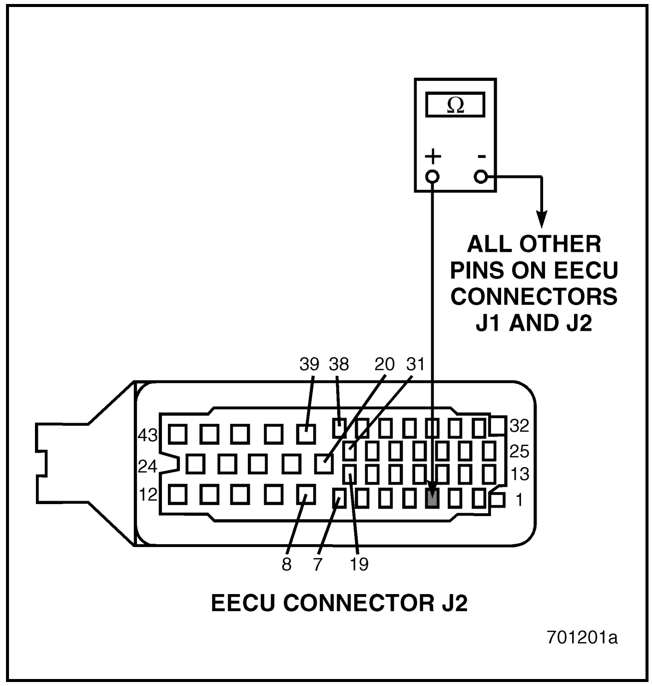


Figure 104

1. Turn the ignition key OFF.
2. Remove the jumper from pin A of the Coolant Level Sensor harness connector.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Check for continuity between EECU connector J2 pin 3 and all other pins on EECU connectors J1 and J2 (see Figure 104).

   If continuity exists, pin 3 is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 20 — Checking the Engine Electronic Control Unit (EECU) for an Open Circuit" on page 110.

Test 16 — Checking for an Open Circuit

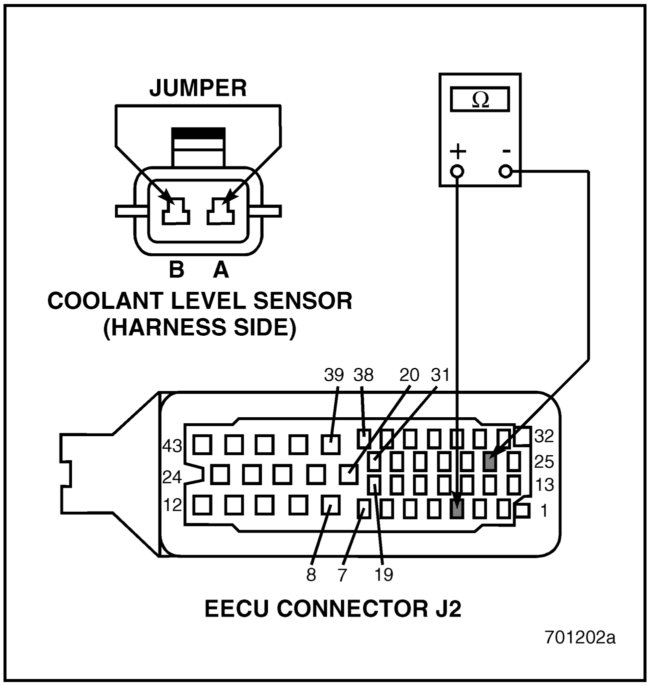


Figure 105

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Coolant Level Sensor.
3. Connect a jumper between pins A and B on the harness side of the Coolant Level Sensor harness connector.
4. Check for continuity between Engine Electronic Control Unit (EECU) connector J2 pins 3 and 26 (see Figure 105).

   If continuity exists, go to test "Test 32 — Checking for a Pin to Pin Short Circuit in the Harness" on page 110.

   If there is NO continuity, repair the open circuit in the coolant level probe return line (EJ2-26-0.5).

Test 20 — Checking the Engine Electronic Control Unit (EECU) for an Open Circuit

1. Visually inspect Engine Electronic Control Unit (EECU) connector J2 pin 3 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead found in the J 38581 V-MAC Jumper Wire Kit with harness connector. Gently push the test lead into pin 3 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair or replace harness connector.

   If the test lead is making good contact with the connector terminal, go to test "Test 40 — Checking for a Faulty Engine Electronic Control Unit (EECU)" on page 111.

Test 32 — Checking for a Pin to Pin Short Circuit in the Harness

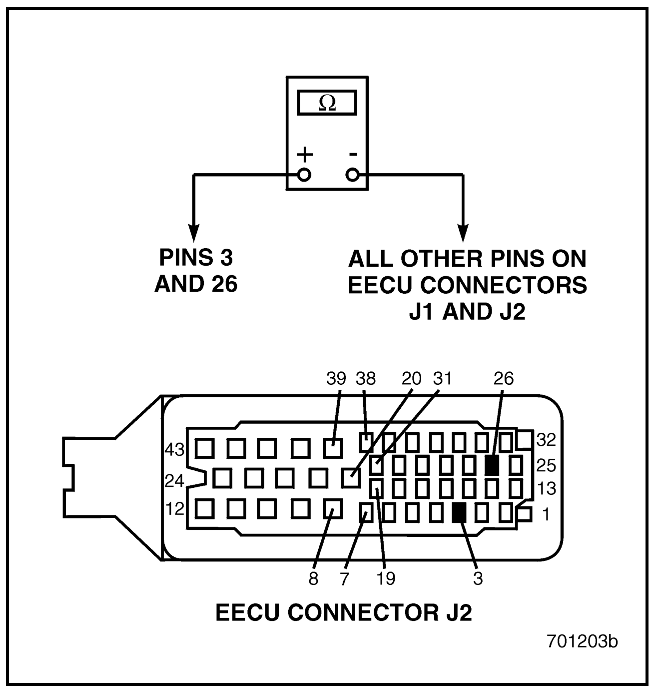


Figure 106

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect the jumper from the Coolant Level Sensor harness connector.

4. Check for continuity between Engine Electronic Control Unit (EECU) connector J2 pins 3 and 26 versus all other pins on EECU connectors J1 and J2 (see Figure 106).

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 64 — Checking for a Faulty Sensor” on page 111.

Test 40 — Checking for a Faulty Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect the Coolant Level Sensor harness connector.
3. Connect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Turn the ignition key ON.

   If code 1-7 is still present, replace the Engine Control Unit (EECU).

   If code 1-7 is NOT present, the procedure has corrected the problem. Check all connectors to ensure proper connections.

Test 64 — Checking for a Faulty Sensor

1. Turn the ignition key OFF.
2. Replace the Coolant Level Sensor and refill the cooling system with Mack specified coolant (refer to the TS494 Maintenance and Lubrication manual).
3. Connect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Turn the ignition key ON.
5. Wait one minute.

   If code 1-7 is no longer present, replacing the sensor has fixed the problem.

   If code 1-7 becomes ACTIVE go to test “Test 128 — Checking for a Damaged Connector” on page 111.

Test 128 — Checking for a Damaged Connector

1. Turn the ignition key OFF.
2. Disconnect Engine Control Unit (EECU) connector J2.
3. Inspect EECU connector J2 for damaged, missing or broken pins.

   If damage is evident, repair the J2 connector if possible. If damage is not repairable, replace EECU connector J2.

   If there is NO evidence of damage, reconnect the circuit and turn the ignition key ON. If code 1-7 is still present, replace the Engine Electronic Control Unit (EECU). If code 1-7 is NOT present, the procedure has corrected the problem. Clean and inspect the connections.

BLINK CODE 1-7 — COOLANT LEVEL SENSOR (ASET™ CEGR ENGINE)

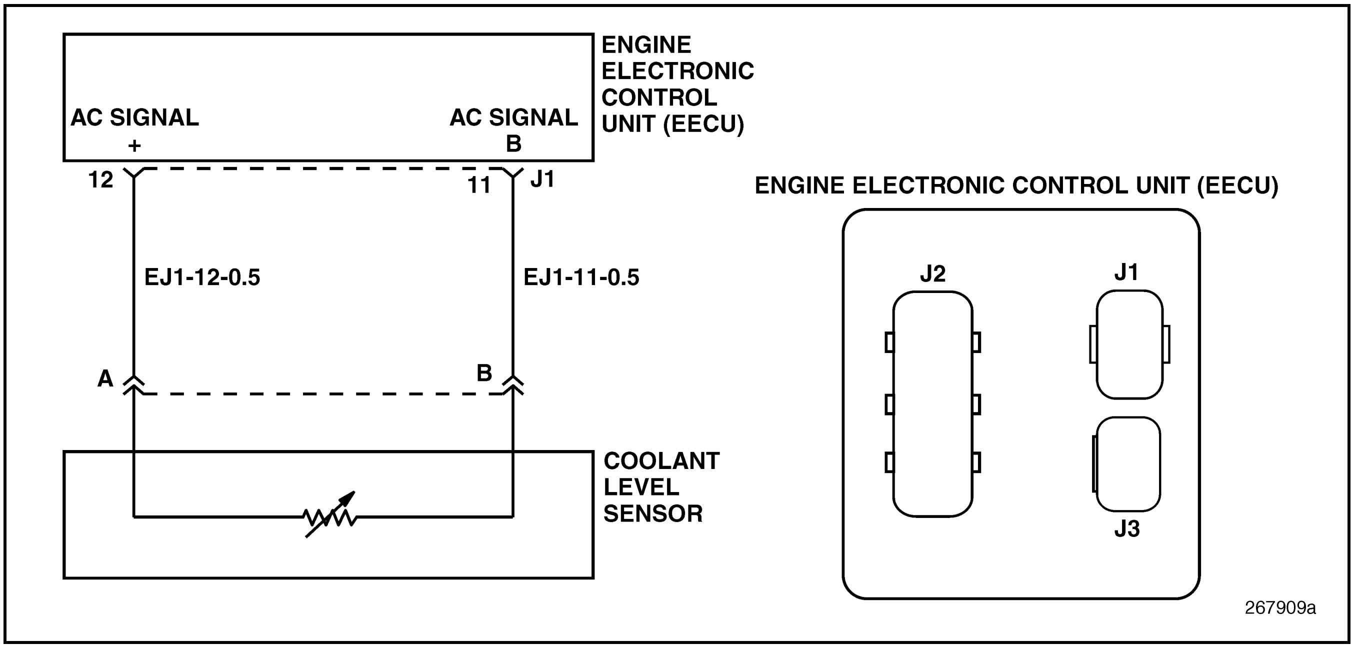


Figure 107 — Coolant Level Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High/Open)

Parameter Identification (PID): P111

Message Identification (MID): 128

Circuit Description: The Coolant Level Sensor detects the presence of coolant in the reservoir by measuring the continuity or impedance in the Coolant Level Sensor circuit. The sensor contains two electrodes, one is in the probe tip and the other in the probe base. The Coolant Level Sensor operates by applying a small AC current to the sensor probe. When the sensor is immersed in coolant, the coolant acts as a conductor between the two electrodes in the sensor. If the coolant level falls below the two electrodes on the probe, the circuit resistance will increase and the Engine Electronic Control Unit (EECU) will detect the change in circuit impedance and set fault code 1-7. The EECU signals the Vehicle Electronic Control Unit (VECU), over the serial data lines, that the coolant level is low. The VECU delays warning the driver for several seconds to account for sloshing encountered during turns and steep grades. Coolant Level Sensors are sensitive to coolant gelation and excessive coolant additives. If a vehicle has a low coolant level and no warning is experienced, inspect and clean the probe.

Location: The Coolant Level Sensor is located in the upper radiator tank or on the lower right side of the coolant reservoir.

Code Setting Conditions: If the Coolant Level Sensor signal is greater than 1.3 volts (AC) for more than 12 seconds, the Engine Electronic Control Unit (EECU) will set code 1-7 and the Electronic Malfunction Lamp (EML) will be turned on. The driver alarm will also sound when code 1-7 is set. Some vehicles may be programmed to shutdown the engine when code 1-7 is active.

Additional Symptoms: Engine overheating.

NOTE

When measuring voltage in the following tests, set the multimeter to measure AC volts.

Test 1 — Checking the Coolant Level

1. Check the coolant level.

   If the coolant is at the appropriate level, go to test “Test 2 — Checking the Voltage at the Sensor” on page 113.

   If the radiator and coolant overflow tank are NOT filled to the correct level, fill the system with coolant, check for the cause of the low coolant, and ensure that the fault is no longer active.

Test 2 — Checking the Voltage at the Sensor

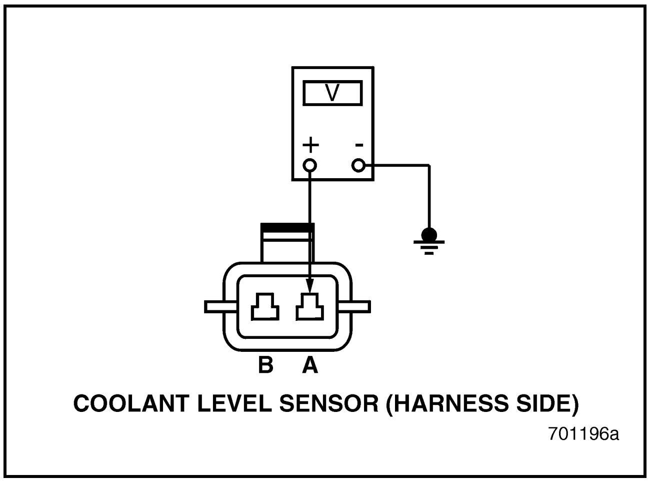


Figure 108

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Coolant Level Sensor.
3. Turn the ignition key ON.
4. Set the multimeter to measure A/C voltage.
5. Measure the voltage between pin A on the harness side of the connector and a good ground (see Figure 108).

   If the measured voltage is about 1 volt AC, go to test “Test 4 — Checking the Sensor Return Line” on page 113.

   If the measured voltage is much less than 1 volt, go to test “Test 5 — Checking for Continuity in the Harness” on page 114.

Test 4 — Checking the Sensor Return Line

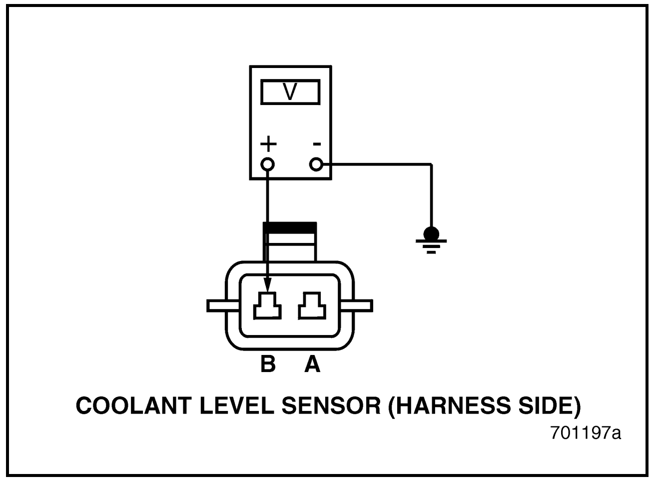


Figure 109

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Coolant Level Sensor.
3. Measure the voltage between pin B on the harness side of the connector and a good ground (see Figure 109).

   If the measured voltage is less than 0.5 volts AC, go to test “Test 8 — Checking for a Short Circuit to Voltage in the Harness” on page 114.

   If the measured voltage is much greater than 0.5 volts AC, go to test “Test 9 — Checking for Voltage on the Sensor Return Line” on page 115.

Test 5 — Checking for Continuity in the Harness

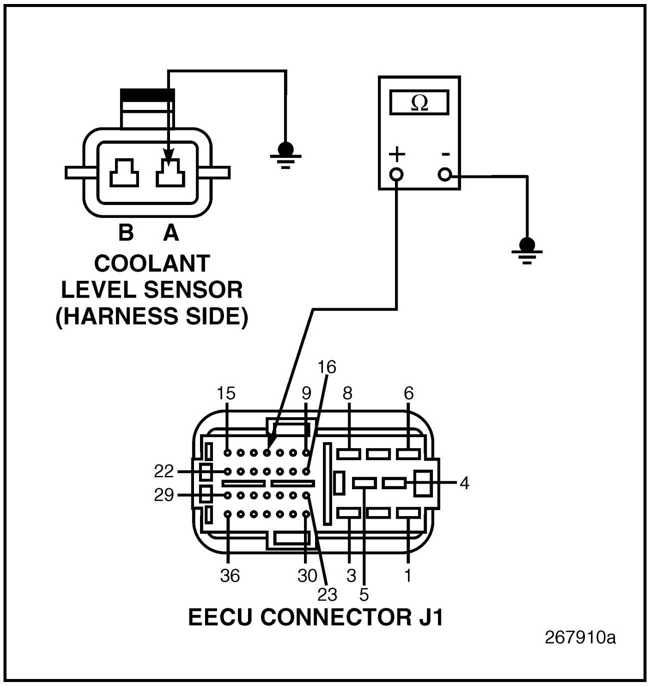


Figure 110

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Disconnect the harness connector from the Coolant Level Sensor.
4. Connect a jumper between pin A on the harness side of the Coolant Level Sensor and a known good ground (see Figure 110).
5. Check for continuity between EECU connector J1 pin 12 and a good ground.

   If continuity exists, go to test "Test 10 — Checking for a Pin to Pin Short Circuit in the Harness" on page 115.

   If there is NO continuity, there is an open circuit in the probe supply line. Repair the open circuit in the harness.

Test 8 — Checking for a Short Circuit to Voltage in the Harness

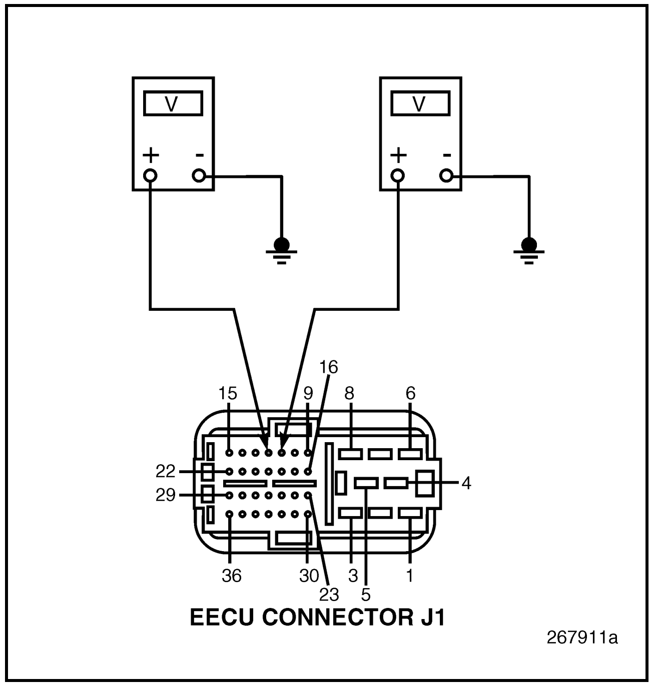


Figure 111

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pin 12 and a good ground (see Figure 111).
5. Measure the voltage between EECU connector J1 pin 11 and a good ground (see Figure 111).

   If the measured voltage on both lines is less than 0.5 volts AC, go to test "Test 16 — Checking for an Open Circuit" on page 116.

   If the measured voltage on EITHER line is greater than 0.5 volts AC, locate and repair the short circuit to voltage.

Test 9 — Checking for Voltage on the Sensor Return Line

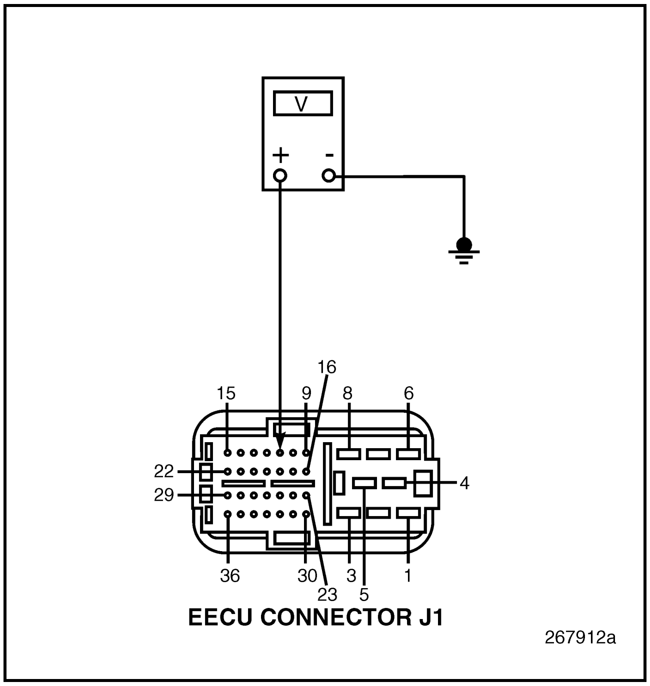


Figure 112

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
3. Turn the ignition key ON.
4. Measure the voltage between Engine Electronic Control Unit (EECU) connector J1 pin 11 and a good ground (see Figure 112).

   If the measured voltage is less than 0.5 volts AC, inspect EECU connector J1 pin 11 for dirt, looseness, or any damage that could cause a short circuit to voltage. If repairable damage is found, repair the connector and then replace the EECU. If the damage is not repairable, replace the connector and then replace the EECU.

   If EECU connector J1 is undamaged, replace the EECU.

   If the measured voltage is greater than 0.5 volts AC, locate and repair the short circuit to voltage and replace the Engine Electronic Control Unit (EECU).

Test 10 — Checking for a Pin to Pin Short Circuit in the Harness

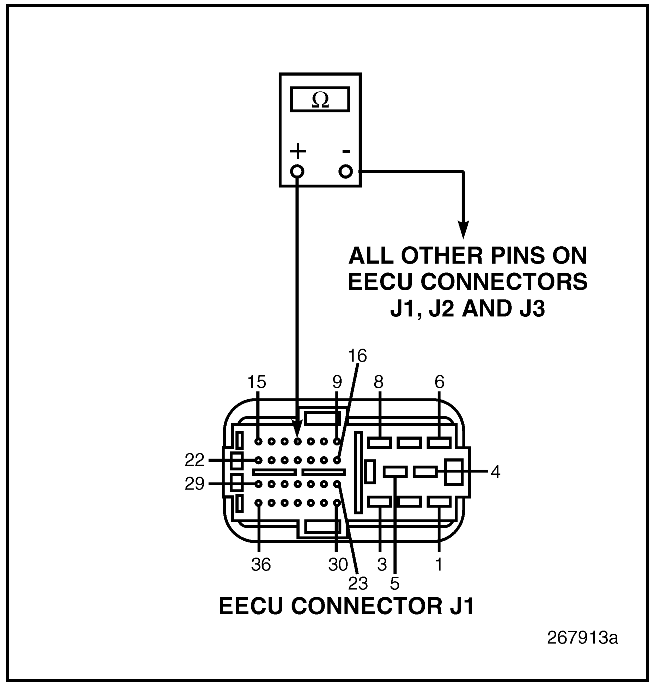


Figure 113

1. Turn the ignition key OFF.
2. Remove the jumper from pin A of the Coolant Level Sensor harness connector.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
4. Check for continuity between EECU connector J1 pin 12 and all other pins on EECU connectors J1, J2, and J3 (see Figure 113).

   If continuity exists, pin 12 is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 20 — Checking the Engine Electronic Control Unit (EECU) for an Open Circuit” on page 116.

Test 16 — Checking for an Open Circuit

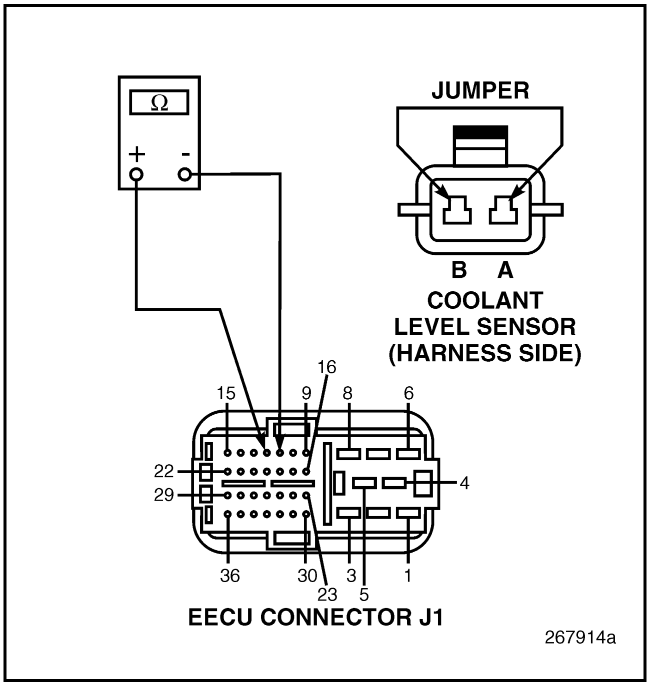


Figure 114

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Coolant Level Sensor.
3. Connect a jumper between pins A and B on the harness side of the Coolant Level Sensor harness connector.
4. Check for continuity between Engine Electronic Control Unit (EECU) connector J1 pins 11 and 12 (see Figure 114).

   If continuity exists, go to test “Test 32 — Checking for a Pin to Pin Short Circuit in the Harness” on page 117.

   If there is NO continuity, repair the open circuit in the coolant level probe return line (EJ1-12-0.5).

Test 20 — Checking the Engine Electronic Control Unit (EECU) for an Open Circuit

1. Visually inspect Engine Electronic Control Unit (EECU) connector J1 pin 12 for dirt, looseness, or deformed contacts.
2. If a repairable open is found, repair or replace harness connector.

   If the terminals are making good contact, go to test “Test 40 — Checking for a Faulty Engine Electronic Control Unit (EECU)” on page 117.

Test 32 — Checking for a Pin to Pin Short Circuit in the Harness

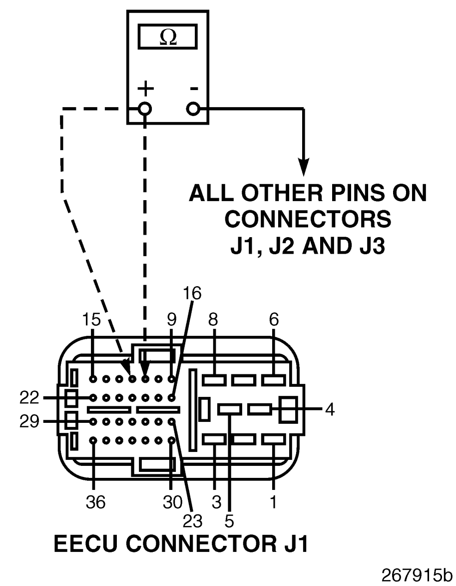


Figure 115

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
3. Disconnect the jumper from the Coolant Level Sensor harness connector.
4. Check for continuity between Engine Electronic Control Unit (EECU) connector J1 pins 11 and 12 versus all other pins on EECU connectors J1, J2, and J3 (see Figure 115).

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 64 — Checking for a Faulty Sensor" on page 117.

Test 40 — Checking for a Faulty Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect the Coolant Level Sensor harness connector.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
4. Turn the ignition key ON.

   If code 1-7 is still present, replace the Engine Control Unit (EECU).

   If code 1-7 is NOT present, the procedure has corrected the problem. Check all connectors to ensure proper connections.

Test 64 — Checking for a Faulty Sensor

1. Turn the ignition key OFF.
2. Replace the Coolant Level Sensor and refill the cooling system with Mack specified coolant (refer to the TS494 Maintenance and Lubrication manual).
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
4. Turn the ignition key ON.
5. Wait one minute.

   If code 1-7 is no longer present, replacing the sensor has corrected the problem.

   If code 1-7 becomes ACTIVE go to test "Test 128 — Checking for a Damaged Connector" on page 117.

Test 128 — Checking for a Damaged Connector

1. Turn the ignition key OFF.
2. Disconnect Engine Control Unit (EECU) connector J1.
3. Inspect EECU connector J1 for damaged, missing or broken pins.

   If damage is evident, repair the J1 connector if possible. If damage is not repairable, replace EECU connector J1.

   If there is NO evidence of damage, reconnect the circuit and turn the ignition key ON. If code 1-7 is still present, replace the Engine Electronic Control Unit (EECU). If code 1-7 is NOT present, the procedure has corrected the problem. Clean and inspect the connections.

BLINK CODE 1-8 — ESTIMATED % FAN SPEED (ASET™ IEGR ENGINE)

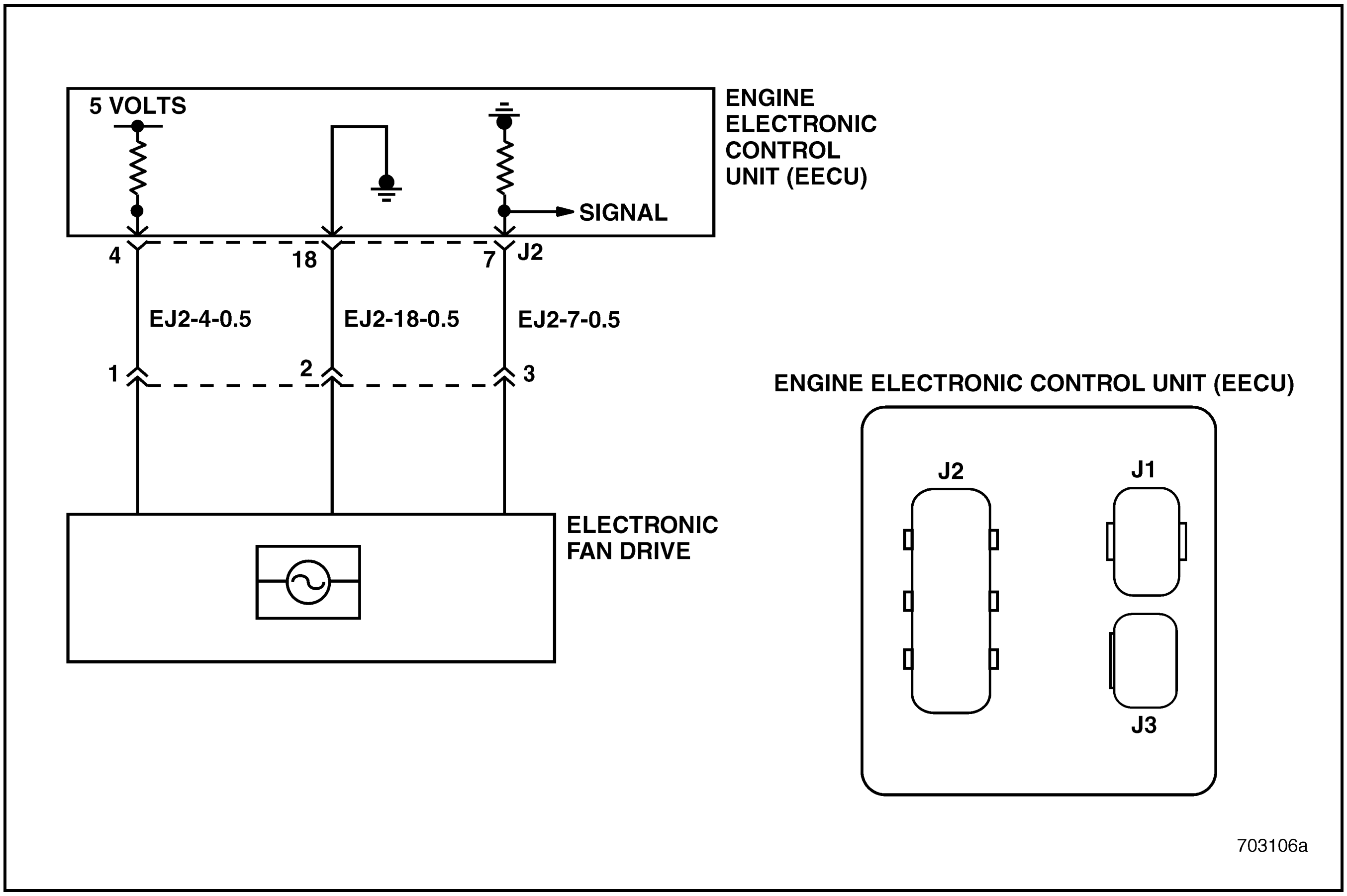


Figure 116 — Electronic Fan Drive Circuit (ASET™ IEGR Engine)

Failure Mode Identifier (FMI): 0 (Valid High), 1 (Valid Low), 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): 26

Message Identification (MID): 128

Circuit Description: The electronic fan drive contains a Hall effect speed sensor. When the engine is running, a series of vanes in the fan drive housing rotates past a magnet in the fan drive solenoid generating a pulsed voltage signal. The Engine Electronic Control Unit (EECU) monitors the status of the engine brake solenoids and the air conditioning system and signals from the Engine Coolant Temperature (ECT) Sensor, the Engine Oil Temperature (EOT) Sensor, and the Engine Speed/Timing (RPM/TDC) Sensor and calculates the optimal cooling fan speed. The EECU transmits a pulse width modulated signal to the fan drive solenoid which opens and closes a valve in the primary drive plate, allowing fluid to fill or drain from the fan drive housing until the target fan speed is achieved.

Location: The Cooling Fan Speed (CFS) Sensor is located in the electronic fan drive housing.

Additional Symptoms: High engine coolant temperature could occur and cause engine shutdown.

Test 1 — Checking for Code 1-8

1. Verify that code 1-8 is set.

   If code 1-8 is set, go to test "Test 2 — Checking Code 1-8 Failure Mode Identifier (FMI)" on page 119.

   If code 1-8 is not set, the code is intermittent. Wiggle the wires and connectors to try to set the code. Visually inspect the electronic fan drive connector and wires for poor connections.

Test 2 — Checking Code 1-8 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

NOTE

If code 1-8 is set with FMI 3 or FMI 4, fault code 10-4 may also be set.

If the FMI is 4 or 1, check for a broken or improperly routed fan drive belt. If the belt is in good condition, go to test "Test 4 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit" on page 119.

If the FMI is 3, go to test "Test 5 — Checking for a Short to Voltage in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit" on page 120.

If the FMI is 0, check the fan drive for a locked-up condition. If the cooling fan turns freely with the engine shut down, check the Vehicle Electronic Control Unit (VECU) fault table for severe engine overspeed events. If no engine overspeed events have occurred, contact Mack Service Engineering to have the Engine Electronic Control Unit (EECU) data file updated.

Test 4 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit

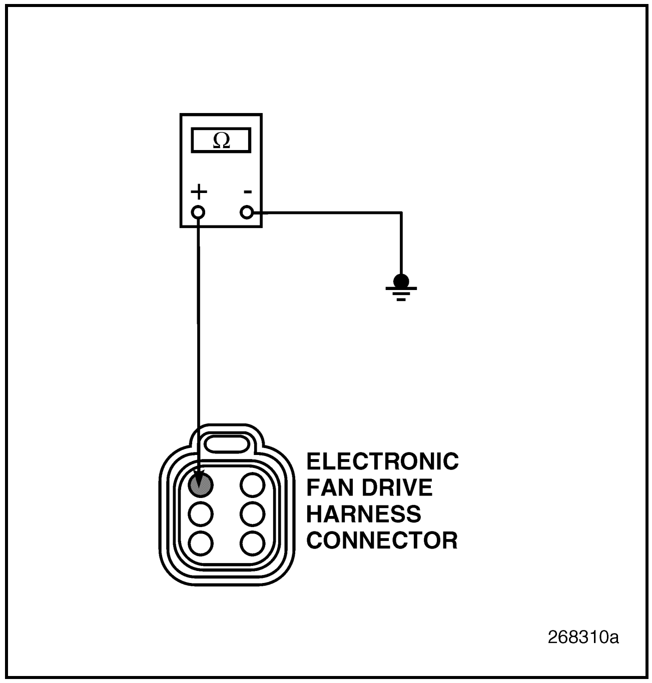


Figure 117

1. Turn the ignition key ON.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between electronic fan drive harness connector pin 1 and a good ground (see Figure 117).

   If continuity exists, locate and repair the short circuit to ground in the supply voltage circuit between the electronic fan drive and the EECU.

   If there is NO continuity to ground, go to test "Test 8 — Checking for a Short Circuit to Ground in the Sensor" on page 120.

Test 5 — Checking for a Short to Voltage in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit

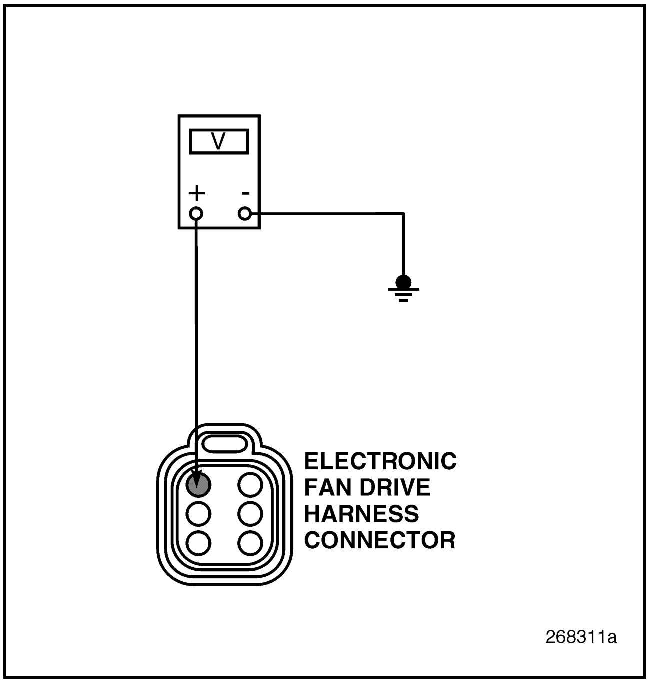


Figure 118

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Turn the ignition key ON.
5. Measure the voltage between electronic fan drive harness connector pin 1 and a good ground (see Figure 118).

   If voltage is present, locate and repair the short circuit to voltage in the supply voltage circuit between the electronic fan drive and the EECU.

   If voltage is NOT present, go to test “Test 10 — Checking for a Short Circuit to Voltage on the Cooling Fan Speed (CFS) Sensor Signal Line” on page 121.

Test 8 — Checking for a Short Circuit to Ground in the Sensor

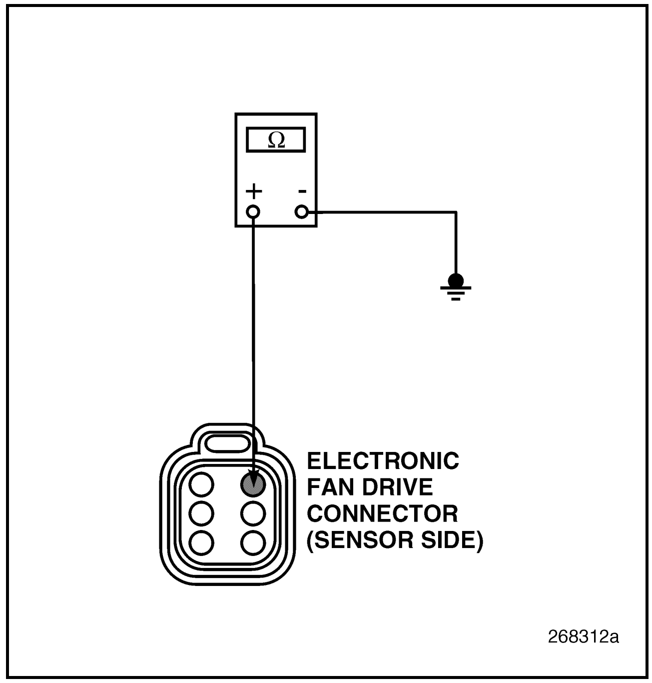


Figure 119

1. Turn the ignition key OFF.
2. Disconnect the electronic fan drive harness connector.
3. Check for continuity between the sensor side of electronic fan drive connector pin 1 and a good ground (see Figure 119).

   If continuity exists, replace the electronic fan drive assembly.

   If there is NO continuity to ground, go to test “Test 16 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Signal Line” on page 121.

Test 10 — Checking for a Short Circuit to Voltage on the Cooling Fan Speed (CFS) Sensor Signal Line

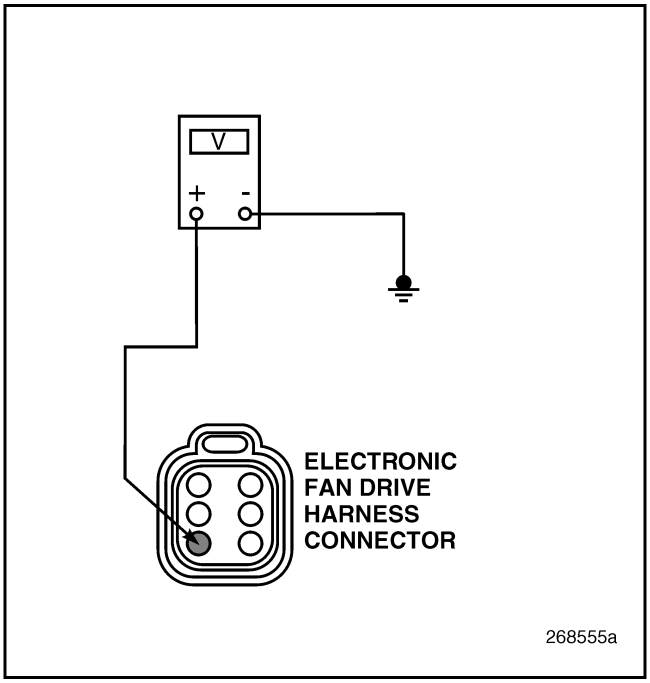


Figure 120

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Turn the ignition key ON.
5. Measure the voltage between electronic fan drive harness connector pin 3 and a good ground (see Figure 120).

   If voltage is present, locate and repair the short circuit to voltage in the sensor signal circuit between the electronic fan drive and the EECU.

   If voltage is NOT present, go to test “Test 20 — Checking for an Open Cooling Fan Speed (CFS) Sensor Ground Line” on page 122.

Test 16 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Signal Line

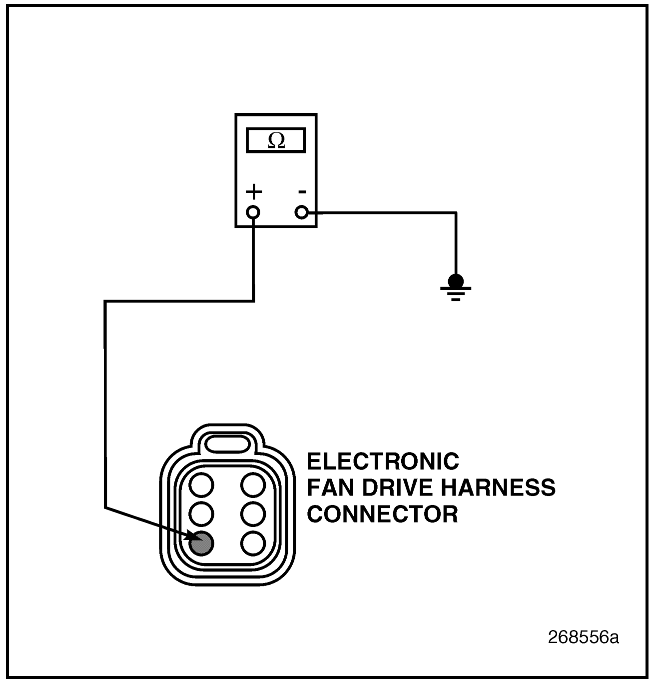


Figure 121

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between electronic fan drive harness connector pin 3 and a good ground (see Figure 121).

   If continuity exists, locate and repair the short circuit in the electronic fan drive signal line.

   If there is NO continuity, go to test “Test 32 — Checking for a Short Circuit to Ground in the Sensor” on page 122.

Test 20 — Checking for an Open Cooling Fan Speed (CFS) Sensor Ground Line

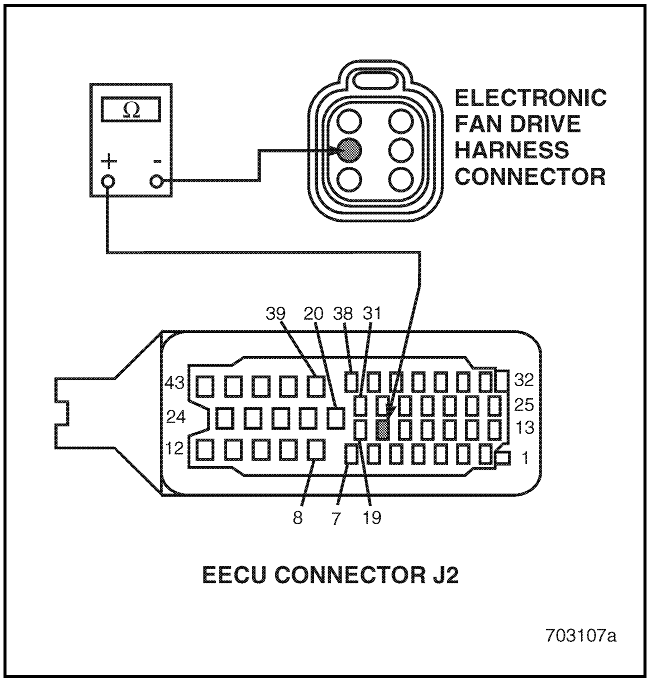


Figure 122

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between EECU harness connector J2 pin 18 and electronic fan drive harness connector pin 2 (see Figure 122).

   If continuity exists, go to test "Test 40 — Checking for a Pin to Pin Short Circuit at the EECU" on page 123.

   If there is NO continuity, locate and repair the open circuit in the electronic fan drive ground line.

Test 32 — Checking for a Short Circuit to Ground in the Sensor

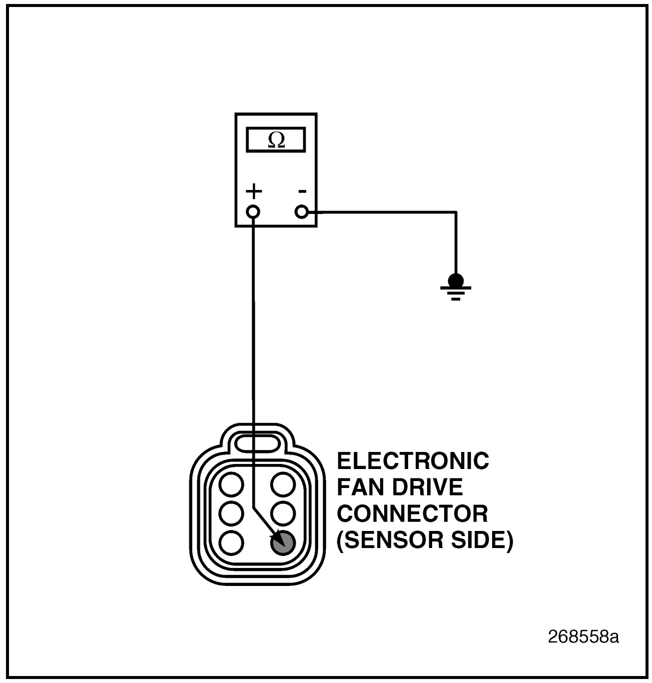


Figure 123

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between the sensor side of electronic fan drive connector pin 3 and a good ground (see Figure 123).

   If continuity exists, replace the electronic fan drive assembly.

   If there is NO continuity to ground, go to test "Test 64 — Checking for an Open Cooling Fan Speed (CFS) Sensor Supply Line" on page 123.

Test 40 — Checking for a Pin to Pin Short Circuit at the EECU

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect the EECU and connector J2 for broken, damaged, or shorted pins.

   If any damage is found, repair or replace the damaged component.

   If there are NO damaged pins, go to test "Test 80 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor" on page 123.

Test 64 — Checking for an Open Cooling Fan Speed (CFS) Sensor Supply Line

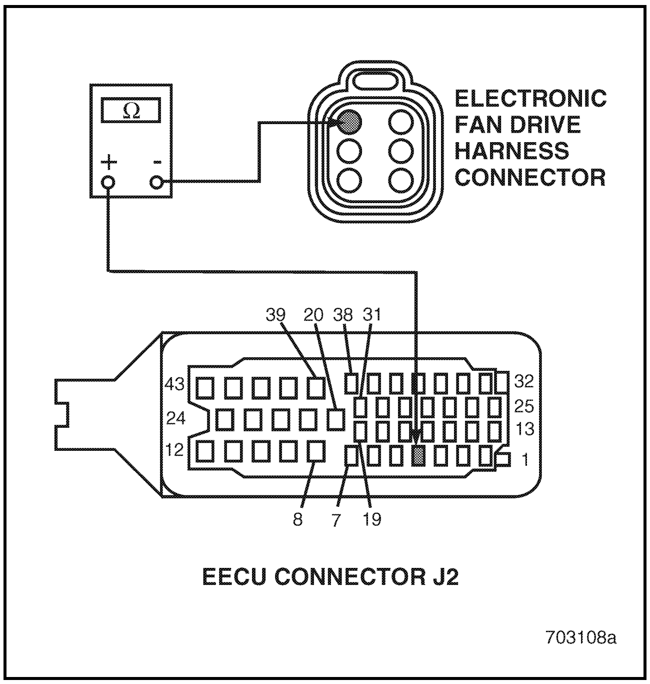


Figure 124

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between EECU harness connector J2 pin 4 and electronic fan drive harness connector pin 1 (see Figure 124).

   If continuity exists, go to test "Test 128 — Checking for an Open Signal Line" on page 124.

   If there is NO continuity, locate and repair the open circuit in the electronic fan drive supply line.

Test 80 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor

1. Turn the ignition key OFF.
2. Replace the electronic fan drive with a known good unit.
3. Restore all electrical connections and retest the system.

   If blink code 1-8 is still active, install the original electronic fan drive and replace the EECU.

   If blink code 1-8 is NOT active, replacing the electronic fan drive solved the problem. Check all connectors to ensure proper connections.

Test 128 — Checking for an Open Signal Line

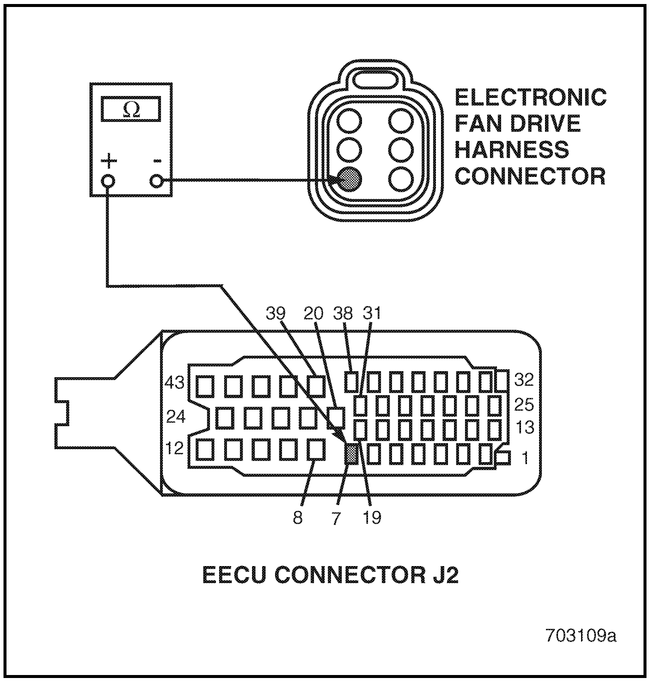


Figure 125

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between EECU harness connector J2 pin 7 and electronic fan drive harness connector pin 3 (see Figure 125).

   If continuity exists, go to test “Test 256 — Checking for a Pin to Pin Short Circuit at the EECU” on page 124.

   If there is NO continuity, locate and repair the open circuit in the electronic fan drive signal line.

Test 256 — Checking for a Pin to Pin Short Circuit at the EECU

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect the EECU and connector J2 for broken, damaged, or shorted pins.

   If any damage is found, repair or replace the damaged component.

   If there are NO damaged pins, go to test “Test 512 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor” on page 124.

Test 512 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor

1. Turn the ignition key OFF.
2. Replace the electronic fan drive with a known good unit.
3. Restore all electrical connections an retest the system.

   If blink code 1-8 is still active, install the original electronic fan drive and replace the EECU.

   If blink code 1-8 is NOT active, replacing the electronic fan drive solved the problem. Check all connectors to ensure proper connections.

BLINK CODE 1-8 — ESTIMATED % FAN SPEED (ASET™ CEGR ENGINE)

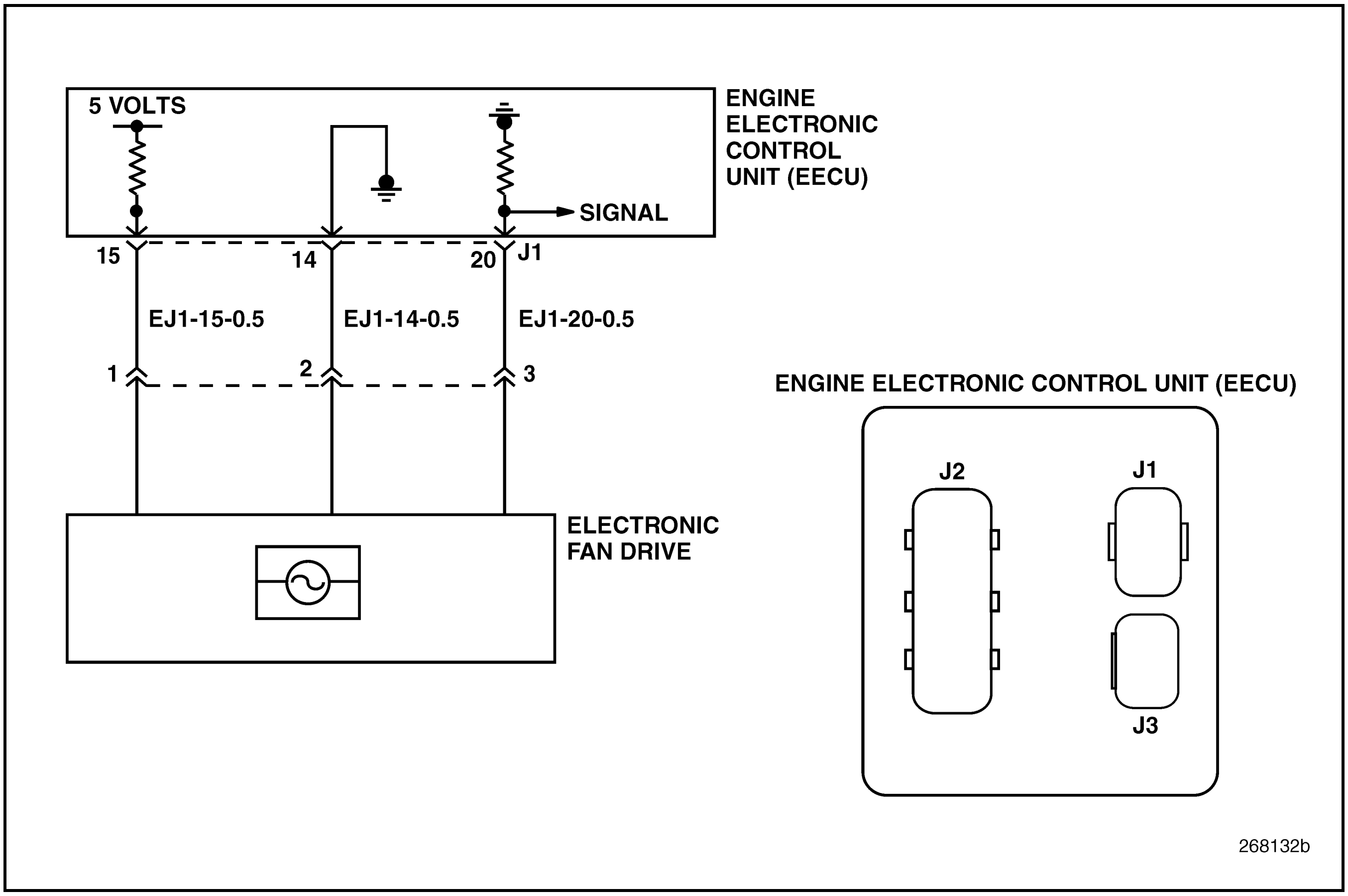


Figure 126 — Electronic Fan Drive Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 0 (Valid High), 1 (Valid Low), 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): 26

Message Identification (MID): 128

Circuit Description: The electronic fan drive contains a Hall effect speed sensor. When the engine is running, a series of vanes in the fan drive housing rotates past a magnet in the fan drive solenoid generating a pulsed voltage signal. The Engine Electronic Control Unit (EECU) monitors the status of the engine brake solenoids and the air conditioning system and signals from the Engine Coolant Temperature (ECT) Sensor, the Engine Oil Temperature (EOT) Sensor, and the Engine Speed/Timing (RPM/TDC) Sensor and calculates the optimal cooling fan speed. The EECU transmits a pulse width modulated signal to the fan drive solenoid which opens and closes a valve in the primary drive plate, allowing fluid to fill or drain from the fan drive housing until the target fan speed is achieved.

Location: The Cooling Fan Speed (CFS) Sensor is located in the electronic fan drive housing.

Additional Symptoms: High engine coolant temperature could occur and cause engine shutdown.

Test 1 — Checking for Code 1-8

1. Verify that code 1-8 is set.

   If code 1-8 is set, go to test "Test 2 — Checking Code 1-8 Failure Mode Identifier (FMI)" on page 126.

   If code 1-8 is not set, the code is intermittent. Wiggle the wires and connectors to try to set the code. Visually inspect the electronic fan drive connector and wires for poor connections.

Test 2 — Checking Code 1-8 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

NOTE

If code 1-8 is set with FMI 3 or FMI 4, fault code 10-4 may also be set.

If the FMI is 4 or 1, check for a broken or improperly routed fan drive belt. If the belt is in good condition, go to test "Test 4 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit" on page 126.

If the FMI is 3, go to test "Test 5 — Checking for a Short to Voltage in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit" on page 127.

If the FMI is 0, check the fan drive for a locked-up condition. If the cooling fan turns freely with the engine shut down, check the Vehicle Electronic Control Unit (VECU) fault table for severe engine overspeed events. If no engine overspeed events have occurred, contact Mack Service Engineering to have the Engine Electronic Control Unit (EECU) data file updated.

Test 4 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit

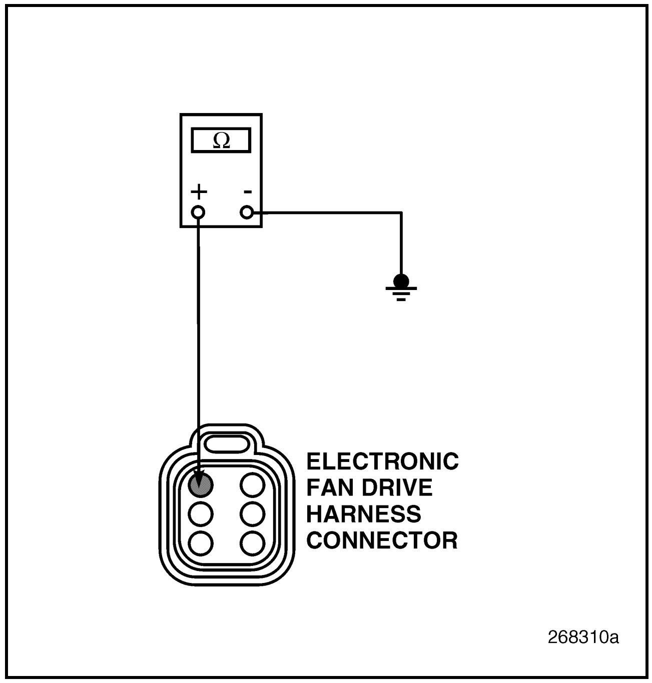


Figure 127

1. Turn the ignition key ON.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between electronic fan drive harness connector pin 1 and a good ground (see Figure 127).

   If continuity exists, locate and repair the short circuit to ground in the supply voltage circuit between the electronic fan drive and the EECU.

   If there is NO continuity to ground, go to test "Test 8 — Checking for a Short Circuit to Ground in the Sensor" on page 127.

Test 5 — Checking for a Short to Voltage in the Cooling Fan Speed (CFS) Sensor Supply Voltage Circuit

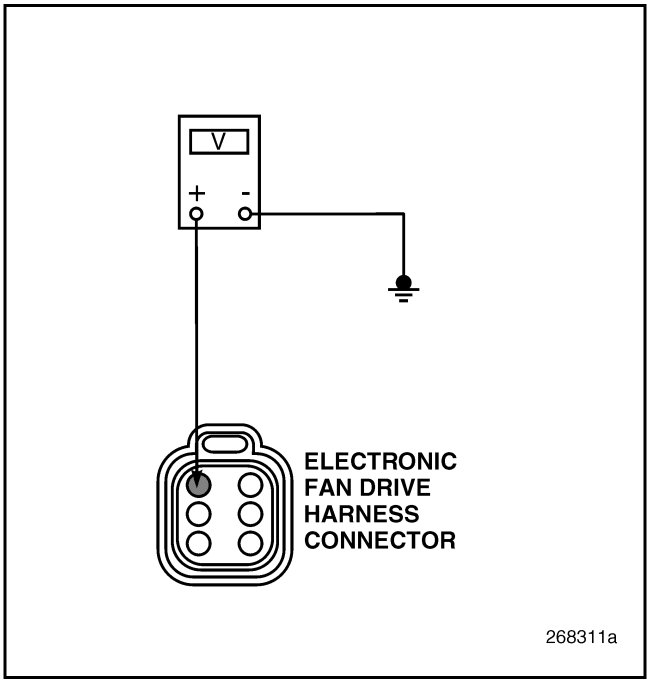


Figure 128

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Turn the ignition key ON.
5. Measure the voltage between electronic fan drive harness connector pin 1 and a good ground (see Figure 128).

   If voltage is present, locate and repair the short circuit to voltage in the supply voltage circuit between the electronic fan drive and the EECU.

   If voltage is NOT present, go to test "Test 10 — Checking for a Short Circuit to Voltage on the Cooling Fan Speed (CFS) Sensor Signal Line" on page 128.

Test 8 — Checking for a Short Circuit to Ground in the Sensor

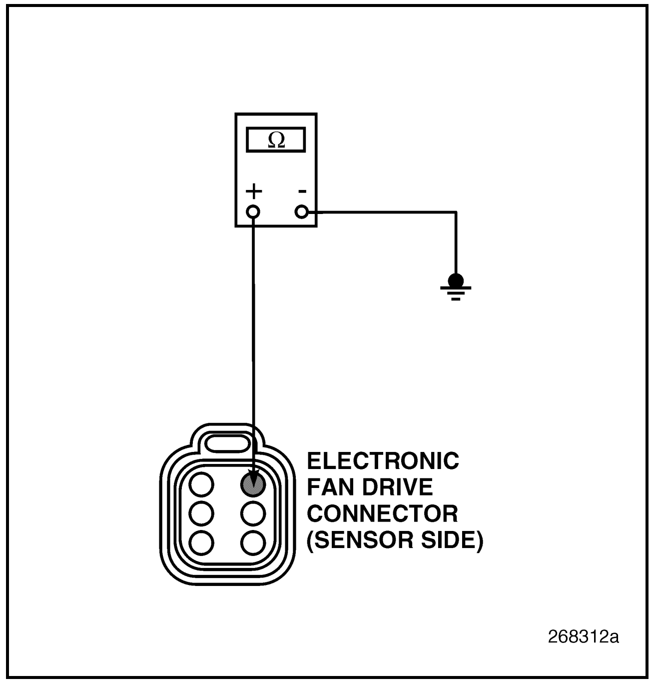


Figure 129

1. Turn the ignition key OFF.
2. Disconnect the electronic fan drive harness connector.
3. Check for continuity between the sensor side of electronic fan drive connector pin 1 and a good ground (see Figure 129).

   If continuity exists, replace the electronic fan drive assembly.

   If there is NO continuity to ground, go to test "Test 16 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Signal Line" on page 128.

Test 10 — Checking for a Short Circuit to Voltage on the Cooling Fan Speed (CFS) Sensor Signal Line

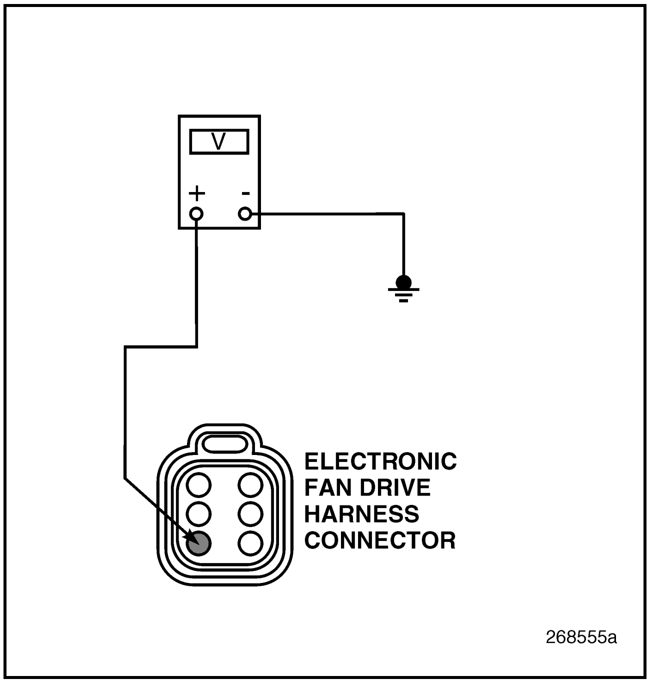


Figure 130

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Turn the ignition key ON.
5. Measure the voltage between electronic fan drive harness connector pin 3 and a good ground (see Figure 130).

   If voltage is present, locate and repair the short circuit to voltage in the sensor signal circuit between the electronic fan drive and the EECU.

   If voltage is NOT present, go to test "Test 20 — Checking for an Open Cooling Fan Speed (CFS) Sensor Ground Line" on page 129.

Test 16 — Checking for a Short to Ground in the Cooling Fan Speed (CFS) Sensor Signal Line

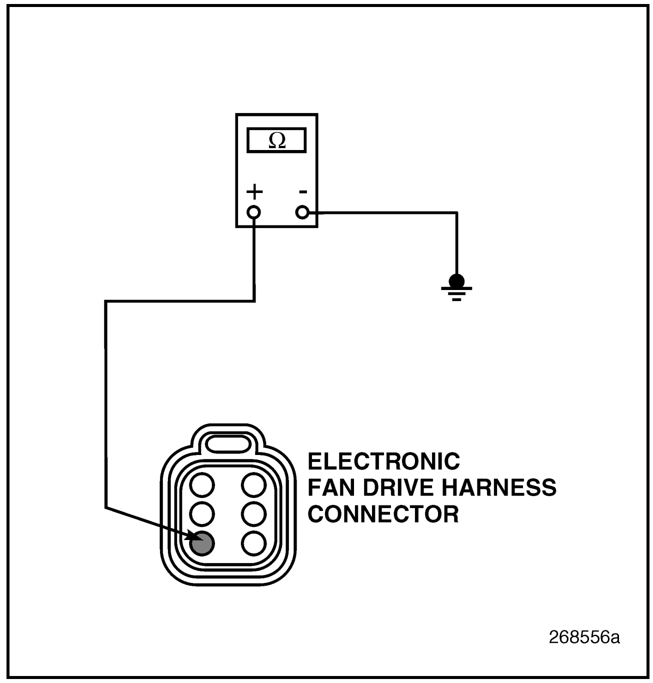


Figure 131

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between electronic fan drive harness connector pin 3 and a good ground (see Figure 131).

   If continuity exists, locate and repair the short circuit in the electronic fan drive signal line.

   If there is NO continuity, go to test "Test 32 — Checking for a Short Circuit to Ground in the Sensor" on page 129.

Test 20 — Checking for an Open Cooling Fan Speed (CFS) Sensor Ground Line

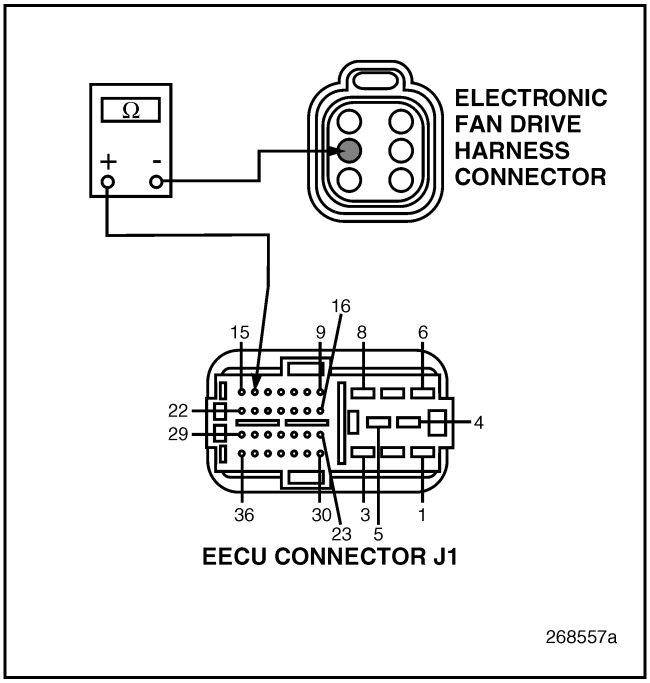


Figure 132

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between EECU harness connector J1 pin 14 and electronic fan drive harness connector pin 2 (see Figure 132).

   If continuity exists, go to test “Test 40 — Checking for a Pin to Pin Short Circuit at the EECU” on page 130.

   If there is NO continuity, locate and repair the open circuit in the electronic fan drive ground line.

Test 32 — Checking for a Short Circuit to Ground in the Sensor

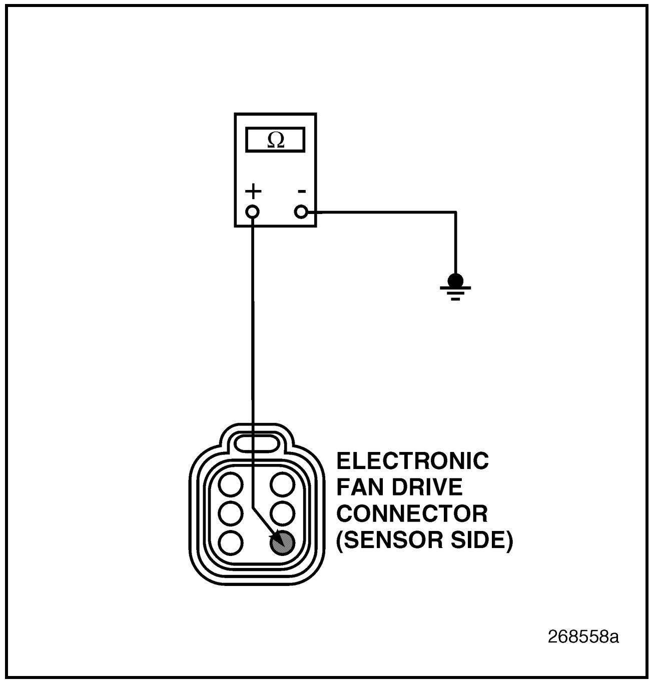


Figure 133

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between the sensor side of electronic fan drive connector pin 3 and a good ground (see Figure 133).

   If continuity exists, replace the electronic fan drive assembly.

   If there is NO continuity to ground, go to test “Test 64 — Checking for an Open Cooling Fan Speed (CFS) Sensor Supply Line” on page 130.

Test 40 — Checking for a Pin to Pin Short Circuit at the EECU

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect the EECU and connector J1 for broken, damaged, or shorted pins.

   If any damage is found, repair or replace the damaged component.

   If there are NO damaged pins, go to test “Test 80 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor” on page 130.

Test 64 — Checking for an Open Cooling Fan Speed (CFS) Sensor Supply Line

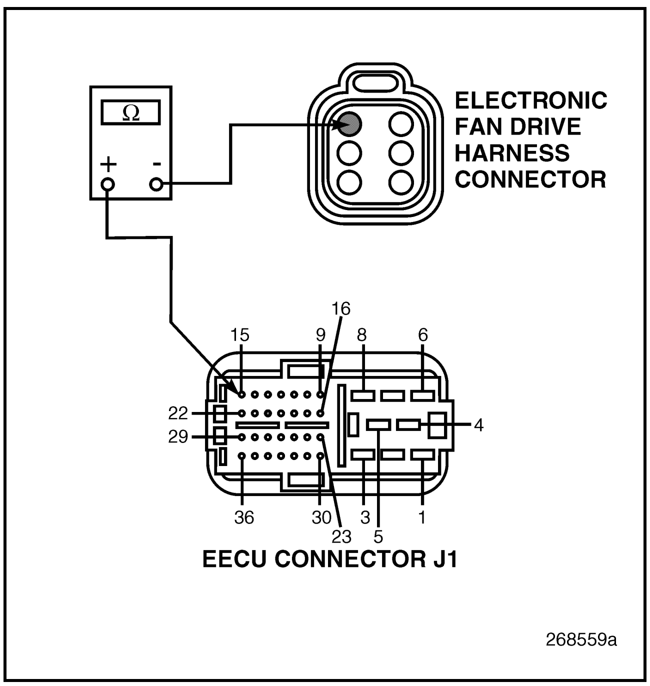


Figure 134

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between EECU harness connector J1 pin 15 and electronic fan drive harness connector pin 1 (see Figure 134).

   If continuity exists, go to test “Test 128 — Checking for an Open Signal Line” on page 131.

   If there is NO continuity, locate and repair the open circuit in the electronic fan drive supply line.

Test 80 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor

1. Turn the ignition key OFF.
2. Replace the electronic fan drive with a known good unit.
3. Restore all electrical connections and retest the system.

   If blink code 1-8 is still active, install the original electronic fan drive and replace the EECU.

   If blink code 1-8 is NOT active, replacing the electronic fan drive solved the problem. Check all connectors to ensure proper connections.

Test 128 — Checking for an Open Signal Line

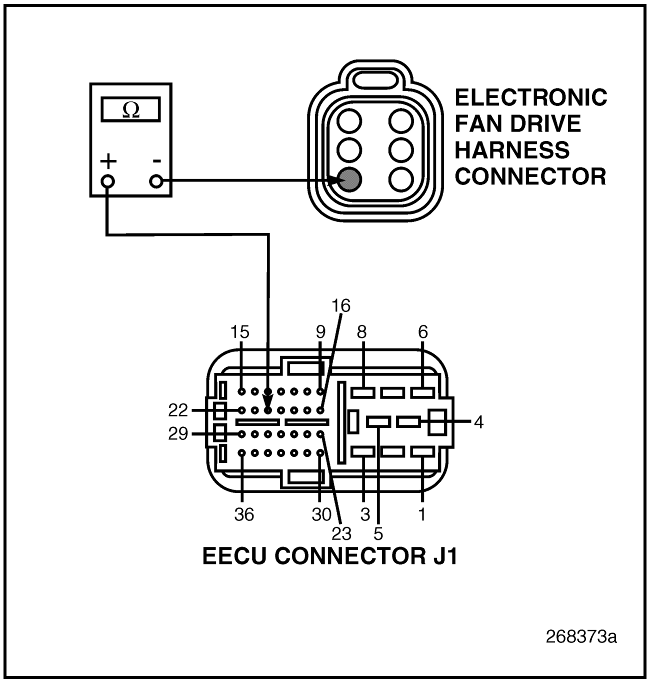


Figure 135

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the electronic fan drive harness connector.
4. Check for continuity between EECU harness connector J1 pin 20 and electronic fan drive harness connector pin 3 (see Figure 135).

   If continuity exists, go to test “Test 256 — Checking for a Pin to Pin Short Circuit at the EECU” on page 131.

   If there is NO continuity, locate and repair the open circuit in the electronic fan drive signal line.

Test 256 — Checking for a Pin to Pin Short Circuit at the EECU

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect the EECU and connector J1 for broken, damaged, or shorted pins.

   If any damage is found, repair or replace the damaged component.

   If there are NO damaged pins, go to test “Test 512 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor” on page 131.

Test 512 — Checking for a Faulty Cooling Fan Speed (CFS) Sensor

1. Turn the ignition key OFF.
2. Replace the electronic fan drive with a known good unit.
3. Restore all electrical connections an retest the system.

   If blink code 1-8 is still active, install the original electronic fan drive and replace the EECU.

   If blink code 1-8 is NOT active, replacing the electronic fan drive solved the problem. Check all connectors to ensure proper connections.

BLINK CODE 1-10 — AUXILIARY COOLING RELAY OUTPUT

Failure Mode Identifier (FMI): 4 (Voltage Low/Open)

Parameter Identification (PID): S275

Message Identification (MID): 128

NOTE

If this fault occurs, contact Mack Trucks Service Engineering.

BLINK CODE 2-1 — ENGINE COOLANT TEMPERATURE (ECT) SENSOR (ASET™ IEGR ENGINE)

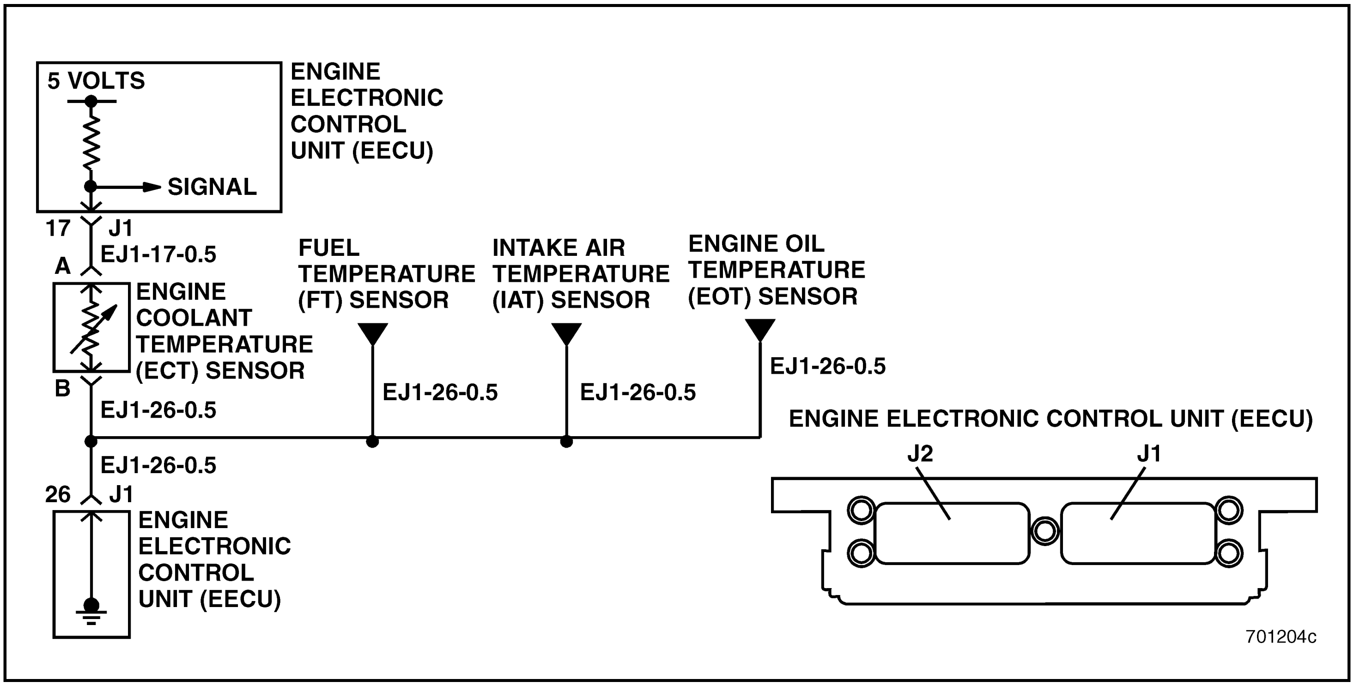


Figure 136 — Engine Coolant Temperature (ECT) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): P110

Message Identification (MID): 128

Circuit Description: The Engine Coolant Temperature (ECT) Sensor is a thermistor. The resistance of the ECT Sensor changes inversely to the temperature of the engine coolant. When the coolant is cold, the sensor resistance is high. As the temperature of the coolant increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the ECT Sensor and uses this signal to calculate fuel injection timing and to evaluate operating conditions that may cause high coolant temperature. Examples of conditions that may cause high coolant temperature are: thermostat failure, fan failure, heavy load, high ambient temperatures and radiator blockage.

Location: The Engine Coolant Temperature (ECT) Sensor is located on the left side of the engine, on the rear of the water manifold.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-1 will set when the Engine Electronic Control Unit (EECU) senses that the ECT Sensor signal voltage is less than 0.2 volts or greater than 4.5 volts for 5 seconds. If the ECT Sensor voltage returns to between 0.2 volts and 4.5 volts for more than 5 seconds, the fault will become inactive.

Normal ECT Sensor Parameters: The Engine Coolant Temperature (ECT) Sensor has a resistance between 9300 ohms at 32°F (0°C) and 200 ohms at 194°F (90°C).

Test 1 — Checking for Code 2-1

1. Verify that code 2-1 is set.

   If code 2-1 is set, go to test “Test 2 — Checking Code 2-1 Failure Mode Identifier (FMI)” on page 134.

   If code 2-1 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Coolant Temperature (ECT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-1 Failure Mode Identifier (FMI)

1. Check Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test “Test 4 — Checking for Code 1-3” on page 134.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short Circuit to Ground in the Sensor” on page 134.

Test 4 — Checking for Code 1-3

1. Is code 1-3, 2-3 or 2-7 also set?

   If code 1-3, 2-3 or 2-7 is also set, go to test “Test 8 — Checking for an Open ECT Sensor Return Line” on page 135.

   If only code 2-1 is set, go to test “Test 9 — Checking Sensor Resistance” on page 135.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

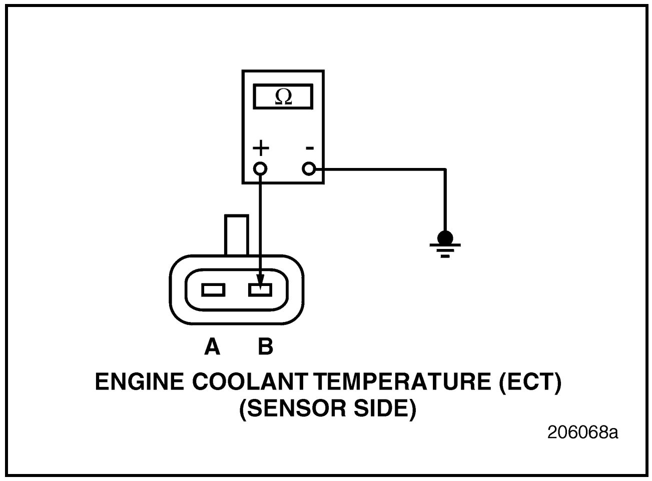


Figure 137

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Check for continuity between either pin of the ECT Sensor and a good ground (see Figure 137).

   If continuity exists, replace the ECT Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 136.

Test 8 — Checking for an Open ECT Sensor Return Line

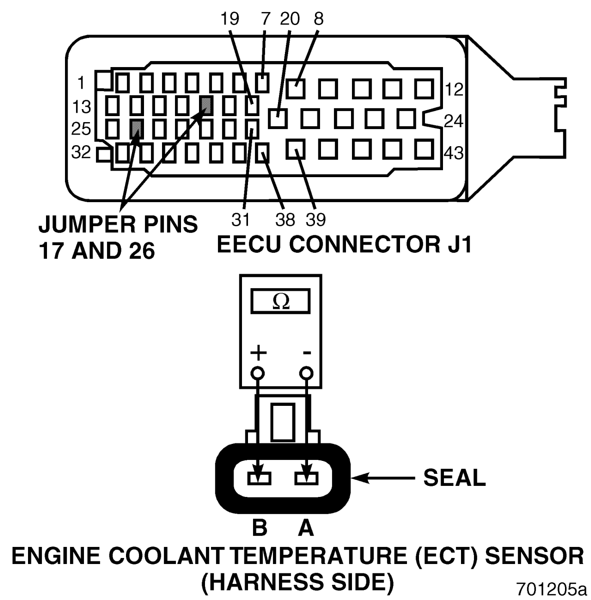


Figure 138

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between J1 pin 17 and J1 pin 26 of the EECU harness connector (see Figure 138).
5. Check for continuity between pins A and B of the ECT Sensor harness connector.

   If continuity exists, go to test "Test 16 — Checking for Voltage on the Sensor Return Line" on page 136.

   If there is NO continuity, there is an open ground circuit in the harness between the common ground splice of the sensors and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

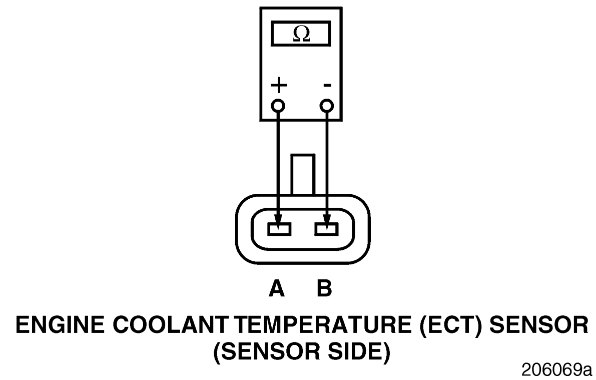


Figure 139

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Measure the resistance across the pins of the ECT Sensor with the coolant temperature between 32° and 194°F (0° and 90°C) (see Figure 139).

   If the resistance of the sensor is between 9300 and 200 ohms or if the resistance is infinite (open circuit), go to test "Test 18 — Checking the Signal Line Voltage" on page 137.

   If the resistance of the sensor is not within normal operating parameters (9300 to 200 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

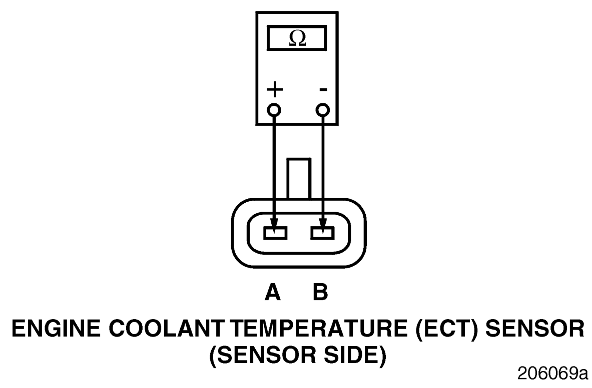


Figure 140

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Measure the resistance across the pins of the ECT Sensor with the coolant temperature between 32° and 194°F (0° and 90°C) (see Figure 140).

   If the resistance is between 9300 and 200 ohms respectively, go to test “Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the ECT Sensor” on page 137.

   If the resistance is less than 200 ohms, replace the ECT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

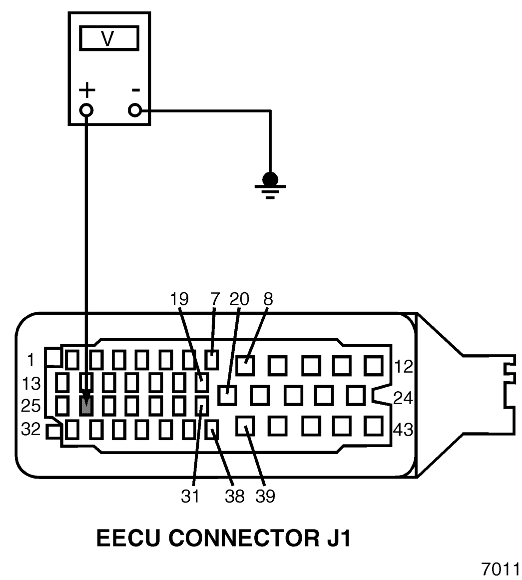


Figure 141

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Measure the voltage between EECU connector J1 pin 26 and a good ground (see Figure 141).

   If there is less than 0.5 volts present, go to test “Test 32 — Checking the EECU Connector for an Open in the Sensor Return Line” on page 138.

   If there is more than 0.5 volts present, there is a short circuit to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking the Signal Line Voltage

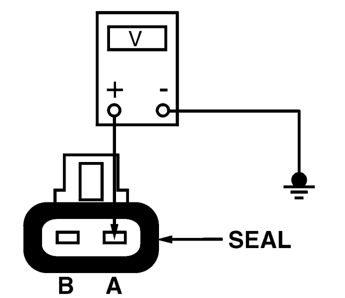


Figure 142

1. Disconnect the ECT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between the ECT Sensor harness connector pin A and a good ground (see Figure 142).

   If the measured voltage is greater than 6 volts, the ECT Sensor signal line is shorted to voltage; go to test “Test 36 — Checking for a Short Circuit to Voltage in the Sensor Signal Line” on page 138.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 9, go to test “Test 37 — Checking for an Open ECT Sensor Signal Line” on page 138.

Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the ECT Sensor

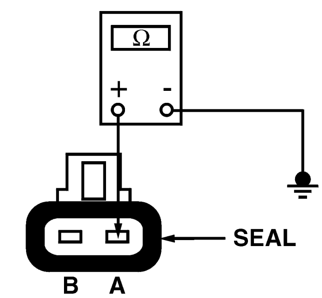


Figure 143

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin A of the ECT Sensor harness connector and a good ground (see Figure 143).

   If continuity exists between pin A and ground, go to test “Test 40 — Checking for a Pin to Pin Short in the Harness” on page 139.

   If there is NO continuity, go to test “Test 41 — Checking for Proper Supply Voltage to the Sensor” on page 139.

Test 32 — Checking the EECU Connector for an Open in the Sensor Return Line

1. Visually inspect the EECU harness connector J1 pin 26 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pin 26. Gently push the test lead into the harness connector pin and check for looseness.

   If a repairable open is found or the pin feels loose, repair EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pin 26, go to test "Test 64 — Checking for Blink Code 2-1" on page 140.

Test 36 — Checking for a Short Circuit to Voltage in the Sensor Signal Line

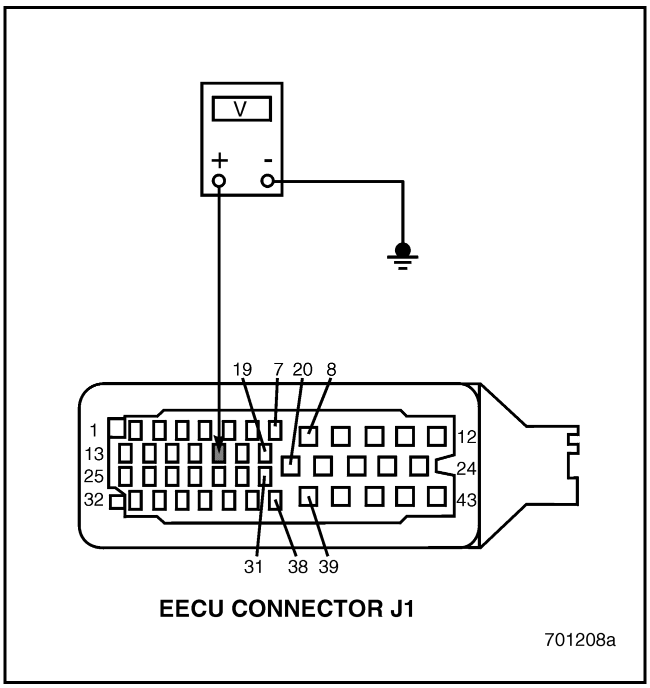


Figure 144

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect connector J1 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J1 pin 17 and a good ground (see Figure 144).

   If there is NO voltage indicated, go to test "Test 72 — Checking for a Short Circuit at the EECU Connector" on page 140.

   If voltage is present, go to test "Test 73 — Checking for a Pin to Pin Short Circuit in the Harness" on page 140.

Test 37 — Checking for an Open ECT Sensor Signal Line

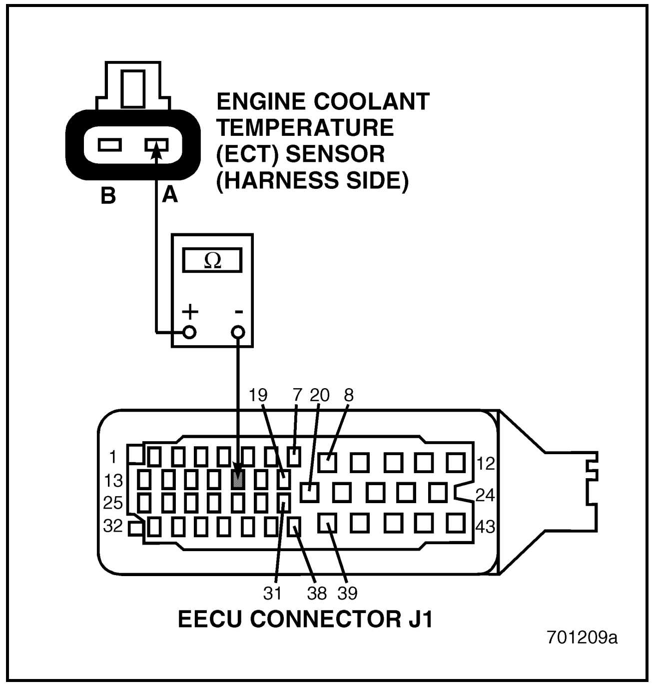


Figure 145

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect EECU connector J1.
4. Check for continuity between pin A of the ECT Sensor harness connector and EECU harness connector J1 pin 17 (see Figure 145).

   If there is NO continuity, locate and repair the open signal circuit between the ECT Sensor harness connector and EECU harness connector J1 pin 17.

   If continuity exists, go to test "Test 74 — Checking for an Open ECT Sensor Return Circuit" on page 141.

Test 40 — Checking for a Pin to Pin Short in the Harness

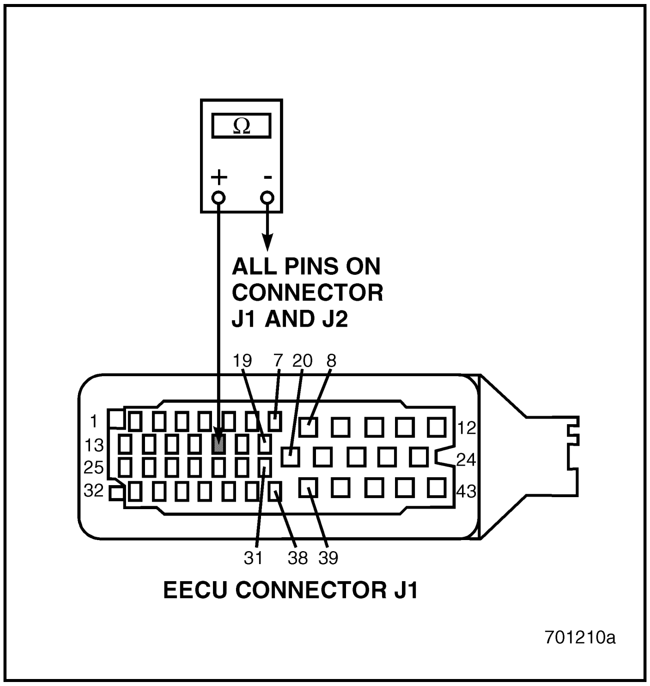


Figure 146

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 17 and all other pins on EECU connectors J1 and J2 (see Figure 146).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to ground.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

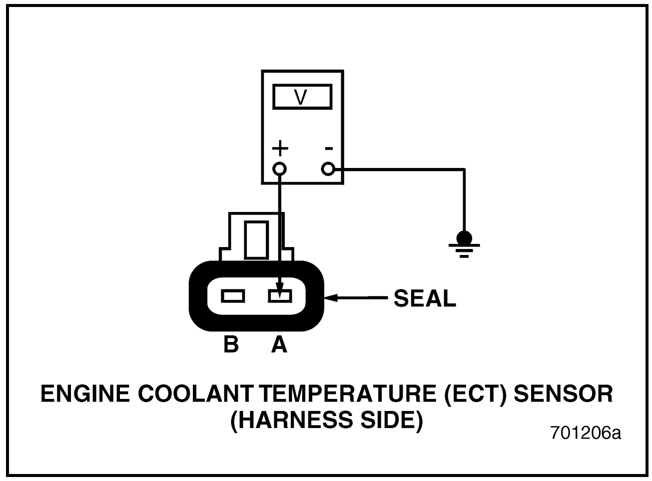


Figure 147

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Connect connector J1 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage at pin A of the ECT Sensor harness connector (see Figure 147).

   If the measured voltage is between 4.5 and 5.5 volts, check the ECT Sensor harness connector for deformed pins or insufficient contact with the ECT Sensor pins. If the pins are not damaged, replace the ECT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 141.

Test 64 — Checking for Blink Code 2-1

1. Connect the ECT Sensor connector.
2. Connect EECU harness connector J1 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-1 is still active, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Engine Coolant Temperature Sensor was open in test 9, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the ECT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-1 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short Circuit in the Harness

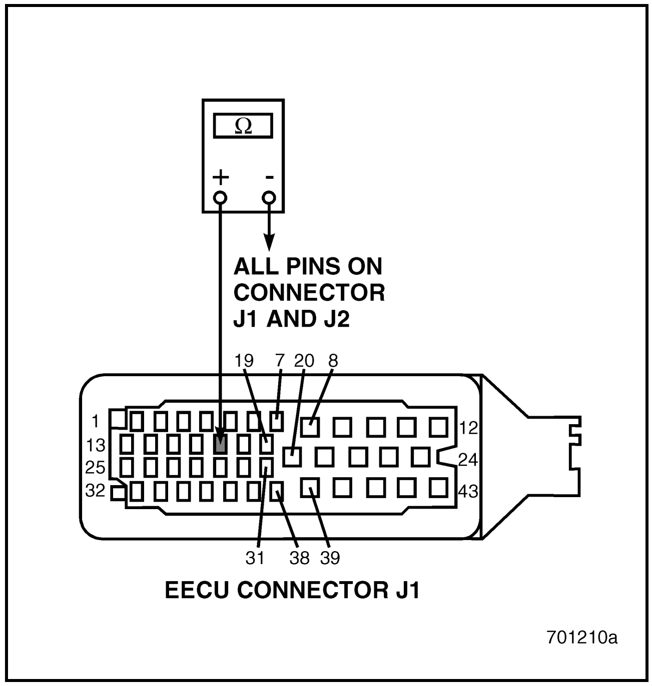


Figure 148

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 17 and all other pins on EECU connectors J1 and J2 (see Figure 148).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 74 — Checking for an Open ECT Sensor Return Circuit

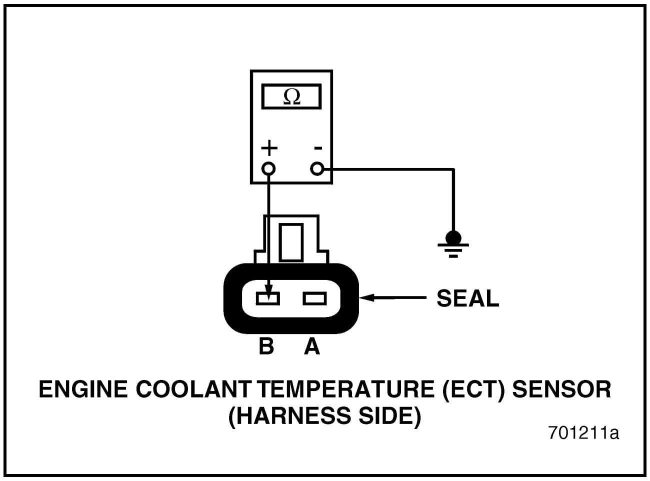


Figure 149

1. Disconnect the ECT Sensor connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J1.
4. Check for continuity between pin B of the ECT Sensor harness connector and a good ground (see Figure 149).

   If there is NO continuity, locate and repair the open circuit in the harness between the ECT Sensor and the common ground splice with the other temperature sensors.

   If continuity exists, check the ECT Sensor harness connector for damaged pins or improper mating with the ECT Sensor. If the ECT Sensor is OK, go to test “Test 148 — Checking the EECU Connector for an Open Circuit” on page 141.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the ECT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-1 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident or are not repairable, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J1 pins 17 and 26 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pins 17 and 26. Gently push the test lead into each harness connector pin individually, and check for looseness.

   If a repairable open is found or either of the pins feels loose, repair EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pins 17 and 26, go to test “Test 296 — Checking the EECU” on page 141.

Test 296 — Checking the EECU

1. Connect the ECT Sensor connector.
2. Connect connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-1 is still active, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-1 — ENGINE COOLANT TEMPERATURE (ECT) SENSOR (ASET™ CEGR ENGINE)

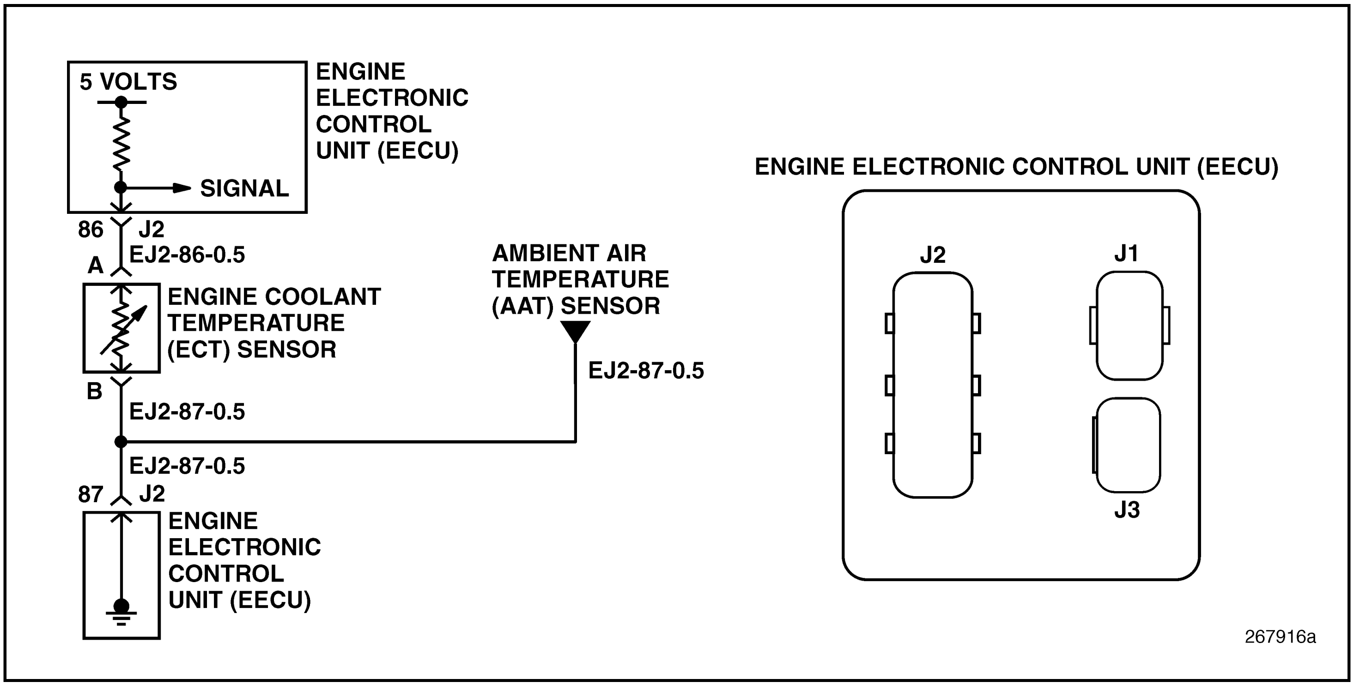


Figure 150 — Engine Coolant Temperature (ECT) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 10 (Abnormal Rate of Change)

Parameter Identification (PID): P110

Message Identification (MID): 128

Circuit Description: The Engine Coolant Temperature (ECT) Sensor is a thermistor. The resistance of the ECT Sensor changes inversely to the temperature of the engine coolant. When the coolant is cold, the sensor resistance is high. As the temperature of the coolant increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the ECT Sensor and uses this signal to calculate fuel injection timing and to evaluate operating conditions that may cause high coolant temperature. Examples of conditions that may cause high coolant temperature are: thermostat failure, fan failure, heavy load, high ambient temperatures and radiator blockage.

Location: The Engine Coolant Temperature (ECT) Sensor is located on the left side of the engine, on the rear of the water manifold.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-1 will set with FMI 3 if the Engine Electronic Control Unit (EECU) senses that the ECT Sensor signal voltage is greater than 4.785 volts for 5 seconds. Code 2-1 will set with FMI 4 if the EECU senses that the ECT Sensor signal voltage is less than .15 volts for 5 seconds. Code 2-1 will set with FMI 5 if the EECU senses that the ECT Sensor signal voltage is between 4.525 and 4.785 volts for 5 seconds. Code 2-1 will set with FMI 10 if the EECU senses that the the engine coolant temperature is greater than 215°F (101.6°C) and does not change. If the ECT Sensor signal returns to between 0.15 volts and 4.525 volts for more than 5 seconds, the fault will become inactive.

Normal ECT Sensor Parameters: The Engine Coolant Temperature (ECT) Sensor has a resistance between 9300 ohms at 32°F (0°C) and 200 ohms at 194°F (90°C).

Test 1 — Checking for Code 2-1

1. Verify that code 2-1 is set.

   If code 2-1 is set, go to test "Test 2 — Checking Code 2-1 Failure Mode Identifier (FMI)" on page 143.

   If code 2-1 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Coolant Temperature (ECT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-1 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test "Test 4 — Checking for Code 1-4" on page 143.

   If the FMI is 4 (voltage low), go to test "Test 5 — Checking for a Short Circuit to Ground in the Sensor" on page 143.

   If the FMI is 10 (abnormal rate of change), check the cooling system to determine the cause of high coolant temperature.

Test 4 — Checking for Code 1-4

1. Is code 1-4 also set?

   If code 1-4 is also set, go to test "Test 8 — Checking for an Open ECT Sensor Return Line" on page 144.

   If code 1-4 is NOT set, go to test "Test 9 — Checking Sensor Resistance" on page 144.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

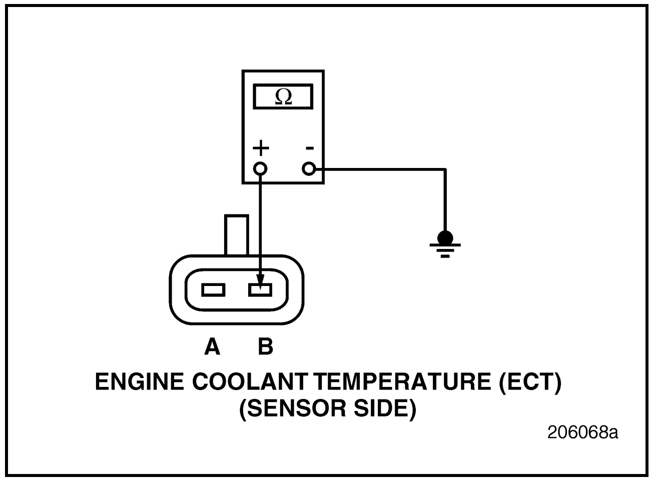


Figure 151

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Check for continuity between either pin of the ECT Sensor and a good ground (see Figure 151).

   If continuity exists, replace the ECT Sensor.

   If there is NO continuity, go to test "Test 10 — Checking Sensor Resistance" on page 145.

Test 8 — Checking for an Open ECT Sensor Return Line

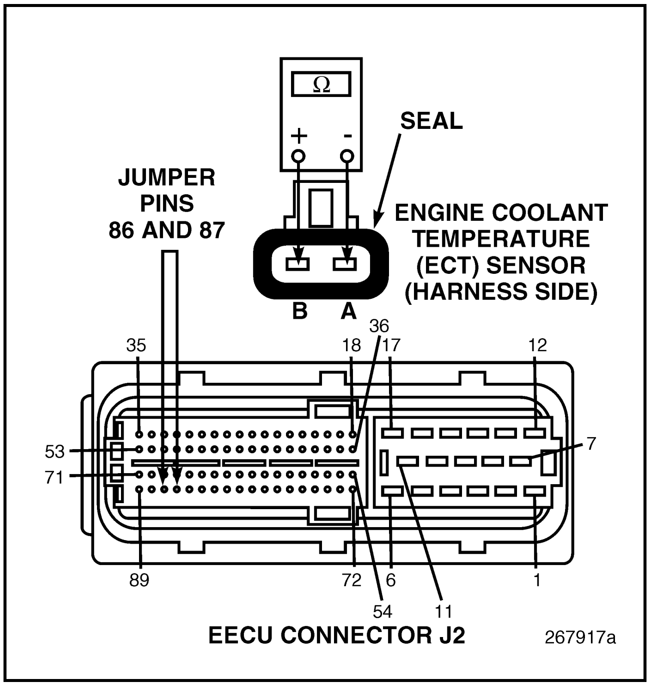


Figure 152

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between EECU harness connector J2 pins 86 and 87 (see Figure 152).
5. Check for continuity between pins A and B of the ECT Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 145.

   If there is NO continuity, there is an open ground circuit in the harness between the common ground splice to the Ambient Air Temperature (AAT) Sensor and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

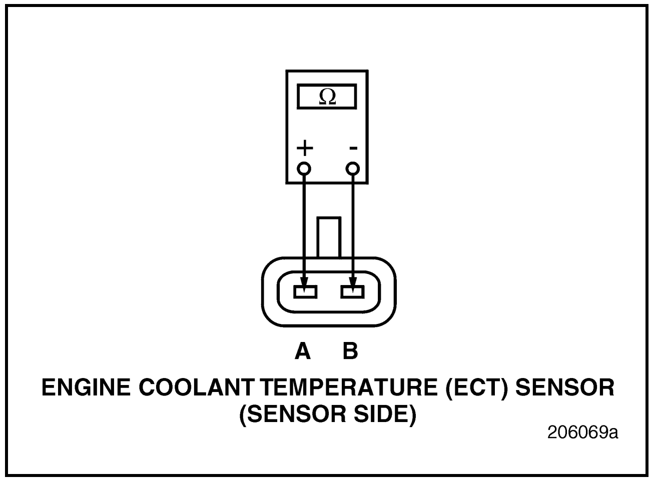


Figure 153

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Measure the resistance across the pins of the ECT Sensor with the coolant temperature between 32° and 194°F (0° and 90°C) (see Figure 153).

   If the resistance of the sensor is between 9300 and 200 ohms or if the resistance is infinite (open circuit), go to test “Test 18 — Checking the Signal Line Voltage” on page 146.

   If the resistance of the sensor is not within normal operating parameters (9300 to 200 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

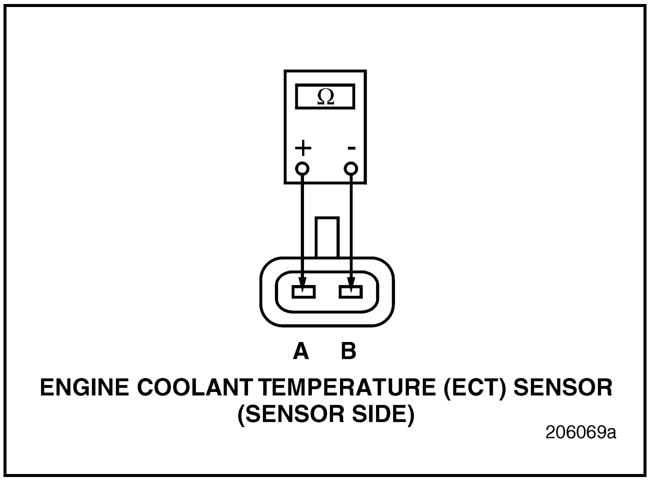


Figure 154

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Measure the resistance across the pins of the ECT Sensor with the coolant temperature between 32° and 194°F (0° and 90°C) (see Figure 154).

   If the resistance is between 9300 and 200 ohms respectively, go to test “Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the ECT Sensor” on page 146.

   If the resistance is less than 200 ohms, replace the ECT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

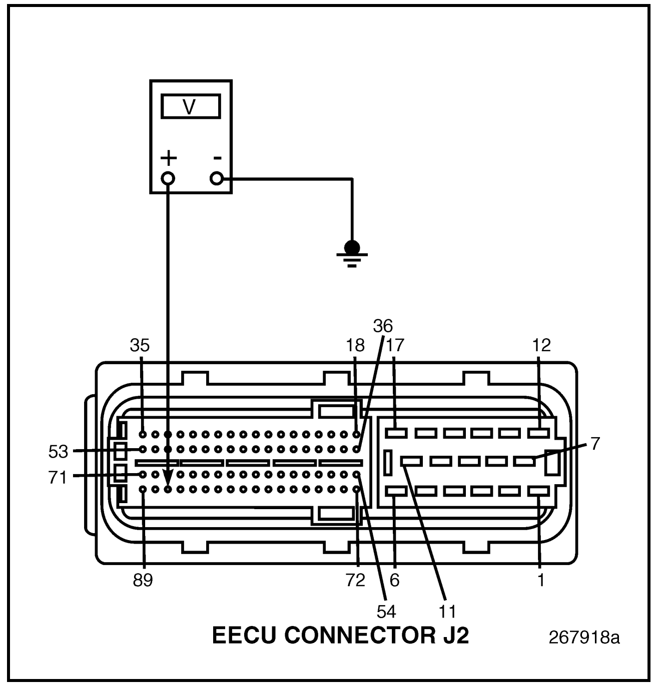


Figure 155

1. Turn the ignition key OFF.
2. Disconnect the Engine Coolant Temperature (ECT) Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Measure the voltage between EECU connector J2 pin 87 and a good ground (see Figure 155).

   If there is less than 0.5 volts present, go to test “Test 32 — Checking the EECU Connector for an Open in the Sensor Return Line” on page 147.

   If there is more than 0.5 volts present, there is a short circuit to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking the Signal Line Voltage

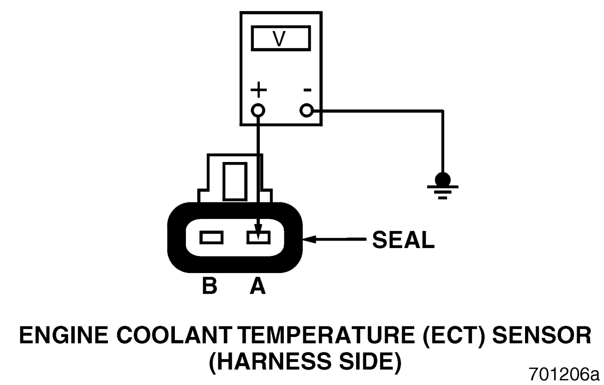


Figure 156

1. Disconnect the ECT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between the ECT Sensor harness connector pin A and a good ground (see Figure 156).

   If the measured voltage is greater than 6 volts, the ECT Sensor signal line is shorted to voltage; go to test "Test 36 — Checking for a Short Circuit to Voltage in the Sensor Signal Line" on page 147.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 9, go to test "Test 37 — Checking for an Open ECT Sensor Signal Line" on page 147.

Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the ECT Sensor

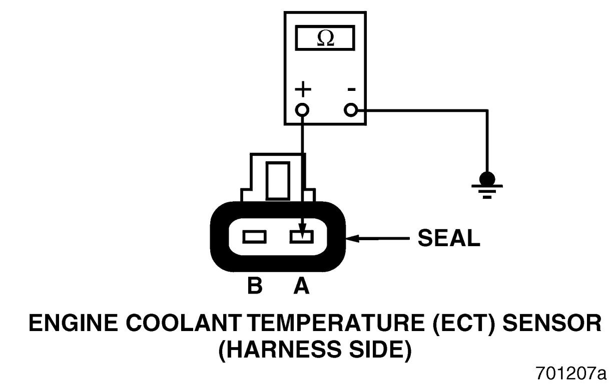


Figure 157

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) harness connector J2.
4. Check for continuity between pin A of the ECT Sensor harness connector and a good ground (see Figure 157).

   If continuity exists between pin A and ground, go to test "Test 40 — Checking for a Pin to Pin Short in the Harness" on page 148.

   If there is NO continuity, go to test "Test 41 — Checking for Proper Supply Voltage to the Sensor" on page 148.

Test 32 — Checking the EECU Connector for an Open in the Sensor Return Line

1. Visually inspect the EECU harness connector J2 pin 87 for dirt, looseness, or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J2 pin 87. Gently push the test lead into the harness connector pin and check for looseness.

   If a repairable open is found or the pin feels loose, repair EECU harness connector J2.

   If the test lead is making good contact with EECU harness connector J2 pin 87, go to test "Test 64 — Checking for Blink Code 2-1" on page 149.

Test 36 — Checking for a Short Circuit to Voltage in the Sensor Signal Line

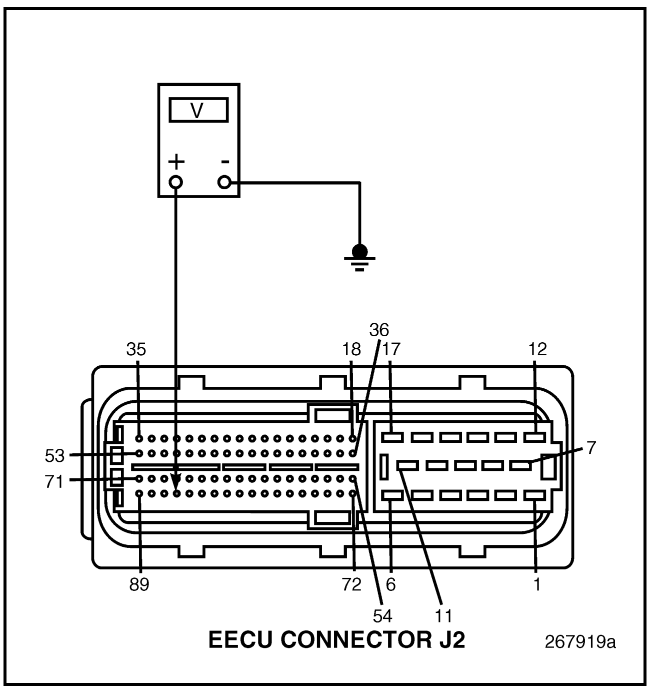


Figure 158

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect connector J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J2 pin 86 and a good ground (see Figure 158).

   If there is NO voltage indicated, go to test "Test 72 — Checking for a Short Circuit at the EECU Connector" on page 149.

   If voltage is present, go to test "Test 73 — Checking for a Pin to Pin Short Circuit in the Harness" on page 149.

Test 37 — Checking for an Open ECT Sensor Signal Line

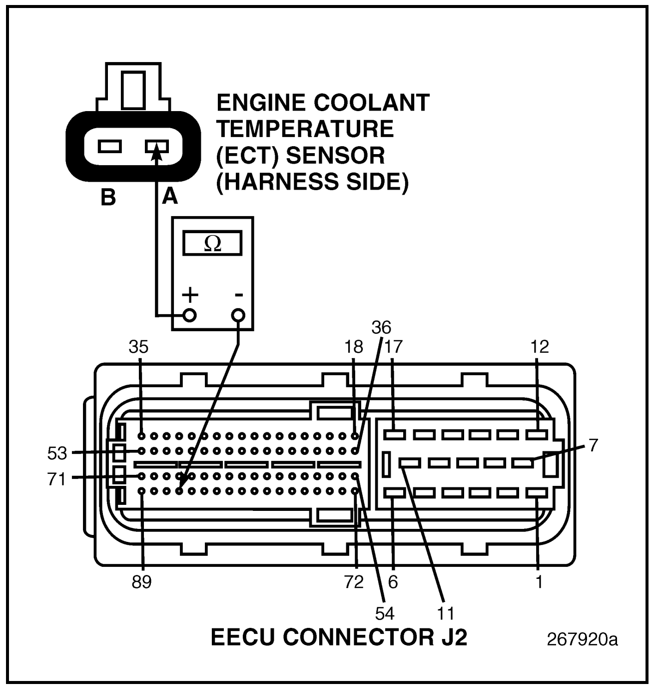


Figure 159

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin A of the ECT Sensor harness connector and EECU harness connector J2 pin 86 (see Figure 159).

   If there is NO continuity, locate and repair the open signal circuit between the ECT Sensor harness connector and EECU harness connector J2 pin 86.

   If continuity exists, go to test "Test 74 — Checking for an Open ECT Sensor Return Circuit" on page 150.

Test 40 — Checking for a Pin to Pin Short in the Harness

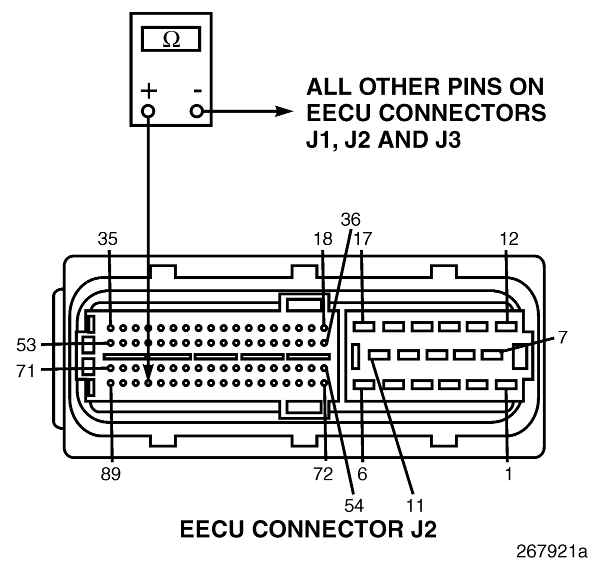


Figure 160

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect EECU connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 86 and all other pins on EECU harness connectors J1, J2, and J3 (see Figure 160).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

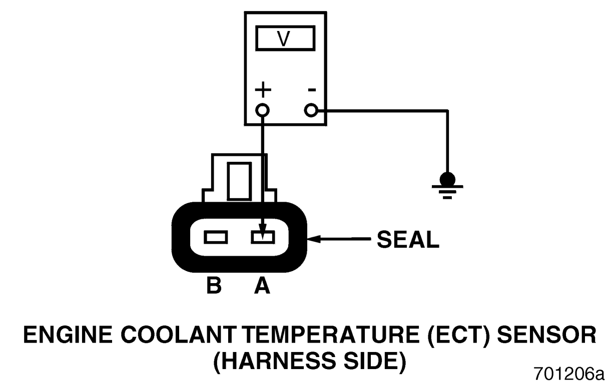


Figure 161

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage at pin A of the ECT Sensor harness connector (see Figure 161).

   If the measured voltage is between 4.5 and 5.5 volts, check the ECT Sensor harness connector for deformed pins or insufficient contact with the ECT Sensor pins. If the pins are not damaged, replace the ECT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 150.

Test 64 — Checking for Blink Code 2-1

1. Connect the ECT Sensor connector.
2. Connect EECU harness connector J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-1 is still active, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Engine Coolant Temperature Sensor was open in test 9, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the ECT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-1 is still active, check the EECU and connectors J1, J2, and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short Circuit in the Harness

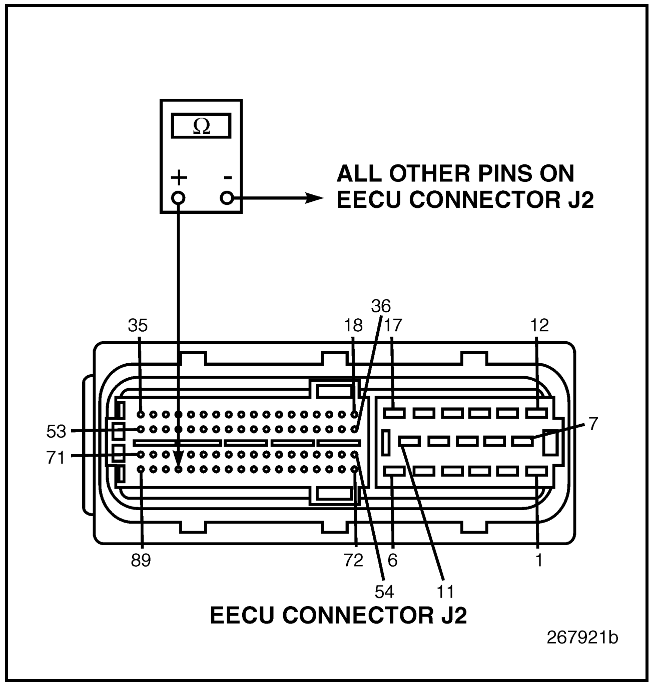


Figure 162

1. Turn the ignition key OFF.
2. Disconnect the ECT Sensor connector.
3. Disconnect EECU connector J2.
4. Check for continuity between EECU harness connector J2 pin 86 and all other pins on EECU connector J2 (see Figure 162).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 74 — Checking for an Open ECT Sensor Return Circuit

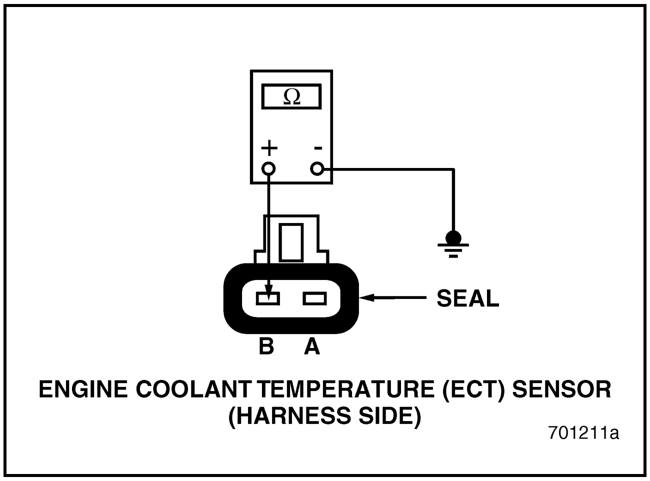


Figure 163

1. Disconnect the ECT Sensor connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J2.
4. Check for continuity between pin B of the ECT Sensor harness connector and a good ground (see Figure 163).

   If there is NO continuity, locate and repair the open circuit in the harness between the ECT Sensor and the common ground splice with the other temperature sensors.

   If continuity exists, check the ECT Sensor harness connector for damaged pins or improper mating with the ECT Sensor. If the ECT Sensor is OK, go to test "Test 148 — Checking the EECU Connector for an Open Circuit" on page 150.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the ECT Sensor connector.
3. Connect connectors J1, J2, and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-1 is still active, check the EECU and connectors J1, J2, and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident or are not repairable, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 86 and 87 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test "Test 296 — Checking the EECU" on page 150.

Test 296 — Checking the EECU

1. Connect the ECT Sensor connector.
2. Connect connectors J1, J2, and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-1 is still active, replace the EECU and retest the system.

   If blink code 2-1 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-2 — BOOST AIR PRESSURE (BAP) SENSOR (ASET™ IEGR ENGINE)

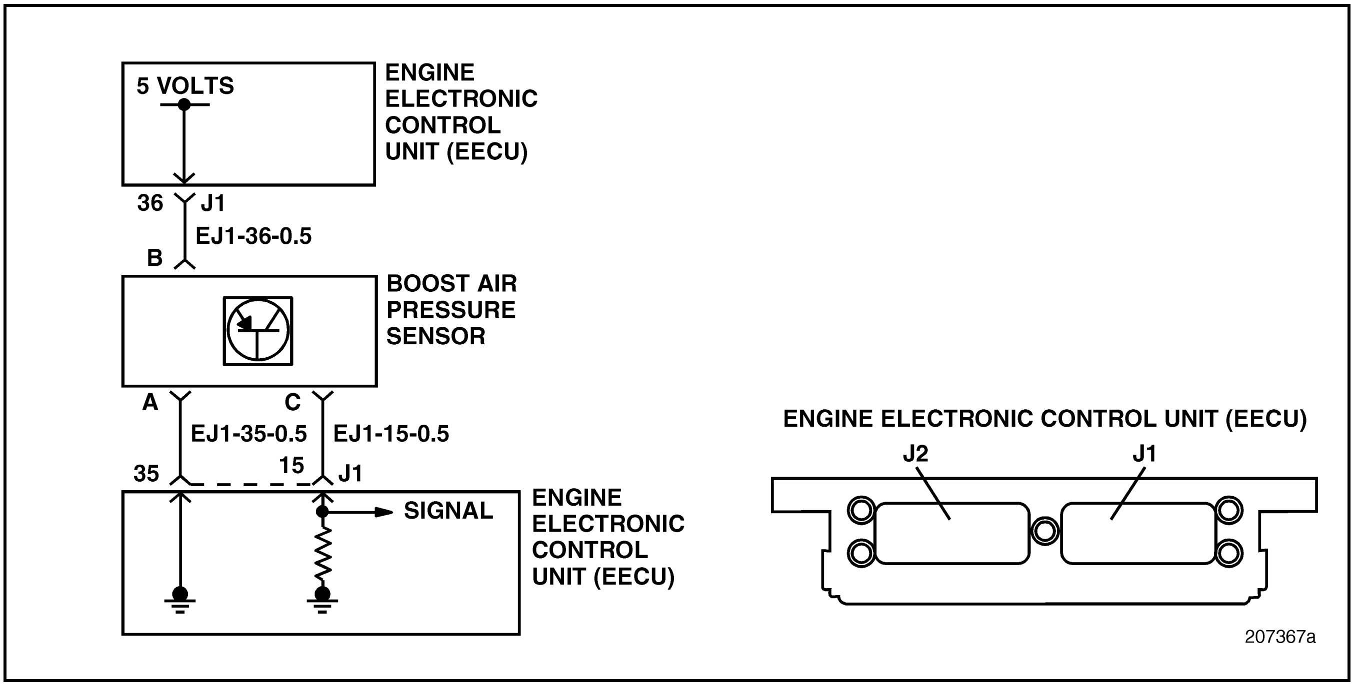


Figure 164 — Boost Air Pressure (BAP) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): 102

Message Identification (MID): 128

Circuit Description: The Boost Air Pressure (BAP) Sensor is used to detect the pressure of the air in the intake manifold. The sensor consists of a pressure sensitive diaphragm and amplifier. Air pressure causes the sensor's diaphragm to deflect and produce an electrical signal proportional to the pressure. The diaphragm deflection signal is amplified in the sensor. The sensor's signal is monitored by the Engine Electronic Control Unit (EECU). The EECU will set a fault code if the sensor signal is not within predetermined limits.

Location: The Boost Air Pressure (BAP) Sensor is threaded into the top of the intake manifold on the left side of the engine. The Engine Electronic Control Unit (EECU) is mounted on a fuel cooled mounting plate on the air intake manifold on the left side of the engine.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-2 will set when the BAP Sensor signal line voltage is less than 0.4 volts or greater than 4.94 volts for 1 second. If the signal line voltage returns to between 0.4 volts and 4.94 volts for 1 second, the fault will become inactive.

Normal BAP Sensor Parameters: Not applicable.

NOTE

See Test 128 for Boost Air Pressure (BAP) Sensor testing procedures.

Test 1 — Checking for Code 2-2

1. Verify that code 2-2 is set.

   If code 2-2 is set, go to test "Test 2 — Checking Code 2-2 Failure Mode Identifier (FMI)" on page 152.

   If code 2-2 is not set, wiggle the harness and connectors to try and set the code.

Test 2 — Checking Code 2-2 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (voltage low or open), go to test "Test 4 — Checking the BAP Sensor Reference Voltage Line" on page 152.

   If the FMI is 3 (voltage high), go to test "Test 5 — Checking Code 2-2 Failure Mode Identifier (FMI) with the BAP Sensor Disconnected" on page 152.

Test 4 — Checking the BAP Sensor Reference Voltage Line

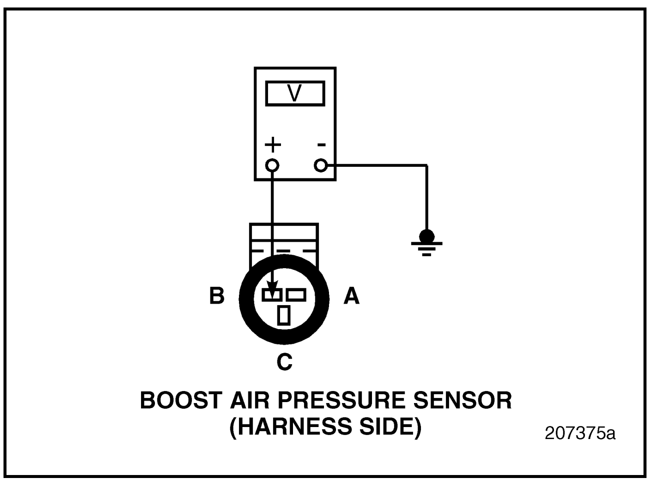


Figure 165

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between BAP Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 165).

   If the measured voltage is greater than 4.9 volts, go to test "Test 8 — Checking the BAP Sensor Signal Line for a Short to Ground" on page 153.

   If the measured voltage is less than 4.9 volts, go to test "Test 9 — Checking the Harness for Continuity in the BAP Sensor Reference Voltage Line" on page 153.

Test 5 — Checking Code 2-2 Failure Mode Identifier (FMI) with the BAP Sensor Disconnected

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Turn the ignition key ON.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI 3 (voltage high) changed to FMI 4 (voltage low or open), go to test "Test 10 — Checking the BAP Sensor Reference Voltage Line" on page 154.

   If the FMI code did NOT change, go to test "Test 11 — Checking the Harness for a Pin to Pin Short Circuit" on page 154.

Test 8 — Checking the BAP Sensor Signal Line for a Short to Ground

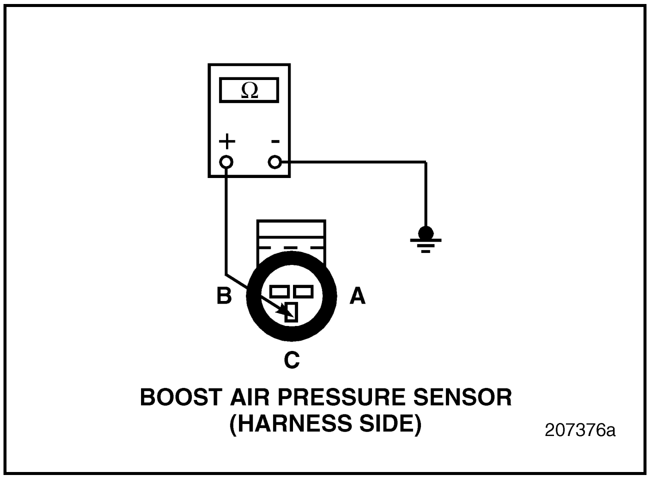


Figure 166

1. Turn the ignition key OFF.
2. Check for continuity between Boost Air Pressure (BAP) Sensor harness connector pin C (signal line) and a good ground (see Figure 166).

   If there is NO continuity, go to test “Test 16 — Checking the Harness for Continuity in the BAP Sensor Signal Line” on page 155.

   If continuity exists, locate and repair the short circuit to ground in the BAP Sensor signal line.

Test 9 — Checking the Harness for Continuity in the BAP Sensor Reference Voltage Line

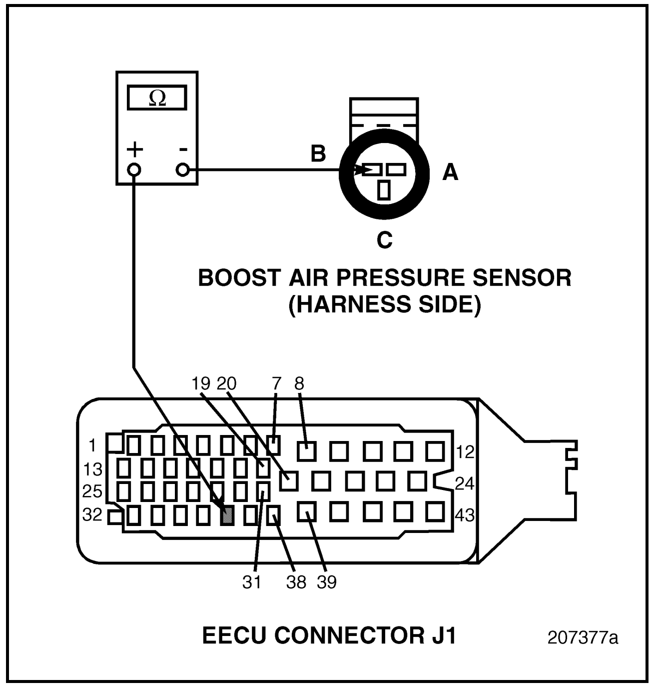


Figure 167

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Check for continuity between Boost Air Pressure (BAP) Sensor harness connector pin B (reference voltage line) and EECU harness connector J1 pin 36 (see Figure 167).

   If continuity exists, go to test “Test 18 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Reference Voltage Line” on page 155.

   If there is NO continuity, repair the open in the harness reference voltage line.

Test 10 — Checking the BAP Sensor Reference Voltage Line

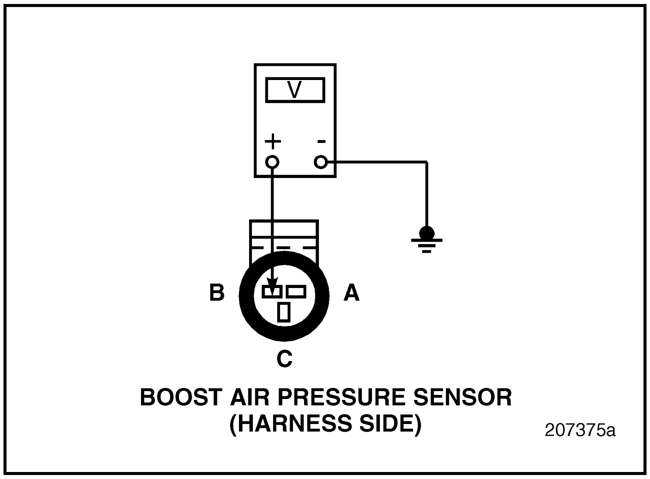


Figure 168

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between Boost Air Pressure (BAP) Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 168).

   If the measured voltage is less than 5.25 volts, go to test “Test 20 — Checking the BAP Sensor Return Line for a Short Circuit” on page 156.

   If the measured voltage is greater than 5.25 volts, go to test “Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the BAP Sensor Reference Voltage Line” on page 156.

Test 11 — Checking the Harness for a Pin to Pin Short Circuit

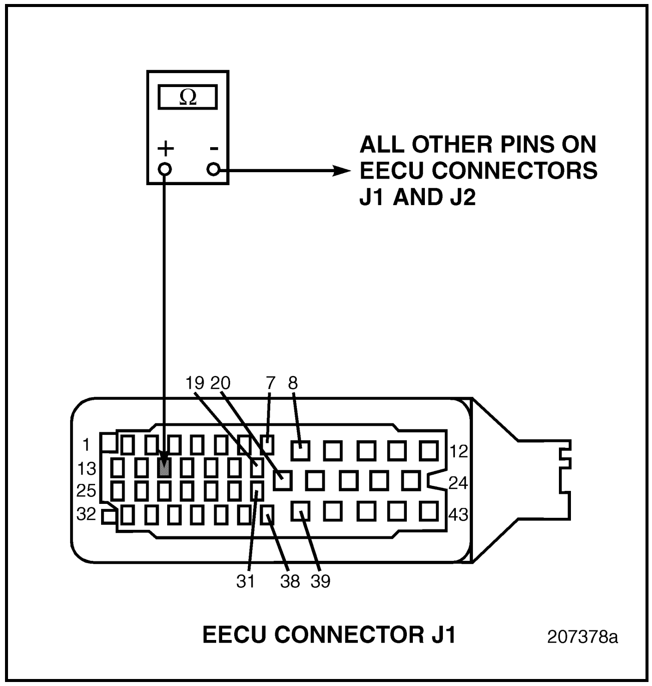


Figure 169

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 15 (signal line) and all other pins in EECU harness connectors J1 and J2 (see Figure 169).
5. Visually check EECU connector J1 pin 15 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the signal line.

   If there is NO continuity or visual short, replace the EECU.

Test 16 — Checking the Harness for Continuity in the BAP Sensor Signal Line

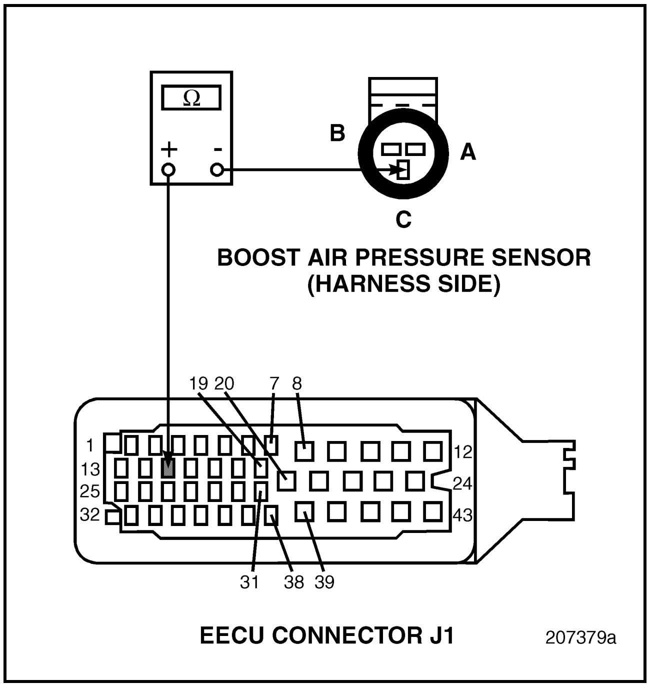


Figure 170

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J1.
4. Check for continuity between BAP Sensor harness connector pin C (signal line) and EECU harness connector J1 pin 15 (see Figure 170).

   If continuity exists, go to test "Test 32 — Checking the BAP Sensor Connector" on page 157.

   If there is NO continuity, repair the open circuit in the harness signal line.

Test 18 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Reference Voltage Line

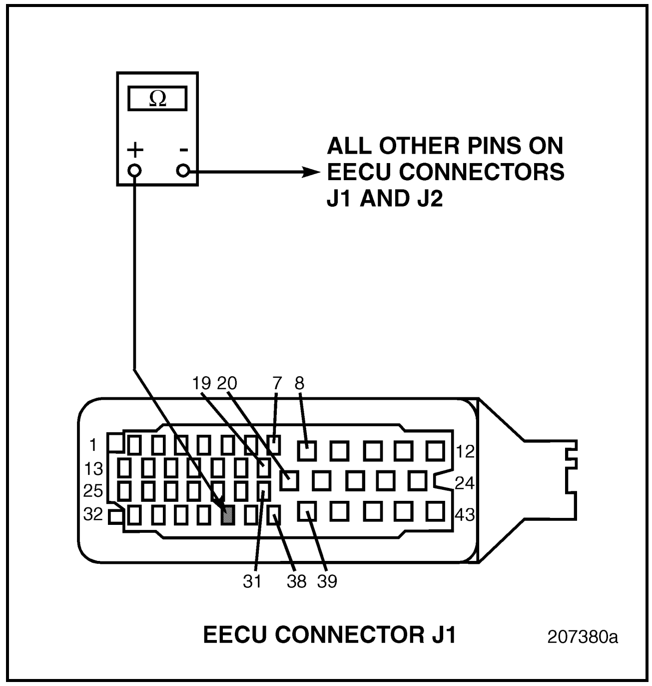


Figure 171

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 36 (reference voltage line) and all other pins in EECU harness connectors J1 and J2 (see Figure 171).
5. Visually check EECU connector J1 pin 36 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 20 — Checking the BAP Sensor Return Line for a Short Circuit

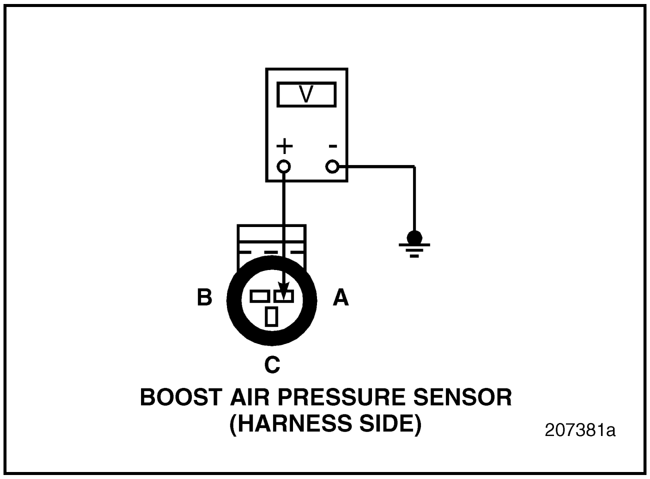


Figure 172

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between BAP Sensor harness connector pin A (ground line) and a good ground (see Figure 172).

   If the measured voltage is 0.5 volts or less, go to test "Test 40 — Checking the BAP Sensor Return Line for an Open Circuit" on page 157.

   If the measured voltage is greater than 0.5 volts, go to test "Test 41 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Return Line" on page 158.

Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the BAP Sensor Reference Voltage Line

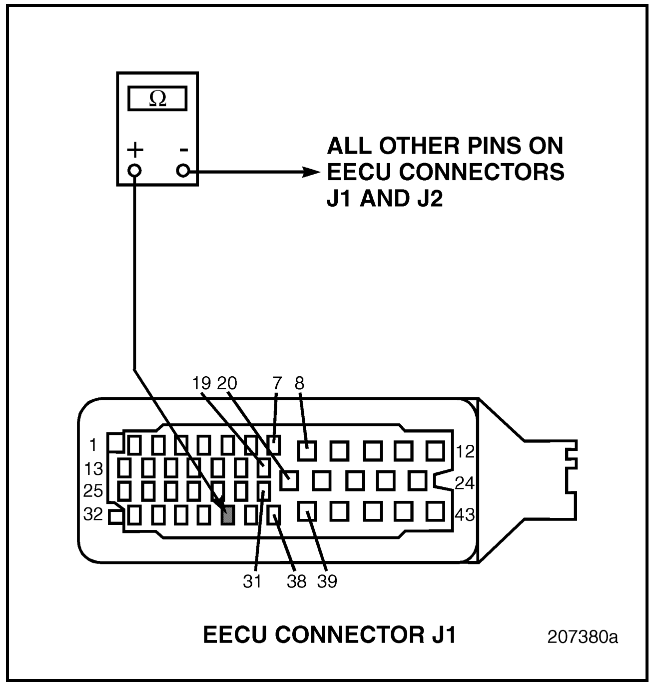


Figure 173

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Disconnect the Boost Air Pressure (BAP) Sensor.
4. Check for continuity between EECU harness connector J1 pin 36 (reference voltage line) and all other pins in EECU harness connectors J1 and J2 (see Figure 173).
5. Visually check EECU connector J1 pin 36 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 32 — Checking the BAP Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Boost Air Pressure (BAP) Sensor connector for a repairable open.
2. Find the gray male test lead from the J 38581 V-MAC Jumper Wire Kit. Align the male test lead with one of the rectangular female pins in the BAP Sensor harness connector. Gently push the test lead into the harness connector pin. Repeat this process for the remaining two female pins (pin C is turned 90 degrees from pins A and B).

   If there is a repairable fault or any of the pins feel loose, repair or replace connector.
3. Find the gray female test lead from the J 38581 V-MAC Jumper Wire Kit. Align the female test lead with one of the rectangular male pins in the BAP Sensor connector. Gently push the test lead over the pin. Repeat this process for the remaining two male pins (pin C is turned 90 degrees from pins A and B).

   If any of the pins feel loose, replace the BAP Sensor.

   If the pins in the connector are NOT loose, go to test “Test 64 — Checking the EECU Connector for an Open in the BAP Sensor Signal Line” on page 158.

Test 40 — Checking the BAP Sensor Return Line for an Open Circuit

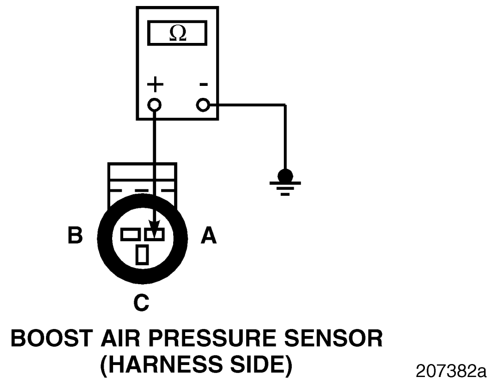


Figure 174

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Check continuity between BAP Sensor harness connector pin A (ground line) and a good ground (see Figure 174).

   If continuity exists, go to test “Test 80 — Checking the BAP Sensor Connector” on page 158.

   If there is NO continuity, go to test “Test 81 — Checking the Harness for an Open BAP Sensor Return Line” on page 159.

Test 41 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Return Line

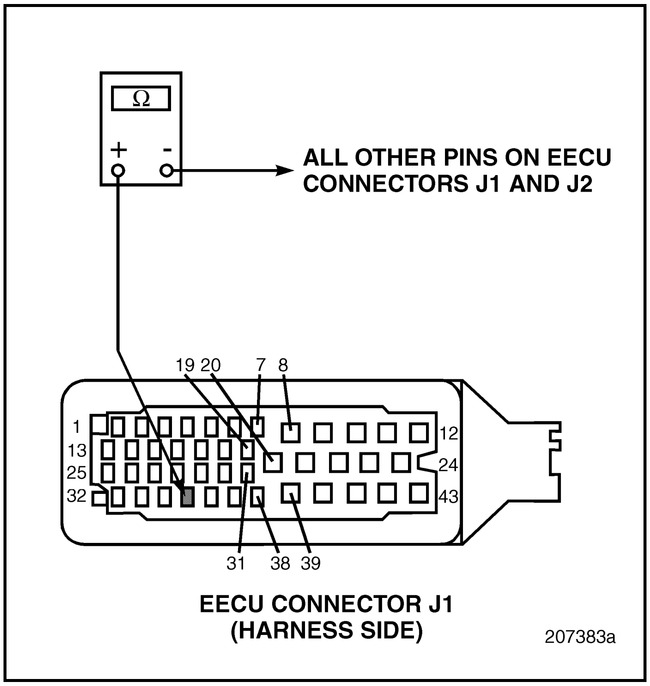


Figure 175

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Disconnect the Boost Air Pressure (BAP) Sensor.
4. Check for continuity between EECU harness connector J1 pin 35 (ground line) and all other pins in EECU harness connectors J1 and J2 (see Figure 175).
5. Visually check EECU connector J1 pin 35 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the ground line.

   If there is NO continuity or visual short, replace the EECU.

Test 64 — Checking the EECU Connector for an Open in the BAP Sensor Signal Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J1 pin 15 for a repairable open in signal line.

   If a repairable open is found, repair or replace EECU harness connector J1.

   If the pin is making good contact, go to test "Test 128 — Checking the BAP Sensor for a Fault" on page 159.

Test 80 — Checking the BAP Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Boost Air Pressure (BAP) Sensor connector for a repairable open.
2. Find the gray male test lead from the J 38581 V-MAC Jumper Wire Kit. Align the male test lead with one of the rectangular female pins in the BAP Sensor harness connector. Gently push the test lead into the harness connector pin. Repeat this process for the remaining two female pins (pin C is turned 90 degrees from pins A and B).

   If there is a repairable fault or if any of the pins feel loose, repair or replace the connector.
3. Find the gray female test lead from the J 38581 V-MAC Jumper Wire Kit. Align the female test lead with one of the rectangular male pins in the BAP Sensor. Gently push the test lead over the pin. Repeat this process for the remaining two male pins (pin C is turned 90 degrees from pins A and B).

   If any of the pins feel loose, replace the BAP Sensor.

   If the pins in the connector are NOT loose, go to test "Test 160 — Checking the BAP Sensor for a Fault" on page 160.

Test 81 — Checking the Harness for an Open BAP Sensor Return Line

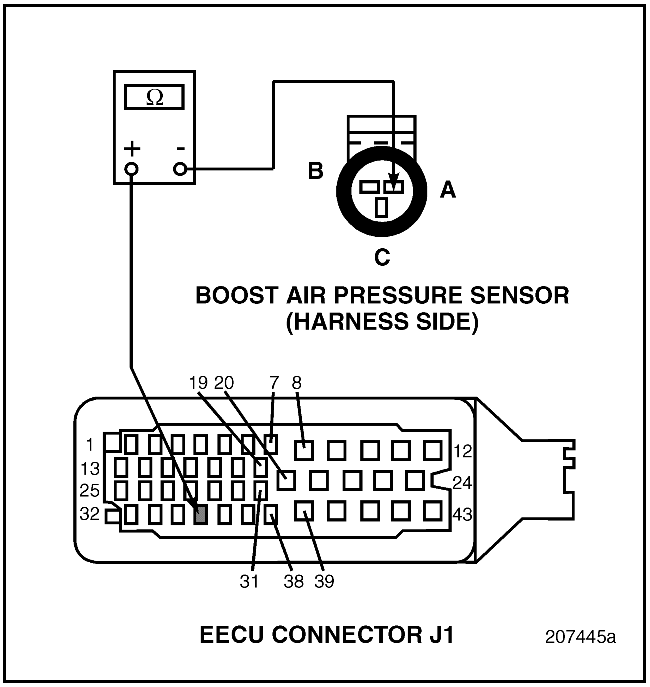


Figure 176

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J1.
4. Check for continuity between BAP Sensor harness connector pin A (ground line) and EECU harness connector J1 pin 35 (see Figure 176).

   If continuity exists, go to test "Test 162 — Checking the EECU Connector for an Open BAP Sensor Return Line" on page 160.

   If there is NO continuity, repair the open circuit in the harness ground line.

Test 128 — Checking the BAP Sensor for a Fault

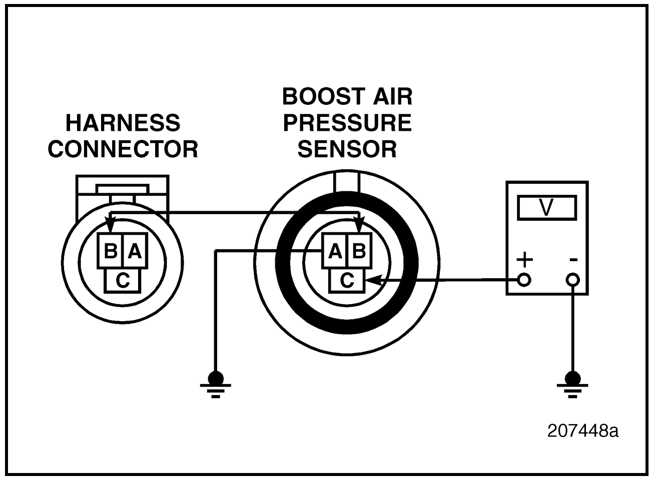


Figure 177

1. Remove the Boost Air Pressure (BAP) Sensor from the engine.
2. Connect the BAP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between BAP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between BAP Sensor pin A and a good ground.
5. Turn the ignition key ON.

6. Measure the voltage between BAP Sensor pin C and a good ground at various pressures between 0 psi and 80 psi (see Figure 177). The correct pressure and output voltage specifications are shown in the table below.

Boost Air Pressure	Sensor Output (5 volt input)
0 psi	.7 volts
5 psi	1.1 volts
10 psi	1.7 volts
15 psi	2.1 volts
20 psi	2.6 volts
25 psi	3.1 volts
30 psi	3.6 volts
35 psi	4.1 volts
40 psi	4.6 volts

If the BAP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the BAP Sensor output is NOT correct throughout the entire pressure range, replace the BAP Sensor and recheck the system.

Test 160 — Checking the BAP Sensor for a Fault

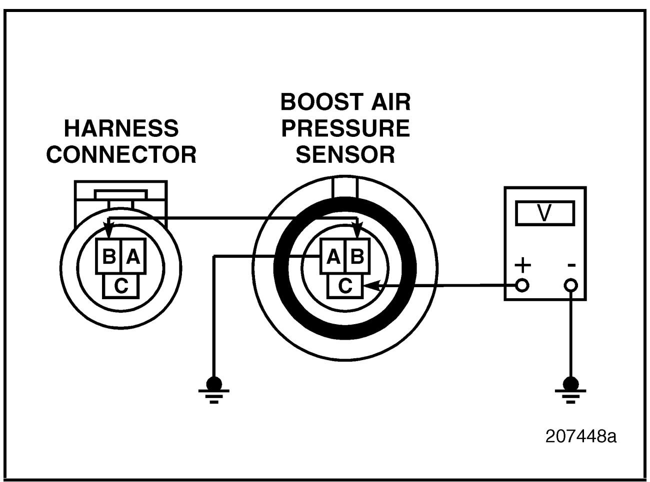


Figure 178

1. Remove the Boost Air Pressure (BAP) Sensor from the engine.
2. Connect the BAP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between BAP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between BAP Sensor pin A and a good ground.
5. Turn the ignition key ON.
6. Measure the voltage between BAP Sensor pin C and a good ground at various pressures between 0 psi and 80 psi (see Figure 178). The correct pressure and output voltage specifications are shown in the table below.

Boost Air Pressure	Sensor Output (5 volt input)
0 psi	.7 volts
5 psi	1.1 volts
10 psi	1.7 volts
15 psi	2.1 volts
20 psi	2.6 volts
25 psi	3.1 volts
30 psi	3.6 volts
35 psi	4.1 volts
40 psi	4.6 volts

If the BAP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the BAP Sensor output is NOT correct throughout the entire pressure range, replace the BAP Sensor and recheck the system.

Test 162 — Checking the EECU Connector for an Open BAP Sensor Return Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J1 pin 35 for a repairable open in the ground line.

   If a repairable open is found, repair or replace EECU harness connector J1.

   If the pin is making good contact, replace the EECU.

BLINK CODE 2-2 — BOOST AIR PRESSURE (BAP) SENSOR (ASET™ CEGR ENGINE)

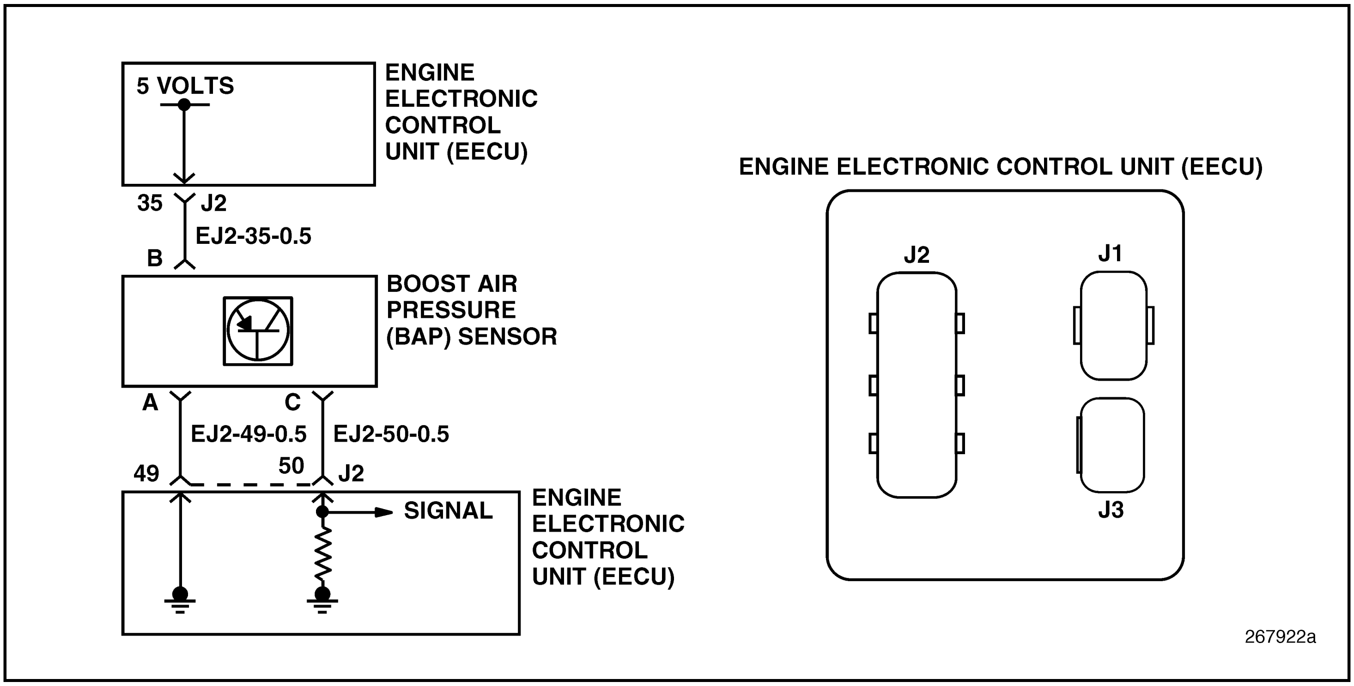


Figure 179 — Boost Air Pressure (BAP) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): 439

Message Identification (MID): 128

Circuit Description: The Boost Air Pressure (BAP) Sensor is used to monitor the pressure of the air in the intake system downstream from the turbocharger. The sensor consists of a pressure sensitive diaphragm and amplifier. Air pressure causes the sensor's diaphragm to deflect and produce an electrical signal proportional to the pressure. The diaphragm deflection signal is amplified in the sensor. The sensor's signal is monitored by the Engine Electronic Control Unit (EECU). The EECU will set a fault code if the sensor signal is not within predetermined limits.

Location: The Boost Air Pressure (BAP) Sensor is threaded into the EGR mixer. The Engine Electronic Control Unit (EECU) is mounted on a fuel cooled mounting plate on the air intake manifold on the left side of the engine.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-2 will set if the BAP Sensor signal line voltage is less than 0.15 volts or greater than 4.9 volts for 1 second. If the signal line voltage returns to between 0.15 volts and 4.9 volts for 1 second, the fault will become inactive.

Normal BAP Sensor Parameters: Not applicable.

NOTE

See Test 128 for Boost Air Pressure (BAP) Sensor testing procedures.

Test 1 — Checking for Code 2-2

1. Verify that code 2-2 is set.

   If code 2-2 is set, go to test “Test 2 — Checking Code 2-2 Failure Mode Identifier (FMI)” on page 162.

   If code 2-2 is not set, wiggle the harness and connectors to try and set the code.

Test 2 — Checking Code 2-2 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (voltage low or open), go to test “Test 4 — Checking the BAP Sensor Reference Voltage Line” on page 162.

   If the FMI is 3 (voltage high), go to test “Test 5 — Checking Code 2-2 Failure Mode Identifier (FMI) with the BAP Sensor Disconnected” on page 162.

Test 4 — Checking the BAP Sensor Reference Voltage Line

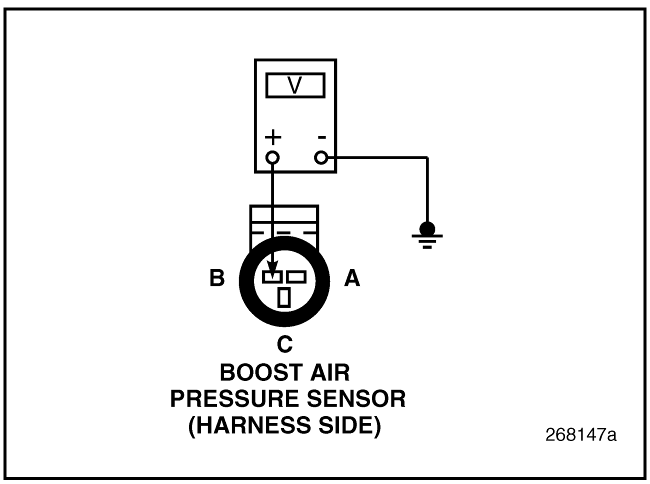


Figure 180

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between BAP Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 180).

   If the measured voltage is greater than 4.9 volts, go to test “Test 8 — Checking the BAP Sensor Signal Line for a Short Circuit to Ground” on page 163.

   If the measured voltage is less than 4.9 volts, go to test “Test 9 — Checking the Harness for Continuity in the BAP Sensor Reference Voltage Line” on page 163.

Test 5 — Checking Code 2-2 Failure Mode Identifier (FMI) with the BAP Sensor Disconnected

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Turn the ignition key ON.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI 3 (voltage high) changed to FMI 4 (voltage low or open), go to test “Test 10 — Checking the BAP Sensor Reference Voltage Line” on page 164.

   If the FMI code did NOT change, go to test “Test 11 — Checking the Harness for a Pin to Pin Short Circuit” on page 164.

Test 8 — Checking the BAP Sensor Signal Line for a Short Circuit to Ground

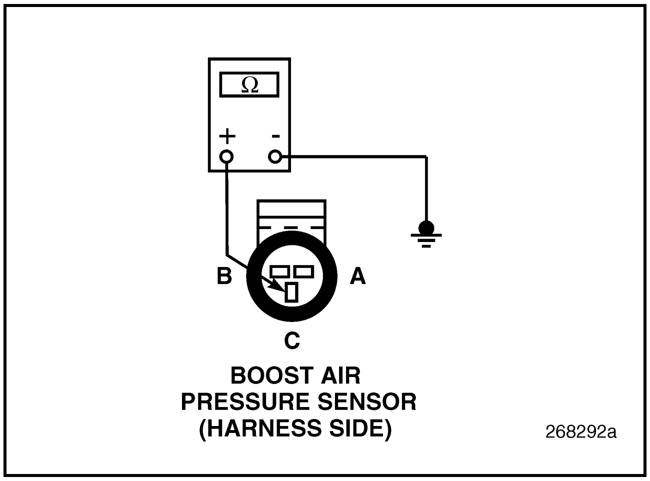


Figure 181

1. Turn the ignition key OFF.
2. Check for continuity between Boost Air Pressure (BAP) Sensor harness connector pin C (signal line) and a good ground (see Figure 181).

   If there is NO continuity, go to test “Test 16 — Checking the Harness for Continuity in the BAP Sensor Signal Line” on page 165.

   If continuity exists, locate and repair the short circuit to ground in the BAP Sensor signal line.

Test 9 — Checking the Harness for Continuity in the BAP Sensor Reference Voltage Line

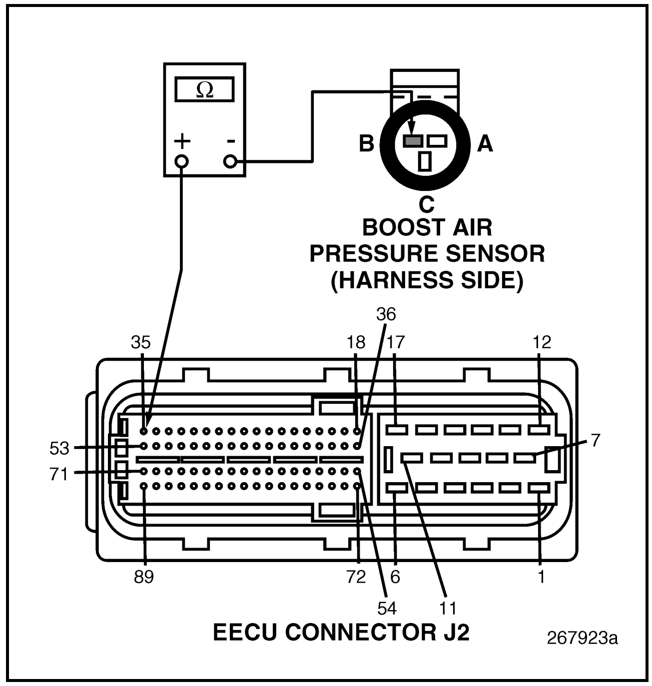


Figure 182

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Check for continuity between Boost Air Pressure (BAP) Sensor harness connector pin B (reference voltage line) and EECU harness connector J2 pin 35 (see Figure 182).

   If continuity exists, go to test “Test 18 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Reference Voltage Line” on page 165.

   If there is NO continuity, repair the open in the harness reference voltage line.

Test 10 — Checking the BAP Sensor Reference Voltage Line

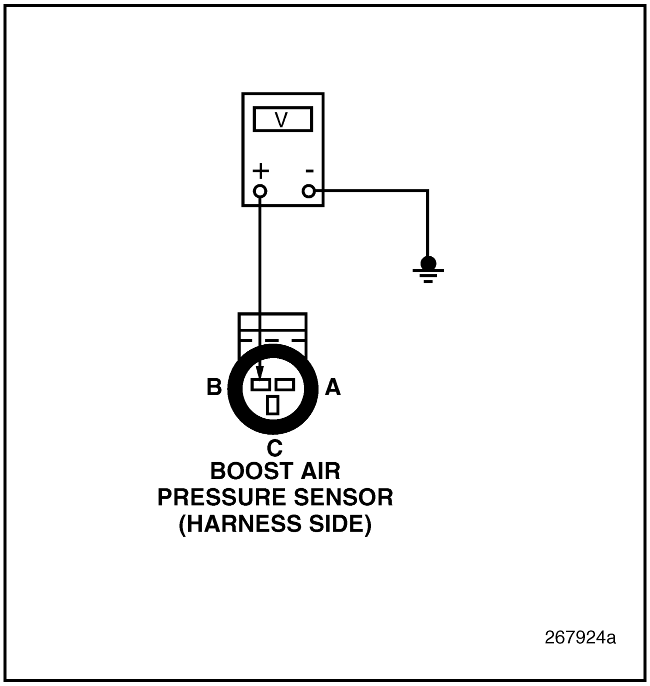


Figure 183

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between Boost Air Pressure (BAP) Sensor harness connector pin B (reference voltage line) and a good ground (see Figure 183).

   If the measured voltage is less than 5.25 volts, go to test “Test 20 — Checking the BAP Sensor Return Line for a Short Circuit” on page 166.

   If the measured voltage is greater than 5.25 volts, go to test “Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the BAP Sensor Reference Voltage Line” on page 166.

Test 11 — Checking the Harness for a Pin to Pin Short Circuit

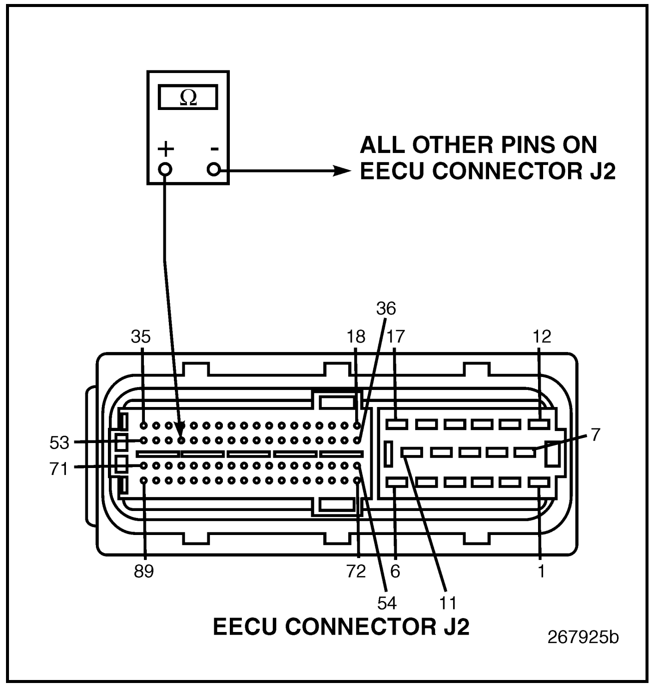


Figure 184

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between EECU harness connector J2 pin 50 (signal line) and all other pins in EECU harness connector J2 (see Figure 184).
5. Visually check EECU connector J2 pin 50 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the signal line.

   If there is NO continuity or visual short, replace the EECU.

Test 16 — Checking the Harness for Continuity in the BAP Sensor Signal Line

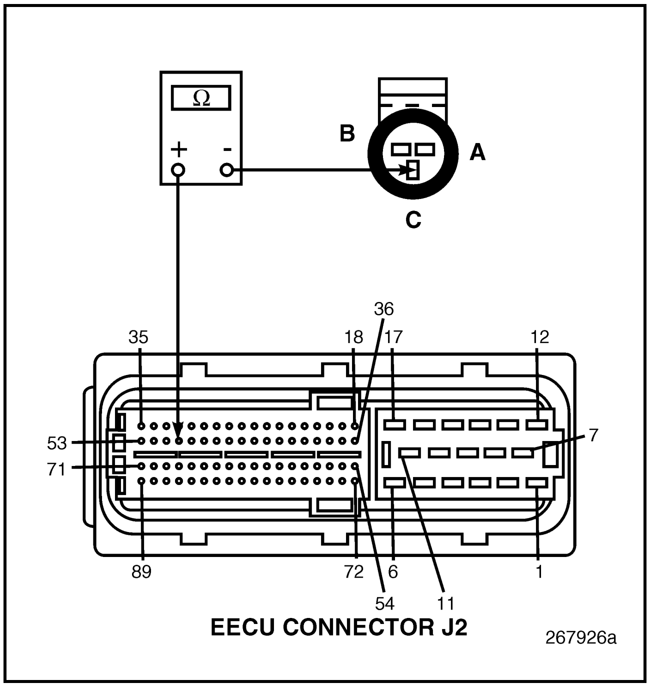


Figure 185

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between BAP Sensor harness connector pin C (signal line) and EECU harness connector J2 pin 50 (see Figure 185).

   If continuity exists, go to test “Test 32 — Checking the BAP Sensor Connector” on page 167.

   If there is NO continuity, repair the open circuit in the harness signal line.

Test 18 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Reference Voltage Line

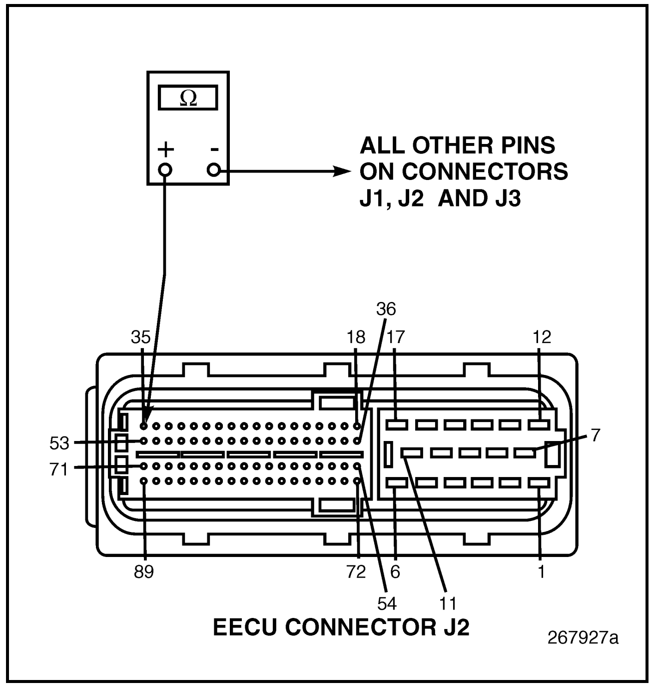


Figure 186

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 35 (reference voltage line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 186).
5. Visually check EECU connector J2 pin 35 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 20 — Checking the BAP Sensor Return Line for a Short Circuit

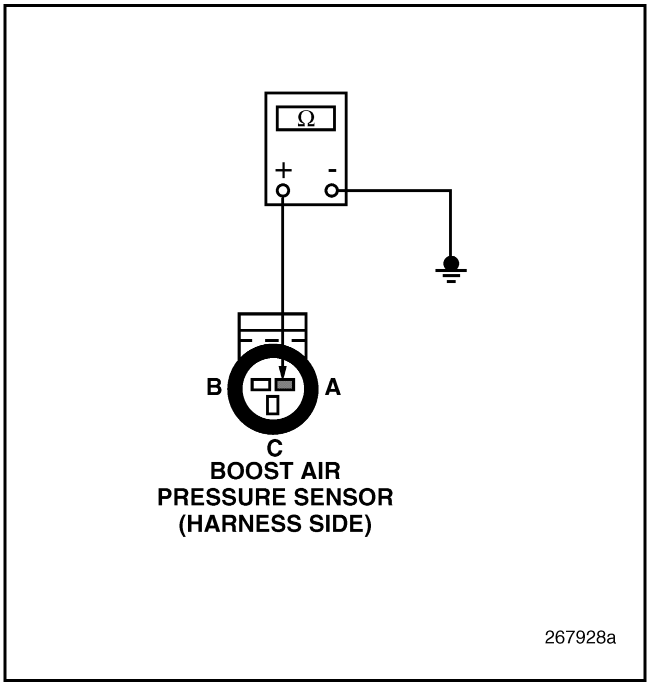


Figure 187

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor harness connector.
3. Turn the ignition key ON.
4. Measure the voltage between BAP Sensor harness connector pin A (ground line) and a good ground (see Figure 187).

   If the measured voltage is 0.5 volts or less, go to test “Test 40 — Checking the BAP Sensor Return Line for an Open Circuit” on page 167.

   If the measured voltage is greater than 0.5 volts, go to test “Test 41 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Return Line” on page 167.

Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the BAP Sensor Reference Voltage Line

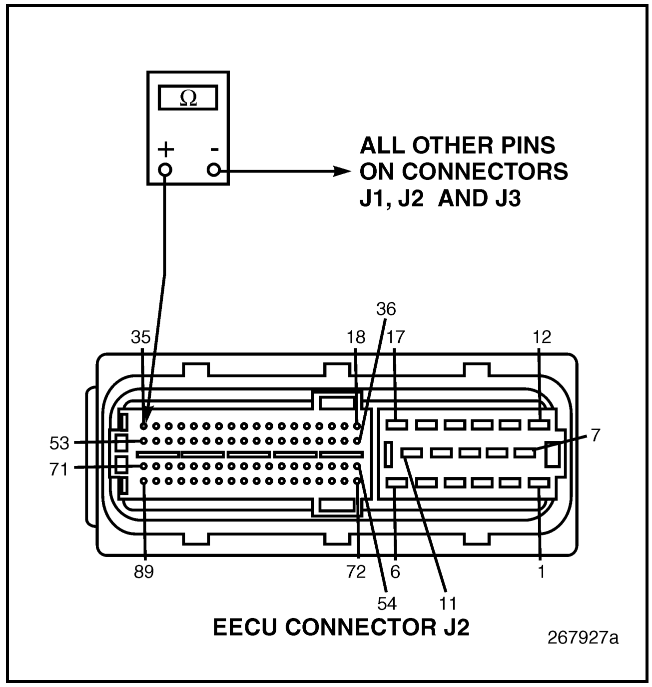


Figure 188

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
3. Disconnect the Boost Air Pressure (BAP) Sensor.
4. Check for continuity between EECU harness connector J2 pin 35 (reference voltage line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 188).
5. Visually check EECU connector J2 pin 35 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 32 — Checking the BAP Sensor Connector

1. Visually inspect both sides of the Boost Air Pressure (BAP) Sensor connector for a repairable open.
2. If any of the pins is NOT making good contact, replace the BAP Sensor.

   If the pins in the connector are NOT loose, go to test “Test 64 — Checking the EECU Connector for an Open in the BAP Sensor Signal Line” on page 168.

Test 40 — Checking the BAP Sensor Return Line for an Open Circuit

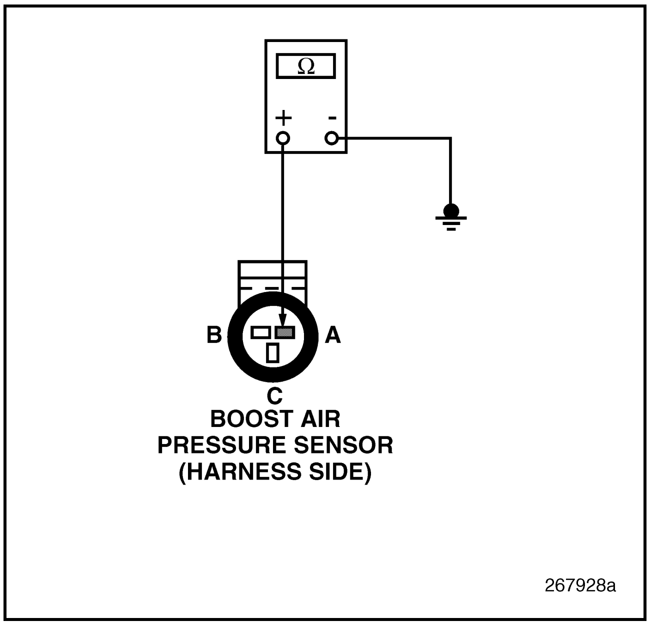


Figure 189

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor harness connector.
3. Check for continuity between BAP Sensor harness connector pin A (ground line) and a good ground (see Figure 189).

   If continuity exists, go to test “Test 80 — Checking the BAP Sensor Connector” on page 168.

   If there is NO continuity, go to test “Test 81 — Checking the Harness for an Open BAP Sensor Return Line” on page 168.

Test 41 — Checking the Harness for a Pin to Pin Short in the BAP Sensor Return Line

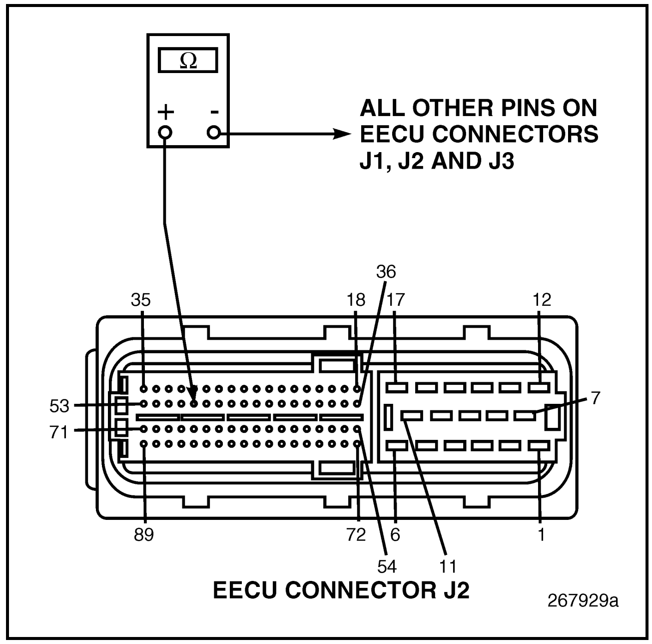


Figure 190

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
3. Disconnect the Boost Air Pressure (BAP) Sensor harness connector.
4. Check for continuity between EECU harness connector J2 pin 49 (ground line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 190).
5. Visually check EECU connector J2 pin 49 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the ground line.

   If there is NO continuity or visual short, replace the EECU.

Test 64 — Checking the EECU Connector for an Open in the BAP Sensor Signal Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pin 50 for a repairable open in signal line.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pin is making good contact, go to test “Test 128 — Checking the BAP Sensor for a Fault” on page 168.

Test 80 — Checking the BAP Sensor Connector

1. Visually inspect both sides of the Boost Air Pressure (BAP) Sensor connector for a repairable open.
2. If any of the pins are loose or damaged, replace the BAP Sensor or harness connector.

   If the pins in the connector are NOT loose, go to test “Test 160 — Checking the BAP Sensor for a Fault” on page 169.

Test 81 — Checking the Harness for an Open BAP Sensor Return Line

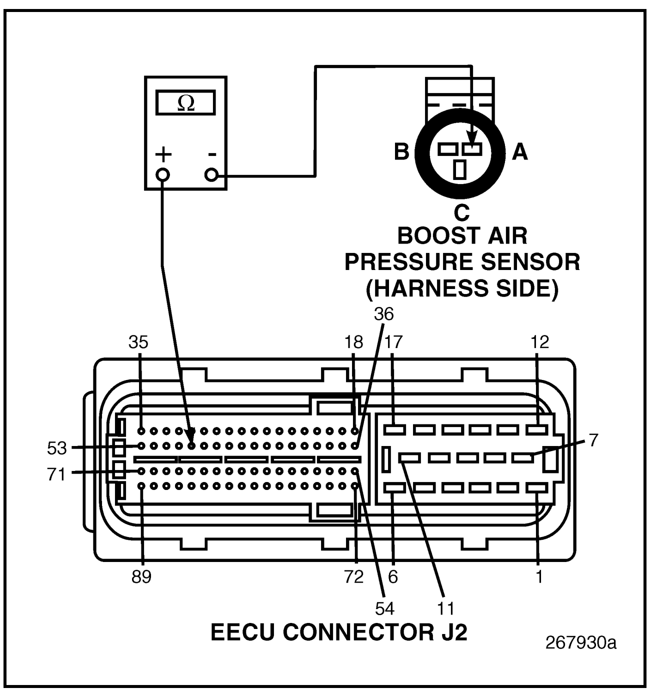


Figure 191

1. Turn the ignition key OFF.
2. Disconnect the Boost Air Pressure (BAP) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between BAP Sensor harness connector pin A (ground line) and EECU harness connector J2 pin 49 (see Figure 191).

   If continuity exists, go to test “Test 162 — Checking the EECU Connector for an Open BAP Sensor Return Line” on page 169.

   If there is NO continuity, repair the open circuit in the harness ground line.

Test 128 — Checking the BAP Sensor for a Fault

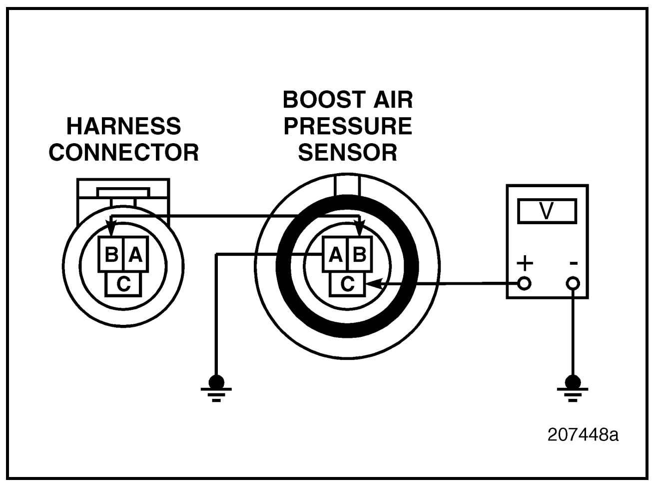


Figure 192

1. Remove the Boost Air Pressure (BAP) Sensor from the vehicle.
2. Connect the BAP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between BAP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between BAP Sensor pin A and a good ground.

5. Turn the ignition key ON.
6. Measure the voltage between BAP Sensor pin C and a good ground at various pressures between 0 psi and 60 psi (see Figure 192). The correct pressure and output voltage specifications are shown in the table below.

Boost Air Pressure	Sensor Output (5 volt input)
0 psi	0.5 volts
10 psi	1.1 volts
20 psi	1.7 volts
30 psi	2.3 volts
40 psi	3.0 volts
50 psi	3.6 volts
60 psi	4.2 volts

If the BAP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the BAP Sensor output is NOT correct throughout the entire pressure range, replace the BAP Sensor and recheck the system.

Test 160 — Checking the BAP Sensor for a Fault

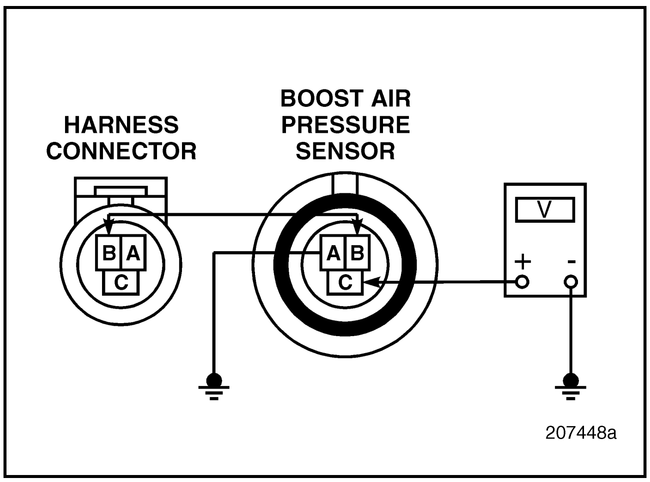


Figure 193

1. Remove the Boost Air Pressure (BAP) Sensor from the engine.
2. Connect the BAP Sensor to a regulated air supply with an accurate pressure gauge.
3. Connect a jumper wire between BAP Sensor pin B and pin B on the sensor harness connector.
4. Connect a jumper wire between BAP Sensor pin A and a good ground.
5. Turn the ignition key ON.
6. Measure the voltage between BAP Sensor pin C and a good ground at various pressures between 0 psi and 60 psi (see Figure 193). The correct pressure and output voltage specifications are shown in the table below.

Boost Air Pressure	Sensor Output (5 volt input)
0 psi	0.5 volts
10 psi	1.1 volts
20 psi	1.7 volts
30 psi	2.3 volts
40 psi	3.0 volts
50 psi	3.6 volts
60 psi	4.2 volts

If the BAP Sensor output is correct throughout the entire pressure range, reinstall the sensor and replace the EECU.

If the BAP Sensor output is NOT correct throughout the entire pressure range, replace the BAP Sensor and recheck the system.

Test 162 — Checking the EECU Connector for an Open BAP Sensor Return Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pin 49 for a repairable open in the ground line.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pin is making good contact, replace the EECU.

BLINK CODE 2-3 — INTAKE AIR TEMPERATURE (IAT) SENSOR (ASET™ IEGR ENGINE)

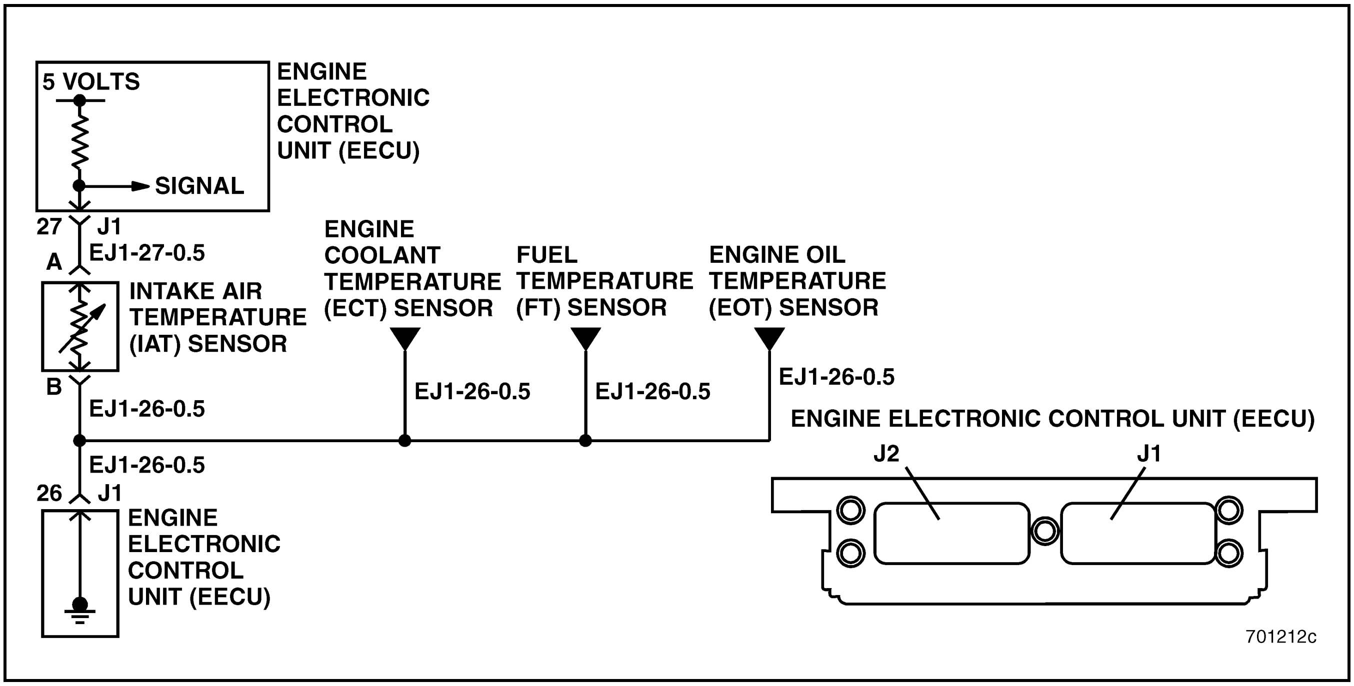


Figure 194 — Intake Air Temperature (IAT) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): 105

Message Identification (MID): 128

Circuit Description: The Intake Air Temperature (IAT) Sensor is a thermistor. The resistance of the IAT Sensor changes inversely to the temperature of the air in the intake manifold. When the intake air is cold, the sensor resistance is high. As the temperature of the air increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the IAT Sensor and uses this signal to accurately calculate the air/fuel mixture. The IAT Sensor information is also used for fuel timing control, to prevent the formation of white smoke during engine warm-up and to prevent misfire under light load conditions.

Location: The Intake Air Temperature (IAT) Sensor is located on the left side of the engine, on the intake manifold.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-3 will set when the Engine Electronic Control Unit (EECU) senses that the IAT Sensor signal voltage is less than 0.4 volts or greater than 4.5 volts for 2 seconds. If the IAT Sensor voltage returns to between 0.4 volts and 4.5 volts for more than 2 seconds, the fault will become inactive.

Normal IAT Sensor Parameters: The Intake Air Temperature (IAT) Sensor has a resistance between 9300 ohms at 32°F (0°C) and 200 ohms at 194°F (90°C).

Test 1 — Checking for Code 2-3

1. Verify that code 2-3 is set.

   If code 2-3 is set, go to test “Test 2 — Checking Code 2-3 Failure Mode Identifier (FMI)” on page 171.

   If code 2-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Intake Air Temperature (IAT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-3 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test “Test 4 — Checking for Other Codes” on page 171.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short Circuit to Ground in the Sensor” on page 171.

Test 4 — Checking for Other Codes

1. Is code 1-3, 2-1, or 2-7 also set?

   If code 1-3, 2-1, or 2-7 is also set, go to test “Test 8 — Checking for an Open IAT Sensor Return Line” on page 172.

   If only code 2-3 is set, go to test “Test 9 — Checking Sensor Resistance” on page 172.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

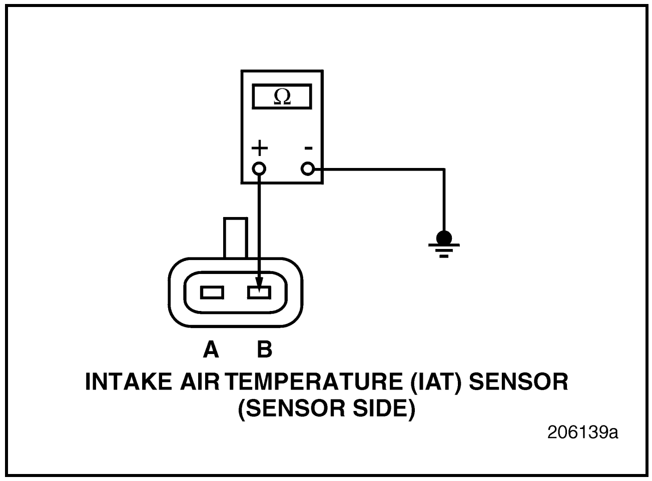


Figure 195

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature (IAT) Sensor connector.
3. Check for continuity between either pin of the IAT Sensor and a good ground (see Figure 195).

   If continuity exists, replace the IAT Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 173.

Test 8 — Checking for an Open IAT Sensor Return Line

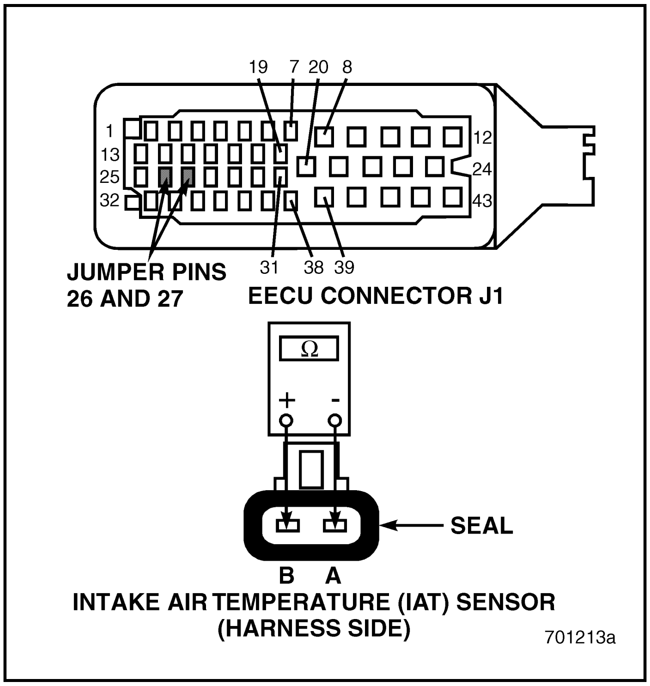


Figure 196

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature (IAT) Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper wire between EECU harness connector J1 pins 26 and 27 (see Figure 196).
5. Check for continuity between pins A and B of the IAT Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 173.

   If there is NO continuity, there is an open in the ground circuit between the common temperature sensor ground splice and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

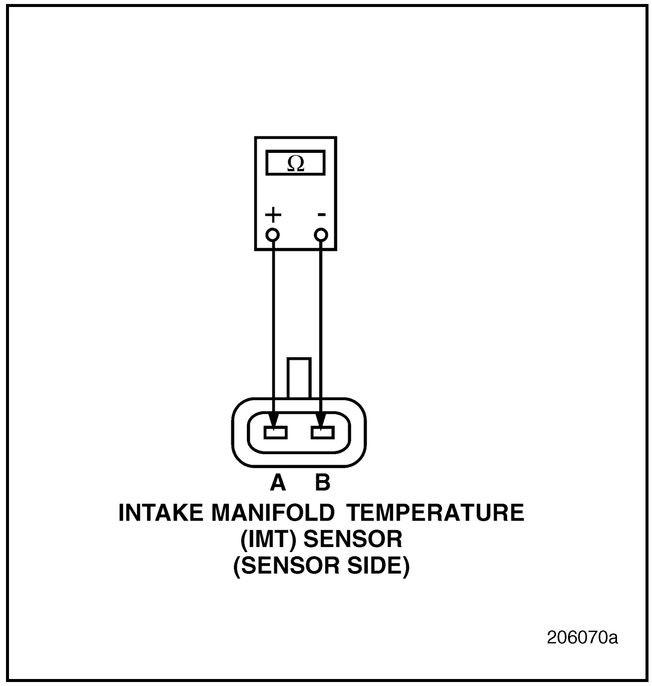


Figure 197

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature (IAT) Sensor connector.
3. Measure the resistance across the pins of the IAT Sensor with the air temperature between 32° and 194°F (0° and 90°C) (see Figure 197).

   If the resistance of the sensor is between 9300 and 200 ohms or if the resistance is infinite (open circuit), go to test “Test 18 — Checking Signal Line Voltage” on page 174.

   If the resistance of the sensor is not within normal operating parameters (9300 to 200 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

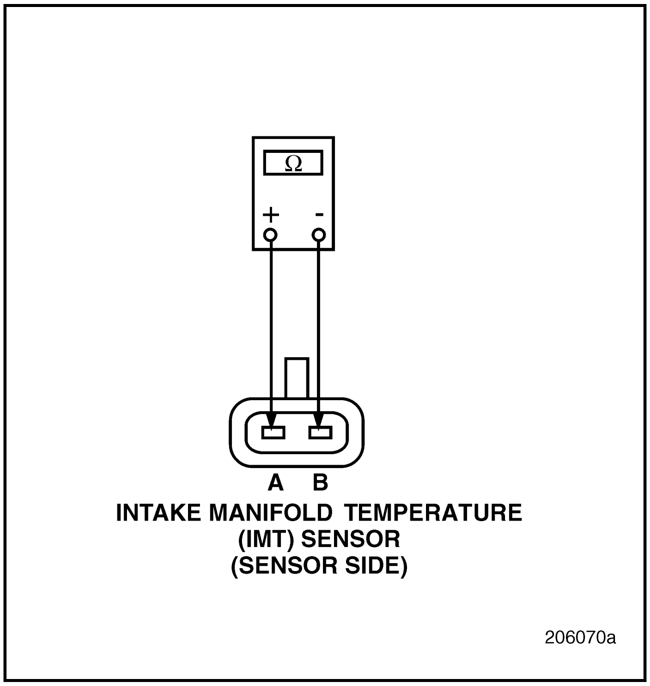


Figure 198

1. Turn the ignition key OFF.
2. Disconnect the IAT Sensor connector.
3. Measure the resistance across the pins of the IAT Sensor with the air temperature between 32° and 194°F (0° and 90°C) (see Figure 198).

   If the resistance is between 9300 and 200 ohms respectively, go to test "Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the IAT Sensor" on page 174.

   If the resistance is less than 200 ohms, replace the IAT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

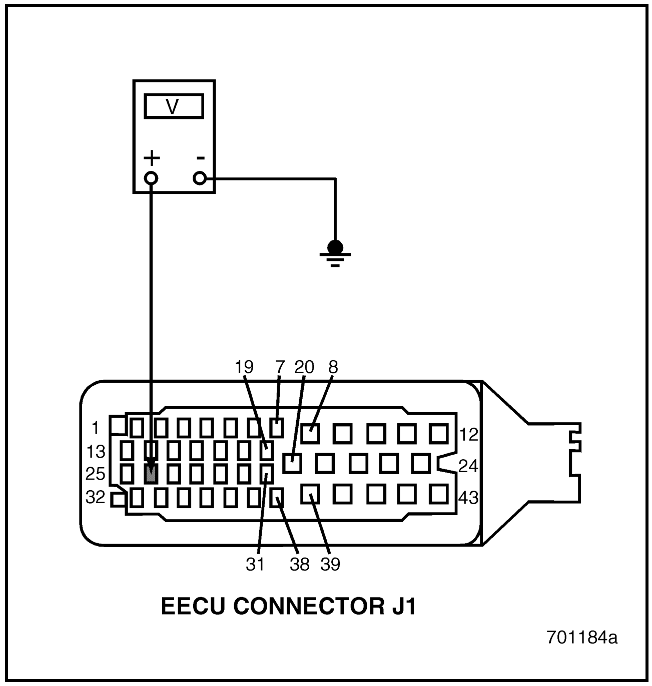


Figure 199

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature (IAT) Sensor connector.
3. Disconnect connector J1 from Engine Electronic Control Unit (EECU).
4. Measure the voltage between EECU connector J1 pin 26 and a good ground (see Figure 199).

   If there is less than 0.5 volts present, go to test "Test 32 — Checking the EECU Connector for an Open IAT Sensor Return Line" on page 175.

   If there is more than 0.5 volts present, there is a short circuit to voltage on the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking Signal Line Voltage

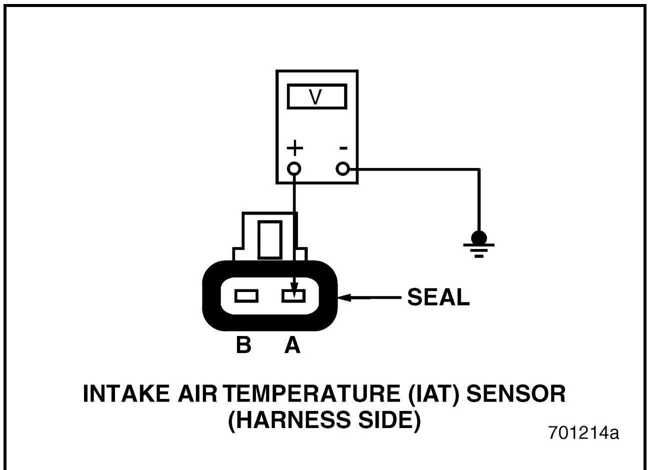


Figure 200

1. Disconnect the IAT Sensor harness connector.
2. Turn the ignition key ON.
3. Measure the voltage between IAT Sensor harness connector pin A and a good ground (see Figure 200).

   If the measured voltage is greater than 6 volts, the IAT Sensor signal wire is shorted to voltage; go to test “Test 36 — Checking for a Short Circuit to Voltage in the Signal Line” on page 175.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 9, go to test “Test 37 — Checking for an Open IAT Sensor Signal Line” on page 175.

Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the IAT Sensor

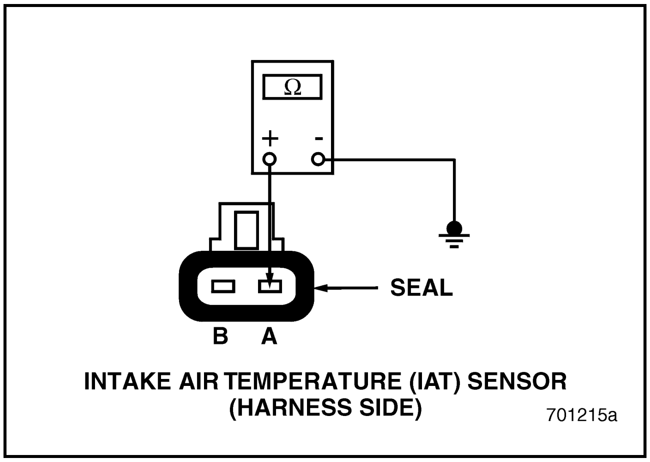


Figure 201

1. Turn the ignition key OFF.
2. Disconnect the IAT Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin A of the IAT Sensor harness connector and a good ground (see Figure 201).

   If continuity exists between pin A and ground, go to test “Test 40 — Checking for a Pin to Pin Short in the Harness” on page 176.

   If there is NO continuity, go to test “Test 41 — Checking for Proper Supply Voltage to the Sensor” on page 176.

Test 32 — Checking the EECU Connector for an Open IAT Sensor Return Line

1. Visually inspect EECU harness connector J1 pin 27 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pin 27. Gently push the test lead into the harness connector pin and check for looseness.

   If a repairable open is found or the pin feels loose, repair EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pin 27, go to test "Test 64 — Checking for Blink Code 2-3" on page 176.

Test 36 — Checking for a Short Circuit to Voltage in the Signal Line

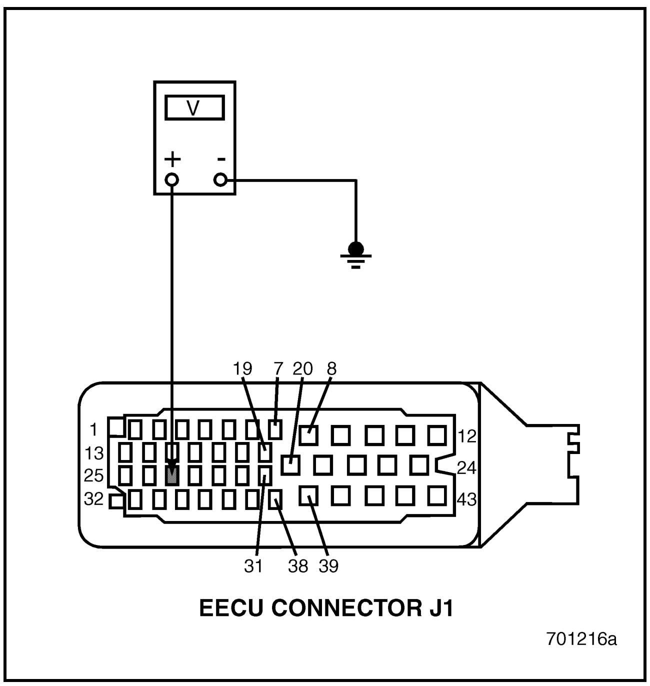


Figure 202

1. Turn the ignition key OFF.
2. Disconnect the IAT Sensor connector.
3. Disconnect connector J1 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage from EECU harness connector J1 pin 27 to a good ground (see Figure 202).

   If there is NO voltage indicated, go to test "Test 72 — Checking for a Short Circuit at the EECU Connector" on page 177.

   If voltage is present, go to test "Test 73 — Checking for a Pin to Pin Short in the Harness" on page 177.

Test 37 — Checking for an Open IAT Sensor Signal Line

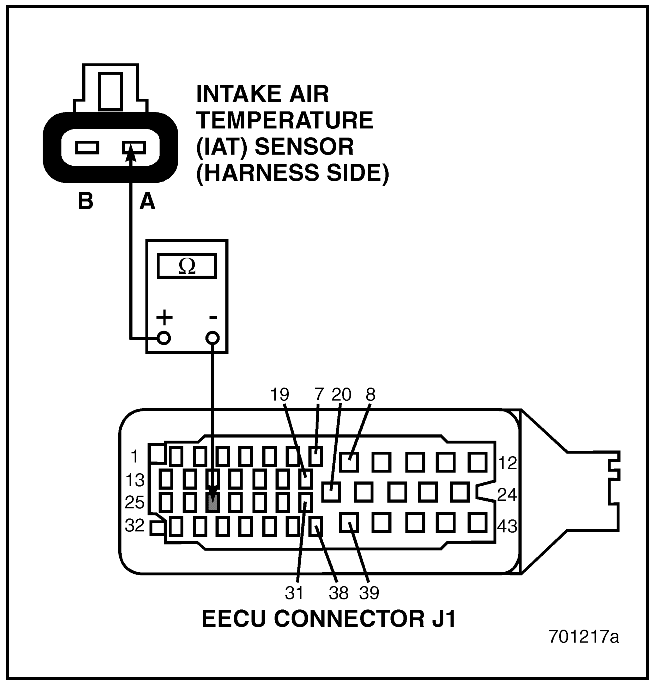


Figure 203

1. Turn the ignition key OFF.
2. Disconnect the IAT Sensor connector.
3. Disconnect EECU connector J1.
4. Check for continuity between pin A of the IAT Sensor harness connector and EECU harness connector J1 pin 27 (see Figure 203).

   If there is NO continuity, locate and repair the open in the signal circuit between the IAT Sensor harness connector and EECU harness connector J1 pin 27.

   If continuity exists, go to test "Test 74 — Checking for an Open IAT Sensor Return Circuit" on page 178.

Test 40 — Checking for a Pin to Pin Short in the Harness

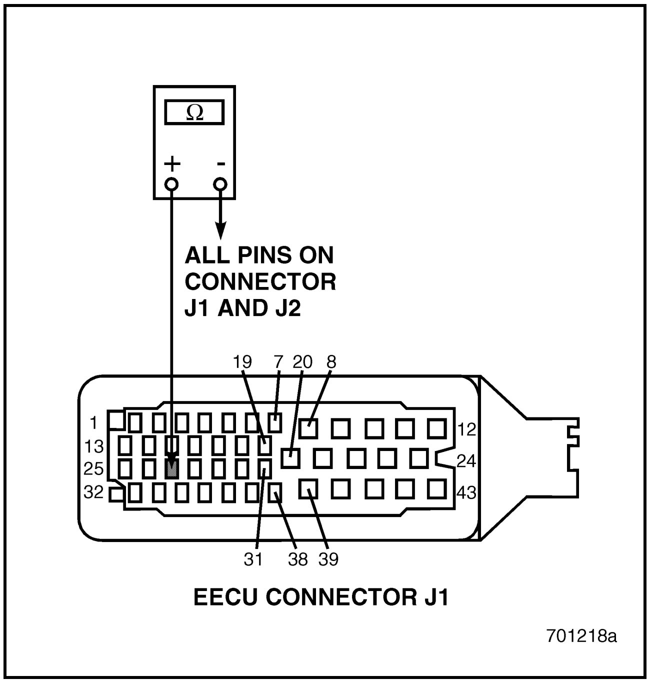


Figure 204

1. Turn the ignition key OFF.
2. Disconnect the IAT Sensor harness connector.
3. Disconnect EECU connector J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 27 and all other pins on EECU connectors J1 and J2 (see Figure 204).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

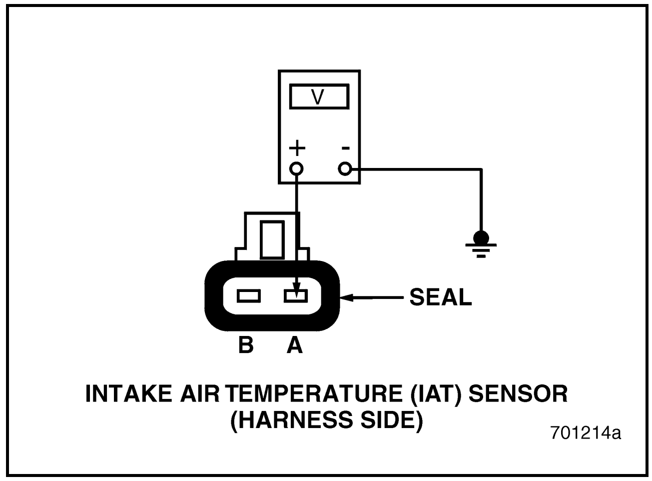


Figure 205

1. Turn the ignition key OFF.
2. Disconnect the IAT Sensor connector.
3. Connect connector J1 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin A of the IAT Sensor harness connector and a good ground (see Figure 205).

   If the measured voltage is between 4.5 and 5.5 volts, check the IAT Sensor harness connector for deformed pins or insufficient contact with the IAT Sensor pins. If the pins are not damaged, replace the IAT Sensor.

   If the measured voltage is less than 4.5 volts, go to test "Test 82 — Checking for a Short Circuit at the EECU Connector" on page 178.

Test 64 — Checking for Blink Code 2-3

1. Connect the IAT Sensor harness connector.
2. Connect EECU harness connector J1 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-3 is still active, replace the EECU and retest the system.

   If blink code 2-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Intake Air Temperature (IAT) Sensor was open in test 18, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the IAT Sensor harness connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-3 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident or are NOT repairable, replace the EECU module and retest the system.

   If blink code 2-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short in the Harness

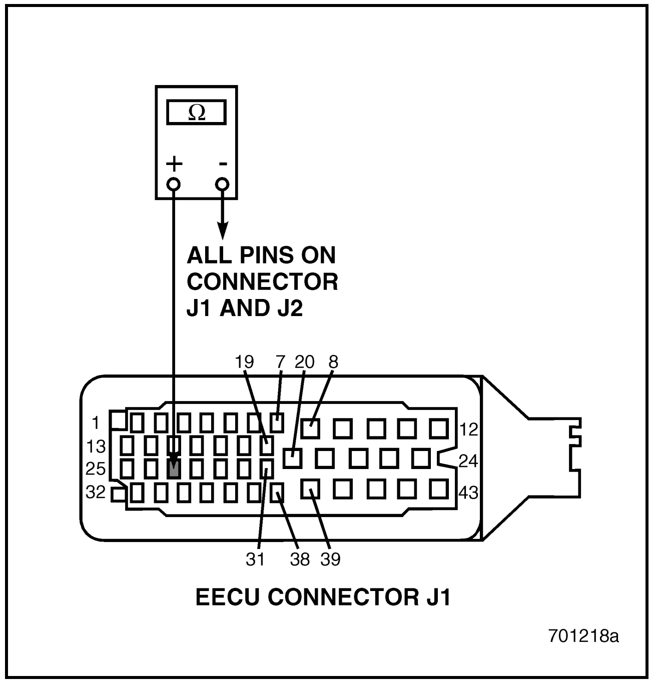


Figure 206

1. Turn the ignition key OFF.
2. Disconnect the IAT Sensor harness connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 27 and all other pins on EECU connectors J1 and J2 (see Figure 206).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 74 — Checking for an Open IAT Sensor Return Circuit

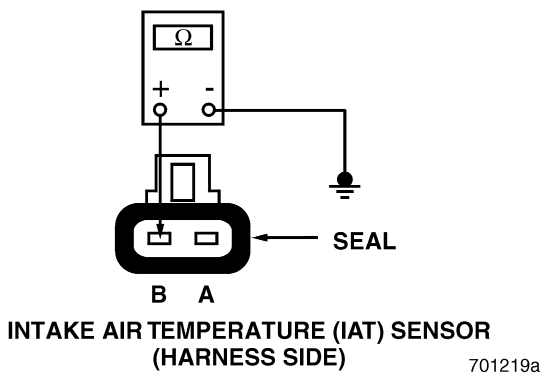


Figure 207

1. Disconnect the IAT Sensor harness connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J1.
4. Check for continuity between pin B of the IAT Sensor harness connector and a good ground (see Figure 207).

   If there is NO continuity, locate and repair the open circuit in the harness between the IAT Sensor and the common ground with the other temperature sensors.

   If continuity exists, check the IAT Sensor harness connector for damaged pins or improper mating with the IAT Sensor. If the IAT Sensor connector is OK, go to test "Test 148 — Checking the EECU Connector for an Open Circuit" on page 178.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the IAT Sensor harness connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-3 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J1 pins 27 and 28 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pins 27 and 28. Gently push the test lead into each harness connector pin individually to check for looseness.

   If a repairable open is found or either of the pins feels loose, repair EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pins 27 and 28, go to test "Test 296 — Checking for an Open Circuit at the EECU Connector" on page 178.

Test 296 — Checking for an Open Circuit at the EECU Connector

1. Connect the IAT Sensor harness connector.
2. Connect connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-3 is still active, replace the EECU and retest the system.

   If blink code 2-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-3 — INTAKE MANIFOLD TEMPERATURE (IMT) SENSOR (ASET™ CEGR ENGINE)

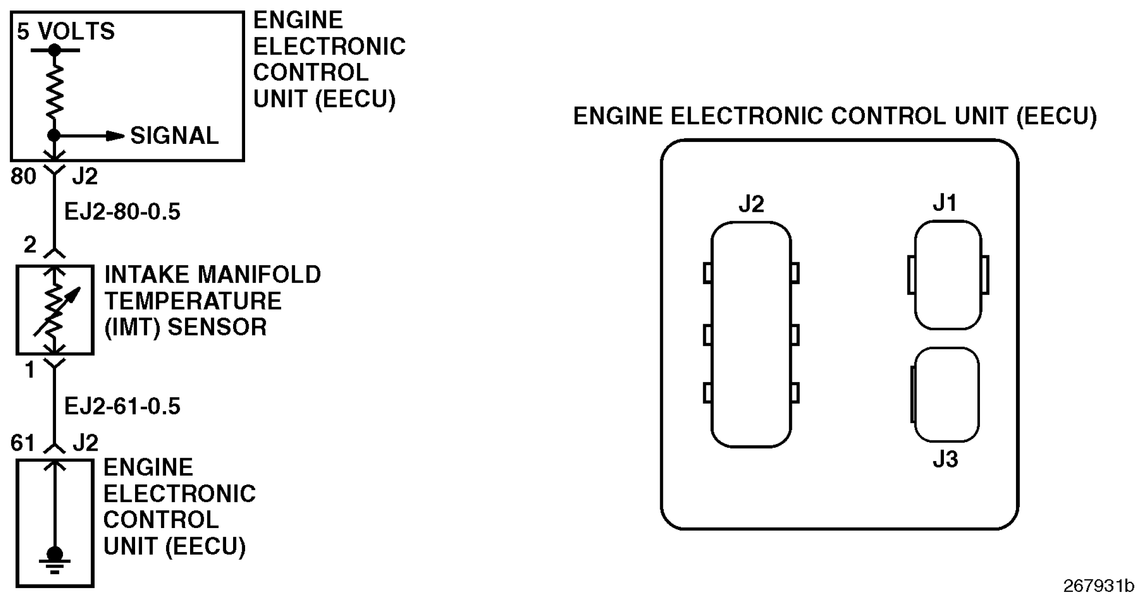


Figure 208 — Intake Manifold Temperature (IMT) Sensor Circuit (ASET™ CEGR Engine)

N O T E

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Open), 2 (Data Intermittent)

Parameter Identification (PID): 105

Message Identification (MID): 128

Circuit Description: The Intake Manifold Temperature (IMT) Sensor is a thermistor. The resistance of the IMT Sensor changes inversely to the temperature of the air in the intake manifold. When the intake air is cold, the sensor resistance is high. As the temperature of the air increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the IMT Sensor and uses this signal to accurately calculate the air/fuel mixture. The IMT Sensor information is also used for fuel timing control, to prevent the formation of white smoke during engine warm-up, and to prevent misfire under light load conditions.

Location: The Intake Manifold Temperature (IMT) Sensor is located on the left side of the engine, on the intake manifold.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-3 will set with FMI 3 when the Engine Electronic Control Unit (EECU) senses the IMT Sensor signal voltage is greater than 4.8 volts for 2 seconds. The EML will turn on and code 2-3 will set with FMI 4 when the EECU senses the IMT Sensor signal voltage is less than 0.15 volts for 2 seconds. If the IMT Sensor voltage returns to between 0.15 volts and 4.8 volts for more than 2 seconds, the fault will become inactive. When the engine returns to ambient temperature after being shut down at normal operating temperature and the key is turned to the ON position (engine not running), the IMT Sensor, the Aftercooler Outlet Temperature (AOT) Sensor, and the Compressor Discharge Temperature (CDT) Sensor should all indicate the same temperature. Under these conditions, the EML will turn on and code 2-3 will set with FMI 2 if the IMT Sensor signal indicates a temperature that is NOT within 15°F of the average of the three sensors.

NOTE

FMI 2 is only available with EECU version 1MS378 software. Additionally, code 2-3 with FMI 2 will only appear as an active fault when the engine is not running.

NOTE

FMI 5 is only available with EECU version 1MS368 software. The EML will turn on and code 2-3 will set with FMI 5 when the EECU senses the IMT Sensor signal voltage is between 4.37 volts and 4.8 volts, and the aftercooler outlet temperature is greater than 50°F. Additionally, FMI 5 will only appear as an active fault when the engine is running.

Normal IMT Sensor Parameters: The Intake Manifold Temperature (IMT) Sensor has a resistance between 59,500 ohms at 55°F (10°C) and 3,500 ohms at 180°F (82°C).

Test 1 — Checking for Code 2-3

1. Verify that code 2-3 is set.

   If code 2-3 is set, go to test "Test 2 — Checking Code 2-3 Failure Mode Identifier (FMI)" on page 180.

   If code 2-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Intake Manifold Temperature (IMT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-3 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (open), go to test "Test 4 — Checking Sensor Resistance" on page 180.

   If the FMI is 4 (voltage low) or 2 (data intermittent), go to test "Test 5 — Checking for a Short Circuit to Ground in the Sensor" on page 181.

Test 4 — Checking Sensor Resistance

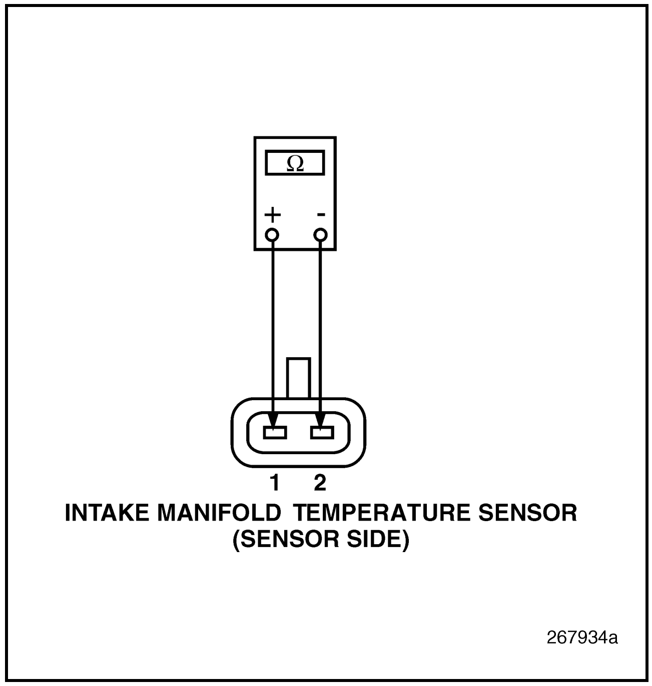


Figure 209

1. Turn the ignition key OFF.
2. Disconnect the Intake Manifold Temperature (IMT) Sensor connector.
3. Measure the resistance across the pins of the IMT Sensor with the air temperature between 55° and 180°F (10° and 82°C) (see Figure 209).

   If the resistance of the sensor is between 59,500 and 3,500 ohms or if the resistance is infinite (open circuit), go to test "Test 8 — Checking Signal Line Voltage" on page 181.

   If the resistance of the sensor is not within normal operating parameters (59,500 to 3,500 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

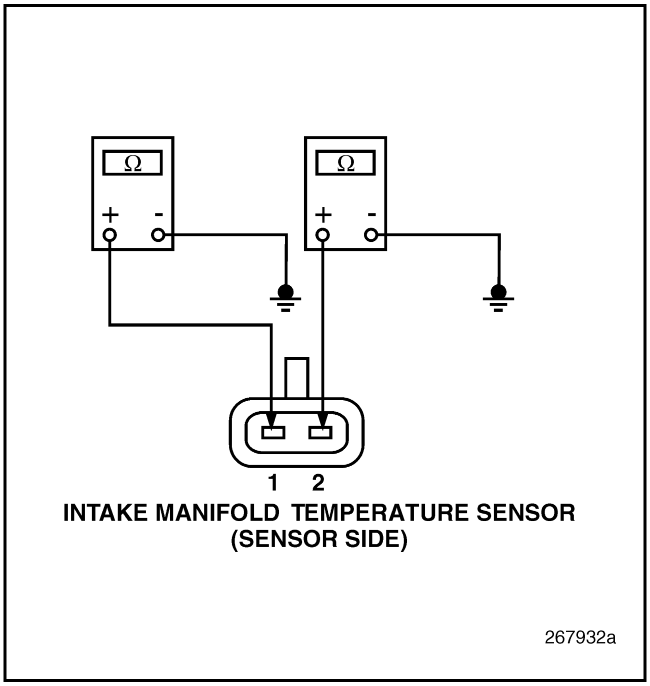


Figure 210

1. Turn the ignition key OFF.
2. Disconnect the Intake Manifold Temperature (IMT) Sensor connector.
3. Check for continuity between either pin of the IMT Sensor and a good ground (see Figure 210).

   If continuity exists, replace the IMT Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 182.

Test 8 — Checking Signal Line Voltage

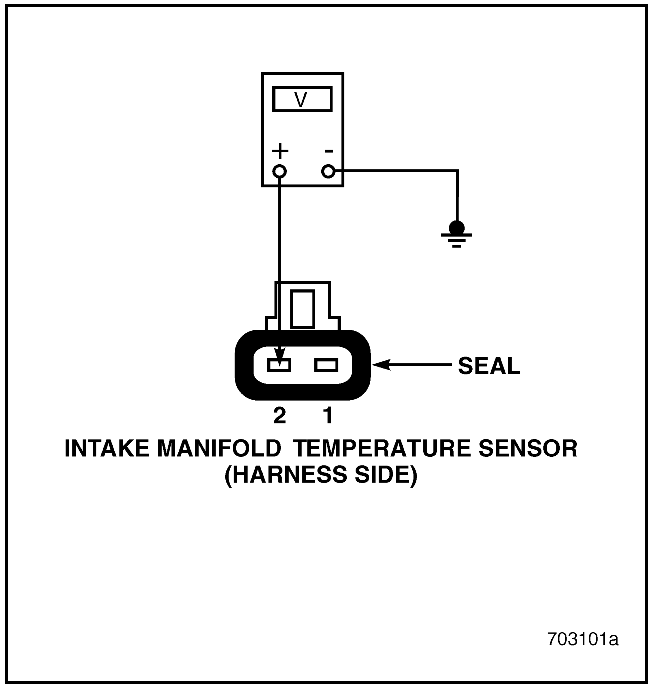


Figure 211

1. Disconnect the IMT Sensor harness connector.
2. Turn the ignition key ON.
3. Measure the voltage between IMT Sensor harness connector pin 2 and a good ground (see Figure 211).

   If the measured voltage is greater than 6 volts, the IMT Sensor signal wire is shorted to voltage; go to test “Test 16 — Checking for a Short Circuit to Voltage in the Signal Line” on page 182.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 4, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 4, go to test “Test 17 — Checking for an Open IMT Sensor Signal Line” on page 183.

Test 10 — Checking Sensor Resistance

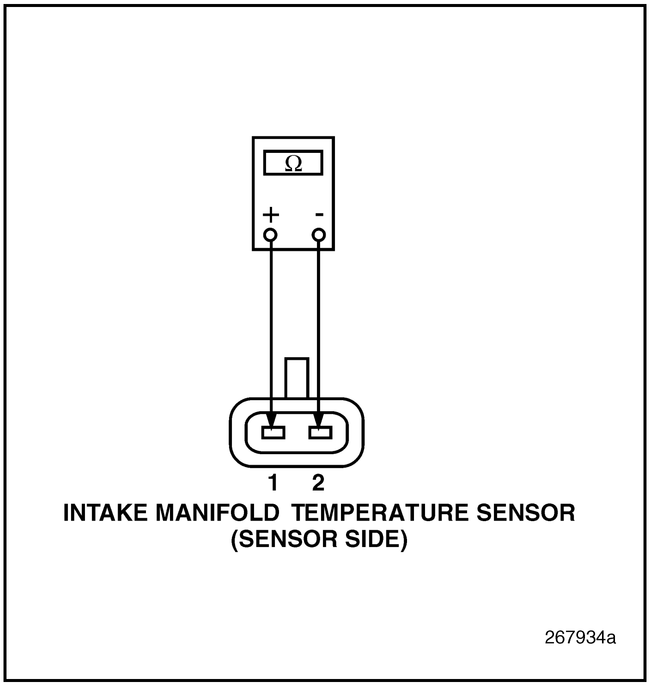


Figure 212

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Measure the resistance across the pins of the IMT Sensor with the air temperature between 55° and 180°F (10° and 82°C) (see Figure 212).

   If the resistance of the sensor is between 59,500 and 3,500 ohms respectively, and the FMI was 4, go to test "Test 20 — Checking for a Short Circuit to Ground in the Sensor Signal Line" on page 183.

   If the resistance of the sensor is between 59,500 and 3,500 ohms respectively, and the FMI was 2, go to test "Test 21 — Checking for Voltage on the Sensor Return Line" on page 184.

   If the resistance is less than 3,500 ohms, replace the IMT Sensor.

Test 16 — Checking for a Short Circuit to Voltage in the Signal Line

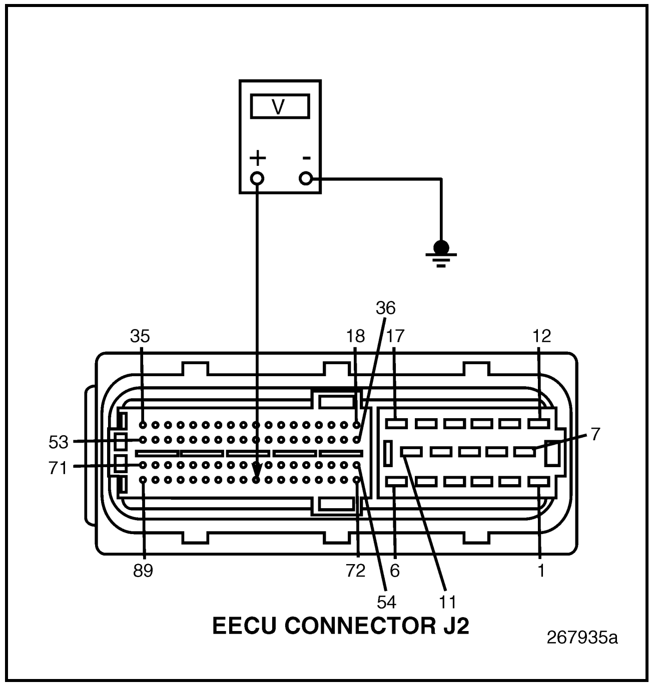


Figure 213

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor connector.
3. Disconnect connector J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J2 pin 80 and a good ground (see Figure 213).

   If there is NO voltage indicated, go to test "Test 32 — Checking for a Short Circuit at the EECU Connector" on page 184.

   If voltage is present, go to test "Test 33 — Checking for a Pin to Pin Short in the Harness" on page 185.

Test 17 — Checking for an Open IMT Sensor Signal Line

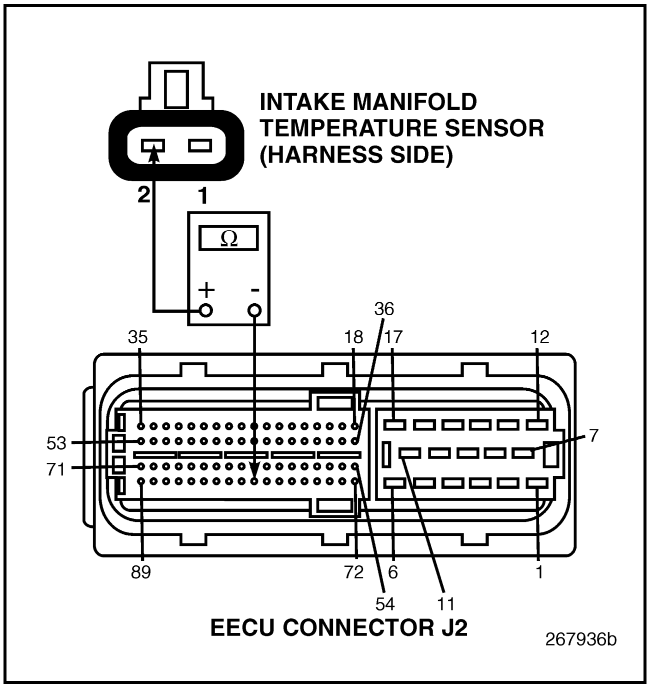


Figure 214

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin 2 of the IMT Sensor harness connector and EECU harness connector J2 pin 80 (see Figure 214).

   If there is NO continuity, locate and repair the open in the signal circuit between the IMT Sensor harness connector and EECU harness connector J2 pin 80.

   If continuity exists, go to test "Test 34 — Checking for an Open IMT Sensor Return Circuit" on page 185.

Test 20 — Checking for a Short Circuit to Ground in the Sensor Signal Line

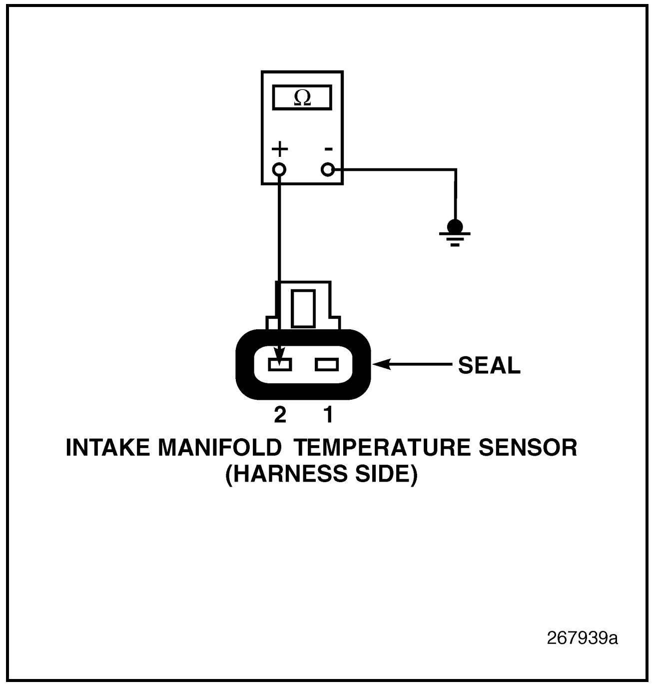


Figure 215

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 2 of the IAT Sensor harness connector and a good ground (see Figure 215).

   If continuity exists between pin 2 and ground, go to test "Test 40 — Checking for a Pin to Pin Short in the Harness" on page 186.

   If there is NO continuity, go to test "Test 41 — Checking for Proper Supply Voltage to the Sensor" on page 186.

Test 21 — Checking for Voltage on the Sensor Return Line

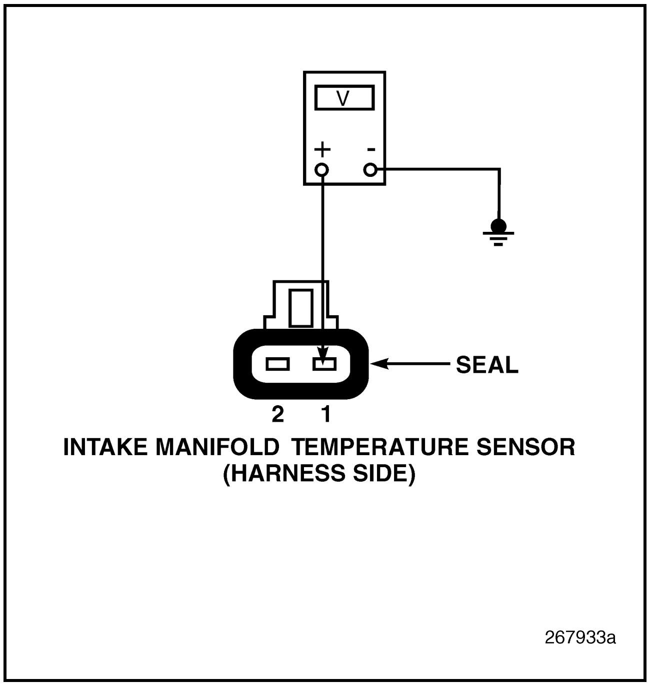


Figure 216

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Turn the ignition key ON.
5. Measure the voltage between pin 1 of the IMT Sensor harness connector and a good ground (see Figure 216).

   If voltage is present, locate and repair the short circuit to voltage in the IMT Sensor return line.

   If there is NO voltage present, go to test “Test 42 — Checking for a Short Circuit to Ground in the Sensor Signal Line” on page 187.

Test 32 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Intake Manifold Temperature (IMT) Sensor was open in test 4, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the IMT Sensor harness connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-3 is still active, check the EECU and connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 33 — Checking for a Pin to Pin Short in the Harness

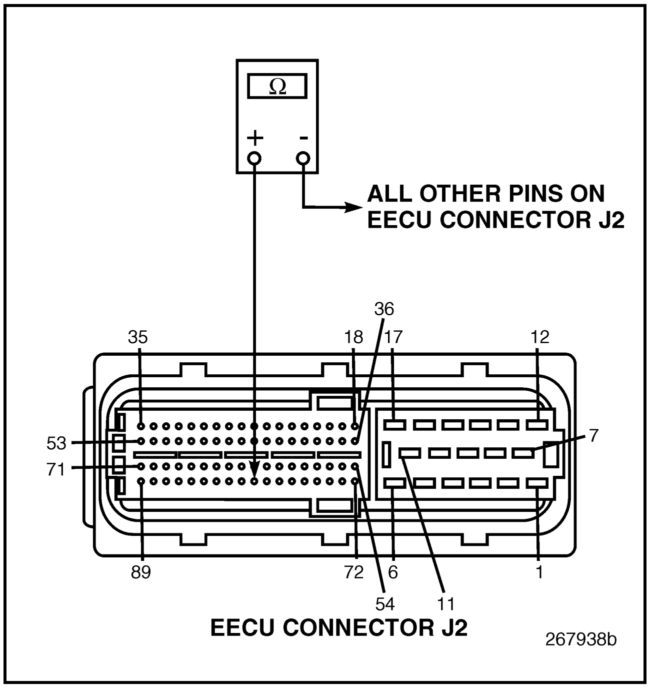


Figure 217

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect EECU harness connector J2.
4. Check for continuity between EECU harness connector J2 pin 80 and all other pins on EECU connector J2 (see Figure 217).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 34 — Checking for an Open IMT Sensor Return Circuit

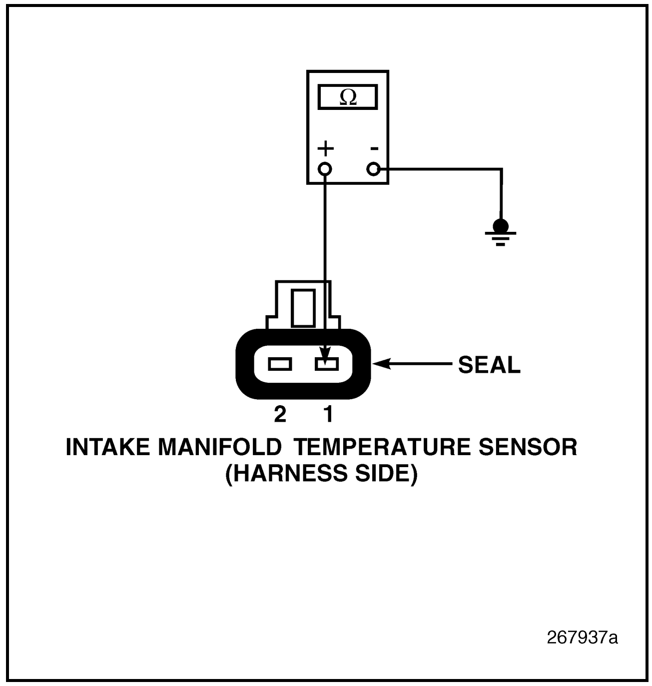


Figure 218

1. Disconnect the IAT Sensor harness connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J2.
4. Check for continuity between pin 1 of the IMT Sensor harness connector and a good ground (see Figure 218).

   If there is NO continuity, locate and repair the open circuit in the harness between the IMT Sensor and EECU connector J2 pin 61.

   If continuity exists, check the IMT Sensor harness connector for damaged pins or improper mating with the IMT Sensor. If the IMT Sensor connector is OK, go to test “Test 68 — Checking the EECU Connector for an Open Circuit” on page 187.

Test 40 — Checking for a Pin to Pin Short in the Harness

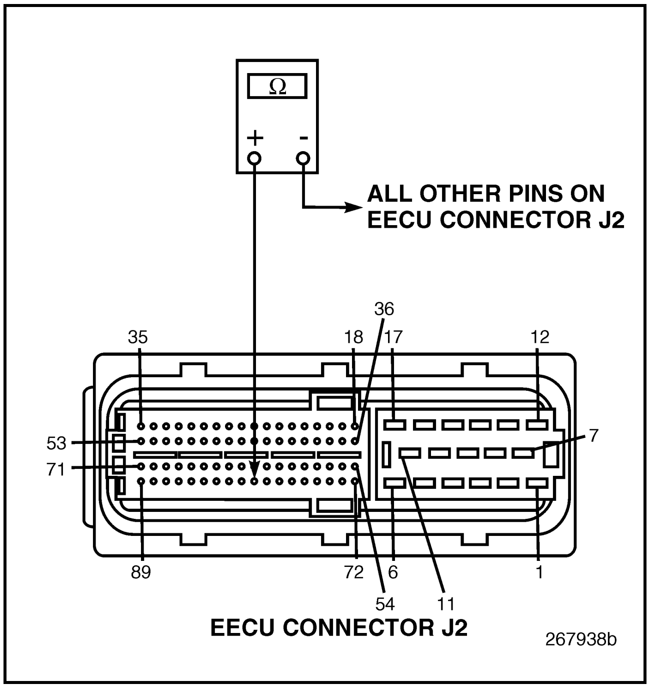


Figure 219

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between EECU harness connector J2 pin 80 and all other pins on EECU connector J2 (see Figure 219).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

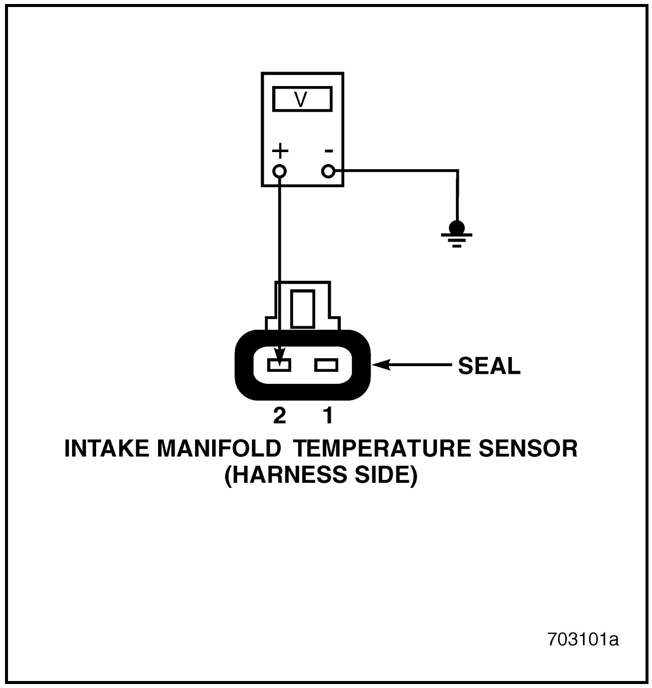


Figure 220

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin 2 of the IMT Sensor harness connector and a good ground (see Figure 220).

   If the measured voltage is between 4.5 and 5.5 volts, check the IMT Sensor harness connector for deformed pins or insufficient contact with the IMT Sensor pins. If the pins are not damaged, replace the IMT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 187.

Test 42 — Checking for a Short Circuit to Ground in the Sensor Signal Line

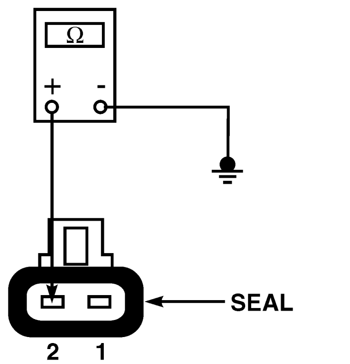


Figure 221

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 2 of the IAT Sensor harness connector and a good ground (see Figure 221).

   If continuity exists between pin 2 and ground, locate and repair the short circuit in the IMT Sensor signal line.

   If there is NO continuity, replace the IMT Sensor and retest the system. If code 2-3 is still active, go to test “Test 84 — Checking the EECU Connector” on page 188.

Test 68 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 61 and 80 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test “Test 136 — Checking for an Open Circuit at the EECU Connector” on page 188.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the IMT Sensor harness connector.
3. Connect EECU connector J2.
4. Turn the ignition key ON.

   If blink code 2-3 is still active, check the EECU and connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 84 — Checking the EECU Connector

1. Visually inspect EECU harness connector J2 pins 61 and 80 for dirt, loose pins or deformed contacts.
2. If any damage is found, repair EECU harness connector J2.

   If the terminals are making good contact, replace the EECU.

Test 136 — Checking for an Open Circuit at the EECU Connector

1. Connect the IMT Sensor harness connector.
2. Connect connector J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-3 is still active, replace the EECU and retest the system.

   If blink code 2-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-4 — TRANSMISSION OIL TEMPERATURE (TOT) SENSOR

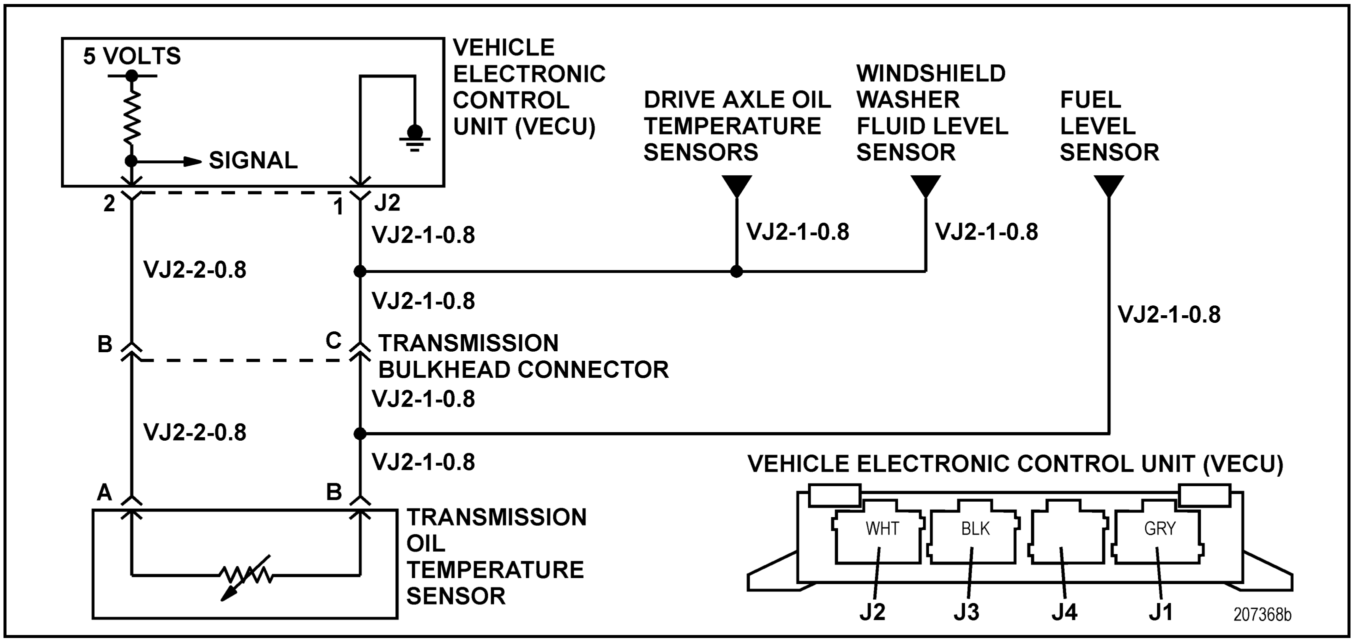


Figure 222 — Transmission Oil Temperature (TOT) Sensor Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High/Open), 4 (Voltage Low)

Parameter Identification (PID): P177

Message Identification (MID): 142

Circuit Description: The Transmission Oil Temperature (TOT) Sensor is a thermistor. The resistance of the TOT Sensor changes inversely to the temperature of the transmission oil. When the transmission oil is cold, the sensor resistance is high. As the temperature of the transmission oil increases, the sensor resistance decreases. The Vehicle Electronic Control Unit (VECU) monitors the voltage drop across the TOT Sensor and uses this signal to warn the driver and shut down the engine if the transmission oil temperature exceeds the programmed limit.

Location: The Transmission Oil Temperature (TOT) Sensor is threaded into the right side of the transmission.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-4 will set when the Vehicle Electronic Control Unit (VECU) senses that the TOT Sensor signal voltage is less than 0.3 volts or greater than 4.4 volts for 2 seconds. If the TOT Sensor voltage returns to between 0.3 volts and 4.4 volts for more than 2 seconds, the fault will become inactive. Code 2-4 will not set unless TOT Sensor diagnostics are enabled in the VECU Mack Data area.

Normal TOT Sensor Parameters: The Transmission Oil Temperature (TOT) Sensor has a resistance of 6300 ohms at 32°F (0°C) and 250 ohms at 194°F (90°C).

NOTE

Blink code 2-4 is can be enabled and disabled in the Optional Data section of the Vehicle Electronic Control Unit (VECU) OEM Data area. If a Transmission Oil Temperature (TOT) Sensor is NOT installed, contact Mack Trucks Service Engineering Division to have the blink code 2-4 disabled in the vehicle's chassis data file, then reprogram the VECU with the updated file.

Test 1 — Checking for Code 2-4

1. Verify that code 2-4 is set.

   If code 2-4 is set, go to test “Test 2 — Checking the Sensor Resistance” on page 190.

   If code 2-4 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Transmission Oil Temperature (TOT) Sensor connector and wires for poor connections.

Test 2 — Checking the Sensor Resistance

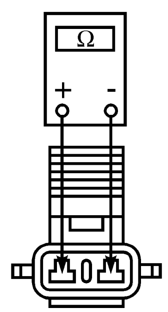


Figure 223

1. Turn the Ignition key OFF.
2. Disconnect the Transmission Oil Temperature (TOT) Sensor harness connector.
3. Measure the resistance across the two terminals of the sensor with the transmission between 32° and 194°F (0° and 90°C) (see Figure 223).

   If the resistance is between 6300 and 250 ohms, go to test “Test 4 — Checking for a Short to Ground in the Sensor” on page 190.

   If the resistance is NOT between 6300 and 250 ohms, go to test “Test 5 — Checking for a Short to Voltage in the Signal Line” on page 191.

Test 4 — Checking for a Short to Ground in the Sensor

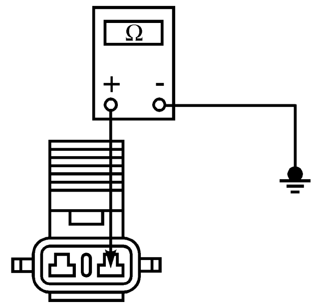


Figure 224

1. Turn the ignition key OFF.
2. Disconnect the Transmission Oil Temperature (TOT) Sensor connector.
3. Check for continuity between either pin of the TOT Sensor and a good ground (see Figure 224).

   If there is continuity to ground, replace the TOT Sensor.

   If there is NO continuity, go to test “Test 8 — Checking Voltage on the TOT Sensor Signal Line” on page 191.

Test 5 — Checking for a Short to Voltage in the Signal Line

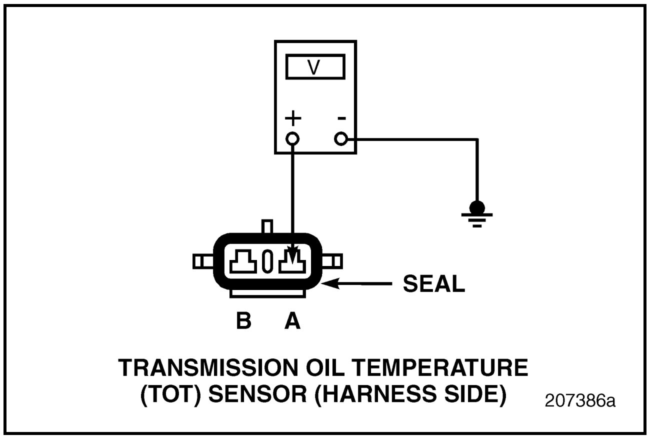


Figure 225

1. Turn the ignition key ON.
2. Measure the voltage between TOT Sensor harness connector pin A and a good ground (see Figure 225).

   If the measured voltage is greater than 6 volts, go to test “Test 10 — Checking for a Short Circuit to Voltage in the Signal Line” on page 191.

   If the measured voltage is less than 6 volts, inspect the TOT Sensor and the harness connector for a repairable short or open circuit. If there is NOT a repairable condition, replace the TOT Sensor.

Test 8 — Checking Voltage on the TOT Sensor Signal Line

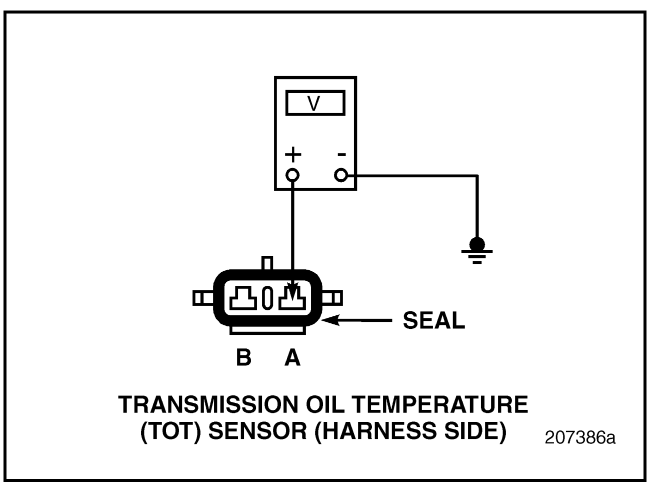


Figure 226

1. Turn the ignition key ON.
2. Disconnect the Transmission Oil Temperature (TOT) Sensor connector.
3. Measure the voltage between TOT Sensor harness connector pin A and a good ground (see Figure 226).

   If the measured voltage is between 4.5 and 5.5 volts, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 192.

   If the measured voltage is NOT between 4.5 and 5.5 volts, go to test “Test 17 — Checking for an Open Harness” on page 192.

Test 10 — Checking for a Short Circuit to Voltage in the Signal Line

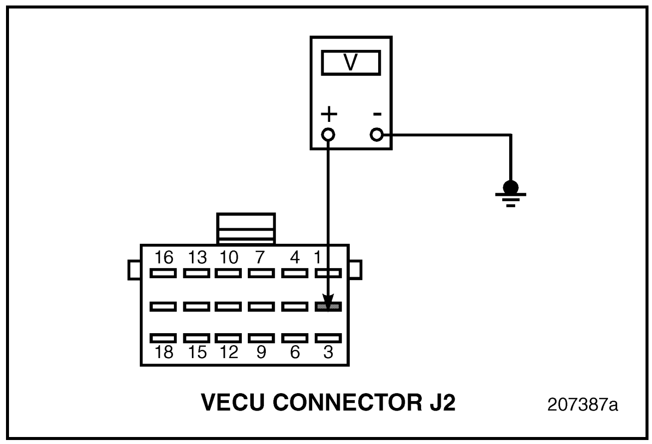


Figure 227

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2, and J3.
3. Install the Serial Link Jumper into the Serial Communications Port.
4. Measure the voltage between VECU connector J2 pin 2 and a good ground (see Figure 227).

   If NO voltage is present, go to test “Test 20 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector” on page 193.

   If the measured voltage is greater than 6 volts, the TOT Sensor signal line is shorted to voltage. Locate and repair the short circuit and then replace the TOT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

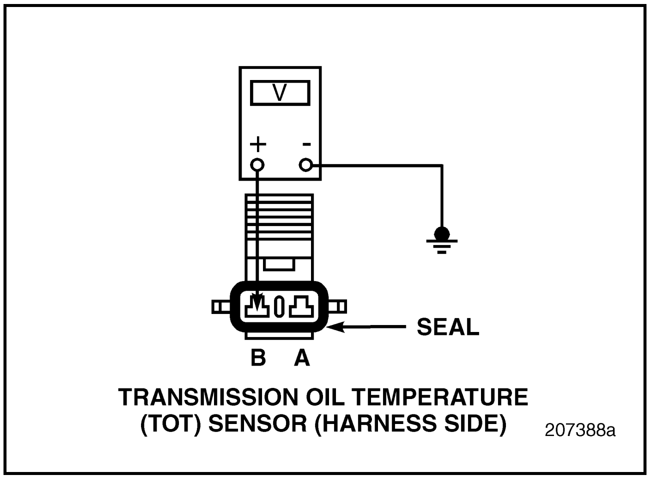


Figure 228

1. Turn the ignition key ON.
2. Disconnect the Transmission Oil Temperature (TOT) Sensor connector.
3. Measure the voltage between TOT Sensor harness connector pin B and a good ground (see Figure 228).

   If the measured voltage is less than 0.3 volts, go to test “Test 32 — Checking for an Open TOT Sensor Return Line” on page 193.

   If the measured voltage is greater than 0.3 volts, go to test “Test 33 — Checking for a Short to Voltage in the TOT Sensor Return Line” on page 194.

Test 17 — Checking for an Open Harness

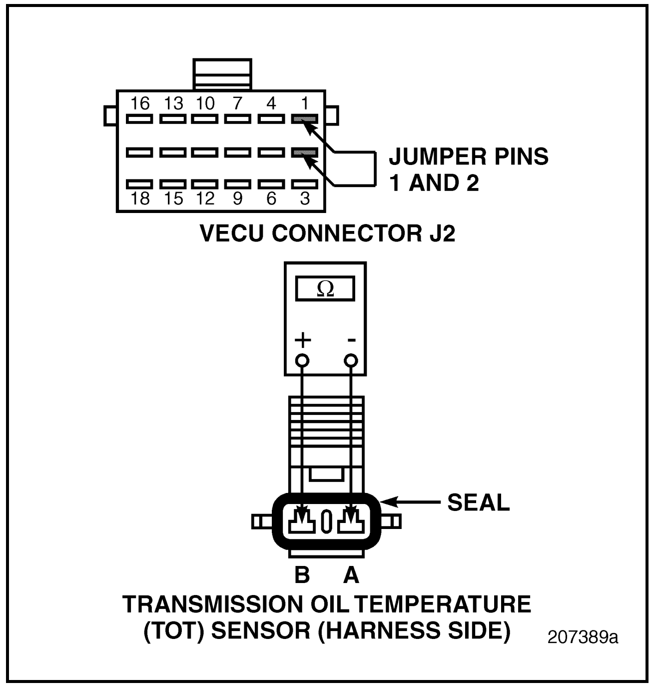


Figure 229

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
3. Install a jumper wire between VECU connector J2 pins 1 and 2.
4. Check for continuity between pins A and B of the Transmission Oil Temperature Sensor harness connector (see Figure 229).

   If continuity exists, go to test “Test 34 — Checking for a Short to Voltage in the TOT Sensor Signal Line” on page 194.

   If there is NO continuity, there is an open circuit in the harness. Locate and repair the open circuit.

Test 20 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

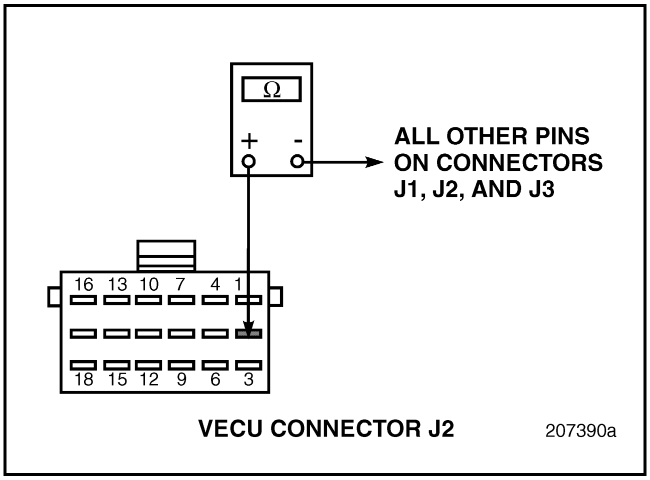


Figure 230

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 2 and all other pins in connectors J1, J2, and J3 (see Figure 230).

   If there is NO continuity between pin 2 and any other pin, go to test "Test 40 — Checking for a Damaged Harness Connector" on page 195.

   If continuity exists between pin 2 and any other pin, repair or replace the damaged connector and replace the Transmission Oil Temperature (TOT) Sensor.

Test 32 — Checking for an Open TOT Sensor Return Line

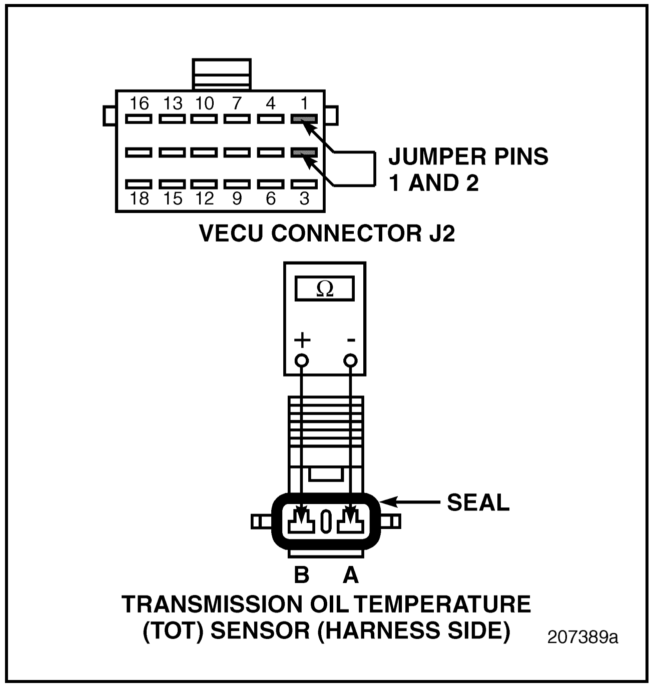


Figure 231

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
3. Install a jumper wire between VECU connector J2 pins 1 and 2.
4. Check for continuity between pins A and B of the Transmission Oil Temperature Sensor harness connector (see Figure 231).

   If continuity exists, go to test "Test 64 — Checking for a Damaged Vehicle Electronic Control Unit (VECU) Harness Connector" on page 195.

   If there is NO continuity, there is an open circuit in the harness. Locate and repair the open circuit.

SERVICE HINT

If blink codes 2-5 or 2-6 are also present, the open circuit is probably downstream from the sensor return line splice.

Test 33 — Checking for a Short to Voltage in the TOT Sensor Return Line

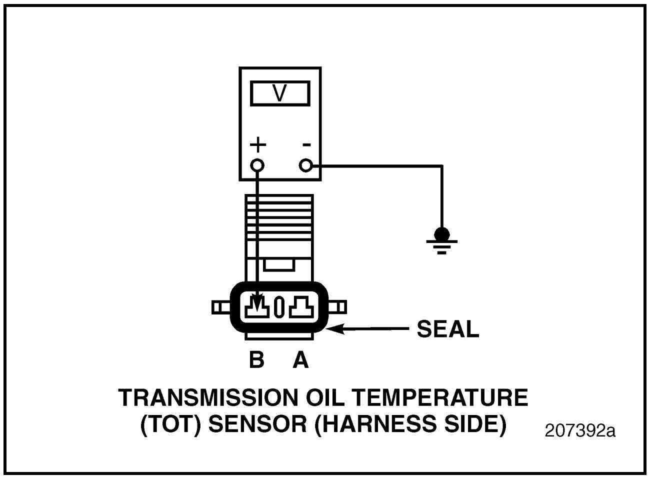


Figure 232

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
3. Install the Serial Link Jumper into the Serial Communications Port.
4. Disconnect the Transmission Oil Temperature (TOT) Sensor harness connector.
5. Measure the voltage between Transmission Oil Temperature (TOT) Sensor harness connector pin B and a good ground (see Figure 232).

   If the measured voltage is less than 0.3 volts, go to step 66.

   If the measured voltage is greater than 0.3 volts, locate and repair the short to voltage in the TOT Sensor return line, replace the Vehicle Electronic Control Unit (VECU), and retest the system.

Test 34 — Checking for a Short to Voltage in the TOT Sensor Signal Line

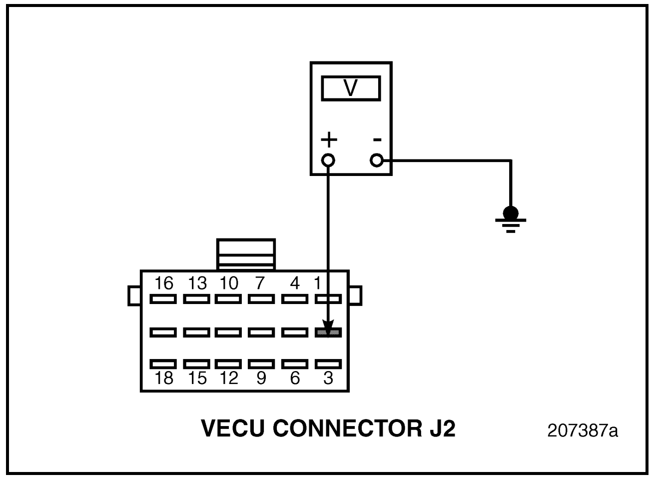


Figure 233

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
3. Disconnect the Transmission Oil Temperature (TOT) Sensor harness connector.
4. Install the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between Vehicle Electronic Control Unit (VECU) harness connector J2 pin 2 and a good ground (see Figure 233).

   If the measured voltage is less than 4.5 volts, go to step 68.

   If the measured voltage is greater than 5.5 volts, locate and repair the short to voltage in the TOT Sensor signal line.

Test 40 — Checking for a Damaged Harness Connector

1. Turn the ignition key OFF.
2. Visually inspect the Transmission Oil Temperature (TOT) Sensor harness connector for a short circuit between pins A and B.
3. Visually inspect Vehicle Electronic Control Unit (VECU) harness connector J2 for a short circuit between pin 2 and a 12 volt supply.

   If there is a repairable short circuit, repair the short circuit and replace the Transmission Oil Temperature (TOT) Sensor.

   If there is NO repairable short circuit, replace the Transmission Oil Temperature (TOT) Sensor and the Vehicle Electronic Control Unit (VECU). Retest the system.

Test 64 — Checking for a Damaged Vehicle Electronic Control Unit (VECU) Harness Connector

1. Turn the ignition key OFF.
2. Visually inspect Vehicle Electronic Control Unit (VECU) and harness connector J2 for an open circuit at pin 2.

   If there is a repairable open circuit, repair the open circuit.

   If there is NO repairable open circuit, replace the Vehicle Electronic Control Unit (VECU) or harness connector as needed.

Test 66 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

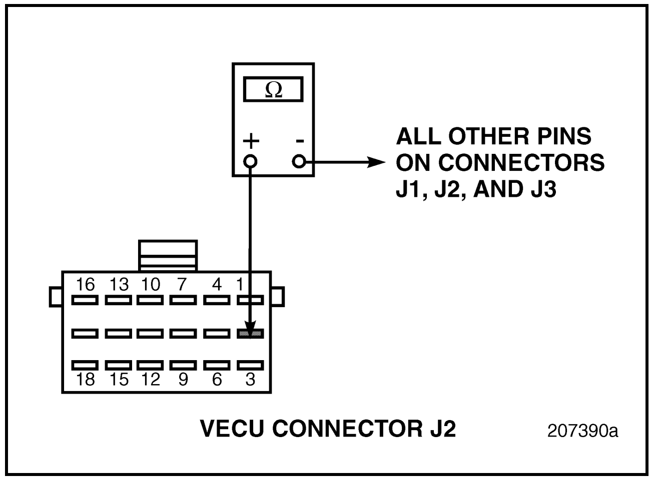


Figure 234

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 2 and all other pins in connectors J1, J2, and J3 (see Figure 234).

   If there is NO continuity between pin 2 and any other pin, replace the VECU and retest the system.

   If continuity exists between pin 2 and any other pin, repair or replace the damaged connector and replace the Vehicle Electronic Control Unit (VECU). Retest the system.

Test 68 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

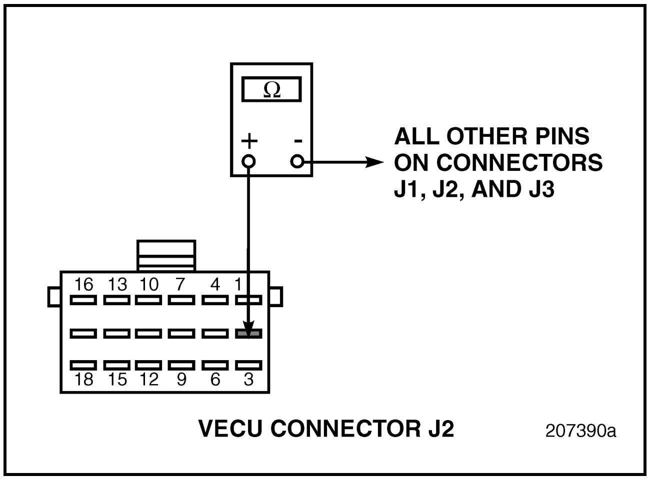


Figure 235

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 2 and all other pins in connectors J1, J2, and J3 (see Figure 235).

   If there is NO continuity between pin 2 and any other pin, go to test “Test 136 — Checking for a Defective VECU” on page 196.

   If continuity exists between pin 2 and any other pin, repair or replace the damaged connector.

Test 136 — Checking for a Defective VECU

1. Turn the Ignition key OFF.
2. Reconnect harness connectors J1, J2, and J3 to the Vehicle Electronic Control Unit (VECU).
3. Turn the Ignition key ON.

   If blink code 2-4 is still active, check the Vehicle Electronic Control Unit (VECU) connectors for dirt, and loose or broken pins. If no repairable damage is evident, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 2-4 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors for good connections.

BLINK CODE 2-5 — FRONT DRIVE AXLE OIL TEMPERATURE (FAOT) SENSOR

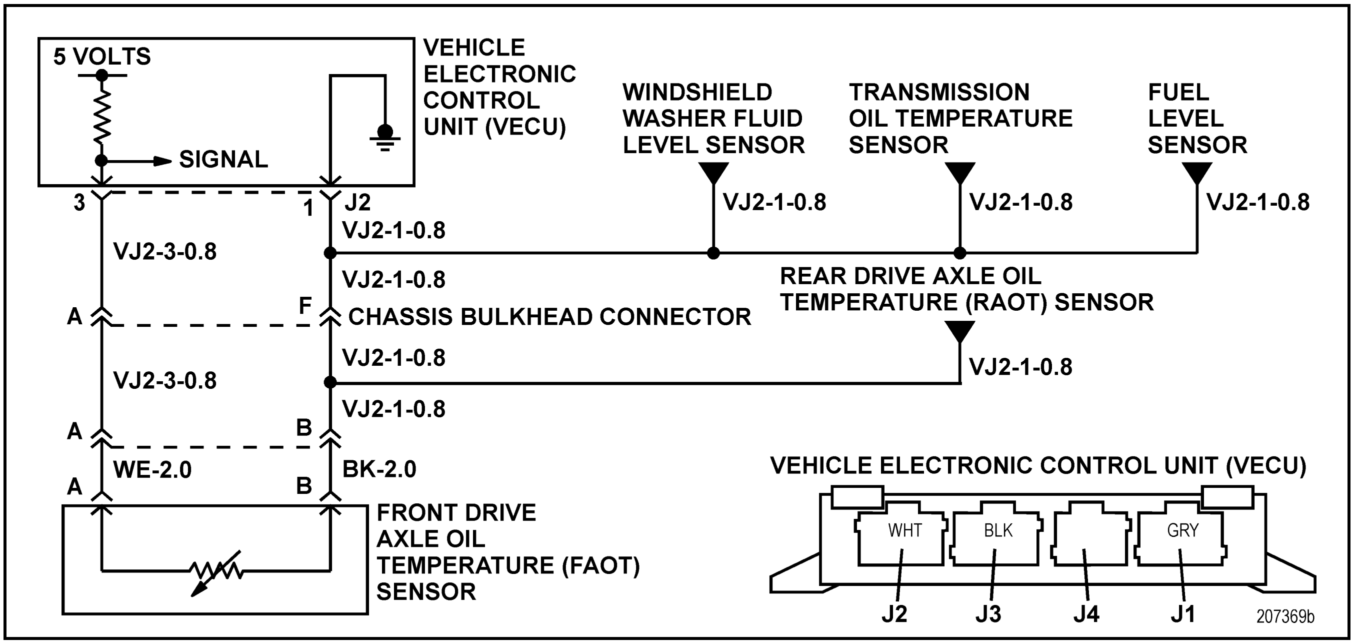


Figure 236 — Front Drive Axle Oil Temperature (FAOT) Sensor Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High/Open), 4 (Voltage Low)

Parameter Identification (PID): P77

Message Identification (MID): 142

Circuit Description: The Front Drive Axle Oil Temperature (FAOT) Sensor is a thermistor. The resistance of the FAOT Sensor changes inversely to the temperature of the front drive axle oil. When the front drive axle oil is cold, the sensor resistance is high. As the temperature of the front drive axle oil increases, the sensor resistance decreases. The Vehicle Electronic Control Unit (VECU) monitors the voltage drop across the FAOT Sensor and uses this signal to warn the driver and shut down the engine if the front drive axle oil temperature exceeds the programmed limit.

Location: The Front Drive Axle Oil Temperature (FAOT) Sensor is threaded into the front drive axle housing near the differential carrier.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-5 will set when the Vehicle Electronic Control Unit (VECU) senses that the FAOT Sensor signal voltage is less than 0.3 volts or greater than 4.4 volts for 2 seconds. If the FAOT Sensor voltage returns to between 0.3 volts and 4.4 volts for more than 2 seconds, the fault will become inactive. Code 2-5 will not set unless FAOT Sensor diagnostics are enabled in the VECU Mack Data area.

Normal FAOT Sensor Parameters: The Front Drive Axle Oil Temperature (FAOT) Sensor has a resistance of 6300 ohms at 32°F (0°C) and 250 ohms at 194°F (90°C).

NOTE

Blink code 2-5 is enabled and disabled in the Optional Data section of the Vehicle Electronic Control Unit (VECU) OEM Data area. If a Front Drive Axle Oil Temperature (FAOT) Sensor is NOT installed, contact Mack Trucks Service Engineering Division to have the blink code 2-5 disabled in the vehicle's chassis data file, then reprogram the VECU with the updated file.

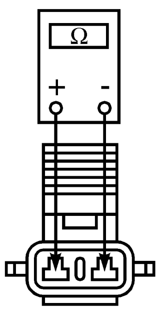
Test 1 — Checking for Code 2-5

1. Verify that code 2-5 is set.

   If code 2-5 is set, go to test "Test 2 — Checking the Sensor Resistance" on page 198.

   If code 2-5 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Front Drive Axle Oil Temperature (FAOT) Sensor connector and wires for poor connections.

Test 2 — Checking the Sensor Resistance



FRONT DRIVE AXLE OIL TEMPERATURE (FAOT) SENSOR (SENSOR SIDE) 207395a

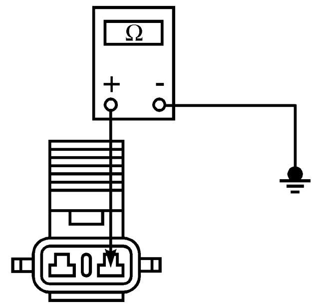
Figure 237

1. Turn the Ignition key OFF.
2. Disconnect the Front Drive Axle Oil Temperature (FAOT) Sensor harness connector.
3. Measure the resistance across the two terminals of the sensor with the front drive axle between 32°F (0°C) and 194°F (90°C) (see Figure 237).

   If the resistance is between 6300 and 250 ohms, go to test "Test 4 — Checking for a Short to Ground in the Sensor" on page 198.

   If the resistance is NOT between 6300 and 250 ohms, go to test "Test 5 — Checking for a Short Circuit to Voltage in the Signal Line" on page 199.

Test 4 — Checking for a Short to Ground in the Sensor



FRONT DRIVE AXLE OIL TEMPERATURE (FAOT) SENSOR (SENSOR SIDE) 207396a

Figure 238

1. Turn the ignition key OFF.
2. Disconnect the Front Drive Axle Oil Temperature (FAOT) Sensor connector.
3. Check for continuity between either pin of the FAOT Sensor and a good ground (see Figure 238).

   If there is continuity to ground, replace the FAOT Sensor.

   If there is NO continuity, go to test "Test 8 — Checking for Voltage on the FAOT Sensor Signal Line" on page 199.

Test 5 — Checking for a Short Circuit to Voltage in the Signal Line

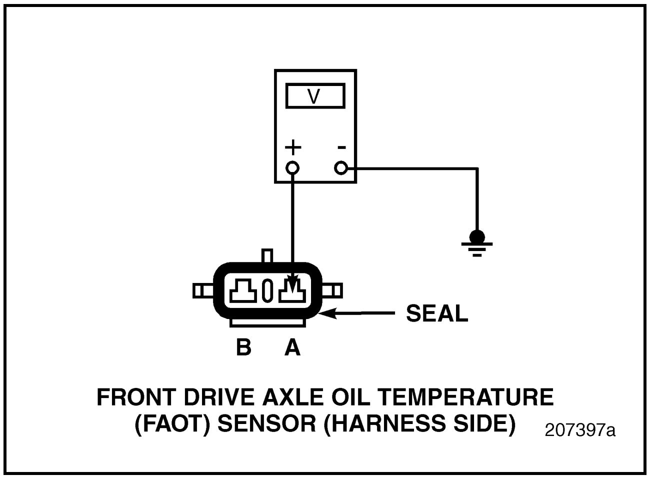


Figure 239

1. Turn the ignition key ON.
2. Measure the voltage between FAOT Sensor harness connector pin A and a good ground (see Figure 239).

   If the measured voltage is greater than 6 volts, go to test “Test 10 — Checking for a Short to Voltage in the Signal Line” on page 200.

   If the measured voltage is less than 6 volts, inspect the FAOT Sensor and the harness connector for a repairable short or open circuit. If there is NOT a repairable condition, replace the FAOT Sensor.

Test 8 — Checking for Voltage on the FAOT Sensor Signal Line

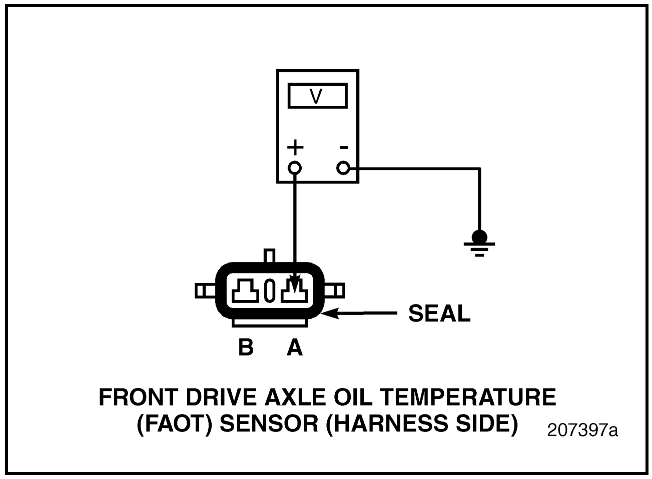


Figure 240

1. Turn the ignition key ON.
2. Disconnect the Front Drive Axle Oil Temperature (FAOT) Sensor connector.
3. Measure the voltage between FAOT Sensor harness connector pin A and a good ground (see Figure 240).

   If the measured voltage is between 4.5 and 5.5 volts, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 200.

   If the measured voltage is NOT between 4.5 and 5.5 volts, go to test “Test 17 — Checking for an Open Harness” on page 201.

Test 10 — Checking for a Short to Voltage in the Signal Line

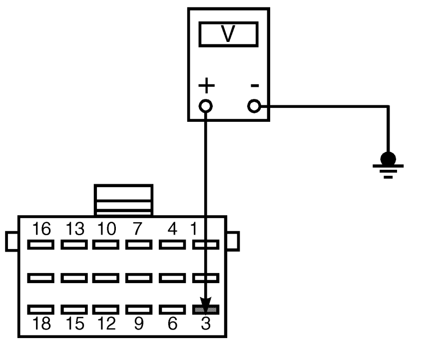


Figure 241

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2, and J3.
3. Install the Serial Link Jumper into the Serial Communications Port.
4. Measure the voltage between VECU connector J2 pin 3 and a good ground (see Figure 241).

   If no voltage is present, go to test "Test 20 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector" on page 201.

   If the measured voltage is greater than 6 volts, the FAOT Sensor signal line is shorted to voltage. Locate and repair the short circuit and then replace the FAOT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

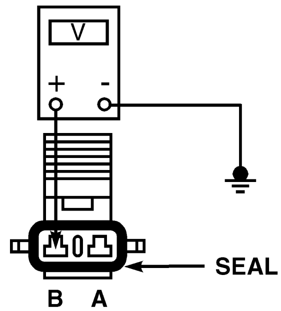


Figure 242

1. Turn the ignition key ON.
2. Disconnect the Front Drive Axle Oil Temperature (FAOT) Sensor connector.
3. Measure the voltage between FAOT Sensor harness connector pin B and a good ground (see Figure 242).

   If the measured voltage is less than 0.3 volts, go to test "Test 32 — Checking for an Open FAOT Sensor Return Line" on page 202.

   If the measured voltage is greater than 0.3 volts, go to test "Test 33 — Checking for a Short Circuit to Voltage in the FAOT Sensor Return Line" on page 202.

Test 17 — Checking for an Open Harness

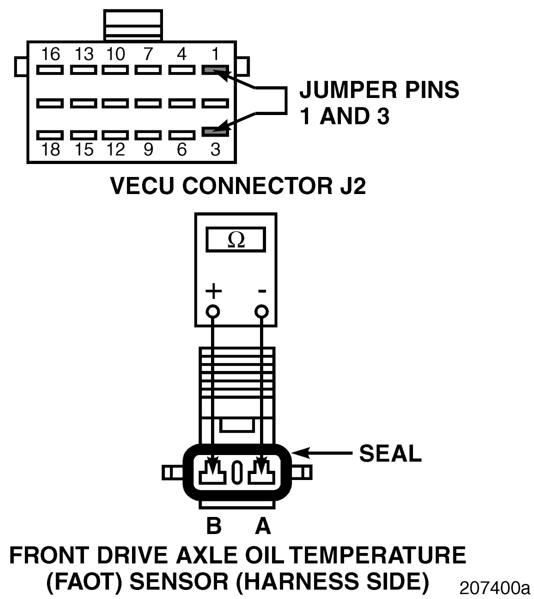


Figure 243

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
3. Install a jumper wire between VECU connector J2 pins 1 and 3.
4. Check for continuity between pins A and B of the Front Drive Axle Oil Temperature (FAOT) Sensor harness connector (see Figure 243).

   If continuity exists, go to test “Test 34 — Checking for a Short Circuit to Voltage in the FAOT Sensor Signal Line” on page 203.

   If there is NO continuity, there is an open circuit in the harness. Locate and repair the open circuit.

Test 20 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

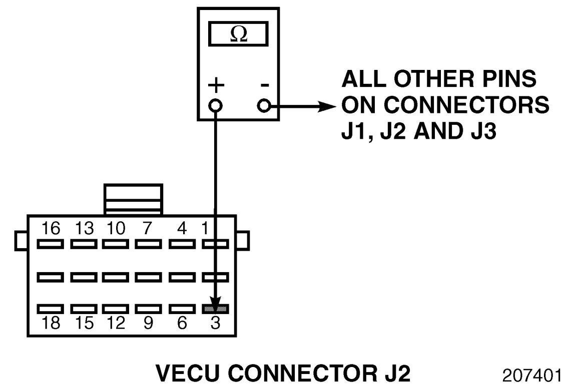


Figure 244

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 3 and all other pins in connectors J1, J2, and J3 (see Figure 244).

   If there is NO continuity between pin 3 and any other pin, go to test “Test 40 — Checking for a Damaged Harness Connector” on page 203.

   If continuity exists between pin 3 and any other pin, repair or replace the damaged connector and replace the Front Drive Axle Oil Temperature (FAOT) Sensor.

Test 32 — Checking for an Open FAOT Sensor Return Line

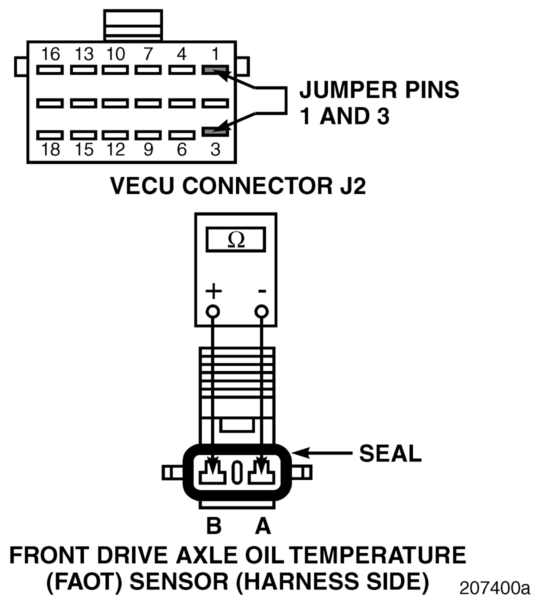


Figure 245

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
3. Install a jumper wire between VECU connector J2 pins 1 and 3.
4. Check for continuity between pins A and B of the Front Drive Axle Oil Temperature (FAOT) Sensor harness connector (see Figure 245).

   If continuity exists, go to test "Test 64 — Checking for a Damaged Vehicle Electronic Control Unit (VECU) Harness Connector" on page 203.

   If there is NO continuity, there is an open circuit in the harness. Locate and repair the open circuit.

S E R V I C E H I N T

If blink codes 2-4 or 2-6 are also present, the open circuit is probably downstream from the sensor return line splice.

Test 33 — Checking for a Short Circuit to Voltage in the FAOT Sensor Return Line

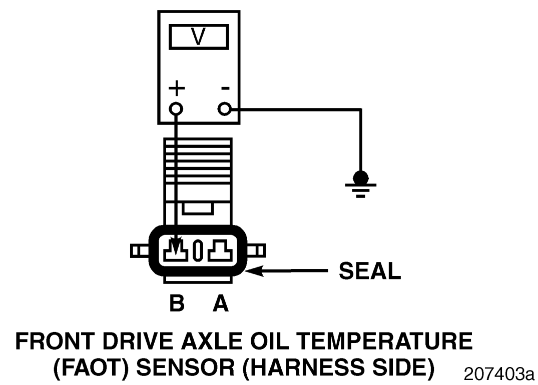


Figure 246

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
3. Install the Serial Link Jumper into the Serial Communications Port.
4. Disconnect the Front Drive Axle Oil Temperature (FAOT) Sensor harness connector.
5. Measure the voltage between Front Drive Axle Oil Temperature (FAOT) Sensor harness connector pin B and a good ground (see Figure 246).

   If the measured voltage is less than 0.3 volts, go to step 66.

   If the measured voltage is greater than 0.3 volts, locate and repair the short to voltage in the FAOT Sensor return line, replace the Vehicle Electronic Control Unit (VECU), and retest the system.

Test 34 — Checking for a Short Circuit to Voltage in the FAOT Sensor Signal Line

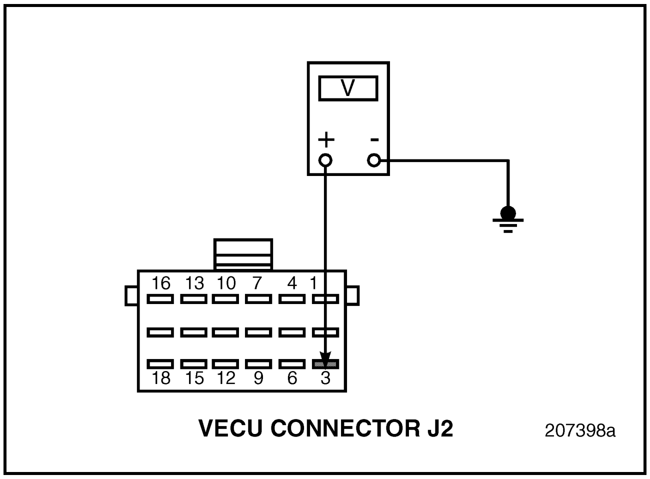


Figure 247

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
3. Disconnect the Front Drive Axle Oil Temperature (FAOT) Sensor harness connector.
4. Install the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between Vehicle Electronic Control Unit (VECU) harness connector J2 pin 3 and a good ground (see Figure 247).

   If the measured voltage is less than 4.5 volts, go to step 68.

   If the measured voltage is greater than 5.5 volts, locate and repair the short to voltage in the FAOT Sensor signal line.

Test 40 — Checking for a Damaged Harness Connector

1. Turn the ignition key OFF.
2. Visually inspect the Front Drive Axle Oil Temperature (FAOT) Sensor harness connector for a short circuit between pins A and B.
3. Visually inspect Vehicle Electronic Control Unit (VECU) harness connector J2 for a short circuit between pin 3 and a 12 volt supply.

   If there is a repairable short circuit, repair the short circuit and replace the Front Drive Axle Oil Temperature (FAOT) Sensor.

   If there is NO repairable short circuit, replace the Front Drive Axle Oil Temperature (FAOT) Sensor and the Vehicle Electronic Control Unit (VECU). Retest the system.

Test 64 — Checking for a Damaged Vehicle Electronic Control Unit (VECU) Harness Connector

1. Turn the ignition key OFF.
2. Visually inspect Vehicle Electronic Control Unit (VECU) and harness connector J2 for an open circuit at pin 3.

   If there is a repairable open circuit, repair the open circuit.

   If there is NO repairable open circuit, replace the Vehicle Electronic Control Unit (VECU) or harness connector as needed.

Test 66 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

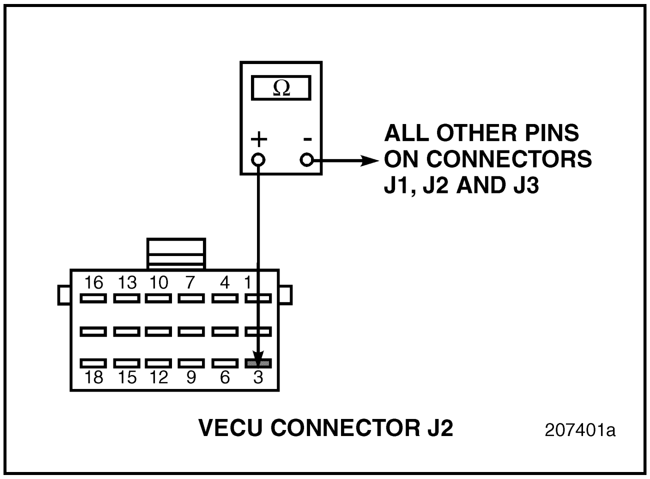


Figure 248

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 3 and all other pins in connectors J1, J2, and J3 (see Figure 248).

   If there is NO continuity between pin 3 and any other pin, replace the VECU and retest the system.

   If continuity exists between pin 3 and any other pin, repair or replace the damaged connector and replace the Vehicle Electronic Control Unit (VECU). Retest the system.

Test 68 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

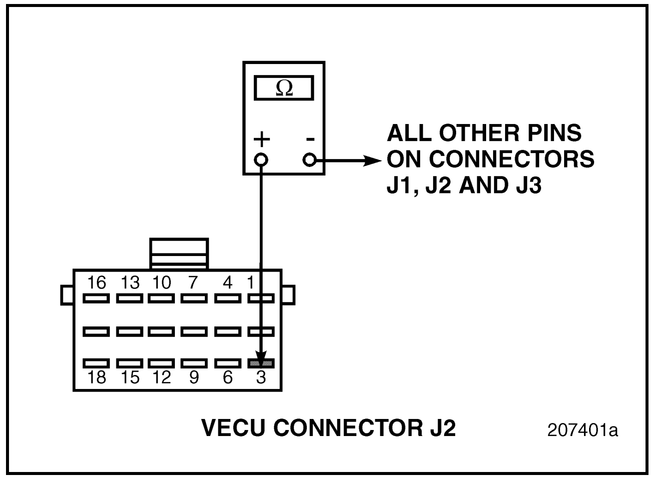


Figure 249

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 3 and all other pins in connectors J1, J2, and J3 (see Figure 249).

   If there is NO continuity between pin 3 and any other pin, go to test “Test 136 — Checking for a Defective VECU” on page 205.

   If continuity exists between pin 3 and any other pin, repair or replace the damaged connector.

Test 136 — Checking for a Defective VECU

1. Turn the Ignition key OFF.
2. Reconnect harness connectors J1, J2, and J3 to the Vehicle Electronic Control Unit (VECU).
3. Turn the Ignition key ON.

   If blink code 2-5 is still active, check the Vehicle Electronic Control Unit (VECU) connectors for dirt, and loose or broken pins. If no repairable damage is evident, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 2-5 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors for good connections.

BLINK CODE 2-6 — REAR DRIVE AXLE OIL TEMPERATURE (RAOT) SENSOR

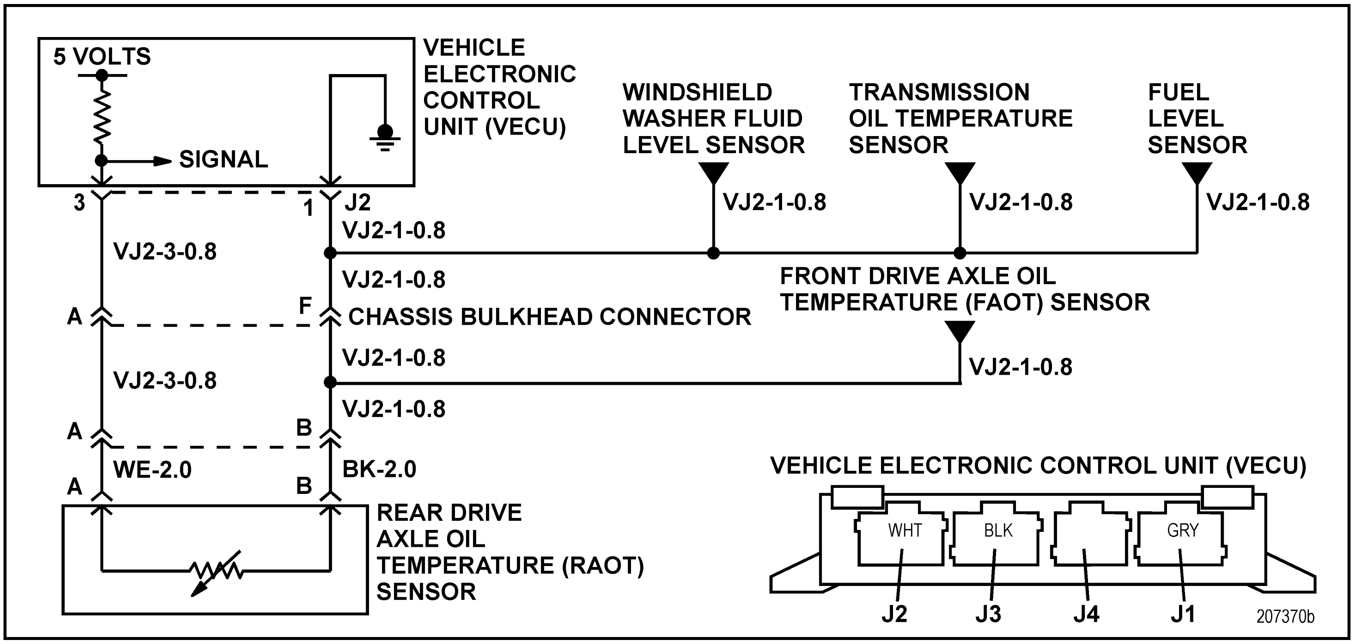


Figure 250 — Rear Drive Axle Oil Temperature (RAOT) Sensor Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High/Open), 4 (Voltage Low)

Parameter Identification (PID): P78

Message Identification (MID): 142

Circuit Description: The Rear Drive Axle Oil Temperature (RAOT) Sensor is a thermistor. The resistance of the RAOT Sensor changes inversely to the temperature of the rear drive axle oil. When the rear drive axle oil is cold, the sensor resistance is high. As the temperature of the rear drive axle oil increases, the sensor resistance decreases. The Vehicle Electronic Control Unit (VECU) monitors the voltage drop across the RAOT Sensor and uses this signal to warn the driver and/or shut down the engine if the rear drive axle oil temperature exceeds the programmed limit.

Location: The Rear Drive Axle Oil Temperature (RAOT) Sensor is threaded into the rear drive axle housing near the differential carrier.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-6 will set when the Vehicle Electronic Control Unit (VECU) senses that the RAOT Sensor signal voltage is less than 0.3 volts or greater than 4.4 volts for 2 seconds. If the RAOT Sensor voltage returns to between 0.3 volts and 4.4 volts for more than 2 seconds, the fault will become inactive. Code 2-6 will not set unless RAOT Sensor diagnostics are enabled in the VECU Mack Data area.

Normal RAOT Sensor Parameters: The Rear Drive Axle Oil Temperature (RAOT) Sensor has a resistance of 6300 ohms at 32°F (0°C) and 250 ohms at 194°F (90°C).

NOTE

Blink code 2-6 can be enabled and disabled in the Optional Data section of the Vehicle Electronic Control Unit (VECU) OEM Data area. If a Rear Drive Axle Oil Temperature (RAOT) Sensor is NOT installed, contact Mack Trucks Service Engineering Division to have the blink code 2-6 disabled in the vehicle's chassis data file, then reprogram the VECU with the updated file.

Test 1 — Checking for Code 2-6

1. Verify that code 2-6 is set.

   If code 2-6 is set, go to test "Test 2 — Checking the Sensor Resistance" on page 207.

   If code 2-6 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Rear Drive Axle Oil Temperature (RAOT) Sensor connector and wires for poor connections.

Test 2 — Checking the Sensor Resistance

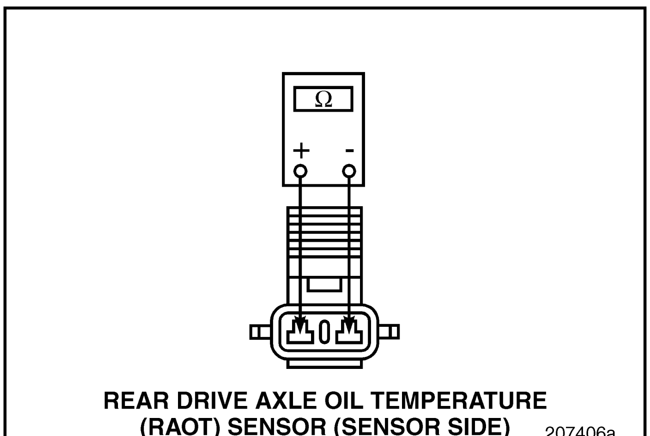


Figure 251

1. Turn the Ignition key OFF.
2. Disconnect the Rear Drive Axle Oil Temperature (RAOT) Sensor harness connector.
3. Measure the resistance across the two terminals of the sensor with the rear drive axle between 32° and 194°F (0° and 90°C) (see Figure 251).

   If the resistance is between 6300 and 250 ohms, go to test "Test 4 — Checking for a Short to Ground in the Sensor" on page 207.

   If the resistance is NOT between 6300 and 250 ohms, go to test "Test 5 — Checking for a Short to Voltage in the Signal Line" on page 208.

Test 4 — Checking for a Short to Ground in the Sensor

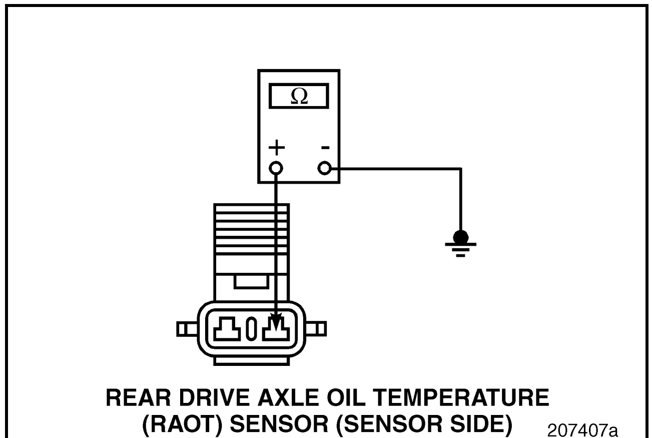


Figure 252

1. Turn the ignition key OFF.
2. Disconnect the Rear Drive Axle Oil Temperature (RAOT) Sensor connector.
3. Check for continuity from either pin of the RAOT Sensor to a good ground (see Figure 252).

   If there is continuity to ground, replace the RAOT Sensor.

   If there is NO continuity, go to test "Test 8 — Checking Voltage on the RAOT Sensor Signal Line" on page 208.

Test 5 — Checking for a Short to Voltage in the Signal Line

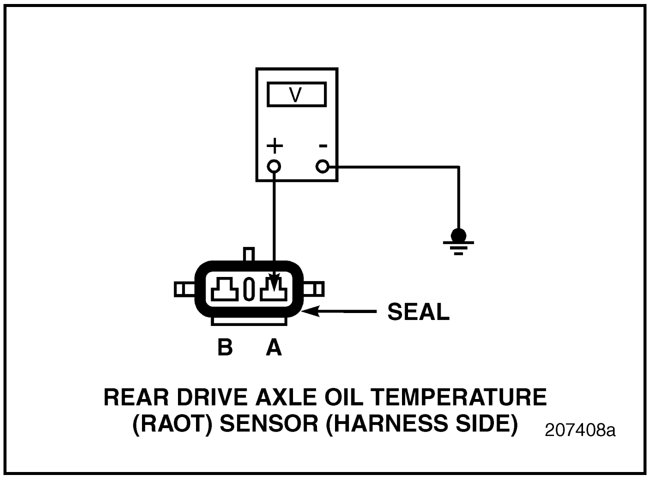


Figure 253

1. Turn the ignition key ON.
2. Measure the voltage between RAOT Sensor harness connector pin A and a good ground (see Figure 253).

   If the measured voltage is greater than 6 volts, go to test “Test 10 — Checking for a Short Circuit to Voltage in the Signal Line” on page 209.

   If the measured voltage is less than 6 volts, inspect the RAOT Sensor and the harness connector for a repairable short or open circuit. If there is NOT a repairable condition, replace the RAOT Sensor.

Test 8 — Checking Voltage on the RAOT Sensor Signal Line

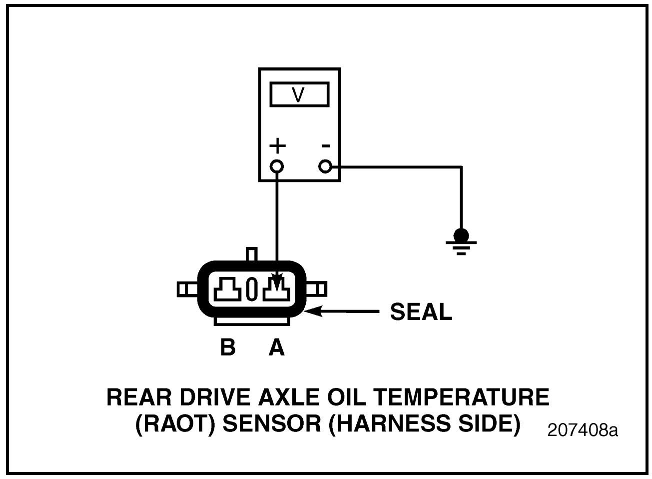


Figure 254

1. Turn the ignition key ON.
2. Disconnect the Rear Drive Axle Oil Temperature (RAOT) Sensor connector.
3. Measure the voltage between RAOT Sensor harness connector pin A and a good ground (see Figure 254).

   If the measured voltage is between 4.5 and 5.5 volts, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 209.

   If the measured voltage is NOT between 4.5 and 5.5 volts, go to test “Test 17 — Checking for an Open Harness” on page 210.

Test 10 — Checking for a Short Circuit to Voltage in the Signal Line

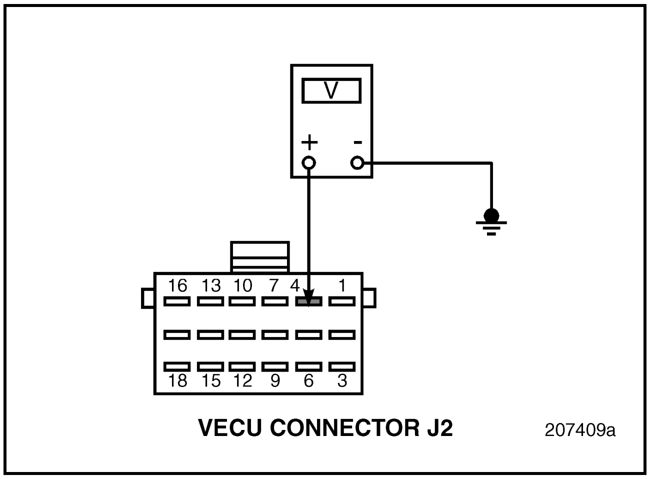


Figure 255

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2, and J3.
3. Install the Serial Link Jumper into the Serial Communications Port.
4. Measure the voltage between VECU connector J2 pin 4 and a good ground (see Figure 255).

   If NO voltage is present, go to test "Test 20 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector" on page 210.

   If the measured voltage is greater than 6 volts, the RAOT Sensor signal line is shorted to voltage. Locate and repair the short circuit and then replace the RAOT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

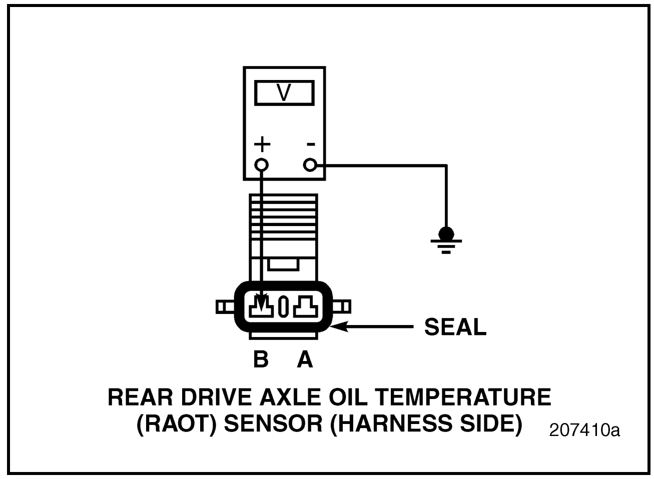


Figure 256

1. Turn the ignition key ON.
2. Disconnect the Rear Drive Axle Oil Temperature (RAOT) Sensor connector.
3. Measure the voltage between RAOT Sensor harness connector pin B and a good ground (see Figure 256).

   If the measured voltage is less than 0.3 volts, go to test "Test 32 — Checking for an Open RAOT Sensor Return Line" on page 211.

   If the measured voltage is greater than 0.3 volts, go to test "Test 33 — Checking for a Short Circuit to Voltage in the RAOT Sensor Return Line" on page 211.

Test 17 — Checking for an Open Harness

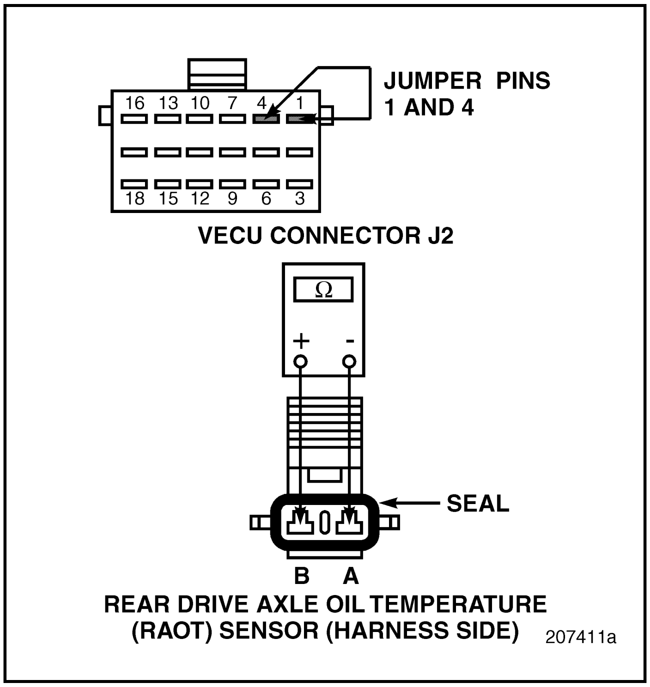


Figure 257

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
3. Install a jumper wire between VECU connector J2 pins 1 and 4.
4. Check for continuity between pins A and B of the Rear Drive Axle Oil Temperature (RAOT) Sensor harness connector (see Figure 257).

   If continuity exists, go to test "Test 34 — Checking for a Short to Voltage in the RAOT Sensor Signal Line" on page 212.

   If there is NO continuity, there is an open circuit in the harness. Locate and repair the open circuit.

Test 20 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

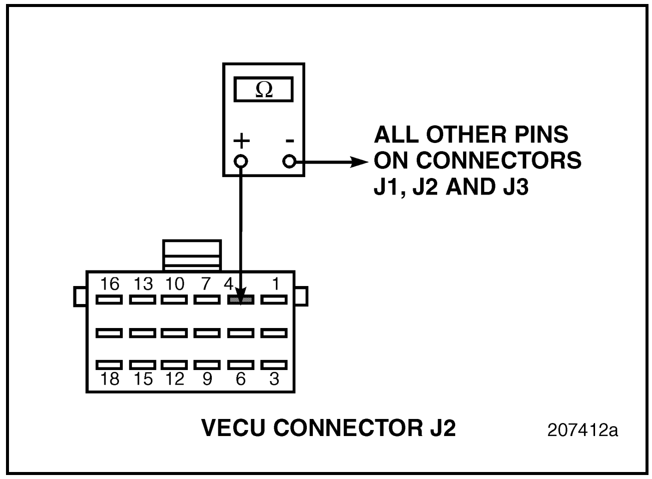


Figure 258

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 4 and all other pins in connectors J1, J2, and J3 (see Figure 258).

   If there is NO continuity between pin 4 and any other pin, go to test "Test 40 — Checking for a Damaged Harness Connector" on page 212.

   If continuity exists between pin 4 and any other pin, repair or replace the damaged connector and replace the Rear Drive Axle Oil Temperature (RAOT) Sensor.

Test 32 — Checking for an Open RAOT Sensor Return Line

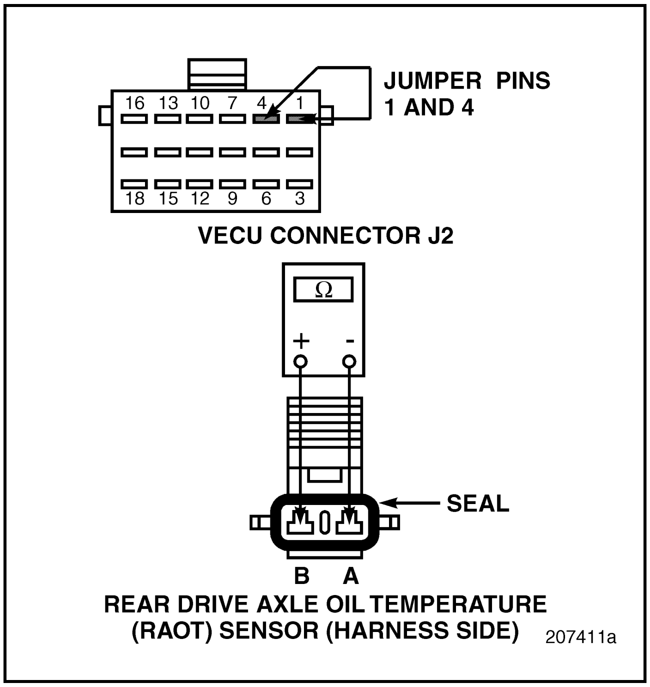


Figure 259

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
3. Install a jumper wire between VECU connector J2 pins 1 and 4.
4. Check for continuity between pins A and B of the Rear Drive Axle Oil Temperature Sensor harness connector (see Figure 259).

   If continuity exists, go to test "Test 64 — Checking for a Damaged Vehicle Electronic Control Unit (VECU) Harness Connector" on page 212.

   If there is NO continuity, there is an open circuit in the harness. Locate and repair the open circuit.

S E R V I C E   H I N T

If blink codes 2-4 or 2-5 are also present, the open circuit is probably downstream from the sensor return line splice.

Test 33 — Checking for a Short Circuit to Voltage in the RAOT Sensor Return Line

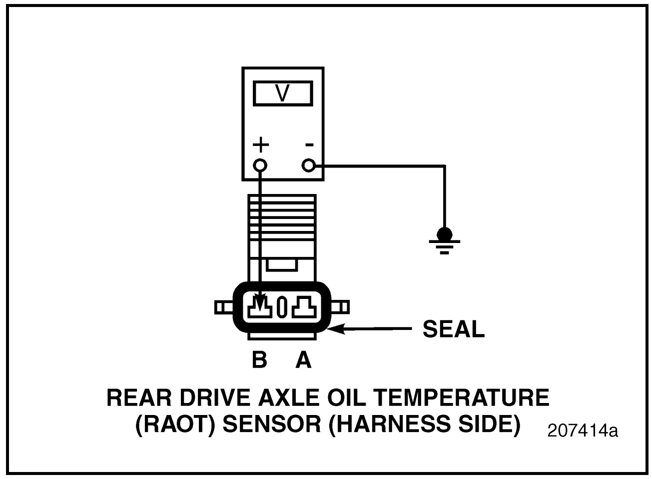


Figure 260

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
3. Install the Serial Link Jumper into the Serial Communications Port.
4. Disconnect the Rear Drive Axle Oil Temperature (RAOT) Sensor harness connector.
5. Measure the voltage between Rear Drive Axle Oil Temperature (RAOT) Sensor harness connector pin B and a good ground (see Figure 260).

   If the measured voltage is less than 0.3 volts, go to step 66.

   If the measured voltage is greater than 0.3 volts, locate and repair the short to voltage in the RAOT Sensor return line, replace the Vehicle Electronic Control Unit (VECU), and retest the system.

Test 34 — Checking for a Short to Voltage in the RAOT Sensor Signal Line

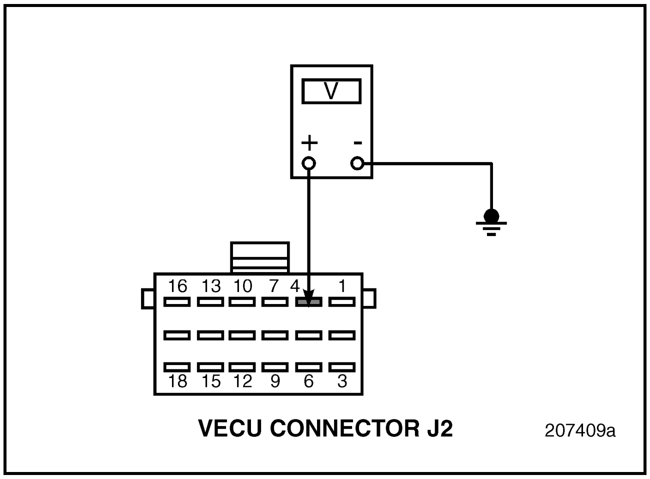


Figure 261

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
3. Disconnect the Rear Drive Axle Oil Temperature (RAOT) Sensor harness connector.
4. Install the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between Vehicle Electronic Control Unit (VECU) harness connector J2 pin 4 and a good ground (see Figure 261).

   If the measured voltage is less than 4.5 volts, go to step 68.

   If the measured voltage is greater than 5.5 volts, locate and repair the short to voltage in the RAOT Sensor signal line.

Test 40 — Checking for a Damaged Harness Connector

1. Turn the ignition key OFF.
2. Visually inspect the Rear Drive Axle Oil Temperature (RAOT) Sensor harness connector for a short circuit between pins A and B.
3. Visually inspect Vehicle Electronic Control Unit (VECU) harness connector J2 for a short circuit between pin 4 and a 12 volt supply.

   If there is a repairable short circuit, repair the short circuit and replace the Rear Drive Axle Oil Temperature (RAOT) Sensor.

   If there is NO repairable short circuit, replace the Rear Drive Axle Oil Temperature (RAOT) Sensor and the Vehicle Electronic Control Unit (VECU). Retest the system.

Test 64 — Checking for a Damaged Vehicle Electronic Control Unit (VECU) Harness Connector

1. Turn the ignition key OFF.
2. Visually inspect the Vehicle Electronic Control Unit (VECU) and harness connector J2 for an open circuit at pin 4.

   If there is a repairable open circuit, repair the open circuit.

   If there is NO repairable open circuit, replace the Vehicle Electronic Control Unit (VECU) or harness connector as needed.

Test 66 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

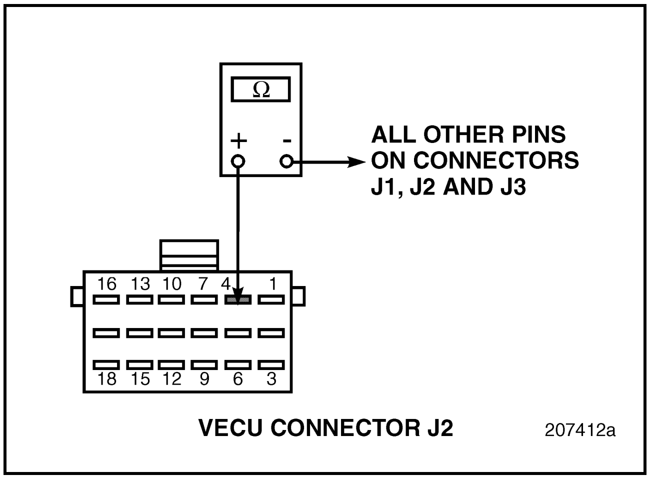


Figure 262

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 4 and all other pins in connectors J1, J2, and J3 (see Figure 262).

   If there is NO continuity between pin 4 and any other pin, replace the VECU and retest the system.

   If continuity exists between pin 4 and any other pin, repair or replace the damaged connector and replace the Vehicle Electronic Control Unit (VECU). Retest the system.

Test 68 — Checking for a Pin to Pin Short in the Vehicle Electronic Control Unit (VECU) Harness Connector

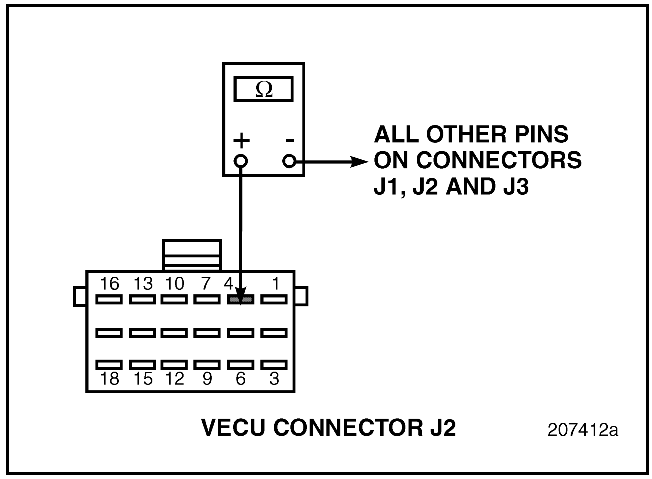


Figure 263

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper from the Serial Communications Port.
3. Disconnect connectors J1, J2, and J3 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 4 and all other pins in connectors J1, J2, and J3 (see Figure 263).

   If there is NO continuity between pin 4 and any other pin, go to test “Test 136 — Checking for a Defective VECU” on page 214.

   If continuity exists between pin 4 and any other pin, repair or replace the damaged connector.

Test 136 — Checking for a Defective VECU

1. Turn the Ignition key OFF.
2. Reconnect harness connectors J1, J2, and J3 to the Vehicle Electronic Control Unit (VECU).
3. Turn the Ignition key ON.

   If blink code 2-6 is still active, check the Vehicle Electronic Control Unit (VECU) connectors for dirt, and loose or broken pins. If no repairable damage is evident, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 2-6 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors for good connections.

BLINK CODE 2-7 — ENGINE OIL TEMPERATURE (EOT) SENSOR (ASET™ IEGR ENGINE)

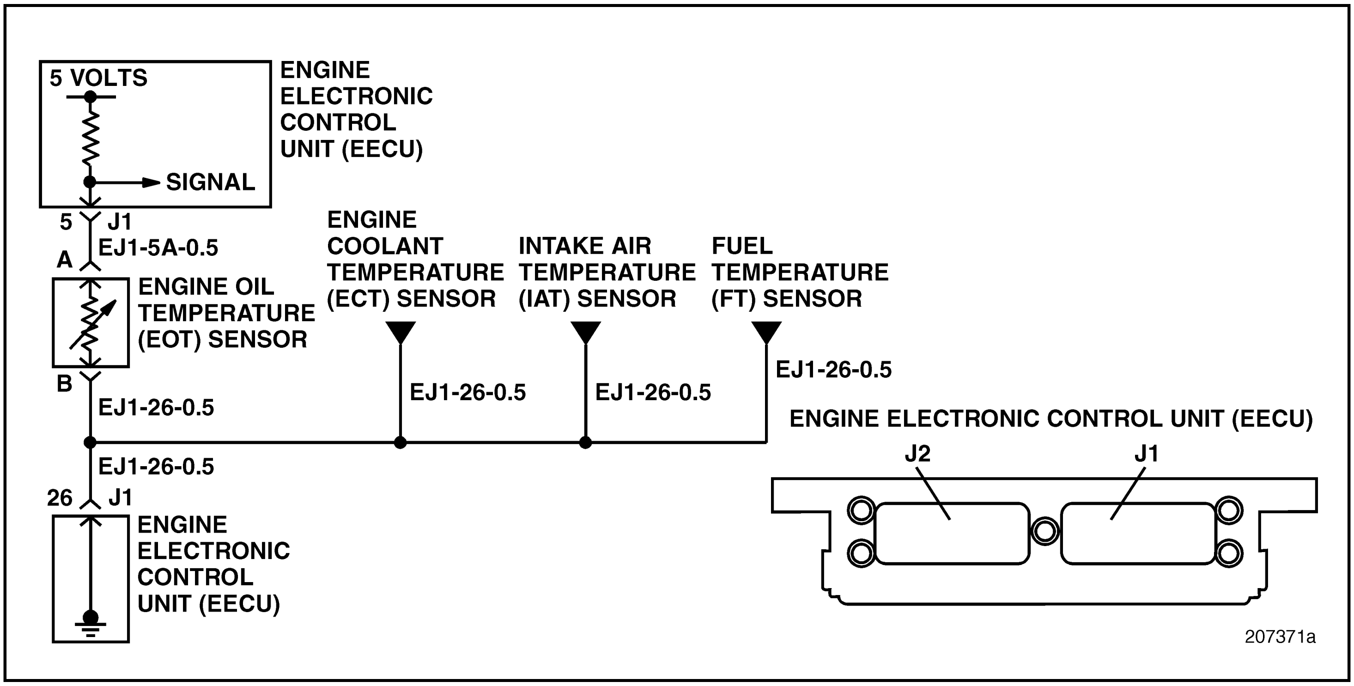


Figure 264 — Engine Oil Temperature (EOT) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): 175

Message Identification (MID): 128

Circuit Description: The Engine Oil Temperature (EOT) Sensor is a thermistor. The resistance of the EOT Sensor changes inversely to the temperature of the engine oil. When the engine oil is cold, the sensor resistance is high. As the temperature of the engine oil increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the EOT Sensor and uses this signal to warn the driver and evoke engine shutdown if the signal is not within programmed limits.

Location: The Engine Oil Temperature Sensor is located on the oil filter pedestal, above the Engine Oil Pressure Sensor.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-7 will set when the Engine Electronic Control Unit (EECU) senses that the EOT Sensor signal voltage is less than 0.5 volts or greater than 4.5 volts for 1 second. If the EOT Sensor voltage returns to between 0.5 volts and 4.5 volts for more than 1 second, the fault will become inactive.

Normal EOT Sensor Parameters: The Engine Oil Temperature (EOT) Sensor has a resistance between 5500 ohms at 32°F (0°C) and 267 ohms at 194°F (90°C).

NOTE

Blink code 2-7 can be enabled and disabled in the Customer Data area of the Engine Electronic Control Unit (EECU).

Test 1 — Checking for Code 2-7

1. Verify that code 2-7 is set.

   If code 2-7 is set, go to test "Test 2 — Checking Code 2-7 Failure Mode Identifier (FMI)" on page 216.

   If code 2-7 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Oil Temperature (EOT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-7 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test "Test 4 — Checking for Other Blink Codes" on page 216.

   If the FMI is 4 (voltage low), go to test "Test 5 — Checking for a Short Circuit to Ground in the Sensor" on page 216.

Test 4 — Checking for Other Blink Codes

1. Is code 1-3, 2-1, or 2-3 also set?

   If code 1-3, 2-1, or 2-3 is also set, go to test "Test 8 — Checking for an Open EOT Sensor Return Line" on page 217.

   If only code 2-7 is set, go to test "Test 9 — Checking Sensor Resistance" on page 217.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

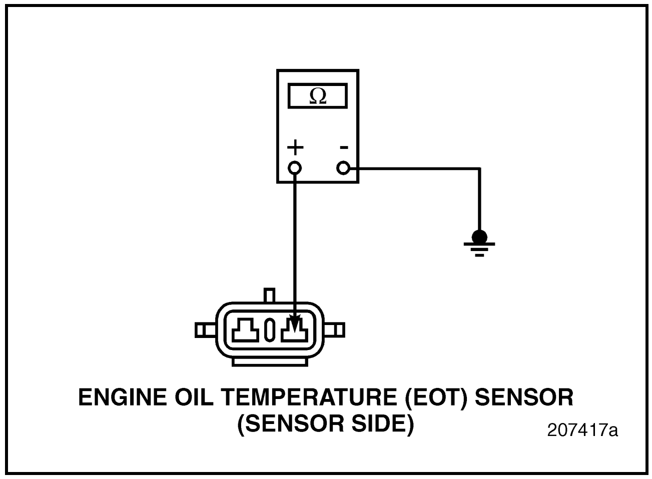


Figure 265

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor connector.
3. Check for continuity between either pin of the EOT Sensor and a good ground (see Figure 265).

   If continuity exists, replace the EOT Sensor.

   If there is NO continuity, go to test "Test 10 — Checking Sensor Resistance" on page 218.

Test 8 — Checking for an Open EOT Sensor Return Line

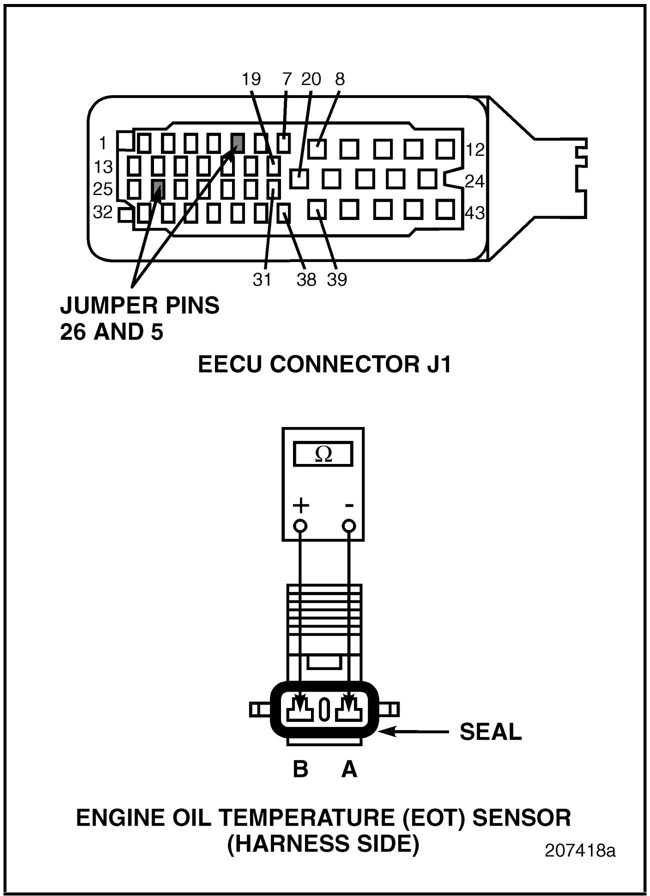


Figure 266

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor harness connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between connector J1 pins 5 and 26 of the EECU harness connector (see Figure 266).
5. Check for continuity between pins A and B of the EOT Sensor harness connector.

   If continuity exists, go to test "Test 16 — Checking for Voltage on the Sensor Return Line" on page 218.

   If there is NO continuity, there is an open in the ground circuit in the harness between the common ground splice of the sensors and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

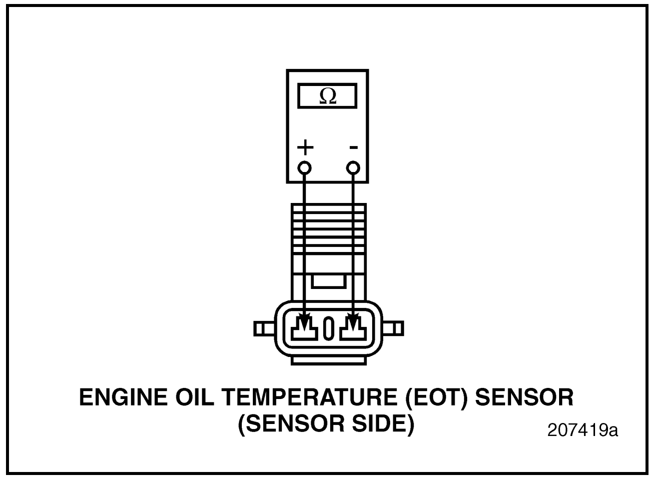


Figure 267

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor connector.
3. Measure the resistance across the pins of the EOT Sensor with the engine oil temperature between 32° and 194°F (0° and 90°C) (see Figure 267).

   If the resistance of the sensor is between 9300 and 200 ohms or if the resistance is infinite (open circuit), go to test "Test 18 — Checking Signal Line Voltage" on page 219.

   If the resistance of the sensor is not within normal operating parameters (9300 to 200 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

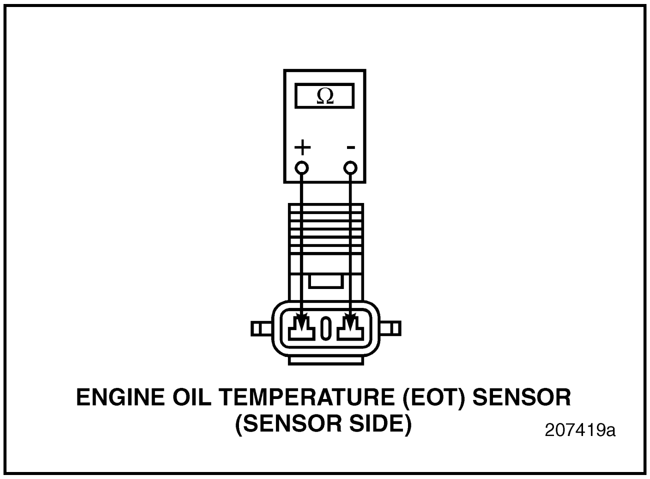


Figure 268

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Measure the resistance across the pins of the EOT Sensor with the engine oil temperature between 32° and 194°F (0° and 90°C) (see Figure 268).

   If the resistance is between 9300 and 200 ohms (64MT2107 EOT Sensor) or 5500 and 267 ohms (64MT2113 EOT Sensor) respectively, go to test "Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the EOT Sensor" on page 219.

   If the resistance is less than 200 ohms, replace the EOT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

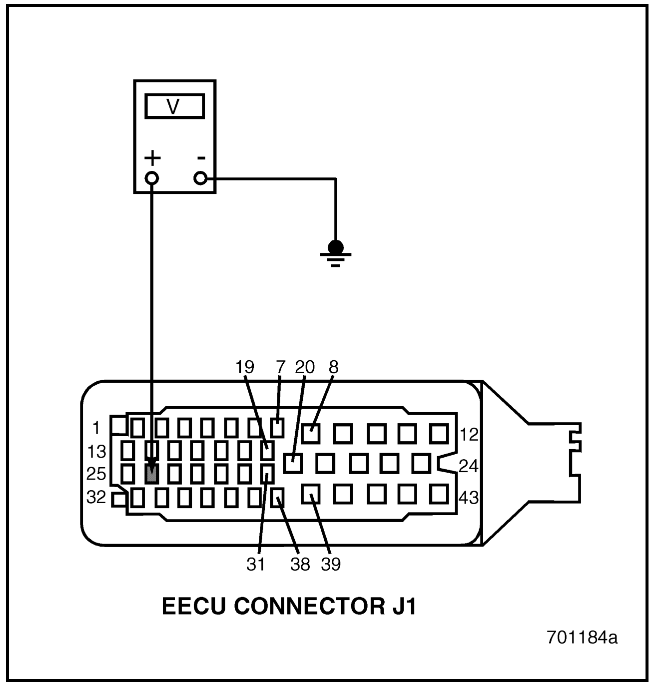


Figure 269

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Measure the voltage between EECU connector J1 pin 26 and a good ground (see Figure 269).

   If there is less than 0.5 volts present, go to test "Test 32 — Checking the EECU Connector for an Open EOT Sensor Return Line" on page 220.

   If there is greater than 0.5 volts present, there is a short circuit to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking Signal Line Voltage

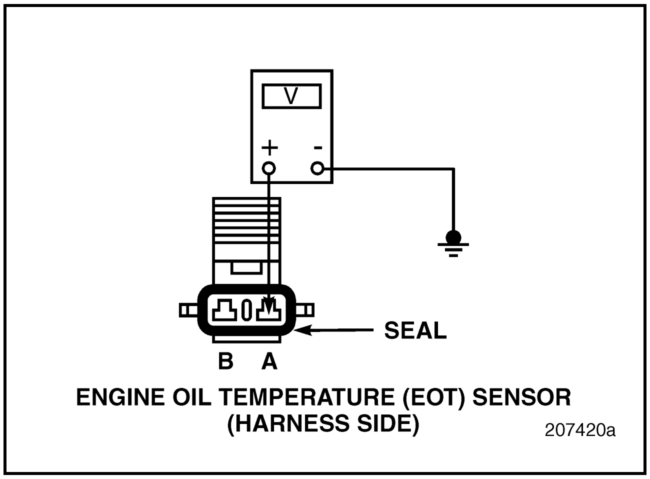


Figure 270

1. Disconnect the EOT Sensor harness connector.
2. Turn the ignition key ON.
3. Measure voltage between EOT Sensor harness connector pin A and a good ground (see Figure 270).

   If the measured voltage is greater than 6 volts, the EOT Sensor signal line is shorted to voltage; go to test "Test 36 — Checking for a Short to Voltage on the Sensor Signal Line" on page 220.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the EOT Sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 9, go to test "Test 37 — Checking for an Open EOT Sensor Signal Line" on page 220.

Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the EOT Sensor

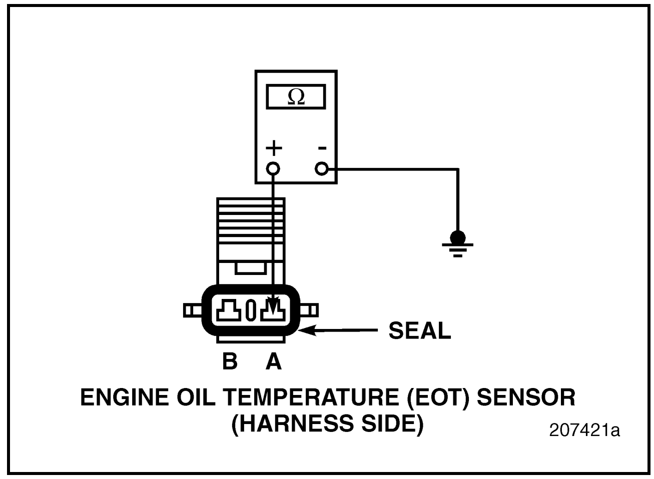


Figure 271

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin A of the EOT Sensor harness connector and a good ground (see Figure 271).

   If continuity exists between pin A and ground, go to test "Test 40 — Checking for a Pin to Pin Short in the Harness" on page 221.

   If there is NO continuity, go to test "Test 41 — Checking for Proper Supply Voltage to the EOT Sensor" on page 221.

Test 32 — Checking the EECU Connector for an Open EOT Sensor Return Line

1. Visually inspect EECU harness connector J1 pin 26 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pin 26. Gently push the test lead into the harness connector pin and check for looseness.

   If a repairable open is found or the pin feels loose, repair the EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pin 26, go to test "Test 64 — Checking for Blink Code 2-7" on page 222.

Test 36 — Checking for a Short to Voltage on the Sensor Signal Line

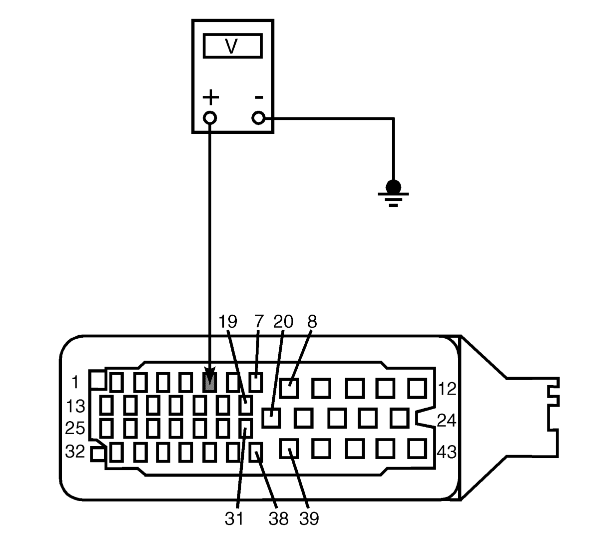


Figure 272

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect connector J1 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J1 pin 5 and a good ground (see Figure 272).

   If there is NO voltage indicated, go to test "Test 72 — Checking for a Short at the EECU Connector" on page 222.

   If voltage is present, go to test "Test 73 — Checking for a Pin to Pin Short Circuit in the Harness" on page 222.

Test 37 — Checking for an Open EOT Sensor Signal Line

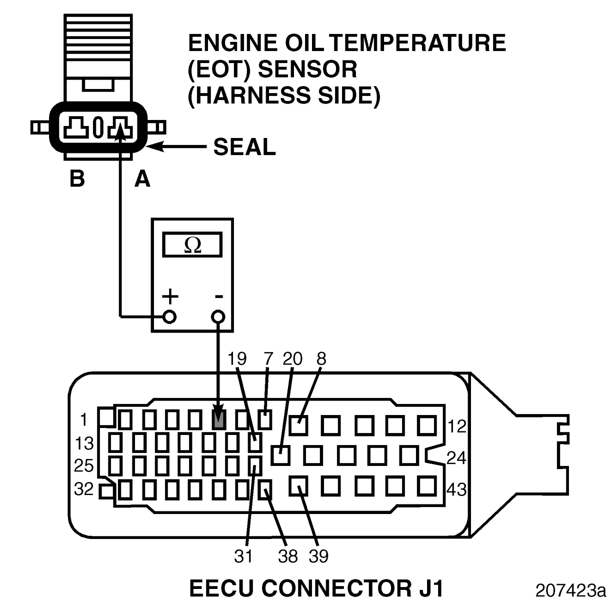


Figure 273

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect EECU connector J1.
4. Check for continuity between pin A of the EOT Sensor harness connector and EECU harness connector J1 pin 5 (see Figure 273).

   If there is NO continuity, locate and repair the open in the signal circuit between the EOT Sensor harness connector and EECU harness connector J1 pin 5.

   If continuity exists, go to test "Test 74 — Checking for an Open EOT Sensor Return Circuit" on page 223.

Test 40 — Checking for a Pin to Pin Short in the Harness

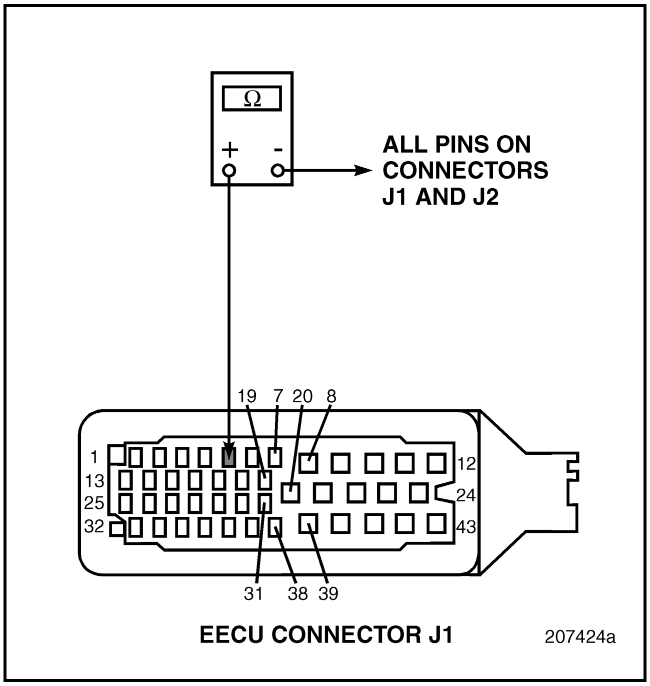


Figure 274

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect EECU connector J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 5 and all other pins on EECU connectors J1 and J2 (see Figure 274).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short to ground.

Test 41 — Checking for Proper Supply Voltage to the EOT Sensor

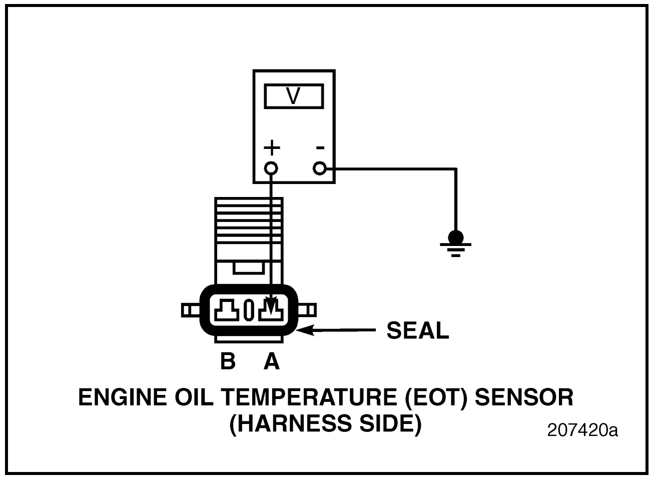


Figure 275

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Connect connector J1 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin A of the EOT Sensor harness connector and a good ground (see Figure 275).

   If the measured voltage is between 4.5 and 5.5 volts, check the EOT Sensor harness connector for deformed pins or insufficient contact with the EOT Sensor pins. If the pins are not damaged, replace the EOT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 223.

Test 64 — Checking for Blink Code 2-7

1. Connect the EOT Sensor connector.
2. Connect EECU harness connector J1 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-7 is still active, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short at the EECU Connector

NOTE

If the Engine Oil Temperature (EOT) Sensor was open in test 9, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the EOT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-7 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short Circuit in the Harness

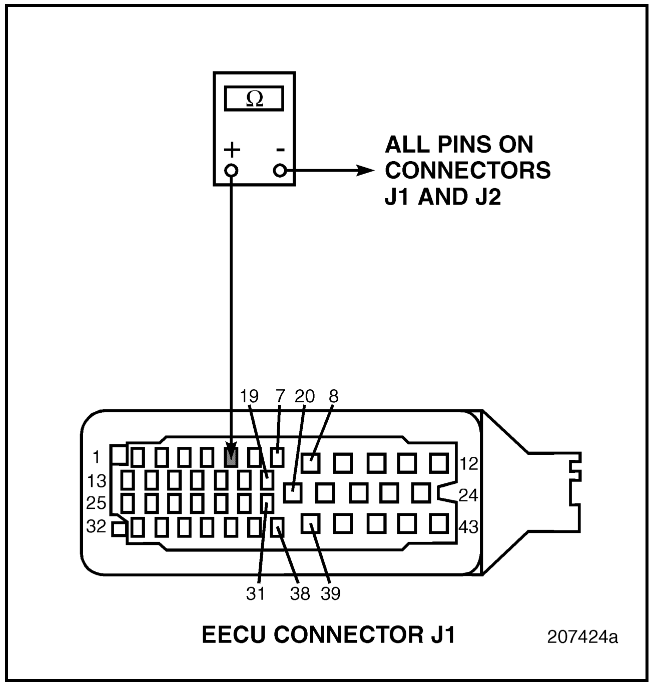


Figure 276

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU harness connector J1 pin 5 and all other pins on EECU connectors J1 and J2 (see Figure 276).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short to voltage, then replace the EOT Sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the EOT Sensor.

Test 74 — Checking for an Open EOT Sensor Return Circuit

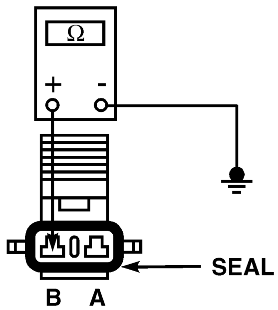


Figure 277

1. Disconnect the EOT Sensor connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J1.
4. Check for continuity between pin B of the EOT Sensor harness connector and a good ground (see Figure 277).

   If there is NO continuity, locate and repair the open circuit in the harness between the EOT Sensor and the common ground with the other temperature sensors.

   If continuity exists, check the EOT Sensor harness connector for damaged pins or improper mating with the EOT Sensor. If the EOT Sensor is OK, go to test "Test 148 — Checking the EECU Connector for an Open Circuit" on page 223.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the EOT Sensor connector.
3. Connect connectors J1 and J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-7 is still active, check the EECU and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect the EECU harness connector J1 pins 5 and 26 for dirt, loose pins or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J1 pins 5 and 26. Gently push the test lead into each harness connector pin individually to check for looseness.

   If a repairable open is found or either of the pins feels loose, repair EECU harness connector J1.

   If the test lead is making good contact with EECU harness connector J1 pins 5 and 26, go to test "Test 296 — Checking the EECU Connector" on page 223.

Test 296 — Checking the EECU Connector

1. Connect the EOT Sensor connector.
2. Connect connectors J1 and J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-7 is still active, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-7 — ENGINE OIL TEMPERATURE (EOT) SENSOR (ASET™ CEGR ENGINE)

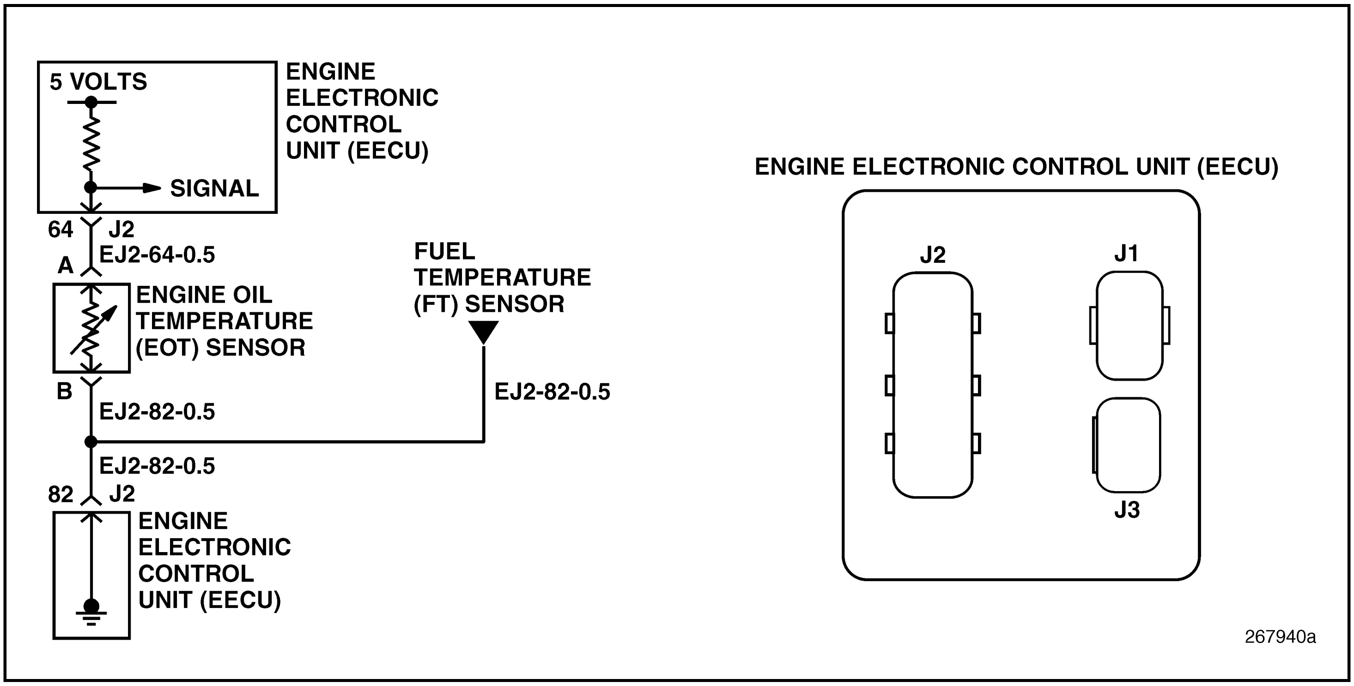


Figure 278 — Engine Oil Temperature (EOT) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): 175

Message Identification (MID): 128

Circuit Description: The Engine Oil Temperature (EOT) Sensor is a thermistor. The resistance of the EOT Sensor changes inversely to the temperature of the engine oil. When the engine oil is cold, the sensor resistance is high. As the temperature of the engine oil increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the EOT Sensor and uses this signal to warn the driver and evoke engine shutdown if the signal is not within programmed limits.

Location: The Engine Oil Temperature Sensor is located on the oil filter pedestal, above the Engine Oil Pressure Sensor.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-7 will set when the Engine Electronic Control Unit (EECU) senses that the EOT Sensor signal voltage is less than 0.15 volts or greater than 4.525 volts for 1 second. If the EOT Sensor voltage returns to between 0.15 volts and 4.525 volts for more than 1 second, the fault will become inactive.

Normal EOT Sensor Parameters: The Engine Oil Temperature (EOT) Sensor has a resistance between 5500 ohms at 32°F (0°C) and 267 ohms at 194°F (90°C).

NOTE

Blink code 2-7 can be enabled and disabled in the Customer Data area of the Engine Electronic Control Unit (EECU).

Test 1 — Checking for Code 2-7

1. Verify that code 2-7 is set.

   If code 2-7 is set, go to test “Test 2 — Checking Code 2-7 Failure Mode Identifier (FMI)” on page 225.

   If code 2-7 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Oil Temperature (EOT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-7 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test “Test 4 — Checking for Other Blink Codes” on page 225.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short Circuit to Ground in the Sensor” on page 225.

Test 4 — Checking for Other Blink Codes

1. Is code 1-3 also set?

   If code 1-3 is also set, go to test “Test 8 — Checking for an Open EOT Sensor Return Line” on page 226.

   If only code 2-7 is set, go to test “Test 9 — Checking Sensor Resistance” on page 226.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

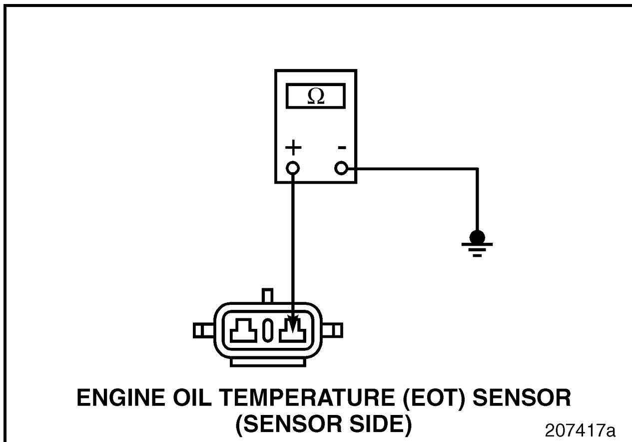


Figure 279

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor connector.
3. Check for continuity between either pin of the EOT Sensor and a good ground (see Figure 279).

   If continuity exists, replace the EOT Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 227.

Test 8 — Checking for an Open EOT Sensor Return Line

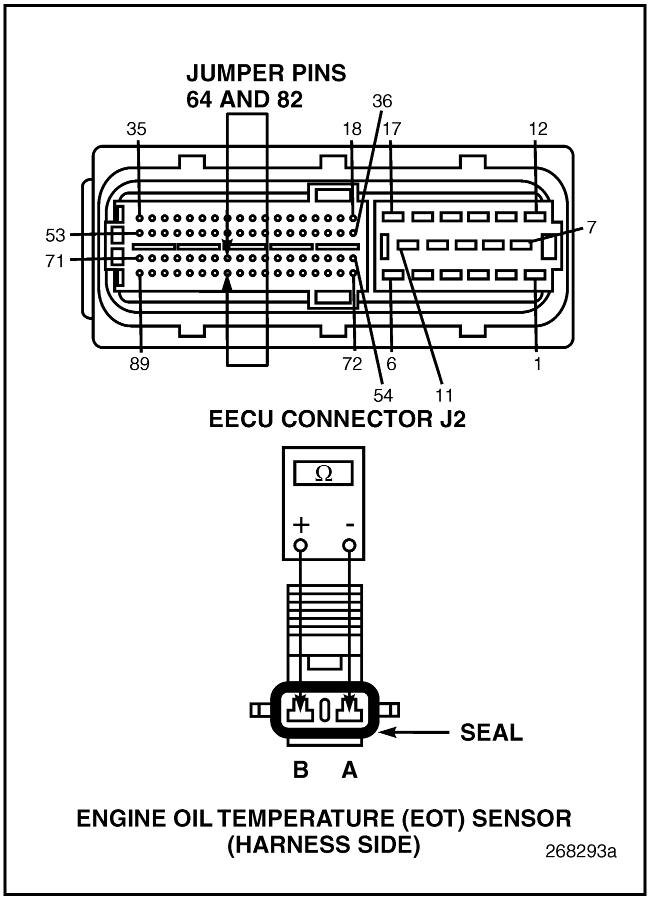


Figure 280

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between EECU harness connector J2 pins 64 and 82 (see Figure 280).
5. Check for continuity between pins A and B of the EOT Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 227.

   If there is NO continuity, there is an open in the ground circuit in the harness between the common ground splice with the Fuel Temperature (FT) sensor and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

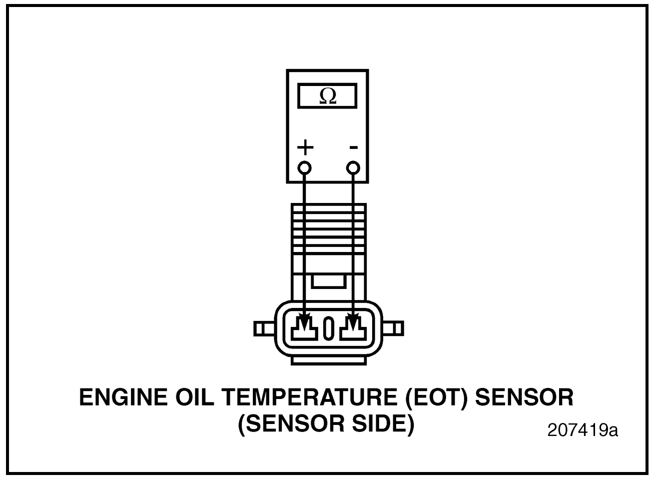


Figure 281

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor connector.
3. Measure the resistance across the pins of the EOT Sensor with the engine oil temperature between 32° and 194°F (0° and 90°C) (see Figure 281).

   If the resistance of the sensor is between 5500 and 267 ohms or if the resistance is infinite (open circuit), go to test “Test 18 — Checking Signal Line Voltage” on page 228.

   If the resistance of the sensor is not within normal operating parameters (5500 to 267 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

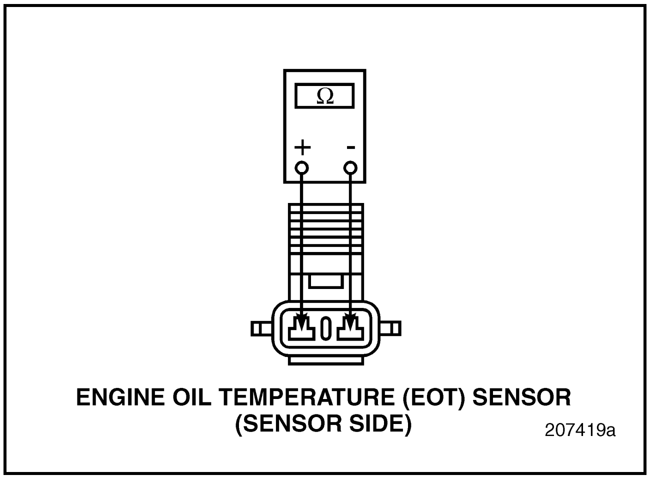


Figure 282

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Measure the resistance across the pins of the EOT Sensor with the engine oil temperature between 32° and 194°F (0° and 90°C) (see Figure 282).

   If the resistance is between 5500 and 267 ohms respectively, go to test "Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the EOT Sensor" on page 228.

   If the resistance is less than 267 ohms, replace the EOT Sensor.

Test 16 — Checking for Voltage on the Sensor Return Line

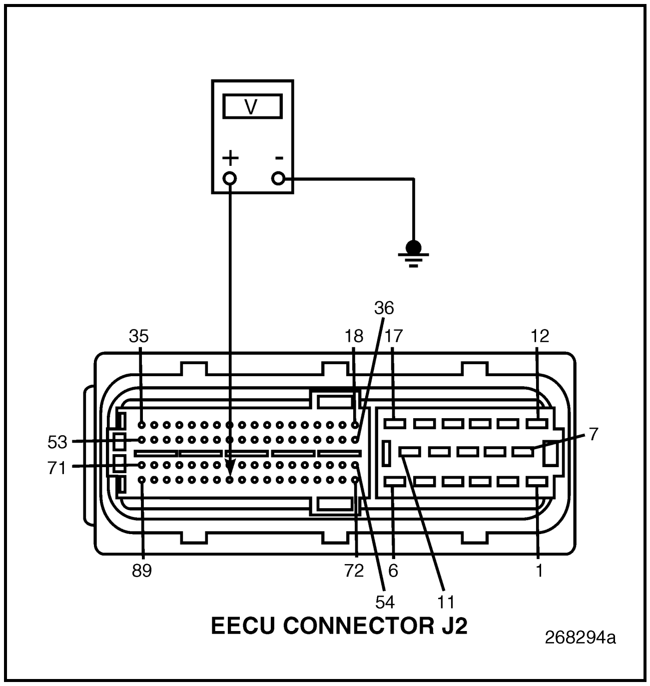


Figure 283

1. Turn the ignition key OFF.
2. Disconnect the Engine Oil Temperature (EOT) Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Measure the voltage between EECU connector J2 pin 82 and a good ground (see Figure 283).

   If there is less than 0.5 volts present, go to test "Test 32 — Checking the EECU Connector for an Open EOT Sensor Return Line" on page 229.

   If there is greater than 0.5 volts present, there is a short circuit to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking Signal Line Voltage

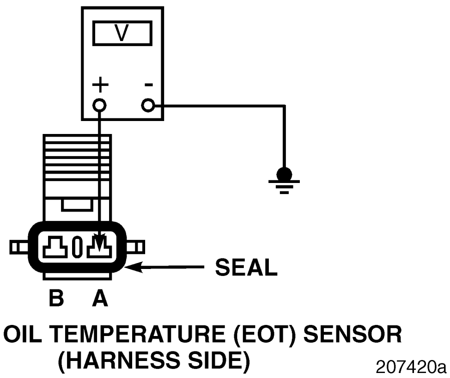


Figure 284

1. Disconnect the EOT Sensor harness connector.
2. Turn the ignition key ON.
3. Measure voltage between EOT Sensor harness connector pin A and a good ground (see Figure 284).

   If the measured voltage is greater than 6 volts, the EOT Sensor signal line is shorted to voltage; go to test “Test 36 — Checking for a Short Circuit to Voltage on the Sensor Signal Line” on page 229.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the EOT Sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 9, go to test “Test 37 — Checking for an Open EOT Sensor Signal Line” on page 229.

Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the EOT Sensor

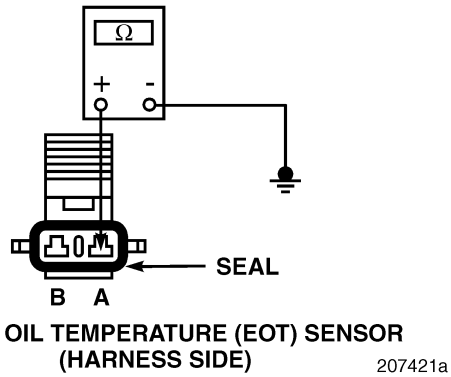


Figure 285

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin A of the EOT Sensor harness connector and a good ground (see Figure 285).

   If continuity exists between pin A and ground, go to test “Test 40 — Checking for a Pin to Pin Short in the Harness” on page 230.

   If there is NO continuity, go to test “Test 41 — Checking for Proper Supply Voltage to the EOT Sensor” on page 230.

Test 32 — Checking the EECU Connector for an Open EOT Sensor Return Line

1. Visually inspect EECU harness connector J2 pin 82 for dirt, looseness or deformed contacts.
2. Align the gray male test lead, found in the J 38581 V-MAC Jumper Wire Kit, with EECU harness connector J2 pin 82. Gently push the test lead into the harness connector pin and check for looseness.

   If a repairable open is found or the pin feels loose, repair the EECU harness connector J2.

   If the test lead is making good contact with EECU harness connector J2 pin 82, go to test “Test 64 — Checking for Blink Code 2-7” on page 231.

Test 36 — Checking for a Short Circuit to Voltage on the Sensor Signal Line

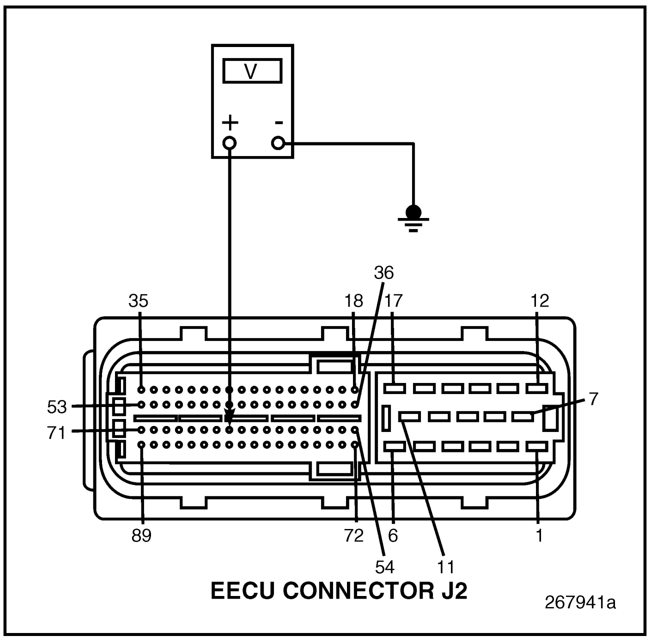


Figure 286

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect connectors J1, J2, and J3 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J2 pin 64 and a good ground (see Figure 286).

   If there is NO voltage indicated, go to test “Test 72 — Checking for a Short Circuit at the EECU Connector” on page 231.

   If voltage is present, go to test “Test 73 — Checking for a Pin to Pin Short Circuit in the Harness” on page 231.

Test 37 — Checking for an Open EOT Sensor Signal Line

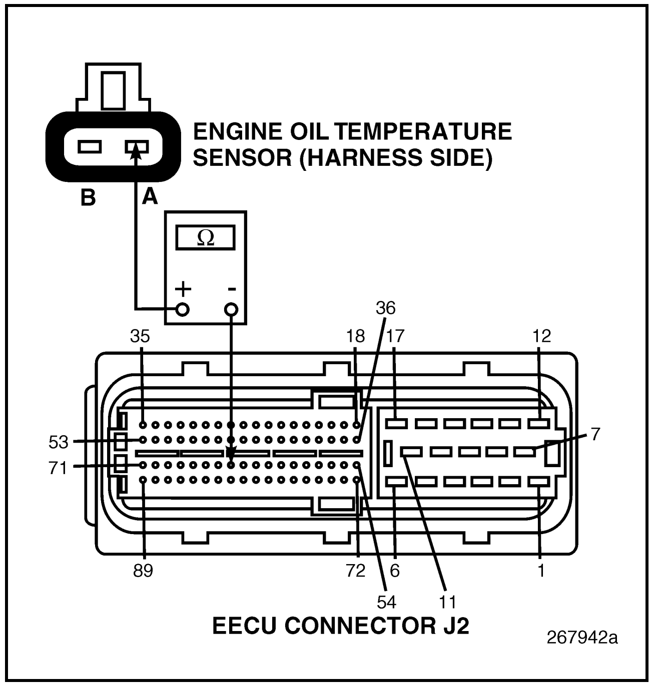


Figure 287

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin A of the EOT Sensor harness connector and EECU harness connector J2 pin 64 (see Figure 287).

   If there is NO continuity, locate and repair the open in the signal circuit between the EOT Sensor harness connector and EECU harness connector J2 pin 64.

   If continuity exists, go to test “Test 74 — Checking for an Open EOT Sensor Return Circuit” on page 232.

Test 40 — Checking for a Pin to Pin Short in the Harness

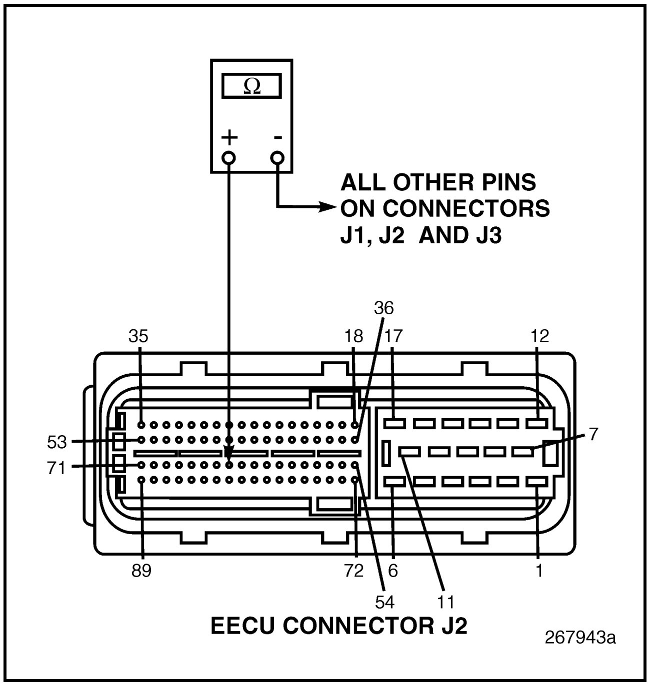


Figure 288

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect EECU connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 64 and all other pins on EECU connectors J1, J2, and J3 (see Figure 288).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the EOT Sensor

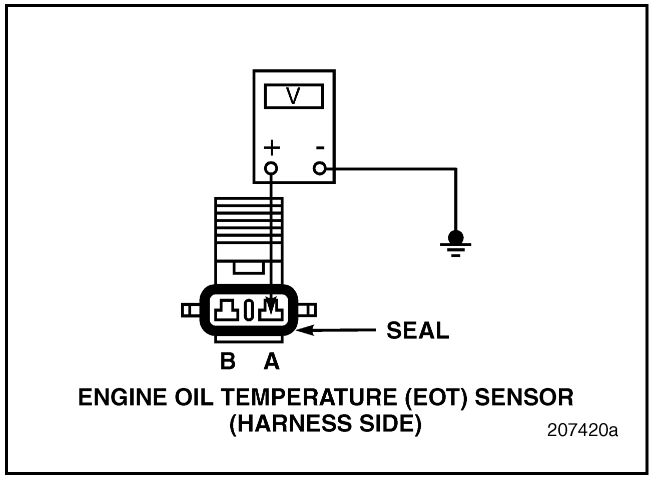


Figure 289

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin A of the EOT Sensor harness connector and a good ground (see Figure 289).

   If the measured voltage is between 4.5 and 5.5 volts, check the EOT Sensor harness connector for deformed pins or insufficient contact with the EOT Sensor pins. If the pins are not damaged, replace the EOT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 232.

Test 64 — Checking for Blink Code 2-7

1. Connect the EOT Sensor connector.
2. Connect EECU harness connector J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-7 is still active, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Engine Oil Temperature (EOT) Sensor was open in test 9, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the EOT Sensor connector.
3. Connect connectors J1, J2, and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-7 is still active, check the EECU and connectors J1, J2, and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short Circuit in the Harness

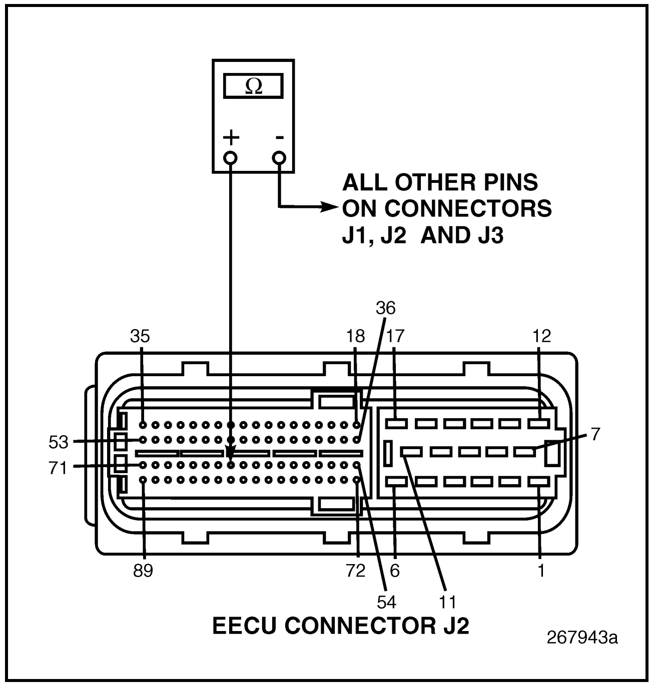


Figure 290

1. Turn the ignition key OFF.
2. Disconnect the EOT Sensor connector.
3. Disconnect EECU connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 64 and all other pins on EECU connectors J1, J2, and J3 (see Figure 290).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short to voltage, then replace the EOT Sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the EOT Sensor.

Test 74 — Checking for an Open EOT Sensor Return Circuit

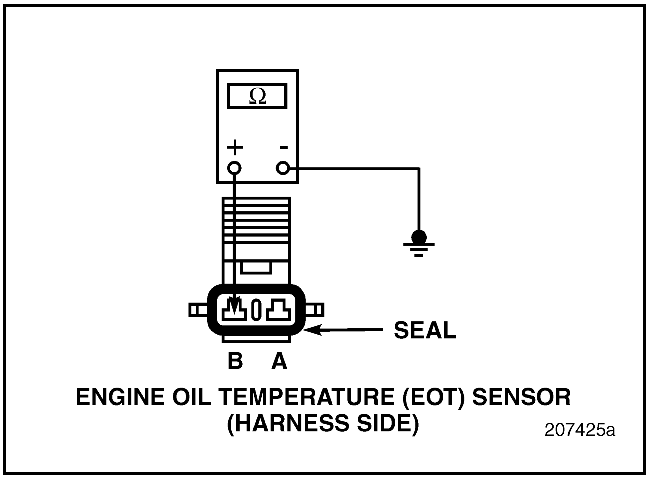


Figure 291

1. Disconnect the EOT Sensor connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J2.
4. Check for continuity between pin B of the EOT Sensor harness connector and a good ground (see Figure 291).

   If there is NO continuity, locate and repair the open circuit in the harness between the EOT Sensor and the common ground with the Fuel Temperature (FT) sensor.

   If continuity exists, check the EOT Sensor harness connector for damaged pins or improper mating with the EOT Sensor. If the EOT Sensor is OK, go to test “Test 148 — Checking the EECU Connector for an Open Circuit” on page 232.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the EOT Sensor connector.
3. Connect connectors J1, J2, and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-7 is still active, check the EECU and connectors J1, J2, and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect the EECU harness connector J2 pins 64 and 82 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test “Test 296 — Checking the EECU Connector” on page 232.

Test 296 — Checking the EECU Connector

1. Connect the EOT Sensor connector.
2. Connect connectors J1, J2 and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-7 is still active, replace the EECU and retest the system.

   If blink code 2-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-8 — INTAKE AIR TEMPERATURE (ASET™ IEGR ENGINE)

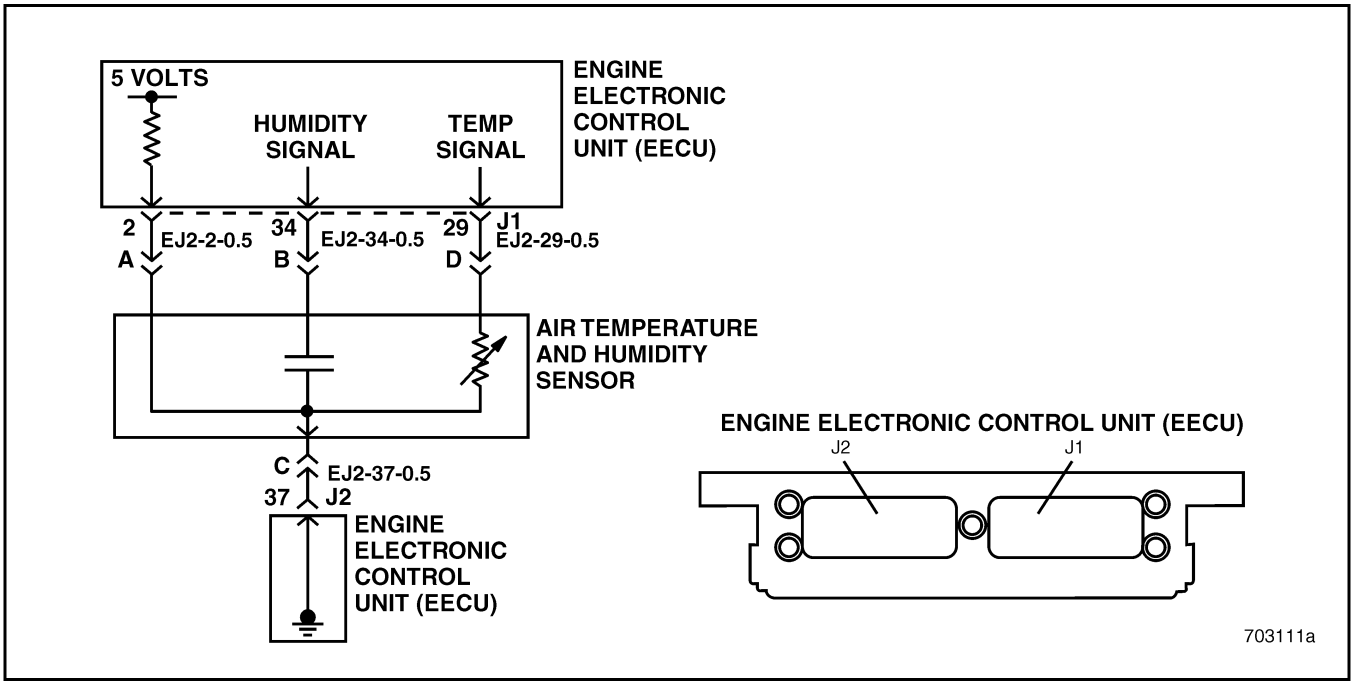


Figure 292 — Intake Air Temperature and Humidity (IATH) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): 172

Message Identification (MID): 128

Circuit Description: The Intake Air Temperature and Humidity (IATH) Sensor contains a thermistor and a capacitive sensor. The resistance of the thermistor varies inversely to temperature. The value of the capacitive sensor changes in relationship the the air humidity. By monitoring the current flow through the thermistor and the voltage from the capacitor, the Engine Electronic Control Unit (EECU) calculates the temperature and humidity of the air entering the turbocharger.

Location: The Intake Air Temperature and Humidity (IATH) Sensor is located in the air intake tube just downstream from the air filter canister.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-8 will set when the Engine Electronic Control Unit (EECU) senses that the IATH Sensor signal voltage is less than 0.415 volts or greater than 4.460 volts for 1 second. If the IATH Sensor voltage returns to between 0.415 volts and 4.460 volts for more than 1 second, the fault will become inactive.

Test 1 — Checking for Code 2-8

1. Verify that code 2-8 is set.

   If code 2-8 is set, go to test “Test 2 — Checking Code 2-8 Failure Mode Identifier (FMI)” on page 234.

   If code 2-8 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Intake Air Temperature and Humidity (IATH) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-8 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (Current Low/Open), go to test “Test 4 — Checking Sensor Resistance” on page 234.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short Circuit to Ground in the Sensor” on page 234.

Test 4 — Checking Sensor Resistance

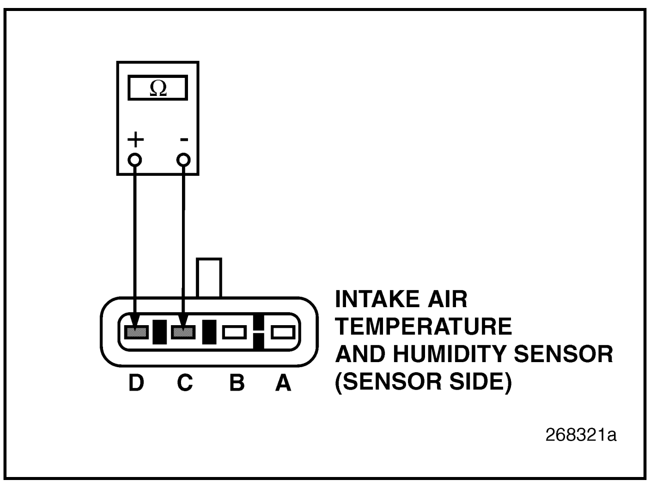


Figure 293

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor connector.
3. Measure the resistance between pins C and D of the IATH Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 293).

   If the measured resistance is between 31,961 and 5,308 ohms, or if the sensor is open (infinite resistance), go to test “Test 8 — Checking Signal Line Voltage” on page 235.

   If the measured resistance is NOT between 31,961 and 5,308 ohms but is NOT open (infinite resistance), replace the sensor.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

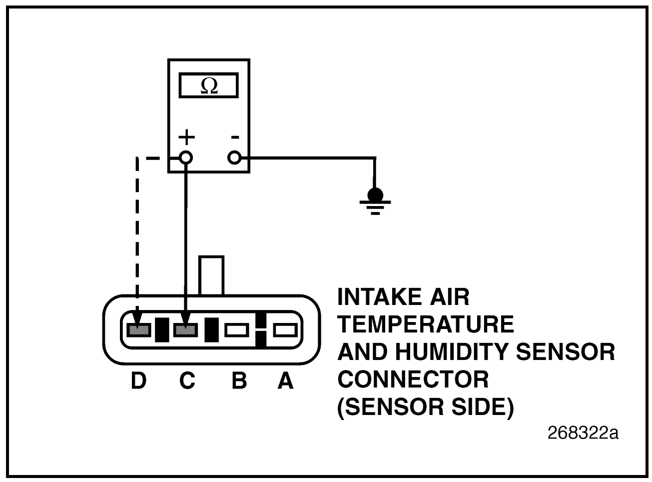


Figure 294

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor connector.
3. Check for continuity between pin C of the IATH Sensor and a good ground (see Figure 294).

   Check for continuity between pin D of the IATH Sensor and a good ground (see Figure 294).

   If continuity exists on either pin, replace the IATH Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 235.

Test 8 — Checking Signal Line Voltage

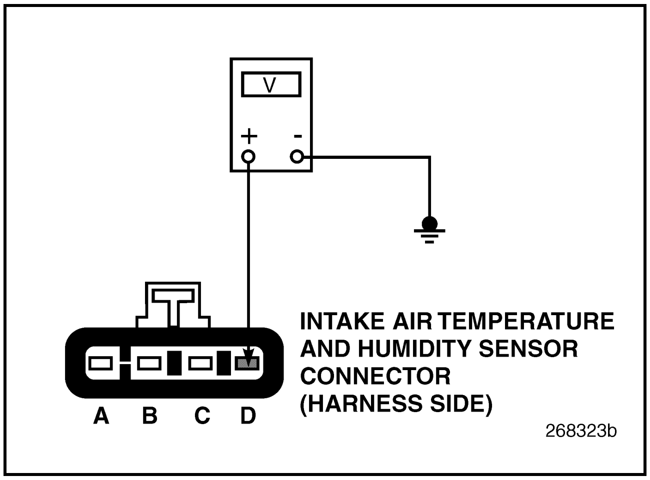


Figure 295

1. Disconnect the IATH Sensor harness connector.
2. Turn the ignition key ON.
3. Measure the voltage between IATH Sensor harness connector pin D and a good ground (see Figure 295).

   If the measured voltage is greater than 6 volts, the IATH Sensor signal wire is shorted to voltage; go to test “Test 16 — Checking for a Short Circuit to Voltage in the Signal Line” on page 236.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 4, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 4, go to test “Test 17 — Checking for an Open IATH Sensor Signal Line” on page 236.

Test 10 — Checking Sensor Resistance

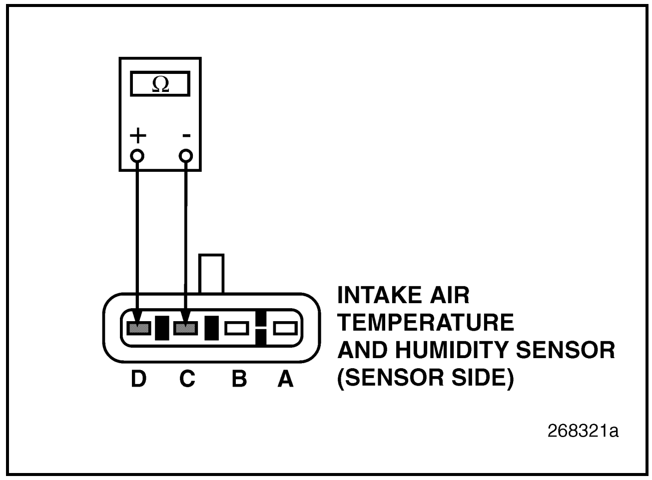


Figure 296

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Measure the resistance between pins C and D of the IATH Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 296).

   If the measured resistance is between 31,961 and 5,308 ohms, go to test “Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the IATH Sensor” on page 237.

   If the measured resistance is NOT between 31,961 and 5,308 ohms, replace the IATH Sensor.

Test 16 — Checking for a Short Circuit to Voltage in the Signal Line

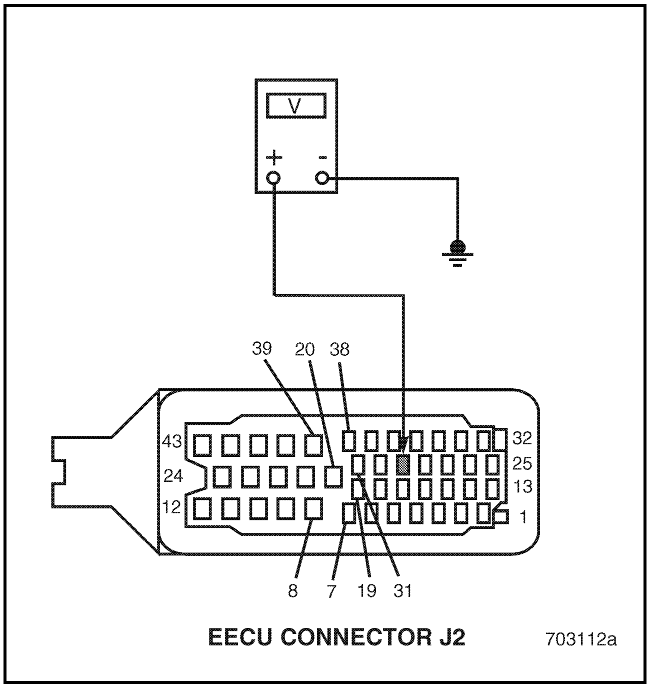


Figure 297

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor connector.
3. Disconnect connector J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J2 pin 29 and a good ground (see Figure 297).

   If there is NO voltage indicated, go to test "Test 32 — Checking for a Short Circuit at the EECU Connector" on page 237.

   If voltage is present, go to test "Test 33 — Checking for a Pin to Pin Short in the Harness" on page 237.

Test 17 — Checking for an Open IATH Sensor Signal Line

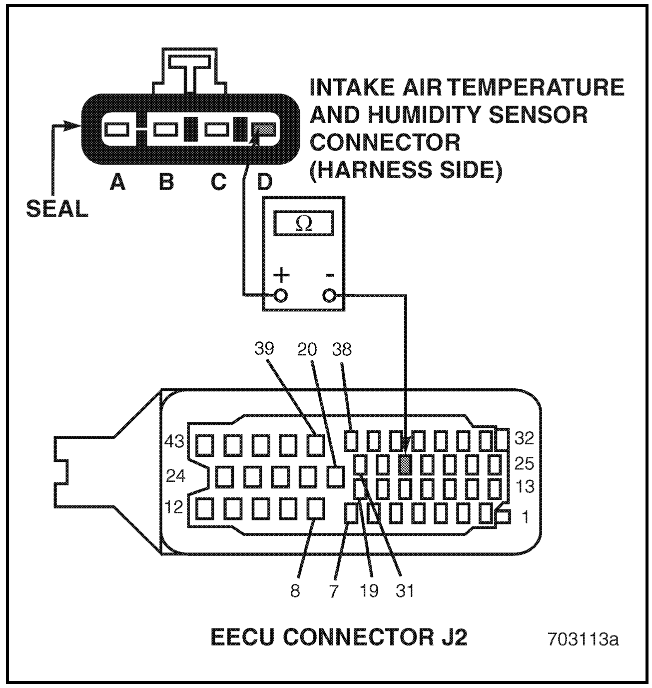


Figure 298

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin D of the IATH Sensor harness connector and EECU harness connector J2 pin 29 (see Figure 298).

   If there is NO continuity, locate and repair the open in the signal circuit between the IATH Sensor harness connector and EECU harness connector J2 pin 29.

   If continuity exists, go to test "Test 34 — Checking for an Open IATH Sensor Return Circuit" on page 238.

Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the IATH Sensor

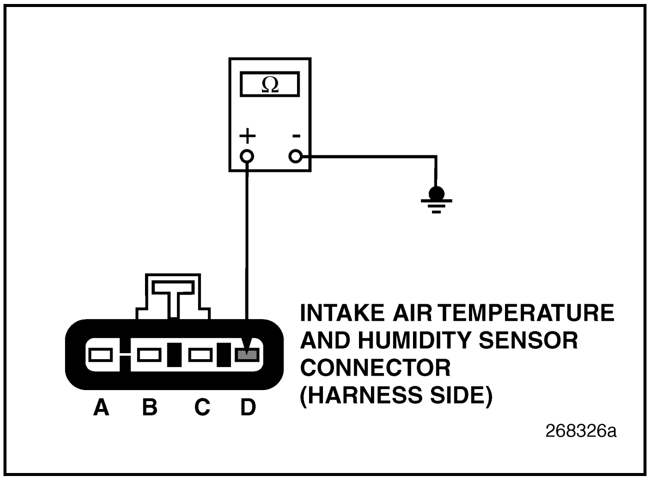


Figure 299

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin D of the IATH Sensor harness connector and a good ground (see Figure 299).

   If continuity exists between pin D and ground, go to test “Test 40 — Checking for a Pin to Pin Short in the Harness” on page 238.

   If there is NO continuity, go to test “Test 41 — Checking for Proper Supply Voltage to the Sensor” on page 239.

Test 32 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Intake Air Temperature and Humidity (IATH) Sensor was open in test 4, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the IATH Sensor harness connector.
3. Restore all electrical connections to the EECU.
4. Turn the ignition key ON.

   If blink code 2-8 is still active, check the EECU and connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-8 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 33 — Checking for a Pin to Pin Short in the Harness

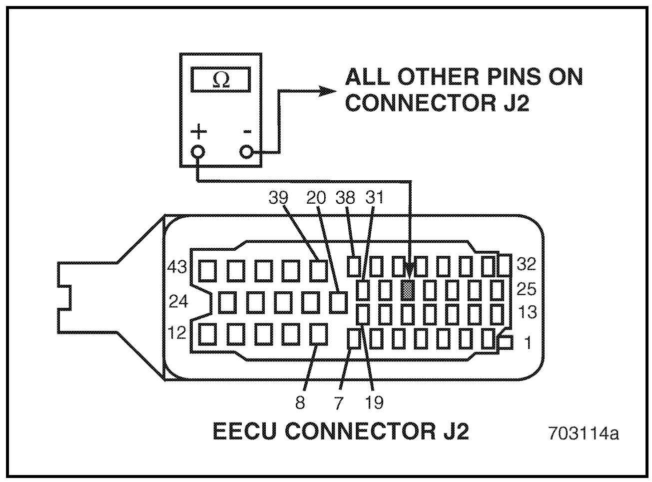


Figure 300

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Disconnect EECU harness connector J2.
4. Check for continuity between EECU harness connector J2 pin 29 and all other pins on EECU connectorJ2 (see Figure 300).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 34 — Checking for an Open IATH Sensor Return Circuit

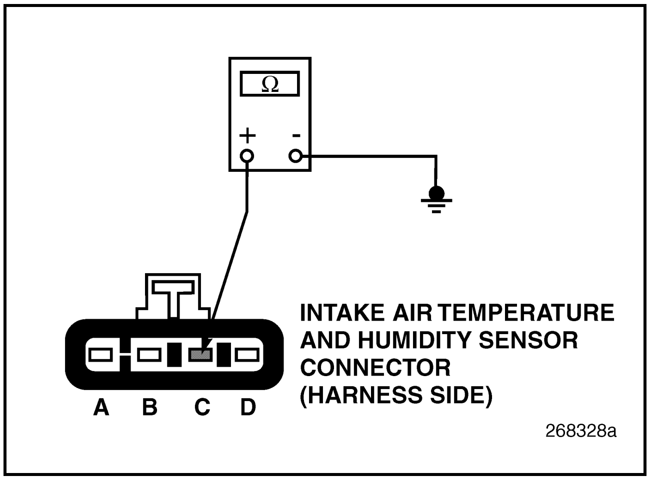


Figure 301

1. Disconnect the IATH Sensor harness connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J2.
4. Check for continuity between pin C of the IATH Sensor harness connector and a good ground (see Figure 301).

   If there is NO continuity, locate and repair the open circuit in the harness between the IATH Sensor and EECU connector J2 pin 37.

   If continuity exists, check the IATH Sensor harness connector for damaged pins or improper mating with the IATH Sensor. If the IATH Sensor connector is OK, go to test "Test 68 — Checking the EECU Connector for an Open Circuit" on page 239.

Test 40 — Checking for a Pin to Pin Short in the Harness

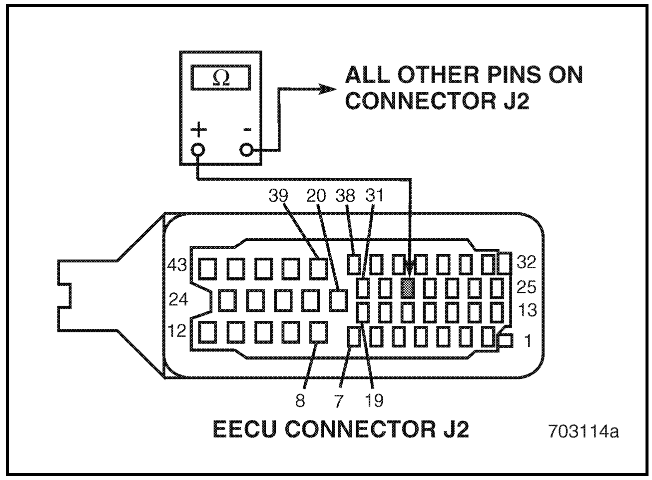


Figure 302

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between EECU harness connector J2 pin 29 and all other pins on EECU connector J2 (see Figure 302).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

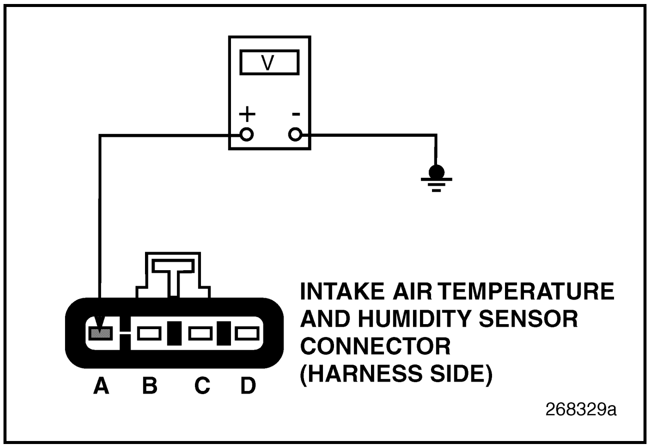


Figure 303

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin A of the IATH Sensor harness connector and a good ground (see Figure 303).

   If the measured voltage is between 4.5 and 5.5 volts, check the IATH Sensor harness connector for deformed pins or insufficient contact with the IATH Sensor pins. If the pins are not damaged, replace the IATH Sensor.

   If the measured voltage is less than 4.5 volts, go to test "Test 82 — Checking for a Short Circuit at the EECU Connector" on page 239.

Test 68 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 29 and 37 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test "Test 136 — Checking for an Open Circuit at the EECU Connector" on page 239.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the IATH Sensor harness connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-8 is still active, check the EECU and connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-8 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 136 — Checking for an Open Circuit at the EECU Connector

1. Connect the IATH Sensor harness connector.
2. Connect connector J2 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-8 is still active, replace the EECU and retest the system.

   If blink code 2-8 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-8 — INTAKE AIR TEMPERATURE (ASET™ CEGR ENGINE)

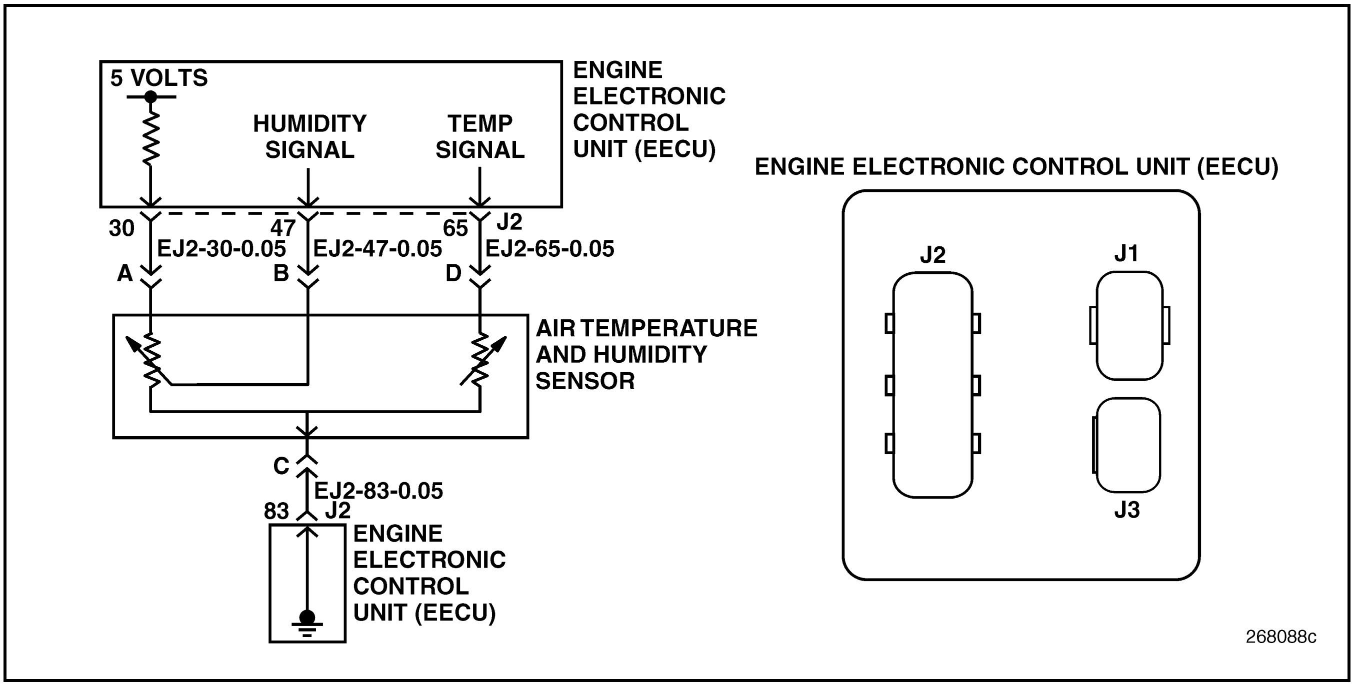


Figure 304 — Intake Air Temperature and Humidity (IATH) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open)

Parameter Identification (PID): 172

Message Identification (MID): 128

Circuit Description: The Intake Air Temperature and Humidity (IATH) Sensor contains two thermistors, The resistance of each thermistor varies inversely to temperature. By monitoring the current flow through each thermistor, the Engine Electronic Control Unit (EECU) calculates the temperature and humidity of the air entering the turbocharger.

Location: The Intake Air Temperature and Humidity (IATH) Sensor is located in the air intake tube just downstream from the air filter canister.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-8 will set when the Engine Electronic Control Unit (EECU) senses that the IATH Sensor signal voltage is less than 0.415 volts or greater than 4.460 volts for 1 second. If the IATH Sensor voltage returns to between 0.415 volts and 4.460 volts for more than 1 second, the fault will become inactive.

Test 1 — Checking for Code 2-8

1. Verify that code 2-8 is set.

   If code 2-8 is set, go to test "Test 2 — Checking Code 2-8 Failure Mode Identifier (FMI)" on page 241.

   If code 2-8 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Intake Air Temperature and Humidity (IATH) Sensor connector and wires for poor connections.

Test 2 — Checking Code 2-8 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (Current Low/Open), go to test “Test 4 — Checking Sensor Resistance” on page 241.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking for a Short Circuit to Ground in the Sensor” on page 241.

Test 4 — Checking Sensor Resistance

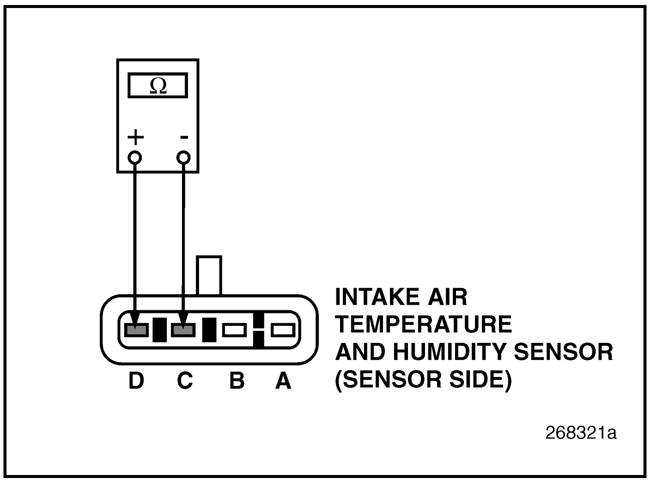


Figure 305

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor connector.
3. Measure the resistance between pins C and D of the IATH Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 305).

   If the measured resistance is between 31,961 and 5,308 ohms, or if the sensor is open (infinite resistance), go to test “Test 8 — Checking Signal Line Voltage” on page 242.

   If the measured resistance is NOT between 31,961 and 5,308 ohms but is NOT open (infinite resistance), replace the sensor.

Test 5 — Checking for a Short Circuit to Ground in the Sensor

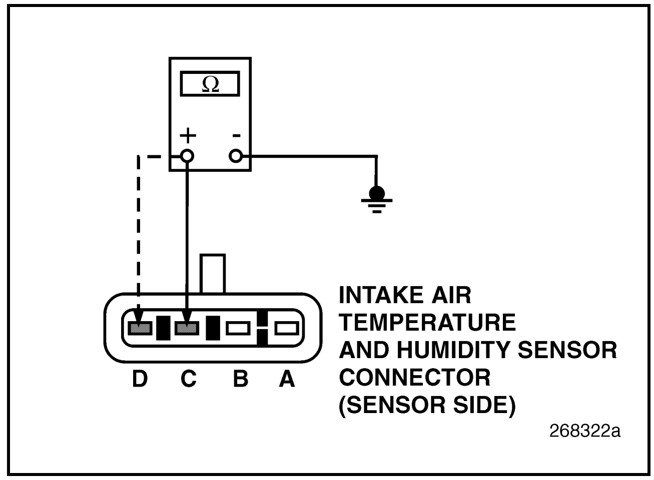


Figure 306

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor connector.
3. Check for continuity between pin C of the IATH Sensor and a good ground (see Figure 306).

   Check for continuity between pin D of the IATH Sensor and a good ground (see Figure 306).

   If continuity exists on either pin, replace the IATH Sensor.

   If there is NO continuity, go to test “Test 10 — Checking Sensor Resistance” on page 242.

Test 8 — Checking Signal Line Voltage

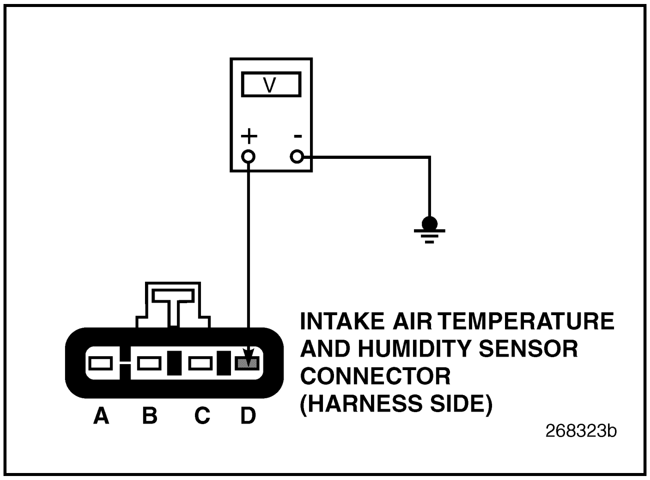


Figure 307

1. Disconnect the IATH Sensor harness connector.
2. Turn the ignition key ON.
3. Measure the voltage between IATH Sensor harness connector pin D and a good ground (see Figure 307).

   If the measured voltage is greater than 6 volts, the IATH Sensor signal wire is shorted to voltage; go to test “Test 16 — Checking for a Short Circuit to Voltage in the Signal Line” on page 243.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 4, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was not open in test 4, go to test “Test 17 — Checking for an Open IATH Sensor Signal Line” on page 243.

Test 10 — Checking Sensor Resistance

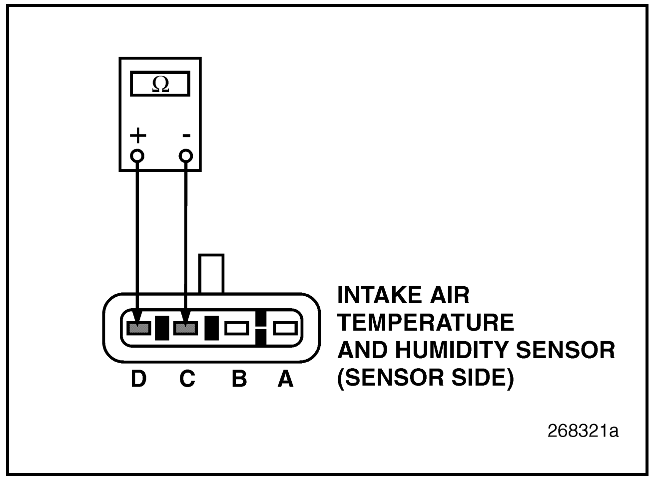


Figure 308

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Measure the resistance between pins C and D of the IATH Sensor with the ambient air temperature between 32° and 104°F (0° and 40°C) (see Figure 308).

   If the measured resistance is between 31,961 and 5,308 ohms, go to test “Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the IATH Sensor” on page 244.

   If the measured resistance is NOT between 31,961 and 5,308 ohms, replace the IATH Sensor.

Test 16 — Checking for a Short Circuit to Voltage in the Signal Line

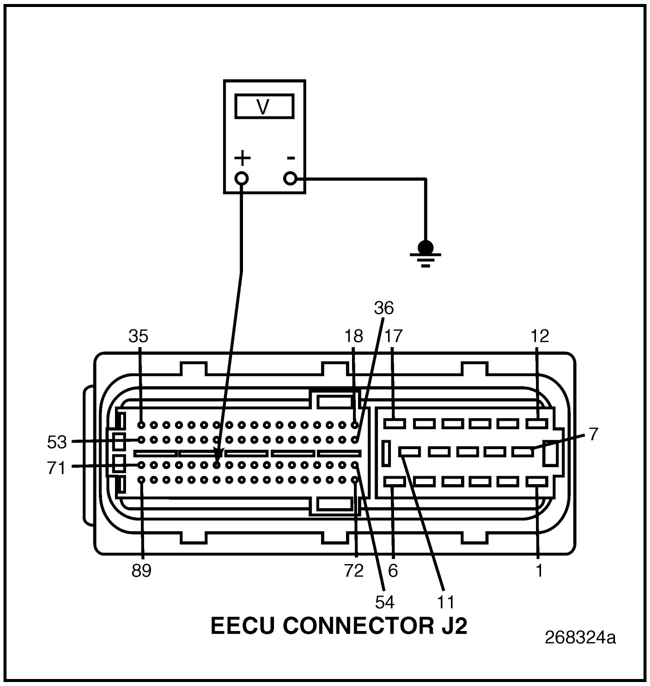


Figure 309

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor connector.
3. Disconnect connector J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between EECU harness connector J2 pin 65 and a good ground (see Figure 309).

   If there is NO voltage indicated, go to test "Test 32 — Checking for a Short Circuit at the EECU Connector" on page 244.

   If voltage is present, go to test "Test 33 — Checking for a Pin to Pin Short in the Harness" on page 244.

Test 17 — Checking for an Open IATH Sensor Signal Line

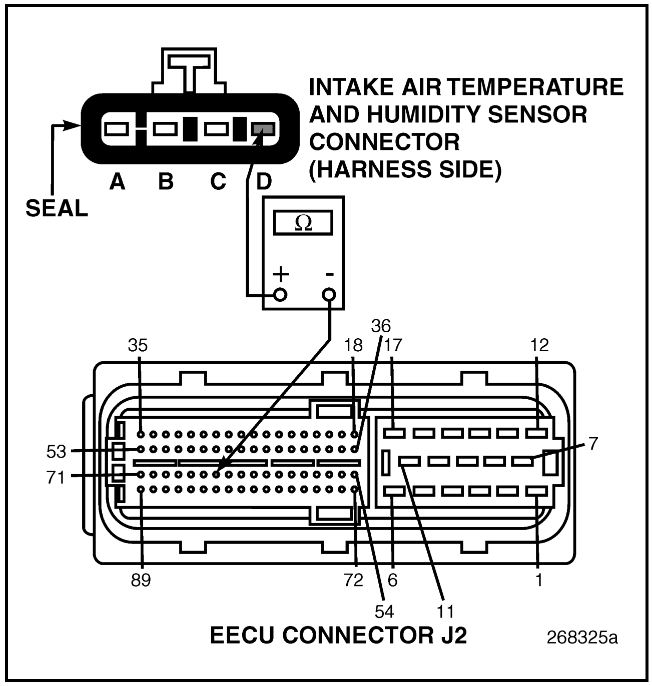


Figure 310

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin D of the IATH Sensor harness connector and EECU harness connector J2 pin 65 (see Figure 310).

   If there is NO continuity, locate and repair the open in the signal circuit between the IATH Sensor harness connector and EECU harness connector J2 pin 65.

   If continuity exists, go to test "Test 34 — Checking for an Open IATH Sensor Return Circuit" on page 245.

Test 20 — Checking for a Short Circuit in the Harness Between the Engine Electronic Control Unit (EECU) and the IATH Sensor

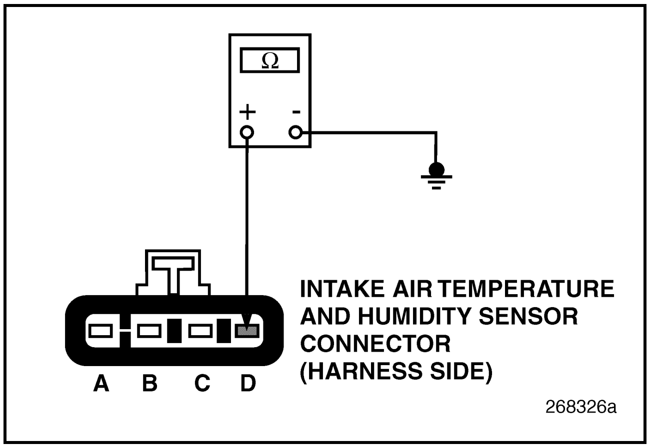


Figure 311

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin D of the IATH Sensor harness connector and a good ground (see Figure 311).

   If continuity exists between pin D and ground, go to test “Test 40 — Checking for a Pin to Pin Short in the Harness” on page 245.

   If there is NO continuity, go to test “Test 41 — Checking for Proper Supply Voltage to the Sensor” on page 246.

Test 32 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Intake Air Temperature and Humidity (IATH) Sensor was open in test 4, replace the sensor before testing the circuit.

1. Turn the ignition key OFF.
2. Connect the IATH Sensor harness connector.
3. Connect connectors J1, J2, and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-8 is still active, check the EECU and connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-8 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 33 — Checking for a Pin to Pin Short in the Harness

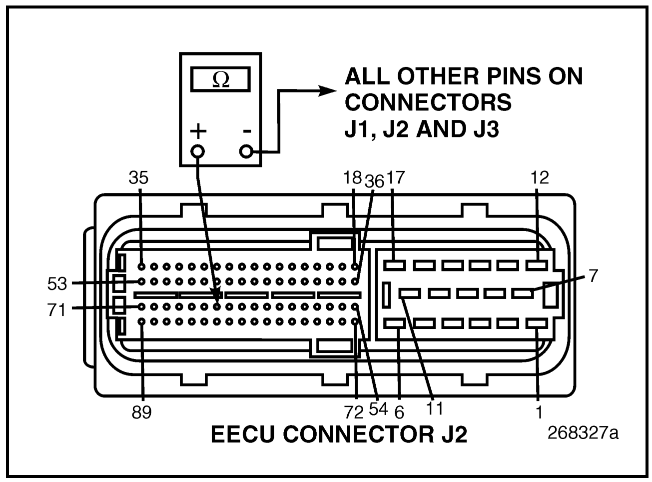


Figure 312

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Disconnect EECU harness connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 65 and all other pins on EECU connectors J1, J2, and J3 (see Figure 312).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 34 — Checking for an Open IATH Sensor Return Circuit

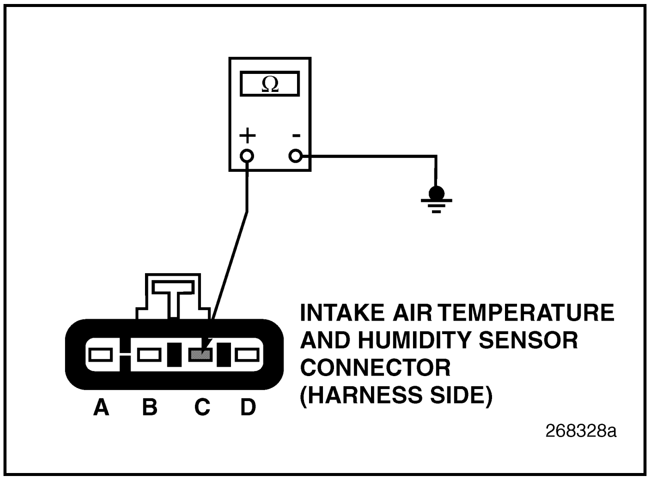


Figure 313

1. Disconnect the IATH Sensor harness connector.
2. Turn the ignition key OFF.
3. Connect EECU connector J2.
4. Check for continuity between pin C of the IATH Sensor harness connector and a good ground (see Figure 313).

   If there is NO continuity, locate and repair the open circuit in the harness between the IATH Sensor and EECU connector J2 pin 83.

   If continuity exists, check the IATH Sensor harness connector for damaged pins or improper mating with the IATH Sensor. If the IATH Sensor connector is OK, go to test “Test 68 — Checking the EECU Connector for an Open Circuit” on page 246.

Test 40 — Checking for a Pin to Pin Short in the Harness

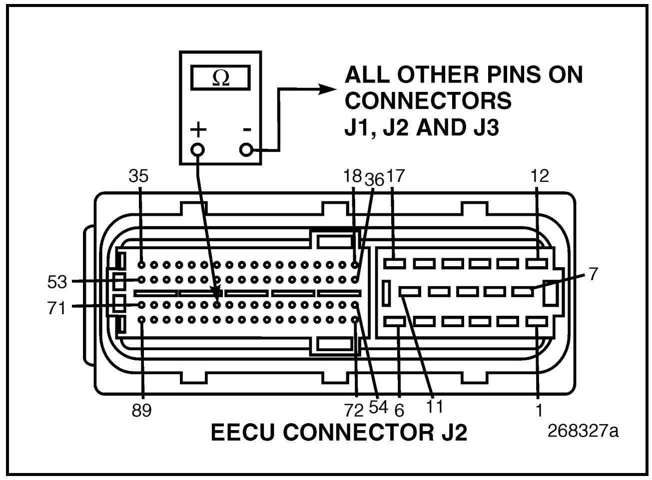


Figure 314

1. Turn the ignition key OFF.
2. Disconnect the IMT Sensor harness connector.
3. Disconnect EECU connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 65 and all other pins on EECU connectors J1, J2, and J3 (see Figure 314).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

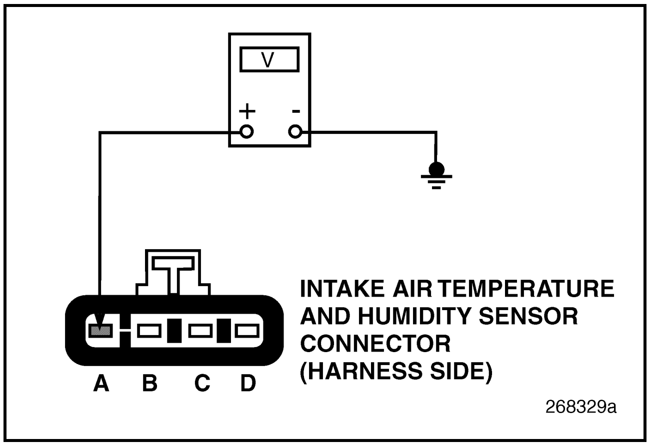


Figure 315

1. Turn the ignition key OFF.
2. Disconnect the IATH Sensor harness connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin A of the IATH Sensor harness connector and a good ground (see Figure 315).

   If the measured voltage is between 4.5 and 5.5 volts, check the IATH Sensor harness connector for deformed pins or insufficient contact with the IATH Sensor pins. If the pins are not damaged, replace the IATH Sensor.

   If the measured voltage is less than 4.5 volts, go to test "Test 82 — Checking for a Short Circuit at the EECU Connector" on page 246.

Test 68 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 65 and 83 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test "Test 136 — Checking for an Open Circuit at the EECU Connector" on page 246.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the IATH Sensor harness connector.
3. Connect connectors J1, J2, and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 2-8 is still active, check the EECU and connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 2-8 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 136 — Checking for an Open Circuit at the EECU Connector

1. Connect the IATH Sensor harness connector.
2. Connect connectors J1. J2, and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 2-8 is still active, replace the EECU and retest the system.

   If blink code 2-8 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 2-9 — INTAKE AIR HUMIDITY (ASET™ IEGR ENGINE)

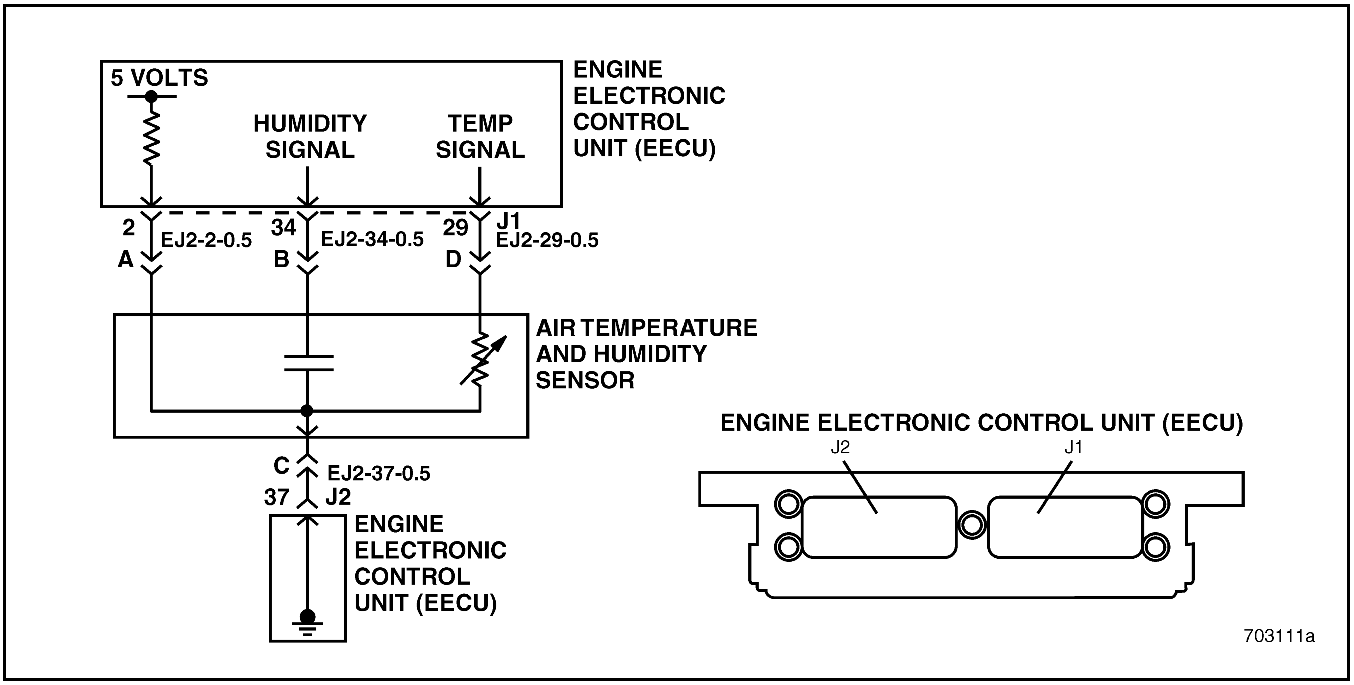


Figure 316 — Intake Air Temperature and Humidity (IATH) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): 274

Message Identification (MID): 128

Circuit Description: The Intake Air Temperature and Humidity (IATH) Sensor contains a thermistor and a capacitive sensor. The resistance of the thermistor varies inversely to temperature. The value of the capacitive sensor changes in relationship the the air humidity. By monitoring the current flow through the thermistor and the voltage from the capacitor, the Engine Electronic Control Unit (EECU) calculates the temperature and humidity of the air entering the turbocharger.

Location: The Intake Air Temperature and Humidity (IATH) Sensor is located in the air intake tube just downstream from the air filter canister.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-9 will set when the Engine Electronic Control Unit (EECU) senses that the IATH Sensor signal voltage is less than 0.15 volts or greater than 4.9 volts for 1 second. If the IATH Sensor voltage returns to between 0.15 volts and 4.9 volts for more than 1 second, the fault will become inactive.

Test 1 — Checking for Code 2-9

1. Verify that code 2-9 is set.

   If code 2-9 is set, go to test “Test 2 — Checking Code 2-9 Failure Mode Identifier (FMI)” on page 247.

   If code 2-9 is not set, wiggle the harness and connectors to try and set the code.

Test 2 — Checking Code 2-9 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

If the FMI is 4 (voltage low or open), go to test “Test 4 — Checking the IATH Sensor Reference Voltage Line” on page 248.

If the FMI is 3 (voltage high), go to test “Test 5 — Checking Code 2-9 Failure Mode Identifier (FMI) with the IATH Sensor Disconnected” on page 248.

Test 4 — Checking the IATH Sensor Reference Voltage Line

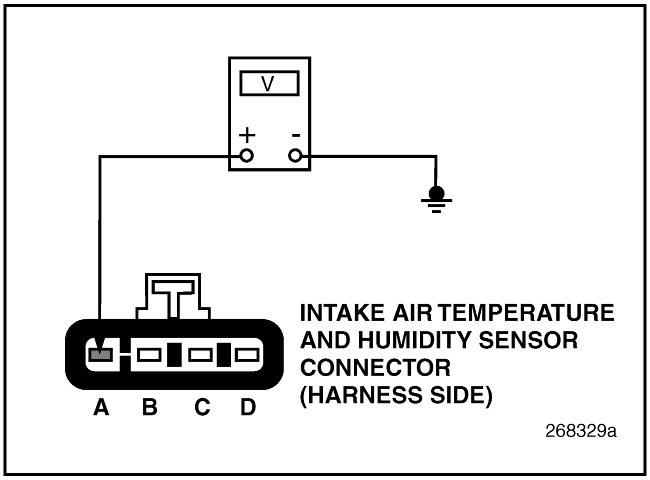


Figure 317

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between IATH Sensor harness connector pin A (reference voltage line) and a good ground (see Figure 317).

   If the measured voltage is greater than 4.9 volts, go to test “Test 8 — Checking the IATH Sensor Signal Line for a Short Circuit to Ground” on page 248.

   If the measured voltage is less than 4.9 volts, go to test “Test 9 — Checking the Harness for Continuity in the IATH Sensor Reference Voltage Line” on page 249.

Test 5 — Checking Code 2-9 Failure Mode Identifier (FMI) with the IATH Sensor Disconnected

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI 3 (voltage high) changed to FMI 4 (voltage low or open), go to test “Test 10 — Checking the IATH Sensor Reference Voltage Line” on page 249.

   If the FMI code did NOT change, go to test “Test 11 — Checking the Harness for a Pin to Pin Short Circuit” on page 250.

Test 8 — Checking the IATH Sensor Signal Line for a Short Circuit to Ground

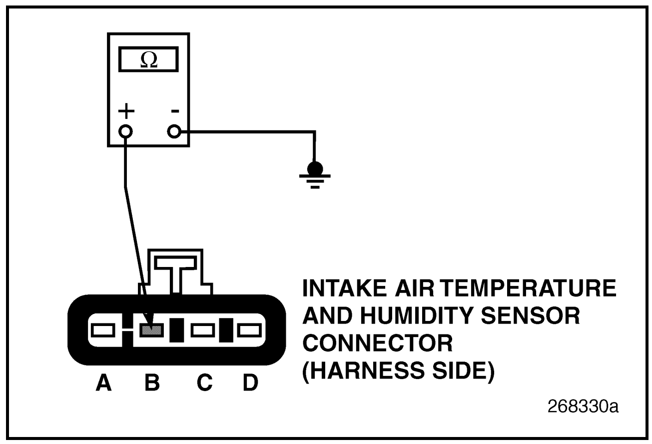


Figure 318

1. Turn the ignition key OFF.
2. Disconnect the EECU.
3. Check for continuity between IATH Sensor harness connector pin B (signal line) and a good ground (see Figure 318).

   If there is NO continuity, go to test “Test 16 — Checking the Harness for Continuity in the IATH Sensor Signal Line” on page 250.

   If continuity exists, locate and repair the short circuit to ground in the IATH Sensor signal line.

Test 9 — Checking the Harness for Continuity in the IATH Sensor Reference Voltage Line

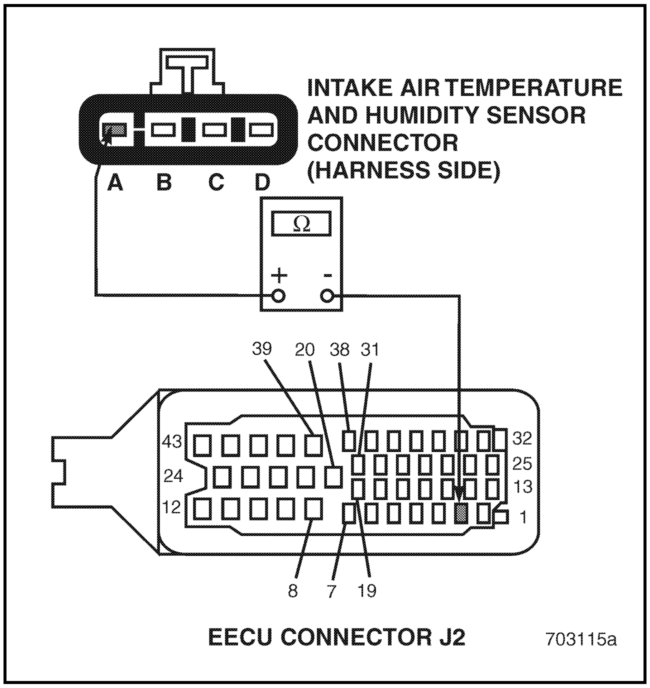


Figure 319

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Check for continuity between the Intake Air Temperature and Humidity (IATH) Sensor harness connector pin A (reference voltage line) and EECU harness connector J2 pin 2 (see Figure 319).

   If continuity exists, go to test “Test 18 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Reference Voltage Line” on page 251.

   If there is NO continuity, repair the open in the harness reference voltage line.

Test 10 — Checking the IATH Sensor Reference Voltage Line

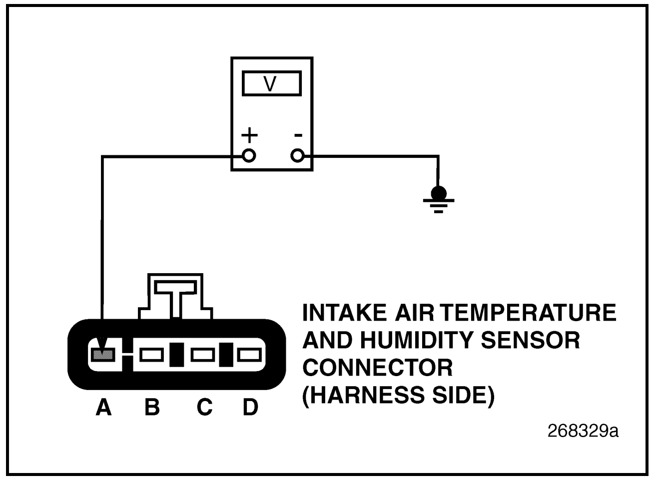


Figure 320

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between the Intake Air Temperature and Humidity (IATH) Sensor harness connector pin A (reference voltage line) and a good ground (see Figure 320).

   If the measured voltage is less than 5.25 volts, go to test “Test 20 — Checking the IATH Sensor Return Line for a Short Circuit” on page 251.

   If the measured voltage is greater than 5.25 volts, go to test “Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the IATH Sensor Reference Voltage Line” on page 252.

Test 11 — Checking the Harness for a Pin to Pin Short Circuit

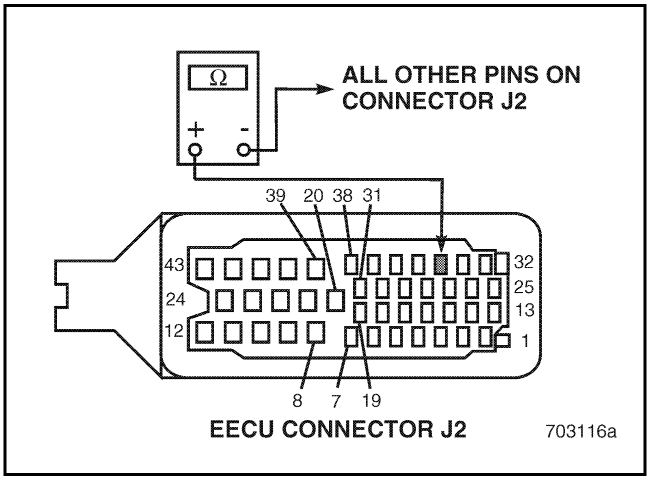


Figure 321

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between EECU harness connector J2 pin 34 (signal line) and all other pins in EECU harness connector J2 (see Figure 321).
5. Visually check EECU connector J2 pin 34 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the signal line.

   If there is NO continuity or visual short, replace the EECU.

Test 16 — Checking the Harness for Continuity in the IATH Sensor Signal Line

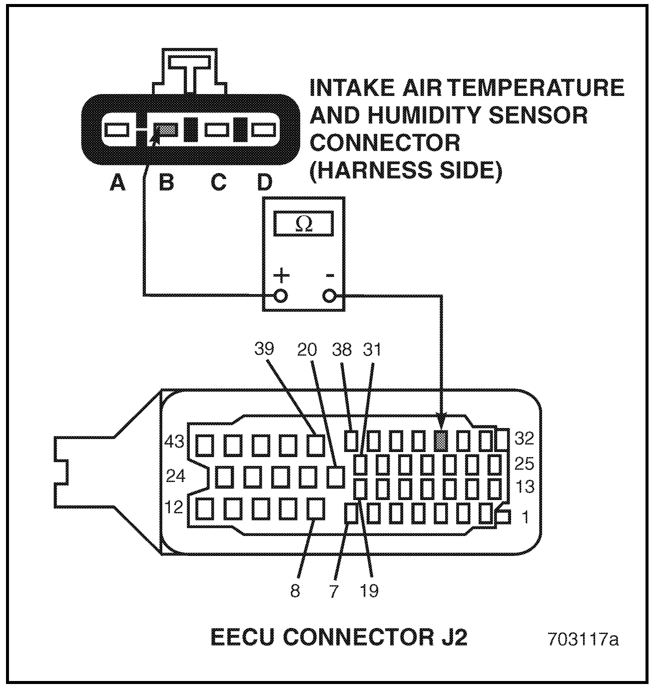


Figure 322

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between IATH Sensor harness connector pin B (signal line) and EECU harness connector J2 pin 34 (see Figure 322).

   If continuity exists, go to test “Test 32 — Checking the IATH Sensor Connector” on page 252.

   If there is NO continuity, repair the open circuit in the harness signal line.

Test 18 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Reference Voltage Line

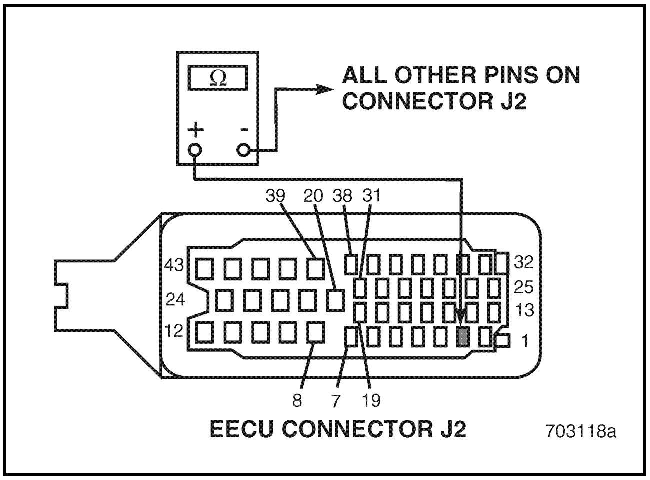


Figure 323

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between EECU harness connector J2 pin 2 (reference voltage line) and all other pins in EECU harness connector J2 (see Figure 323).
5. Visually check EECU connector J2 pin 2 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 20 — Checking the IATH Sensor Return Line for a Short Circuit

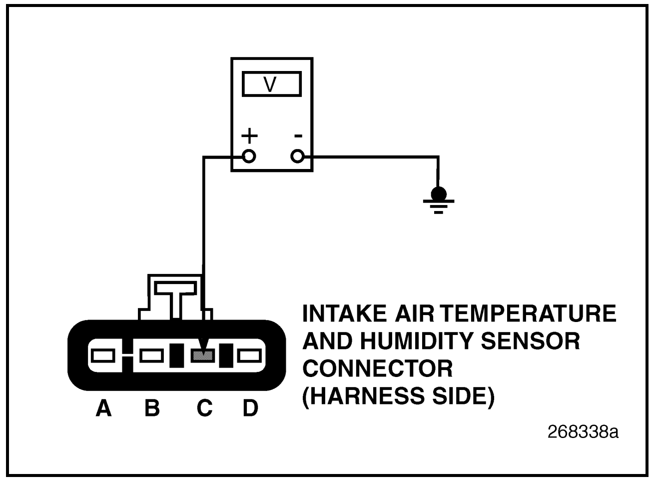


Figure 324

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between IATH Sensor harness connector pin C (ground line) and a good ground (see Figure 324).

   If the measured voltage is 0.5 volts or less, go to test “Test 40 — Checking the IATH Sensor Return Line for an Open Circuit” on page 252.

   If the measured voltage is greater than 0.5 volts, go to test “Test 41 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Return Line” on page 253.

Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the IATH Sensor Reference Voltage Line

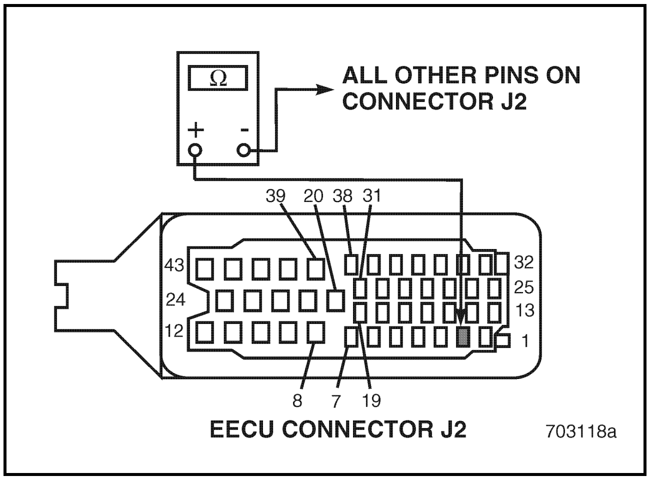


Figure 325

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
4. Check for continuity between EECU harness connector J2 pin 2 (reference voltage line) and all other pins in EECU harness connector J2 (see Figure 325).
5. Visually check EECU connector J2 pin 2 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 32 — Checking the IATH Sensor Connector

1. Visually inspect both sides of the Intake Air Temperature and Humidity (IATH) Sensor connector for a repairable open.
2. If any of the pins appear to be loose or damaged, replace the IATH Sensor.

   If the pins in the connector are making good contact, go to test “Test 64 — Checking the EECU Connector for an Open Circuit” on page 253.

Test 40 — Checking the IATH Sensor Return Line for an Open Circuit

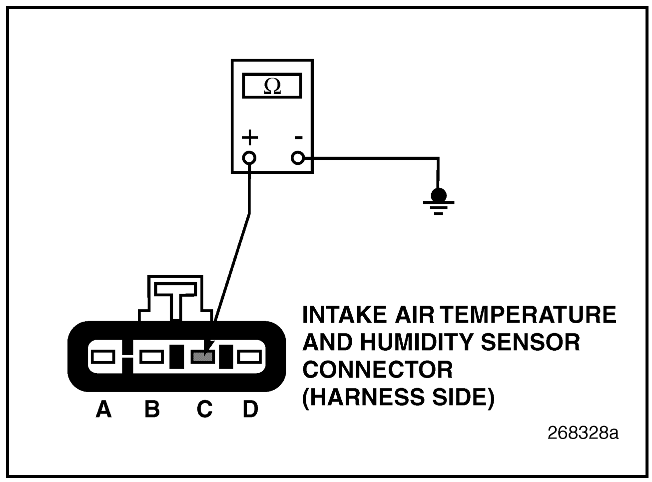


Figure 326

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Check for continuity between IATH Sensor harness connector pin C (ground line) and a good ground (see Figure 326).

   If continuity exists, go to test “Test 80 — Checking the IATH Sensor Connector” on page 253.

   If there is NO continuity, go to test “Test 81 — Checking the Harness for an Open IATH Sensor Return Line” on page 254.

Test 41 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Return Line

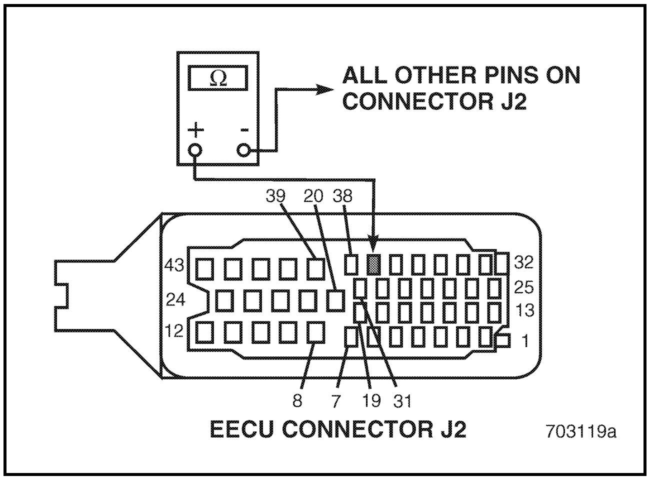


Figure 327

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
4. Check for continuity between EECU harness connector J2 pin 37 (ground line) and all other pins in EECU harness connector J2 (see Figure 327).
5. Visually check EECU connector J2 pin 37 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the ground line.

   If there is NO continuity or visual short, replace the EECU.

Test 64 — Checking the EECU Connector for an Open Circuit

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pins 2, 34, and 37 for a repairable open.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pins are making good contact, replace the Intake Air Temperature and Humidity (IATH) Sensor.

Test 80 — Checking the IATH Sensor Connector

1. Visually inspect both sides of the Intake Air Temperature and Humidity (IATH) Sensor connector for a repairable open.
2. If any of the pins appear to be loose or damaged, replace the IATH Sensor.

   If the pins in the connector are making good contact, replace the Intake Air Temperature and Humidity (IATH) Sensor.

Test 81 — Checking the Harness for an Open IATH Sensor Return Line

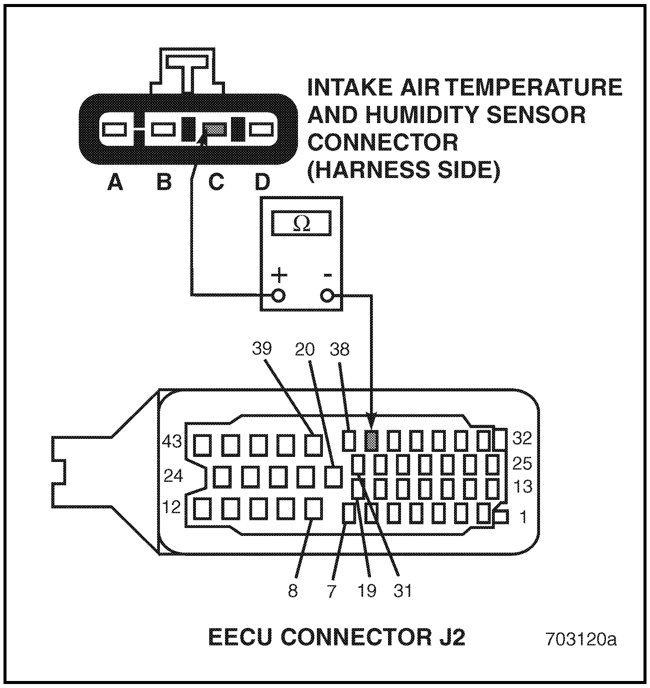


Figure 328

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between IATH Sensor harness connector pin C (ground line) and EECU harness connector J2 pin 37 (see Figure 328).

   If continuity exists, go to test "Test 162 — Checking the EECU Connector for an Open IATH Sensor Return Line" on page 254.

   If there is NO continuity, repair the open circuit in the harness ground line.

Test 162 — Checking the EECU Connector for an Open IATH Sensor Return Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pin 83 for a repairable open in the ground line.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pin is making good contact, replace the EECU.

BLINK CODE 2-9 — INTAKE AIR HUMIDITY (ASET™ CEGR ENGINE)

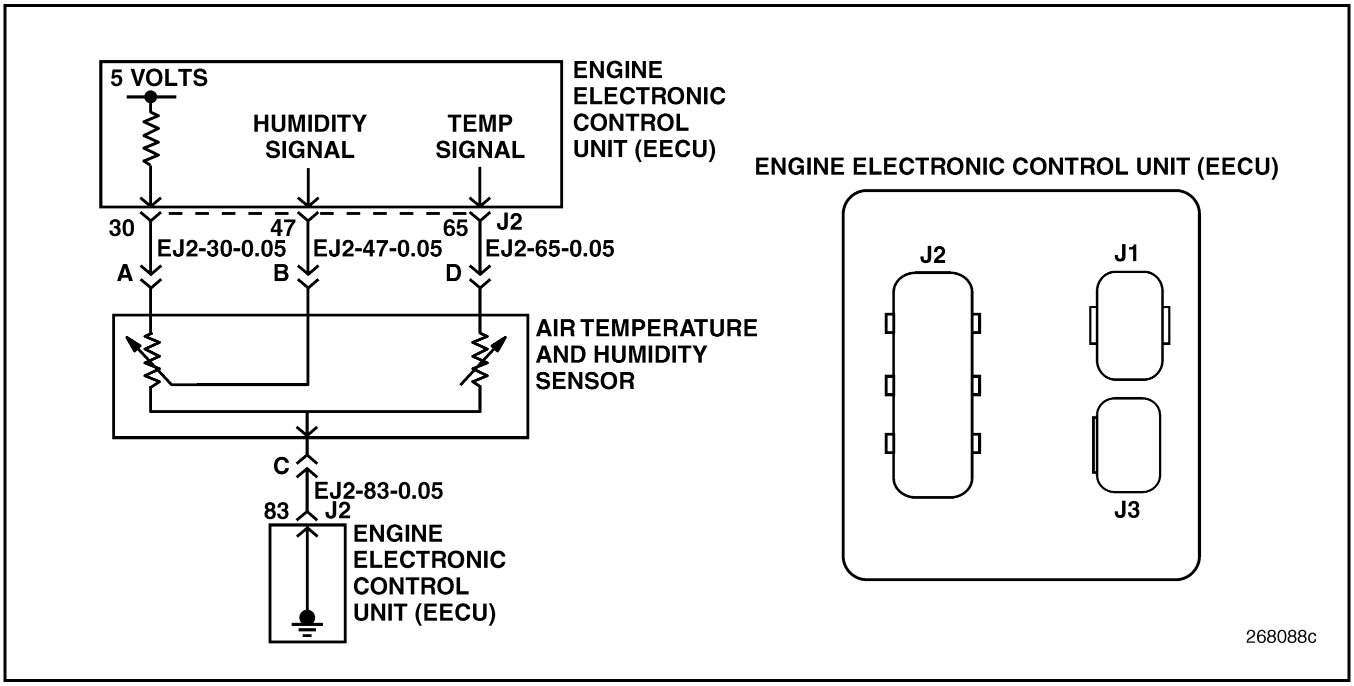


Figure 329 — Intake Air Temperature and Humidity (IATH) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): 274

Message Identification (MID): 128

Circuit Description: The Intake Air Temperature and Humidity (IATH) Sensor contains two thermistors, The resistance of each thermistor varies inversely to temperature. By monitoring the current flow through each thermistor, the Engine Electronic Control Unit (EECU) calculates the temperature and humidity of the air entering the turbocharger.

Location: The Intake Air Temperature and Humidity (IATH) Sensor is located in the air intake tube just downstream from the air filter canister.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 2-9 will set when the Engine Electronic Control Unit (EECU) senses that the IATH Sensor signal voltage is less than 0.15 volts or greater than 4.9 volts for 1 second. If the IATH Sensor voltage returns to between 0.15 volts and 4.9 volts for more than 1 second, the fault will become inactive.

Test 1 — Checking for Code 2-9

1. Verify that code 2-9 is set.

   If code 2-9 is set, go to test "Test 2 — Checking Code 2-9 Failure Mode Identifier (FMI)" on page 256.

   If code 2-9 is not set, wiggle the harness and connectors to try and set the code.

Test 2 — Checking Code 2-9 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (voltage low or open), go to test "Test 4 — Checking the IATH Sensor Reference Voltage Line" on page 256.

   If the FMI is 3 (voltage high), go to test "Test 5 — Checking Code 2-9 Failure Mode Identifier (FMI) with the IATH Sensor Disconnected" on page 256.

Test 4 — Checking the IATH Sensor Reference Voltage Line

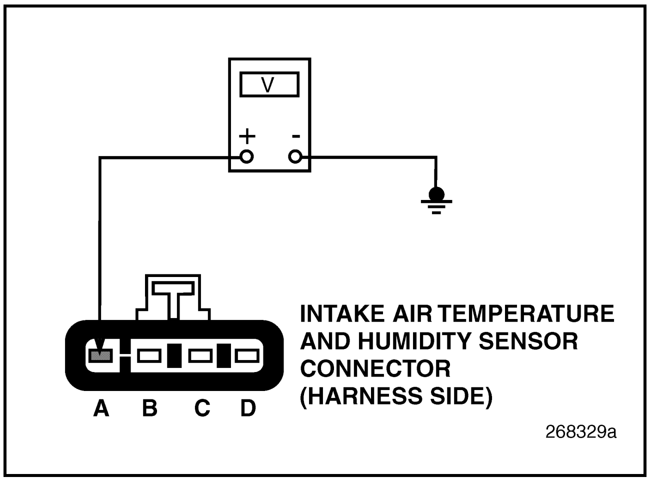


Figure 330

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between IATH Sensor harness connector pin A (reference voltage line) and a good ground (see Figure 330).

   If the measured voltage is greater than 4.9 volts, go to test "Test 8 — Checking the IATH Sensor Signal Line for a Short Circuit to Ground" on page 256.

   If the measured voltage is less than 4.9 volts, go to test "Test 9 — Checking the Harness for Continuity in the IATH Sensor Reference Voltage Line" on page 257.

Test 5 — Checking Code 2-9 Failure Mode Identifier (FMI) with the IATH Sensor Disconnected

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI 3 (voltage high) changed to FMI 4 (voltage low or open), go to test "Test 10 — Checking the IATH Sensor Reference Voltage Line" on page 257.

   If the FMI code did NOT change, go to test "Test 11 — Checking the Harness for a Pin to Pin Short Circuit" on page 258.

Test 8 — Checking the IATH Sensor Signal Line for a Short Circuit to Ground

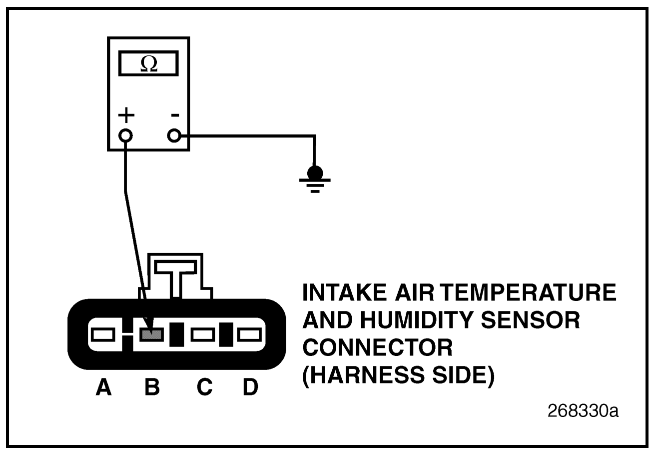


Figure 331

1. Turn the ignition key OFF.
2. Disconnect the EECU.
3. Check for continuity between IATH Sensor harness connector pin B (signal line) and a good ground (see Figure 331).

   If there is NO continuity, go to test "Test 16 — Checking the Harness for Continuity in the IATH Sensor Signal Line" on page 258.

   If continuity exists, locate and repair the short circuit to ground in the IATH Sensor signal line.

Test 9 — Checking the Harness for Continuity in the IATH Sensor Reference Voltage Line

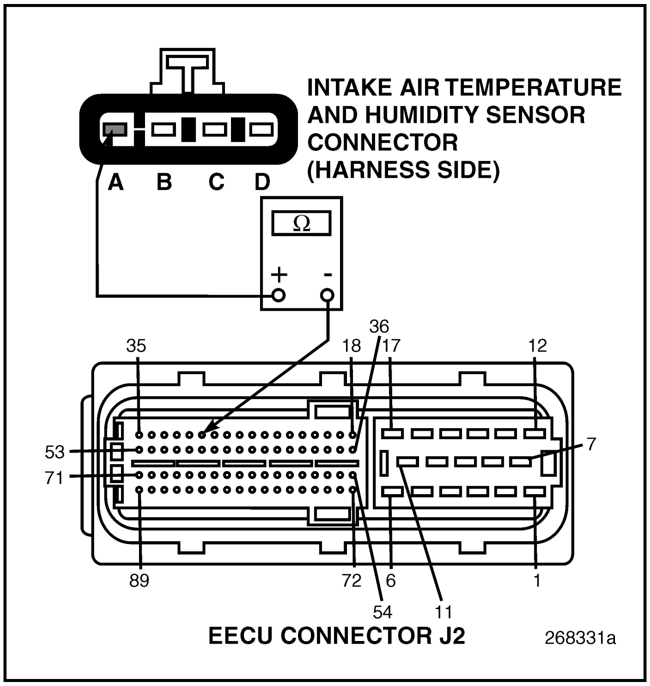


Figure 332

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Check for continuity between the Intake Air Temperature and Humidity (IATH) Sensor harness connector pin A (reference voltage line) and EECU harness connector J2 pin 30 (see Figure 332).

   If continuity exists, go to test “Test 18 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Reference Voltage Line” on page 259.

   If there is NO continuity, repair the open in the harness reference voltage line.

Test 10 — Checking the IATH Sensor Reference Voltage Line

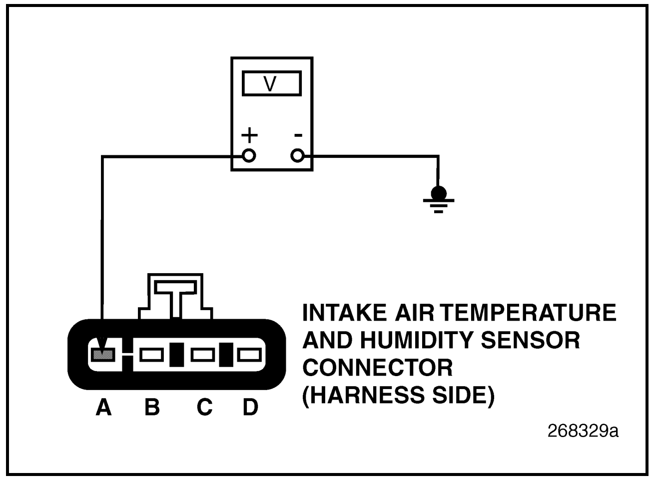


Figure 333

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between the Intake Air Temperature and Humidity (IATH) Sensor harness connector pin A (reference voltage line) and a good ground (see Figure 333).

   If the measured voltage is less than 5.25 volts, go to test “Test 20 — Checking the IATH Sensor Return Line for a Short Circuit” on page 259.

   If the measured voltage is greater than 5.25 volts, go to test “Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the IATH Sensor Reference Voltage Line” on page 260.

Test 11 — Checking the Harness for a Pin to Pin Short Circuit

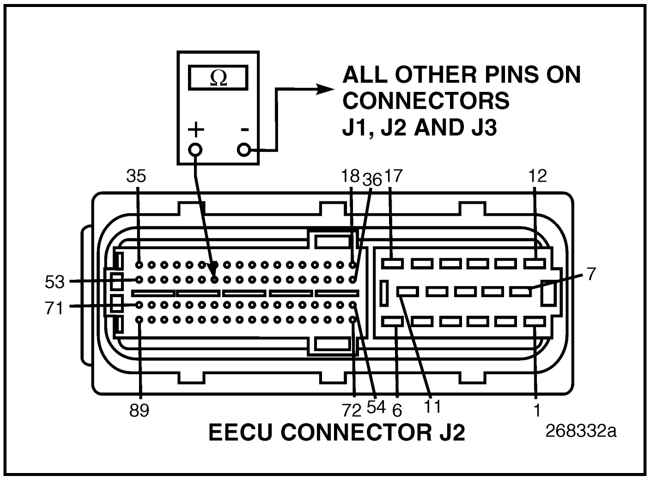


Figure 334

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 47 (signal line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 334).
5. Visually check EECU connector J2 pin 47 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the signal line.

   If there is NO continuity or visual short, replace the EECU.

Test 16 — Checking the Harness for Continuity in the IATH Sensor Signal Line

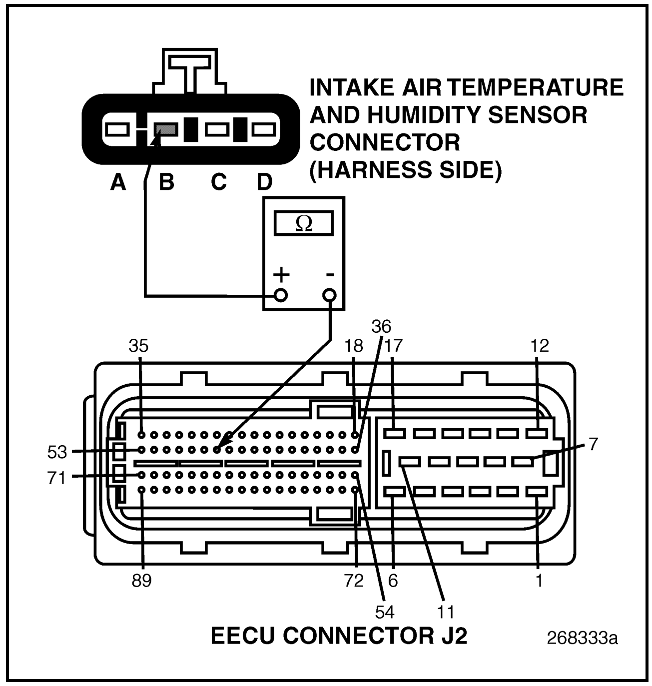


Figure 335

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between IATH Sensor harness connector pin B (signal line) and EECU harness connector J2 pin 47 (see Figure 335).

   If continuity exists, go to test “Test 32 — Checking the IATH Sensor Connector” on page 260.

   If there is NO continuity, repair the open circuit in the harness signal line.

Test 18 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Reference Voltage Line

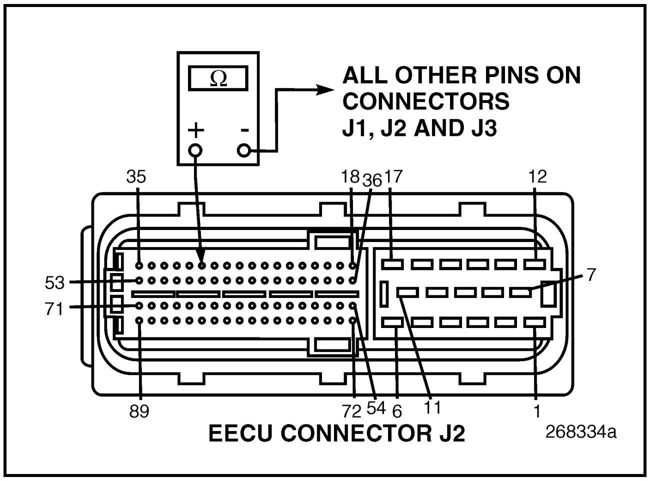


Figure 336

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 30 (reference voltage line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 336).
5. Visually check EECU connector J2 pin 30 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 20 — Checking the IATH Sensor Return Line for a Short Circuit

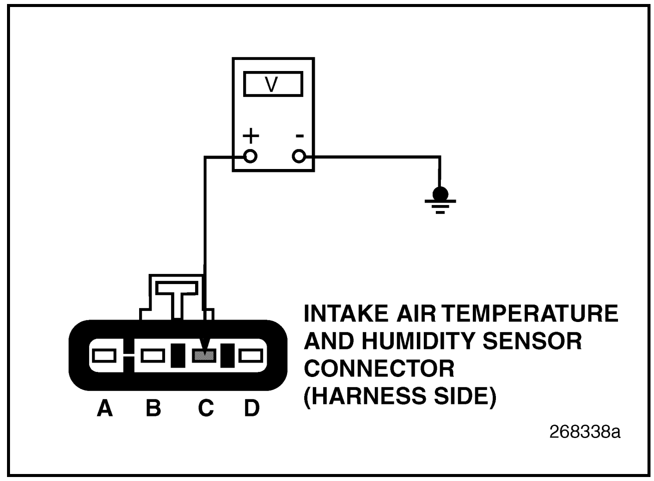


Figure 337

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between IATH Sensor harness connector pin C (ground line) and a good ground (see Figure 337).

   If the measured voltage is 0.5 volts or less, go to test “Test 40 — Checking the IATH Sensor Return Line for an Open Circuit” on page 260.

   If the measured voltage is greater than 0.5 volts, go to test “Test 41 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Return Line” on page 261.

Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the IATH Sensor Reference Voltage Line

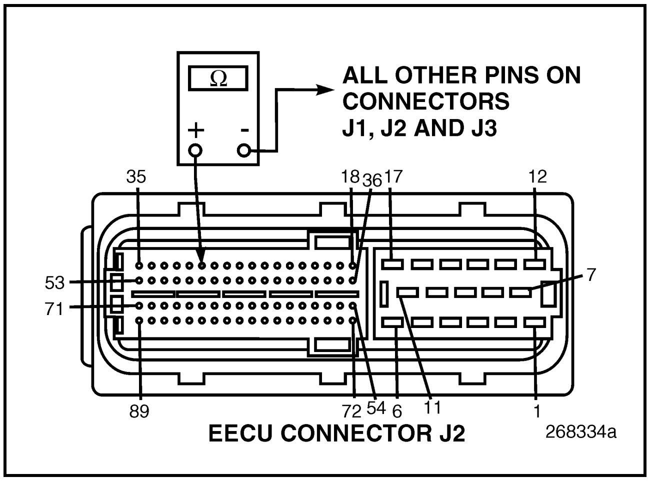


Figure 338

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
3. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
4. Check for continuity between EECU harness connector J2 pin 30 (reference voltage line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 338).
5. Visually check EECU connector J2 pin 30 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, replace the EECU.

Test 32 — Checking the IATH Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Intake Air Temperature and Humidity (IATH) Sensor connector for a repairable open.
2. If any of the pins feel loose, replace the IATH Sensor.

   If the pins in the connector are NOT loose, go to test "Test 64 — Checking the EECU Connector for an Open Circuit" on page 261.

Test 40 — Checking the IATH Sensor Return Line for an Open Circuit

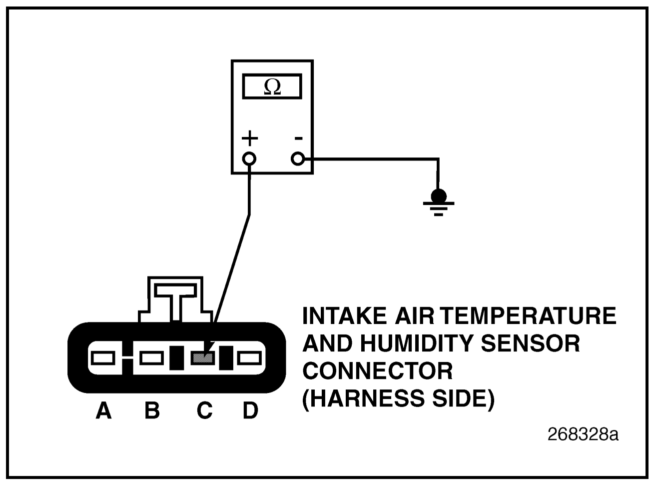


Figure 339

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Check for continuity between IATH Sensor harness connector pin C (ground line) and a good ground (see Figure 339).

   If continuity exists, go to test "Test 80 — Checking the IATH Sensor Connector" on page 261.

   If there is NO continuity, go to test "Test 81 — Checking the Harness for an Open IATH Sensor Return Line" on page 262.

Test 41 — Checking the Harness for a Pin to Pin Short in the IATH Sensor Return Line

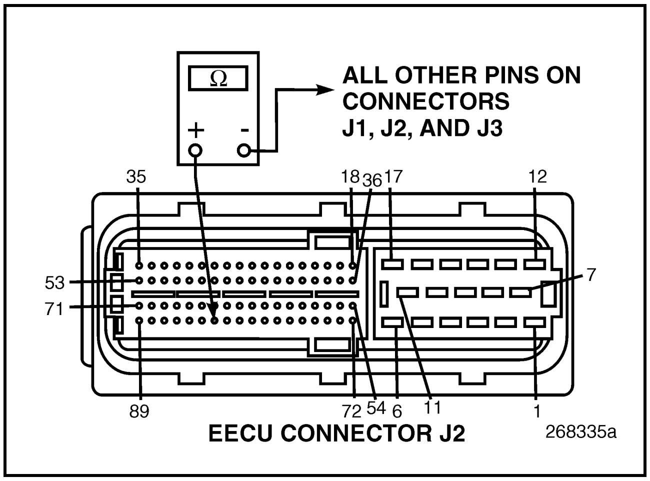


Figure 340

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
3. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
4. Check for continuity between EECU harness connector J2 pin 83 (ground line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 340).
5. Visually check EECU connector J2 pin 83 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the ground line.

   If there is NO continuity or visual short, replace the EECU.

Test 64 — Checking the EECU Connector for an Open Circuit

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pins 30, 47, and 83 for a repairable open.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pins are making good contact, replace the Intake Air Temperature and Humidity (IATH) Sensor.

Test 80 — Checking the IATH Sensor Connector

NOTE

Make sure that the test leads used for checking pin snugness are in good condition.

1. Visually inspect both sides of the Intake Air Temperature and Humidity (IATH) Sensor connector for a repairable open.
2. If any of the pins feel loose, replace the IATH Sensor.

   If the pins in the connector are NOT loose, replace the Intake Air Temperature and Humidity (IATH) Sensor.

Test 81 — Checking the Harness for an Open IATH Sensor Return Line

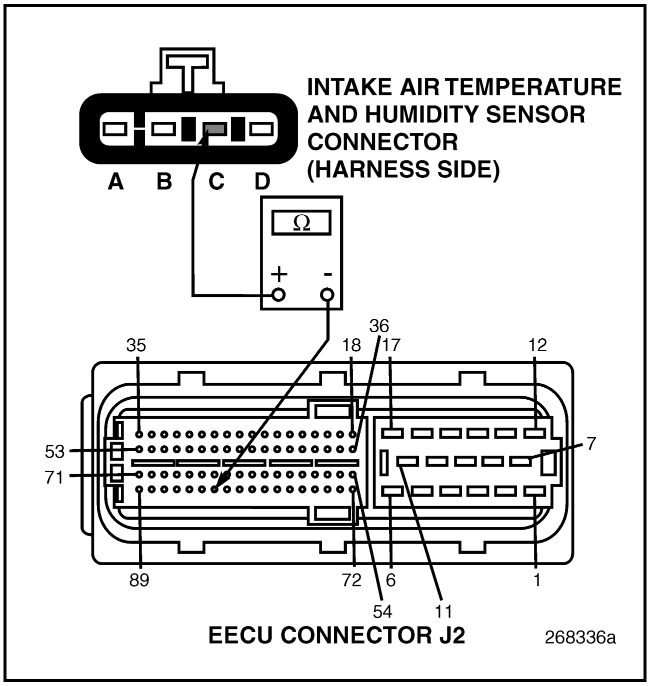


Figure 341

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity (IATH) Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between IATH Sensor harness connector pin C (ground line) and EECU harness connector J2 pin 83 (see Figure 341).

   If continuity exists, go to test “Test 162 — Checking the EECU Connector for an Open IATH Sensor Return Line” on page 262.

   If there is NO continuity, repair the open circuit in the harness ground line.

Test 162 — Checking the EECU Connector for an Open IATH Sensor Return Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pin 83 for a repairable open in the ground line.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pin is making good contact, replace the EECU.

BLINK CODE 3-1 — EXHAUST TEMPERATURE (ET) SENSOR

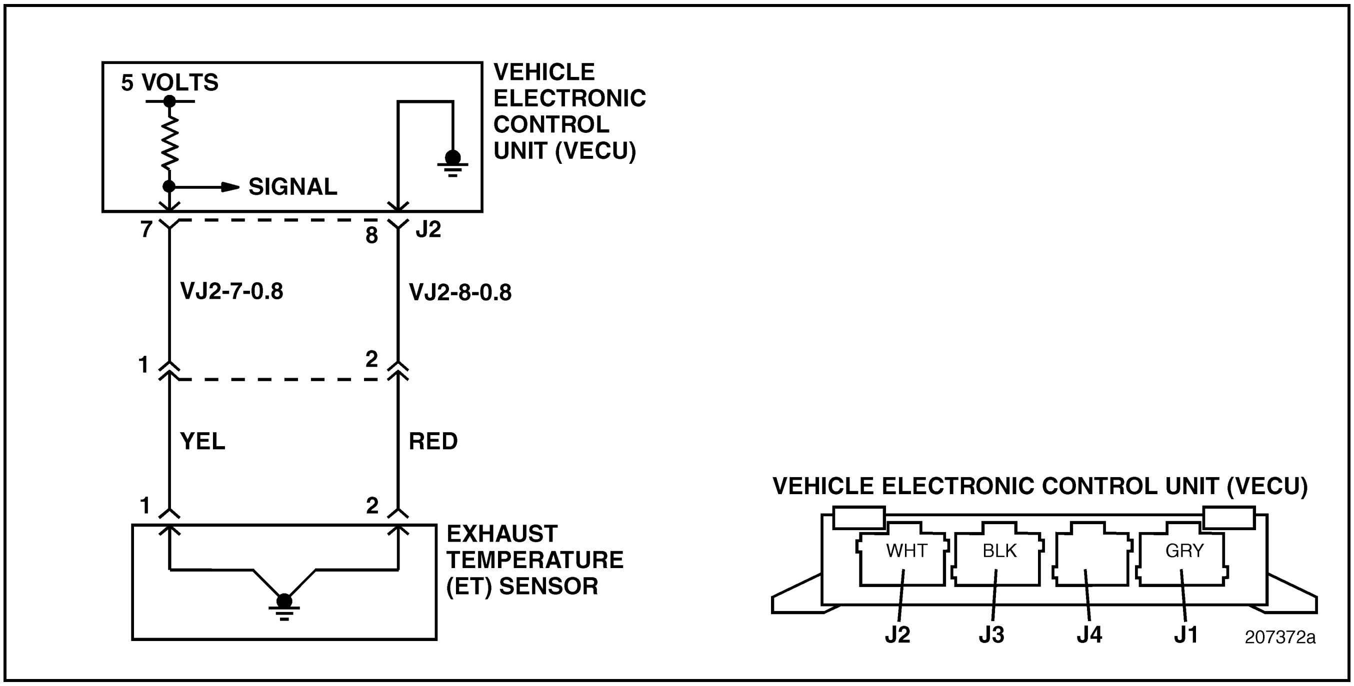


Figure 342 — Exhaust Temperature (ET) Sensor Circuit

NOTE
When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): P173

Message Identification (MID): 142

Circuit Description: The Exhaust Temperature (ET) Sensor is a thermocouple. The output voltage of the ET Sensor increases with an increase in exhaust temperature. The Vehicle Electronic Control Unit (VECU) monitors the voltage output of the ET Sensor and compares it to the output voltage of an internal reference thermocouple. By comparing the two voltages, the VECU calculates the temperature of the engine exhaust gasses. The VECU places exhaust temperature information on the J1587 serial data lines for use by other control units and to warn the driver of high exhaust temperatures.

Location: The Exhaust Temperature (ET) Sensor is located in the exhaust pipe, just downstream from the turbocharger.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 3-1 will set with an FMI of 4, if the Vehicle Electronic Control Unit (VECU) senses that the engine has been running at greater than 30% load for at least 60 seconds and the exhaust temperature is less than 100°F (82°C) for 2 seconds. If the engine load drops to less than 30% after code 3-1 has set, the code will remain active. If the engine load remains greater than 30% and the ET Sensor output voltage returns to normal for 2 seconds, the fault code will become inactive. The Electronic Malfunction Lamp (EML) will turn on and code 3-1 will set with an FMI of 3, if the Vehicle Electronic Control Unit (VECU) receives an ET Sensor signal greater than 4.3 volts for 2 seconds.

Normal ET Sensor Parameters: The Exhaust Temperature (ET) Sensor has an output voltage of 8.3 mvolts at 400°F (204°C) and 27 mvolts at 1200°F (649°C).

NOTE

Blink code 3-1 can be enabled and disabled in the Optional Parameters section of the Vehicle Electronic Control Unit (VECU) OEM Data area. If an Exhaust Temperature (ET) Sensor is NOT installed in the vehicle, contact Mack Trucks Service Engineering Division to have blink code 3-1 diagnostics disabled in the Chassis Data file. Download the updated file and reprogram the VECU.

NOTE

If a new tractor is delivered with the Electronic Malfunction Light on and blink code 3-1 active, it may be necessary to connect a trailer to the vehicle to establish the 30% load needed to deactivate the fault and clear the code.

Test 1 — Checking for Code 3-1

1. Verify that code 3-1 is set.

   If code 3-1 is set, go to test “Test 2 — Checking for Sensor Continuity” on page 264.

   If code 3-1 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Exhaust Temperature (ET) Sensor connector and wires for poor connections.

Test 2 — Checking for Sensor Continuity

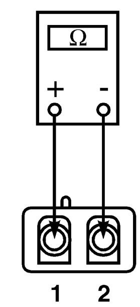


Figure 343

1. Turn the ignition key OFF.
2. Disconnect the Exhaust Temperature (ET) Sensor harness connector.
3. Check for continuity between the terminals of the ET Sensor (see Figure 343).

   If continuity exists between the terminals of the ET Sensor, go to test “Test 4 — Checking for a Short Circuit to Ground in the Sensor” on page 265.

   If there is NO continuity between the terminals of the ET Sensor, replace the sensor.

Test 4 — Checking for a Short Circuit to Ground in the Sensor

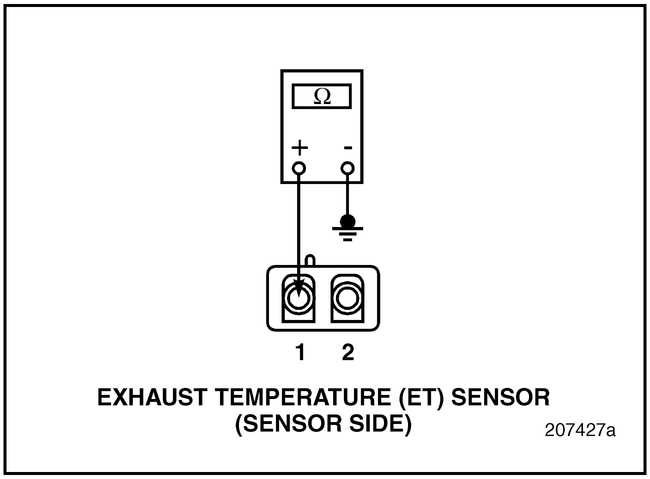


Figure 344

1. Turn the ignition key OFF.
2. Disconnect the Exhaust Temperature (ET) Sensor connector.
3. Check for continuity between either pin of the ET Sensor and a good ground (see Figure 344).

   If continuity exists, replace the ET Sensor.

   If there is NO continuity, go to test “Test 8 — Checking for an Open ET Sensor Harness” on page 265.

Test 8 — Checking for an Open ET Sensor Harness

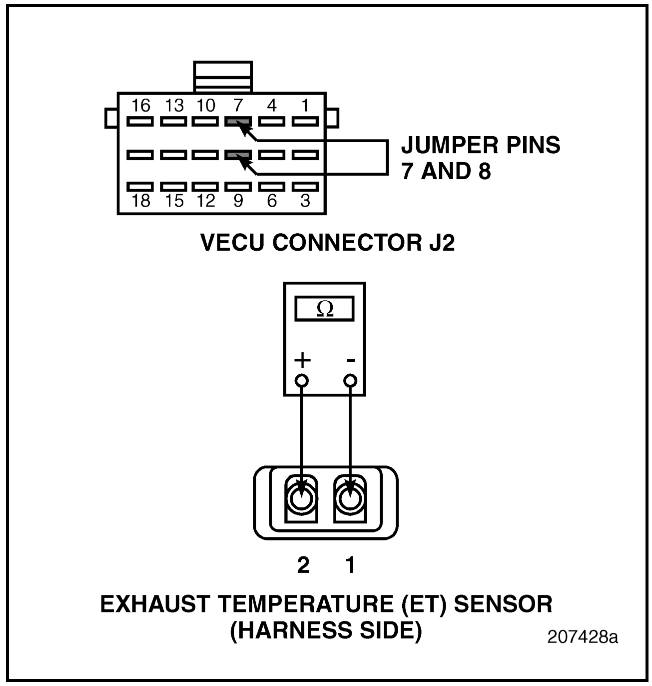


Figure 345

1. Turn the ignition key OFF.
2. Disconnect the Exhaust Temperature (ET) Sensor connector.
3. Disconnect connector J2 from the Vehicle Electronic Control Unit (VECU).
4. Connect a jumper between VECU harness connector J2 pins 7 and 8 (see Figure 345).
5. Check for continuity between pins 1 and 2 of the ET Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 266.

   If there is NO continuity, go to test “Test 17 — Locating the Open Circuit” on page 266.

Test 16 — Checking for Voltage on the Sensor Return Line

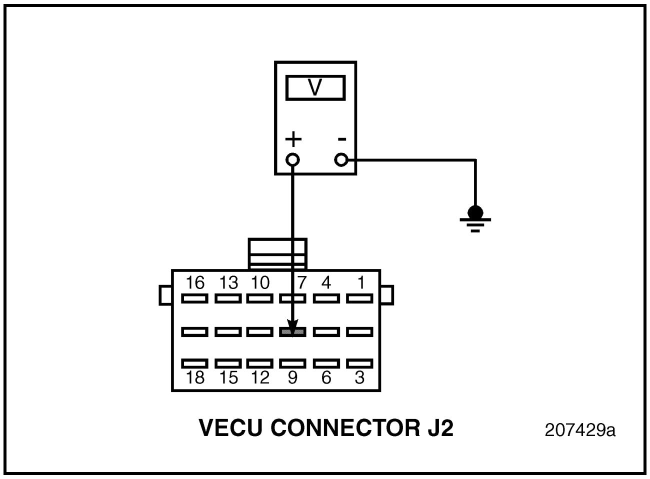


Figure 346

1. Turn the ignition key OFF.
2. Disconnect the Exhaust Temperature (ET) Sensor connector.
3. Disconnect connector J2 from Vehicle Electronic Control Unit (VECU).
4. Turn the ignition key ON.
5. Measure the voltage between VECU connector J2 pin 8 and a good ground (see Figure 346).

   If there is less than 0.5 volts present, go to test "Test 32 — Checking for Voltage on the Sensor Signal Line" on page 267.

   If there is greater than 0.5 volts present, there is a short to voltage on the sensor return line. Locate and repair the short circuit to voltage.

Test 17 — Locating the Open Circuit

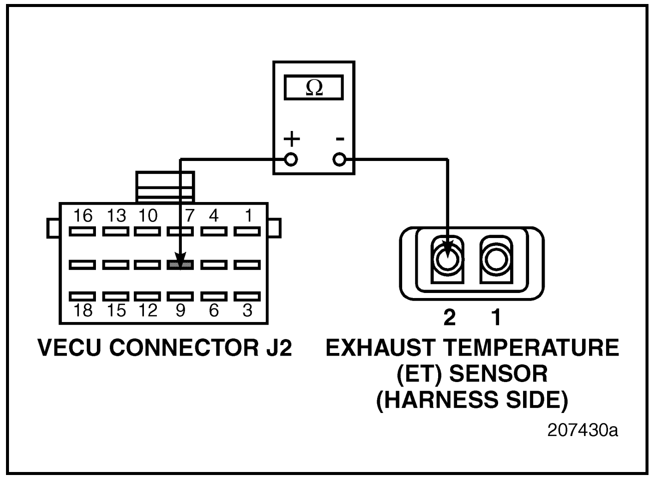


Figure 347

1. Turn the ignition key OFF.
2. Disconnect the Exhaust Temperature (ET) Sensor connector.
3. Disconnect connector J2 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Exhaust Temperature (ET) Sensor harness connector pin 2 and Vehicle Electronic Control Unit (VECU) connector J2 pin 8 (see Figure 347).

   If there is NO continuity, locate and repair the open circuit in the ET Sensor return line (VJ2-8-0.8).

   If continuity exists between VECU connector J2 pin 8 and ET Sensor harness connector pin 2, the open circuit is in the signal side of the circuit. Locate and repair the open circuit in the ET Sensor signal line between VECU harness connector J2 pin 7 and ET harness connector pin 1.

Test 32 — Checking for Voltage on the Sensor Signal Line

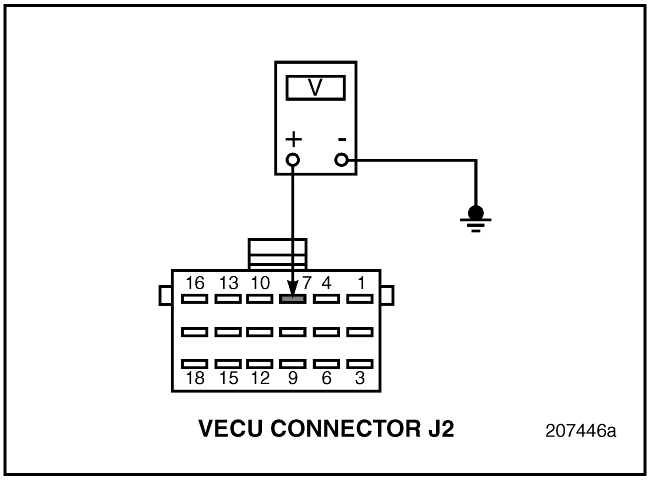


Figure 348

1. Turn the ignition key OFF.
2. Disconnect the Exhaust Temperature (ET) Sensor connector.
3. Disconnect connector J2 from Vehicle Electronic Control Unit (VECU).
4. Turn the ignition key ON.
5. Measure the voltage between VECU connector J2 pin 7 and a good ground (see Figure 348).

   If there is less than 0.5 volts present, go to test “Test 64 — Checking for a Short Circuit to Ground in the Sensor Signal Line” on page 267.

   If there is greater than 0.5 volts present, there is a short circuit to voltage on the sensor signal line. Locate and repair the short circuit to voltage.

Test 64 — Checking for a Short Circuit to Ground in the Sensor Signal Line

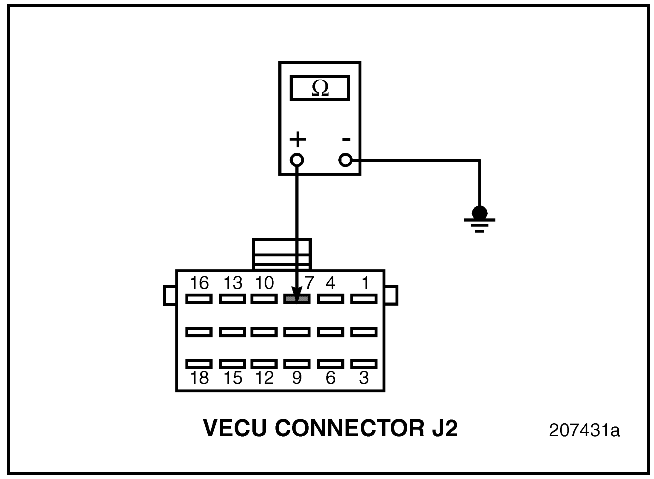


Figure 349

1. Turn the ignition key OFF.
2. Disconnect the Exhaust Temperature (ET) Sensor connector.
3. Disconnect connector J2 from the Vehicle Electronic Control Unit (VECU).
4. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J2 pin 7 and a good ground (see Figure 349).

   If continuity exists, locate and repair the short circuit in the ET Sensor signal line.

   If there is NO continuity, go to test “Test 128 — Checking for a Pin to Pin Short in the Harness” on page 268.

Test 128 — Checking for a Pin to Pin Short in the Harness

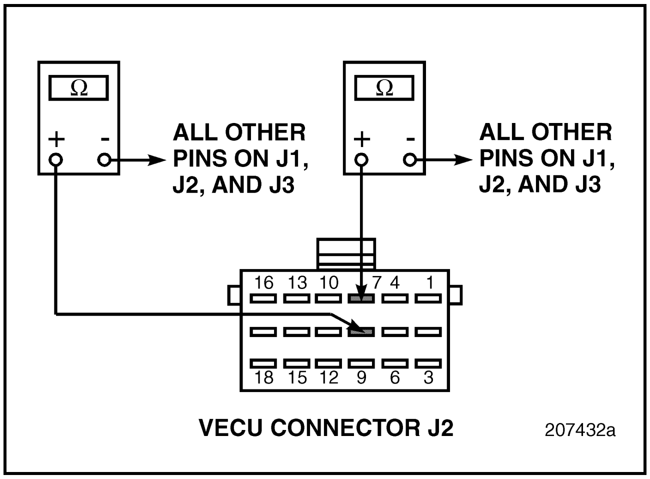


Figure 350

1. Turn the ignition key OFF.
2. Disconnect the ET Sensor connector.
3. Disconnect VECU connectors J1, J2, and J3.
4. Check for continuity between VECU harness connector J2 pins 7 and 8, versus all other pins on VECU connectors J1, J2, and J3 (see Figure 350).

   If continuity exists, repair or replace VECU connector J2.

   If there is NO continuity, go to test "Test 256 — Checking for a Short Circuit at the VECU Connector" on page 268.

Test 256 — Checking for a Short Circuit at the VECU Connector

1. Turn the ignition key OFF.
2. Install a known good ET Sensor.
3. Connect connectors J1, J2 and J3 to the VECU.
4. Run the engine at greater than 30% load.

   If blink code 3-1 is still active, check the VECU and connectors J1, J2, and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident or are not repairable, replace the VECU and retest the system.

   If blink code 3-1 is no longer active, the problem was in the ET Sensor.

BLINK CODE 3-2 — ENGINE SPEED/TIMING (RPM/TDC) SENSOR (ASET™ IEGR ENGINE)

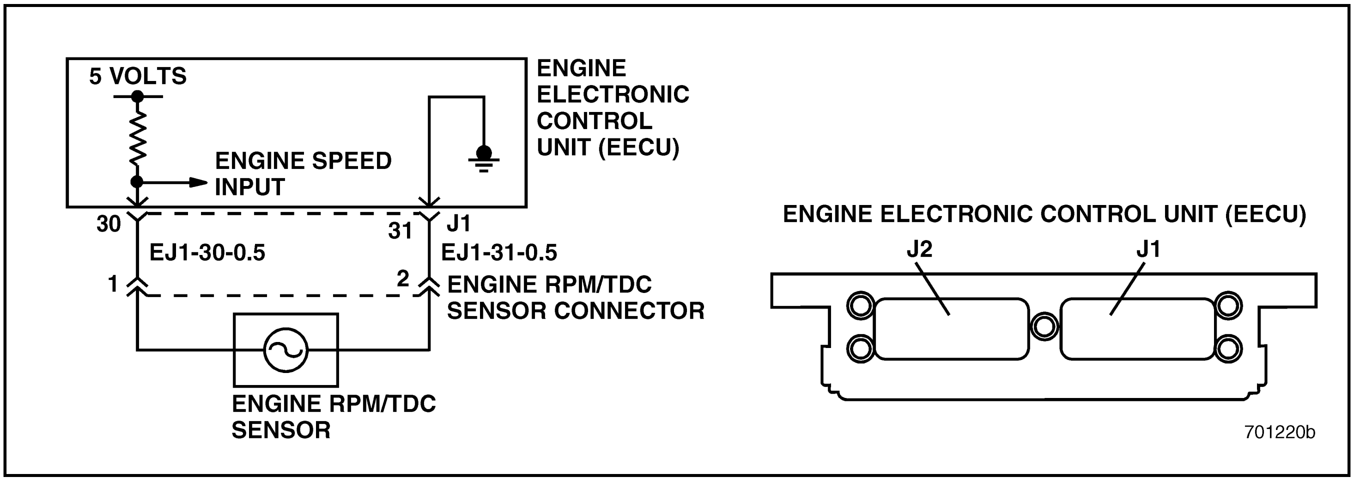


Figure 351 — Engine Speed/Timing (RPM/TDC) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic) or 8 (Abnormal Frequency)

Parameter Identification (PID): S22

Message Identification (MID): 128

Circuit Description: The Engine Speed/Timing (RPM/TDC) Sensor is an inductive sensor that will generate a variable voltage signal when the sensor's magnetic field is excited. The Engine Speed/Timing (RPM/TDC) Sensor is installed near the flywheel. When the engine is running the flywheel's teeth rotate past the sensor's tip and voltage pulses are generated. The Engine Electronic Control Unit (EECU) monitors the frequency of the signal generated by the RPM/TDC Sensor and calculates the engine RPM. The air gap between the sensor tip and the flywheel teeth can influence the sensor's output signal and should be checked if code 3-2 is set or is setting intermittently.

Location: The Engine Speed/Timing (RPM/TDC) Sensor is located on the left side of the engine, on the flywheel housing.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) calculates a significant difference between the Engine Speed/Timing (RPM/TDC) Sensor input signal and the Engine Position (EP) Sensor input signal for more than 1 second, the EECU will turn on the Electronic Malfunction Lamp (EML) and code 3-2 will set, with an FMI of 2 or 8. If the engine speed signals agree for more than 1 second, the fault will become inactive. The engine and tachometer will continue to operate when code 3-2 is set because the EECU will use the Engine Position (EP) Sensor signal to calculate engine speed.

The Engine Electronic Control Unit (EECU) detects FMIs 3, 4 & 5 only when the engine is stopped, and the key is in the ON position.

NOTE

Electrical problems can cause this fault to be generated, and electrical diagnostics are provided in this section. Mechanical problems can also cause temporary or permanent speed signal errors. After all electrical possibilities have been ruled out, check mechanical conditions that could cause vibration or signal errors. Such conditions include but are not limited to:

- Faulty Engine Vibration Damper
- Contaminated sensor tips
- Missing or chipped gear teeth
- Improperly installed Flywheel Ring Gear
- Incorrect Flywheel
- Contaminated Flywheel Ring Gear
- Improperly adjusted sensor
- Excessive Driveshaft backlash
- Improperly balanced engine components.

Test 1 — Checking for Blink Code 3-2

1. Verify that code 3-2 is set.

   If code 3-2 is set, go to test "Test 2 — Checking for an Open or Short in the Sensor" on page 270.

   If code 3-2 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for an Open or Short in the Sensor

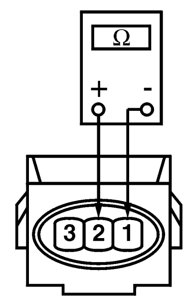


Figure 352

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Measure the resistance between terminals 1 and 2 on the sensor side of the Engine Speed/Timing (RPM/TDC) Sensor harness connector (see Figure 352).

   If the resistance is correct (see table below), go to test "Test 4 — Checking for a Short to Ground in the Sensor" on page 271.

   If the resistance is NOT correct, check the Engine Speed/Timing (RPM/TDC) Sensor pigtail connector and wiring for damage. If the connector and wiring are NOT damaged, replace the Engine Speed/Timing (RPM/TDC) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 4 — Checking for a Short to Ground in the Sensor

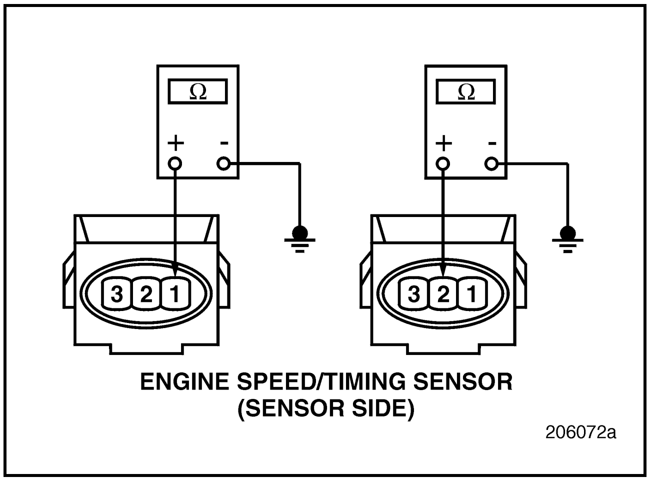


Figure 353

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor connector.
3. On the sensor side of the harness connector, check for continuity between pin 1 and a good ground. Also check for continuity between pin 2 and a good ground (see Figure 353).

   If continuity exists between either pin and ground, replace the sensor.

   If there is NO continuity, go to test “Test 8 — Checking for a Short Circuit to Voltage in the Sensor Signal Line” on page 271.

Test 8 — Checking for a Short Circuit to Voltage in the Sensor Signal Line

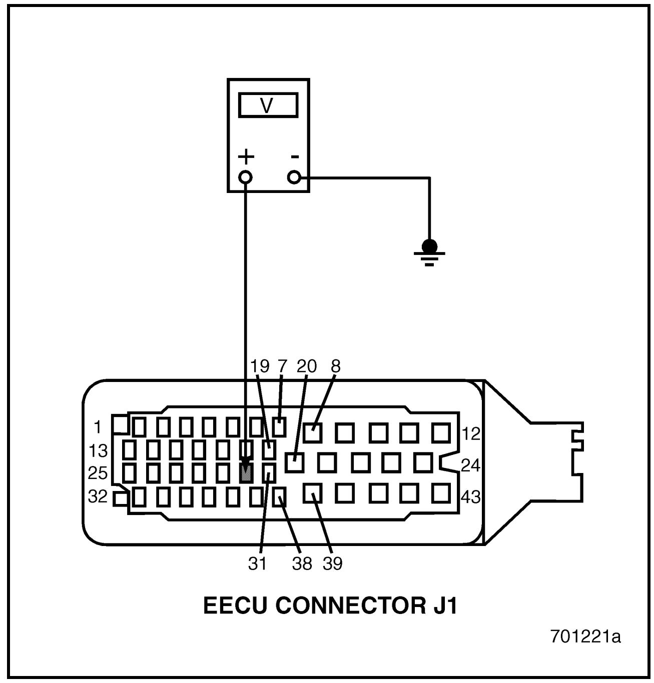


Figure 354

1. Turn the ignition key OFF.
2. Disconnect connector J1 from the Engine Electronic Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pin 30 and a good ground (see Figure 354).

   If the measured voltage is less than 0.5 volts, go to test “Test 16 — Checking for a Short Circuit to Voltage in the Sensor Return Line” on page 272.

   If the measured voltage is greater than 0.5 volts, go to test “Test 17 — Checking for a Pin to Pin Short Circuit to Voltage” on page 272.

Test 16 — Checking for a Short Circuit to Voltage in the Sensor Return Line

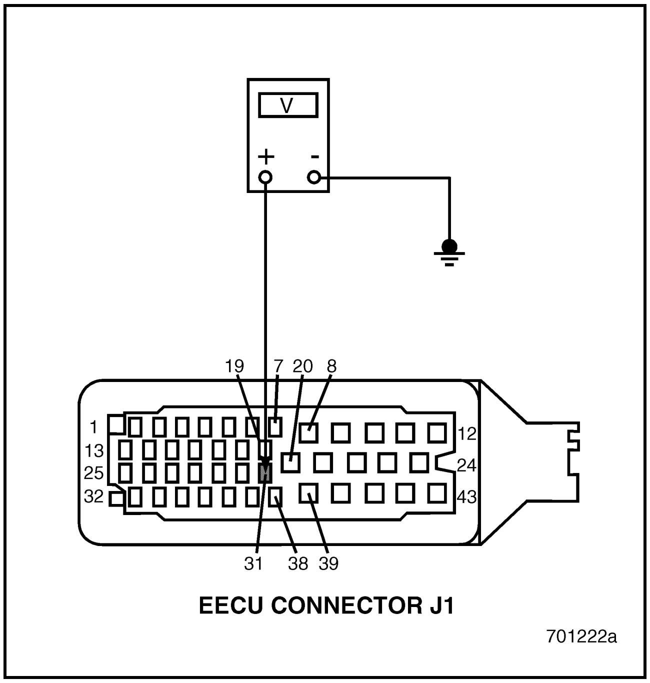


Figure 355

1. Turn the ignition key OFF.
2. Disconnect connector J1 from the EECU.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pin 31 and a good ground (see Figure 355).

   If the measured voltage is less than 0.5 volts, go to test "Test 32 — Checking for a Short to Ground" on page 273.

   If the measured voltage is greater than 0.5 volts, go to test "Test 33 — Isolating the Short Circuit to Voltage" on page 273.

Test 17 — Checking for a Pin to Pin Short Circuit to Voltage

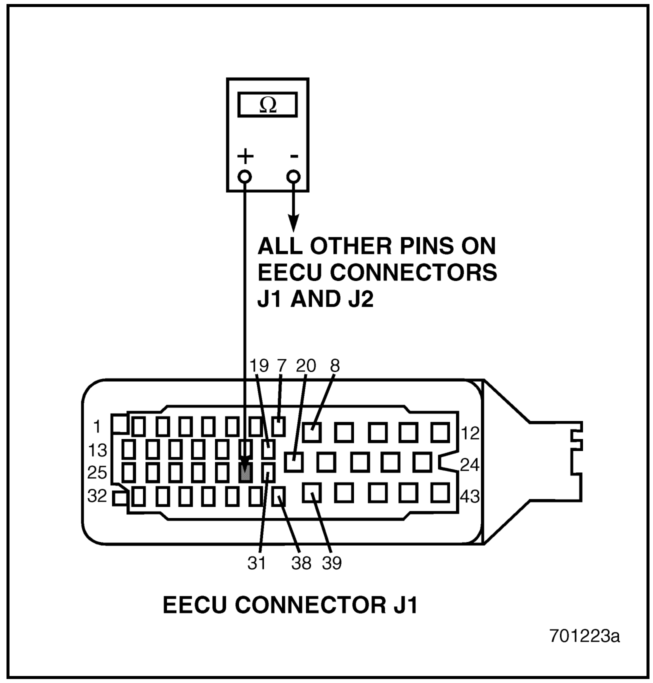


Figure 356

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Check for continuity between EECU connector J1 pin 30 and all other pins on EECU connectors J1 and J2 (see Figure 356).

   If continuity exists between pin 30 and any other pin, pin 30 is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage in the connector.

   If there is NO continuity, the sensor signal line is shorted to voltage somewhere else in the harness. Locate and repair the short to voltage.

Test 32 — Checking for a Short to Ground

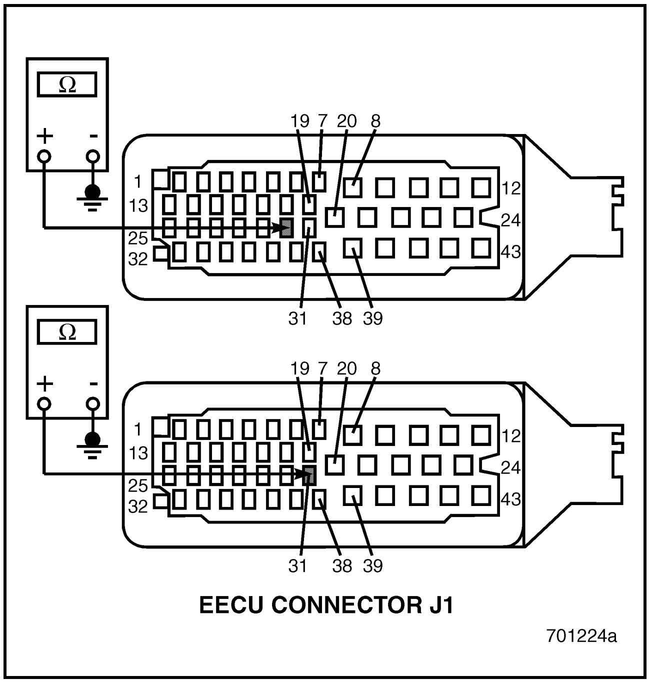


Figure 357

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
4. Check for continuity between EECU connector J1 pin 30 and a good ground and between EECU connector J1 pin 31 and a good ground (see Figure 357).

   If there is NO continuity, go to test "Test 64 — Checking for a Pin to Pin Short Circuit in the Harness" on page 274.

   If there is continuity to ground on either circuit, go to test "Test 65 — Isolating the Short Circuit to Ground" on page 274.

Test 33 — Isolating the Short Circuit to Voltage

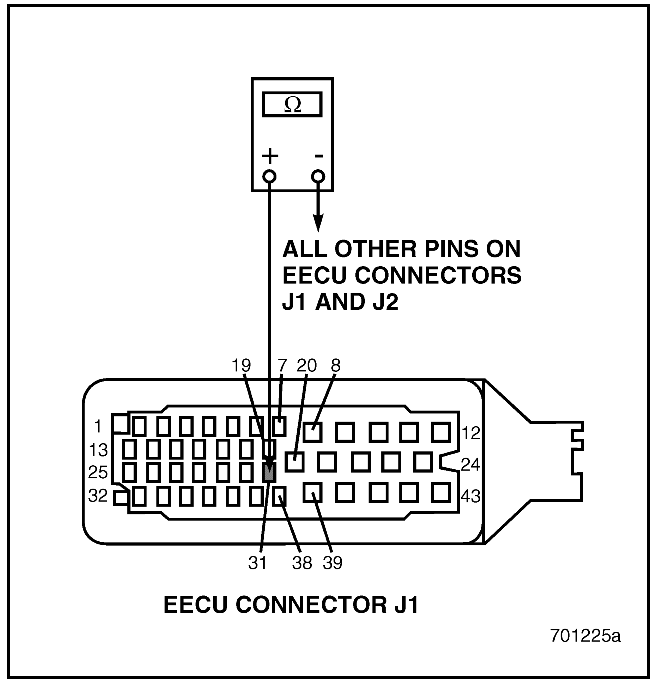


Figure 358

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Check for continuity between EECU connector J1 pin 31 and all other pins on EECU connectors J1 and J2 (see Figure 358).

   If continuity exists between pin 31 and any other pin, pin 31 is shorted to one of the other EECU circuits. Locate and repair the short to voltage.

   If NO continuity exists, the signal return line is shorted to voltage somewhere else in the harness. Locate and repair the short to voltage.

Test 64 — Checking for a Pin to Pin Short Circuit in the Harness

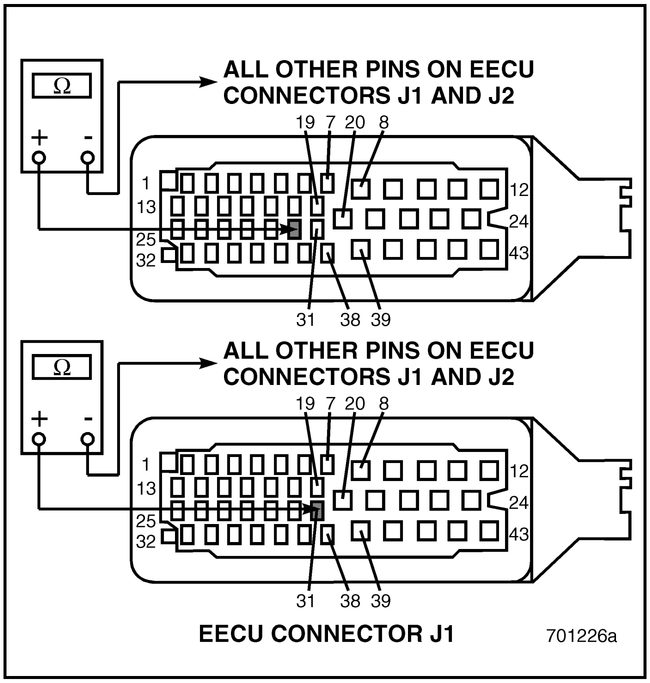


Figure 359

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU connector J1 pins 30 and 31 versus all other pins on EECU connectors J1 and J2 (see Figure 359).

   If there is NO continuity, go to test “Test 128 — Checking for an Open Circuit in the Harness” on page 275.

   If continuity exists between pin 30 or pin 31 and any other pin, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 65 — Isolating the Short Circuit to Ground

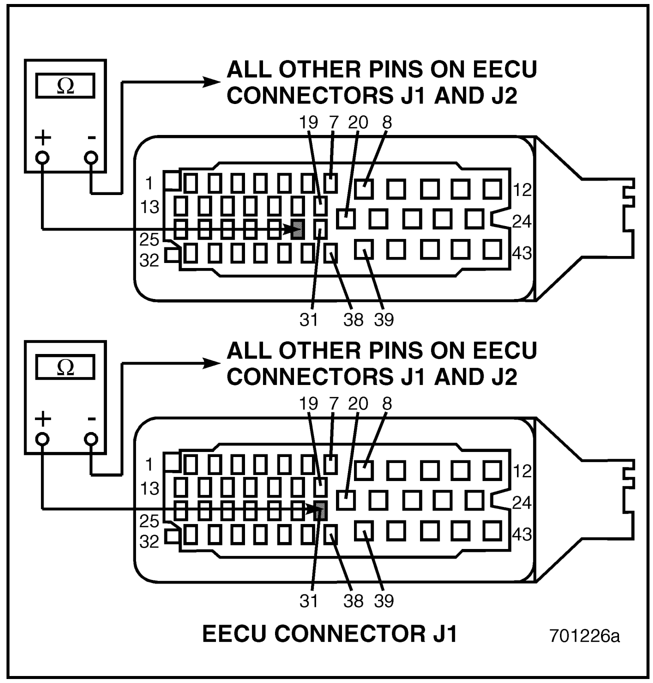


Figure 360

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between the circuit (connector J1 pin 30 or 31) that showed continuity in test 32 and all other pins on EECU connectors J1 and J2 (see Figure 360).

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the suspect pin is shorted to ground somewhere else in the harness. Locate and repair the short circuit.

Test 128 — Checking for an Open Circuit in the Harness

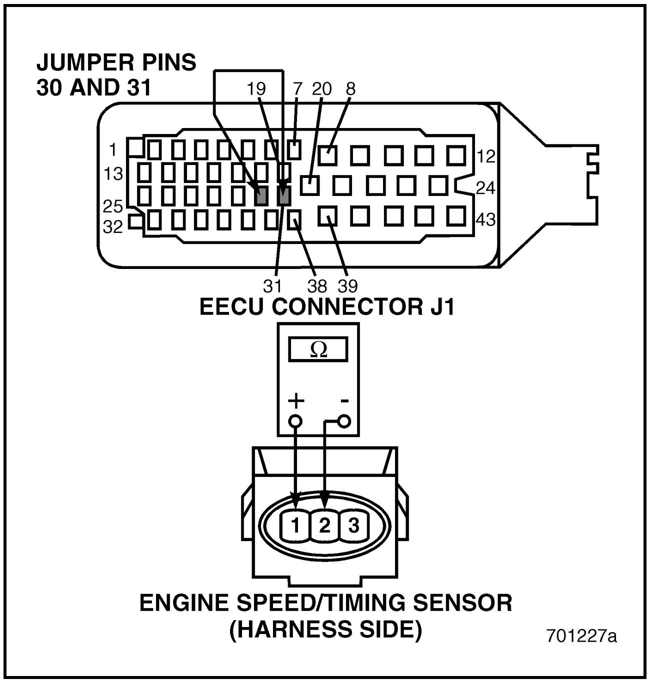


Figure 361

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor connector.
3. Disconnect EECU connector J1.
4. Connect a jumper between EECU connector J1 pin 30 and EECU connector J1 pin 31.
5. Check for continuity between pins 1 and 2 on the harness side of the Engine Speed/Timing (RPM/TDC) Sensor connector (see Figure 361).

   If continuity exists, go to test "Test 256 — Checking for an Open Circuit at the Sensor End of the Harness" on page 275.

   If there is NO continuity, go to test "Test 257 — Checking for an Open Circuit in the RPM/TDC Sensor Harness" on page 276.

Test 256 — Checking for an Open Circuit at the Sensor End of the Harness

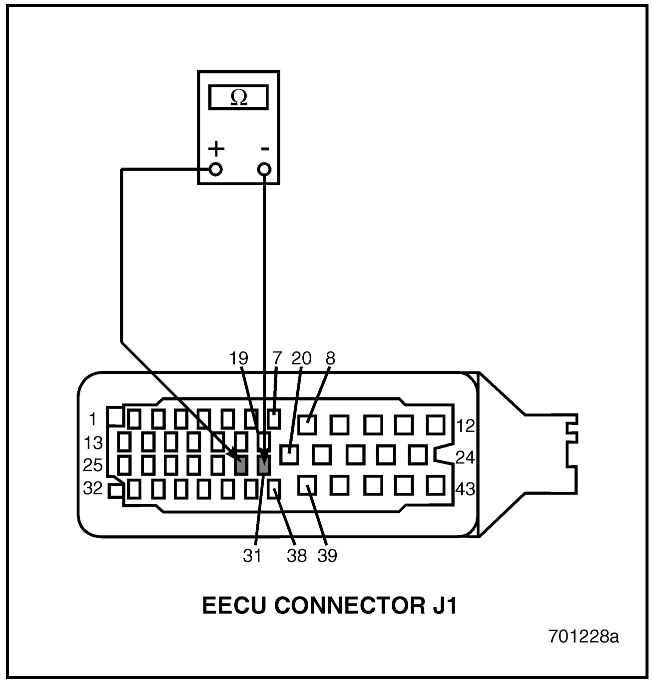


Figure 362

1. Turn the ignition key OFF.
2. Connect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Disconnect EECU connector J1.
4. Measure the resistance between EECU connector J1 pins 30 and 31 (see Figure 362).

   If the resistance is between 650 and 1300 ohms, go to test "Test 512 — Checking for a Faulty EECU or a Loose EECU Connector" on page 276.

   If the resistance is not within this range, there is an open circuit or high resistance connection at the sensor harness connector. Repair the connector if possible, otherwise, replace the sensor.

Test 257 — Checking for an Open Circuit in the RPM/TDC Sensor Harness

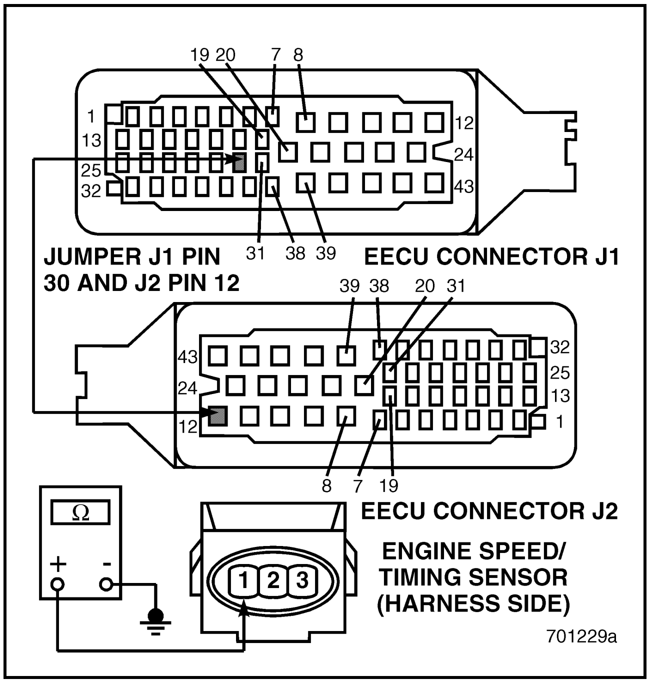


Figure 363

1. Turn the ignition key OFF.
2. Disconnect EECU connectors J1 and J2.
3. Connect a jumper between EECU connector J1 pin 30 and EECU connector J2 pin 12.
4. Check for continuity between RPM/TDC Sensor harness connector pin 1 and a good ground (see Figure 363).

   If continuity exists, there is an open in the RPM/TDC Sensor return line. Locate and repair the open.

   If there is NO continuity, select another chassis ground and re-check. If there is still NO continuity, repair the open in the RPM/TDC Sensor signal line.

Test 512 — Checking for a Faulty EECU or a Loose EECU Connector

NOTE

Before replacing the Engine Control Unit (EECU), check the sensor for proper adjustment. Refer to the Mack ASET™ Engine Service Procedures Manual for the installation and adjustment procedure and shim part numbers.

1. Turn the ignition key OFF.
2. Connect the Engine Speed/Timing Sensor connector.
3. Connect EECU connectors J1 and J2.
4. Start the engine.

   If blink code 3-2 is still active, check the Engine Electronic Control Unit (EECU) and connectors for dirt, loose or broken pins, or repairable damage. If no problems are evident, or they are not repairable, replace the EECU and retest the system.

   If blink code 3-2 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-2 — ENGINE SPEED/TIMING (RPM/TDC) SENSOR (ASET™ CEGR ENGINE)

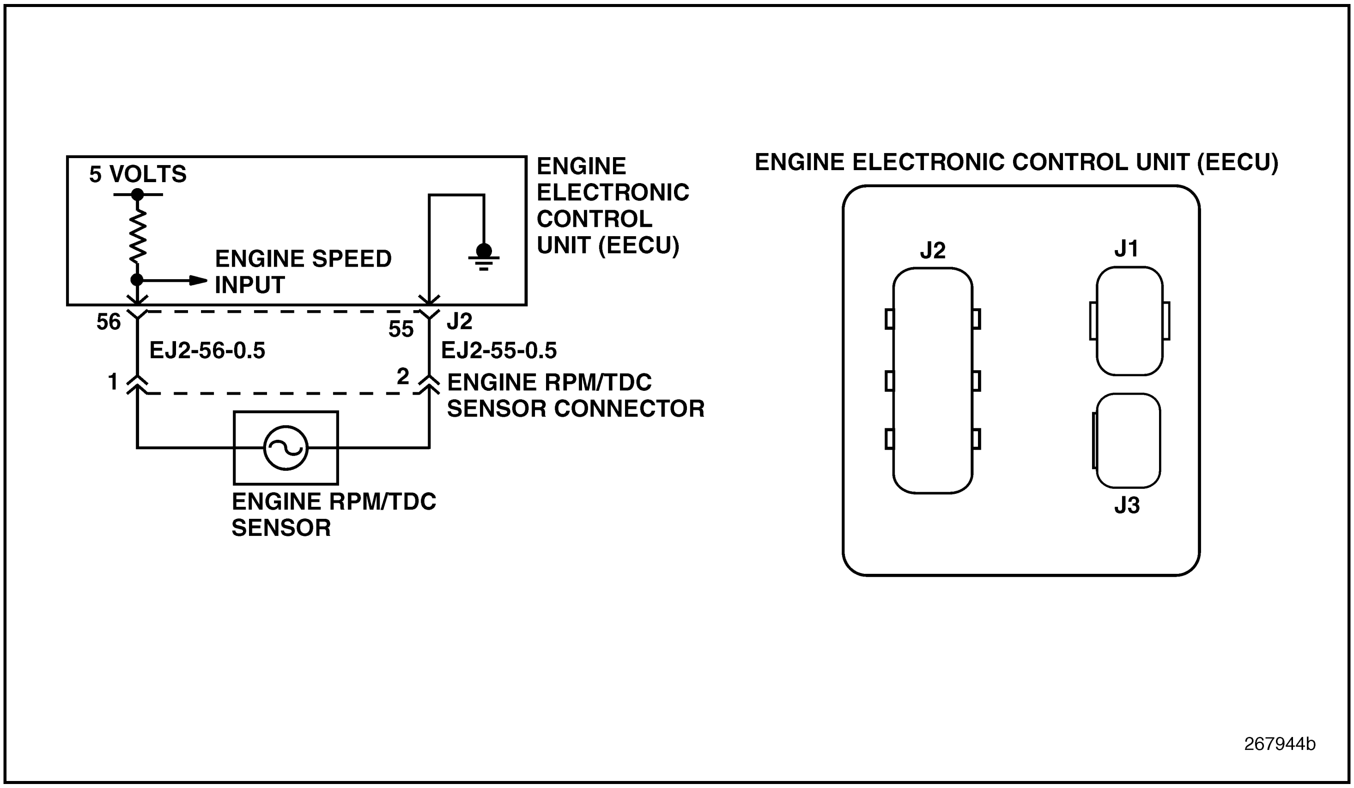


Figure 364 — Engine Speed/Timing (RPM/TDC) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic), 3 (Shorted High), 4 (Shorted Low), 5 (Open) or 8 (Abnormal Frequency)

Parameter Identification (PID): S22

Message Identification (MID): 128

Circuit Description: The Engine Speed/Timing (RPM/TDC) Sensor is an inductive sensor that will generate a variable voltage signal when the sensor's magnetic field is excited. The Engine Speed/Timing (RPM/TDC) Sensor is installed near the flywheel. When the engine is running the flywheel's teeth rotate past the sensor's tip and voltage pulses are generated. The Engine Electronic Control Unit (EECU) monitors the frequency of the signal generated by the RPM/TDC Sensor and calculates the engine RPM. The air gap between the sensor tip and the flywheel teeth can influence the sensor's output signal and should be checked if code 3-2 is set or is setting intermittently.

Location: The Engine Speed/Timing (RPM/TDC) Sensor is located on the left side of the engine, on the flywheel housing.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) calculates a significant difference between the Engine Speed/Timing (RPM/TDC) Sensor input signal and the Engine Position (EP) Sensor input signal for more than 1 second, the EECU will turn on the Electronic Malfunction Lamp (EML) and code 3-2 will set. If the engine speed signals agree for more than 1 second, the fault will become inactive. The engine and tachometer will continue to operate when code 3-2 is set because the EECU will use the Engine Position (EP) Sensor signal to calculate engine speed.

NOTE

Electrical problems can cause this fault to be generated, and electrical diagnostics are provided in this section. Mechanical problems can also cause temporary or permanent speed signal errors. After all electrical possibilities have been ruled out, check mechanical conditions that could cause vibration or signal errors. Such conditions include but are not limited to:

- Faulty Engine Vibration Damper
- Contaminated sensor tips
- Missing or chipped gear teeth
- Improperly installed Flywheel Ring Gear
- Incorrect Flywheel
- Contaminated Flywheel Ring Gear
- Improperly adjusted sensor
- Excessive Driveshaft backlash
- Improperly balanced engine components.

NOTE

FMI 3, 4 and 5 will only be seen as active with the engine OFF. In all cases the Blink Code 3-2 FMI will change to 2 when the engine is started.

Test 1 — Checking for Blink Code 3-2

1. Verify that code 3-2 is set.

   If code 3-2 is set, go to test “Test 2 — Checking for an Open or Short in the Sensor” on page 278.

   If code 3-2 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for an Open or Short in the Sensor

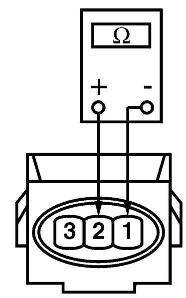


Figure 365

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Measure the resistance between terminals 1 and 2 on the sensor side of the Engine Speed/Timing (RPM/TDC) Sensor harness connector (see Figure 365).

   If the resistance is correct (see table below), go to test “Test 4 — Checking for a Short to Ground in the Sensor” on page 279.

   If the resistance is NOT correct, check the Engine Speed/Timing (RPM/TDC) Sensor pigtail connector and wiring for damage. If the connector and wiring are NOT damaged, replace the Engine Speed/Timing (RPM/TDC) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 4 — Checking for a Short to Ground in the Sensor

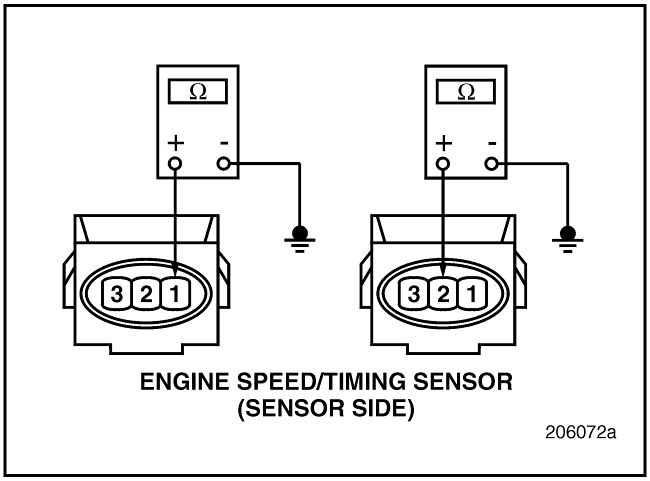


Figure 366

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor connector.
3. On the sensor side of the harness connector, check for continuity between pin 1 and a good ground. Also check for continuity between pin 2 and a good ground (see Figure 366).

   If continuity exists between either pin and ground, replace the sensor.

   If there is NO continuity, go to test "Test 8 — Checking for a Short Circuit to Voltage in the Sensor Signal Line" on page 279.

Test 8 — Checking for a Short Circuit to Voltage in the Sensor Signal Line

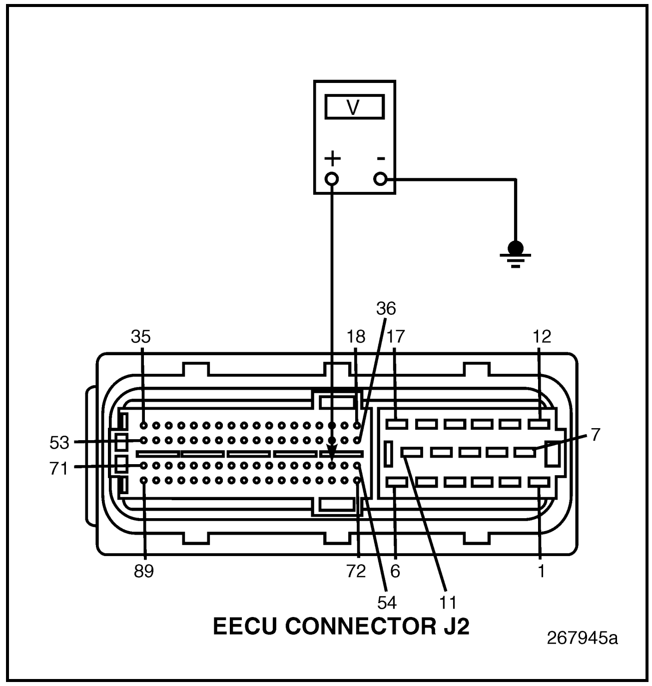


Figure 367

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Electronic Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 56 and a good ground (see Figure 367).

   If the measured voltage is less than 0.5 volts, go to test "Test 16 — Checking for a Short Circuit to Voltage in the Sensor Return Line" on page 280.

   If the measured voltage is greater than 0.5 volts, go to test "Test 17 — Checking for a Pin to Pin Short Circuit to Voltage" on page 280.

Test 16 — Checking for a Short Circuit to Voltage in the Sensor Return Line

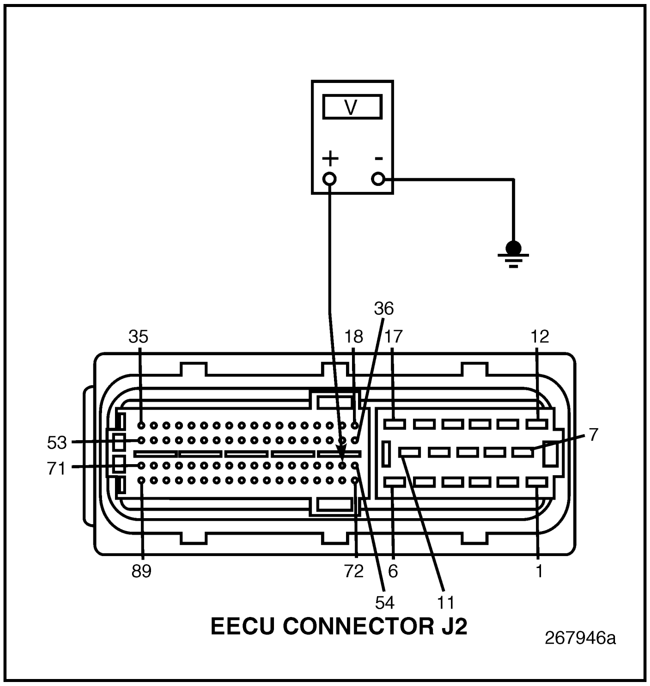


Figure 368

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 55 and a good ground (see Figure 368).

   If the measured voltage is less than 0.5 volts, go to test "Test 32 — Checking for a Short Circuit to Ground" on page 281.

   If the measured voltage is greater than 0.5 volts, go to test "Test 33 — Isolating the Short Circuit to Voltage" on page 281.

Test 17 — Checking for a Pin to Pin Short Circuit to Voltage

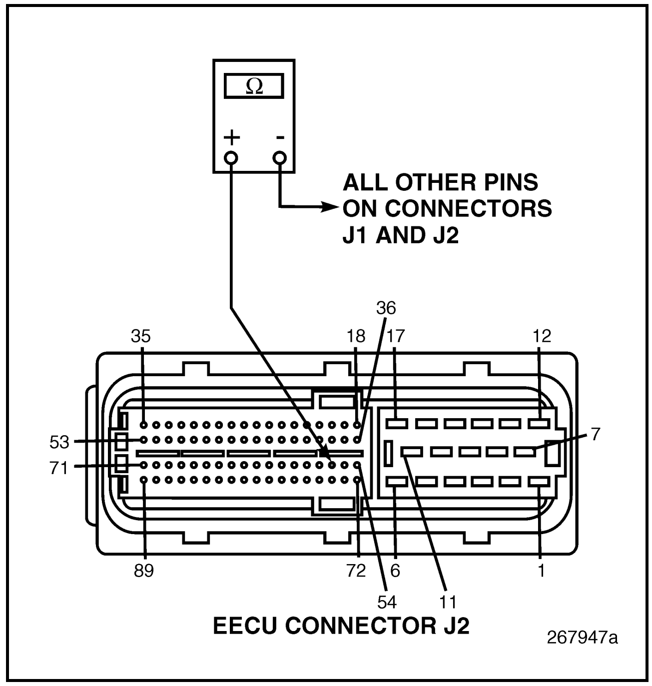


Figure 369

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Check for continuity between EECU connector J2 pin 56 and all other pins on EECU connectors J1 and J2 (see Figure 369).

   If continuity exists between pin 56 and any other pin, pin 56 is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage in the connector.

   If there is NO continuity, the sensor signal line is shorted to voltage somewhere else in the harness. Locate and repair the short to voltage.

Test 32 — Checking for a Short Circuit to Ground

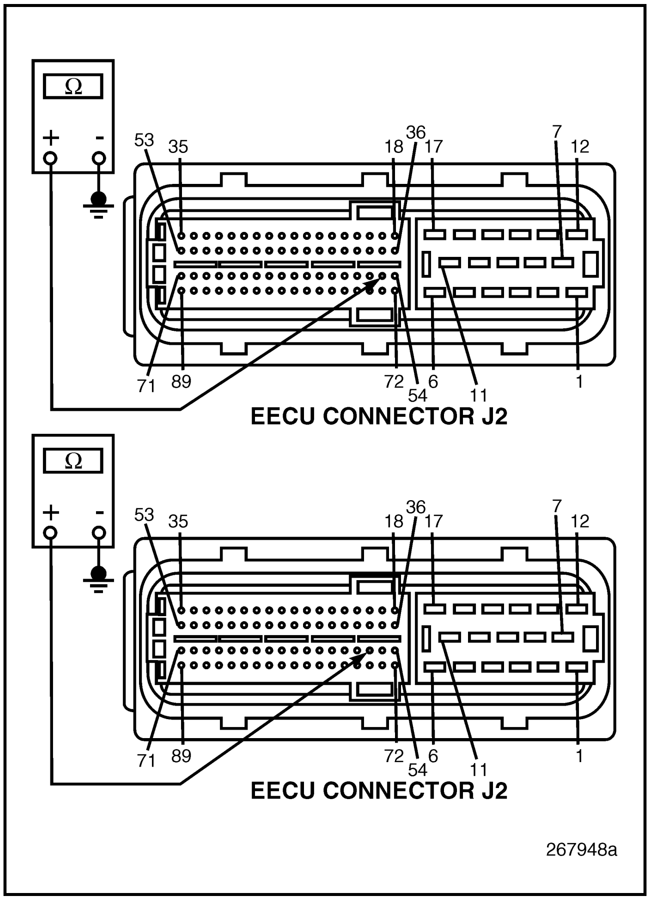


Figure 370

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
4. Check for continuity between EECU connector J2 pin 56 and a good ground and between EECU connector J2 pin 55 and a good ground (see Figure 370).

   If there is NO continuity, go to test “Test 64 — Checking for a Pin to Pin Short Circuit in the Harness” on page 282.

   If there is continuity to ground on either circuit, go to test “Test 65 — Isolating the Short Circuit to Ground” on page 282.

Test 33 — Isolating the Short Circuit to Voltage

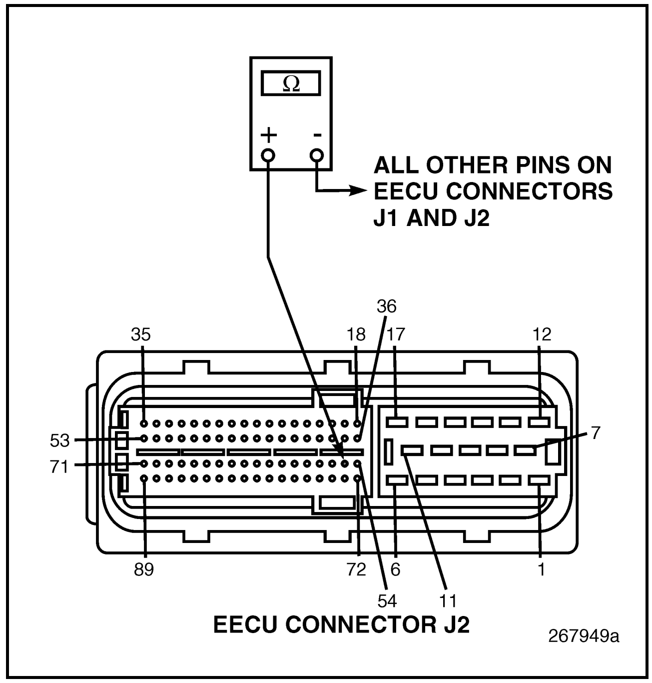


Figure 371

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Check for continuity between EECU connector J2 pin 55 and all other pins on EECU connectors J1 and J2 (see Figure 371).

   If continuity exists between pin 55 and any other pin, pin 55 is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage.

   If NO continuity exists, the return line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 64 — Checking for a Pin to Pin Short Circuit in the Harness

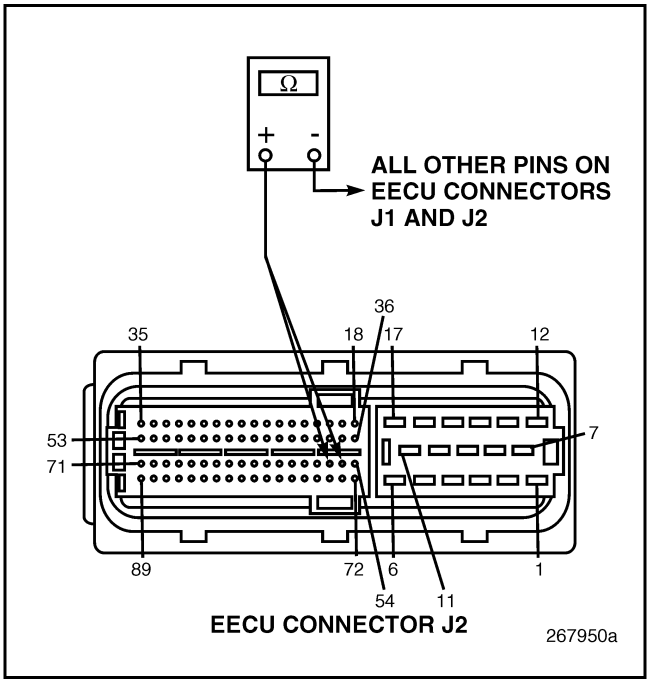


Figure 372

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU connector J2 pins 55 and 56 versus all other pins on EECU connectors J1 and J2 (see Figure 372).

   If there is NO continuity, go to test “Test 128 — Checking for an Open Circuit in the Harness” on page 283.

   If continuity exists between pin 55 or pin 56 and any other pin, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 65 — Isolating the Short Circuit to Ground

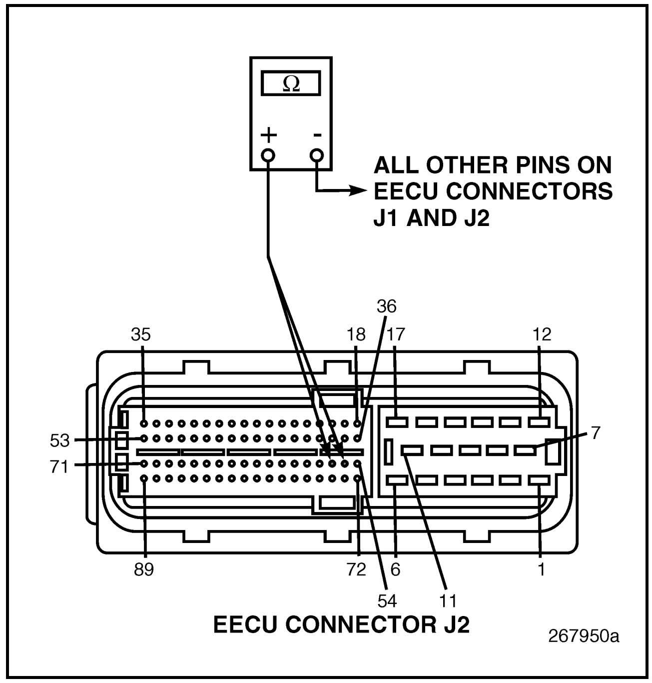


Figure 373

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between the circuit (connector J2 pin 55 or 56) that showed continuity in test 32 and all other pins on EECU connectors J1 and J2 (see Figure 373).

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the suspect pin is shorted to ground somewhere else in the harness. Locate and repair the short circuit.

Test 128 — Checking for an Open Circuit in the Harness

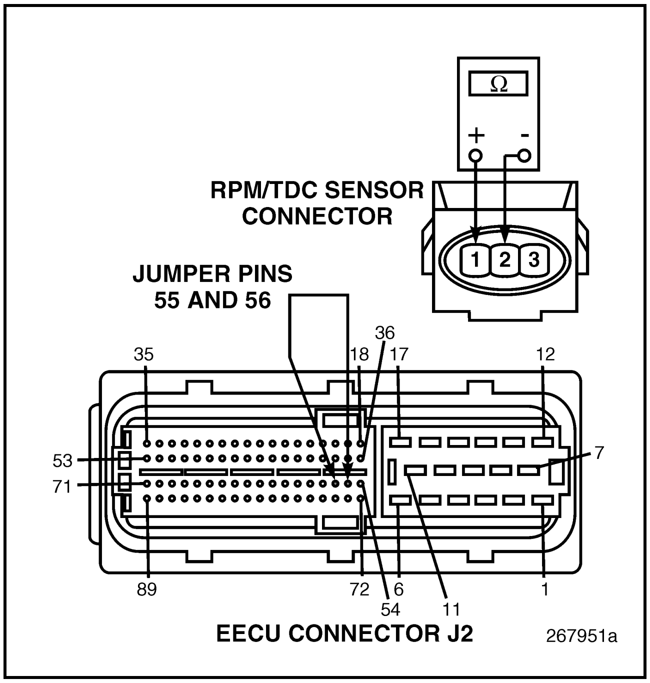


Figure 374

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor connector.
3. Disconnect EECU connector J2.
4. Connect a jumper between EECU connector J2 pin 56 and EECU connector J2 pin 55.
5. Check for continuity between pins 1 and 2 on the harness side of the Engine Speed/Timing (RPM/TDC) Sensor connector (see Figure 374).

   If continuity exists, go to test “Test 256 — Checking for an Open Circuit at the Sensor End of the Harness” on page 283.

   If there is NO continuity, go to test “Test 257 — Checking for an Open Circuit in the RPM/TDC Sensor Harness” on page 284.

Test 256 — Checking for an Open Circuit at the Sensor End of the Harness

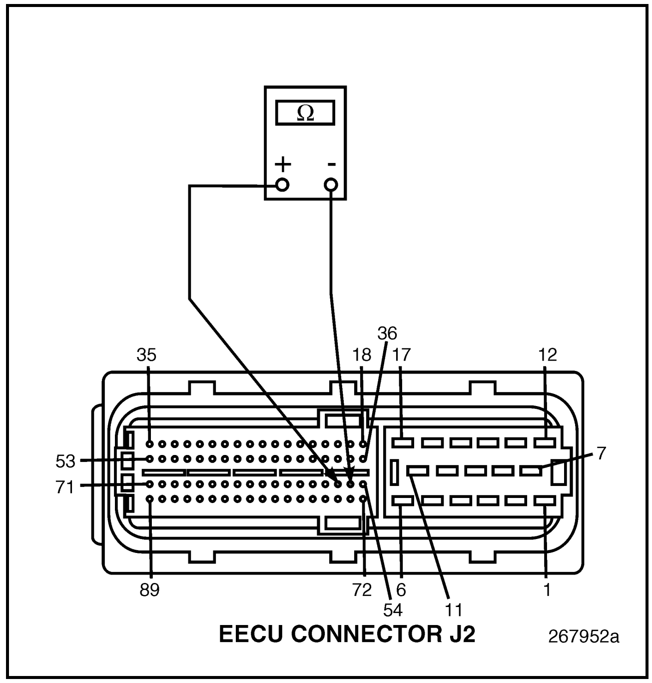


Figure 375

1. Turn the ignition key OFF.
2. Connect the Engine Speed/Timing (RPM/TDC) Sensor.
3. Disconnect EECU connector J2.
4. Measure the resistance between EECU connector J2 pins 55 and 56 (see Figure 375).

   If the resistance is between 650 and 1300 ohms, go to test “Test 512 — Checking for a Faulty EECU or a Loose EECU Connector” on page 284.

   If the resistance is not within this range, there is an open circuit or high resistance connection at the sensor harness connector. Repair the connector if possible, otherwise, replace the sensor.

Test 257 — Checking for an Open Circuit in the RPM/TDC Sensor Harness

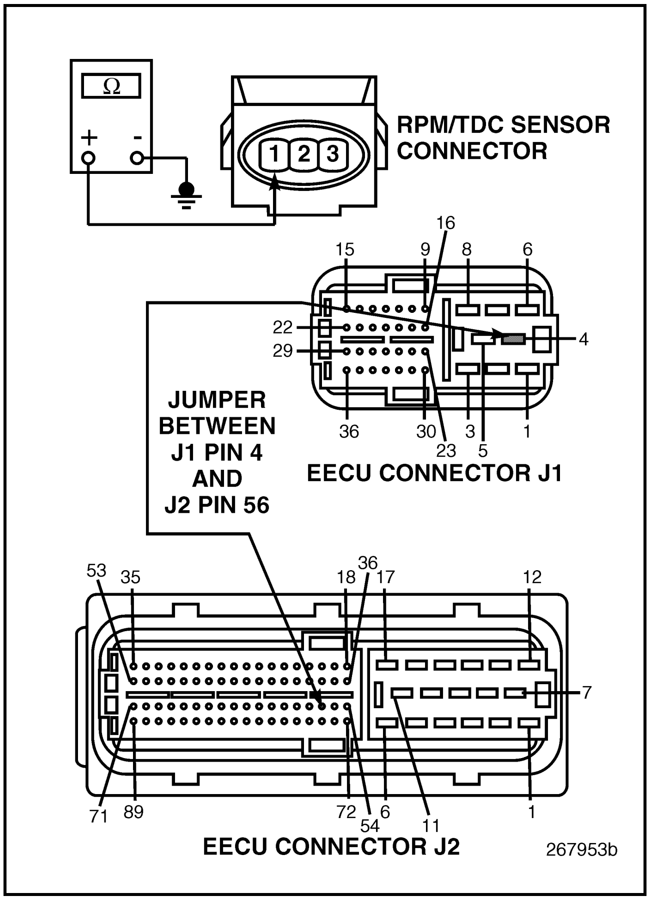


Figure 376

1. Turn the ignition key OFF.
2. Disconnect EECU connectors J1 and J2.
3. Connect a jumper between EECU connector J1 pin 4 and EECU connector J2 pin 56.
4. Check for continuity between RPM/TDC Sensor harness connector pin 1 and a good ground (see Figure 376).

   If continuity exists, there is an open in the RPM/TDC Sensor return line. Locate and repair the open.

   If there is NO continuity, select another chassis ground and re-check. If there is still NO continuity, repair the open in the RPM/TDC Sensor signal line.

Test 512 — Checking for a Faulty EECU or a Loose EECU Connector

NOTE

Before replacing the Engine Control Unit (EECU), check the sensor for proper adjustment. Refer to the Mack ASET™ Engine Service Procedures Manual for the installation and adjustment procedure and shim part numbers.

1. Turn the ignition key OFF.
2. Connect the Engine Speed/Timing Sensor connector.
3. Connect EECU connectors J1 and J2.
4. Start the engine.

   If blink code 3-2 is still active, check the Engine Electronic Control Unit (EECU) and connectors for dirt, loose or broken pins, or repairable damage. If no problems are evident, or they are not repairable, replace the EECU and retest the system.

   If blink code 3-2 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-3 — REDUNDANT ENGINE SPEED MONITORING (ASET™ IEGR ENGINE)

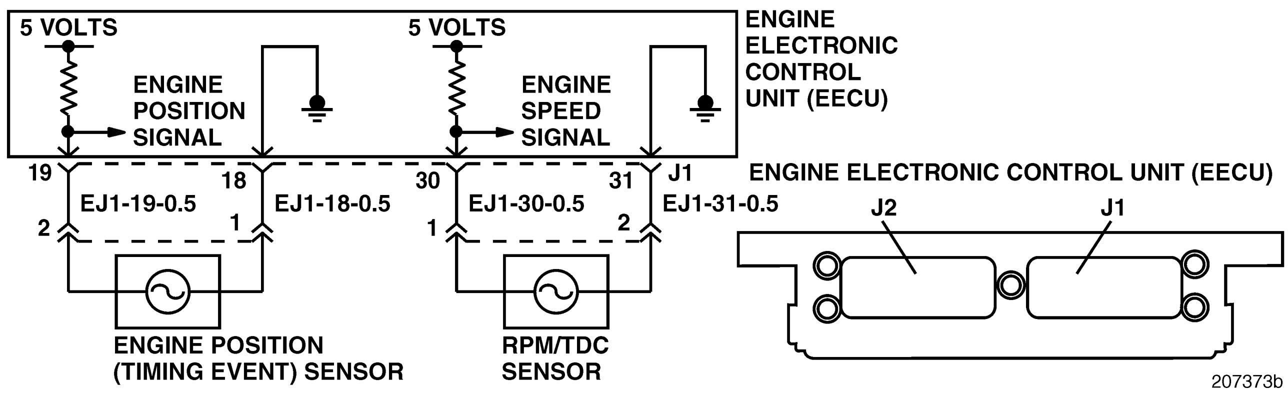


Figure 377 — Redundant Engine Speed Monitoring Circuits (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic)

Parameter Identification (PID): P190

Message Identification (MID): 128

Circuit Description: The Engine Electronic Control Unit (EECU) monitors the frequency of the signals generated by the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor. The EECU continually calculates engine speed using each signal as input, then compares these values.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) calculates a difference of more than 200 RPM between the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor outputs for more than 1 second, the EECU will turn on the Electronic Malfunction Lamp (EML) and code 3-3 will set. If the engine speed signal returns to within 200 RPM of the Engine Position (EP) Sensor input signal for more than 1 second, the fault will become inactive.

This fault is generally caused by a mechanical failure or an intermittent wiring or sensor failure. Code 3-3 can only be set or cleared while the engine is running.

Test 1 — Attempt to Set Blink Code 3-3

1. With the engine running, attempt to set code 3-3.

   If code 3-3 is set, go to test “Test 2 — Attempt to Make Blink Code 3-3 Go Inactive” on page 285.

   If code 3-3 is not set, wiggle the harness and connectors to try to set the code. If the code will not set, go to test “Test 3 — Checking the Sensors for Debris and Physical Damage” on page 286.

Test 2 — Attempt to Make Blink Code 3-3 Go Inactive

1. With the engine running and blink code 3-3 set, wiggle the harness and connectors.

   If code 3-3 goes inactive, go to test “Test 4 — Checking for a Damaged RPM/TDC Sensor Harness” on page 286.

   If code 3-3 does NOT go inactive, go to test “Test 5 — Checking the Sensors for Debris and Physical Damage” on page 286.

Test 3 — Checking the Sensors for Debris and Physical Damage

1. Turn the engine OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor harness connectors.
3. Remove the sensors from the vehicle.
4. Inspect the sensors for physical damage and for dirt or debris on the sensor tips.

   If no physical damage, dirt, or debris are found, go to test "Test 6 — Checking the Ring Gear and Camshaft Gear for Physical Damage" on page 286.

   If either sensor shows any sign of physical damage, replace the sensor.

   If either sensor shows any sign of dirt or debris on the sensor tip, clean and reinstall the sensors.

Test 4 — Checking for a Damaged RPM/TDC Sensor Harness

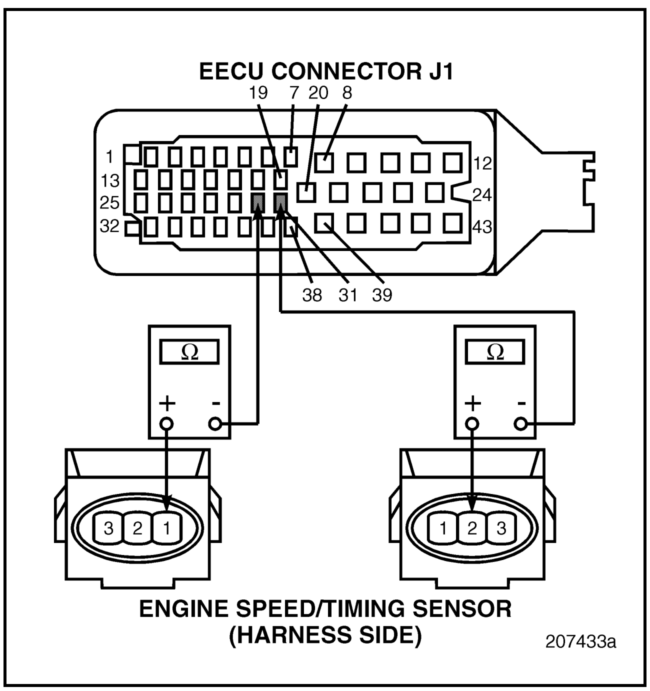


Figure 378

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) connector J1.
4. Have a helper wiggle the harness while you check for continuity between RPM/TDC Sensor connector pin 1 and EECU connector J1 pin 30 and between RPM/TDC Sensor connector pin 2 and EECU connector J1 pin 31 (see Figure 378).

   If continuity is lost during the check, locate and repair the intermittent open circuit in the Engine Speed/Timing (RPM/TDC) Sensor harness.

   If continuity is NOT lost, go to test "Test 8 — Checking for a Damaged Engine Position (EP) Sensor Harness" on page 287.

Test 5 — Checking the Sensors for Debris and Physical Damage

1. Turn the engine OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor harness connectors.
3. Remove the sensors from the vehicle.
4. Inspect the sensors for physical damage and for dirt or debris on the sensor tips.

   If no physical damage, dirt, or debris are found, go to test "Test 10 — Checking the Ring Gear and Camshaft Gear for Physical Damage" on page 287.

   If either sensor shows any sign of physical damage, replace the sensor.

   If either sensor shows any sign of dirt or debris on the sensor tip, clean and reinstall the sensors.

Test 6 — Checking the Ring Gear and Camshaft Gear for Physical Damage

1. Inspect the flywheel ring gear and the camshaft gear for physical damage.

   If no physical damage is found, go to test "Test 12 — Checking the Sensor Air Gaps" on page 287.

   If any physical damage is found, replace the damaged component.

Test 8 — Checking for a Damaged Engine Position (EP) Sensor Harness

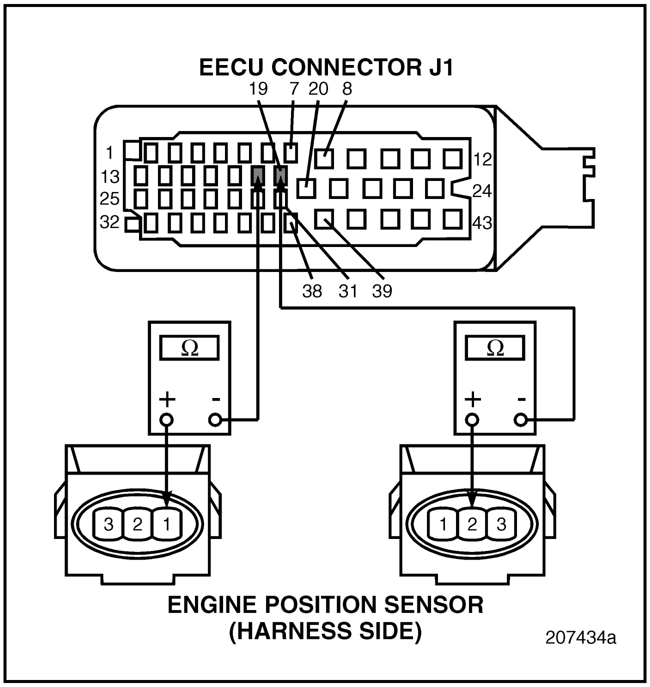


Figure 379

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) connector J1.
4. Have a helper wiggle the harness while you check for continuity between Engine Position (EP) Sensor connector pin 1 and EECU connector J1 pin 18 and between Engine Position (EP) Sensor connector pin 2 and EECU connector J1 pin 19 (see Figure 379).

   If continuity is lost during the check, locate and repair the intermittent open circuit in the Engine Position (EP) Sensor harness.

   If continuity is NOT lost, go to test "Test 16 — Checking the Harness Connectors" on page 287.

Test 10 — Checking the Ring Gear and Camshaft Gear for Physical Damage

1. Inspect the flywheel ring gear and the camshaft gear for physical damage.

   If NO physical damage is found, go to test "Test 20 — Checking the Sensor Air Gaps" on page 288.

   If any physical damage is found, replace the damaged component.

Test 12 — Checking the Sensor Air Gaps

1. Check the air gap settings for the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor.

   If the air gaps are set correctly, go to test "Test 24 — Checking RPM/TDC Sensor Resistance" on page 288.

   If either air gap was set incorrectly, reset the air gap and retest the system.

Test 16 — Checking the Harness Connectors

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor harness connectors.
4. Inspect the connectors for any sign of loose or damaged pins.

   If any loose or damaged pins are found, repair or replace the appropriate connector.

   If NO loose or damaged pins are found, contact Mack Trucks Service Engineering.

Test 20 — Checking the Sensor Air Gaps

1. Check the air gap settings for the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor.

   If the air gaps are set correctly, go to test “Test 40 — Checking RPM/TDC Sensor Resistance” on page 288.

   If either air gap was set incorrectly, reset the air gap and retest the system.

Test 24 — Checking RPM/TDC Sensor Resistance

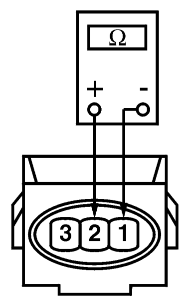


Figure 380

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 380).

   If the sensor resistance is correct (see table below), go to test “Test 48 — Checking Engine Position (EP) Sensor Resistance” on page 289.

   If the sensor resistance is not correct, replace the (RPM/TDC) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 40 — Checking RPM/TDC Sensor Resistance

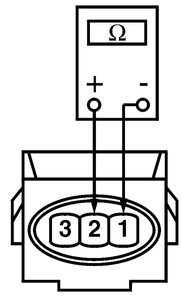


Figure 381

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 381).

   If the sensor resistance is correct (see table below), go to test “Test 80 — Checking Engine Position (EP) Sensor Resistance” on page 289.

   If the sensor resistance is not correct, replace the (RPM/TDC) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 48 — Checking Engine Position (EP) Sensor Resistance

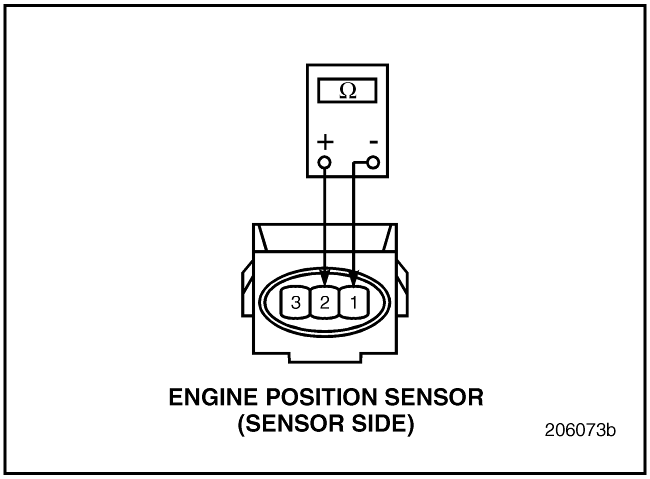


Figure 382

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 382).

   If the sensor resistance is between 650 and 1300 ohms, contact Mack Trucks Service Engineering.

   If the sensor resistance is not 650 and 1300 ohms, replace the Engine Position (EP) Sensor.

Test 80 — Checking Engine Position (EP) Sensor Resistance

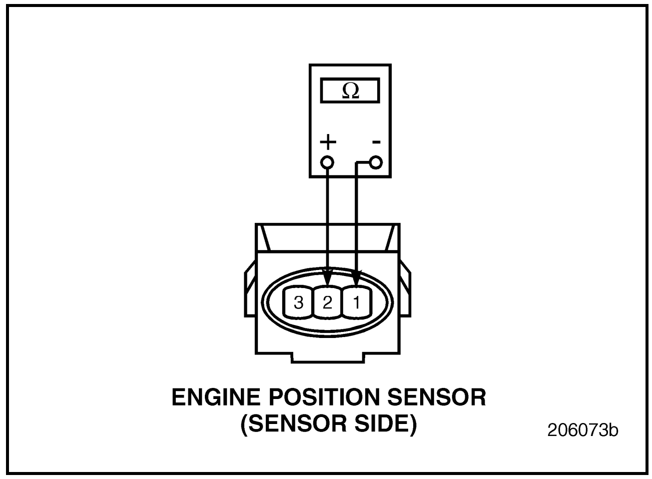


Figure 383

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 383).

   If the sensor resistance is between 650 and 1300 ohms, contact Mack Trucks Service Engineering.

   If the sensor resistance is not 650 and 1300 ohms, replace the Engine Position (EP) Sensor.

BLINK CODE 3-3 — REDUNDANT ENGINE SPEED MONITORING (ASET™ CEGR ENGINE)

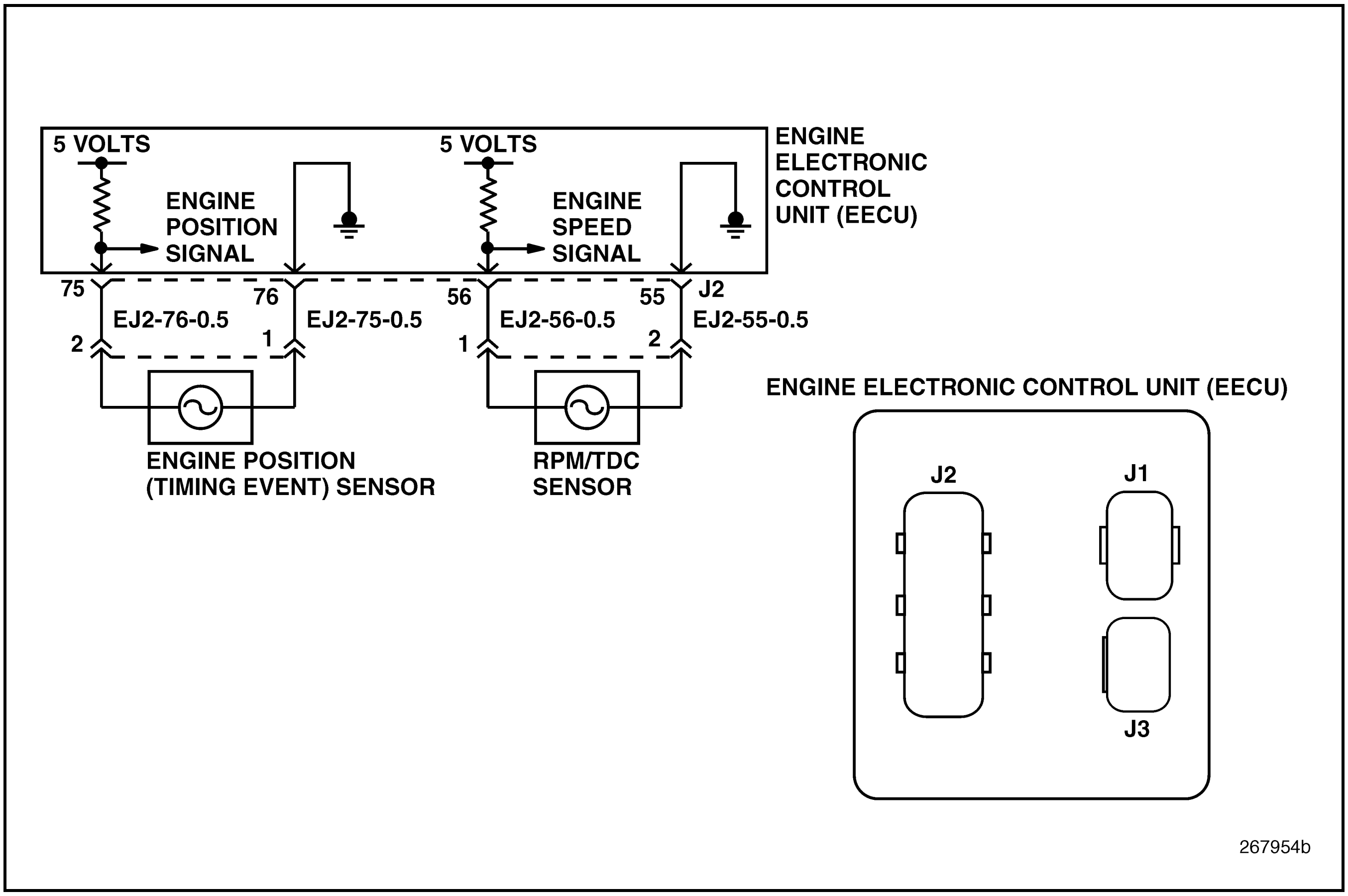


Figure 384 — Redundant Engine Speed Monitoring Circuits (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic)

Parameter Identification (PID): P190

Message Identification (MID): 128

Circuit Description: The Engine Electronic Control Unit (EECU) monitors the frequency of the signals generated by the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor. The EECU continually calculates engine speed using each signal as input, then compares these values.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) calculates an engine speed greater than 2350 RPM from either the Engine Speed/Timing (RPM/TDC) Sensor signal or the Engine Position (EP) Sensor signal for more than 1 second, the EECU will turn on the Electronic Malfunction Lamp (EML) and code 3-3 will set. If the engine speed calculation returns to less than 2350 RPM for more than 1 second, the fault will become inactive.

NOTE

This fault is generally caused by an engine overspeed. If code 3-3 is active at normal engine speeds, perform the following diagnostic routine. If code 3-3 is NOT active, clear the code and test drive the vehicle to attempt to set the code. Code 3-3 can only be set or cleared while the engine is running.

Test 1 — Attempt to Set Blink Code 3-3

1. With the engine running, attempt to set code 3-3.

   If code 3-3 is set, go to test "Test 2 — Attempt to Make Blink Code 3-3 Go Inactive" on page 291.

   If code 3-3 is not set, wiggle the harness and connectors to try to set the code. If the code will not set, go to test "Test 3 — Checking the Sensors for Debris and Physical Damage" on page 291.

Test 2 — Attempt to Make Blink Code 3-3 Go Inactive

1. With the engine running and blink code 3-3 set, wiggle the harness and connectors.

   If code 3-3 goes inactive, go to test "Test 4 — Checking for a Damaged RPM/TDC Sensor Harness" on page 291.

   If code 3-3 does NOT go inactive, go to test "Test 5 — Checking the Sensors for Debris and Physical Damage" on page 292.

Test 3 — Checking the Sensors for Debris and Physical Damage

1. Turn the engine OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor harness connectors.
3. Remove the sensors from the vehicle.
4. Inspect the sensors for physical damage and for dirt or debris on the sensor tips.

   If NO physical damage, dirt, or debris are found, go to test "Test 6 — Checking the Ring Gear and Camshaft Gear for Physical Damage" on page 292.

   If either sensor shows any sign of physical damage, replace the sensor.

   If either sensor shows any sign of dirt or debris on the sensor tip, clean and reinstall the sensors.

Test 4 — Checking for a Damaged RPM/TDC Sensor Harness

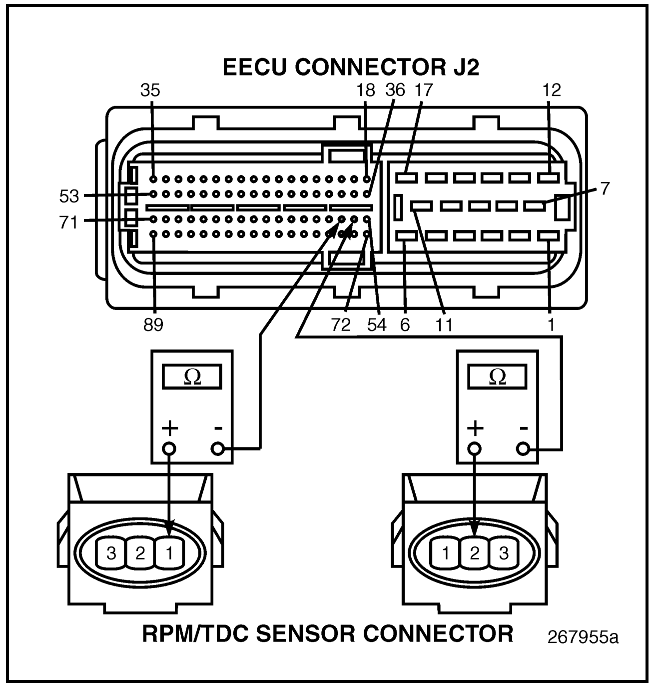


Figure 385

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Have a helper wiggle the harness while you check for continuity between RPM/TDC Sensor connector pin 1 and EECU connector J2 pin 56 and between RPM/TDC Sensor connector pin 2 and EECU connector J2 pin 55 (see Figure 385).

   If continuity is lost during the check, locate and repair the intermittent open circuit in the Engine Speed/Timing (RPM/TDC) Sensor harness.

   If continuity is NOT lost, go to test "Test 8 — Checking for a Damaged Engine Position (EP) Sensor Harness" on page 292.

Test 5 — Checking the Sensors for Debris and Physical Damage

1. Turn the engine OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor harness connectors.
3. Remove the sensors from the vehicle.
4. Inspect the sensors for physical damage and for dirt or debris on the sensor tips.

   If no physical damage, dirt, or debris are found, go to test “Test 10 — Checking the Ring Gear and Camshaft Gear for Physical Damage” on page 293.

   If either sensor shows any sign of physical damage, replace the sensor.

   If either sensor shows any sign of dirt or debris on the sensor tip, clean and reinstall the sensors.

Test 6 — Checking the Ring Gear and Camshaft Gear for Physical Damage

1. Inspect the flywheel ring gear and the camshaft gear for physical damage.

   If NO physical damage is found, go to test “Test 12 — Checking the Sensor Air Gaps” on page 293.

   If any physical damage is found, replace the damaged component.

Test 8 — Checking for a Damaged Engine Position (EP) Sensor Harness

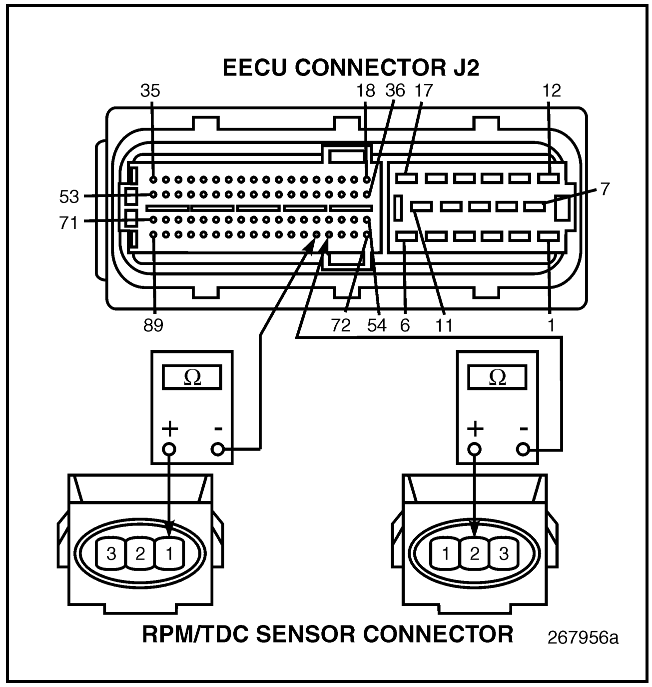


Figure 386

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Have a helper wiggle the harness while you check for continuity between Engine Position (EP) Sensor connector pin 1 and EECU connector J2 pin 76 and between Engine Position (EP) Sensor connector pin 2 and EECU connector J2 pin 75 (see Figure 386).

   If continuity is lost during the check, locate and repair the intermittent open circuit in the Engine Position (EP) Sensor harness.

   If continuity is NOT lost, go to test “Test 16 — Checking the Harness Connectors” on page 293.

Test 10 — Checking the Ring Gear and Camshaft Gear for Physical Damage

1. Inspect the flywheel ring gear and the camshaft gear for physical damage.
   If NO physical damage is found, go to test "Test 20 — Checking the Sensor Air Gaps" on page 293.
   If any physical damage is found, replace the damaged component.

Test 12 — Checking the Sensor Air Gaps

1. Check the air gap settings for the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor.
   If the air gaps are set correctly, go to test "Test 24 — Checking RPM/TDC Sensor Resistance" on page 293.
   If either air gap was set incorrectly, reset the air gap and retest the system.

Test 16 — Checking the Harness Connectors

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor harness connectors.
4. Inspect the connectors for any sign of loose or damaged pins.
   If any loose or damaged pins are found, repair or replace the appropriate connector.
   If NO loose or damaged pins are found, contact Mack Trucks Service Engineering.

Test 20 — Checking the Sensor Air Gaps

1. Check the air gap settings for the Engine Speed/Timing (RPM/TDC) Sensor and the Engine Position (EP) Sensor.
   If the air gaps are set correctly, go to test "Test 40 — Checking RPM/TDC Sensor Resistance" on page 294.
   If either air gap was set incorrectly, reset the air gap and retest the system.

Test 24 — Checking RPM/TDC Sensor Resistance

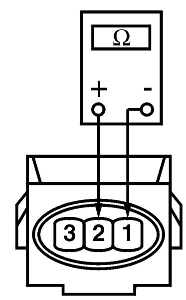


Figure 387

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 387).
   If the sensor resistance is correct (see table below), go to test "Test 48 — Checking Engine Position (EP) Sensor Resistance" on page 294.
   If the sensor resistance is not correct, replace the (RPM/TDC) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 40 — Checking RPM/TDC Sensor Resistance

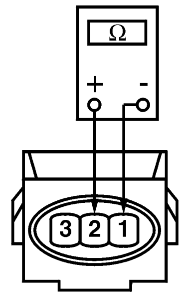


Figure 388

1. Turn the ignition key OFF.
2. Disconnect the Engine Speed/Timing (RPM/TDC) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 388).

   If the sensor resistance is correct (see table below), go to test "Test 80 — Checking Engine Position (EP) Sensor Resistance" on page 295.

   If the sensor resistance is not correct, replace the (RPM/TDC) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 48 — Checking Engine Position (EP) Sensor Resistance

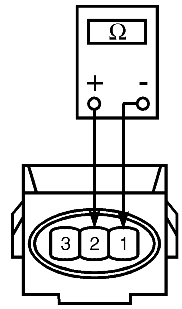


Figure 389

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 389).

   If the sensor resistance is between 650 and 1300 ohms, contact Mack Trucks Service Engineering.

   If the sensor resistance is not 650 and 1300 ohms, replace the Engine Position (EP) Sensor.

Test 80 — Checking Engine Position (EP) Sensor Resistance

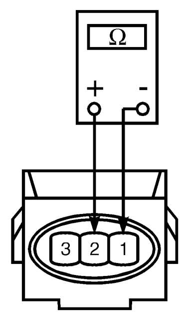


Figure 390

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor harness connector.
3. Measure the resistance between sensor terminals 1 and 2 (see Figure 390).

   If the sensor resistance is between 650 and 1300 ohms, contact Mack Trucks Service Engineering.

   If the sensor resistance is not 650 and 1300 ohms, replace the Engine Position (EP) Sensor.

BLINK CODE 3-4 — ENGINE POSITION (EP) SENSOR (ASET™ IEGR ENGINE)

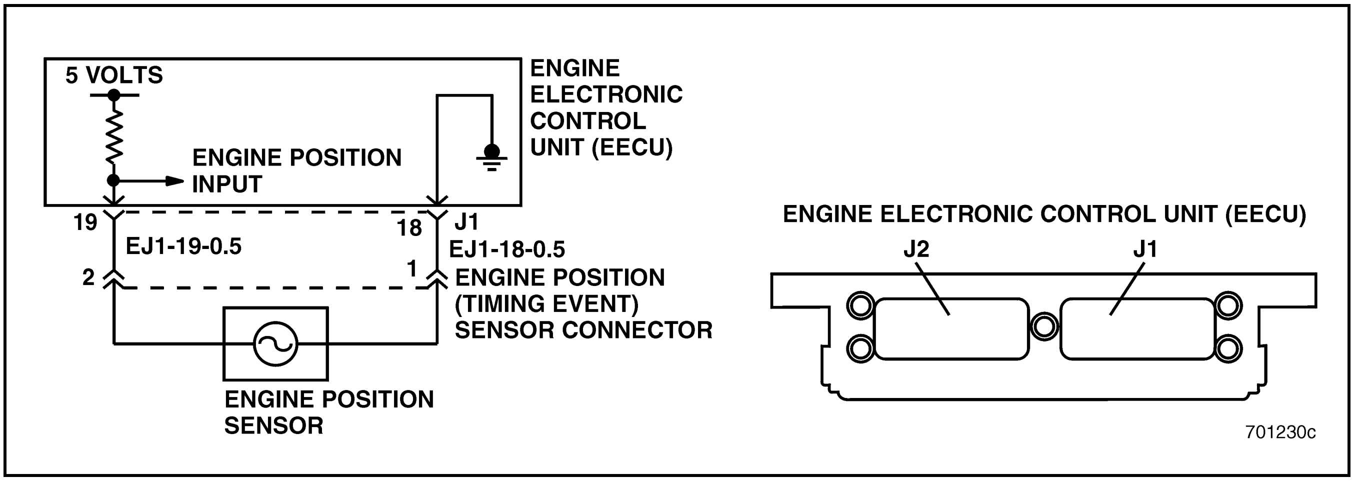


Figure 391 — Engine Position (EP) Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic/Incorrect) or 8 (Abnormal Frequency)

Parameter Identification (PID): S21

Message Identification (MID): 128

Circuit Description: The Engine Position (EP) Sensor is an inductive device. As the camshaft turns, the tip of the Engine Position (EP) Sensor senses the seven holes in the camshaft drive gear and sends a series of voltage pulses to the Engine Electronic Control Unit (EECU). The frequency of the pulses is translated into engine speed and position by the EECU. The EECU uses this information along with the information from Engine Speed/Timing (RPM/TDC) Sensor to synchronize fuel injection.

Location: The Engine Position (EP) Sensor is located on the lower right front of the engine, in the timing gear cover.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) senses a significant difference between the engine speed calculated from the Engine Position (EP) Sensor signal and the engine speed calculated from the Engine Speed/Timing (RPM/TDC) Sensor for 2 seconds, the EECU will turn on the Electronic Malfunction Light, and code 3-4 will set. If the signals return to normal for 2 seconds, the code will become inactive. The engine must be running to set an active Engine Position (EP) Sensor fault code.

NOTE

Electrical problems can cause this fault to be generated, and electrical diagnostics are provided in this section. Mechanical problems can also cause temporary or permanent speed signal errors. After all electrical possibilities have been ruled out, check mechanical conditions that could cause vibration or signal errors. Such conditions include but are not limited to:

- Faulty Engine Vibration Damper
- Contaminated sensor tips
- Contaminated Cam Gear face
- Excessive Camshaft end play
- Improperly adjusted sensor
- Improperly balanced engine components
- Faulty engine timing cover
- Improper Camshaft-to-Crankshaft timing

Refer to Service bulletin SB-221-037 for procedures to diagnose mechanical causes of code 3-4.

NOTE

Before replacing the engine timing cover in an attempt to rectify an intermittent code 3-4, install the Engine Electronic Control Unit (EECU) in another truck built to similar specifications. Road test the other truck and check for code 3-4. If code 3-4 logs in the EECU while installed in the second truck, replace the EECU with a new one and retest the system.

Test 1 — Checking for Code 3-4

1. Verify that code 3-4 is set.

   If code 3-4 is set, go to test “Test 2 — Checking for an Open or Short in the Sensor” on page 297.

   If code 3-4 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for an Open or Short in the Sensor

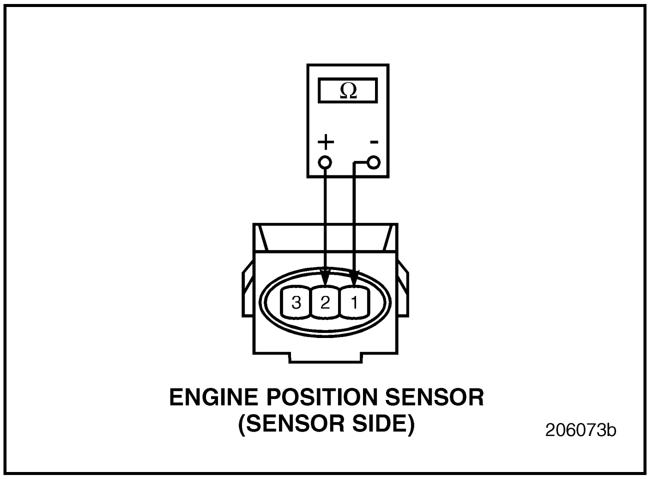


Figure 392

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor.
3. Measure the resistance between terminals 1 and 2 on the Engine Position (EP) Sensor (see Figure 392).

   If the resistance is correct (see table below), go to test “Test 4 — Checking for a Short Circuit to Ground in the Sensor” on page 298.

   If the resistance is NOT correct, check the Engine Position (EP) Sensor pigtail connector and wiring for damage. If the connector and wiring are not damaged, replace the Engine Position (EP) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 4 — Checking for a Short Circuit to Ground in the Sensor

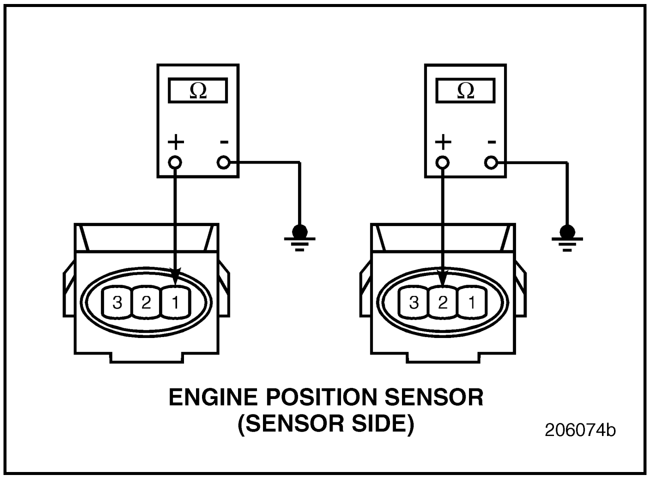


Figure 393

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Measure the resistance between sensor pin 1 and a good ground and between sensor pin 2 and a good ground (see Figure 393).

   If continuity exists between either pin and ground, replace the sensor.

   If there is NO continuity, go to test “Test 8 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Signal Line” on page 298.

Test 8 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Signal Line

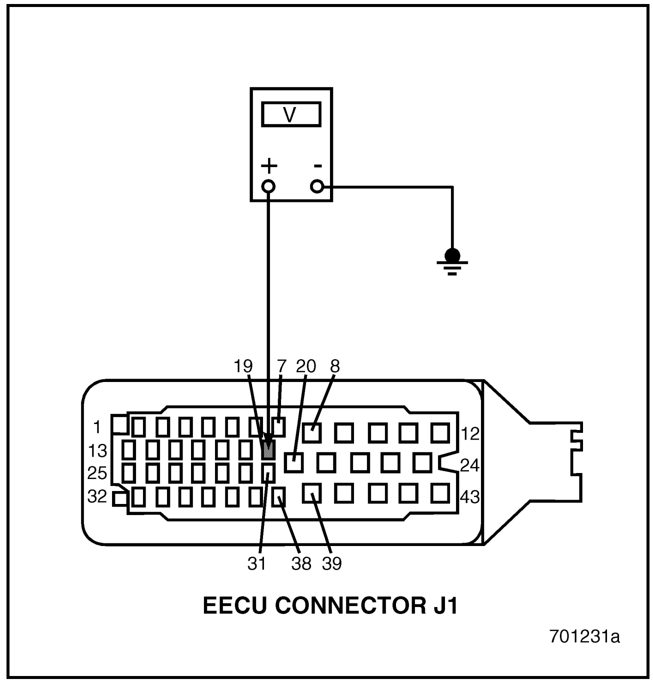


Figure 394

1. Turn the ignition key OFF.
2. Disconnect connector J1 from the Engine Control Unit (EECU).
3. Disconnect the Engine Position (EP) Sensor connector.
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J1 pin 19 and a good ground (see Figure 394).

   If the measured voltage is less than 0.5 volts, go to test “Test 16 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Return Line” on page 299.

   If the measured voltage is greater than 0.5 volts, go to test “Test 17 — Isolating the Short Circuit to Voltage” on page 299.

Test 16 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Return Line

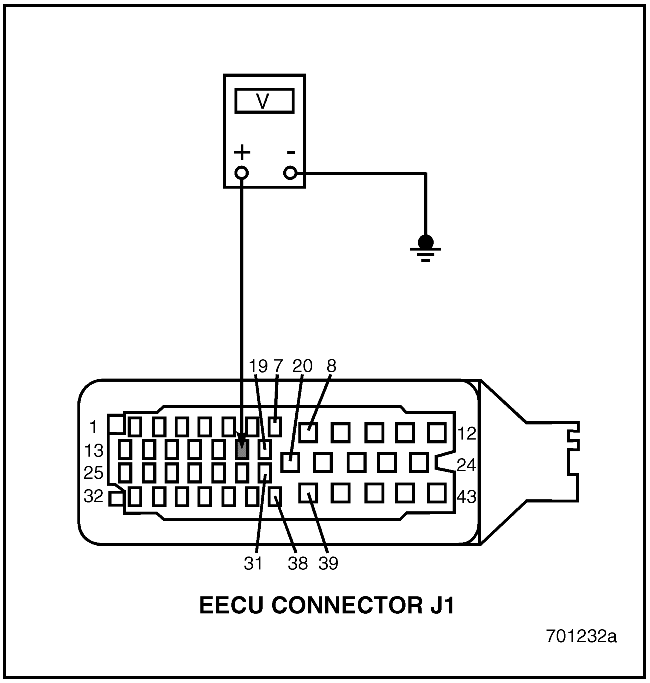


Figure 395

1. Turn the ignition key OFF.
2. Disconnect connector J1 from the EECU.
3. Disconnect the Engine Position (EP) Sensor connector.
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J1 pin 18 and a good ground (see Figure 395).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking for a Short Circuit to Ground” on page 300.

   If the measured voltage is greater than 0.5 volts, go to test “Test 33 — Isolating the Short Circuit to Voltage in the Sensor Return Line” on page 300.

Test 17 — Isolating the Short Circuit to Voltage

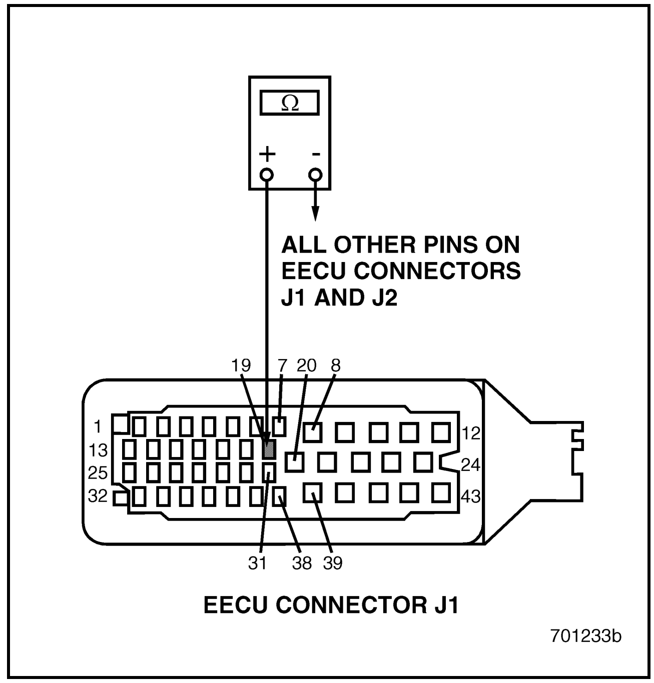


Figure 396

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Disconnect the Engine Position (EP) Sensor connector.
4. Check for continuity between EECU connector J1 pin 19 and all other pins on EECU connectors J1 and J2 (see Figure 396).

   If continuity exists, pin 19 is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage.

   If there is NO continuity, the sensor return line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 32 — Checking for a Short Circuit to Ground

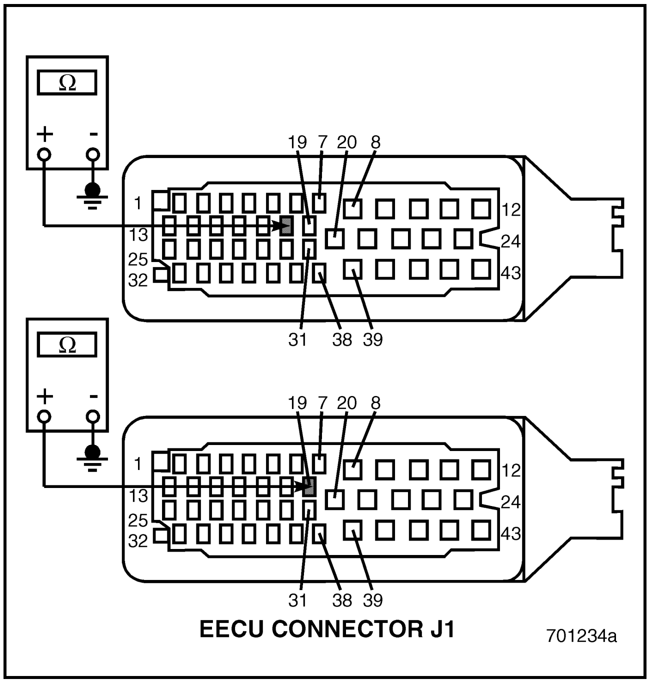


Figure 397

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Engine Position (EP) Sensor.
4. Check for continuity between EECU connector J1 pin 19 and a good ground.

   Check for continuity between EECU connector J1 pin 18 and a good ground (see Figure 397).

   If there is NO continuity, go to test “Test 64 — Checking for a Pin to Pin Short Circuit” on page 301.

   If continuity exists to ground on either circuit, go to test “Test 65 — Isolating the Short Circuit to Ground” on page 301.

Test 33 — Isolating the Short Circuit to Voltage in the Sensor Return Line

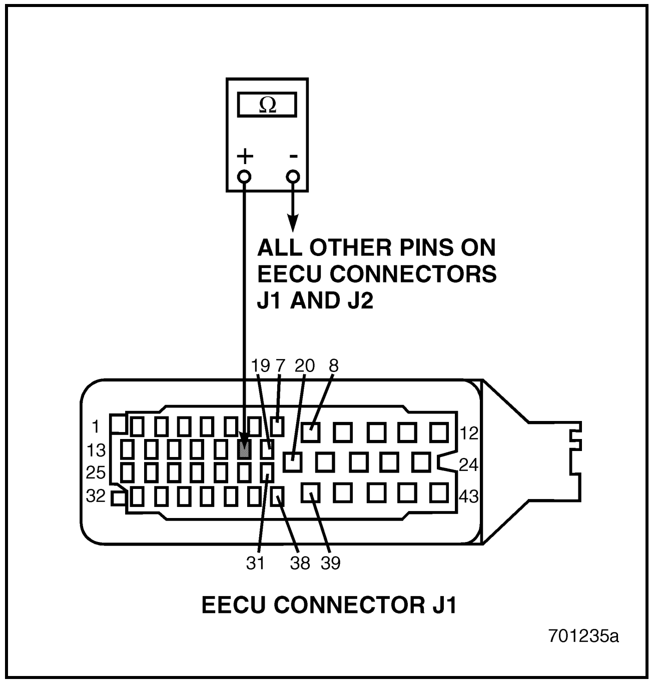


Figure 398

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Disconnect the Engine Position (EP) Sensor.
4. Check for continuity between EECU connector J1 pin 18 and all other pins on EECU connectors J1 and J2 (see Figure 398).

   If continuity exists between pin 18 and any other pin, pin 18 is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage.

   If there is NO continuity, the sensor return line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 64 — Checking for a Pin to Pin Short Circuit

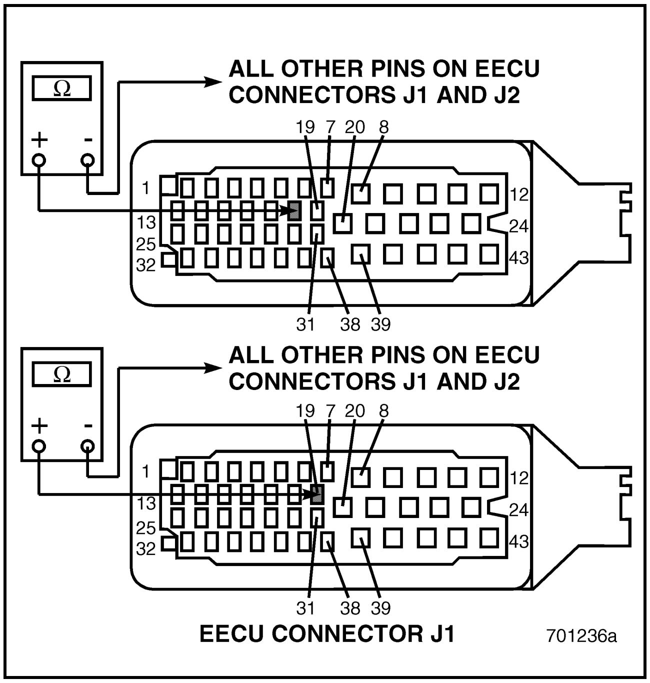


Figure 399

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU connector J1 pins 18 and 19 versus all other pins on EECU connectors J1 and J2 (see Figure 399).

   If there is NO continuity, go to test “Test 128 — Checking for an Open Circuit in the Harness” on page 302.

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 65 — Isolating the Short Circuit to Ground

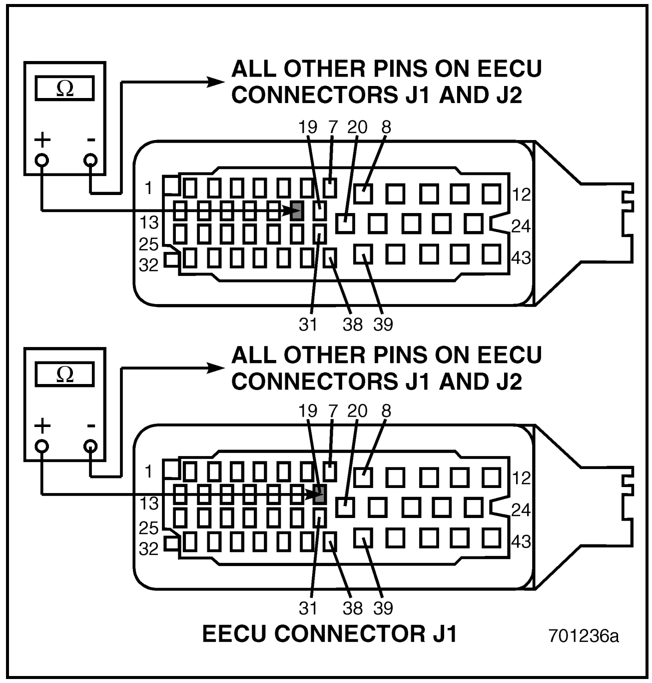


Figure 400

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between the circuit (connector J1 pin 18 or 19) that showed continuity in test 32, versus all other pins on EECU connectors J1 and J2 (see Figure 400).

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the suspect circuit is shorted to ground somewhere else in the harness. Locate and repair the short circuit.

Test 128 — Checking for an Open Circuit in the Harness

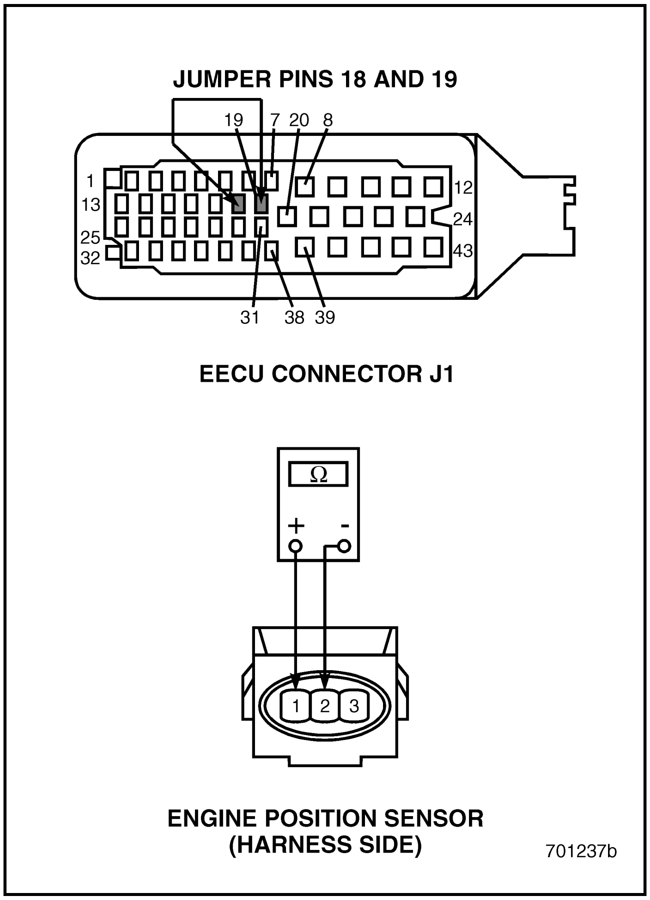


Figure 401

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Disconnect EECU connector J1.
4. Connect a jumper between EECU connector J1 pin 19 and EECU connector J1 pin 18.
5. Check for continuity between pins 1 and 2 on the harness side of the Engine Position (EP) Sensor connector (see Figure 401).

   If continuity exists, go to test "Test 256 — Checking for an Open at the Sensor End of the Harness" on page 302.

   If there is NO continuity, go to test "Test 257 — Checking for an Open in the Sensor Return Line at the Engine EECU End of the Harness" on page 303.

Test 256 — Checking for an Open at the Sensor End of the Harness

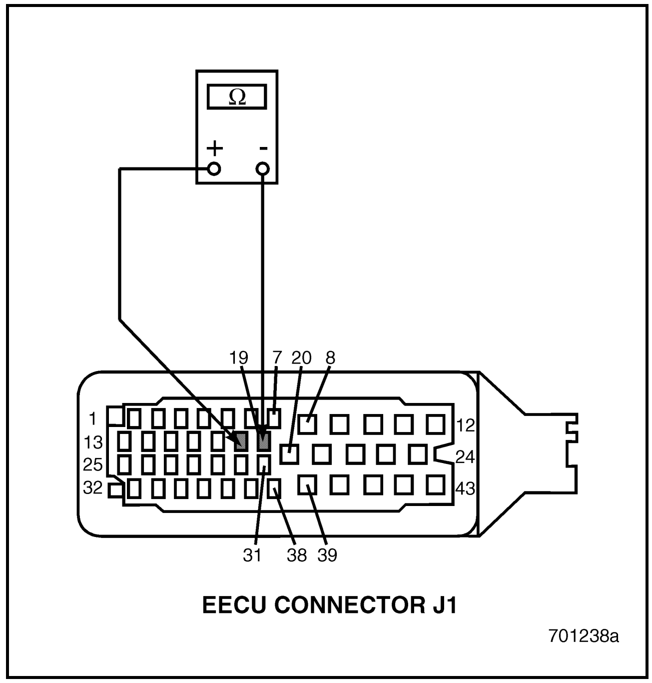


Figure 402

1. Turn the ignition key OFF.
2. Connect the Engine Position (EP) Sensor.
3. Disconnect EECU connector J1.
4. Measure the resistance between EECU connector J1 pins 18 and 19 (see Figure 402).

   If the resistance is between 774 and 946 ohms, go to test "Test 512 — Checking for a Faulty EECU or a Loose EECU Connector" on page 303.

   If the resistance is not within this range, the Engine Position (EP) Sensor has an open circuit or a faulty connector. Repair the connector if possible, otherwise, replace the sensor.

Test 257 — Checking for an Open in the Sensor Return Line at the Engine EECU End of the Harness

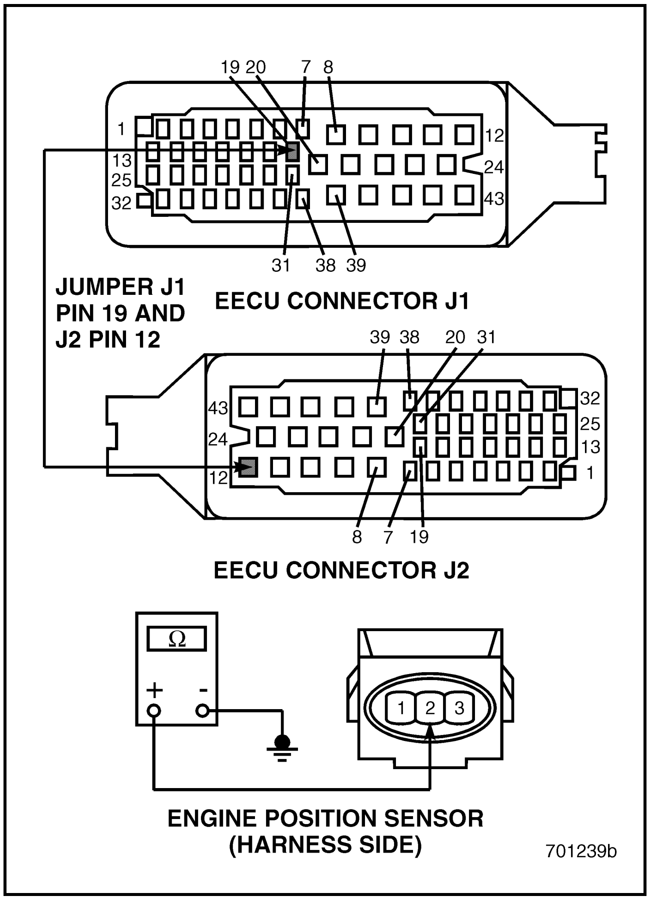


Figure 403

1. Turn the ignition key OFF.
2. Disconnect EECU connectors J1 and J2.
3. Connect a jumper between EECU connector J1 pin 19 and EECU connector J2 pin 12.
4. Check for continuity between pin 2 on the harness side of the Engine Position (EP) Sensor connector and a good ground (see Figure 403).

   If continuity exists, there is an open in the EECU connector J1 pin 18 circuit. Locate and repair the open circuit.

   If there is NO continuity, select another chassis ground and re-check. If there is still NO continuity, repair the open in the EECU connector J1 pin 19 circuit.

Test 512 — Checking for a Faulty EECU or a Loose EECU Connector

NOTE

Before replacing the Engine Control Unit (EECU), check the sensor for proper adjustment. Refer to the Mack ASET™ Engine Service Procedures Manual (5-110) for the installation and adjustment procedure and shim part numbers.

1. Turn the ignition key OFF.
2. Connect the Engine Position (EP) Sensor connector.
3. Connect EECU connectors J1 and J2.
4. Start the engine.

   If blink code 3-4 is still active, check the EECU and connectors for dirt, loose or broken pins, or repairable damage. If no problems are evident, or they are not repairable, replace the EECU and retest the system.

   If blink code 3-4 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-4 — ENGINE POSITION (EP) SENSOR (ASET™ CEGR ENGINE)

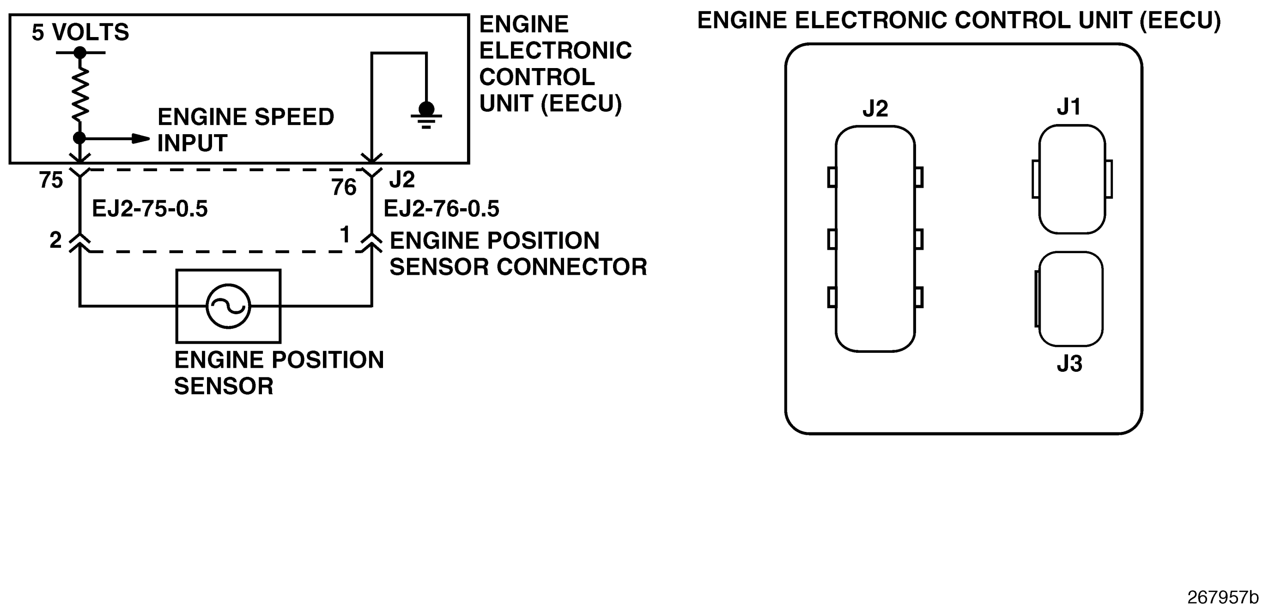


Figure 404 — Engine Position (EP) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic/Incorrect), 3 (Shorted High), 4 (Shorted Low), 5 (Open) or 8 (Abnormal Frequency)

Parameter Identification (PID): S21

Message Identification (MID): 128

Circuit Description: The Engine Position (EP) Sensor is an inductive device. As the camshaft turns, the tip of the Engine Position (EP) Sensor senses the seven holes in the camshaft drive gear and sends a series of voltage pulses to the Engine Electronic Control Unit (EECU). The frequency of the pulses is translated into engine speed and position by the EECU. The EECU uses this information along with the information from Engine Speed/Timing (RPM/TDC) Sensor to synchronize fuel injection.

Location: The Engine Position (EP) Sensor is located on the lower right front of the engine, in the timing gear cover.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) senses a significant difference between the engine speed calculated from the Engine Position (EP) Sensor signal and the engine speed calculated from the Engine Speed/Timing (RPM/TDC) Sensor for 2 seconds, the EECU will turn on the Electronic Malfunction Light, and code 3-4 will set. If the signals return to normal for 2 seconds, the code will become inactive. The engine must be running to set an active Engine Position (EP) Sensor fault code.

NOTE

Electrical problems can cause this fault to be generated, and electrical diagnostics are provided in this section. Mechanical problems can also cause temporary or permanent speed signal errors. After all electrical possibilities have been ruled out, check mechanical conditions that could cause vibration or signal errors. Such conditions include but are not limited to:

- Faulty Engine Vibration Damper
- Contaminated sensor tips
- Contaminated Cam Gear face
- Excessive Camshaft end play
- Improperly adjusted sensor
- Improperly balanced engine components
- Faulty engine timing cover
- Improper Camshaft-to-Crankshaft timing

Refer to Service bulletin SB-221-037 for procedures to diagnose mechanical causes of code 3-4.

NOTE

Before replacing the engine timing cover in an attempt to rectify an intermittent code 3-4, install the Engine Electronic Control Unit (EECU) in another truck built to similar specifications. Road test the other truck and check for code 3-4. If code 3-4 logs in the EECU while installed in the second truck, replace the EECU with a new one and retest the system.

NOTE

FMI 3, 4 and 5 will only be seen as active with the engine OFF. In all cases the Blink Code 3-4 FMI will change to 2 when the engine is started.

Test 1 — Checking for Code 3-4

1. Verify that code 3-4 is set.

   If code 3-4 is set, go to test "Test 2 — Checking for an Open or Short in the Sensor" on page 305.

   If code 3-4 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for an Open or Short in the Sensor

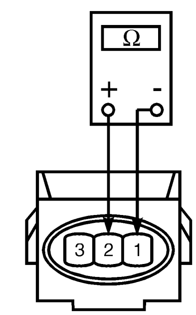


Figure 405

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor.
3. Measure the resistance between terminals 1 and 2 on the Engine Position (EP) Sensor (see Figure 405).

   If the resistance is correct (see table below), go to test "Test 4 — Checking for a Short Circuit to Ground in the Sensor" on page 306.

   If the resistance is NOT correct, check the Engine Position (EP) Sensor pigtail connector and wiring for damage. If the connector and wiring are not damaged, replace the Engine Position (EP) Sensor.

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Test 4 — Checking for a Short Circuit to Ground in the Sensor

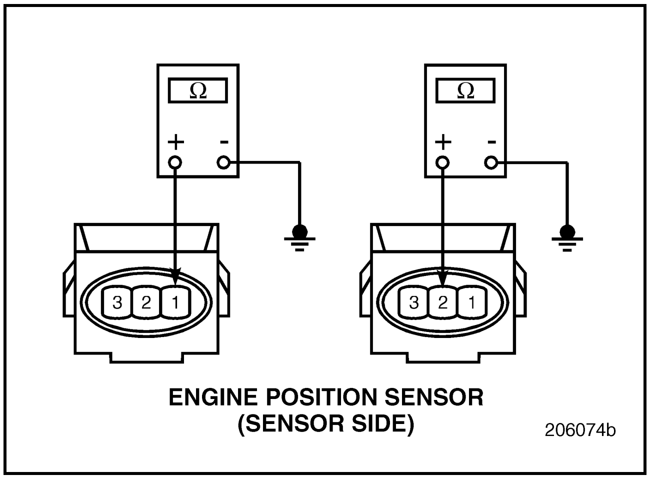


Figure 406

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Measure the resistance between sensor pin 1 and a good ground and between sensor pin 2 and a good ground (see Figure 406).

   If continuity exists between either pin and ground, replace the sensor.

   If there is NO continuity, go to test "Test 8 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Signal Line" on page 306.

Test 8 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Signal Line

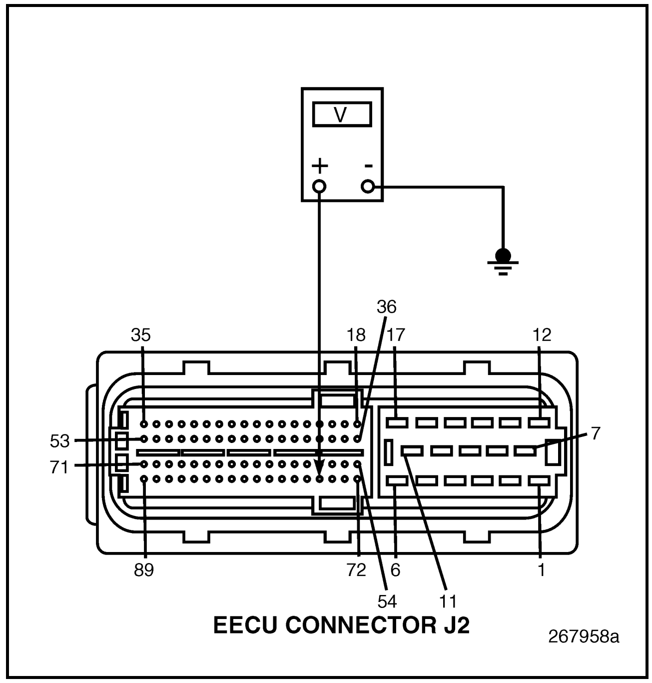


Figure 407

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Control Unit (EECU).
3. Disconnect the Engine Position (EP) Sensor connector.
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J2 pin 75 and a good ground (see Figure 407).

   If the measured voltage is less than 0.5 volts, go to test "Test 16 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Return Line" on page 307.

   If the measured voltage is greater than 0.5 volts, go to test "Test 17 — Isolating the Short Circuit to Voltage" on page 307.

Test 16 — Checking for a Short Circuit to Voltage in the Engine Position (EP) Sensor Return Line

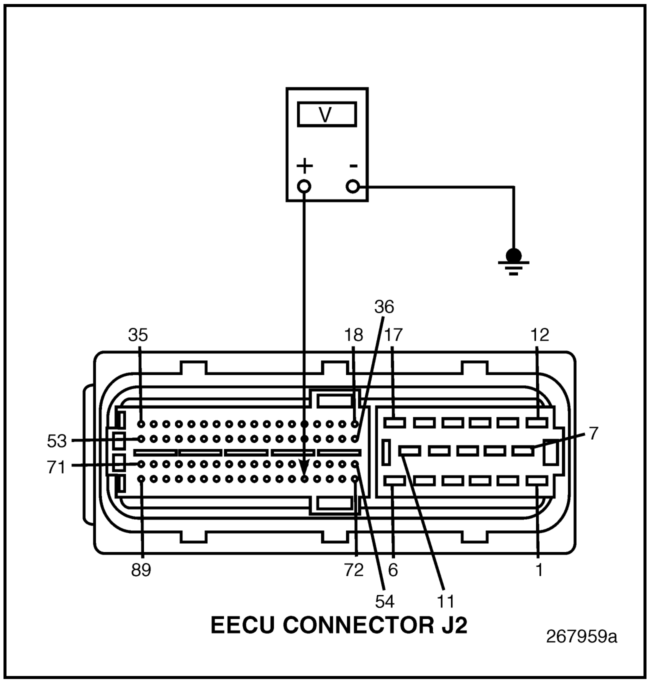


Figure 408

1. Turn the ignition key OFF.
2. Disconnect connector J2 from the EECU.
3. Disconnect the Engine Position (EP) Sensor connector.
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J2 pin 76 and a good ground (see Figure 408).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking for a Short Circuit to Ground” on page 308.

   If the measured voltage is greater than 0.5 volts, go to test “Test 33 — Isolating the Short Circuit to Voltage in the Sensor Return Line” on page 308.

Test 17 — Isolating the Short Circuit to Voltage

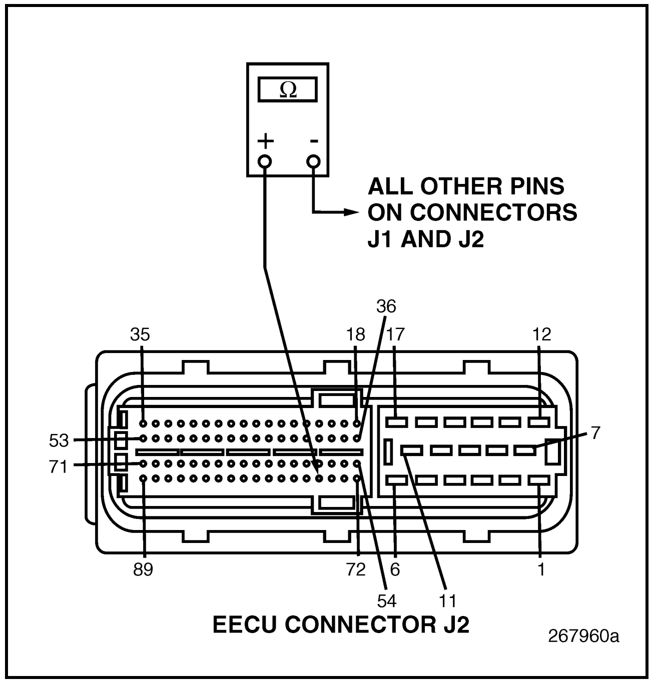


Figure 409

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Disconnect the Engine Position (EP) Sensor connector.
4. Check for continuity between EECU connector J2 pin 75 and all other pins on EECU connectors J1 and J2 (see Figure 409).

   If continuity exists, pin 75 is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage.

   If there is NO continuity, the sensor return line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 32 — Checking for a Short Circuit to Ground

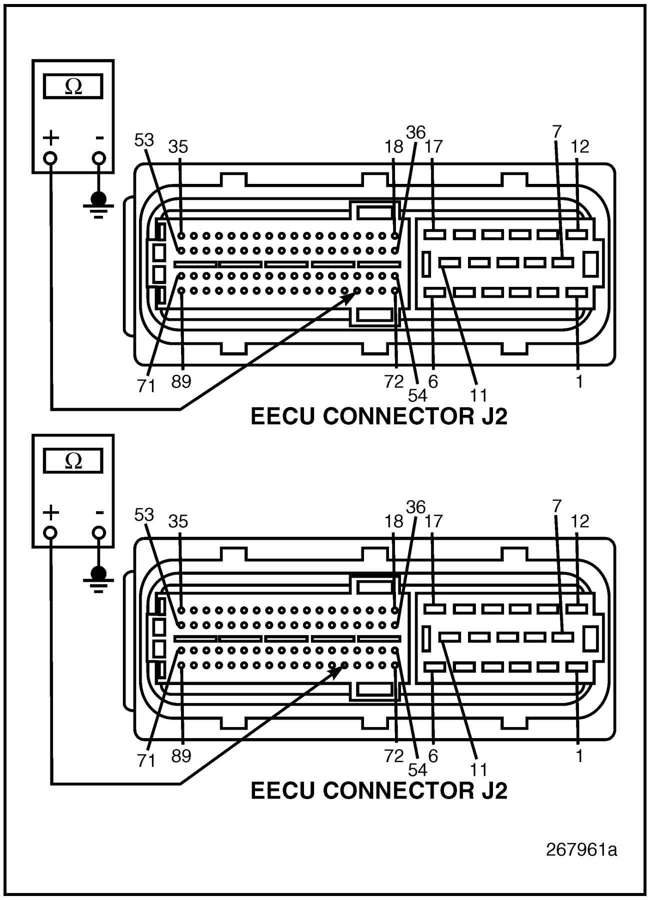


Figure 410

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the Engine Position (EP) Sensor.
4. Check for continuity between EECU connector J2 pin 75 and a good ground.

   Check for continuity between EECU connector J2 pin 76 and a good ground (see Figure 410).

   If there is NO continuity, go to test "Test 64 — Checking for a Pin to Pin Short Circuit" on page 309.

   If continuity exists to ground on either circuit, go to test "Test 65 — Isolating the Short Circuit to Ground" on page 309.

Test 33 — Isolating the Short Circuit to Voltage in the Sensor Return Line

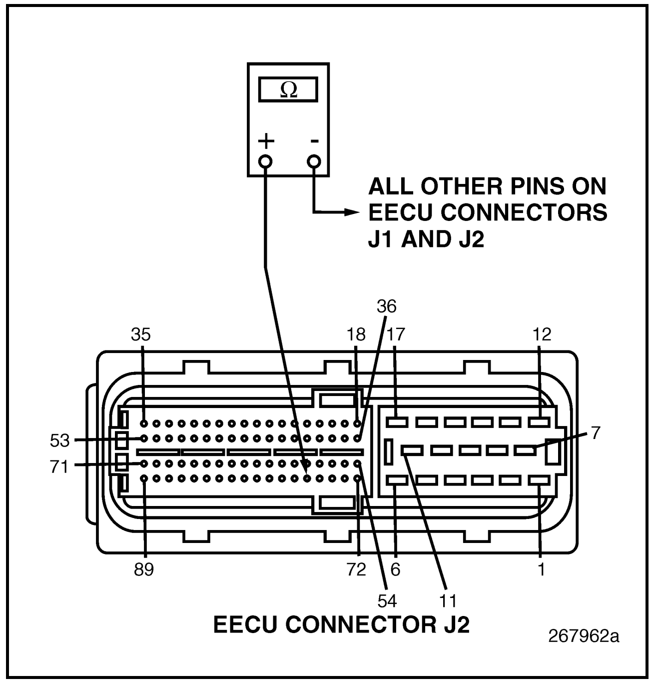


Figure 411

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Disconnect the Engine Position (EP) Sensor.
4. Check for continuity between EECU connector J2 pin 76 and all other pins on EECU connectors J1 and J2 (see Figure 411).

   If continuity exists between pin 76 and any other pin, pin 76 is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage.

   If there is NO continuity, the sensor return line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 64 — Checking for a Pin to Pin Short Circuit

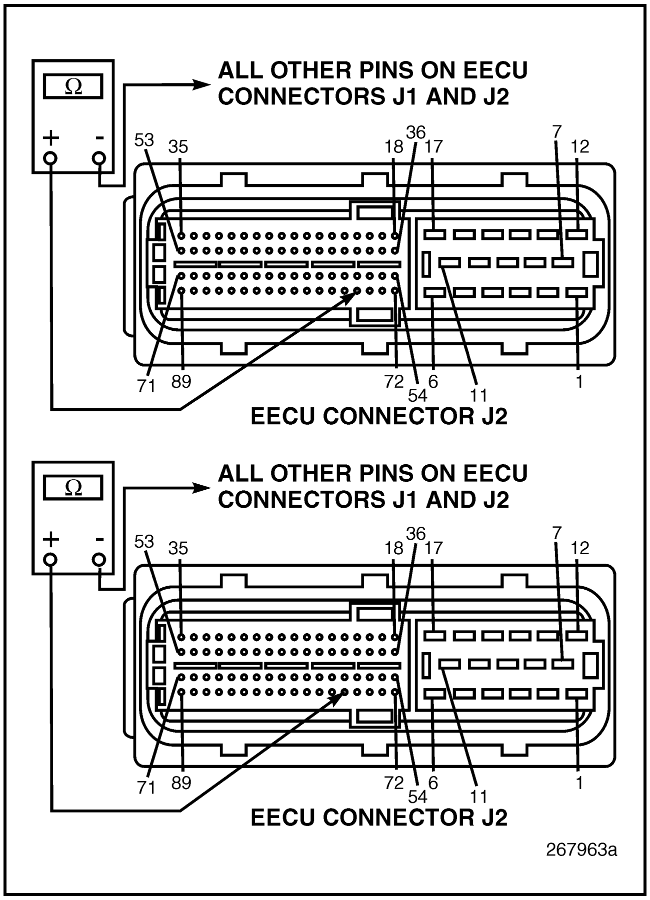


Figure 412

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU connector J2 pins 75 and 76 versus all other pins on EECU connectors J1 and J2 (see Figure 412).

   If there is NO continuity, go to test “Test 128 — Checking for an Open Circuit in the Harness” on page 310.

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 65 — Isolating the Short Circuit to Ground

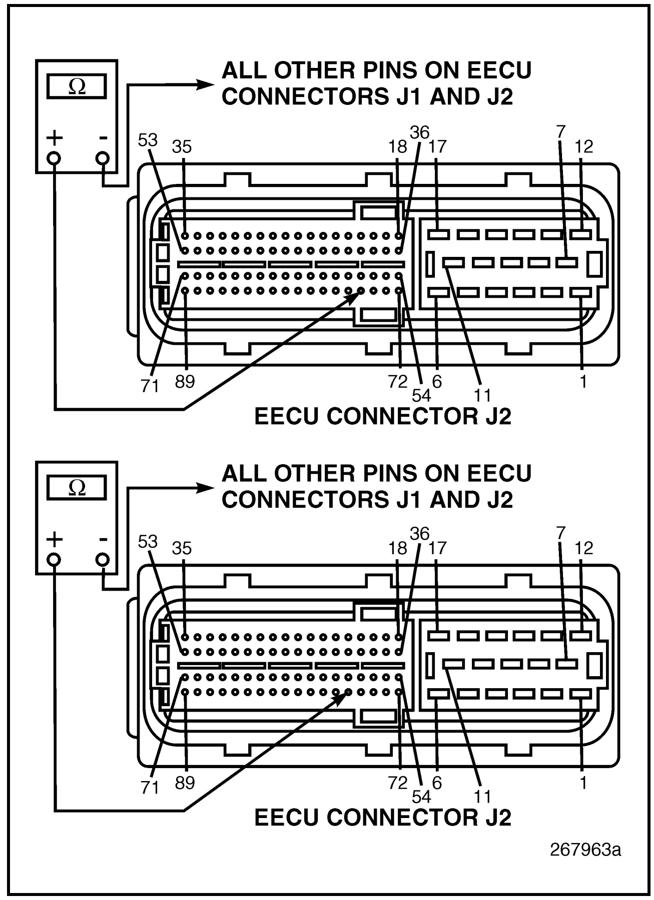


Figure 413

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between the circuit (connector J2 pin 75 or 76) that showed continuity in test 32, versus all other pins on EECU connectors J1 and J2 (see Figure 413).

   If continuity exists, the suspect pin is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the suspect circuit is shorted to ground somewhere else in the harness. Locate and repair the short circuit.

Test 128 — Checking for an Open Circuit in the Harness

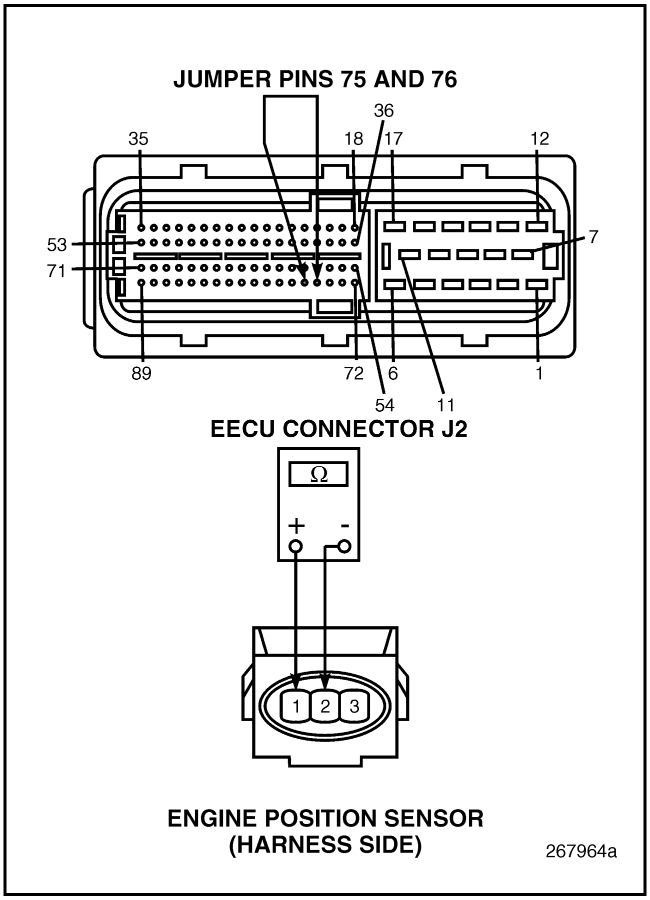


Figure 414

1. Turn the ignition key OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Disconnect EECU connector J2.
4. Connect a jumper between EECU connector J2 pin 75 and EECU connector J2 pin 76.
5. Check for continuity between pins 1 and 2 on the harness side of the Engine Position (EP) Sensor connector (see Figure 414).

   If continuity exists, go to test "Test 256 — Checking for an Open at the Sensor End of the Harness" on page 310.

   If there is NO continuity, go to test "Test 257 — Checking for an Open in the Sensor Return Line at the Engine EECU End of the Harness" on page 311.

Test 256 — Checking for an Open at the Sensor End of the Harness

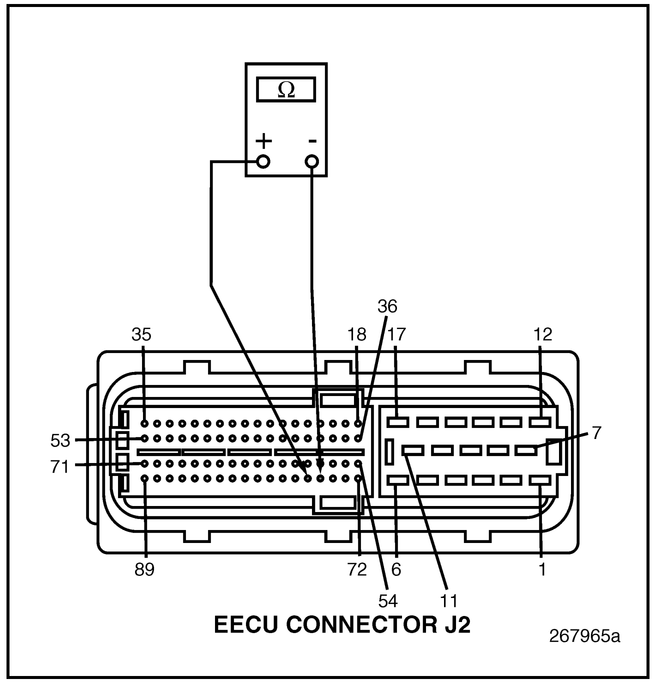


Figure 415

1. Turn the ignition key OFF.
2. Connect the Engine Position (EP) Sensor.
3. Disconnect EECU connector J2.
4. Measure the resistance between EECU connector J2 pins 75 and 76 (see Figure 415).

   If the resistance is between 774 and 946 ohms, go to test "Test 512 — Checking for a Faulty EECU or a Loose EECU Connector" on page 311.

   If the resistance is not within this range, the Engine Position (EP) Sensor has an open circuit or a faulty connector. Repair the connector if possible, otherwise, replace the sensor.

Test 257 — Checking for an Open in the Sensor Return Line at the Engine EECU End of the Harness

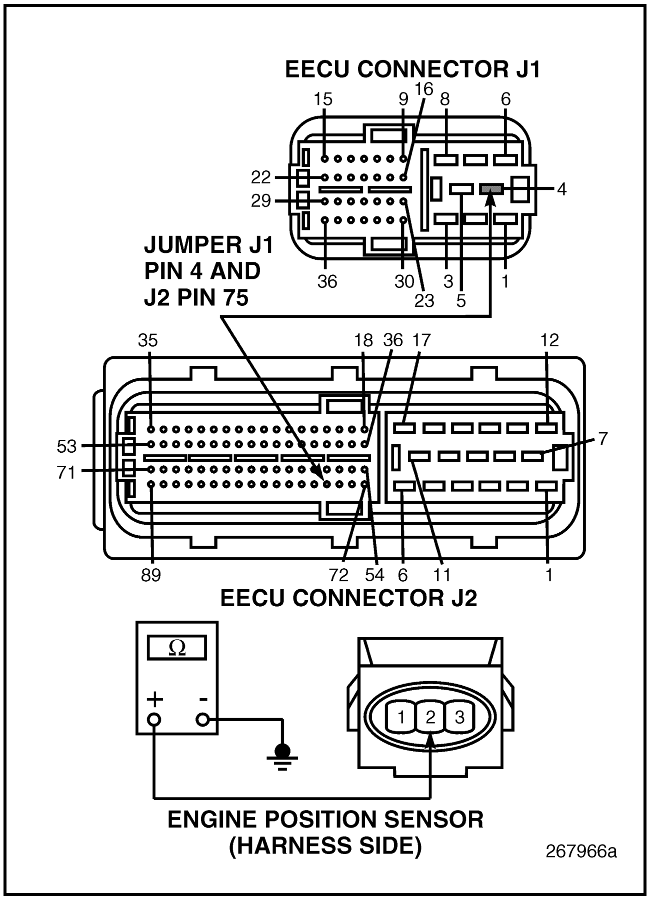


Figure 416

1. Turn the ignition key OFF.
2. Disconnect EECU connectors J1 and J2.
3. Connect a jumper between EECU connector J2 pin 75 and EECU connector J1 pin 4.
4. Check for continuity between pin 2 on the harness side of the Engine Position (EP) Sensor connector and a good ground (see Figure 416).

   If continuity exists, there is an open in the EECU connector J2 pin 76 circuit. Locate and repair the open circuit.

   If there is NO continuity, select another chassis ground and re-check. If there is still NO continuity, repair the open in the EECU connector J2 pin 75 circuit.

Test 512 — Checking for a Faulty EECU or a Loose EECU Connector

NOTE

Before replacing the Engine Control Unit (EECU), check the sensor for proper adjustment. Refer to the Mack ASET™ Engine Service Procedures Manual (5-110) for the installation and adjustment procedure and shim part numbers.

1. Turn the ignition key OFF.
2. Connect the Engine Position (EP) Sensor connector.
3. Connect EECU connectors J1 and J2.
4. Start the engine.

   If blink code 3-4 is still active, check the EECU and connectors for dirt, loose or broken pins, or repairable damage. If no problems are evident, or they are not repairable, replace the EECU and retest the system.

   If blink code 3-4 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-5 — ENGINE BRAKE OUTPUT #1 (ASET™ IEGR ENGINE)

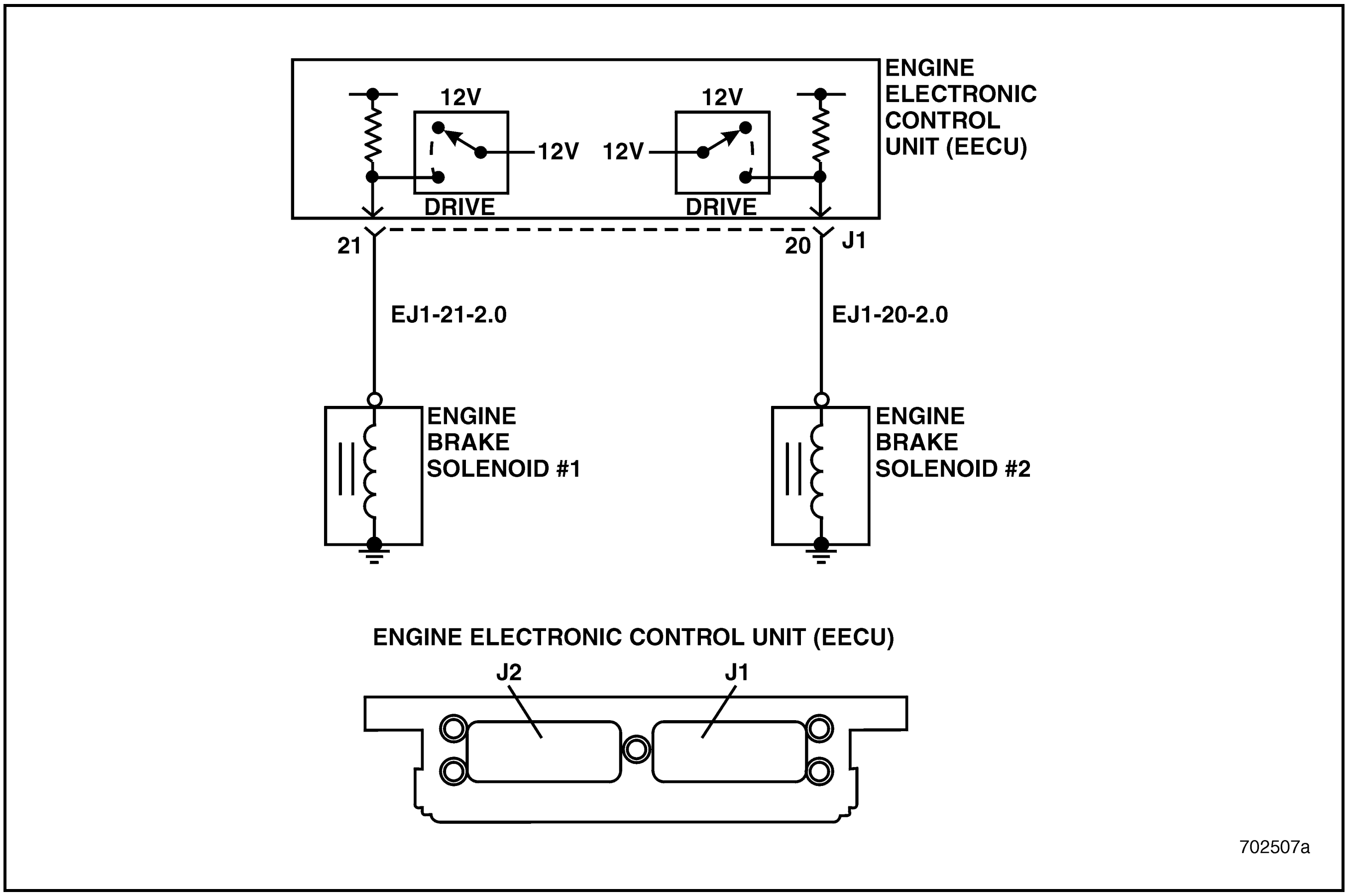


Figure 417 — Engine Brake Output Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 4 (Voltage Low), 5 (Voltage High/Open)

Parameter Identification (PID): S79

Message Identification (MID): 128

Circuit Description: The engine brake is activated when the Engine Electronic Control Unit (EECU) energizes one or both of the Engine Brake Solenoids. With the solenoids energized, engine oil flows through the engine brake assembly, exhaust valve lash is reduced, and the exhaust valves are opened during the piston compression stroke. Before the EECU activates the Engine Brake Solenoids, it must detect an engine speed signal greater than 900 RPM and it must receive a signal from the Vehicle Electronic Control Unit (VECU) that the Engine Brake Switch is in the LOW or HIGH position, and the clutch, brake, and throttle pedals are fully released. Engine Brake Solenoid #1 is generally used only in high engine brake mode, however some wiring harness configurations use Engine Brake Solenoid #1 in both low and high modes.

Location: Engine Brake Solenoid #1 is located on top of the engine brake assembly, under the front engine valve cover. The Engine Brake Solenoid #1 harness connector is located on the left side of the front cylinder head.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) senses battery voltage at connector J1, pin 21 when it is NOT attempting to energize Engine Brake Solenoid #1, the Electronic Malfunction Lamp (EML) will turn on and code 3-5 will set with an FMI of 5. If the EECU senses less than 0.5 volts at connector J1, pin 21 while attempting to energize Engine Brake Solenoid #1, the Electronic Malfunction Lamp (EML) will turn on and code 3-5 will set with an FMI of 4.

NOTE

Code 3-5 is known as a 'latching' fault. The Electronic Malfunction Lamp (EML) will remain on and the fault will remain active even after the conditions which caused the fault have been removed. The fault will only become inactive after the vehicle's electrical power has been cycled. It is important to cycle the vehicle's electrical power (turn the key OFF and ON) to ensure the error is still present while following each step of the diagnostic procedure.

If the source of the fault is removed, the engine brake will work properly even though the Electronic Malfunction Lamp (EML) will remain on and the fault will remain active.

NOTE

On ASET™ IEGR engines, the engine brake will not energize until the engine coolant temperature reaches 125°F (51.67°C).

Additional Symptoms: Decreased engine braking power in high engine brake mode and the possibility of an inoperative engine brake in low mode.

NOTE

If an engine brake is installed on a vehicle, the Customer Data Section of the Engine Electronic Control Unit (EECU) must be programmed to enable engine brake controls and blink code 3-5.

NOTE

This diagnostic code is only available with 1MS327 EECU software.

Test 1 — Checking for Code 3-5

1. Verify that code 3-5 is set.

   If code 3-5 is set, go to test "Test 2 — Checking Code 3-5 Failure Mode Identifier (FMI)" on page 313.

   If code 3-5 is not set, wiggle the harness and connectors, then attempt to energize the engine brake in high mode, to try to set the code. Visually inspect the Engine Brake Solenoid #1 harness connector and wires for frayed or loose connections.

Test 2 — Checking Code 3-5 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. If the fault is NOT active, attempt to energize the engine brake.
3. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4, go to test "Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid" on page 313.

   If the FMI is 5, go to test "Test 5 — Checking for a Short Circuit to Voltage" on page 314.

Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #1 harness connector.
3. Start the truck and energize the engine brake in high mode.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI changes from 4 to 5, replace Engine Brake Solenoid #1 and retest the system.

   If the FMI does NOT change from 4 to 5, go to test "Test 8 — Checking for a Short Circuit to Ground in the Harness" on page 314.

Test 5 — Checking for a Short Circuit to Voltage

1. Turn the ignition key OFF.
2. Turn the engine brake switch OFF.
3. Start the engine and allow it to idle.

   If the engine brake activates with the switch in the OFF position, locate and repair the short circuit to voltage in the Engine Brake Solenoid #1 control line.

   If the engine brake does NOT activate, go to test "Test 10 — Checking for an Open Engine Brake Solenoid" on page 314.

Test 8 — Checking for a Short Circuit to Ground in the Harness

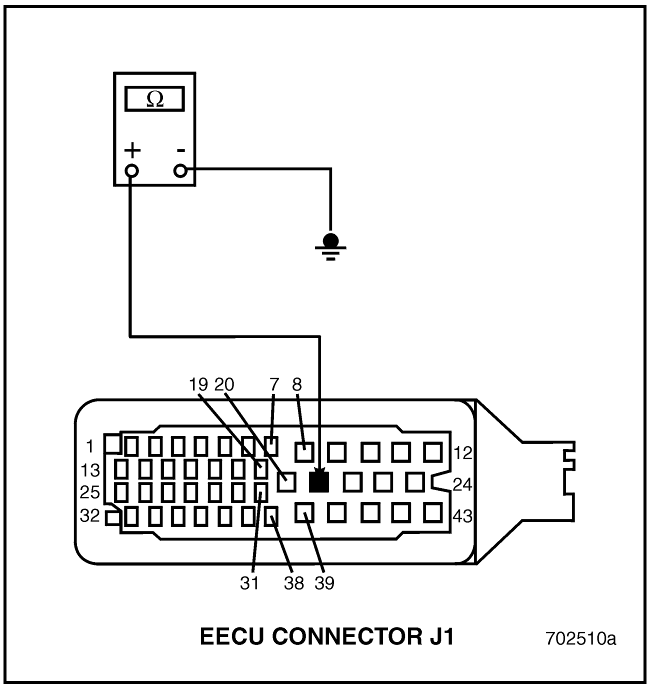


Figure 418

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Engine Brake Solenoid #1 harness connector.
4. Check for continuity between EECU harness connector J1, pin 21 and a good ground (see Figure 418).

   If continuity exists, locate and repair the short circuit to ground in circuit EJ1-21-2.0.

   If there is NO continuity, go to test "Test 16 — Checking for a Faulty EECU Connector" on page 315.

Test 10 — Checking for an Open Engine Brake Solenoid

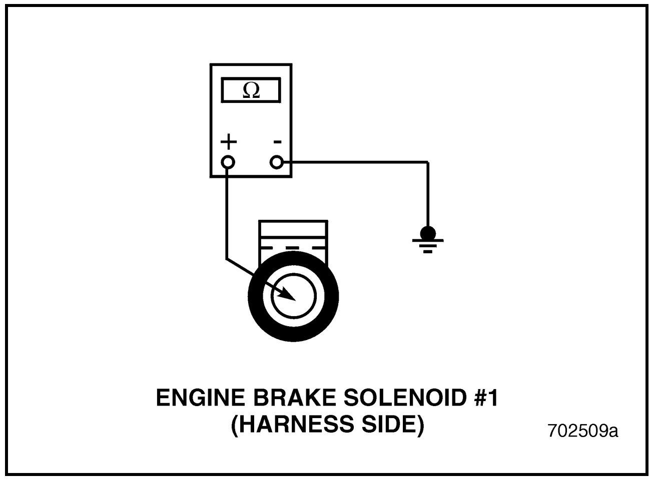


Figure 419

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #1 harness connector.
3. Check for continuity between the terminal of Engine Brake Solenoid #1 and a good ground (see Figure 419).

   If continuity exists, go to test "Test 20 — Checking for an Open Harness" on page 315.

   If there is NO continuity, replace Engine Brake Solenoid #1.

Test 16 — Checking for a Faulty EECU Connector

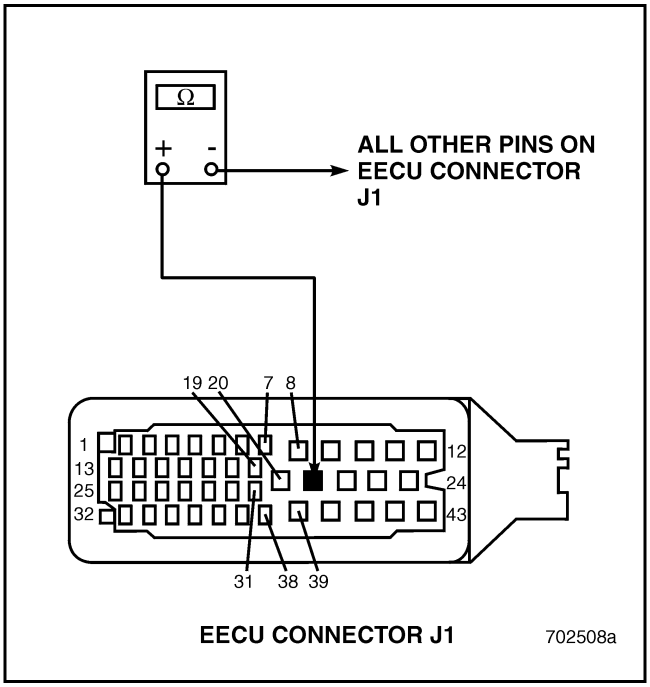


Figure 420

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect EECU connector J1 for dirt, loose pins or deformed contacts.
4. Install the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit into EECU harness connector J1, pin 21. Check for continuity between EECU harness connector J1, pin 21 and all other pins in EECU harness connector J1 (see Figure 420).

   If continuity exists between EECU harness connector J1, pin 21 and any other pin, repair the harness connector.

   If continuity does NOT exist, go to test "Test 32 — Checking the Engine Electronic Control Unit (EECU)" on page 316.

Test 20 — Checking for an Open Harness

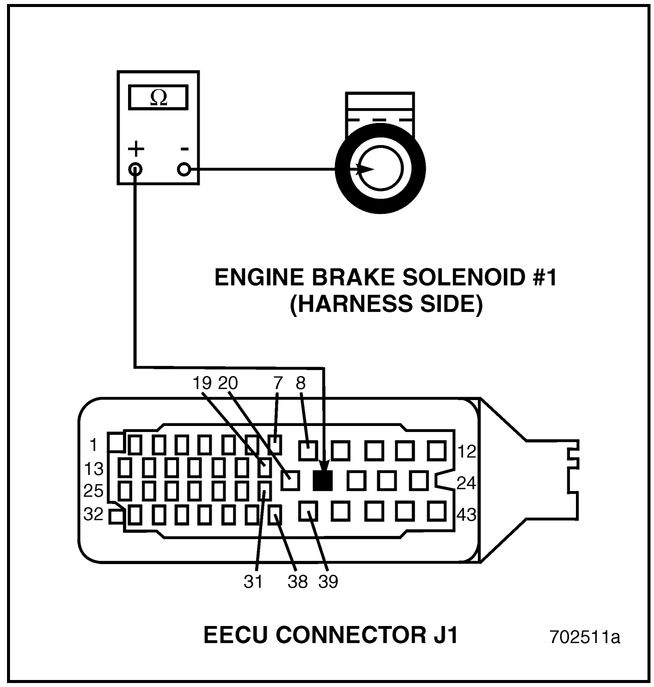


Figure 421

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Engine Brake Solenoid #1 harness connector.
4. Check for continuity between EECU harness connector J1, pin 21 and the terminal of the Engine Brake Solenoid #1 harness connector (see Figure 421).

   If continuity exists, go to test "Test 40 — Checking for a Faulty EECU Connector" on page 316.

   If there is NO continuity, locate and repair the open in circuit EJ1-21-2.0.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Connect the Engine Brake Solenoid #1 harness connector.
4. Start the truck and energize the engine brake in high mode.

   If blink code 3-5 is still active, replace the EECU and retest the system.

   If blink code 3-5 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 40 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect EECU connector J1 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J1, pin 21. Gently push the test lead into pin 21 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the test lead is making good contact with the connector terminal, go to test “Test 80 — Checking the Engine Electronic Control Unit (EECU)” on page 316.

Test 80 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Connect the Engine Brake Solenoid #1 harness connector.
4. Turn the ignition key ON.

   If blink code 3-5 is still active, replace the EECU and retest the system.

   If blink code 3-5 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-5 — ENGINE BRAKE OUTPUT #1 (ASET™ CEGR ENGINE)

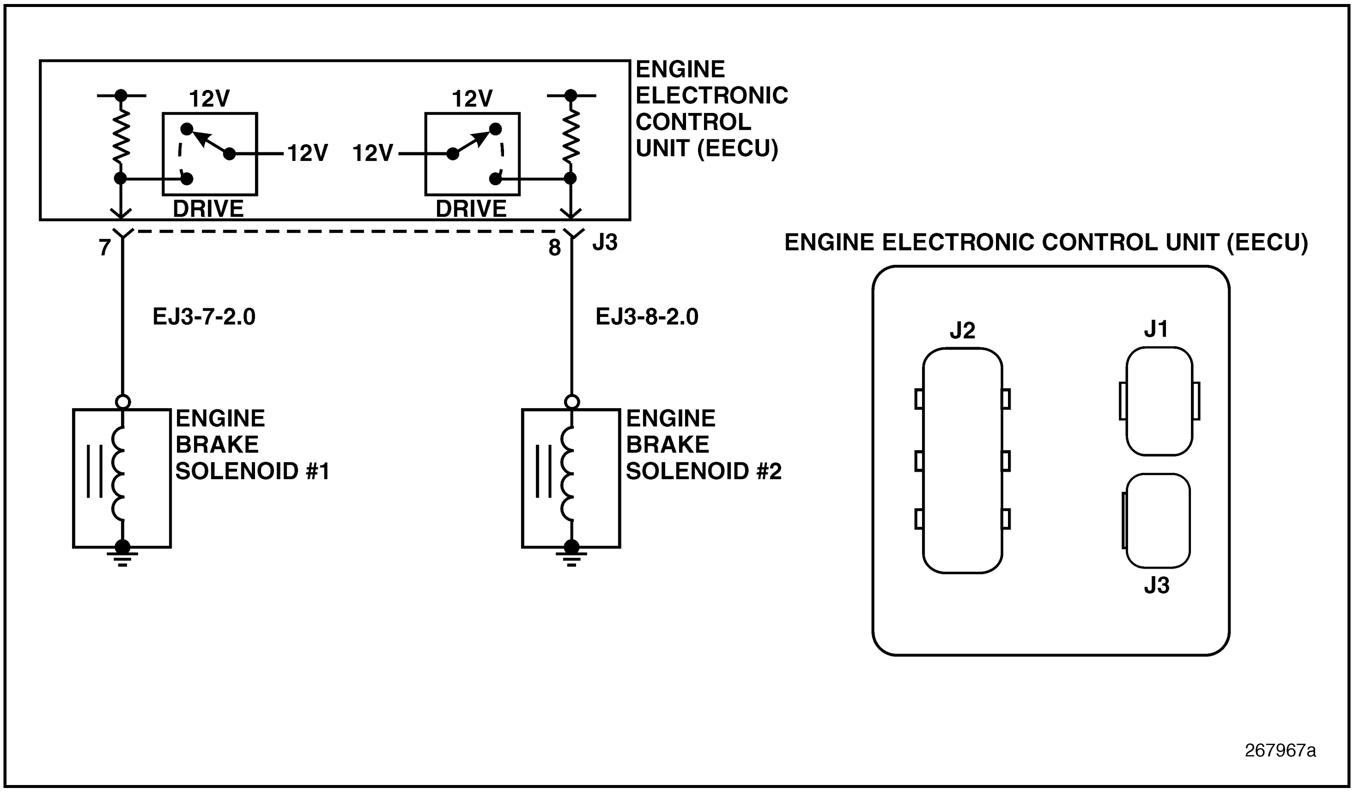


Figure 422 — Engine Brake Output Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 4 (Voltage Low), 5 (Voltage High/Open)

Parameter Identification (PID): S79

Message Identification (MID): 128

Circuit Description: The engine brake is activated when the Engine Electronic Control Unit (EECU) energizes one or both of the Engine Brake Solenoids. With the solenoids energized, engine oil flows through the engine brake assembly, exhaust valve lash is reduced, and the exhaust valves are opened during the piston compression stroke. Before the EECU activates the Engine Brake Solenoids, it must detect an engine speed signal greater than 900 RPM and it must receive a signal from the Vehicle Electronic Control Unit (VECU) that the Engine Brake Switch is in the LOW or HIGH position, and the clutch, brake, and throttle pedals are fully released. Engine Brake Solenoid #1 is generally used only in high engine brake mode, however some wiring harness configurations use Engine Brake Solenoid #1 in both low and high modes.

NOTE

Code 3-5 is known as a 'latching' fault. The Electronic Malfunction Lamp (EML) will remain on and the fault will remain active even after the conditions which caused the fault have been removed. The fault will only become inactive after the vehicle's electrical power has been cycled. It is important to cycle the vehicle's electrical power (turn the key OFF and ON) to ensure the error is still present while following each step of the diagnostic procedure.

If the source of the fault is removed, the engine brake will NOT work properly until the the vehicle's electrical power has been cycled.

NOTE

The engine brake will not energize unless the engine coolant temperature is at least 125°F (37.8°C).

Location: Engine Brake Solenoid #1 is located on top of the engine brake assembly, under the front engine valve cover. The Engine Brake Solenoid #1 harness connector is located on the left side of the front cylinder head.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) senses battery voltage at connector J3, pin 7 when it is NOT attempting to energize Engine Brake Solenoid #1, the Electronic Malfunction Lamp (EML) will turn on and code 3-5 will set with an FMI of 5. If the EECU senses less than 0.5 volts at connector J3, pin 7 while attempting to energize Engine Brake Solenoid #1, the Electronic Malfunction Lamp (EML) will turn on and code 3-5 will set with an FMI of 4.

Additional Symptoms: Decreased engine braking power in high engine brake mode and the possibility of an inoperative engine brake in low mode.

NOTE

If an engine brake is installed on a vehicle, the Customer Data Section of the Engine Electronic Control Unit (EECU) must be programmed to enable engine brake controls and blink code 3-5.

Test 1 — Checking for Code 3-5

1. Verify that code 3-5 is set.

   If code 3-5 is set, go to test “Test 2 — Checking Code 3-5 Failure Mode Identifier (FMI)” on page 318.

   If code 3-5 is not set, wiggle the harness and connectors, then attempt to energize the engine brake in high mode, to try to set the code. Visually inspect the Engine Brake Solenoid #1 harness connector and wires for frayed or loose connections.

Test 2 — Checking Code 3-5 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. If the fault is NOT active, attempt to energize the engine brake.
3. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4, go to test “Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid” on page 318.

   If the FMI is 5, go to test “Test 5 — Checking for a Short Circuit to Voltage” on page 318.

Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #1 harness connector.
3. Start the truck and energize the engine brake in high mode.
4. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI changes from 4 to 5, replace Engine Brake Solenoid #1 and retest the system.

   If the FMI does NOT change from 4 to 5, go to test “Test 8 — Checking for a Short Circuit to Ground in the Harness” on page 319.

Test 5 — Checking for a Short Circuit to Voltage

1. Turn the ignition key OFF.
2. Turn the engine brake switch OFF.
3. Start the engine and allow it to idle.

   If the engine brake activates with the switch in the OFF position, locate and repair the short circuit to voltage in the Engine Brake Solenoid #1 control line.

   If the engine brake does NOT activate, go to test “Test 10 — Checking for an Open Engine Brake Solenoid” on page 319.

Test 8 — Checking for a Short Circuit to Ground in the Harness

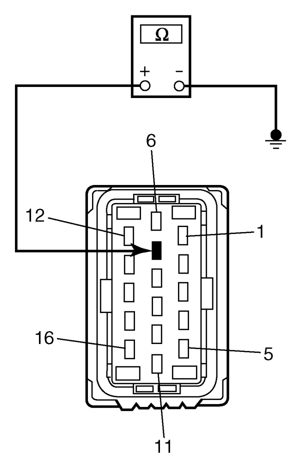


Figure 423

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Disconnect the Engine Brake Solenoid #1 harness connector.
4. Check for continuity between EECU harness connector J3, pin 7 and a good ground (see Figure 423).

   If continuity exists, locate and repair the short circuit to ground in circuit EJ3-7-2.0.

   If there is NO continuity, go to test “Test 16 — Checking for a Faulty EECU Connector” on page 320.

Test 10 — Checking for an Open Engine Brake Solenoid

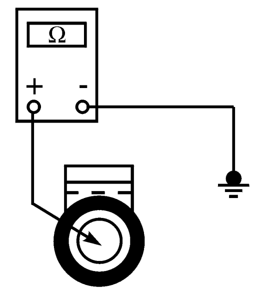


Figure 424

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #1 harness connector.
3. Check for continuity between the terminal of Engine Brake Solenoid #1 and a good ground (see Figure 424).

   If continuity exists, go to test “Test 20 — Checking for an Open Harness” on page 320.

   If there is NO continuity, replace Engine Brake Solenoid #1.

Test 16 — Checking for a Faulty EECU Connector

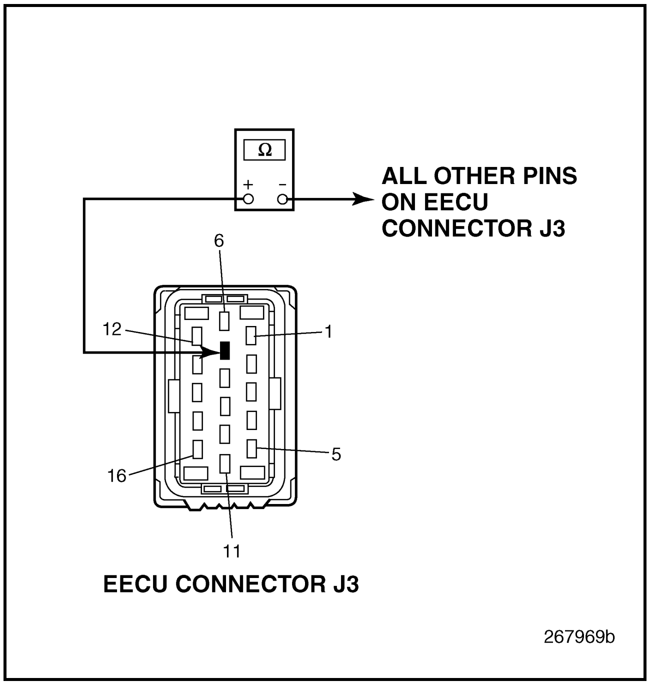


Figure 425

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Visually inspect EECU connector J3 for dirt, loose pins or deformed contacts.
4. Install the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit into EECU harness connector J3, pin 7. Check for continuity between EECU harness connector J3, pin 7 and all other pins in EECU harness connector J3 (see Figure 425).

   If continuity exists between EECU harness connector J3, pin 7 and any other pin, repair the harness connector.

   If continuity does NOT exist, go to test "Test 32 — Checking the Engine Electronic Control Unit (EECU)" on page 321.

Test 20 — Checking for an Open Harness

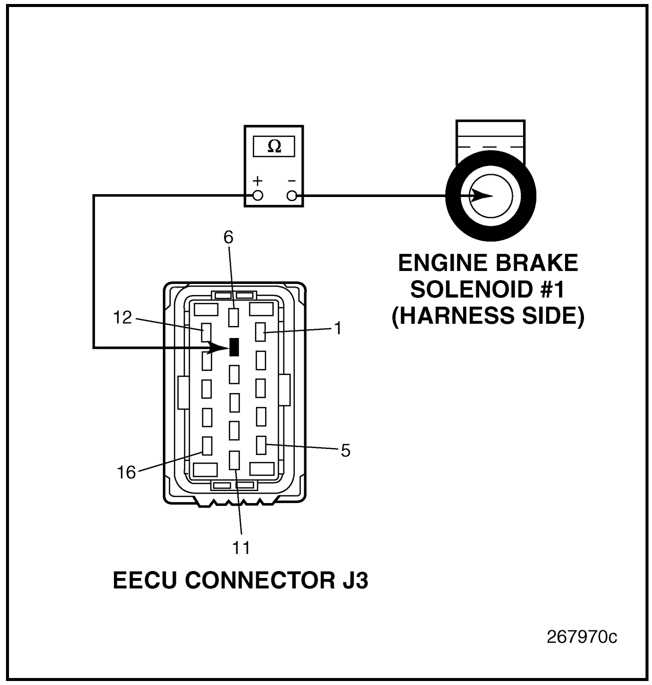


Figure 426

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Disconnect the Engine Brake Solenoid #1 harness connector.
4. Check for continuity between EECU harness connector J3, pin 7 and the terminal of the Engine Brake Solenoid #1 harness connector (see Figure 426).

   If continuity exists, go to test "Test 40 — Checking for a Faulty EECU Connector" on page 321.

   If there is NO continuity, locate and repair the open in circuit EJ3-7-2.0.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J3.
3. Connect the Engine Brake Solenoid #1 harness connector.
4. Start the truck and energize the engine brake in high mode.

   If blink code 3-5 is still active, replace the EECU and retest the system.

   If blink code 3-5 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 40 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Visually inspect EECU connector J3 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J3, pin 7. Gently push the test lead into pin 7 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the test lead is making good contact with the connector terminal, go to test “Test 80 — Checking the Engine Electronic Control Unit (EECU)” on page 321.

Test 80 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J3.
3. Connect the Engine Brake Solenoid #1 harness connector.
4. Turn the ignition key ON.

   If blink code 3-5 is still active, replace the EECU and retest the system.

   If blink code 3-5 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-6 — ENGINE BRAKE OUTPUT #2 (ASET™ IEGR ENGINE)

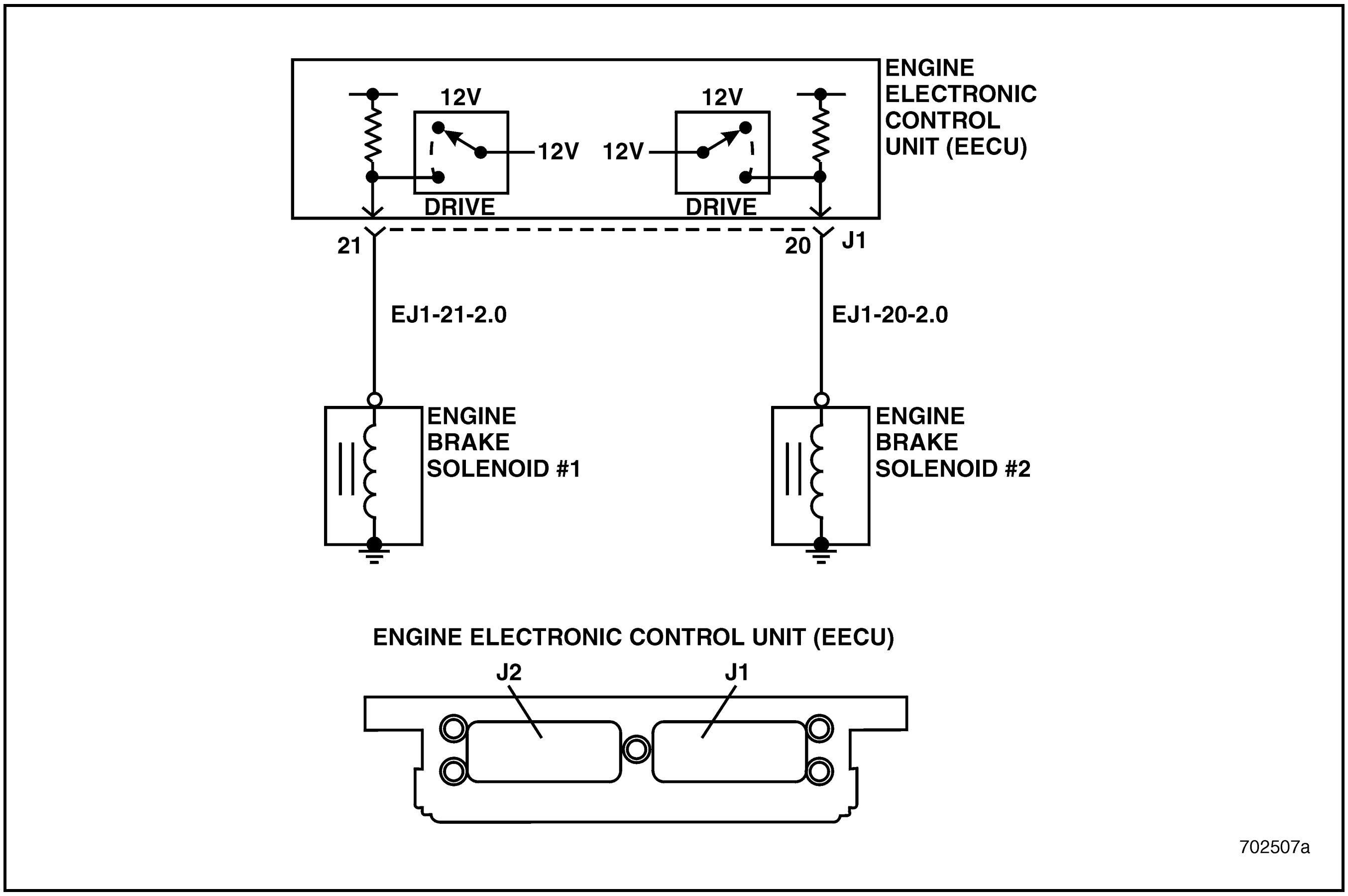


Figure 427 — Engine Brake Output Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 4 (Voltage Low), 5 (Voltage High/Open)

Parameter Identification (PID): S80

Message Identification (MID): 128

Circuit Description: The engine brake is activated when the Engine Electronic Control Unit (EECU) energizes one or both of the Engine Brake Solenoids. With the solenoids energized, engine oil flows through the engine brake assembly, exhaust valve lash is reduced, and the exhaust valves are opened during the piston compression stroke. Before the EECU activates the Engine Brake Solenoids, it must detect an engine speed signal greater than 900 RPM and it must receive a signal from the Vehicle Electronic Control Unit (VECU) that the Engine Brake Switch is in the LOW or HIGH position, and the clutch, brake, and throttle pedals are fully released. Engine Brake Solenoid #2 is generally used in both low and high engine brake modes, however some wiring harness configurations use Engine Brake Solenoid #2 in only high mode.

Location: Engine Brake Solenoid #2 is located on top of the engine brake assembly, under the rear engine valve cover. The Engine Brake Solenoid #2 harness connector is located on the left side of the rear cylinder head.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) senses battery voltage at connector J1, pin 20 when it is NOT attempting to energize Engine Brake Solenoid #2, the Electronic Malfunction Lamp (EML) will turn on and code 3-6 will set with an FMI of 5. If the EECU senses less than 0.5 volts at connector J1, pin 20 while attempting to energize Engine Brake Solenoid #2, the Electronic Malfunction Lamp (EML) will turn on and code 3-6 will set with an FMI of 4.

NOTE

Code 3-6 is known as a 'latching' fault. The Electronic Malfunction Lamp (EML) will remain on and the fault will remain active even after the conditions which caused the fault have been removed. The fault will only become inactive after the vehicle's electrical power has been cycled. It is important to cycle the vehicle's electrical power (turn the key OFF and ON) to ensure the error is still present while following each step of the diagnostic procedure.

If the source of the fault is removed, the engine brake will work properly even though the Electronic Malfunction Lamp (EML) will remain on and the fault will remain active.

NOTE

On ASET™ IEGR engines, the engine brake will not energize until the engine coolant temperature reaches 125°F (51.67°C).

Additional Symptoms: Decreased engine braking power in high engine brake mode and the probability of an inoperative engine brake in low mode.

NOTE

If an engine brake is installed on a vehicle, the Customer Data Section of the Engine Electronic Control Unit (EECU) must be programmed to enable engine brake controls and blink code 3-6.

NOTE

This diagnostic code is only available with 1MS327 EECU software.

Test 1 — Checking for Code 3-6

1. Verify that code 3-6 is set.

   If code 3-6 is set, go to test "Test 2 — Checking Code 3-6 Failure Mode Identifier (FMI)" on page 323.

   If code 3-6 is not set, wiggle the harness and connectors, then attempt to energize the engine brake in high mode, to try to set the code. Visually inspect the Engine Brake Solenoid #2 harness connector and wires for frayed or loose connections.

Test 2 — Checking Code 3-6 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. If the fault is NOT active, attempt to energize the engine brake.
3. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4, go to test "Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid" on page 324.

   If the FMI is 5, go to test "Test 5 — Checking for a Short Circuit to Voltage" on page 324.

Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #2 harness connector.
3. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI changes from 4 to 5, replace Engine Brake Solenoid #2 and retest the system.

   If the FMI does NOT change from 4 to 5, go to test “Test 8 — Checking for a Short Circuit to Ground in the Harness” on page 324.

Test 5 — Checking for a Short Circuit to Voltage

1. Turn the ignition key OFF.
2. Turn the engine brake switch OFF.
3. Start the engine and allow it to idle.

   If the engine brake activates with the switch in the OFF position, locate and repair the short circuit to voltage in the Engine Brake Solenoid #2 control line.

   If the engine brake does NOT activate, go to test “Test 10 — Checking for an Open Engine Brake Solenoid” on page 325.

Test 8 — Checking for a Short Circuit to Ground in the Harness

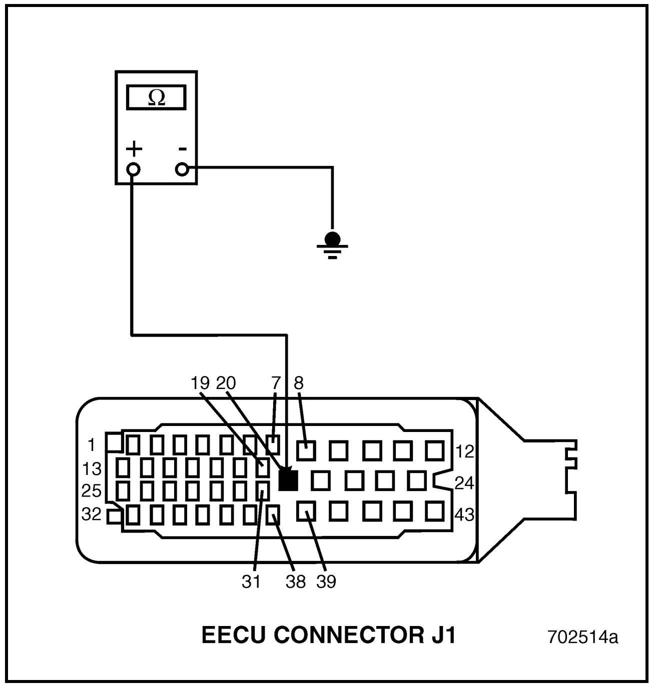


Figure 428

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Engine Brake Solenoid #2 harness connector.
4. Check for continuity between EECU harness connector J1, pin 20 and a good ground (see Figure 428).

   If continuity exists, locate and repair the short to ground in circuit EJ1-20-2.0.

   If there is NO continuity, go to test “Test 16 — Checking for a Faulty EECU Connector” on page 325.

Test 10 — Checking for an Open Engine Brake Solenoid

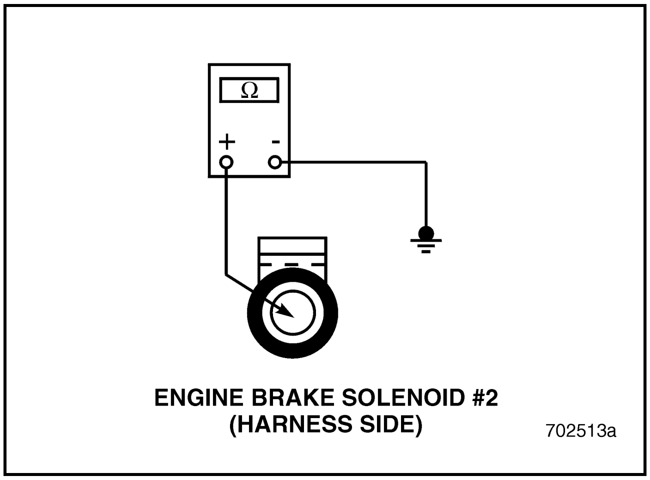


Figure 429

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #2 harness connector.
3. Check for continuity between the terminal of Engine Brake Solenoid #2 and a good ground (see Figure 429).

   If continuity exists, go to test "Test 20 — Checking for an Open Harness" on page 326.

   If there is NO continuity, replace Engine Brake Solenoid #2.

Test 16 — Checking for a Faulty EECU Connector

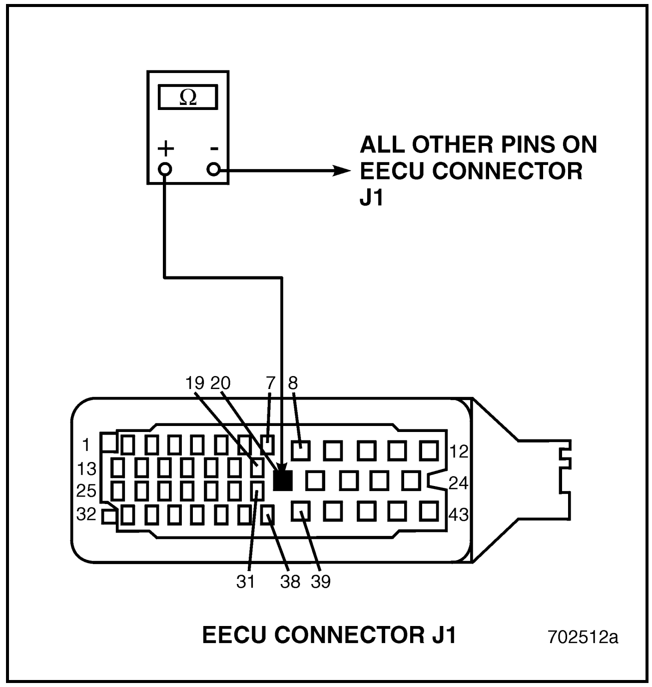


Figure 430

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect EECU connector J1 for dirt, loose pins or deformed contacts.
4. Install the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit into EECU harness connector J1, pin 20. Check for continuity between EECU harness connector J1, pin 20 and all other pins in EECU harness connector J1 (see Figure 430).

   If continuity exists between EECU harness connector J1, pin 20 and any other pin, repair the harness connector.

   If continuity does NOT exist, go to test "Test 32 — Checking the Engine Electronic Control Unit (EECU)" on page 326.

Test 20 — Checking for an Open Harness

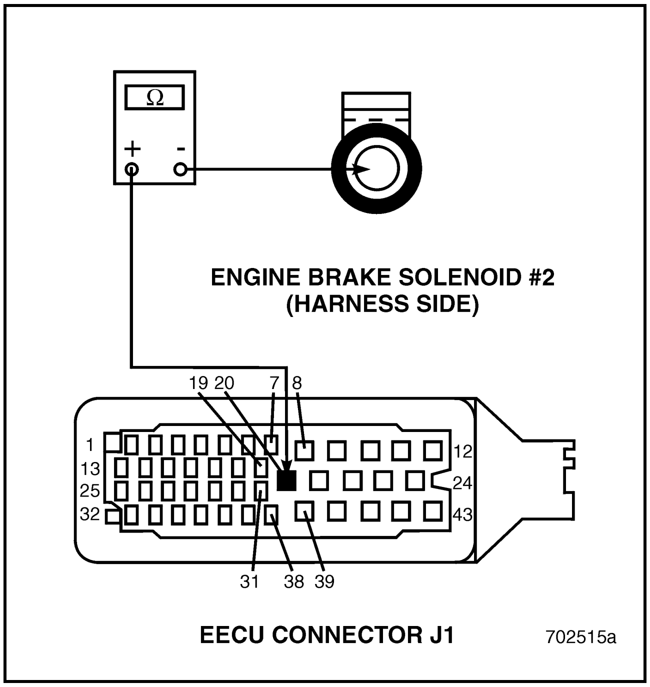


Figure 431

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Engine Brake Solenoid #2 harness connector.
4. Check for continuity between EECU harness connector J1, pin 20 and the terminal of the Engine Brake Solenoid #2 harness connector (see Figure 431).

   If continuity exists, go to test "Test 40 — Checking for a Faulty EECU Connector" on page 326.

   If there is NO continuity, locate and repair the open in circuit EJ1-20-2.0.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Connect the Engine Brake Solenoid #2 harness connector.
4. Start the truck and energize the engine brake in high mode.

   If blink code 3-6 is still active, replace the EECU and re-test the system.

   If blink code 3-6 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 40 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect EECU connector J1 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J1, pin 20. Gently push the test lead into pin 20 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the test lead is making good contact with the connector terminal, go to test "Test 80 — Checking the Engine Electronic Control Unit (EECU)" on page 326.

Test 80 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Connect the Engine Brake Solenoid #2 harness connector.
4. Turn the ignition key ON.

   If blink code 3-6 is still active, replace the EECU and retest the system.

   If blink code 3-6 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-6 — ENGINE BRAKE OUTPUT #2 (ASET™ CEGR ENGINE)

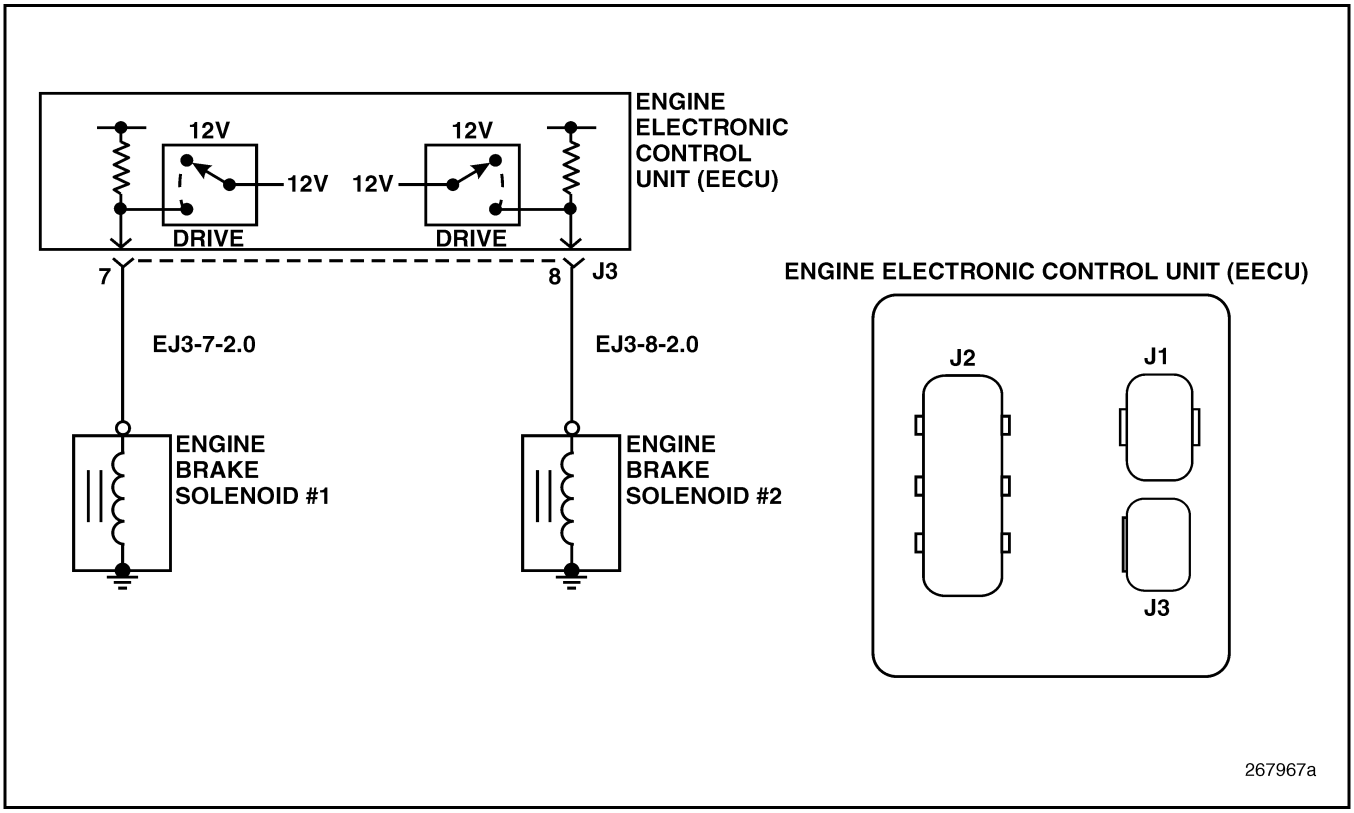


Figure 432 — Engine Brake Output Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 4 (Voltage Low), 5 (Voltage High/Open)

Parameter Identification (PID): S80

Message Identification (MID): 128

Circuit Description: The engine brake is activated when the Engine Electronic Control Unit (EECU) energizes one or both of the Engine Brake Solenoids. With the solenoids energized, engine oil flows through the engine brake assembly, exhaust valve lash is reduced, and the exhaust valves are opened during the piston compression stroke. Before the EECU activates the Engine Brake Solenoids, it must detect an engine speed signal greater than 900 RPM and it must receive a signal from the Vehicle Electronic Control Unit (VECU) that the Engine Brake Switch is in the LOW or HIGH position, and the clutch, brake, and throttle pedals are fully released. Engine Brake Solenoid #2 is generally used in both low and high engine brake modes, however some wiring harness configurations use Engine Brake Solenoid #2 in only high mode.

NOTE

Code 3-6 is known as a 'latching' fault. The Electronic Malfunction Lamp (EML) will remain on and the fault will remain active even after the conditions which caused the fault have been removed. The fault will only become inactive after the vehicle's electrical power has been cycled. It is important to cycle the vehicle's electrical power (turn the key OFF and ON) to ensure the error is still present while following each step of the diagnostic procedure.

If the source of the fault is removed, the engine brake will NOT work properly until the the vehicle's electrical power has been cycled.

NOTE

The engine brake will not energize unless the engine coolant temperature is at least 125°F (37.8°C).

Location: Engine Brake Solenoid #2 is located on top of the engine brake assembly, under the rear engine valve cover. The Engine Brake Solenoid #2 harness connector is located on the left side of the rear cylinder head.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) senses battery voltage at connector J, pin 8 when it is NOT attempting to energize Engine Brake Solenoid #2, the Electronic Malfunction Lamp (EML) will turn on and code 3-6 will set with an FMI of 5. If the EECU senses less than 0.5 volts at connector J3, pin 8 while attempting to energize Engine Brake Solenoid #2, the Electronic Malfunction Lamp (EML) will turn on and code 3-6 will set with an FMI of 4.

Additional Symptoms: Decreased engine braking power in high engine brake mode and the probability of an inoperative engine brake in low mode.

NOTE

If an engine brake is installed on a vehicle, the Customer Data Section of the Engine Electronic Control Unit (EECU) must be programmed to enable engine brake controls and blink code 3-6.

Test 1 — Checking for Code 3-6

1. Verify that code 3-6 is set.

   If code 3-6 is set, go to test “Test 2 — Checking Code 3-6 Failure Mode Identifier (FMI)” on page 328.

   If code 3-6 is not set, wiggle the harness and connectors, then attempt to energize the engine brake in high mode, to try to set the code. Visually inspect the Engine Brake Solenoid #2 harness connector and wires for frayed or loose connections.

Test 2 — Checking Code 3-6 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. If the fault is NOT active, attempt to energize the engine brake.
3. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4, go to test “Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid” on page 328.

   If the FMI is 5, go to test “Test 5 — Checking for a Short Circuit to Voltage” on page 328.

Test 4 — Checking for a Short Circuit to Ground in the Engine Brake Solenoid

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #2 harness connector.
3. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI changes from 4 to 5, replace Engine Brake Solenoid #2 and retest the system.

   If the FMI does NOT change from 4 to 5, go to test “Test 8 — Checking for a Short Circuit to Ground in the Harness” on page 329.

Test 5 — Checking for a Short Circuit to Voltage

1. Turn the ignition key OFF.
2. Turn the engine brake switch OFF.
3. Start the engine and allow it to idle.

   If the engine brake activates with the switch in the OFF position, locate and repair the short circuit to voltage in the Engine Brake Solenoid #2 control line.

   If the engine brake does NOT activate, go to test “Test 10 — Checking for an Open Engine Brake Solenoid” on page 329.

Test 8 — Checking for a Short Circuit to Ground in the Harness

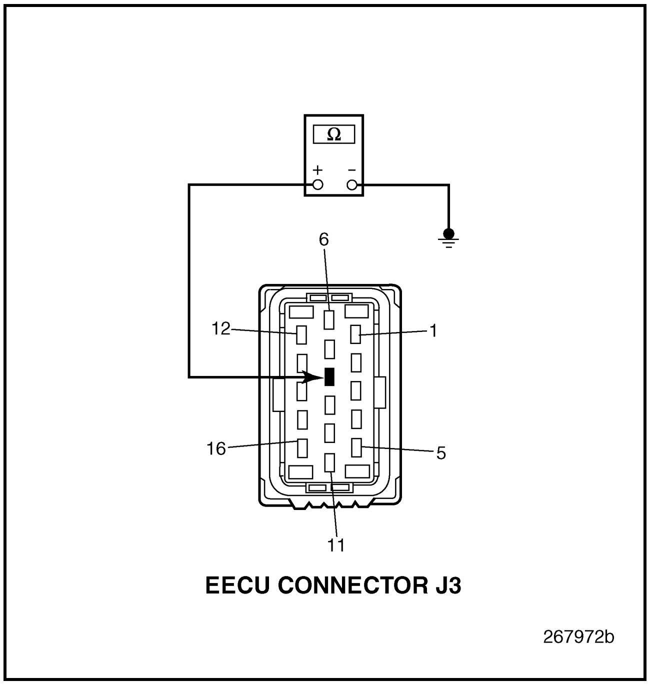


Figure 433

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Disconnect the Engine Brake Solenoid #2 harness connector.
4. Check for continuity between EECU harness connector J3, pin 8 and a good ground (see Figure 433).

   If continuity exists, locate and repair the short to ground in circuit EJ3-8-2.0.

   If there is NO continuity, go to test "Test 16 — Checking for a Faulty EECU Connector" on page 330.

Test 10 — Checking for an Open Engine Brake Solenoid

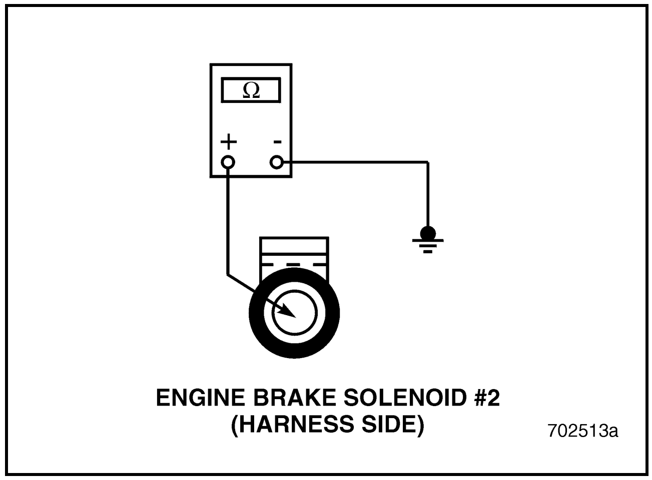


Figure 434

1. Turn the ignition key OFF.
2. Disconnect the Engine Brake Solenoid #2 harness connector.
3. Check for continuity between the terminal of Engine Brake Solenoid #2 and a good ground (see Figure 434).

   If continuity exists, go to test "Test 20 — Checking for an Open Harness" on page 330.

   If there is NO continuity, replace Engine Brake Solenoid #2.

Test 16 — Checking for a Faulty EECU Connector

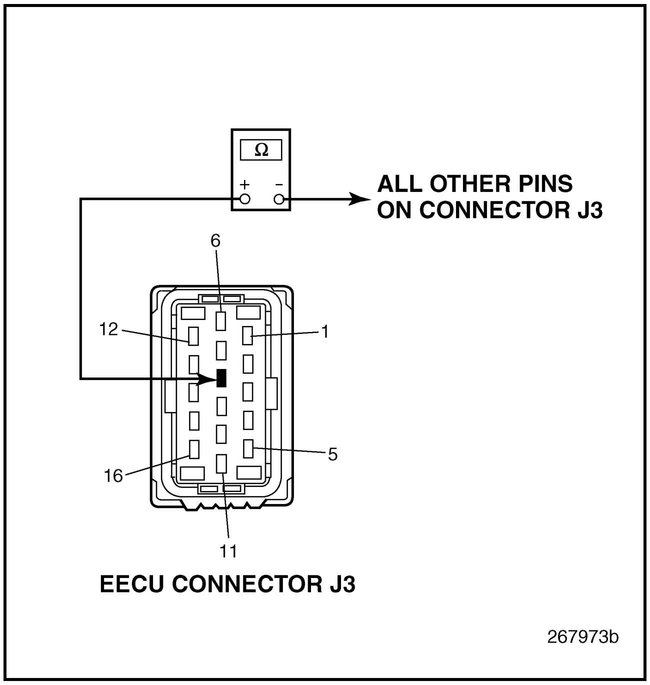


Figure 435

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Visually inspect EECU connector J3 for dirt, loose pins or deformed contacts.
4. Install the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit into EECU harness connector J3, pin 8. Check for continuity between EECU harness connector J3, pin 8 and all other pins in EECU harness connector J3 (see Figure 435).

   If continuity exists between EECU harness connector J3, pin 8 and any other pin, repair the harness connector.

   If continuity does NOT exist, go to test "Test 32 — Checking the Engine Electronic Control Unit (EECU)" on page 331.

Test 20 — Checking for an Open Harness

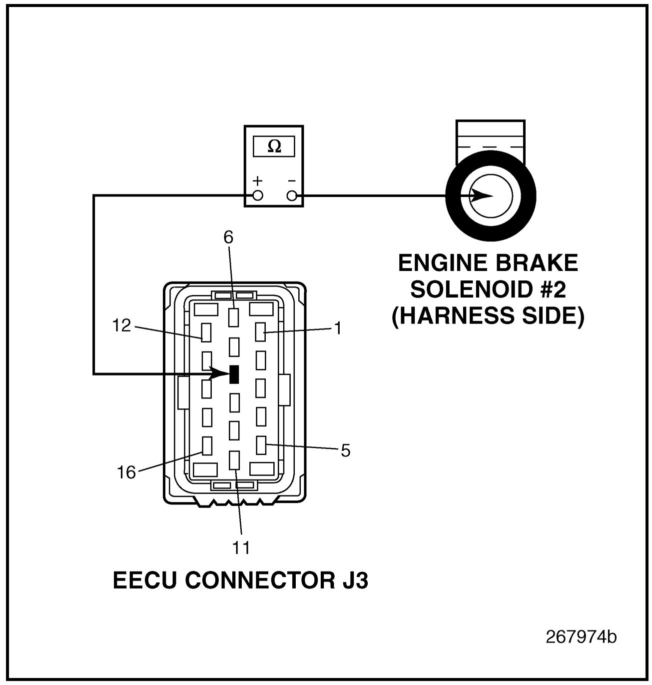


Figure 436

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Disconnect the Engine Brake Solenoid #2 harness connector.
4. Check for continuity between EECU harness connector J3, pin 8 and the terminal of the Engine Brake Solenoid #2 harness connector (see Figure 436).

   If continuity exists, go to test "Test 40 — Checking for a Faulty EECU Connector" on page 331.

   If there is NO continuity, locate and repair the open in circuit EJ3-8-2.0.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J3.
3. Connect the Engine Brake Solenoid #2 harness connector.
4. Start the truck and energize the engine brake in high mode.

   If blink code 3-6 is still active, replace the EECU and re-test the system.

   If blink code 3-6 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 40 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J3.
3. Visually inspect EECU connector J3 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J3, pin 8. Gently push the test lead into pin 8 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the test lead is making good contact with the connector terminal, go to test "Test 80 — Checking the Engine Electronic Control Unit (EECU)" on page 331.

Test 80 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J3.
3. Connect the Engine Brake Solenoid #2 harness connector.
4. Turn the ignition key ON.

   If blink code 3-6 is still active, replace the EECU and retest the system.

   If blink code 3-6 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 3-8 — TRANSMISSION SPLITTER POSITION MECHANICAL MALFUNCTION

Failure Mode Identifier (FMI): 7 (Mechanical System Not Responding), 8 (Abnormal Frequency)

Parameter Identification (PID): S32

Message Identification (MID): 142

Code Setting Conditions: Diagnostic code 3-8 will be set in the Vehicle Electronic Control Unit (VECU) with FMI 7 if the VECU attempts to shift the Eaton Super 10 Top 2™ transmission but is unable to do so because of a mechanical malfunction. Diagnostic code 3-8 will be set in the VECU with FMI 8 if the VECU senses an instantaneous driveshaft acceleration or deceleration greater than 12,000 RPM/second. Instantaneous driveshaft acceleration of this magnitude is caused by an improperly aligned driveshaft or by excessive driveshaft angle.

Test 1 — Checking for Code 3-8

1. Verify that code 3-8 is set.

   If code 3-8 is set, go to test “Test 2 — Checking Code 3-8 Failure Mode Identifier (FMI)” on page 332.

   If code 3-8 is not set, the code is intermittent. Road test the vehicle, operating in every gear, to attempt to set code 3-8.

Test 2 — Checking Code 3-8 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 7, there is a mechanical transmission problem. Inspect the shift rail and air system for damage and defective components.

   If the FMI is 8, check the driveline angle between the transmission and the front carrier, and adjust as necessary.

BLINK CODE 3-10 — ENGINE BRAKE OUTPUT #3 (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 4 (Voltage Low), 5 (Voltage High/Open)

Parameter Identification (PID): S82

Message Identification (MID): 128

NOTE

If this fault occurs, contact Mack Trucks Service Engineering.

BLINK CODE 4-1 — VEHICLE SPEED (MPH) SENSOR (VSS)

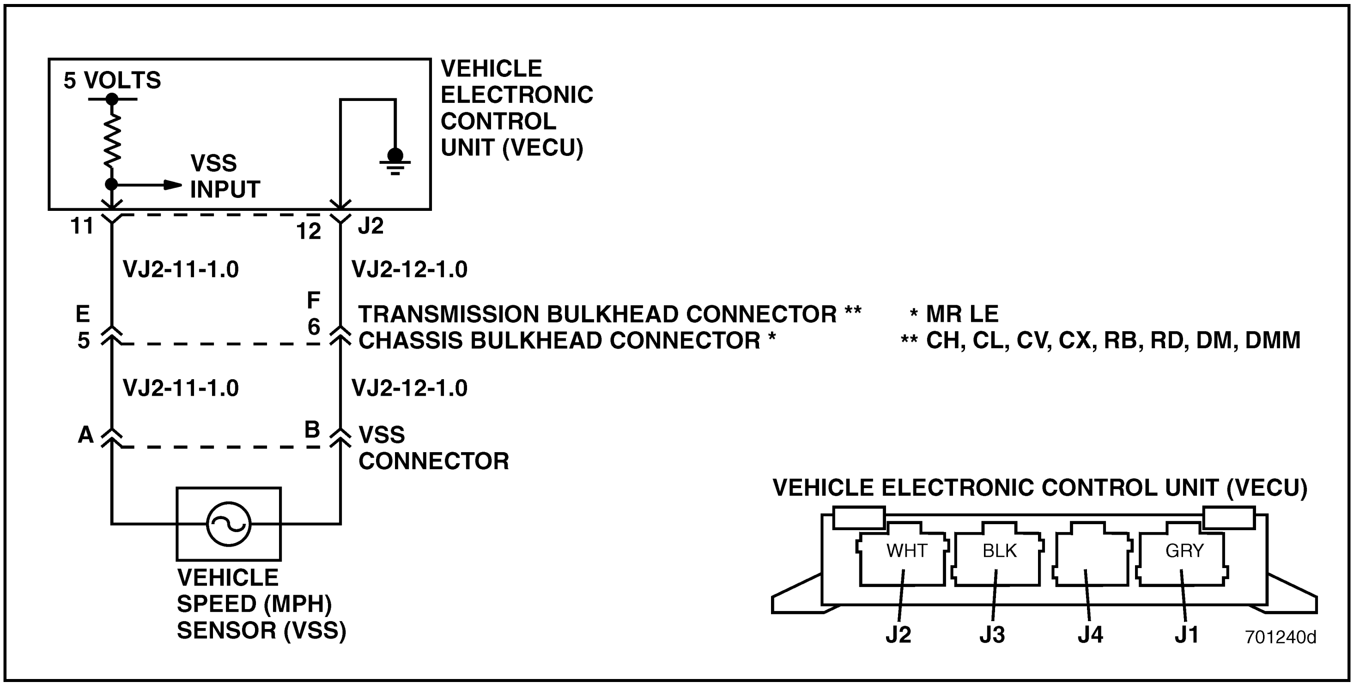


Figure 437 — Vehicle Speed (MPH) Sensor (VSS) Circuit

Failure Mode Identifier (FMI): 2 (Data Invalid), 3 (Voltage High), 4 (Voltage Low), 5 (Open), 8 (Abnormal Frequency), 11 (Mode Not Identifiable)

Parameter Identification (PID): P84

Message Identification (MID): 142

Circuit Description: The Vehicle Speed (MPH) Sensor (VSS) is an inductive sensor. When the vehicle is moving, the transmission output shaft speedometer gear teeth rotate past the VSS tip and a pulsed signal voltage is generated. The Vehicle Electronic Control Unit monitors the frequency of the signal generated by the VSS, to calculate the vehicle speed. The air gap between the sensor and the toothed gear influences the VSS signal output and should be checked if erratic or inaccurate speedometer readings are reported.

Location: The Vehicle Speed (MPH) Sensor (VSS) is located in the rear of transmission, near the output shaft.

Additional Symptoms: The reduced power option may be enabled.

Normal VSS Parameters:

Transmission	Resistance at 75°F (23.9°C)
Mack T200/T300-Series with Sensor #64MT413M	252 to 308 ohms
Mack T200/T300-Series with Sensor #64MT435M	238 to 292 ohms
Mack T200/T300-Series with Sensor #64MT424M	146 to 180 ohms
Mack T200/T300-Series with Sensor #64MT439M	146 to 180 ohms
Allison HD	270 to 330 ohms
Allison HT	2900 to 3400 ohms

NOTE

Diagnostic code 4-1 may be logged if the Engine Load Threshold is set too low in the Vehicle Parameters area of the Vehicle Electronic Control Unit (VECU).

Test 1 — Checking for Code 4-1

1. Verify that code 4-1 is set.

   If code 4-1 is set, go to test “Test 2 — Checking Code 4-1 Failure Mode Identifier (FMI)” on page 335.

   If code 4-1 is not set, the code is intermittent. Wiggle the wires and connectors to try to set the code. Visually inspect the Vehicle Speed (MPH) Sensor (VSS) connector and wires for poor connections.

Test 2 — Checking Code 4-1 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4, go to test “Test 4 — Checking for a Short to Ground” on page 335.

   If the FMI is 3 or 5, go to test “Test 5 — Checking for an Open Sensor” on page 335.

   If the FMI is 2, 8, or 11 check the type of transmission. If the transmission is a MACK T200-Series or T300-Series, the sensor can be adjusted by installing the sensor by hand until it bottoms and then backing the sensor out exactly 1 turn. Torque the jam nut to 15 lb-ft (20 N·m). If the sensor is adjusted properly and the fault is still active, move the vehicle a short distance. If the fault is still active, replace the sensor and retest.

   The VSS on Allison HT and older Allison HD transmissions is not adjustable. If the vehicle has an Allison HT or older Allison HD transmission, check the resistance of the sensor, and if the resistance is out of range, replace the sensor and retest the system.

   If the FMI is 2, and the chassis is equipped with an Allison HD transmission WITHOUT a VSS, proceed to the blink code 6-8 diagnostic test.

Test 4 — Checking for a Short to Ground

1. Turn the ignition key ON.
2. Disconnect the Vehicle Speed (MPH) Sensor (VSS) connector.

   If the FMI changes from 4 to 5, go to test “Test 8 — Checking for a Short in the Sensor” on page 336.

   If the FMI did NOT change to 5, go to test “Test 9 — Checking for Continuity Between the VSS Signal and Return Lines” on page 336.

Test 5 — Checking for an Open Sensor

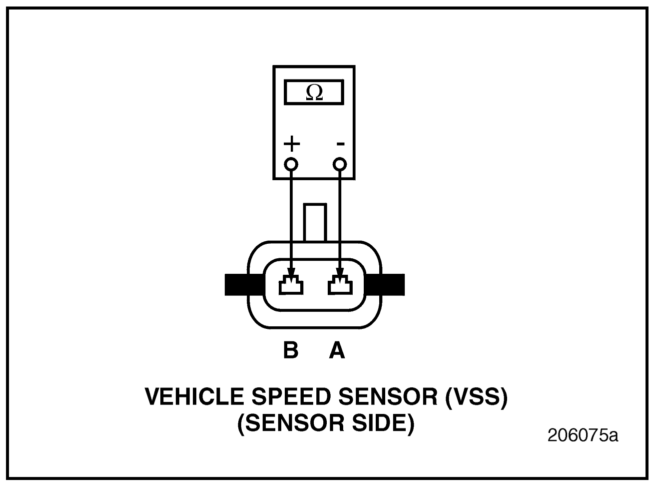


Figure 438

1. Turn the ignition key OFF.
2. Disconnect the Vehicle Speed (MPH) Sensor (VSS) connector.

3. Measure the resistance across the terminals on the sensor side of the connector (see Figure 438). Compare the measurement to the range given for the appropriate transmission.

Transmission	Resistance at 75°F (23.9°C)
Mack T200/T300-Series with Sensor #64MT413M	252 to 308 ohms
Mack T200/T300-Series with Sensor #64MT435M	238 to 292 ohms
Mack T200/T300-Series with Sensor #64MT424M	146 to 180 ohms
Mack T200/T300-Series with Sensor #64MT439M	146 to 180 ohms
Allison HD	270 to 330 ohms
Allison HT	2900 to 3400 ohms

If the resistance is within the given range, proceed to test 10.

If the resistance is NOT within the correct range, inspect the VSS connector for damage. If no damage is evident, replace the VSS.

Test 8 — Checking for a Short in the Sensor

1. Visually inspect the VSS for a pin to pin short in the harness connector or a short to ground.

   If there is a repairable condition, repair the circuit and retest the system.

   If there is NOT a repairable condition, replace the VSS and retest the system.

Test 9 — Checking for Continuity Between the VSS Signal and Return Lines

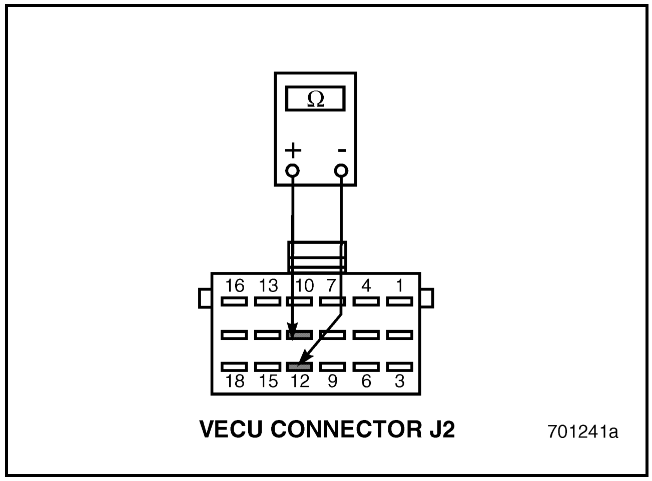


Figure 439

1. Turn the ignition key OFF.
2. Disconnect the VSS connector.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
4. Check for continuity between VECU connector J2 pins 11 and 12 (see Figure 439).

   If continuity exists, go to test “Test 18 — Isolating the Short Circuit” on page 337.

   If there is NO continuity, go to test “Test 19 — Checking for a Short to Ground in the Harness” on page 337.

Test 10 — Checking for an Open VSS Circuit

If the active fault has an FMI of 3 (Shorted High), go to test “Test 20 — Checking the Voltage on the VSS Signal Line” on page 338.

If the active fault has an FMI of 5 (Open), go to test “Test 21 — Checking for Continuity in the Harness” on page 338.

Test 18 — Isolating the Short Circuit

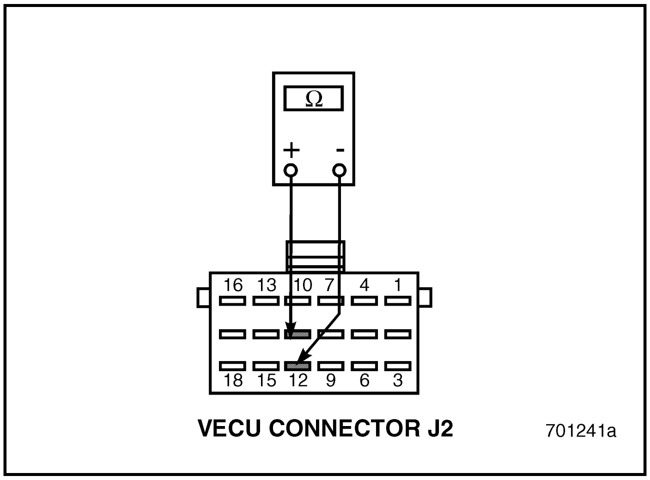


Figure 440

1. Turn the ignition key OFF.
2. Disconnect VECU connector J2.
3. Disconnect the VSS connector.
4. Disconnect the bulkhead connector (see Figure 437).
5. Check for continuity between VECU connector J2 pins 11 and 12 (see Figure 440).

   If continuity exists, the short circuit is located in the cab harness between the bulkhead connector and the VECU.

   If there is NO continuity, the short circuit is located in the engine main harness between the bulkhead connector and the VSS. Locate and repair the short circuit.

Test 19 — Checking for a Short to Ground in the Harness

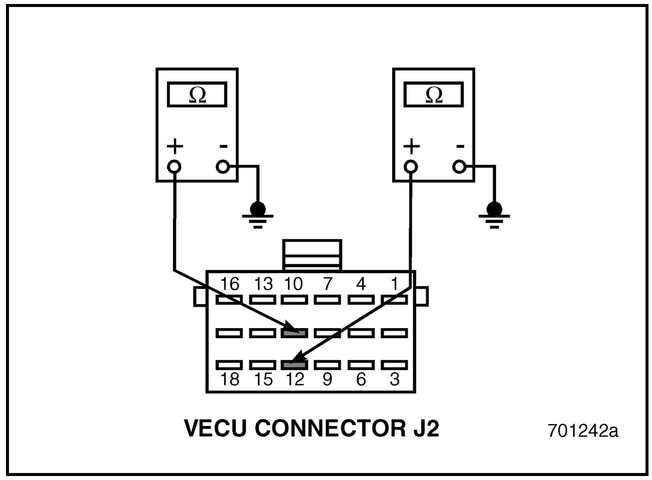


Figure 441

1. Turn the ignition key OFF.
2. Disconnect the VSS connector.
3. Disconnect VECU connector J2.
4. Check for continuity between VECU connector J2 pin 11 and a good ground and between J2 pin 12 and a good ground (see Figure 441).

   If continuity exists between either pin and ground, go to test “Test 38 — Isolating the Short Circuit” on page 339.

   If there is NO continuity, go to test “Test 39 — Checking for a Pin to Pin Short in the Harness” on page 339.

Test 20 — Checking the Voltage on the VSS Signal Line

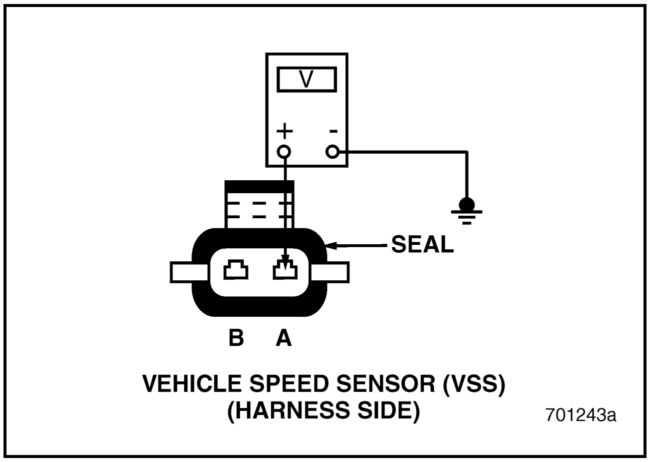


Figure 442

1. Disconnect the VSS connector.
2. Turn the ignition key ON.
3. Measure the voltage between the harness side of VSS connector pin A and a good ground (see Figure 442).

   If the measured voltage is less than 5 volts, go to test “Test 40 — Checking for a Short Circuit to Voltage in the VSS Return Line” on page 340.

   If the measured voltage is greater than 5 volts, go to test “Test 41 — Checking for a Short Circuit to Voltage in the VSS Signal Line” on page 340.

Test 21 — Checking for Continuity in the Harness

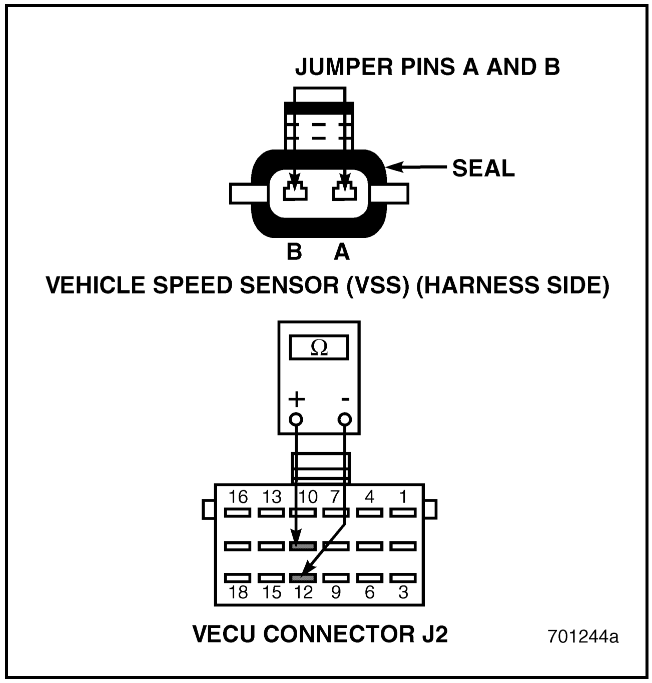


Figure 443

1. Turn the ignition key OFF.
2. Disconnect VECU connector J2.
3. Disconnect the VSS connector.
4. Connect a jumper between pins A and B on the harness side of the VSS connector.
5. Check for continuity between VECU connector J2 pin 11 and J2 pin 12 (see Figure 443).

   If continuity exists, go to test “Test 42 — Checking the Sensor Connection Through the Harness” on page 341.

   If there is NO continuity, proceed to test 43.

Test 38 — Isolating the Short Circuit

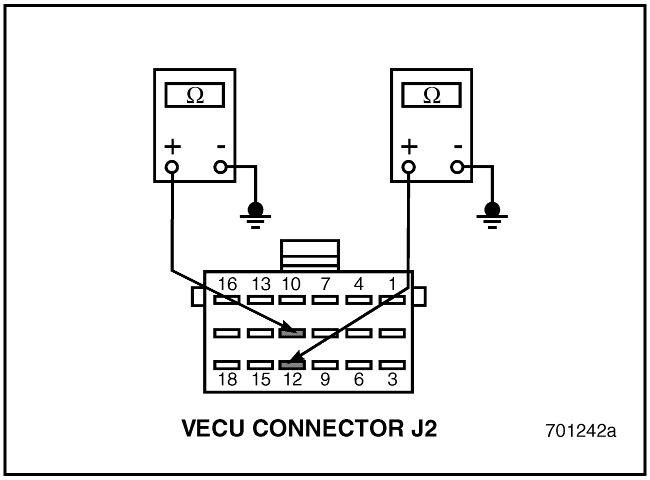


Figure 444

1. Turn the ignition key OFF.
2. Disconnect VECU connector J2.
3. Disconnect the VSS connector.
4. Disconnect the bulkhead connector (see Figure 437).
5. Check for continuity between the circuit (connector J2 pin 11 or 12) that showed continuity in Test 19 and a good ground (see Figure 444).

   If continuity exists, the short circuit is located in the cab harness between the bulkhead connector and the VECU.

   If there is NO continuity, the short circuit is located in the engine main harness between the bulkhead connector and the VSS. Locate and repair the short circuit.

Test 39 — Checking for a Pin to Pin Short in the Harness

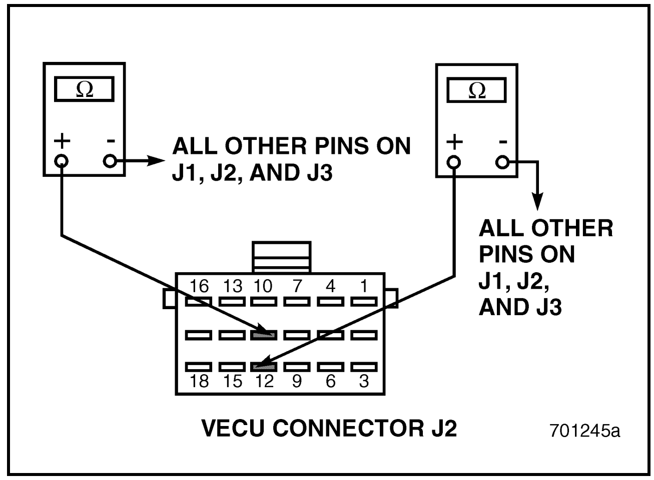


Figure 445

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Disconnect the VSS connector.
4. Check for continuity between VECU connector J2 pins 11 and 12 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 445).

   If continuity exists, go to test “Test 78 — Isolating the Short Circuit” on page 342.

   If there is NO continuity, go to test “Test 79 — Checking for a Faulty VECU Connector” on page 342.

Test 40 — Checking for a Short Circuit to Voltage in the VSS Return Line

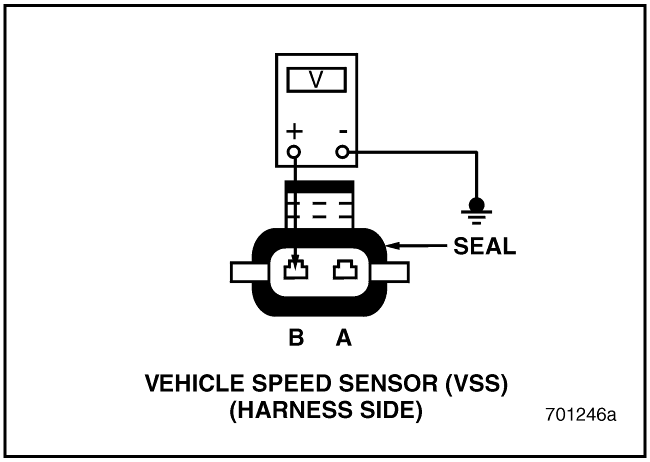


Figure 446

1. Disconnect the VSS connector.
2. Turn the ignition key ON.
3. Measure the voltage between the harness side of VSS connector, pin B, and a good ground (see Figure 446).

   If the measured voltage is less than 0.5 volts, go to test “Test 80 — Checking for a Faulty VECU Connector” on page 342.

   If the measured voltage is greater than 0.5 volts, go to test “Test 81 — Checking for Voltage on the VSS Return Line” on page 343.

Test 41 — Checking for a Short Circuit to Voltage in the VSS Signal Line

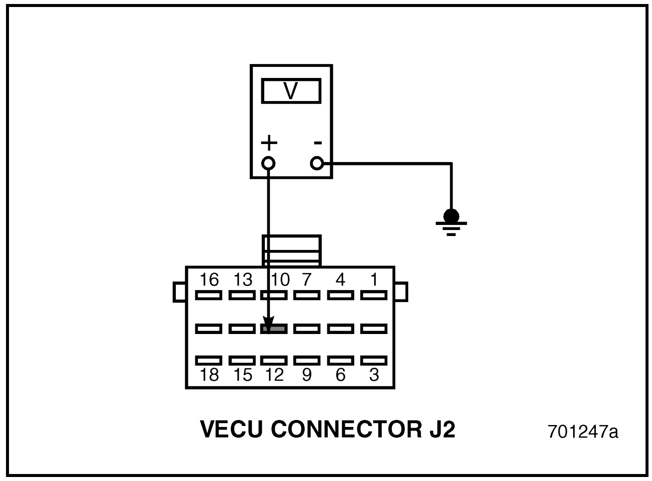


Figure 447

1. Turn the ignition key OFF.
2. Disconnect the VSS connector.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J2 and J3.
4. Connect the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between VECU connector J2 pin 11 and a good ground (see Figure 447).

   If the measured voltage is greater than 0 volts, go to test “Test 82 — Checking for a Short to Voltage” on page 343.

   If NO voltage is present, proceed to test 83.

Test 42 — Checking the Sensor Connection Through the Harness

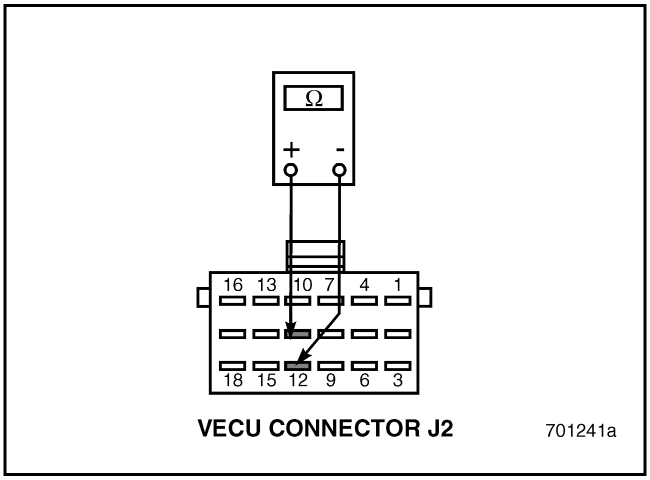


Figure 448

1. Turn the ignition key OFF.
2. Disconnect VECU connector J2.
3. Remove the jumper from the VSS harness connector.
4. Reconnect the VSS harness connector.
5. Measure the resistance between VECU connector J2 pin 11 and J2 pin 12 (see Figure 448).

   If the resistance is within the range given in test 5, go to test "Test 84 — Checking VECU Connector J2 for an Open Circuit" on page 344.

   If the resistance is not within the range given in test 5, check the VSS connector for dirt, loose or broken pins or other repairable damage. If damage is not repairable, replace the VSS and the VSS harness connector.

Test 43 — Checking for an Open in the VSS Signal Line

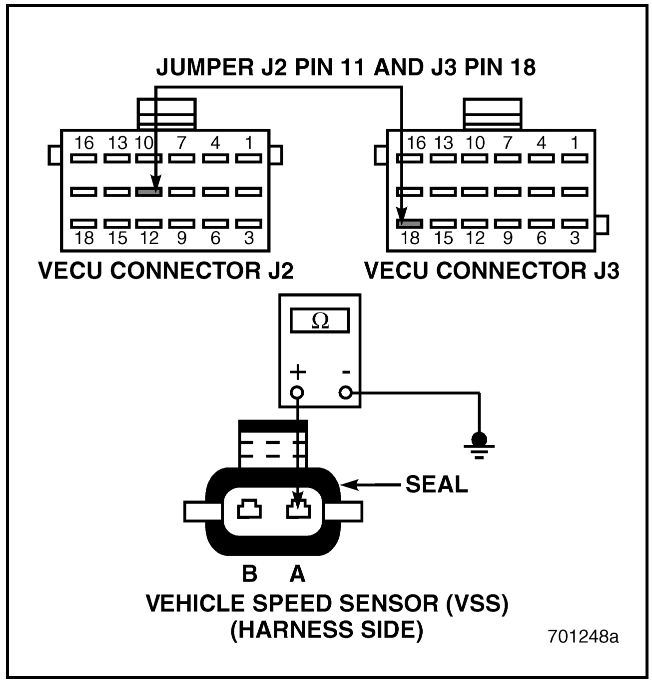


Figure 449

1. Turn the ignition key OFF.
2. Remove the jumper from the VSS connector.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect a jumper between VECU connectors J2 pin 11 and J3 pin 18.
5. On the harness side of the VSS connector, check for continuity between pin A and a good ground (see Figure 449).

   If continuity exists, there is an open circuit in the VSS return line. Locate and repair the open circuit.

   If there is NO continuity, select another chassis ground, and recheck. If there is still NO continuity, repair the open circuit in the VSS signal line.

Test 78 — Isolating the Short Circuit

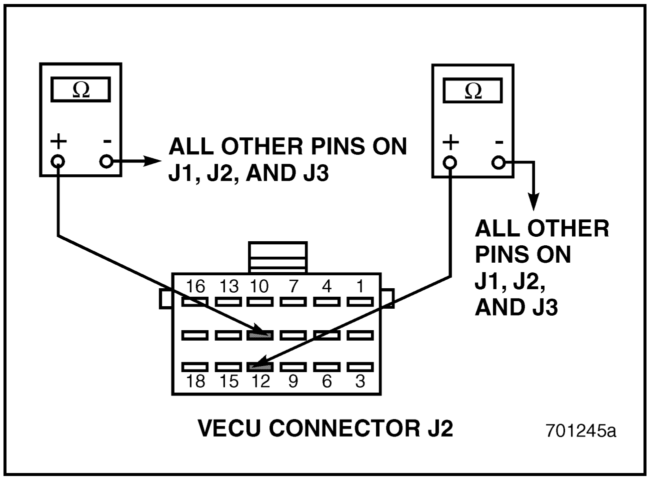


Figure 450

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Disconnect the VSS connector.
4. Disconnect the bulkhead connector (see Figure 437).
5. Check for continuity in the circuit that showed continuity (connector J2 pin 11 or 12) in Test 39 (see Figure 450).

   If continuity exists, the short circuit is located in the cab harness between the bulkhead connector and the VECU.

   If there is NO continuity, the short is located in the engine main harness between the bulkhead connector and the VSS. Locate and repair the short circuit.

Test 79 — Checking for a Faulty VECU Connector

1. Turn the ignition key OFF.
2. Connect the VSS harness connector.
3. Connect connectors J1, J2 and J3 to the VECU.
4. Turn the ignition key ON.

   If blink code 4-1 is still active, check the VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 4-1 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 80 — Checking for a Faulty VECU Connector

1. Turn the ignition key OFF.
2. Connect the VSS harness connector.
3. Turn the ignition key ON.

   If blink code 4-1 is still active, check the VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 4-1 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 81 — Checking for Voltage on the VSS Return Line

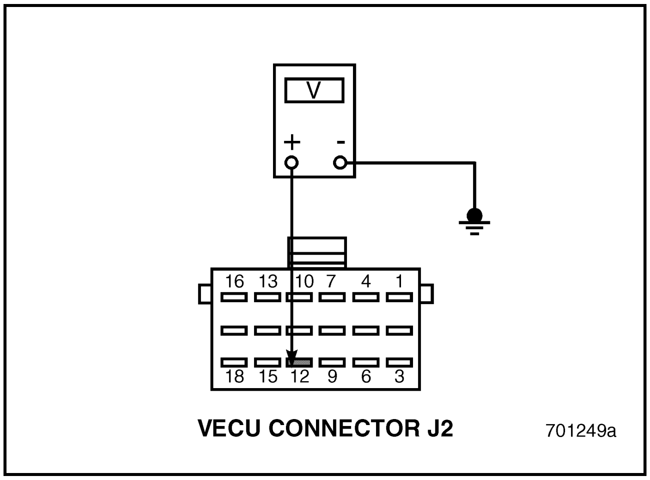


Figure 451

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J2 and J3.
3. Connect the Serial Link Jumper into the Serial Communications Port.
4. Measure the voltage between VECU connector J2 pin 12 and a good ground (see Figure 451).

   If the measured voltage is less than 0.5 volts, go to test "Test 162 — Checking for a Faulty VECU Connector" on page 344.

   If the measured voltage is greater than 0.5 volts, there is a short to voltage on the VSS return line. Locate and repair the short circuit.

Test 82 — Checking for a Short to Voltage

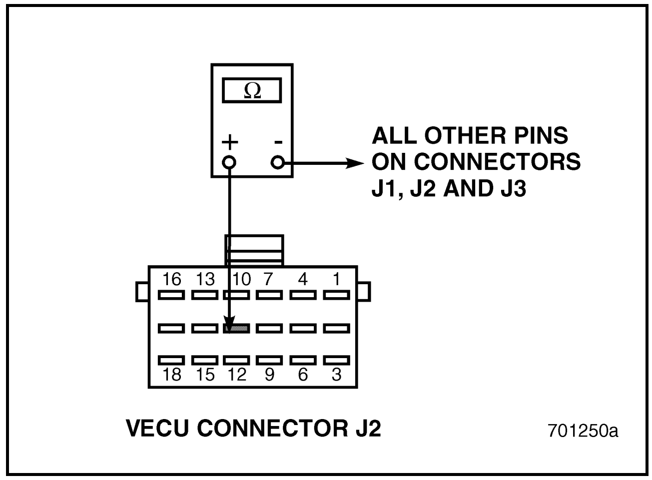


Figure 452

1. Remove the Serial Link Jumper from the Serial Communications Port.
2. Disconnect the VSS harness connector.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J2 pin 11 and all the other pins on VECU connectors J1, J2 and J3 (see Figure 452).

   If continuity exists between pin 11 and any other pin, pin 11 is shorted to one of the other VECU circuits. Locate and repair the short circuit to voltage.

   If there is NO continuity between pin 11 and any other pin, the short circuit to voltage is somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 83 — Checking for a Faulty VECU Connector

1. Remove the serial link jumper from the serial communications port.
2. Connect the VSS harness connector.
3. Connect connectors J1, J2 and J3 to the VECU.
4. Turn the ignition key ON.

   If blink code 4-1 is still active, check the VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 4-1 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 84 — Checking VECU Connector J2 for an Open Circuit

1. Visually inspect VECU connector J2 pins 11 and 12 for dirt, loose pins or deformed contacts.
2. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J2 pins 11 and 12. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or either of the terminals feel loose, repair VECU harness connector J2.

   If the test lead is making good contact with VECU connector J2 terminals 11 and 12, go to test “Test 168 — Checking for a Faulty VECU” on page 344.

Test 162 — Checking for a Faulty VECU Connector

1. Remove the serial link jumper from the serial communications port.
2. Connect the VSS harness connector.
3. Connect connectors J1, J2 and J3 to the VECU.
4. Turn the ignition key ON.

   If blink code 4-1 is still active, check the VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 4-1 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 168 — Checking for a Faulty VECU

1. Connect the VSS harness connector.
2. Connect connectors J1, J2 and J3 to the VECU.
3. Turn the ignition key ON.

   If blink code 4-1 is still active, replace the VECU and retest the system.

   If blink code 4-1 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 4-2 — FAN CLUTCH OUTPUT (ASET™ IEGR ENGINE)

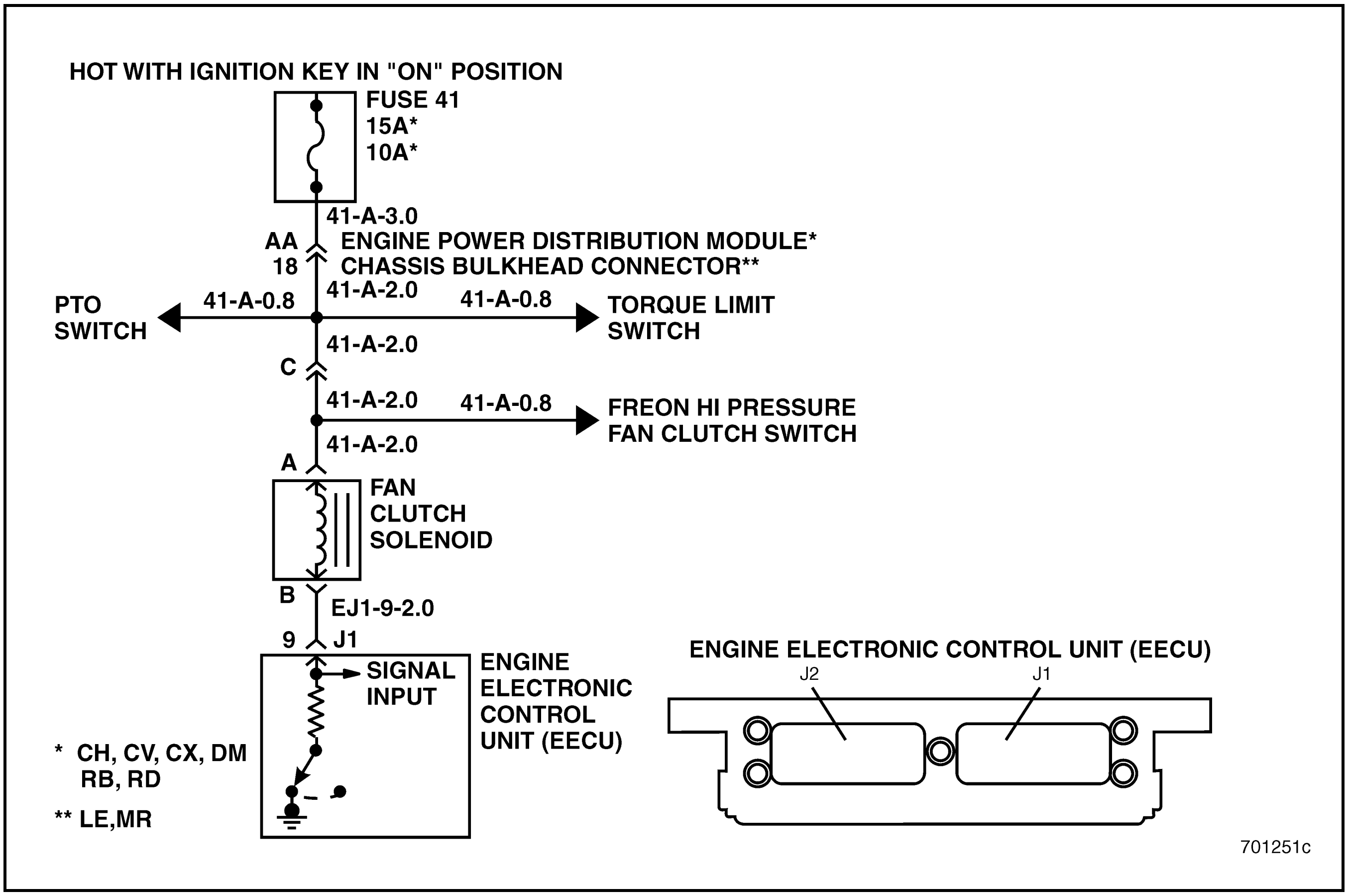


Figure 453 — Fan Clutch Output Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic/Incorrect), 3 (Voltage High/Shorted High), 4 (Voltage Low/Shorted Low) or 5 (Open)

Parameter Identification (PID): S33

Message Identification (MID): 128

Circuit Description: The Fan Clutch controls fan operation and is a pneumatically operated device. Air pressure to the Fan Clutch is controlled by the Fan Clutch Solenoid; and the solenoid valve is controlled by the Engine Electronic Control Unit (EECU). When the EECU determines fan operation is needed, based on coolant temperature, intake air temperature or A/C load, the EECU will de-energize the Fan Clutch Solenoid allowing the fan clutch to engage.

Location: The Fan Clutch Solenoid is located on the lower left side of the radiator shroud.

Code Setting Conditions: When the Engine Electronic Control Unit (EECU) has requested the Fan Clutch OFF, and has detected less than 0.5 volts for more than 1 second at EECU terminal EJ1-9, the Electronic Malfunction Lamp (EML) will turn on and code 4-2 will set with an FMI of 2, 4 or 5 depending on the software version. Some versions will log FMI 3 if the fan drive is requested to be ON and the EECU detects high current.

Additional Symptoms: Higher than normal coolant temperatures, lower than normal coolant temperatures, and poor air conditioning performance may be experienced.

NOTE

Code 4-2 is not a 'latching' fault. If a fault is detected in one state (the Fan Clutch is ON or OFF) it will become inactive when the EECU attempts to change the fan's engagement status. Multiple occurrences of the same fault are probable.

NOTE

If a customer complains that the fan clutch does not disengage and code 4-2 has not been logged in the EECU, the problem may be due to a mechanical failure in the chassis air system.

NOTE

The Customer Data Section of the Engine Electronic Control Unit (EECU) can be programmed to disable blink code 4-2.

DANGER

The fan can engage without warning. Hands, arms and personal items can easily be entangled in the belts or fan blades. Keep arms, hair, clothing, jewelry, etc. clear from the fan and belts when the engine is running.

Test 1 — Checking for Code 4-2

1. Verify that code 4-2 is set.

   If code 4-2 is set, go to test "Test 2 — Checking for a 12 Volt Supply to the Solenoid" on page 346.

   If code 4-2 is not set, wiggle the harness and connectors to try to set the code. Visually inspect the Fan Clutch Solenoid harness connector and wires for frayed or loose connections.

Test 2 — Checking for a 12 Volt Supply to the Solenoid

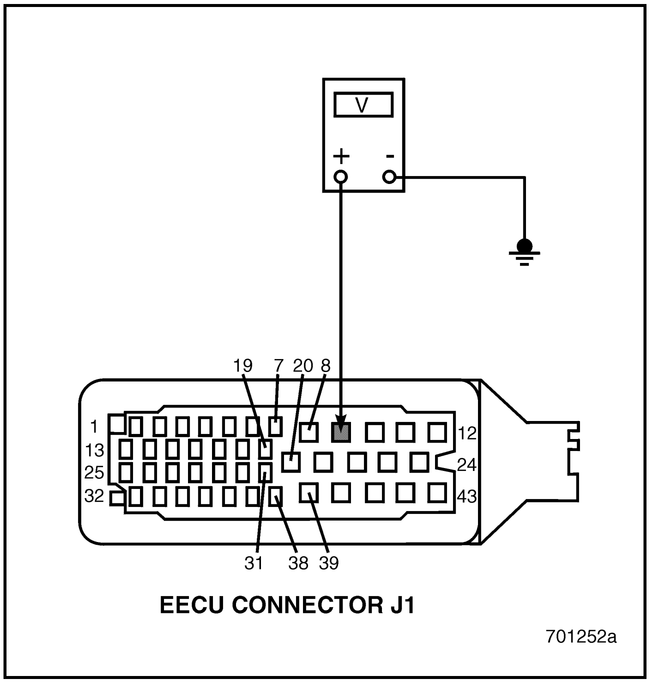


Figure 454

1. Turn the ignition key OFF.
2. Disconnect connector J1 from the EECU.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pin 9 and a good ground (see Figure 454).

   If the measured voltage is less than 12 volts, go to test "Test 4 — Checking for 12 Volts to the Fan Clutch Solenoid" on page 347.

   If the measured voltage is equal to 12 volts, go to test "Test 5 — Checking for a Faulty EECU Connector" on page 347.

Test 4 — Checking for 12 Volts to the Fan Clutch Solenoid

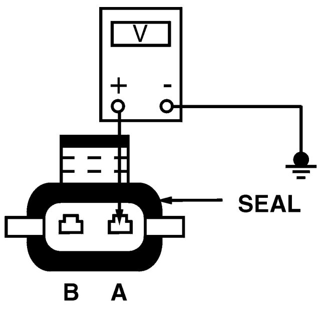


Figure 455

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid connector.
3. Turn the ignition key ON.
4. Measure the voltage between pin A of the Fan Clutch Solenoid harness connector and a good ground (see Figure 455).

   If 12 volts are present, go to test “Test 8 — Checking for an Open Solenoid” on page 347.

   If 12 volts are not present, then there is an open or short to ground in the circuit to the solenoid. Locate and repair the open or short circuit to ground.

Test 5 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect EECU connector J1 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J1 pin 9. Gently push the test lead into pin 9 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the test lead is making good contact with the connector terminal, go to test “Test 10 — Checking the Engine Electronic Control Unit (EECU)” on page 347.

Test 8 — Checking for an Open Solenoid

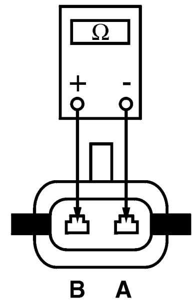


Figure 456

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid.
3. Check for continuity between the terminals of the Fan Clutch Solenoid (see Figure 456).

   If continuity exists, go to test “Test 16 — Checking for an Open Control Line” on page 348.

   If there is NO continuity, replace the solenoid and retest the system.

Test 10 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Turn the ignition key ON.

   If blink code 4-2 is still active, replace the EECU and retest the system.

   If blink code 4-2 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 16 — Checking for an Open Control Line

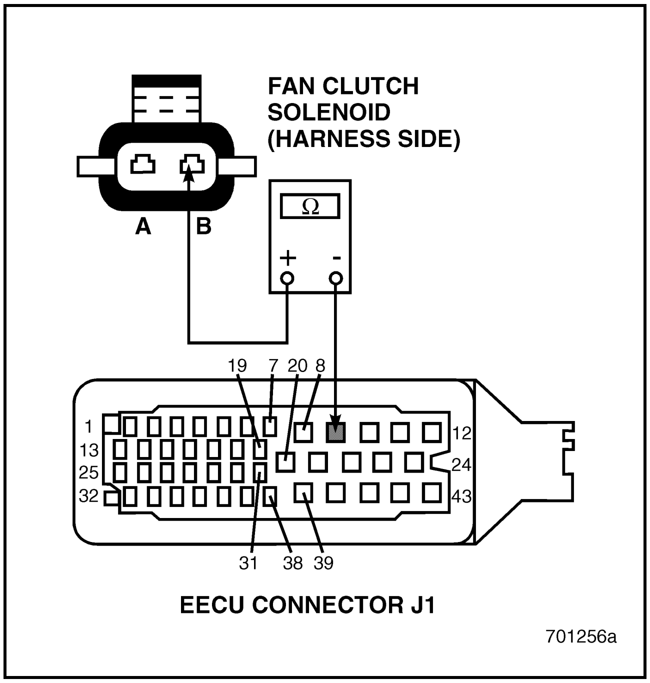


Figure 457

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid connector.
3. Disconnect EECU connector J1.
4. Check for continuity between pin B of the Fan Clutch Solenoid harness connector and EECU connector J1 pin 9 (see Figure 457).

   If continuity exists, go to test “Test 32 — Checking for a Pin to Pin Short in the Harness” on page 348.

   If there is NO continuity, locate and repair the open circuit.

Test 32 — Checking for a Pin to Pin Short in the Harness

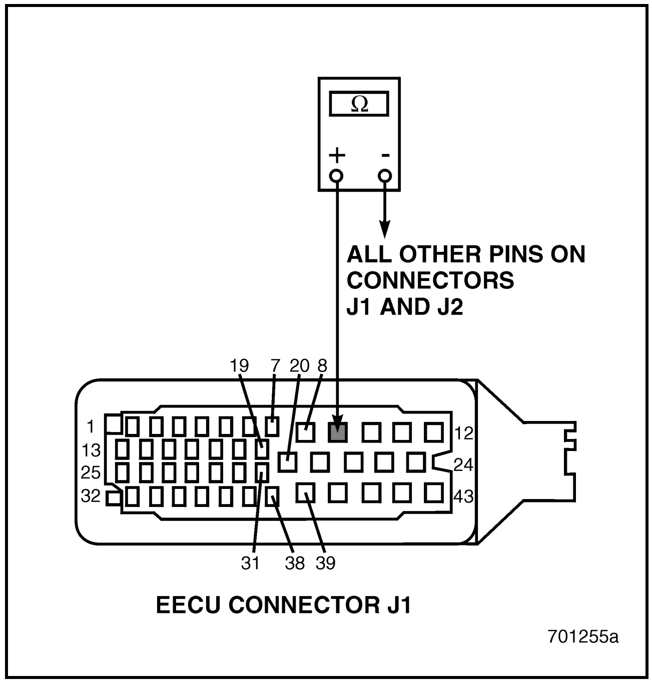


Figure 458

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid connector.
3. Disconnect EECU connectors J1 and J2.
4. Check for continuity between EECU connector J1 pin 9 and all other pins on connectors J1 and J2 (see Figure 458).

   If there is NO continuity, go to test “Test 64 — Checking for a Short Circuit to Ground” on page 349.

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 64 — Checking for a Short Circuit to Ground

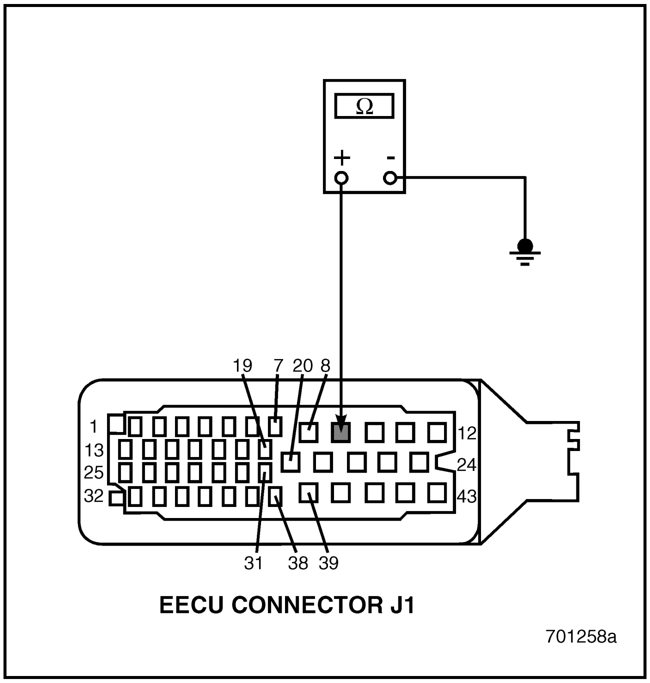


Figure 459

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid connector.
3. Disconnect EECU connector J1.
4. Check for continuity between EECU connector J1 pin 9 and a good ground (see Figure 459).

   If there is NO continuity, go to test “Test 128 — Checking for a Damaged EECU Connector” on page 349.

   If continuity exists to ground, locate and repair the short circuit to ground.

Test 128 — Checking for a Damaged EECU Connector

1. Connect the Fan Clutch Solenoid connector.
2. Connect EECU connectors J1 and J2.
3. Turn the ignition key ON.

   If blink code 4-2 is still active, check the EECU module and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the EECU and retest the system.

   If blink code 4-2 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 4-2 — FAN CLUTCH OUTPUT (ASET™ CEGR ENGINE)

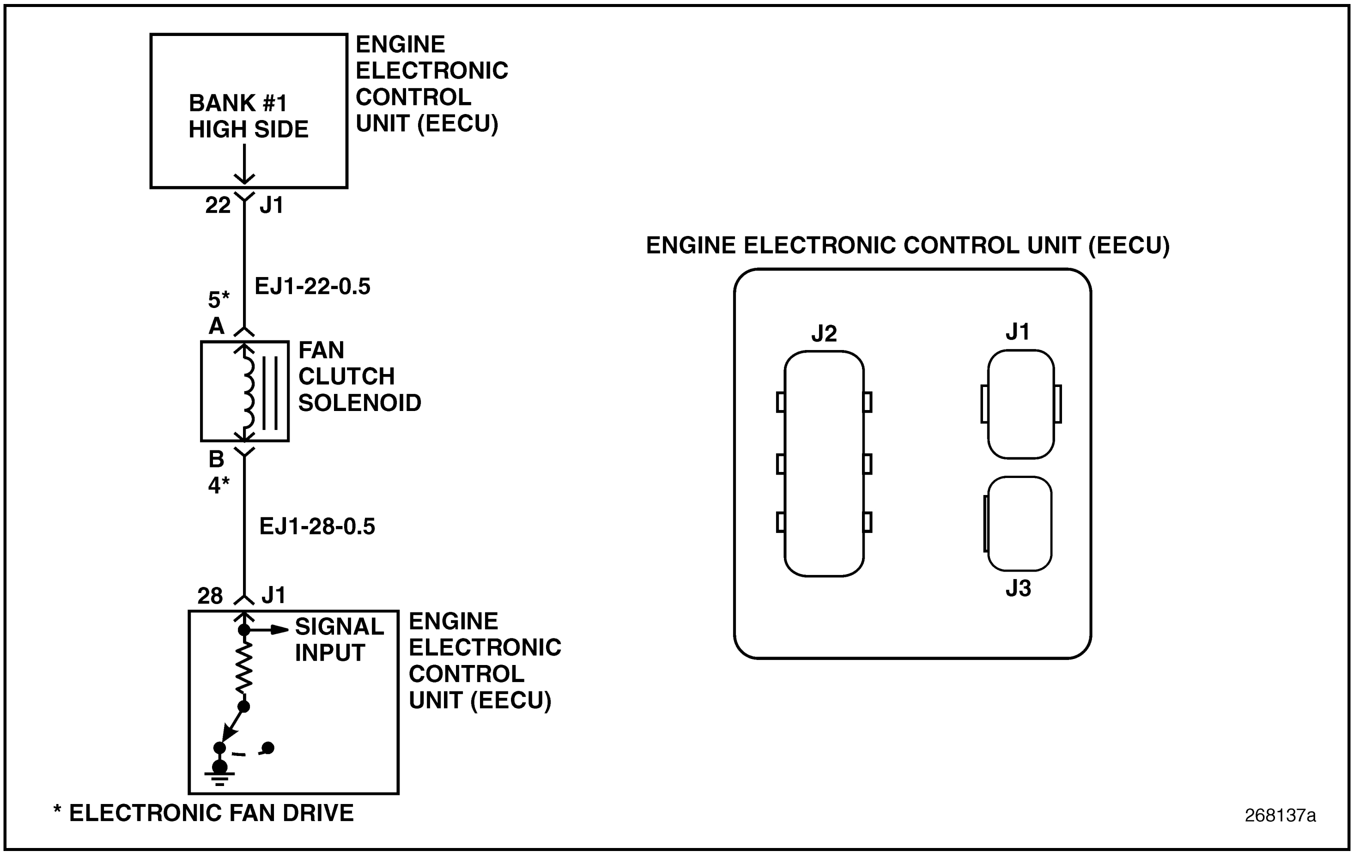


Figure 460 — Fan Clutch Output Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic/Incorrect), 3 (Voltage High/Shorted High), 4 (Voltage Low/Shorted Low) or 5 (Open)

Parameter Identification (PID): S33

Message Identification (MID): 128

Circuit Description (On/Off Fan): The Fan Clutch controls fan operation and is a pneumatically operated device. Air pressure to the Fan Clutch is controlled by the Fan Clutch Solenoid; and the solenoid valve is controlled by the Engine Electronic Control Unit (EECU). When the EECU determines fan operation is needed, based on coolant temperature, intake air temperature or A/C load, the EECU will de-energize the Fan Clutch Solenoid allowing the fan clutch to engage.

Circuit Description (Electronic Viscous Fan): The Electronic Fan Drive contains a solenoid that controls the flow of fluid between reservoirs in the fan drive housing and cover. The EECU provides power to the solenoid and controls solenoid operation to optimize fan speed, based on coolant temperature, intake air temperature and A/C load.

Location: The On/Off Fan Clutch Solenoid is located on the lower left side of the radiator shroud. The Electronic Fan Drive is bolted to the drive pulley on the front of the engine.

Code Setting Conditions: When the Engine Electronic Control Unit (EECU) has requested the fan to disengage, and has detected less than 0.5 volts for more than 1 second at EECU terminal EJ1-28, the Electronic Malfunction Lamp (EML) will turn on and code 4-2 will set with an FMI of 2, 4 or 5 depending on the software version. Some versions will log FMI 3 if the fan drive is requested to be ON and the EECU detects high current.

NOTE

If code 4-2 sets with FMI 4, there may also be an active code 6-7 with FMI 4. If this is the case, follow the diagnostic procedures for code 6-7 first, then check to make sure code 4-2 is no longer active.

Additional Symptoms: Higher than normal coolant temperatures, lower than normal coolant temperatures, and poor air conditioning performance may be experienced.

NOTE

Code 4-2 is not a 'latching' fault. If a fault is detected in one state (the Fan Clutch is ON or OFF) it will become inactive when the EECU attempts to change the fan's engagement status. Multiple occurrences of the same fault are probable.

NOTE

If a customer complains that the fan clutch does not disengage and code 4-2 has not been logged in the EECU, the problem may be due to a mechanical failure in the chassis air system.

NOTE

The Customer Data Section of the Engine Electronic Control Unit (EECU) can be programmed to disable blink code 4-2.

⚠ DANGER

The fan can engage without warning. Hands, arms and personal items can easily be entangled in the belts or fan blades. Keep arms, hair, clothing, jewelry, etc. clear from the fan and belts when the engine is running.

Test 1 — Checking for Code 4-2

1. Verify that code 4-2 is set.

   If code 4-2 is set, go to test "Test 2 — Checking for a 12 Volt Supply to the Solenoid" on page 351.

   If code 4-2 is not set, wiggle the harness and connectors to try to set the code. Visually inspect the Fan Clutch Solenoid harness connector and wires for frayed or loose connections.

Test 2 — Checking for a 12 Volt Supply to the Solenoid

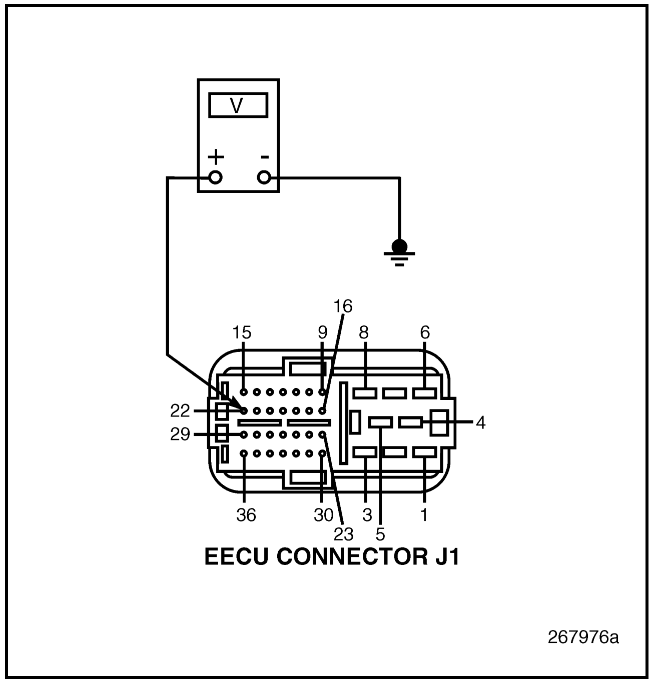


Figure 461

1. Turn the ignition key OFF.
2. Disconnect connector J1 from the EECU.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pin 22 and a good ground (see Figure 461).

   If the measured voltage is less than 12 volts, go to test "Test 4 — Checking for 12 Volts to the Fan Clutch Solenoid" on page 352.

   If the measured voltage is equal to 12 volts, go to test "Test 5 — Checking for a Faulty EECU Connector" on page 352.

Test 4 — Checking for 12 Volts to the Fan Clutch Solenoid

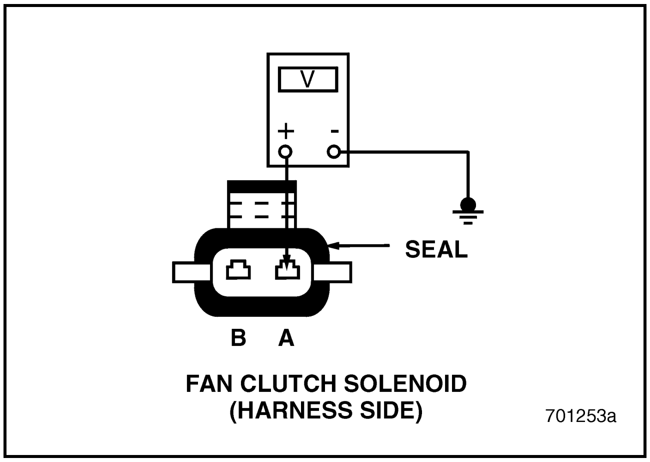


Figure 462

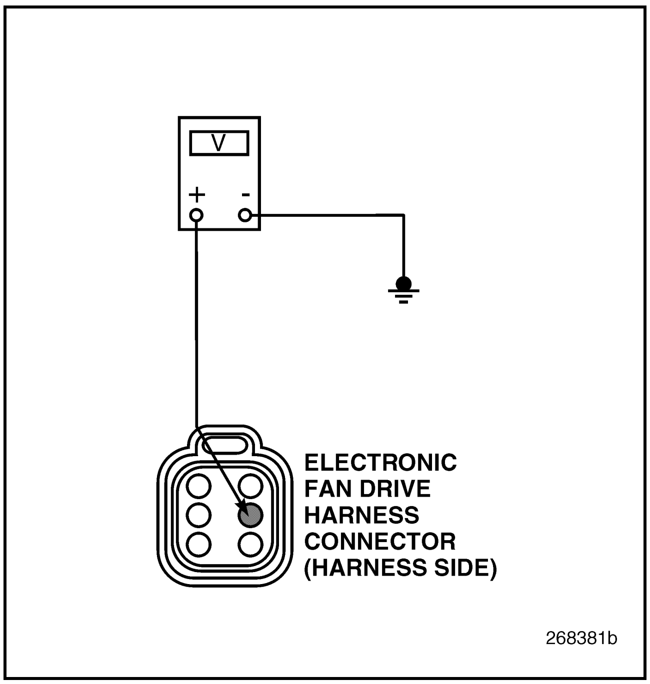


Figure 463

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid or Electronic Fan Drive connector.
3. Turn the ignition key ON.
4. If the vehicle is equipped with an on/off fan clutch, measure the voltage between pin A of the Fan Clutch Solenoid harness connector and a good ground (see Figure 462).

   If the vehicle is equipped with an electronic fan drive, measure the voltage between pin 5 of the Electronic Fan Drive harness connector and a good ground (see Figure 463).

   If 12 volts are present, go to test “Test 8 — Checking for an Open Solenoid” on page 353.

   If 12 volts are not present, then there is an open or short to ground in the circuit to the solenoid. Locate and repair the open or short circuit to ground.

Test 5 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect EECU connector J1 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J1 pin 28. Gently push the test lead into pin 28 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the test lead is making good contact with the connector terminal, go to test “Test 10 — Checking the Engine Electronic Control Unit (EECU)” on page 353.

Test 8 — Checking for an Open Solenoid

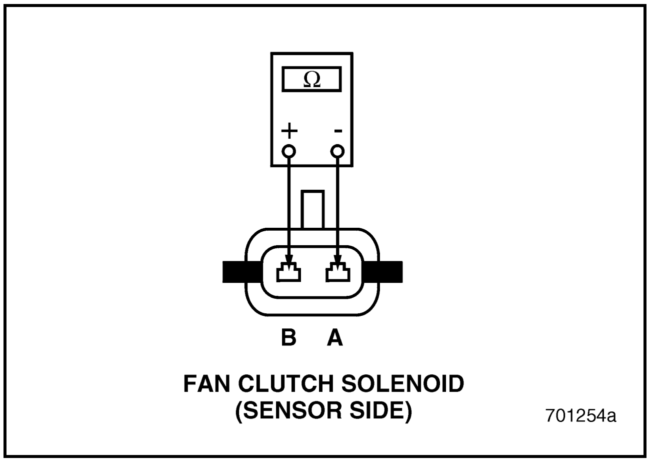


Figure 464

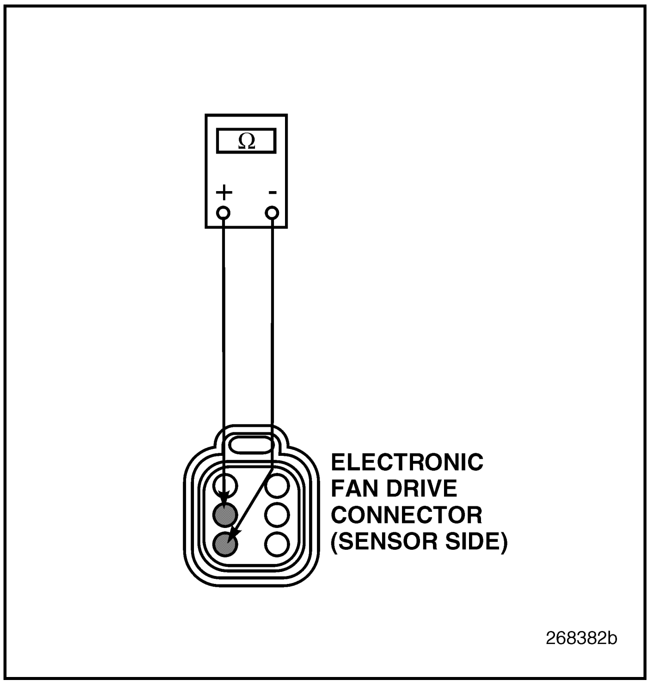


Figure 465

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid or Electronic Fan Drive connector.
3. If the vehicle is equipped with an on/off fan clutch, check for continuity between the terminals of the Fan Clutch Solenoid (see Figure 464).

   If the vehicle is equipped with an electronic fan drive, check for continuity between Electronic Fan Drive connector pins 4 and 5 (see Figure 465).

   If continuity exists, go to test “Test 16 — Checking for an Open Control Line” on page 354.

   If there is NO continuity, replace the solenoid or fan drive and retest the system.

Test 10 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Turn the ignition key ON.

   If blink code 4-2 is still active, replace the EECU and retest the system.

   If blink code 4-2 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 16 — Checking for an Open Control Line

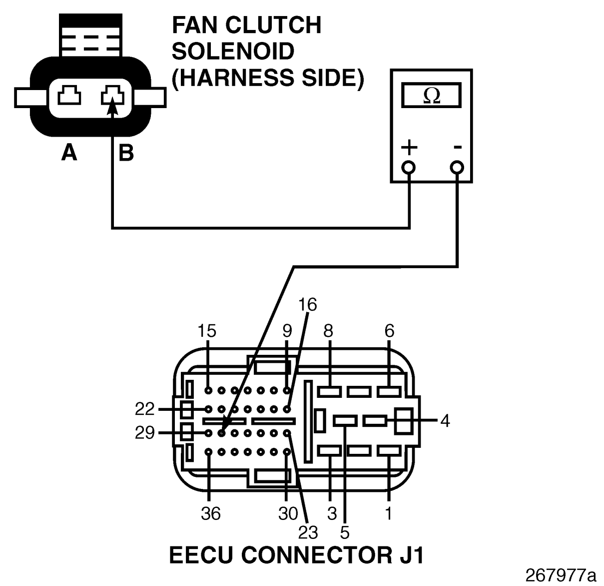


Figure 466

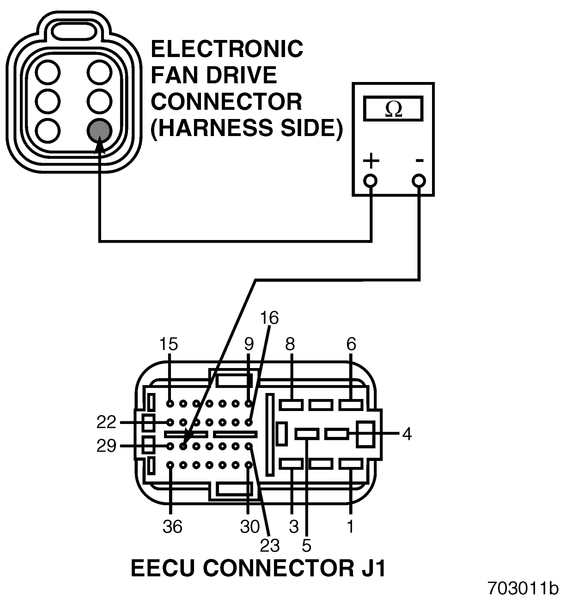


Figure 467

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid or Electronic Fan Drive connector.
3. Disconnect EECU connector J1.
4. If the vehicle is equipped with an on/off fan clutch, check for continuity between pin B of the Fan Clutch Solenoid harness connector and EECU connector J1 pin 28 (see Figure 466).

   If the vehicle is equipped with an electronic fan drive, check for continuity between pin 4 of the Electronic Fan Drive harness connector and EECU connector J1 pin 28 (see Figure 467).

   If continuity exists, go to test “Test 32 — Checking for a Pin to Pin Short in the Harness” on page 355.

   If there is NO continuity, locate and repair the open circuit.

Test 32 — Checking for a Pin to Pin Short in the Harness

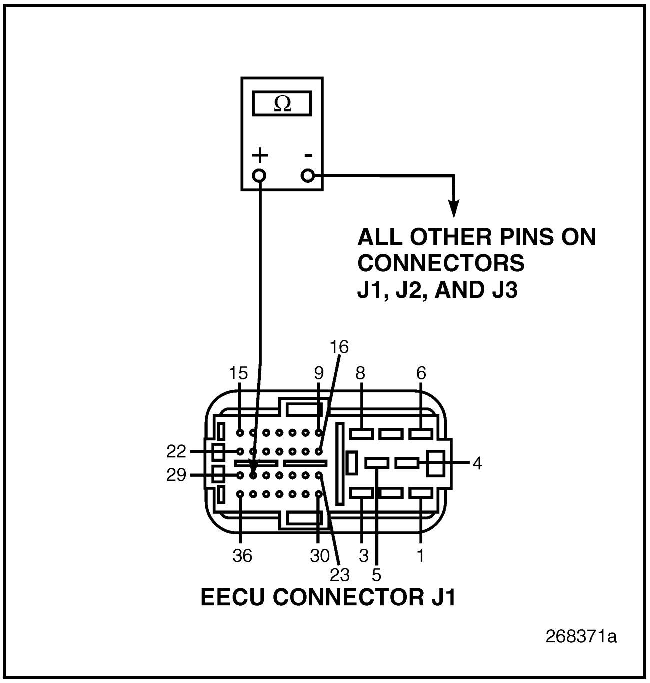


Figure 468

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid or Electronic Fan Drive connector.
3. Disconnect EECU connectors J1, J2, and J3.
4. Check for continuity between EECU connector J1 pin 28 and all other pins on connectors J1, J2, and J3 (see Figure 468).

   If there is NO continuity, go to test “Test 64 — Checking for a Short Circuit to Ground” on page 355.

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 64 — Checking for a Short Circuit to Ground

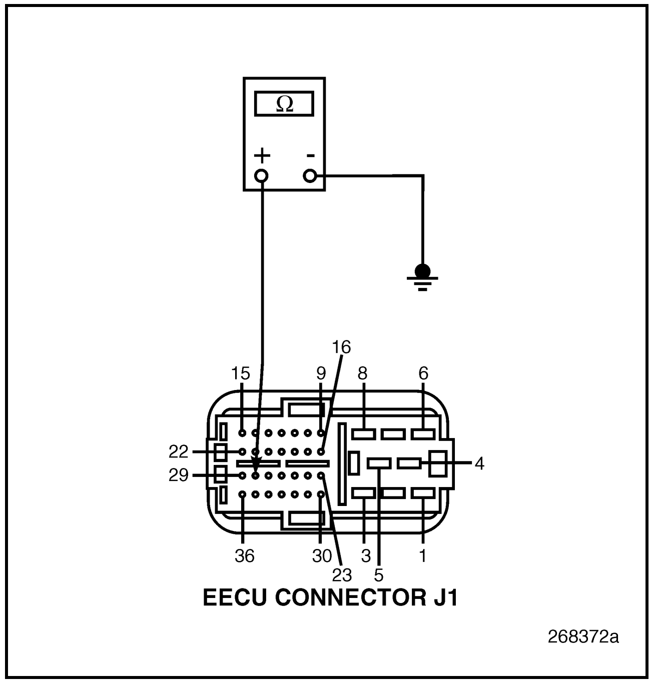


Figure 469

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid or Electronic Fan Drive connector.
3. Disconnect EECU connector J1.
4. Check for continuity between EECU connector J1 pin 28 and a good ground (see Figure 469).

   If there is NO continuity, go to test “Test 128 — Checking for a Damaged EECU Connector” on page 356.

   If continuity exists to ground, locate and repair the short circuit to ground.

Test 128 — Checking for a Damaged EECU Connector

1. Connect the Fan Clutch Solenoid connector.
2. Connect EECU connectors J1 and J2.
3. Turn the ignition key ON.

   If blink code 4-2 is still active, check the EECU module and connectors J1 and J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the EECU and retest the system.

   If blink code 4-2 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 4-3 — AUXILIARY OUTPUT #1

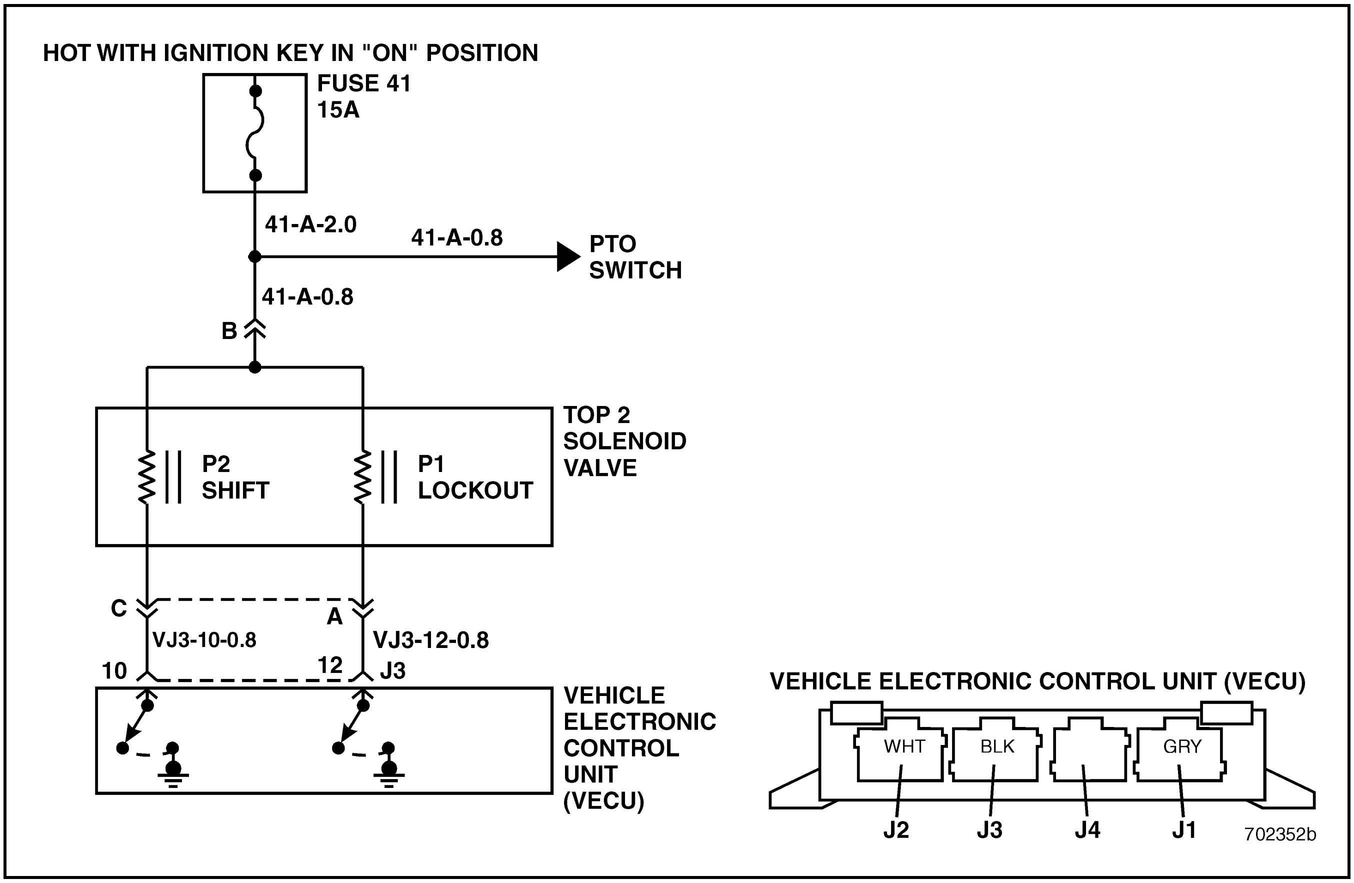


Figure 470 — Solenoid Valve Control Circuit for Eaton Super 10 Top 2 Transmission

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier FMI: 3 (Voltage High), 4 (Voltage Low)

Parameter Identification PID: S10

Message Identification MID: 142

Circuit Description: The Eaton Super 10 Top 2™ transmission uses two electronically controlled air solenoid valves to achieve fully automated 9-10 and 10-9 shifts. The solenoid valves receive a common, switched 12 volt signal from circuit breaker (fuse) 41. The Vehicle Electronic Control Unit (VECU) sinks current from the Lockout and Shift solenoid valves to energize the solenoids and achieve shifting.

Code Setting Conditions: Code 4-3 will set with an FMI of 3 (voltage high), if the Vehicle Electronic Control Unit (VECU) senses voltage greater than 9 volts at VECU connector J3 pin 12 when the VECU is attempting to energize the Lockout solenoid valve. When this situation occurs, the VECU turns the solenoid driver OFF until the key switch is cycled. Code 4-3 will set with an FMI of 4 (voltage low), if the VECU senses that 12 volts is not present at VECU connector J3 pin 12 when the VECU is not attempting to energize the Lockout solenoid valve.

NOTE

Because the Vehicle Electronic Control Unit (VECU) can only detect code 4-3 with FMI 3 while attempting to energize the Lockout solenoid valve, this fault is most likely to be active while driving the vehicle.

Test 1 — Checking for Code 4-3

1. Verify that code 4-3 is set.

   If code 4-3 is set, go to test "Test 2 — Checking Code 4-3 Failure Mode Identifier (FMI)" on page 358.

   If code 4-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Vehicle Electronic Control Unit (VECU) connectors and in-line harness connectors for loose or corroded connections.

Test 2 — Checking Code 4-3 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI code is 4 (voltage low) go to test "Test 4 — Checking for an Intermittent Open or Short to Ground" on page 358.

   If the FMI code is 3 (voltage high) go to test "Test 5 — Checking for a Short Circuit to Voltage" on page 358.

Test 4 — Checking for an Intermittent Open or Short to Ground

1. Turn the ignition key ON.

   If code 4-3 becomes active, go to test "Test 8 — Checking Voltage at the Vehicle Electronic Control Unit (VECU)" on page 359.

   If code 4-3 does NOT become active, the problem is intermittent. Check the connectors at the VECU and Top 2 solenoid valve for secure connections. Road test the vehicle and retest the system.

Test 5 — Checking for a Short Circuit to Voltage

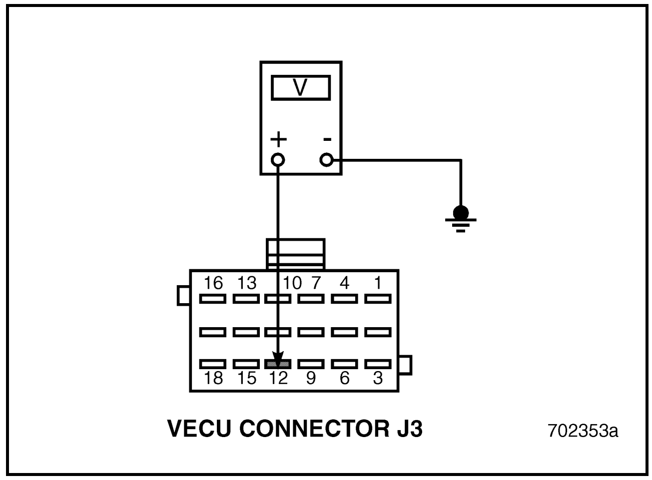


Figure 471

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Disconnect the Top 2 solenoid valve connector.
4. Turn the ignition key ON.
5. Measure the voltage between VECU connector J3, pin 12 and a good ground (see Figure 471).
6. If battery voltage is present, locate and repair the short circuit to voltage between the Top 2 solenoid valve connector and VECU connector J3, pin 12.

   If battery voltage is not present, go to test "Test 10 — Checking for a Short Circuit to Voltage" on page 359.

Test 8 — Checking Voltage at the Vehicle Electronic Control Unit (VECU)

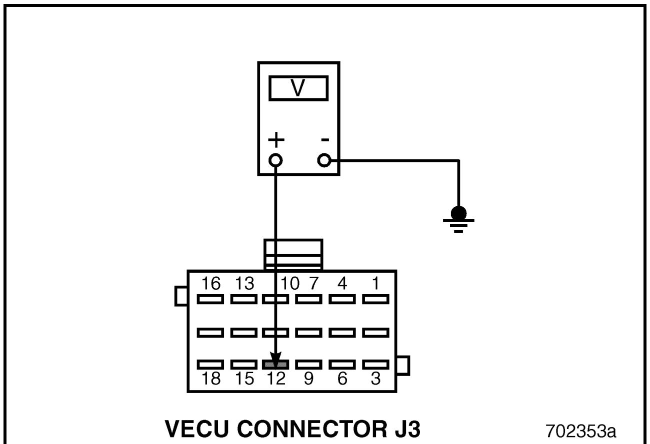


Figure 472

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.
4. Measure the voltage between VECU connector J3 pin 12 and a good ground (see Figure 472).

   If battery voltage is present, go to test “Test 16 — Checking the VECU for a Short Circuit to Ground” on page 359.

   If battery voltage is NOT present, go to test “Test 17 — Checking the Switched Voltage Supply” on page 360.

Test 10 — Checking for a Short Circuit to Voltage

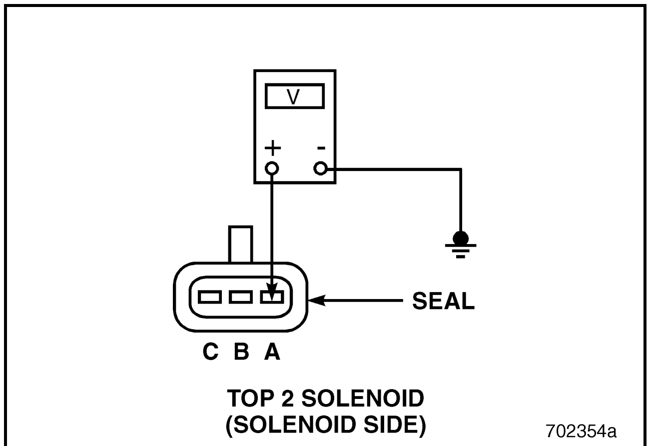


Figure 473

1. Turn the ignition key OFF.
2. Disconnect the Top 2 solenoid valve connector.
3. Turn the ignition key ON.
4. Measure the voltage between pin A of the solenoid side of the Top 2 solenoid valve connector and a good ground (see Figure 473).
5. If battery voltage is present, the solenoid harness is shorted to voltage, replace the Top 2 solenoid valve.

   If battery voltage is not present, go to test “Test 20 — Checking the Top 2 Solenoid for an Internal Short Circuit” on page 360.

Test 16 — Checking the VECU for a Short Circuit to Ground

1. Turn the ignition key OFF.
2. Visually inspect VECU connector J3 for dirt, loose or shorted pins or any other repairable damage.

   If damage is evident, repair the damage and retest the system.

   If no damage is evident or is not repairable, replace the VECU and retest the system.

Test 17 — Checking the Switched Voltage Supply

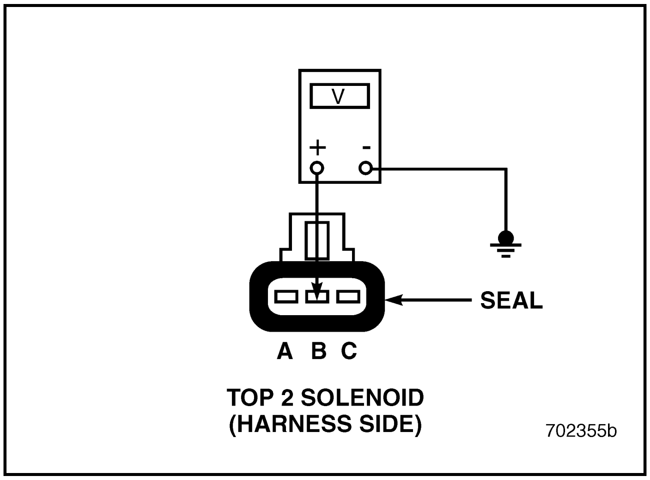


Figure 474

1. Turn the ignition key OFF.
2. Disconnect the Top 2 solenoid valve connector.
3. Turn the ignition key ON.
4. Measure the voltage between pin B on the dash harness side of the connector, and a good ground (see Figure 474).

   If battery voltage is present, go to test "Test 34 — Checking for an Open Top 2 Solenoid" on page 360.

   If battery voltage is NOT present, the problem is in the switched power supply circuit. Check circuit breaker (fuse) 41 and power relay 3 for proper operation.

Test 20 — Checking the Top 2 Solenoid for an Internal Short Circuit

1. Turn the ignition key OFF.
2. Replace the Top 2 solenoid valve.
3. Connect all connectors, road test the vehicle, and retest the system.

   If code 4-3 is no longer present, the Top 2 solenoid valve was shorted internally.

   If code 4-3 is still present, check VECU connector J3 for loose or damaged pins. If the connector is not damaged, replace the VECU, road test the vehicle, and retest the system.

Test 34 — Checking for an Open Top 2 Solenoid

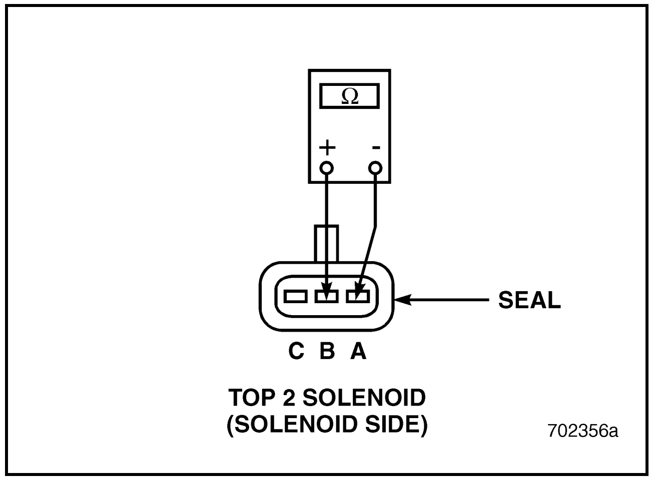


Figure 475

1. Turn the ignition key OFF.
2. Check for continuity between pins A and B on the solenoid side of the Top 2 solenoid valve connector (see Figure 475).

   If continuity exists, go to test "Test 68 — Checking for a Shorted Top 2 Solenoid" on page 361.

   If there is NO continuity, replace the Top 2 solenoid valve.

Test 68 — Checking for a Shorted Top 2 Solenoid

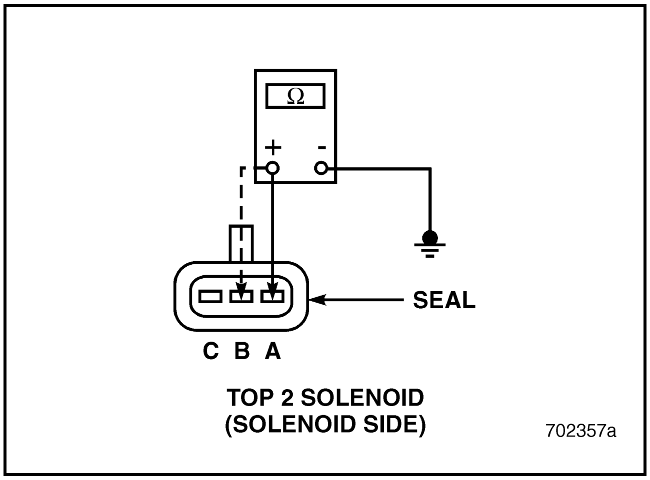


Figure 476

1. Turn the ignition key OFF.
2. Check for continuity between either pin A or B on the solenoid side of the Top 2 solenoid valve connector and a good ground (see Figure 476).

   If continuity exists, replace the Top 2 solenoid valve.

   If there is NO continuity, go to test "Test 136 — Checking for an Open Circuit" on page 361.

Test 136 — Checking for an Open Circuit

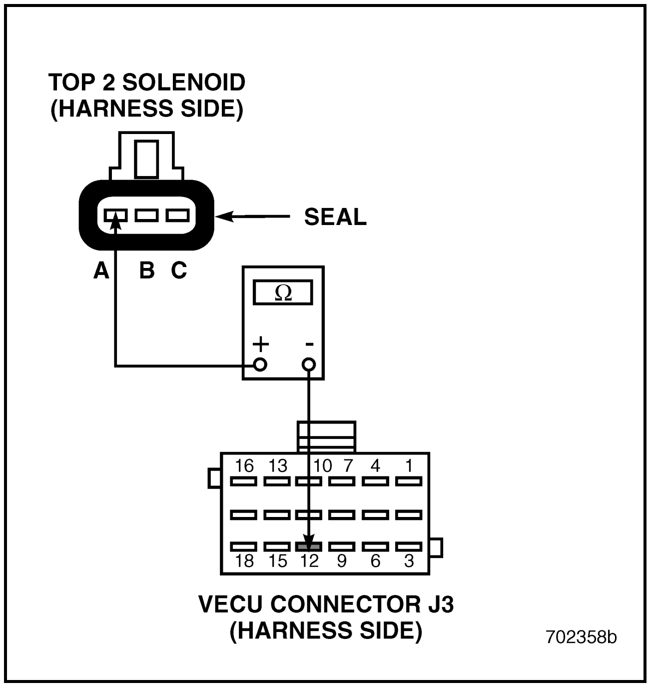


Figure 477

1. Ensure that the ignition key is OFF, VECU connector J3 is disconnected, and the Top 2 solenoid valve connector is disconnected.
2. Check for continuity between pin A on the harness side of the Top 2 solenoid valve connector and VECU connector J3, pin 12 (see Figure 477).

   If continuity exists, go to test "Test 272 — Checking for a Short Circuit to Ground" on page 362.

   If there is NO continuity, locate and repair the open circuit between the Top 2 solenoid valve connector and VECU connector J3.

Test 272 — Checking for a Short Circuit to Ground

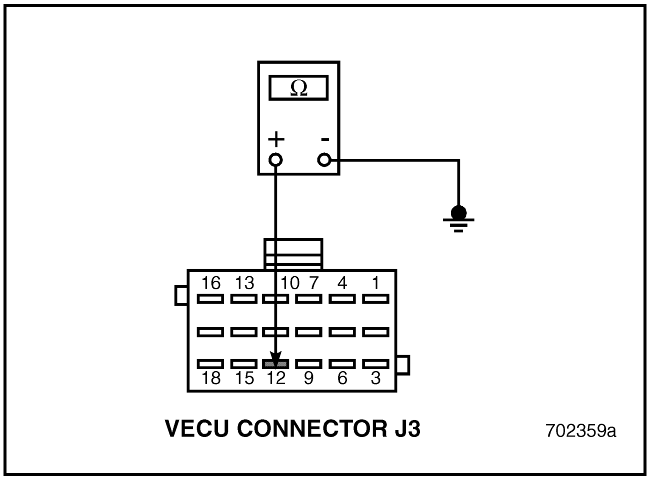


Figure 478

1. Ensure that the ignition key is OFF, VECU connector J3 is disconnected, and the Top 2 solenoid valve connector is disconnected.
2. Check for continuity between VECU connector J3, pin 12 and a good ground (see Figure 478).

   If continuity exists, locate and repair the short circuit between the Top 2 solenoid valve connector and VECU connector J3.

   If there is NO continuity, the diagnostic procedures have corrected the problem. Connect all connectors, road test the vehicle, and retest the system.

BLINK CODE 4-4 — AUXILIARY OUTPUT #2

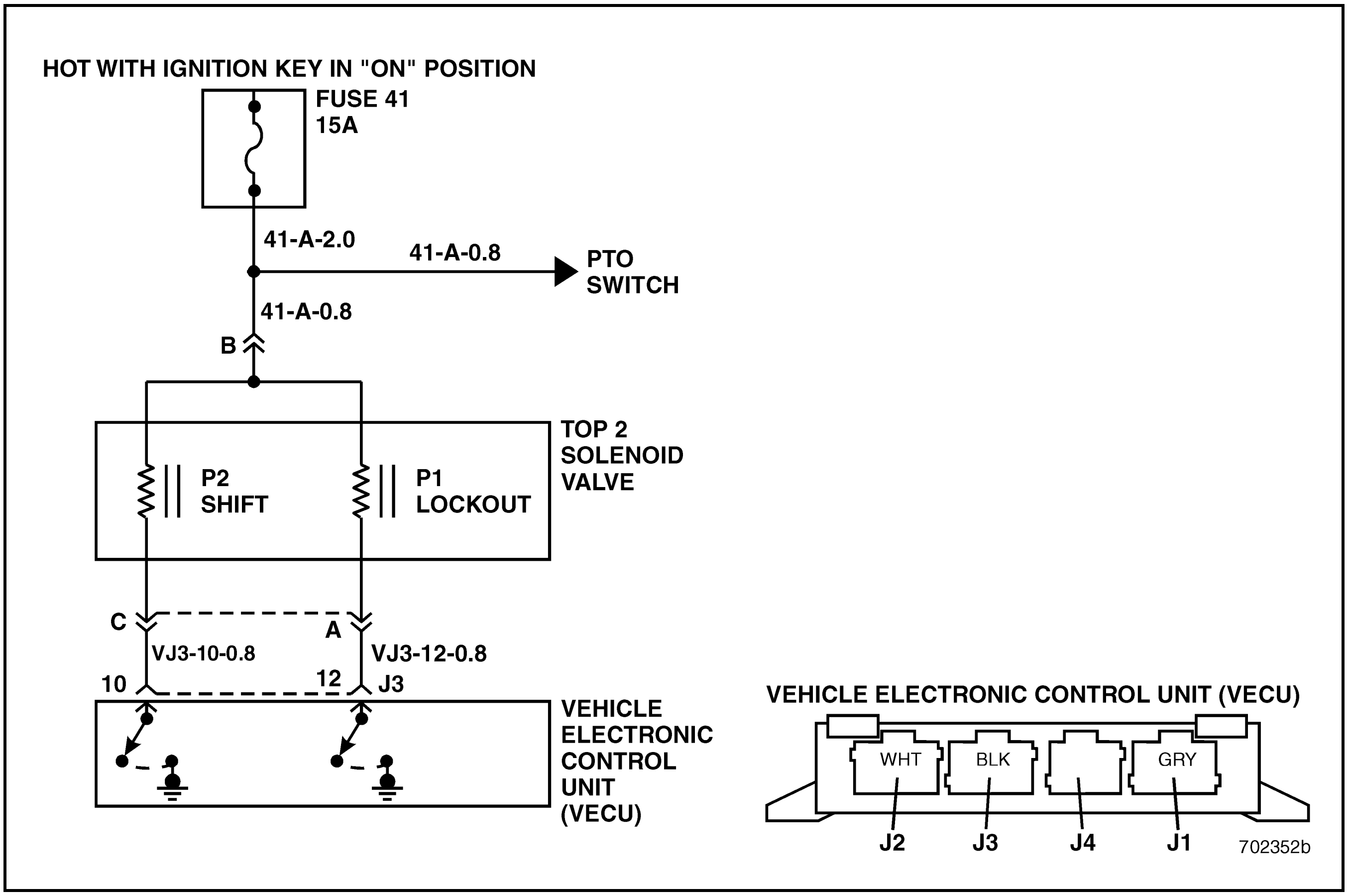


Figure 479 — Solenoid Valve Control Circuit for Eaton Super 10 Top 2 Transmission

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier FMI: 3 (Voltage High), 4 (Voltage Low)

Parameter Identification PID: S11

Message Identification MID: 142

Circuit Description: The Eaton Super 10 Top 2™ transmission uses two electronically controlled air solenoid valves to achieve fully automated 9-10 and 10-9 shifts. The solenoid valves receive a common, switched 12 volt signal from circuit breaker (fuse) 41. The Vehicle Electronic Control Unit (VECU) sinks current from the Lockout and Shift solenoid valves to energize the solenoids and achieve shifting.

Code Setting Conditions: Code 4-4 will set with an FMI of 3 (voltage high), if the Vehicle Electronic Control Unit (VECU) senses voltage greater than 9 volts at VECU connector J3 pin 10 when the VECU is attempting to energize the Shift solenoid valve. When this situation occurs, the VECU turns the solenoid driver OFF until the key switch is cycled. Code 4-4 will set with an FMI of 4 (voltage low), if the VECU senses that 12 volts is not present at VECU connector J3 pin 10 when the VECU is not attempting to energize the Shift solenoid valve.

NOTE

Because the Vehicle Electronic Control Unit (VECU) can only detect code 4-4 with FMI 3 while attempting to energize the Lockout solenoid valve, this fault is most likely to be active while driving the vehicle.

Test 1 — Checking for Code 4-4

1. Verify that code 4-4 is set.

   If code 4-4 is set, go to test "Test 2 — Checking Code 4-4 Failure Mode Identifier (FMI)" on page 364.

   If code 4-4 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Vehicle Electronic Control Unit (VECU) connectors and in-line harness connectors for loose or corroded connections.

Test 2 — Checking Code 4-4 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI code is 4 (voltage low) go to test "Test 4 — Checking for an Intermittent Open or Short to Ground" on page 364.

   If the FMI code is 3 (voltage high) go to test "Test 5 — Checking for a Short Circuit to Voltage" on page 364.

Test 4 — Checking for an Intermittent Open or Short to Ground

1. Turn the ignition key ON.

   If code 4-4 becomes active, go to test "Test 8 — Checking Voltage at the Vehicle Electronic Control Unit (VECU)" on page 365.

   If code 4-4 does NOT become active, the problem is intermittent. Check the connectors at the VECU and Top 2 solenoid valve for secure connections. Road test the vehicle and retest the system.

Test 5 — Checking for a Short Circuit to Voltage

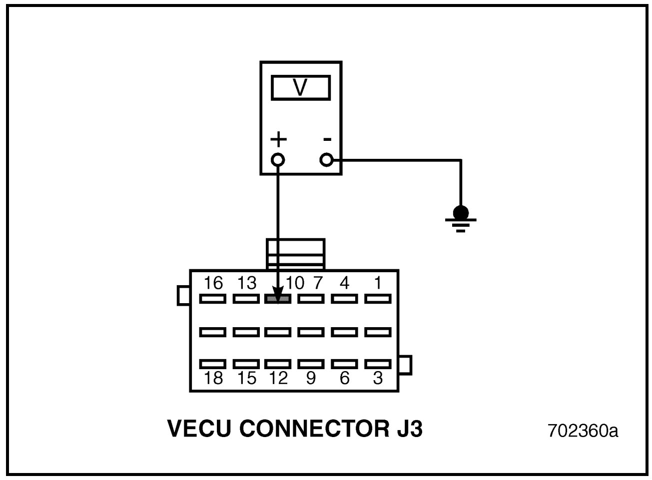


Figure 480

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Disconnect the Top 2 solenoid valve connector.
4. Turn the ignition key ON.
5. Measure the voltage between VECU connector J3, pin 10 and a good ground (see Figure 480).
6. If battery voltage is present, locate and repair the short circuit to voltage between the Top 2 solenoid valve connector and VECU connector J3, pin 10.

   If battery voltage is not present, go to test "Test 10 — Checking for a Short Circuit to Voltage" on page 365.

Test 8 — Checking Voltage at the Vehicle Electronic Control Unit (VECU)

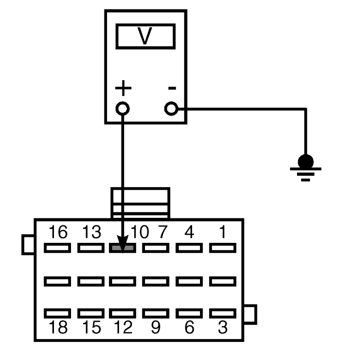


Figure 481

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.
4. Measure the voltage between VECU connector J3 pin 10 and a good ground (see Figure 481).

   If battery voltage is present, go to test “Test 16 — Checking the VECU for a Short Circuit to Ground” on page 365.

   If battery voltage is NOT present, go to test “Test 17 — Checking the Switched Voltage Supply” on page 366.

Test 10 — Checking for a Short Circuit to Voltage

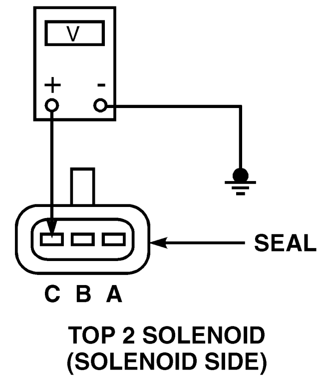


Figure 482

1. Turn the ignition key OFF.
2. Disconnect the Top 2 solenoid valve connector.
3. Turn the ignition key ON.
4. Measure the voltage between pin C of the solenoid side of the Top 2 solenoid valve connector and a good ground (see Figure 482).
5. If battery voltage is present, the solenoid harness is shorted to voltage, replace the Top 2 solenoid valve.

   If battery voltage is not present, go to test “Test 20 — Checking the Top 2 Solenoid for an Internal Short Circuit” on page 366.

Test 16 — Checking the VECU for a Short Circuit to Ground

1. Turn the ignition key OFF.
2. Visually inspect VECU connector J3 for dirt, loose or shorted pins or any other repairable damage.

   If damage is evident, repair the damage and retest the system.

   If no damage is evident or is not repairable, replace the VECU and retest the system.

Test 17 — Checking the Switched Voltage Supply

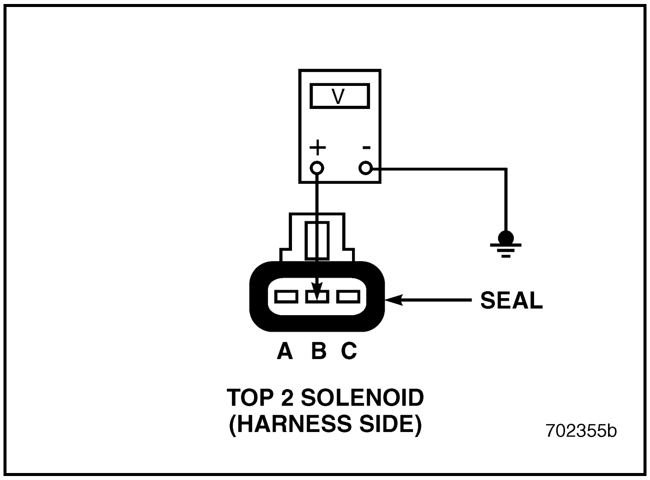


Figure 483

1. Turn the ignition key OFF.
2. Disconnect the Top 2 solenoid valve connector.
3. Turn the ignition key ON.
4. Measure the voltage between pin B on the dash harness side of the connector, and a good ground (see Figure 483).

   If battery voltage is present, go to test “Test 34 — Checking for an Open Top 2 Solenoid” on page 366.

   If battery voltage is NOT present, the problem is in the switched power supply circuit. Check circuit breaker (fuse) 41 and power relay 3 for proper operation.

Test 20 — Checking the Top 2 Solenoid for an Internal Short Circuit

1. Turn the ignition key OFF.
2. Replace the Top 2 solenoid valve.
3. Connect all connectors, road test the vehicle, and retest the system.

   If code 4-4 is no longer present, the Top 2 solenoid valve was shorted internally.

   If code 4-4 is still present, check VECU connector J3 for loose or damaged pins. If the connector is not damaged, replace the VECU, road test the vehicle, and retest the system.

Test 34 — Checking for an Open Top 2 Solenoid

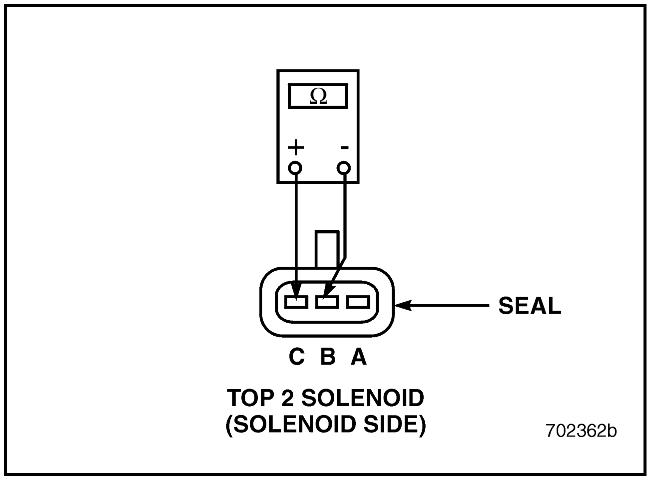


Figure 484

1. Turn the ignition key OFF.
2. Check for continuity between pins B and C on the solenoid side of the Top 2 solenoid valve connector (see Figure 484).

   If continuity exists, go to test “Test 68 — Checking for a Shorted Top 2 Solenoid” on page 367.

   If there is NO continuity, replace the Top 2 solenoid valve.

Test 68 — Checking for a Shorted Top 2 Solenoid

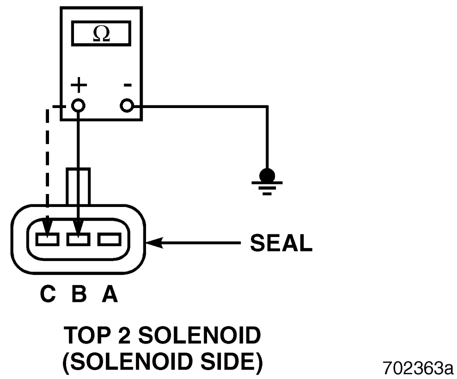


Figure 485

1. Turn the ignition key OFF.
2. Check for continuity between either pin B or C on the solenoid side of the Top 2 solenoid valve connector and a good ground (see Figure 485).

   If continuity exists, replace the Top 2 solenoid valve.

   If there is NO continuity, go to test "Test 136 — Checking for an Open Circuit" on page 367.

Test 136 — Checking for an Open Circuit

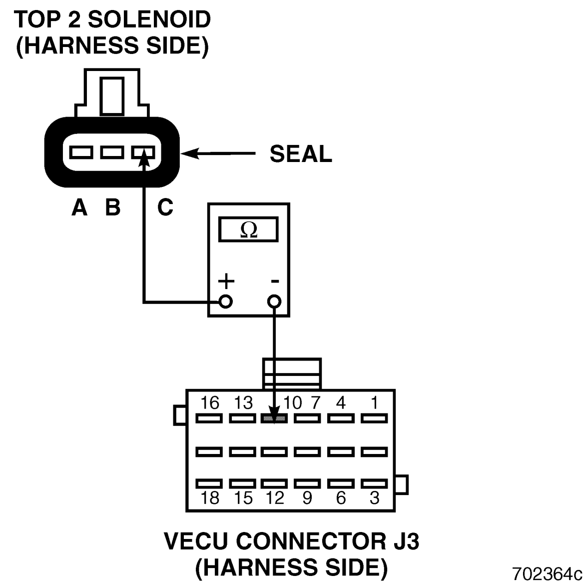


Figure 486

1. Ensure that the ignition key is OFF, VECU connector J3 is disconnected, and the Top 2 solenoid valve connector is disconnected.
2. Check for continuity between pin C on the harness side of the Top 2 solenoid valve connector and VECU connector J3, pin 10 (see Figure 486).

   If continuity exists, go to test "Test 272 — Checking for a Short Circuit to Ground" on page 368.

   If there is NO continuity, locate and repair the open circuit between the Top 2 solenoid valve connector and VECU connector J3.

Test 272 — Checking for a Short Circuit to Ground

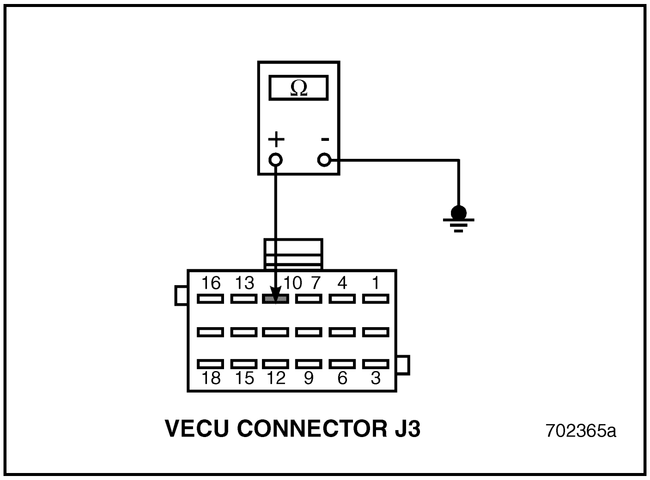


Figure 487

1. Ensure that the ignition key is OFF, VECU connector J3 is disconnected, and the Top 2 solenoid valve connector is disconnected.
2. Check for continuity between VECU connector J3, pin 10 and a good ground (see Figure 487).

   If continuity exists, locate and repair the short circuit between the Top 2 solenoid valve connector and VECU connector J3.

   If there is NO continuity, the diagnostic procedures have corrected the problem. Connect all connectors, road test the vehicle, and retest the system.

BLINK CODE 4-5 — CCRS WASTEGATE OPERATION (ASET™ IEGR ENGINE)

Failure Mode Identifier (FMI): 2 (Data Erratic), 5 (Open), 7 (Mechanical System Not Responding)

Parameter Identification (PID): S32

Message Identification (MID): 128

Circuit Description: CCRS and 460HP step 8 engines use a Wastegate turbocharger to prevent excessive intake manifold pressure. Using the Boost Air Pressure (BAP) Sensor as an input, the Engine Electronic Control Unit (EECU) monitors the intake manifold pressure to ensure the wastegate is regulating intake manifold pressure correctly.

The Wastegate system requires a switched 12 volt supply to Engine Electronic Control Unit (EECU) connector J1 pin 8. This circuit is a splice from EJ2-22-2.0 to a length of 0.8 wire that has an inline 3300 ohm resistor in the EJ1 harness convoluted tubing within 200 mm of connector EJ1. The switched voltage feed is used to drive the logic in the EECU.

Code Setting Conditions: Diagnostic code 4-5 will set in the Engine Electronic Control Unit (EECU) with FMI 2 if the engine speed is greater than 1300 RPM at 85% load or greater and the Boost Air Pressure (BAP) Sensor Signal indicates there is insufficient boost. Diagnostic Code 4-5 will set in the EECU with FMI 5 if the EECU loses the 12 volt input at pin EJ1-8. Diagnostic code 4-5 will set in the EECU with FMI 7 if the engine speed is greater than 1300 RPM at 85% load or greater and the Boost Air Pressure (BAP) Sensor Signal indicates that the wastegate did not open.

NOTE

Any time the Boost Sensor Blink Code 2-2 is logged in the EECU, the Wastegate Output Blink Code 4-5 will also be logged. Always correct the cause of the Boost Sensor Blink Code 2-2 before attempting to diagnose the occurrence of the Wastegate Output Blink Code 4-5.

NOTE

This fault should only be enabled if the vehicle is equipped with a wastegate turbocharger.

Test 1 — Checking for Code 4-5

1. Verify that code 4-5 is set.

   If code 4-5 is set, go to test “Test 2 — Checking Code 4-5 Failure Mode Identifier (FMI)” on page 369.

   If code 4-5 is not set, the code is intermittent. Road test the vehicle, operating at high intake manifold pressures, to attempt to set code 4-5.

Test 2 — Checking Code 4-5 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 5, go to test “Test 4 — Checking for Voltage at Connector EJ1 Pin 8” on page 370.

   If the FMI is 2 there is a mechanical problem in the air induction system that prevents the turbocharger from developing sufficient boost pressure. Inspect the induction system for loose fittings or physical damage that will cause low boost pressure. Inspect the wastegate lever arm and actuator rod for binding and corrosion that could prevent the wastegate from closing.

   If the FMI is 7 there is a mechanical problem with the turbocharger wastegate system. Inspect the air line from the manifold, to the wastegate actuator for kinks, leaks, blockage, cuts or crimping that will prevent manifold pressure from operating the turbocharger wastegate. Inspect the wastegate for binding, corrosion, or other physical damage that could prevent the wastegate from opening.

Test 4 — Checking for Voltage at Connector EJ1 Pin 8

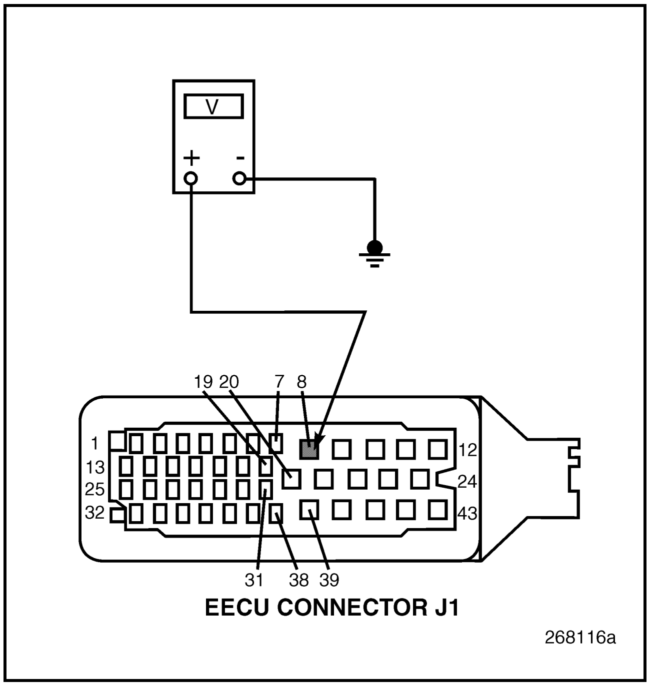


Figure 488

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Turn the ignition key ON.
4. Measure the voltage between connector J1 pin 8 and a good ground (see Figure 488).

   If battery voltage is NOT present, go to test "Test 8 — Checking for an Open Fuse in the 12 Volt Supply Circuit" on page 370.

   If battery voltage is present, replace the EECU and retest the system.

Test 8 — Checking for an Open Fuse in the 12 Volt Supply Circuit

NOTE

CX chassis with CCRS 460HP engines upgraded in the field with a wastegate turbocharger, have an ignition feed from EPDM fuse 46, connector C, pin G. Production CCRS 460HP engines source the ignition power feed from EPDM fuse 41.

1. Check the fuse that supplies switched battery voltage to connector EJ1 pin 8.

   If the fuse is in good condition and switched battery voltage is present, go to test "Test 16 — Checking the Resistance in the Circuit" on page 371.

   If the fuse is in good condition and switched battery voltage is NOT present, go to test "Test 17 — Checking the Power Relay" on page 371.

   If the fuse is open (blown fuse), locate and repair the short circuit to ground in the power feed circuit and replace the fuse.

Test 16 — Checking the Resistance in the Circuit

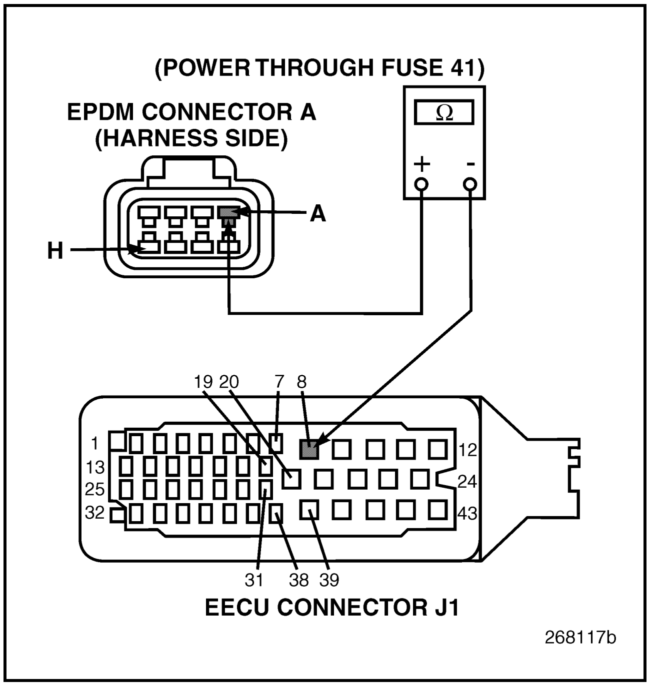


Figure 489

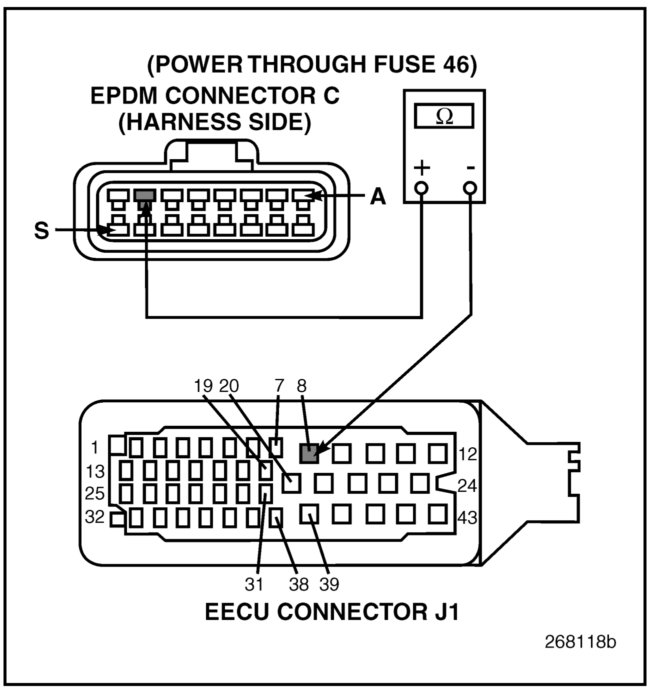


Figure 490

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Remove the fuse from the 12 volt supply circuit.
4. Measure the resistance of the circuit between the fuse in the EPDM and EECU connector J1 pin 8. If power is supplied through fuse 41, measure between EPDM connector A pin A and connector J1 pin 8 (see Figure 489). If power is supplied through fuse 46, measure between EPDM connector C pin G and connector J1 pin 8 (see Figure 490).

NOTE

There is a 3300 ohm resistor in the circuit between the fuse and the EECU.

If the measured resistance is greater than approximately 3300 ohms, locate and repair the open circuit or high resistance connection.

If the measured resistance is approximately 3300 ohms, go to test "Test 32 — Checking for a Short Circuit to Ground" on page 372.

Test 17 — Checking the Power Relay

1. Turn the ignition key ON.
2. Check the state of the power relay that feeds the fuse for the circuit (see the following table).

Chassis Model	Fuse	Power Relay
CX, CH, and CV	40	4
CX, Wastegate Turbocharger Field Upgrade	46	3
RD	40	3

If the power relay is energized, locate and repair the open circuit between power relay pin 87 and the fuse in question.

If the power relay is not energized, go to test "Test 34 — Checking for Power to the Relay" on page 372.

Test 32 — Checking for a Short Circuit to Ground

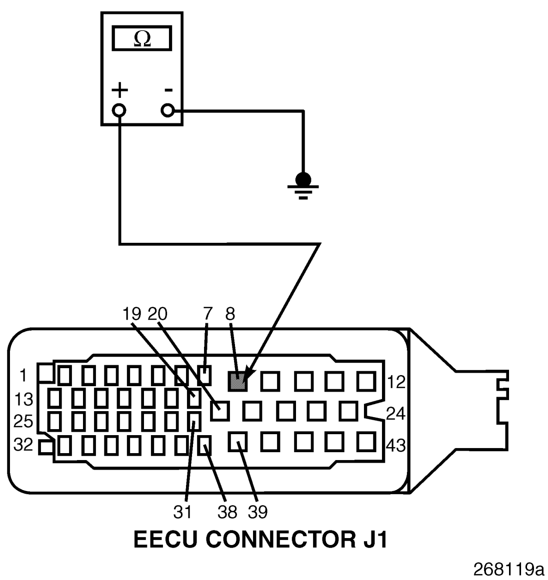


Figure 491

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Remove the fuse from the 12 volt supply circuit.
4. Check for continuity between EECU connector J1 pin 8 and a good ground (see Figure 491).

   If continuity exists, locate and repair the short circuit to ground in circuit EJ1-8.

   If there is NO continuity, the procedures have cured the problem. Check all connectors to ensure proper connections and retest the system to ensure that blink code 4-5 is no longer active.

Test 34 — Checking for Power to the Relay

1. Turn the ignition key OFF.
2. Remove the appropriate power relay from the Electrical Equipment Panel (EEP) (see the following table).

Chassis Model	Fuse	Power Relay
CX, CH, and CV	40	4
CX, Wastegate Turbocharger Field Upgrade	46	3
RD	40	3

3. Turn the ignition key ON.
4. Measure the voltage between EEP relay cavity pin 30 and a good ground. Measure the voltage between EEP relay cavity pin 86 and a good ground.

   If system voltage is present at both pins, go to test “Test 68 — Checking for Ground at the Relay” on page 372.

   If system voltage is not present at one or both pins, locate and repair the open power feed circuit.

Test 68 — Checking for Ground at the Relay

1. Turn the ignition key OFF.
2. Remove the appropriate power relay from the Electrical Equipment Panel (EEP) (see the following table).

Chassis Model	Fuse	Power Relay
CX, CH, and CV	40	4
CX, Wastegate Turbocharger Field Upgrade	46	3
RD	40	3

3. Check for continuity between EEP relay cavity pin 85 and a good ground.

   If continuity exists, replace the power relay and retest the system.

   If continuity does NOT exist, locate and repair the open ground circuit to the power relay.

BLINK CODE 4-5 — VARIABLE TURBINE GEOMETRY (VTG) POSITION SENSOR (ASET™ CEGR ENGINE)

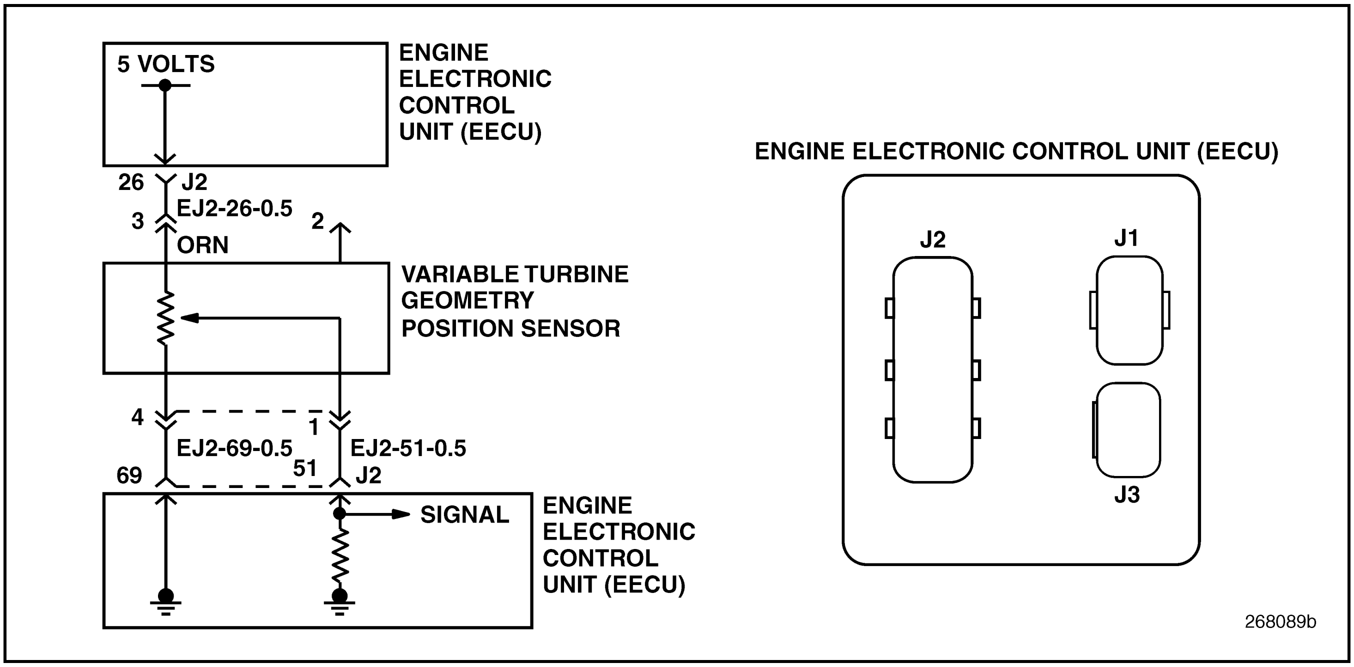


Figure 492 — Variable Turbine Geometry (VTG) Position Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open), or 7 (Position Does Not Follow Command)

Parameter Identification (PID): S269

Message Identification (MID): 128

Circuit Description: The Variable Turbine Geometry (VTG) Position Sensor is a linear induction position sensor. The position sensor is mechanically linked to the actuating element of the turbocharger. The sensor is positioned within a magnetic field and produces a signal that is processed by an internal microprocessor. When the resulting voltage signal is compared to a reference voltage, the position of the turbocharger actuator can be calculated by the EECU.

Location: The Variable Turbine Geometry (VTG) Position Sensor is built into the mechanical VTG actuator.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 4-5 will set when the Engine Electronic Control Unit (EECU) senses that the VTG Position Sensor signal voltage is less than 0.15 volts or greater than 4.9 volts for 1 second. If the VTG Position Sensor voltage returns to between 0.15 volts and 4.9 volts for more than 1 second, the fault will become inactive. Code 4-5 will set with FMI 7 if the VTG vane position differs from the EECU target position by more than 25% or if there is an open or short circuit to voltage in the VTG Position Sensor ground circuit.

NOTE

Code 4-5 with a FMI 7 will not become active within two minutes of engine start. This delay provides time for the air compressor to build air tank pressure.

NOTE

95 psi of air pressure is required to move the VTG actuator to its full travel position.

Test 1 — Checking for Code 4-5

1. Verify that code 4-5 is set.

   If code 4-5 is set with FMI 4 (voltage low or open) or FMI 3 (voltage high), go to test “Test 2 — Checking Code 4-5 Failure Mode Identifier (FMI)” on page 374.

   If code 4-5 is set with FMI 7 (position does not follow command), go to test “Test 3 — Checking the VTG Position Sensor Ground Line for an Open Circuit” on page 374.

   If code 4-5 is not set, wiggle the harness and connectors to try and set the code.

Test 2 — Checking Code 4-5 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (voltage low or open), go to test “Test 4 — Checking the VTG Position Sensor Reference Voltage Line” on page 375.

   If the FMI is 3 (voltage high), go to test “Test 5 — Checking the VTG Position Sensor Signal Line for a Short Circuit to Voltage” on page 375.

Test 3 — Checking the VTG Position Sensor Ground Line for an Open Circuit

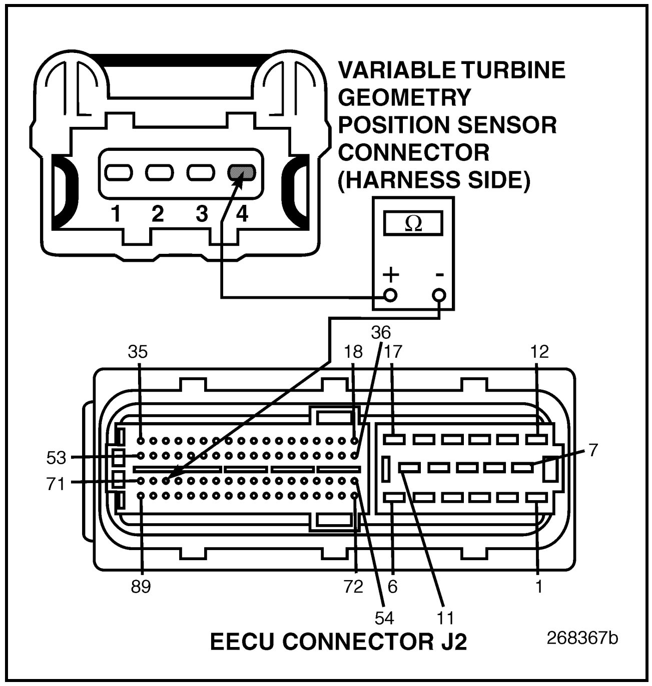


Figure 493

1. Turn the ignition key OFF.
2. Disconnect the VTG Position Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between VTG Position Sensor harness connector pin 4 (ground line) and EECU harness connector J2 pin 69 (see Figure 493).

   If continuity exists, go to test “Test 6 — Checking the VTG Position Sensor Ground Line for a Short Circuit” on page 376.

   If there is NO continuity, locate and repair the open circuit in the ground line.

Test 4 — Checking the VTG Position Sensor Reference Voltage Line

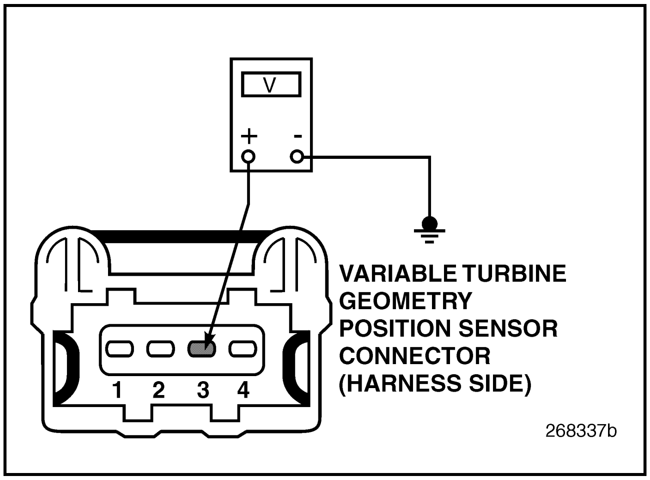


Figure 494

1. Turn the ignition key OFF.
2. Disconnect the VTG Position Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between VTG Position Sensor harness connector pin 3 (reference voltage line) and a good ground (see Figure 494).

   If the measured voltage is greater than 4.9 volts, go to test “Test 8 — Checking the VTG Position Sensor Signal Line for a Short Circuit to Ground” on page 376.

   If the measured voltage is less than 4.9 volts, go to test “Test 9 — Checking the Harness for Continuity in the VTG Position Sensor Reference Voltage Line” on page 377.

Test 5 — Checking the VTG Position Sensor Signal Line for a Short Circuit to Voltage

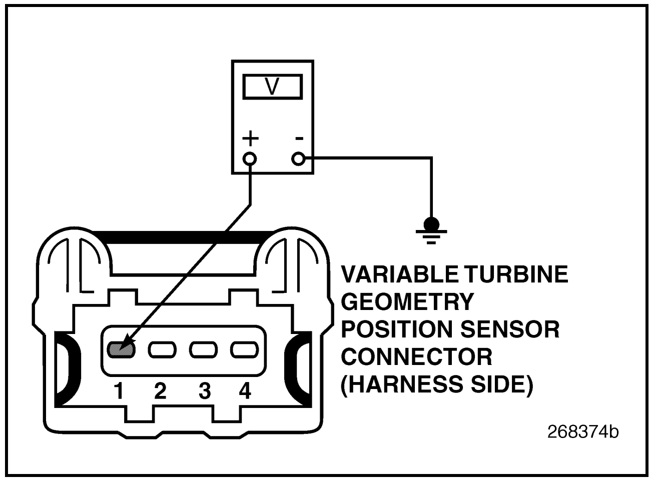


Figure 495

1. Turn the ignition key OFF.
2. Disconnect the VTG Position Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Turn the ignition key ON.
5. Measure the voltage between VTG Position Sensor harness connector pin 1 and a good ground (see Figure 495).

   If voltage is present, locate and repair the short circuit to voltage in the signal line.

   If voltage is NOT present, go to test “Test 10 — Checking the VTG Position Sensor Reference Voltage Line” on page 377.

Test 6 — Checking the VTG Position Sensor Ground Line for a Short Circuit

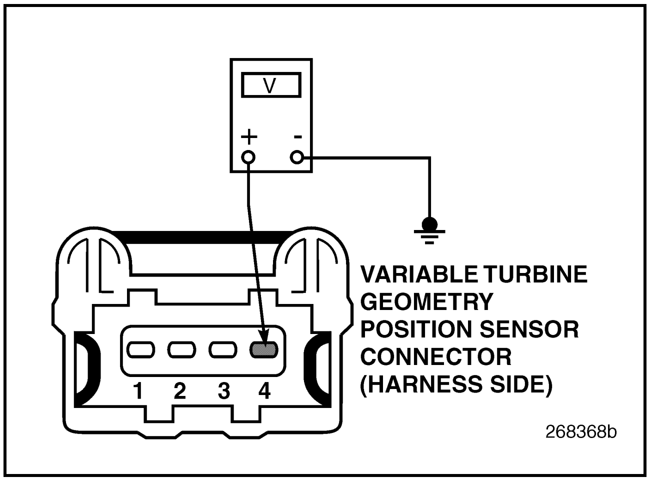


Figure 496

1. Turn the ignition key OFF.
2. Connect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect the VTG Position Sensor.
4. Turn the ignition key ON.
5. Measure the voltage between VTG Position Sensor harness connector pin 4 (ground line) and a good ground (see Figure 496).

   If the measured voltage is 0.5 volts or less, go to test "Test 12 — Checking the Operation of the Turbocharger Vanes" on page 378.

   If the measured voltage is greater than 0.5 volts, locate and repair the short circuit to voltage in the VTG Position Sensor ground line.

Test 8 — Checking the VTG Position Sensor Signal Line for a Short Circuit to Ground

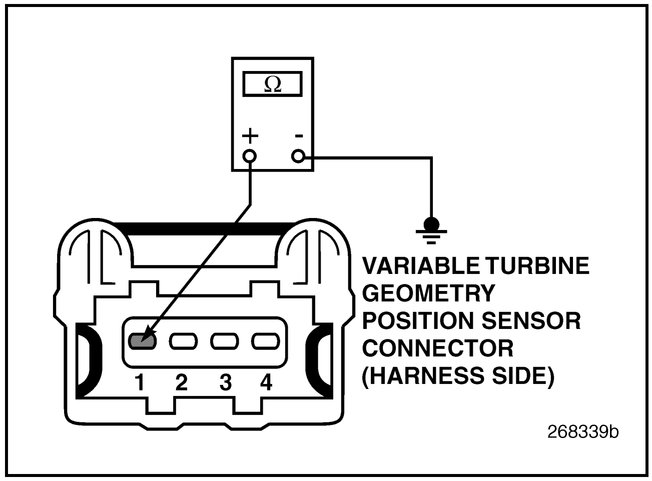


Figure 497

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Check for continuity between VTG Position Sensor harness connector pin 1 (signal line) and a good ground (see Figure 497).

   If there is NO continuity, go to test "Test 16 — Checking the Harness for Continuity in the VTG Position Sensor Signal Line" on page 378.

   If continuity exists, locate and repair the short circuit to ground in the VTG Position Sensor signal line.

Test 9 — Checking the Harness for Continuity in the VTG Position Sensor Reference Voltage Line

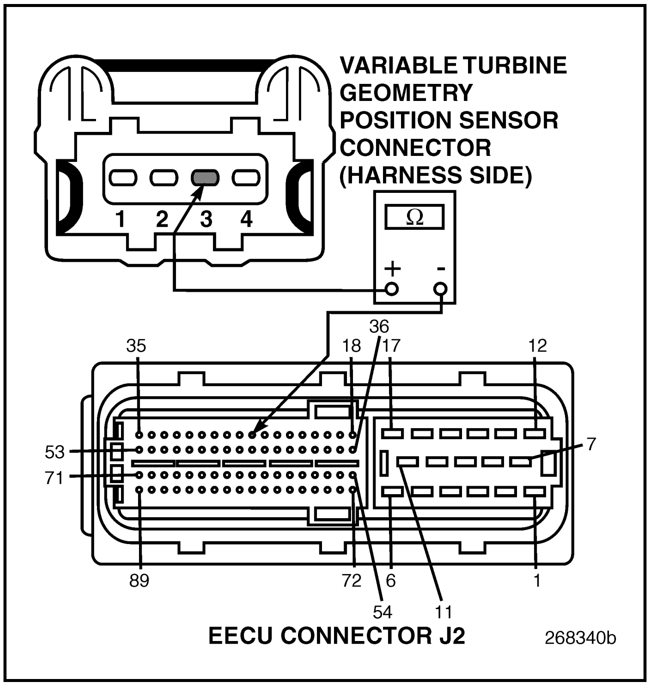


Figure 498

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Check for continuity between the VTG Position Sensor harness connector pin 3 (reference voltage line) and EECU harness connector J2 pin 26 (see Figure 498).

   If continuity exists, go to test "Test 18 — Checking the Harness for a Pin to Pin Short in the VTG Position Sensor Reference Voltage Line" on page 378.

   If there is NO continuity, locate and repair the open in the harness reference voltage line.

Test 10 — Checking the VTG Position Sensor Reference Voltage Line

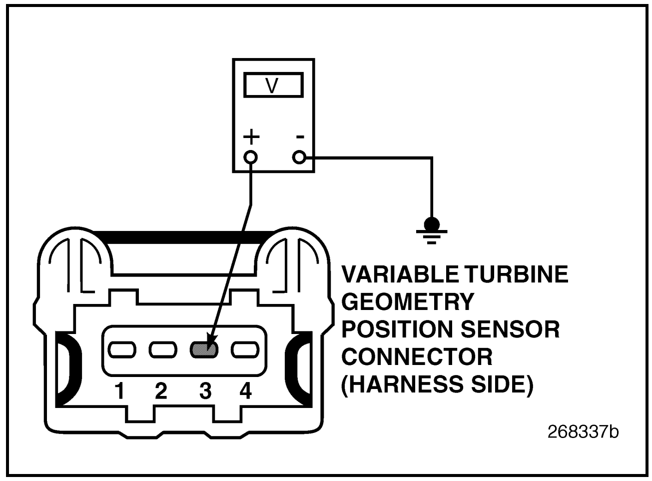


Figure 499

1. Turn the ignition key OFF.
2. Disconnect the VTG Position Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between the VTG Position Sensor harness connector pin 3 (reference voltage line) and a good ground (see Figure 499).

   If the measured voltage is less than 5.25 volts, go to test "Test 20 — Checking the EECU" on page 379.

   If the measured voltage is greater than 5.25 volts, go to test "Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the VTG Position Sensor Reference Voltage Line" on page 379.

Test 12 — Checking the Operation of the Turbocharger Vanes

1. Turn the ignition key OFF.
2. Connect the VTG Position Sensor.
3. Ensure the vehicle system air pressure is at least 95 psi (110 psi preferable).
4. Observe the VTG actuator while an assistant starts the engine.

   If the turbocharger vanes move to the approximately 90% closed position within 1 second, go to test "Test 24 — Checking the VTG Turbocharger Calibration" on page 379.

   If the turbocharger vanes do NOT move to the approximately 90% closed position within 1 second, go to test "Test 25 — Checking the Air Supply to the VTG Actuator" on page 379.

Test 16 — Checking the Harness for Continuity in the VTG Position Sensor Signal Line

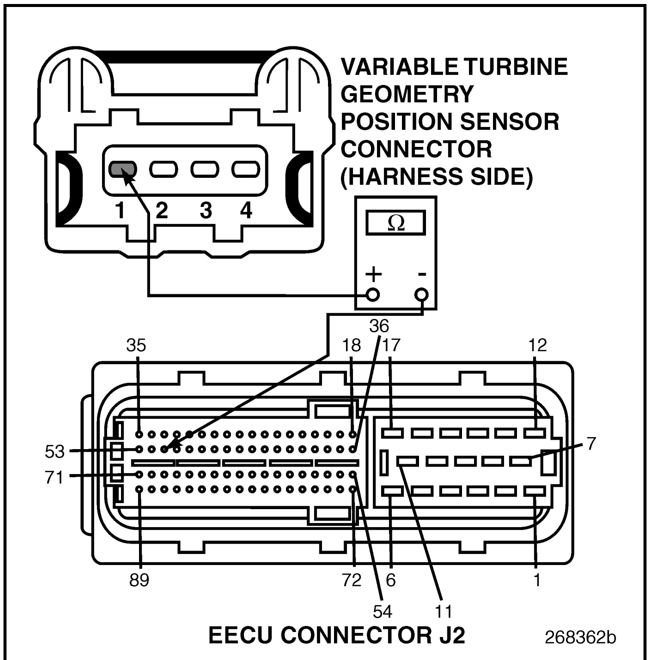


Figure 500

1. Turn the ignition key OFF.
2. Disconnect the VTG Position Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Check for continuity between VTG Position Sensor harness connector pin 1 (signal line) and EECU harness connector J2 pin 51 (see Figure 500).

   If continuity exists, go to test "Test 32 — Checking the VTG Position Sensor Connector" on page 379.

   If there is NO continuity, locate and repair the open circuit in the harness signal line.

Test 18 — Checking the Harness for a Pin to Pin Short in the VTG Position Sensor Reference Voltage Line

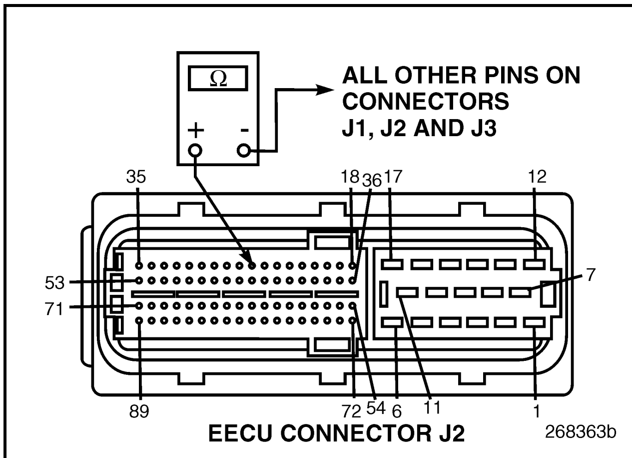


Figure 501

1. Turn the ignition key OFF.
2. Disconnect the VTG Position Sensor.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
4. Check for continuity between EECU harness connector J2 pin 26 (reference voltage line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 501).
5. Visually check EECU connector J2 pin 26 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, go to test "Test 36 — Checking for a Faulty EECU Connector" on page 380.

Test 20 — Checking the EECU

1. Replace the EECU with a known good unit and retest the system.

   If blink code 4-5 is NOT active, replacing the EECU corrected the problem. Check all connectors to ensure proper connections.

   If blink code 4-5 is still active, reinstall the original EECU and replace the VTG assembly.

Test 21 — Checking the Harness for a Pin to Pin Short Circuit in the VTG Position Sensor Reference Voltage Line

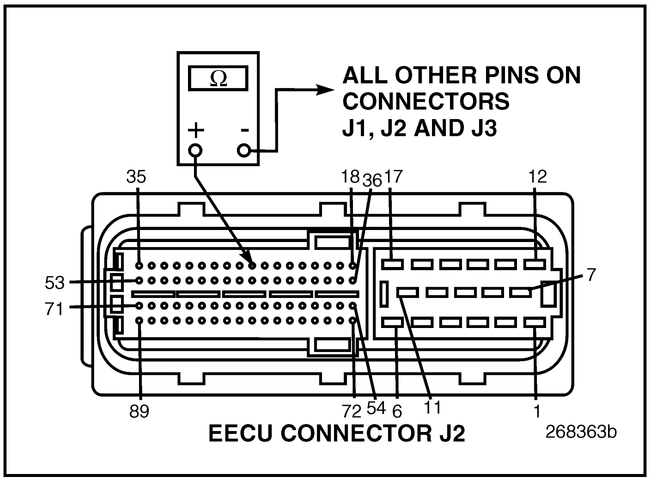


Figure 502

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2, and J3.
3. Disconnect the VTG Position Sensor.
4. Check for continuity between EECU harness connector J2 pin 26 (reference voltage line) and all other pins in EECU harness connectors J1, J2, and J3 (see Figure 502).
5. Visually check EECU connector J2 pin 26 for a short circuit.

   If continuity exists or if there is a visual short, repair the short circuit to the reference voltage line.

   If there is NO continuity or visual short, go to test "Test 42 — Checking the VTG Position Sensor Connector" on page 380.

Test 24 — Checking the VTG Turbocharger Calibration

1. Perform the VTG calibration procedure as outlined in the V-MAC® Support Software User Guide.
2. Road test the vehicle, operating in all gears at a variety of engine loads. Verify that the VTG actuator moves through its entire range.
3. Check to see whether code 4-5 is still set.

   If code 4-5 is still set, go to test "Test 48 — Checking the EECU" on page 380.

   If code 4-5 is NOT set, calibrating the VTG turbocharger corrected the problem. Check all connectors to ensure proper connections.

Test 25 — Checking the Air Supply to the VTG Actuator

1. Check the air supply lines and fittings to the VTG control valve and the VTG actuator for leaks, kinks, or other restrictions.
2. Check the VTG control valve and the VTG actuator for air leaks.

   If any air leaks exist, repair the leaking hose or fitting or replace the leaking component.

   If there are NO leaks in the air supply, go to test "Test 50 — Checking the Chassis Air System Pressure" on page 380.

Test 32 — Checking the VTG Position Sensor Connector

1. Visually inspect both sides of the VTG Position Sensor connector for a repairable open.
2. If any of the pins feel loose, repair or replace the VTG Position Sensor connector.

   If the pins in the connector are making good contact, go to test "Test 64 — Checking the EECU Connector for an Open in the VTG Position Sensor Signal Line" on page 380.

Test 36 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect EECU connector J2 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J2, pin 26. Gently push the test lead into pin 26 and check for looseness.

   If the terminal feels loose, repair the harness connector.

   If the test lead is making good contact with the connector terminal, the EECU is not supplying proper voltage to the VTG Position Sensor. Replace the EECU and retest the system.

Test 42 — Checking the VTG Position Sensor Connector

1. Visually inspect both sides of the VTG Position Sensor connector for a short or open circuit.

   If any of the pins feel loose or appear to be shorted together, repair or replace the VTG Position Sensor connector.

   If the connector is in good condition, the reference voltage line is shorted to voltage elsewhere in the vehicle harness. Locate and repair the short circuit.

Test 48 — Checking the EECU

1. Replace the EECU with a known good unit and retest the system.

   If blink code 4-5 is NOT active, replacing the EECU corrected the problem. Check all connectors to ensure proper connections.

   If blink code 4-5 is still active, reinstall the original EECU and replace the VTG assembly.

Test 50 — Checking the Chassis Air System Pressure

1. Start the engine and allow it to idle.
2. Check the chassis air system pressure using the gauge on the instrument panel.

   If the chassis air pressure gauge indicates 96 psi or greater, go to test “Test 100 — Checking the Turbocharger Vanes” on page 380.

   If the chassis air pressure gauge indicates less than 96 psi, locate and repair the cause of the low air pressure.

Test 64 — Checking the EECU Connector for an Open in the VTG Position Sensor Signal Line

1. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2 pin 51 for a repairable open in signal line.

   If a repairable open is found, repair or replace EECU harness connector J2.

   If the pin is making good contact, go to test “Test 128 — Checking the EECU” on page 381.

Test 100 — Checking the Turbocharger Vanes

1. Remove the pin and clip that connects the VTG actuator to the actuator arm.
2. Manually move the actuator arm through its entire range of travel in both directions.

   If the actuator arm moves smoothly, with little resistance through its entire range of travel, go to test “Test 200 — Checking the VTG Turbocharger Calibration” on page 381.

   If any binding is detected or if the actuator arm does NOT move smoothly through its entire range of travel, replace the VTG turbocharger assembly.

Test 128 — Checking the EECU

1. Replace the EECU with a known good unit and retest the system.

   If blink code 4-5 is NOT active, replacing the EECU corrected the problem. Check all connectors to ensure proper connections.

   If blink code 4-5 is still active, reinstall the original EECU and replace the VTG assembly.

Test 200 — Checking the VTG Turbocharger Calibration

1. Perform the VTG calibration procedure as outlined in the V-MAC® Support Software User Guide.
2. Road test the vehicle, operating in all gears at a variety of engine loads.
3. Check to see whether code 4-5 is still set.

   If code 4-5 is still set, go to test "Test 400 — Checking the VTG Control Valve" on page 381.

   If code 4-5 is NOT set, calibrating the VTG turbocharger corrected the problem. Check all connectors to ensure proper connections.

Test 400 — Checking the VTG Control Valve

1. Replace the VTG control valve with a known good unit.
2. Restore all mechanical and electrical connections.
3. Perform the VTG calibration procedure as outlined in the V-MAC® Support Software User Guide.
4. Road test the vehicle and retest the system.

   If blink code 4-5 is still active, go to test "Test 800 — Checking the EECU" on page 381.

   If blink code 4-5 is NOT active, replacing the VTG control valve corrected the problem. Check all connectors to ensure proper connections.

Test 800 — Checking the EECU

1. Reinstall the original VTG control valve.
2. Replace the EECU with a known good unit and retest the system.

   If blink code 4-5 is NOT active, replacing the EECU corrected the problem. Check all connectors to ensure proper connections.

   If blink code 4-5 is still active, reinstall the original EECU and replace the VTG Turbocharger assembly.

BLINK CODE 4-6 — TACHOMETER DRIVE

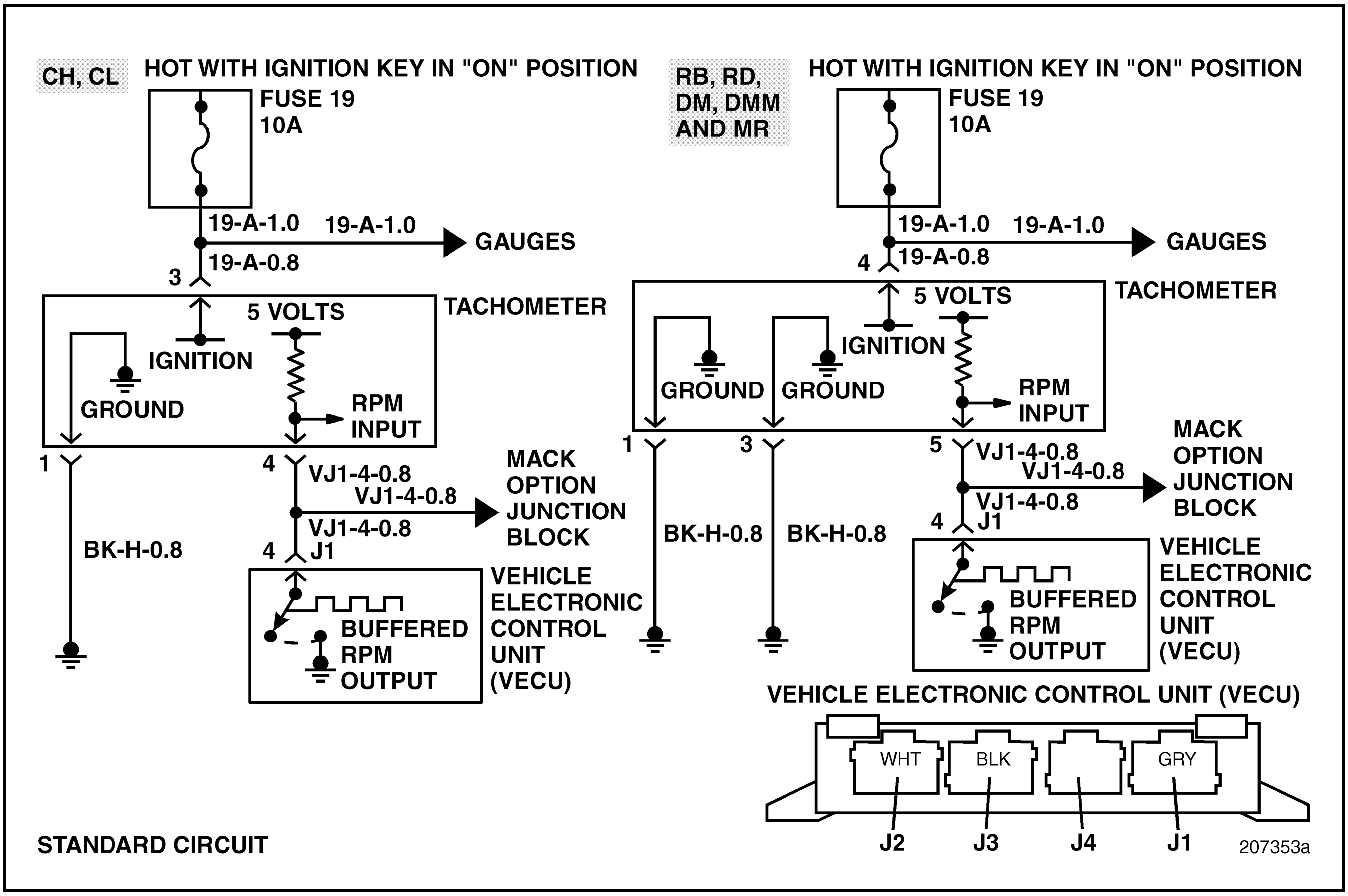


Figure 503 — Standard Tachometer Drive Circuit

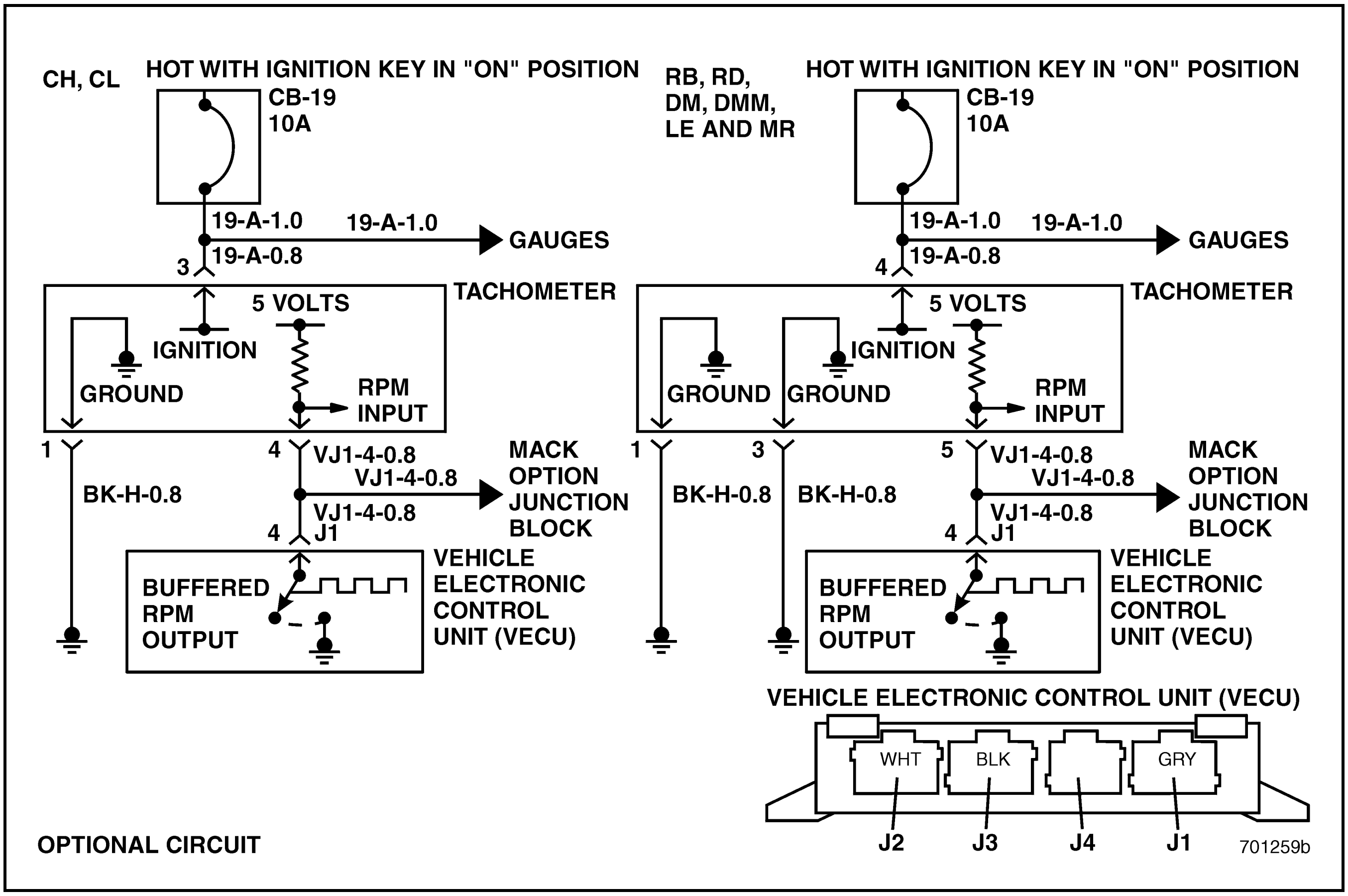


Figure 504 — Optional Tachometer Drive Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

NOTE

This circuit is not used on vehicles equipped with electronic gauge clusters.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S6

Message Identification (MID): 142

Circuit Description: When the engine is running, the Engine Speed Sensor sends a signal to the Engine Electronic Control Unit (EECU). The frequency of the signal is used by the EECU to calculate engine speed. The EECU sends the calculated engine speed to the Vehicle Electronic Control Unit (VECU) over the serial data lines. The VECU outputs the engine speed signal to the Tachometer. The Tachometer translates the engine speed signal into revolutions per minute (RPM) and displays the result on the gauge.

Code Setting Conditions: Code 4-6 will set with an FMI of 3 (voltage high), if the Vehicle Electronic Control Unit (VECU) senses voltage greater than 5 volts for more than 2 seconds at VECU connector J1 pin 4. If the voltage drops to less than 5 volts for more than 2 seconds, the fault will become inactive. Code 4-6 can also set with an FMI of 4 (voltage low), if the voltage is less than 0.5 volts for more than 2 seconds at VECU connector J1 pin 4. If the voltage rises greater than 0.5 volts for more than 2 seconds, the fault will become inactive.

Additional Symptoms: Tachometer inoperative.

Test 1 — Checking for Code 4-6

1. Verify that code 4-6 is set.

   If code 4-6 is set, go to test “Test 2 — Checking for an External Fault” on page 384.

   If code 4-6 is not set, wiggle the harness and wires to try and set the code.

Test 2 — Checking for an External Fault

1. Turn the ignition key OFF.
2. Disconnect all optional equipment using the RPM external tie point at the Mack Option Junction Block located near the accessory bus.
3. Start the engine.

   If the tachometer still does NOT operate properly, go to test “Test 4 — Checking Tachometer Supply Voltage” on page 384.

   If the tachometer is now working, there is a short circuit in an optional equipment component or related harness. Locate and repair the short circuit.

Test 4 — Checking Tachometer Supply Voltage

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Check for continuity between the pin in the following chart and a good ground.

Model	Tachometer Connector (harness side pin number)
CL	1
RB, RD, DM, MR, LE	1 and 3

4. Turn the ignition key ON.
5. Measure the voltage between the pin in the following chart and a good ground.

Model	Tachometer Connector (harness side pin number)
CL	3
RB, RD, DM, MR, LE	4

   If battery voltage or ground is present at the appropriate pins, go to test “Test 8 — Checking Code 4-6 Failure Mode Identifier (FMI)” on page 384.

   If battery voltage or ground is not present, repair the suspect supply or ground circuit.

Test 8 — Checking Code 4-6 Failure Mode Identifier (FMI)

1. Check Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high), go to test “Test 16 — Checking for Voltage on the Buffered RPM Line in the Harness” on page 385.

   If the FMI is 4 (voltage low), go to test “Test 17 — Checking for a Short Circuit to Ground” on page 385.

Test 16 — Checking for Voltage on the Buffered RPM Line in the Harness

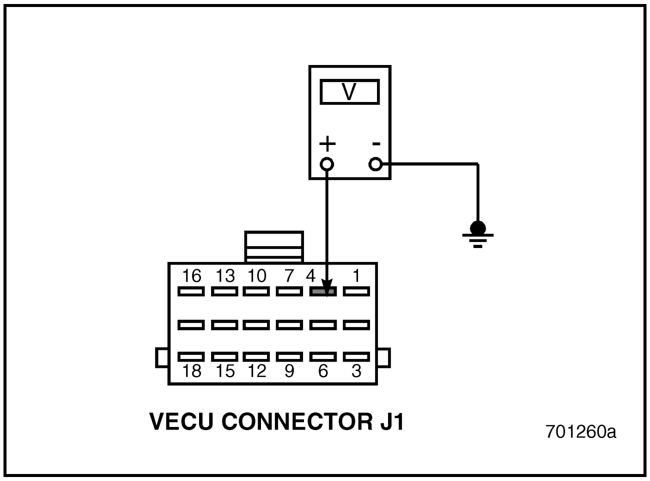


Figure 505

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J1.
4. Turn the ignition key ON.
5. Measure the voltage between VECU connector J1 pin 4 and a good ground (see Figure 505).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking for a Pin to Pin Short in the Harness” on page 386.

   If the measured voltage is greater than 0.5 volts, go to test “Test 33 — Isolating the Short Circuit to Voltage” on page 386.

Test 17 — Checking for a Short Circuit to Ground

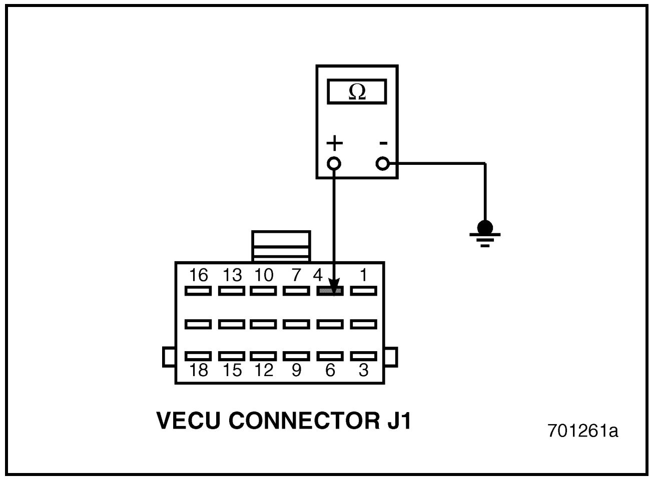


Figure 506

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Disconnect VECU connector J1.
4. Check for continuity between VECU connector J1 pin 4 and a good ground (see Figure 506).

   If continuity exists between pin 4 and ground, go to test “Test 34 — Isolating the Short Circuit to Ground” on page 387.

   If there is NO continuity between pin 4 and ground, go to test “Test 35 — Checking for a Pin to Pin Short Circuit in the Harness” on page 387.

Test 32 — Checking for a Pin to Pin Short in the Harness

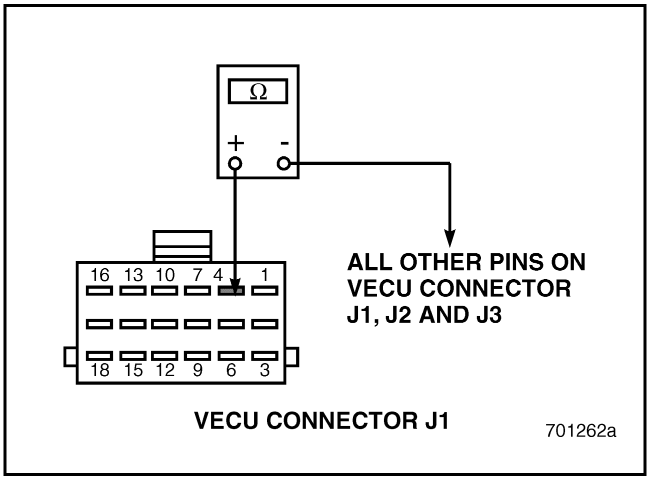


Figure 507

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Disconnect any optional equipment using the RPM external tie point at the Mack Option Junction Block.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between VECU connector J1 pin 4 and all other pins on VECU connectors J1, J2 and J3 (see Figure 507).

   If continuity exists, pin 4 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 64 — Checking for Proper Voltage to the Tachometer When the Engine is Running" on page 388.

Test 33 — Isolating the Short Circuit to Voltage

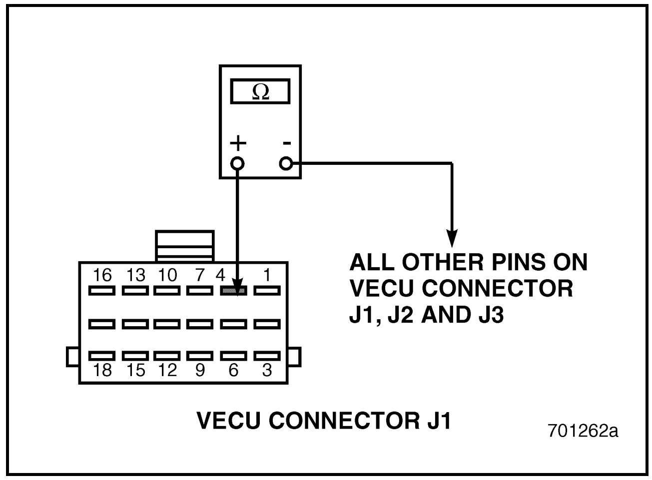


Figure 508

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J1 pin 4 and all other pins on VECU connectors J1, J2 and J3 (see Figure 508).

   If continuity exists, pin 4 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the short circuit to voltage is somewhere in the cab harness. Locate and repair the short circuit.

Test 34 — Isolating the Short Circuit to Ground

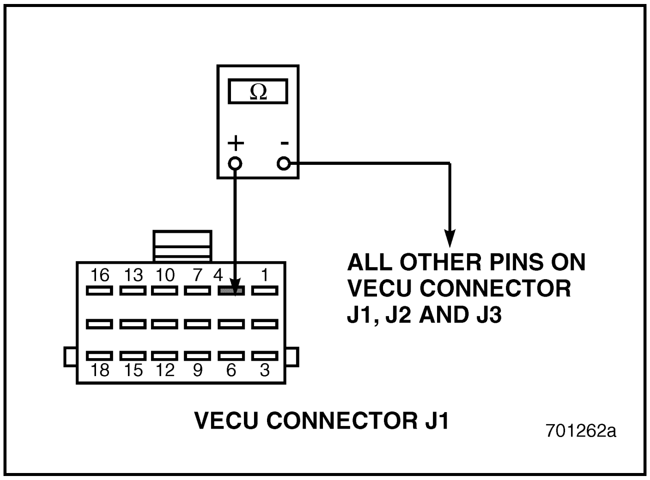


Figure 509

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J1 pin 4 and all other pins on VECU connectors J1, J2 and J3 (see Figure 509).

   If continuity exists, pin 4 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, pin 4 is shorted to ground somewhere else in the cab harness. Locate and repair the short circuit.

Test 35 — Checking for a Pin to Pin Short Circuit in the Harness

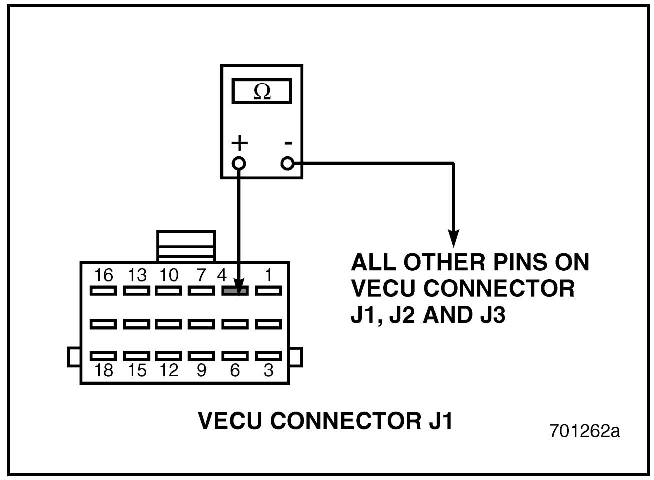


Figure 510

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J1 pin 4 and all other pins on VECU connectors J1, J2 and J3 (see Figure 510).

   If continuity exists, pin 4 is shorted to one of the other VECU circuits. Locate and repair the short.

   If there is NO continuity, go to test “Test 70 — Checking for an Open Circuit in the Harness” on page 388.

Test 64 — Checking for Proper Voltage to the Tachometer When the Engine is Running

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Disconnect the tachometer connector.
4. Start and run the engine.
5. Measure the voltage between the pin shown in the following chart and a good ground.

Model	Tachometer Connector (harness side pin number)
CL	4
RB, RD, DM, MR, LE	5

If the measured voltage is between 1.75 and 3.25 volts, go to test “Test 128 — Checking for Blink Code 4-6” on page 388.

If the measured voltage is NOT within this range, go to test “Test 129 — Checking for Blink Code 4-6” on page 389.

Test 70 — Checking for an Open Circuit in the Harness

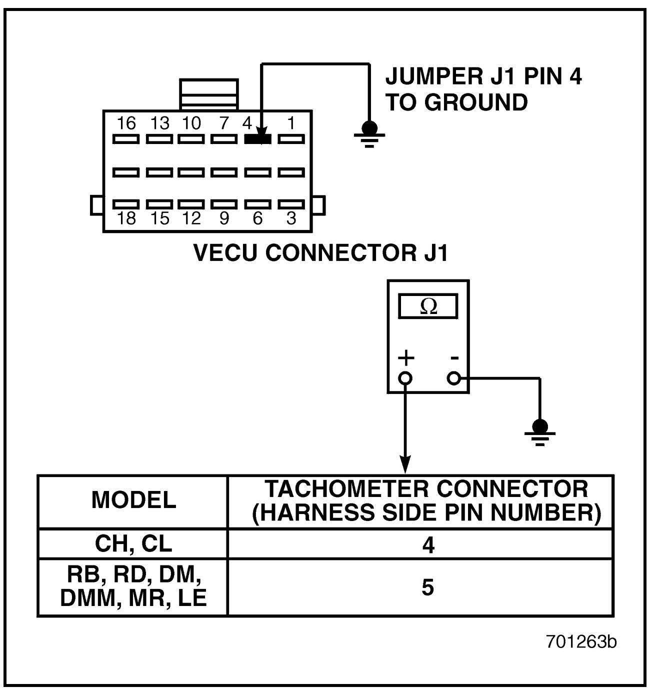


Figure 511

1. Turn the ignition key OFF.
2. Disconnect the tachometer connector.
3. Disconnect VECU connector J1.
4. Connect a jumper between VECU connector J1 pin 4 and a good ground (see Figure 511).
5. Check for continuity between the pin shown in Figure 511 and a good ground.

   If continuity exists, go to test “Test 140 — Checking for Proper Voltage to the Tachometer When the Engine is Running” on page 389.

   If there is NO continuity, the buffered RPM line is open in the harness. Locate and repair the open circuit.

Test 128 — Checking for Blink Code 4-6

1. Turn the ignition switch OFF.
2. Connect VECU connector J1.
3. Replace the tachometer with a known good tachometer.
4. Turn the ignition switch ON and start the engine.

   If blink code 4-6 is still active, install the old tachometer, replace the VECU and retest the system.

   If blink code 4-6 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 129 — Checking for Blink Code 4-6

1. Turn the ignition switch OFF.
2. Connect the tachometer connector.
3. Connect connectors J1, J2 and J3 to the VECU.
4. Turn the ignition switch ON.

   If blink code 4-6 is still active, check the VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 4-6 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 140 — Checking for Proper Voltage to the Tachometer When the Engine is Running

1. Turn the ignition switch OFF.
2. Connect VECU connector J1.
3. Disconnect the tachometer connector.
4. Start and run the engine.
5. Measure the voltage between the pin shown in the following chart and a good ground.

Model	Tachometer Connector (harness side pin number)
CL	4
RB, RD, DM MR, LE	5

If the measured voltage is between 1.75 and 3.25 volts, go to test "Test 280 — Checking for Blink Code 4-6" on page 389.

If the measured voltage is NOT within this range, go to test "Test 281 — Checking the VECU Connector for an Open Circuit" on page 389.

Test 280 — Checking for Blink Code 4-6

1. Turn the ignition switch OFF.
2. Connect VECU connector J1.
3. Replace the tachometer with a known good tachometer.
4. Start and run the engine.

   If blink code 4-6 is still active, re-install the old tachometer, replace the VECU and retest the system.

   If blink code 4-6 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 281 — Checking the VECU Connector for an Open Circuit

1. Visually inspect VECU connector J1 pin 4 for dirt, loose pin or a deformed contact.
2. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J1 pin 4. Gently push the test lead into harness connector terminal and check for looseness.

   If a repairable open is found or the terminal feels loose, repair or replace VECU harness connector J1.

   If the test lead is making good contact with VECU connector J1 pin 4, go to test "Test 562 — Checking for Blink Code 4-6" on page 389.

Test 562 — Checking for Blink Code 4-6

1. Turn the ignition switch OFF.
2. Connect VECU connector J1, J2 and J3.
3. Connect the tachometer connector.
4. Turn the ignition switch ON.

   If blink code 4-6 is still active, replace the VECU and retest the system.

   If blink code 4-6 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 4-7 — SPEEDOMETER DRIVE

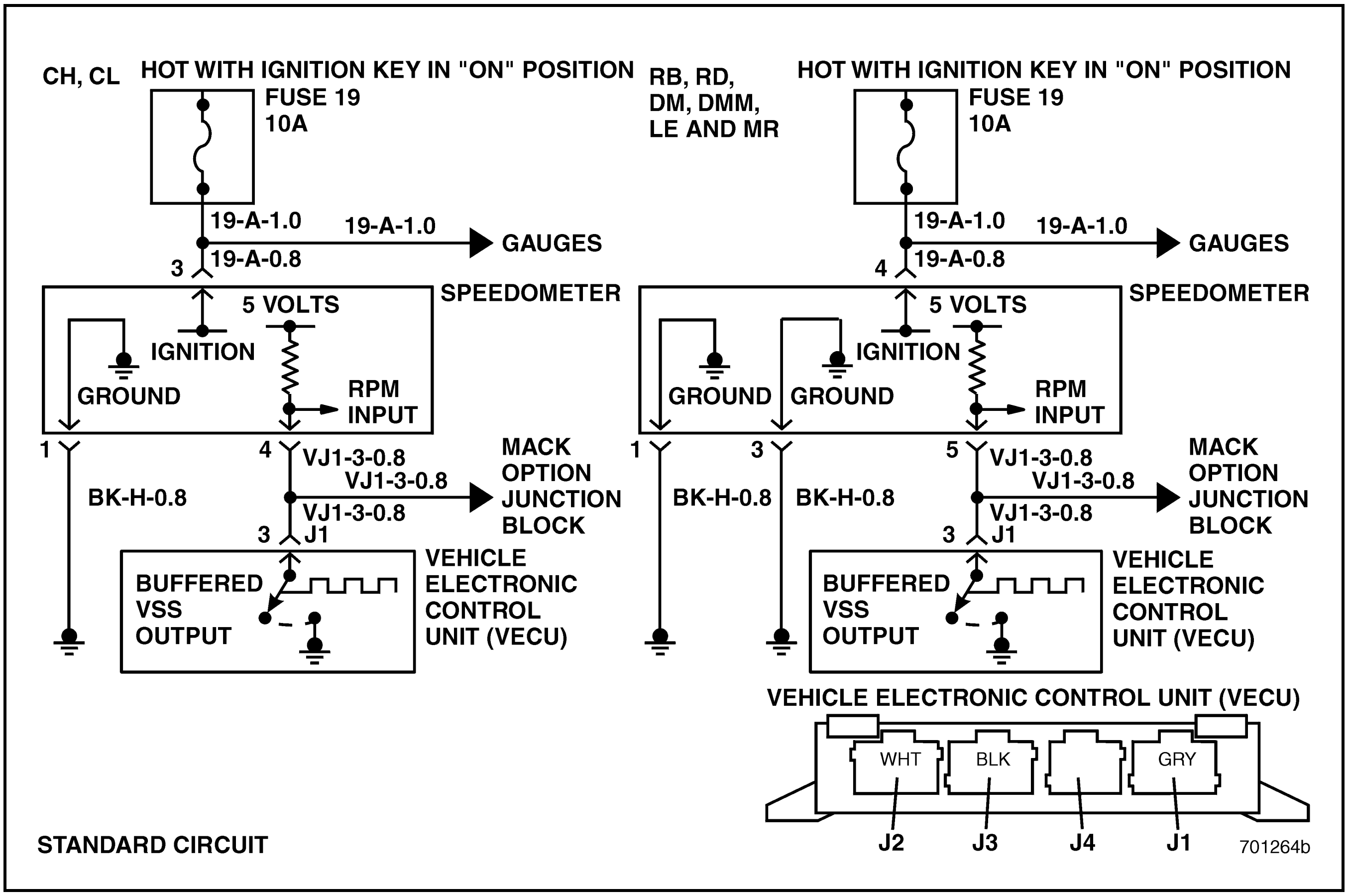


Figure 512 — Standard Speedometer Drive Circuit

BLINK CODE 4-7

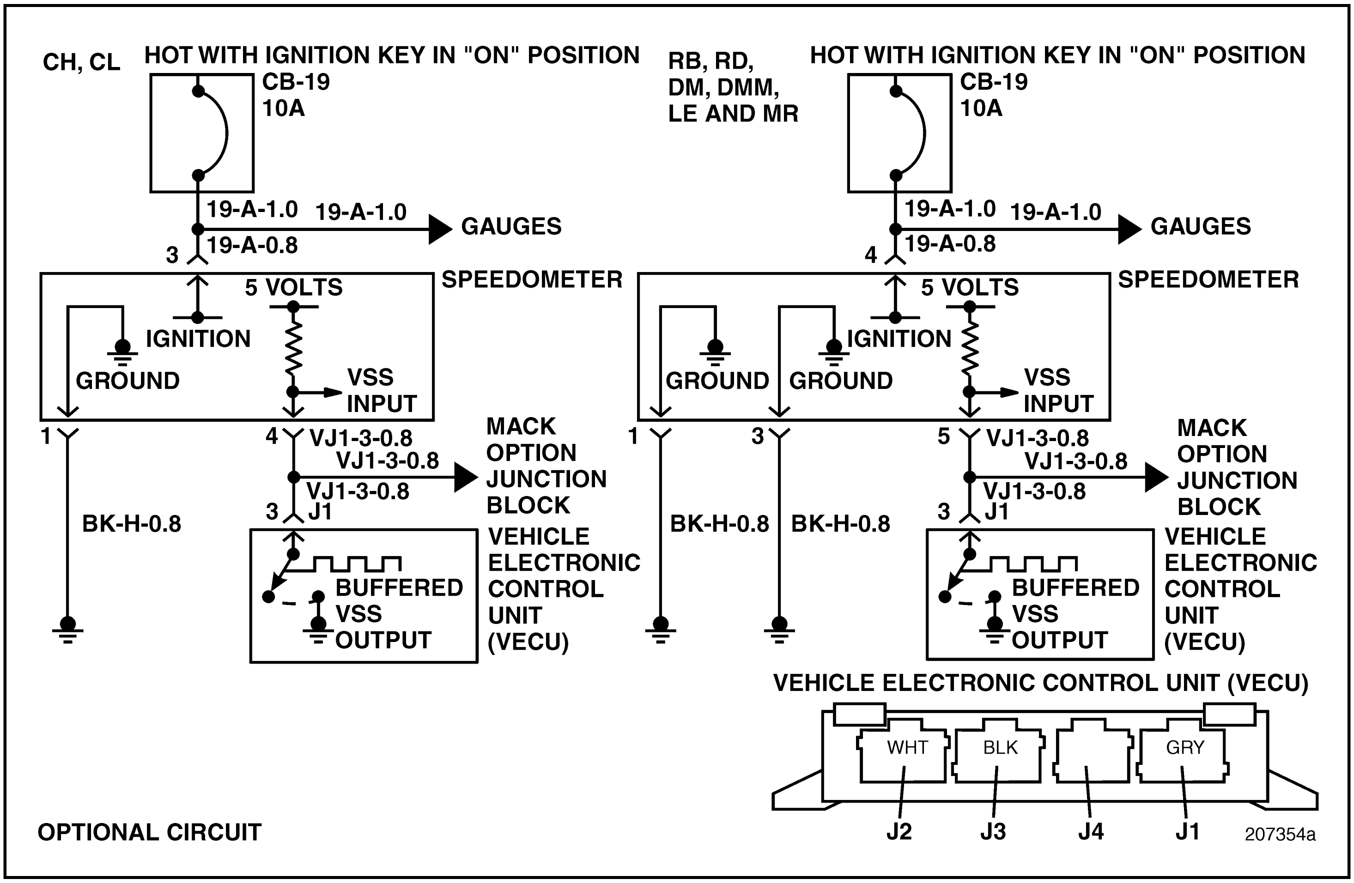


Figure 513 — Optional Speedometer Drive Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

NOTE

This circuit is not used on vehicles equipped with electronic gauge clusters.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S7

Message Identification (MID): 142

Circuit Description: When the vehicle is moving, the transmission output shaft gear teeth rotate past the Vehicle Speed Sensor tip and the sensor generates a series of voltage pulses. The Vehicle Electronic Control Unit (VECU) monitors the frequency of the VSS signal and calculates the vehicle speed. The VECU also buffers the VSS signal and sends the speed signal to the Speedometer from VECU connector J1 pin 3. The Speedometer uses the VECU speed signal to drive the speedometer pointer.

Code Setting Conditions: If the Vehicle Electronic Control Unit (VECU) detects that the vehicle speed output circuit voltage has fallen to less than 0.5 volts for more than two seconds, indicating an open or short to ground, code 4-7 will set with an FMI of 4. Code 4-7 will set with an FMI of 3, indicating a short to voltage, if the Vehicle Electronic Control Unit (VECU) detects that the vehicle speed output circuit voltage is greater than 5 volts for more than two seconds. The Electronic Malfunction Lamp (EML) will light if code 4-7 is active. Code 4-7 will become inactive if the Vehicle Speed (MPH) Sensor (VSS) output voltage returns to between 0.5 and 5 volts for more than two seconds.

Additional Symptoms: Speedometer inoperative.

Test 1 — Check for Code 4-7

1. Verify that code 4-7 is set.

   If code 4-7 is set, go to test "Test 2 — Checking for an External Fault" on page 392.

   If code 4-7 is not set, wiggle the harness and wires to try and set the code.

Test 2 — Checking for an External Fault

1. Turn the ignition switch OFF.
2. Disconnect all optional equipment using the MPH external tie point at the Mack Option Junction Block located near the accessory bus.
3. Test drive the vehicle.

   If the speedometer still does NOT work, go to test "Test 4 — Checking Speedometer Supply Voltage" on page 392.

   If the speedometer is now working, there is a short in an optional equipment component or related harness. Locate and repair the short circuit.

Test 4 — Checking Speedometer Supply Voltage

1. Turn the ignition key OFF.
2. Disconnect the speedometer connector.
3. Check for continuity between the pin in the following chart and a good ground.

Model	Speedometer Connector (harness side pin number)
CL	1
RB, RD, DM, MR, LE	1 and 3

4. Turn the ignition key ON.
5. Measure the voltage between the pin in the following chart and a good ground.

Model	Speedometer Connector (harness side pin number)
CL	3
RB, RD, DM, MR, LE	4

   If battery voltage and ground are present on the appropriate pins, go to test "Test 8 — Checking Code 4-7 Failure Mode Identifier (FMI)" on page 392.

   If battery voltage and/or ground is not present, repair the suspect supply and/or ground circuit.

Test 8 — Checking Code 4-7 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high), go to test "Test 16 — Checking for Voltage on the Buffered MPH Line in the Harness" on page 393.

   If the FMI is 4 (voltage low), go to test "Test 17 — Checking for a Short to Ground" on page 393.

Test 16 — Checking for Voltage on the Buffered MPH Line in the Harness

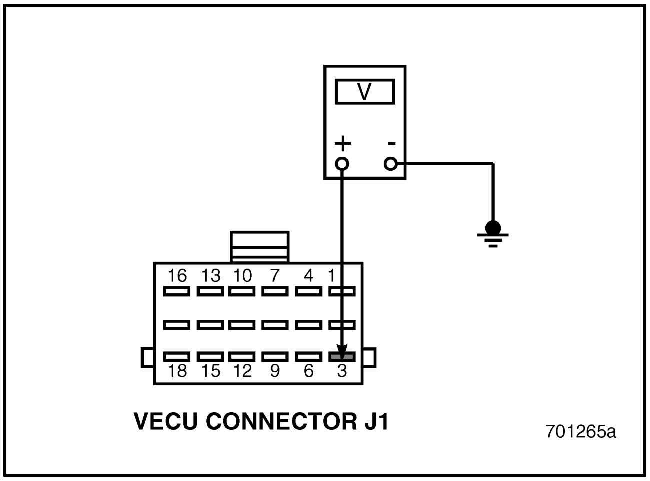


Figure 514

1. Turn the ignition switch OFF.
2. Disconnect the speedometer connector.
3. Disconnect Vehicle Control Unit (VECU) connector J1.
4. Turn the ignition switch ON.
5. Measure the voltage between VECU connector J1 pin 3 and a good ground (see Figure 514).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking for a Pin to Pin Short Circuit in the Harness” on page 394.

   If the measured voltage is greater than 0.5 volts, go to test “Test 33 — Isolating the Short Circuit to Voltage” on page 394.

Test 17 — Checking for a Short to Ground

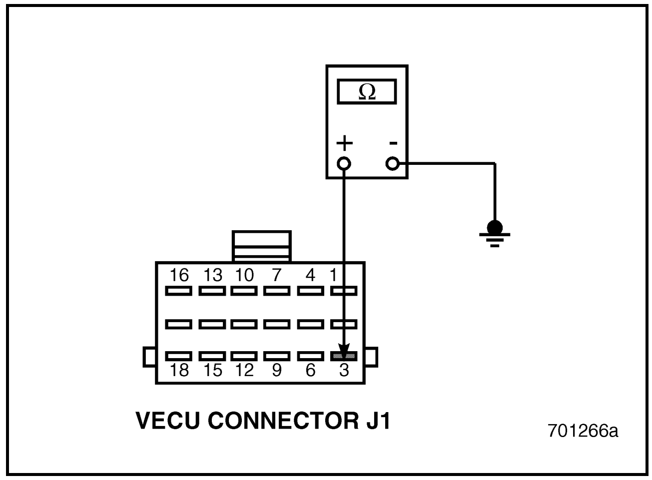


Figure 515

1. Turn the ignition switch OFF.
2. Disconnect the speedometer connector.
3. Disconnect VECU connector J1.
4. Check for continuity between VECU connector J1 pin 3 and a good ground (see Figure 515).

   If continuity exists, go to test “Test 34 — Isolating the Short Circuit to Ground” on page 395.

   If there is NO continuity, go to test “Test 35 — Checking for a Pin to Pin Short Circuit in the Harness” on page 395.

Test 32 — Checking for a Pin to Pin Short Circuit in the Harness

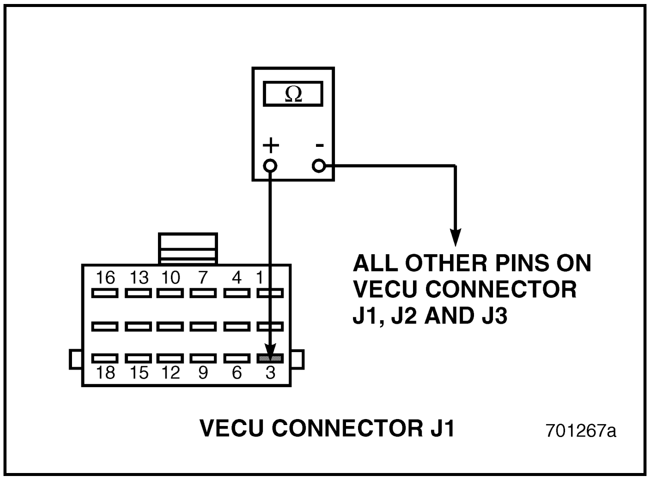


Figure 516

1. Turn the ignition switch OFF.
2. Disconnect the speedometer connector.
3. Disconnect any optional equipment using the MPH external tie point at the Mack Option Junction Block.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between VECU connector J1 pin 3 and all other pins on VECU connectors J1, J2 and J3 (see Figure 516).

   If continuity exists, pin 3 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 64 — Checking for Proper Voltage to the Speedometer When the Engine is Running” on page 396.

Test 33 — Isolating the Short Circuit to Voltage

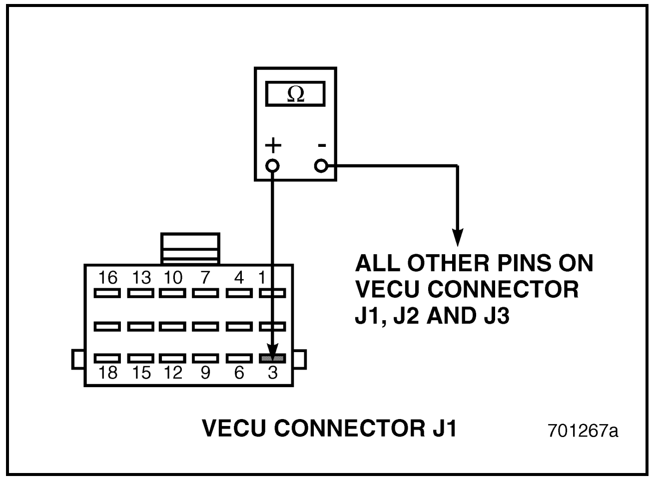


Figure 517

1. Turn the ignition switch OFF.
2. Disconnect the speedometer connector.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J1 pin 3 and all other pins on VECU connectors J1, J2 and J3 (see Figure 517).

   If continuity exists, pin 3 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the short circuit to voltage is somewhere else in the harness. Locate and repair the short circuit.

Test 34 — Isolating the Short Circuit to Ground

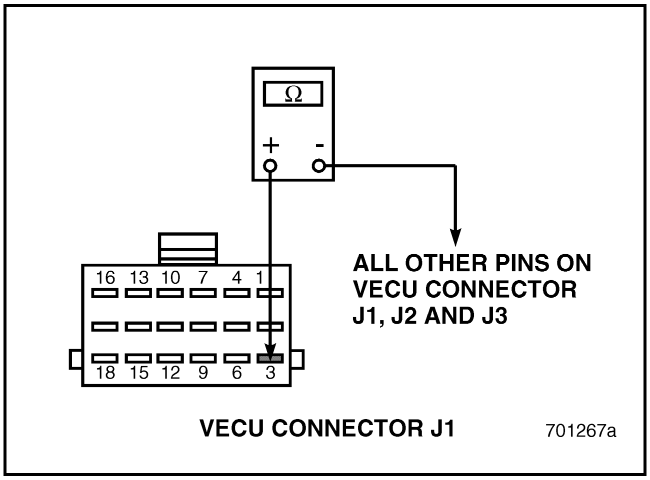


Figure 518

1. Turn the ignition switch OFF.
2. Disconnect the speedometer connector.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J1 pin 3 and all other pins on VECU connectors J1, J2 and J3 (see Figure 518).

   If continuity exists, pin 3 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, pin 3 is shorted to ground somewhere else in the harness. Locate and repair the short circuit.

Test 35 — Checking for a Pin to Pin Short Circuit in the Harness

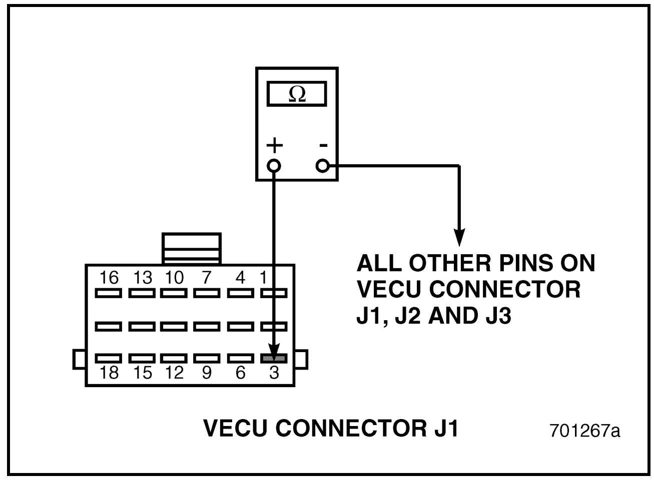


Figure 519

1. Turn the ignition switch OFF.
2. Disconnect the speedometer connector.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J1 pin 3 and all other pins on VECU connectors J1, J2 and J3 (see Figure 519).

   If continuity exists, pin 3 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 70 — Checking for an Open Circuit in the Harness" on page 396.

Test 64 — Checking for Proper Voltage to the Speedometer When the Engine is Running

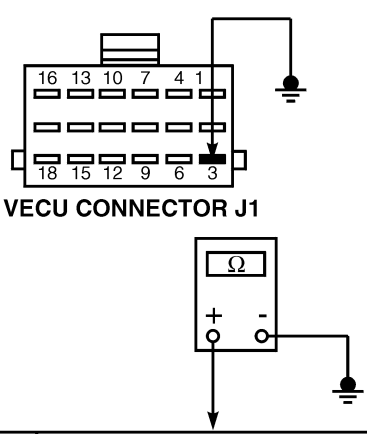
1. Turn the ignition switch OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Disconnect the speedometer connector.
4. Start and run the engine.
5. While the vehicle is being driven above 10 MPH, measure the voltage between the pin shown in the following chart and a good ground.

Model	Speedometer Connector (harness side pin number)
CL	4
RB, RD, DM, MR, LE	5

If the measured voltage is between 1.75 and 3.25 volts, go to test "Test 128 — Checking for Blink Code 4-7" on page 396.

If the measured voltage is NOT within this range, go to test "Test 129 — Checking for Blink Code 4-7" on page 396.

Test 70 — Checking for an Open Circuit in the Harness



MODEL	SPEEDOMETER CONNECTOR (HARNESS SIDE PIN NUMBER)
CH, CL	4
RB, RD, DM, DMM, MR, LE	5

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Figure 520

1. Turn the ignition switch OFF.
2. Disconnect the speedometer connector.
3. Disconnect VECU connector J1.
4. Connect a jumper between VECU connector J1 pin 3 and a good ground (see Figure 520).
5. Check for continuity between the pin shown in Figure 520 and a good ground.

   If continuity exists, go to test "Test 140 — Checking for Proper Voltage to the Speedometer When the Engine is Running" on page 397.

   If there is NO continuity, the buffered MPH line is open in the harness. Locate and repair the open circuit.

Test 128 — Checking for Blink Code 4-7

1. Turn the ignition switch OFF.
2. Connect VECU connector J1.
3. Replace the speedometer with a known good speedometer.
4. Test drive the vehicle.

   If blink code 4-7 is still active, re-install the old speedometer and replace the VECU and retest the system.

   If blink code 4-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 129 — Checking for Blink Code 4-7

1. Turn the ignition switch OFF.
2. Connect the speedometer connector.
3. Connect connectors J1, J2 and J3 to the VECU.
4. Turn the ignition switch ON.

   If blink code 4-7 is still active, check the VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 4-7 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 140 — Checking for Proper Voltage to the Speedometer When the Engine is Running

1. Turn the ignition switch OFF.
2. Connect VECU connector J1.
3. Disconnect the speedometer connector.
4. Start the engine.
5. While the vehicle is being driven above 10 MPH, measure the voltage between the pin shown in the following chart and a good ground.

Model	Speedometer Connector (harness side pin number)
CL	4
RB, RD, DM, MR, LE	5

If the measured voltage is between 1.75 and 3.25 volts, go to test “Test 280 — Checking for Blink Code 4-7” on page 397.

If the measured voltage is NOT within this range, go to test “Test 281 — Checking VECU Connector for an Open Circuit” on page 397.

Test 280 — Checking for Blink Code 4-7

1. Turn the ignition switch OFF.
2. Connect VECU connector J1.
3. Replace the speedometer with a known good speedometer.
4. Test drive the vehicle.

   If blink code 4-7 is still active, re-install the old speedometer, then replace the VECU and retest the system.

   If blink code 4-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 281 — Checking VECU Connector for an Open Circuit

1. Visually inspect VECU connector J1 pin 3 for dirt, loose pin or deformed contacts.
2. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J1 pin 3. Gently push the test lead into harness connector terminal and check for looseness.

   If a repairable open is found or the terminal feels loose, repair or replace VECU harness connector J1.

   If the test lead is making good contact with VECU connector J1 pin 3, go to test “Test 562 — Checking for Blink Code 4-7” on page 397.

Test 562 — Checking for Blink Code 4-7

1. Turn the ignition switch OFF.
2. Connect VECU connector J1, J2 and J3.
3. Connect the speedometer connector.
4. Turn the ignition key ON.

   If blink code 4-7 is still active, replace the VECU and retest the system.

   If blink code 4-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 4-8 — CUSTOM DEFINED STATEMENT FAULT

Failure Mode Identifier (FMI): 0 (Above Normal), 1 (Below Normal), 8 (Abnormal Frequency)

Parameter Identification (PID): S151

Message Identification (MID): 142

Code Setting Conditions: The Vehicle Electronic Control Unit (VECU) can be programmed to log a Custom Defined Statement (CDS) fault; blink code 4-8. The purpose of the CDS fault code is to allow fleet owners to monitor a particular vehicle event without scrolling through the entire DataMax log table. Blink code 4-8 does not imply a problem with the vehicle's electrical system.

Test 1 — Checking for Code 4-8

1. Verify that code 4-8 has been logged in the Vehicle Electronic Control Unit (VECU) fault tables.

   If code 4-8 has been logged, notify the vehicle owner or fleet service group of the number of occurrences at each FMI, and clear the code.

BLINK CODE 4-9 — EGR VALVE MECHANISM (ASET™ CEGR ENGINE)

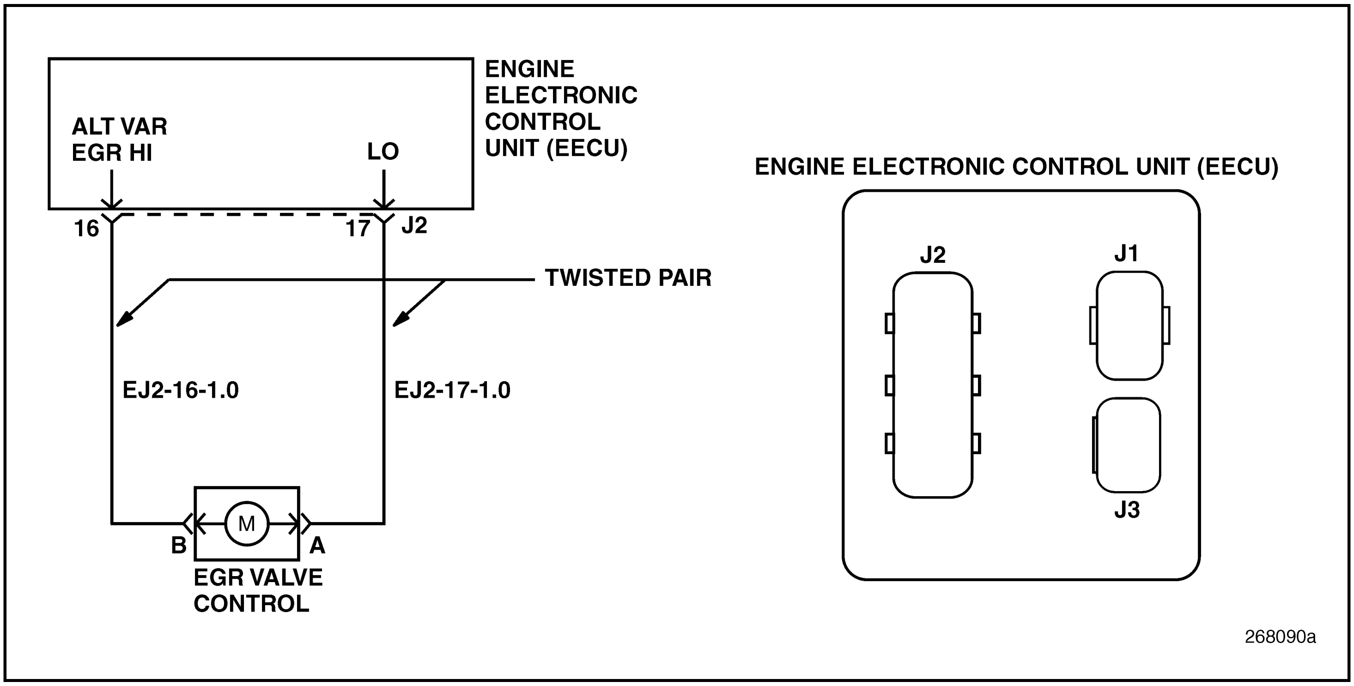


Figure 521 — EGR Control Valve Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 2 (Data Erratic), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), or 7 (Not Within an Acceptable Range)

Parameter Identification (PID): 146

Message Identification (MID): 128

Circuit Description: The EGR Valve operation is controlled by the Engine Electronic Control Unit (EECU) using output transistor drivers that provide the power and ground circuits.

Location: The EGR Valve is located on the right side of the engine, on the exhaust manifold, near the turbocharger.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) detects an open, short to ground or short to voltage while attempting to operate the EGR valve, the Electronic Malfunction Lamp (EML) will turn ON and blink code 4-9 will set. Code 4-9 will also set if EGR flow is not within the proper range for the current engine operating conditions.

NOTE

If the Engine Electronic Control Unit (EECU) detects a short circuit to ground in the EGR control valve high side drive circuit, the EECU will turn off the high side drive and the drive will remain OFF until the key is cycled. As a result, code 4-9 with FMI 4 may not be seen as active. A short circuit to ground in the high side drive may also generate a code 4-9 with FMI 7.

Test 1 — Checking for Code 4-9

1. Check that code 4-9 is set.

   If code 4-9 is set, go to test “Test 2 — Checking the Failure Mode Indicator (FMI)” on page 400.

   If code 4-9 is NOT set, wiggle the harness connectors to try to set the code. Visually inspect the EGR connector and terminals for frayed, loose or corroded connections.

NOTE

If code 4-9 is logged with FMI 7, the code may not be seen active in the workshop. If possible, run the vehicle on a chassis dynamometer while flexing the wiring harness and moving the harness connectors. Listen for the EGR control valve to click on or off indicating an intermittent open or short circuit.

Test 2 — Checking the Failure Mode Indicator (FMI)

1. Check the blink code 4-9 FMI using a diagnostic computer.

   If the FMI is 2, 3, 4 or 5, go to test "Test 4 — Checking for an Open EGR Control Valve" on page 400.

   If the FMI is 7, go to test "Test 5 — Checking the EGR Flow" on page 400.

Test 4 — Checking for an Open EGR Control Valve

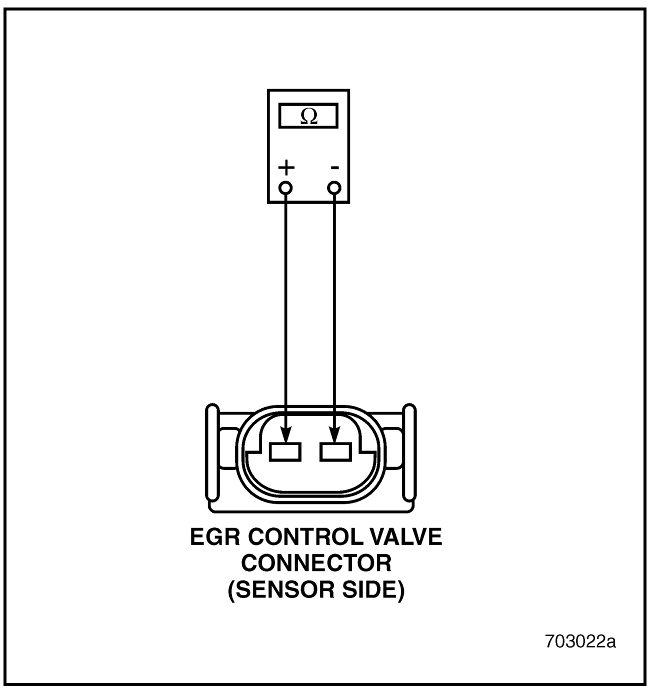


Figure 522

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connector from the EGR control valve.
3. Check for continuity between the pins on the EGR control valve (see Figure 522).

   If continuity exists, go to test "Test 8 — Checking for a Short to Ground in the EGR Control Valve" on page 401.

   If there is NO continuity at the EGR control valve, the solenoid is open and must be replaced.

Test 5 — Checking the EGR Flow

1. Start the engine and allow it to idle.
2. Road test the vehicle, operating in the full range of loads and engine speeds.
3. Use the Advanced Diagnostics screen of the Mack Diagnostics Software to monitor EGR flow while the EECU is requesting the EGR valve to open.

   If the measured EGR flow is more than 5-10 lbs/min less than the target value, go to test "Test 10 — Checking EGR Valve Operation" on page 401.

   If the measured EGR flow is more than 5-10 lbs/min greater than the target value, go to test "Test 11 — Checking EGR Valve Operation at Idle" on page 401.

Test 8 — Checking for a Short to Ground in the EGR Control Valve

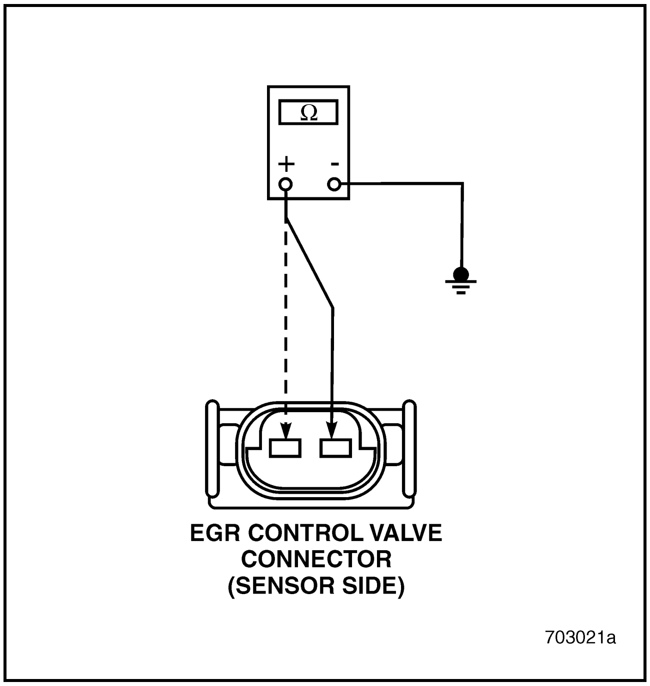


Figure 523

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connector from the EGR Control Valve.
3. Check for continuity from either pin on the EGR Control Valve to a good ground (see Figure 523).

   If there is NO continuity at the EGR Control Valve, go to test "Test 16 — Checking for a Short to Ground at the EGR Control Valve Harness Connector" on page 402.

   If continuity exists, the EGR Control Valve is shorted to ground and must be replaced.

Test 10 — Checking EGR Valve Operation

1. Shut down the engine.
2. Observe the EGR valve shaft while an assistant starts the engine. The shaft should move from left to right when the EECU requests EGR.

   If the EGR valve opens when the EECU requests EGR, go to test "Test 20 — Checking for Other Codes" on page 402.

   If the EGR valve does NOT open when the EECU requests EGR, go to test "Test 21 — Checking for Oil Pressure to the EGR Valve" on page 402.

Test 11 — Checking EGR Valve Operation at Idle

1. Start the engine and allow it to idle.
2. Use the Advanced Diagnostics screen of the Mack Diagnostics Software to monitor the EGR valve position command.

   If the EGR valve is OFF at idle, go to test "Test 22 — Checking Boost Pressure at Road Speed" on page 403.

   If the EGR valve is ON at idle, go to test "Test 23 — Checking for Debris in the EGR Valve" on page 403.

Test 16 — Checking for a Short to Ground at the EGR Control Valve Harness Connector

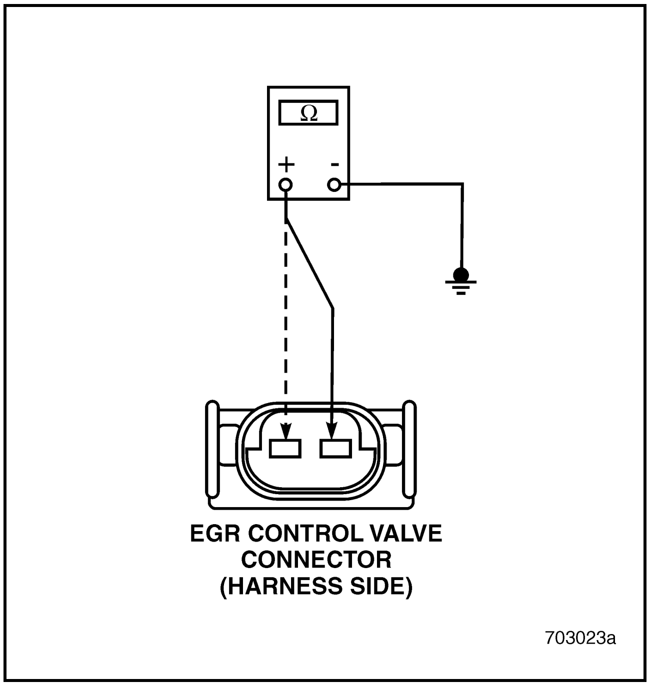


Figure 524

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from the EGR Control Valve.
4. Check for continuity between the two pins of the EGR Control Valve harness connector and a good ground (see Figure 524).

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 32 — Checking for an Open Circuit in the EGR Control Valve High Side Drive” on page 403.

Test 20 — Checking for Other Codes

1. Check to see whether blink code 5-8 or 5-9 are also set.

   If code 5-8 or 5-9 are set, diagnose and repair the cause of these codes first, then retest the system to ensure blink code 4-9 is no longer active.

   If code 5-8 or 5-9 are NOT set, go to test “Test 40 — Checking the Turbocharger Vane Position” on page 404.

Test 21 — Checking for Oil Pressure to the EGR Valve

1. Turn the ignition key OFF.
2. Connect an oil pressure gauge to the EGR valve oil supply line.
3. Plug the open oil port.
4. Start the engine and allow it to idle.

   If the oil pressure at the supply line is roughly equal to system pressure, go to test “Test 42 — Checking for a Short to Ground at the EGR Control Valve Harness Connector” on page 404.
5. If the oil pressure at the supply line is significantly less than system pressure, there is an obstruction in the oil supply line. Locate and repair the cause of the low oil pressure.

Test 22 — Checking Boost Pressure at Road Speed

1. Road test the vehicle.
2. Verify that EGR flow varies with changes in engine speed and load.

   If EGR is flowing but does not vary with changes in engine speed and load, replace the EGR Mass Flow Sensor assembly and retest the system.
3. Monitor the boost pressure while operating the vehicle at the rated engine speed and under full load.

   If the boost pressure reaches 32-35 psi at 100% load, go to test “Test 44 — Checking the EGR Mass Flow Sensor Assembly” on page 404.

   If 32 psi of boost pressure cannot be achieved at 100% load, go to test “Test 45 — Checking for Boost and EGR Leaks” on page 404.

Test 23 — Checking for Debris in the EGR Valve

1. Start the engine and allow it to idle.
2. With the EGR control valve ON, disconnect the harness connector.

   If the EGR valve remains open (high flow and the actuator shaft moved to the right), go to test “Test 46 — Checking for Debris in the EGR Valve” on page 405.

   If the EGR valve closes (no flow and the actuator shaft moved to the left), go to test “Test 47 — Checking Turbocharger Wheel Speed” on page 405.

Test 32 — Checking for an Open Circuit in the EGR Control Valve High Side Drive

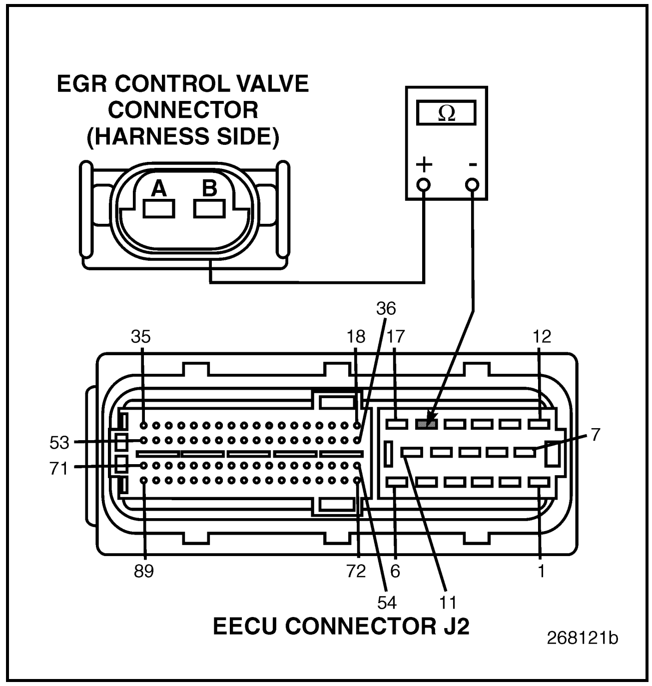


Figure 525

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from the EGR Control Valve.
4. Check for continuity between EECU harness connector J2 pin 16 and pin B at the EGR Control Valve connector (see Figure 525).

   If there is NO continuity, repair the open in circuit EJ2-16-1.0.

   If continuity exists, go to test “Test 64 — Checking for an Open Circuit in the EGR Control Valve Low Side Drive” on page 405.

Test 40 — Checking the Turbocharger Vane Position

1. Start the engine and allow it to idle.
2. With the chassis air pressure at approximately 110 psi, observe the turbocharger vane position.

   If the turbocharger vanes are near the closed position, go to test “Test 80 — Checking for Intake and EGR Leaks” on page 406.

   If the turbocharger vanes are NOT near the closed position, refer to blink code 4-5 for VTG turbocharger diagnostics.

Test 42 — Checking for a Short to Ground at the EGR Control Valve Harness Connector

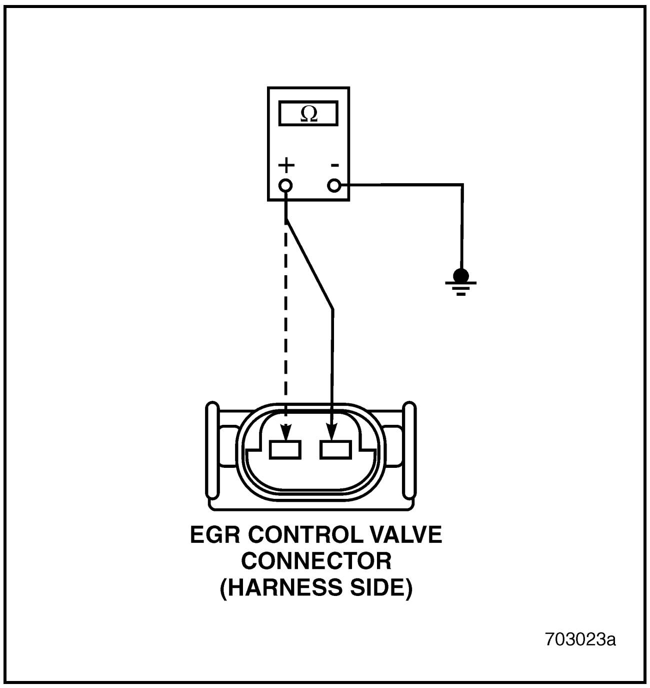


Figure 526

1. Turn the ignition key OFF.
2. Disconnect connectors J2 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from the EGR Control Valve.
4. Check for continuity between each pin of the EGR Control Valve harness connector versus a good ground (see Figure 526).

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 84 — Checking for a Short to Voltage in the EGR Control Valve High Side Drive Circuit” on page 406.

Test 44 — Checking the EGR Mass Flow Sensor Assembly

1. Turn the ignition key OFF.
2. Replace the EGR Mass Flow Sensor assembly with a known good unit.
3. Road test the vehicle and retest the system.

   If code 4-9 becomes active, reinstall the original EGR Mass Flow Sensor assembly and replace the EECU.

   If code 4-9 does NOT become active, replacing the EGR Mass Flow Sensor assembly corrected the problem. Check all connectors to ensure proper connections.

Test 45 — Checking for Boost and EGR Leaks

1. Turn the ignition key OFF.
2. Visually inspect the EGR system for leaks. Leaks are often indicated by soot or carbon marks at joints or connections.

   If any leaks are apparent, repair or replace the faulty component and retest the system.

   If there are NO apparent leaks, go to test “Test 90 — Pressure Testing the System” on page 406.

Test 46 — Checking for Debris in the EGR Valve

1. Start the engine and allow it to idle.
2. With the EECU requesting EGR flow, disconnect and connect the EGR valve harness connector several times.
3. Road test the vehicle, operating in the full range of loads and engine speeds.

   If blink code 4-9 becomes active, go to test "Test 92 — Checking the Engine Electronic Control Unit (EECU)" on page 407.

   If blink code 4-9 does NOT become active, disconnecting and reconnecting the EGR control valve dislodged debris from the valve.

Test 47 — Checking Turbocharger Wheel Speed

1. Start the engine and allow it to idle.
2. Monitor the turbocharger wheel speed.

   If the turbocharger wheel speed is greater than 12,000 rpm, go to test "Test 94 — Checking for Other Codes" on page 407.

   If the turbocharger wheel speed is less than approximately 12,000 rpm, go to test "Test 95 — Checking for Valid Boost Pressure" on page 407.

Test 64 — Checking for an Open Circuit in the EGR Control Valve Low Side Drive

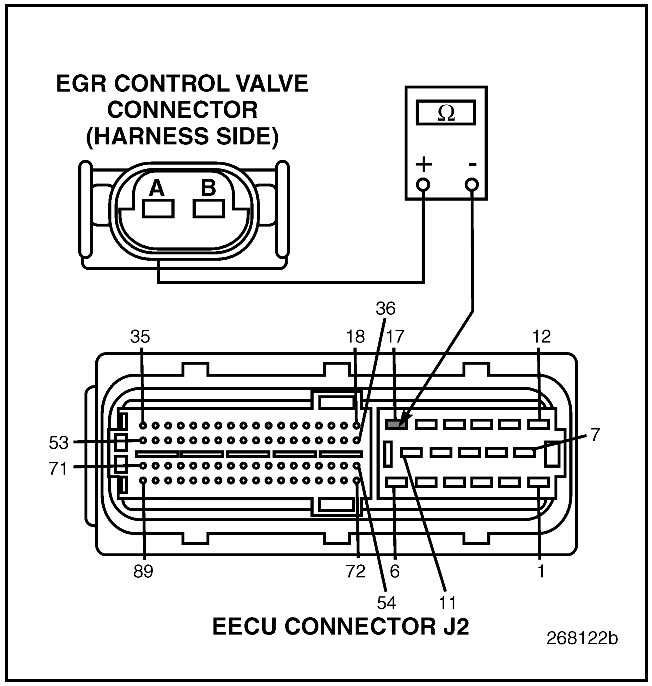


Figure 527

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the EGR Control Valve electrical connector.
4. Check for continuity between EECU harness connector J2 pin 17 and pin A at the EGR Control Valve connector (see Figure 527).

   If there is NO continuity, repair the open in circuit EJ2-17-1.0.

   If continuity exists, go to test "Test 128 — Checking for a Short to Voltage in the EGR Control Valve High Side Drive Circuit" on page 407.

Test 80 — Checking for Intake and EGR Leaks

1. Turn the ignition key OFF.
2. Visually inspect the air induction system between the turbocharger and in intake manifold for leaks. Pay special attention to sensors, fittings, seams and connections.
3. Visually inspect the EGR system for leaks. If any leaks are located, repair or replace the damaged component.

   If there are NO leaks, go to test “Test 160 — Pressure Testing the System” on page 408.

Test 84 — Checking for a Short to Voltage in the EGR Control Valve High Side Drive Circuit

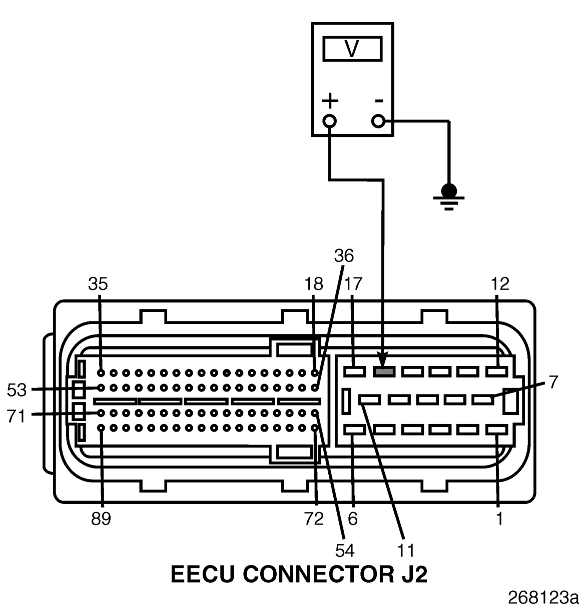


Figure 528

1. Turn the ignition key OFF.
2. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 16 and a good ground (see Figure 528).

   If voltage is present, the high side drive circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test “Test 168 — Checking for a Short to Voltage in the EGR Control Valve Low Side Drive Circuit” on page 408.

Test 90 — Pressure Testing the System

1. Turn the ignition key OFF.
2. Allow the engine to cool to room temperature.
3. Disconnect the exhaust pipe from the turbocharger and securely cap the turbocharger outlet.
4. Disconnect the intake pipe from the turbocharger and securely cap the turbocharger inlet.
5. Use a regulated compressed air source to pressurize the system to approximately 15 psi.
6. Listen and feel for air leaks along the entire length of the EGR and intake system. Leaks are often indicated by soot or carbon marks at joints or connections.

   If any leaks are apparent, repair or replace the faulty component and retest the system.

   If there are NO apparent leaks, go to test “Test 180 — Checking the VTG Turbocharger Calibration” on page 409.

Test 92 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Disconnect connector J2 from the EECU.
3. Visually inspect EECU connector J2 for dirt, loose pins, or deformed contacts.

   If a terminal feels loose or damaged, repair the connector.

   If all the terminals appear to make good contact, go to test “Test 184 — Checking the EGR Control Valve” on page 409.

Test 94 — Checking for Other Codes

1. Check to see whether blink code 5-8 or 5-9 are also set.

   If code 5-8 or 5-9 are set, diagnose and repair the cause of these codes first, then retest the system to ensure blink code 4-9 is no longer active.

   If code 5-8 or 5-9 are NOT set, go to test “Test 188 — Checking the Engine Electronic Control Unit (EECU)” on page 409.

Test 95 — Checking for Valid Boost Pressure

1. Turn the ignition key OFF.
2. Turn the ignition key ON, and monitor the boost pressure.

   If the boost pressure reads more than 0.5 psi with the engine shut down, contact Mack Trucks Service Engineering to ensure the proper EECU data file is installed.

   If the boost pressure reads less than 0.5 psi, go to test “Test 190 — Pressure Testing the System” on page 409.

Test 128 — Checking for a Short to Voltage in the EGR Control Valve High Side Drive Circuit

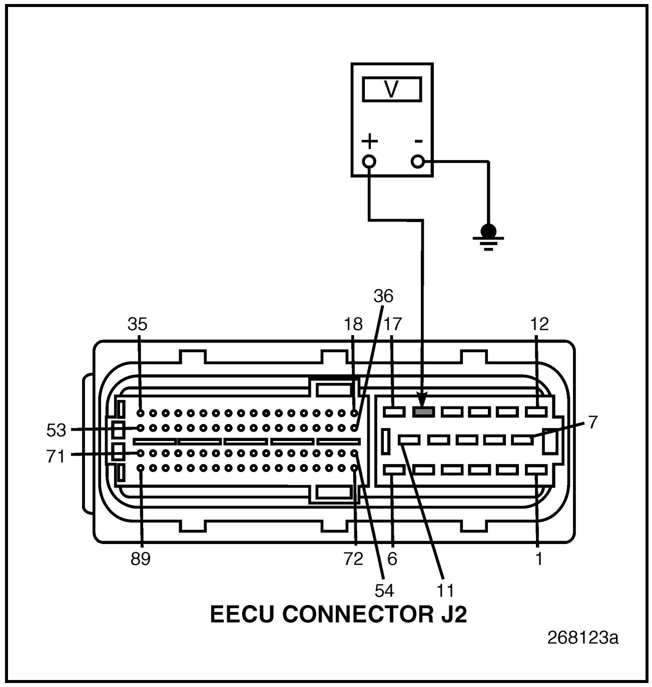


Figure 529

1. Turn the ignition key OFF.
2. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 16 and a good ground (see Figure 529).

   If voltage is present, the high side drive circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test “Test 256 — Checking for a Short to Voltage in the EGR Control Valve Low Side Drive Circuit” on page 410.

Test 160 — Pressure Testing the System

1. Turn the ignition key OFF.
2. Allow the engine to cool to room temperature.
3. Disconnect the exhaust pipe from the turbocharger and securely cap the turbocharger outlet.
4. Disconnect the intake pipe from the turbocharger and securely cap the turbocharger inlet.
5. Use a regulated compressed air source to pressurize the system to approximately 15 psi.
6. Listen and feel for air leaks along the entire length of the EGR and intake system. Leaks are often indicated by soot or carbon marks at joints or connections.

   If any leaks are apparent, repair or replace the faulty component and retest the system.

   If there are NO apparent leaks, go to test "Test 320 — Checking for a Clogged EGR Valve" on page 410.

Test 168 — Checking for a Short to Voltage in the EGR Control Valve Low Side Drive Circuit

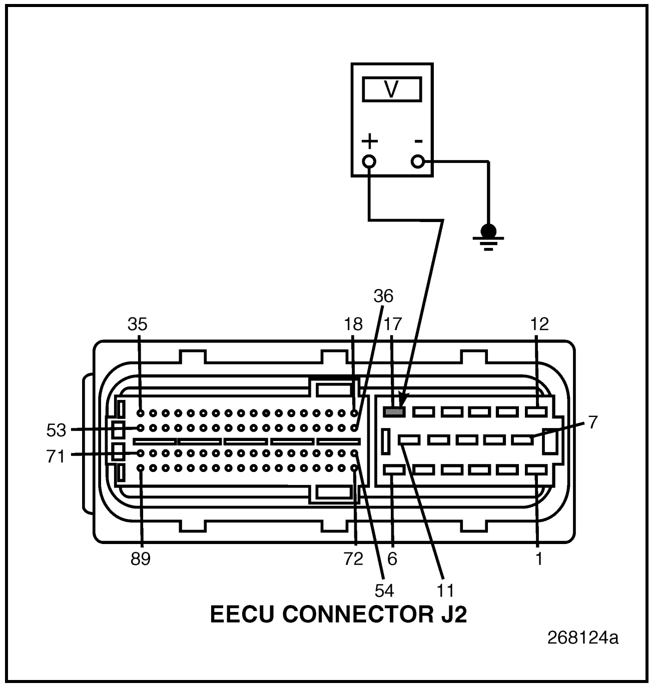


Figure 530

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between the EECU connector J2 pin 17 and a good ground (see Figure 530).

   If voltage is present, the low side drive circuit is shorted to voltage. Locate and repair the short circuit.

   If voltage is NOT present, go to test "Test 336 — Checking the EGR Valve" on page 410.

Test 180 — Checking the VTG Turbocharger Calibration

1. Restore all connections to the turbocharger.
2. Perform the VTG calibration procedure as outlined in the V-MAC Support Software User Guide.
3. Road test the vehicle, operating in the full range of loads and engine speeds.
4. Check to see whether code 4-9 becomes active.

   If code 4-9 becomes active, go to test "Test 360 — Checking the Boost Pressure Relief Valve" on page 410.

   If code 4-9 does NOT become active, calibrating the VTG turbocharger corrected the problem.

Test 184 — Checking the EGR Control Valve

1. Replace the EGR control valve.
2. Road test the vehicle, operating in the full range of loads and engine speeds.

   If blink code 4-9 becomes active, reinstall the original EGR control valve and replace the EECU.

   If blink code 4-9 does NOT become active, replacing the EGR control valve corrected the problem.

Test 188 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Disconnect connector J2 from the EECU.
3. Visually inspect EECU connector J2 for dirt, loose pins, or deformed contacts.

   If a terminal feels loose or damaged, repair the connector.

   If all the terminals appear to make good contact, go to test "Test 376 — Checking the EGR Valve" on page 411.

Test 190 — Pressure Testing the System

1. Turn the ignition key OFF.
2. Allow the engine to cool to room temperature.
3. Disconnect the exhaust pipe from the turbocharger and securely cap the turbocharger outlet.
4. Disconnect the intake pipe from the turbocharger and securely cap the turbocharger inlet.
5. Use a regulated compressed air source to pressurize the system to approximately 15 psi.
6. Listen and feel for air leaks along the entire length of the EGR and intake system. Leaks are often indicated by soot or carbon marks at joints or connections.

   If any leaks are apparent, repair or replace the faulty component and retest the system.

   If there are NO apparent leaks, go to test "Test 380 — Checking for Debris in the EGR Valve" on page 411.

Test 256 — Checking for a Short to Voltage in the EGR Control Valve Low Side Drive Circuit

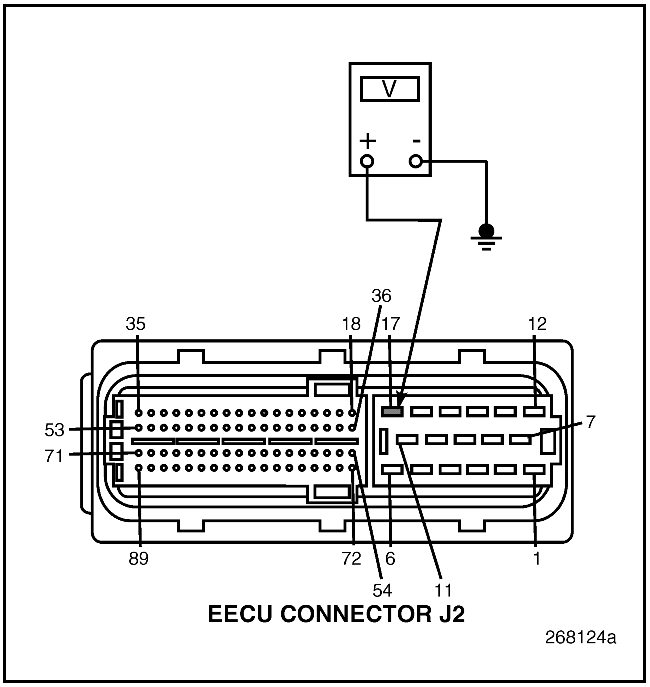


Figure 531

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between the EECU connector J2 pin 17 and a good ground (see Figure 531).

   If voltage is present, the low side drive circuit is shorted to voltage. Locate and repair the short circuit.

   If voltage is NOT present, go to test “Test 512 — Checking for a Short in the EGR Control Valve High Side Drive” on page 411.

Test 320 — Checking for a Clogged EGR Valve

1. Remove the EGR valve from the engine.
2. Visually inspect the exhaust ports inside the EGR valve for carbon deposits that could reduce EGR flow.

   If excessive carbon deposits are present, replace the EGR valve.

   If excessive carbon deposits are NOT found, reinstall the EGR valve and go to test “Test 640 — Checking the EGR Mass Flow Sensor Assembly” on page 412.

Test 336 — Checking the EGR Valve

1. Turn the ignition key OFF.
2. Replace the EGR valve with a known good unit and retest the system.

   If blink code 4-9 is still active, go to test “Test 672 — Checking the EGR Mass Flow Sensor Assembly” on page 412.

   If blink code 4-9 is no longer active, replacing the EGR valve solved the problem.

Test 360 — Checking the Boost Pressure Relief Valve

1. Turn the ignition key OFF.
2. Remove the Boost Pressure Relief Valve from the vehicle.
3. Use a small, blunt object to press against the relief valve diaphragm.

   If moderate resistance is felt, go to test “Test 720 — Checking the VTG Turbocharger” on page 412.

   If the diaphragm moves easily, replace the Boost Pressure Relief Valve and retest the system.

Test 376 — Checking the EGR Valve

1. Replace the EGR valve.
2. Road test the vehicle, operating in the full range of loads and engine speeds.

   If blink code 4-9 becomes active, reinstall the original EGR valve and replace the EECU.

   If blink code 4-9 does NOT become active, replacing the EGR valve corrected the problem.

Test 380 — Checking for Debris in the EGR Valve

1. Restore all connections to the turbocharger.
2. Start the engine and allow it to idle.
3. With the EECU requesting EGR flow, disconnect and connect the EGR valve harness connector several times.
4. Road test the vehicle, operating in the full range of loads and engine speeds.

   If blink code 4-9 becomes active, go to test “Test 760 — Checking the Engine Electronic Control Unit (EECU)” on page 412.

   If blink code 4-9 does NOT become active, disconnecting and reconnecting the EGR control valve dislodged debris from the valve.

Test 512 — Checking for a Short in the EGR Control Valve High Side Drive

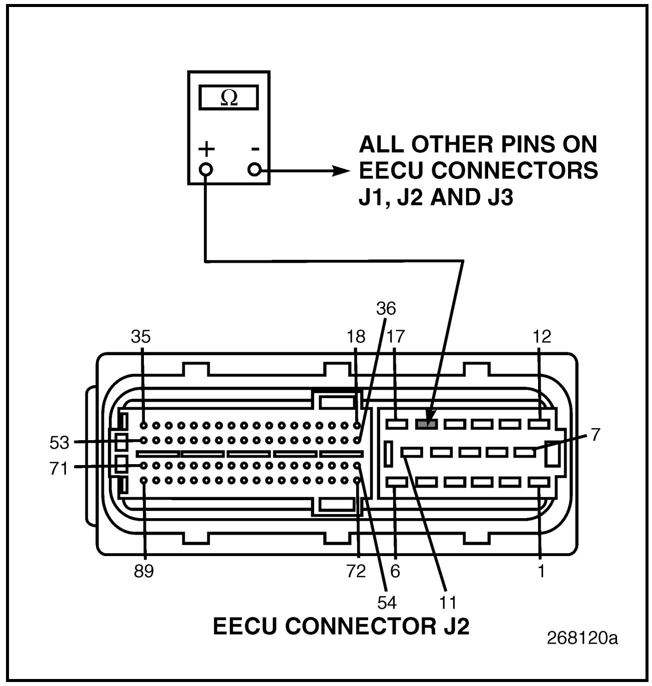


Figure 532

1. Turn the ignition key OFF.
2. Disconnect connector J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connector from the EGR Control Valve.
4. Check for continuity between EECU harness connector J2 pin 16 and all other pins on EECU connectors J1, J2 and J3 (see Figure 532).

   If there is NO continuity, go to test “Test 1024 — Checking for a Short Circuit in the EGR Control Valve Low Side Drive” on page 413.

   If continuity exists, the EGR Control Valve circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 640 — Checking the EGR Mass Flow Sensor Assembly

1. Replace the EGR Mass Flow Sensor assembly with a known good unit.
2. Restore all turbocharger connections.
3. Road test the vehicle and retest the system.

   If code 4-9 becomes active, reinstall the original EGR Mass Flow Sensor assembly and replace the EECU.

   If code 4-9 does NOT become active, replacing the EGR Mass Flow Sensor assembly corrected the problem. Check all connectors to ensure proper connections.

Test 672 — Checking the EGR Mass Flow Sensor Assembly

1. Turn the ignition key OFF.
2. Replace the EGR Mass Flow Sensor assembly with a known good unit.
3. Road test the vehicle and retest the system.

   If code 4-9 becomes active, reinstall the original EGR Mass Flow Sensor assembly and replace the EECU.

   If code 4-9 does NOT become active, replacing the EGR Mass Flow Sensor assembly corrected the problem. Check all connectors to ensure proper connections.

Test 720 — Checking the VTG Turbocharger

1. Install the Boost Pressure Relief Valve.
2. Start the engine and allow it to idle.
3. Disconnect the electrical connector from the EGR control valve.
4. Monitor the boost pressure while operating the vehicle at the rated engine speed and under full load.

   If the boost pressure reaches 32-35 psi, replace the EGR control valve and go to test “Test 1440 — Checking the EGR Valve” on page 413.

   If 32 psi of boost pressure can NOT be achieved, there is a problem with the turbocharger. Diagnose and repair the turbocharger.

Test 760 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Disconnect connector J2 from the EECU.
3. Visually inspect EECU connector J2 for dirt, loose pins, or deformed contacts.

   If a terminal feels loose or damaged, repair the connector.

   If all the terminals appear to make good contact, go to test “Test 1520 — Checking the EGR Control Valve” on page 413.

Test 1024 — Checking for a Short Circuit in the EGR Control Valve Low Side Drive

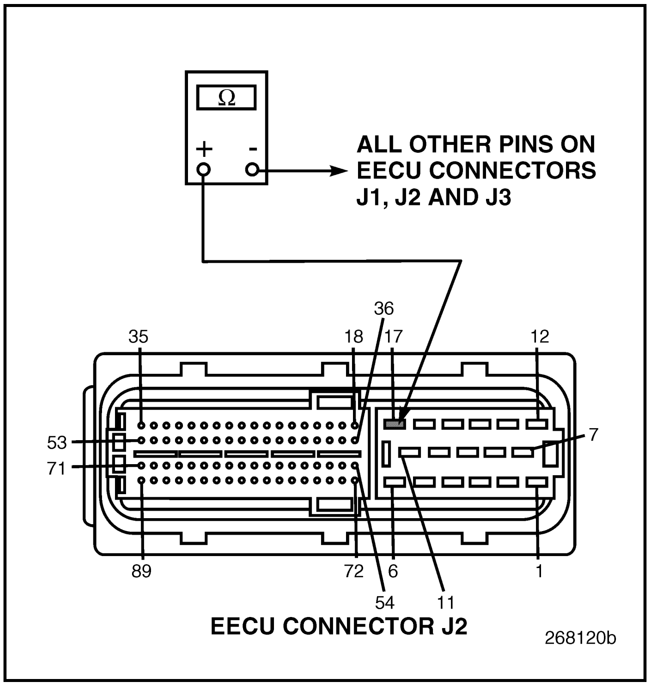


Figure 533

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connector from the EGR Control Valve.
4. Check for continuity between the EECU harness connector J2 pin 17 all other pins on EECU connectors J1, J2 and J3 (see Figure 533).

   If there is NO continuity, go to test “Test 2048 — Checking for a Short Circuit at the EECU Connector” on page 413.

   If continuity exists, the EGR Control Valve circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 1440 — Checking the EGR Valve

1. Turn the ignition key OFF.
2. Replace the EGR valve with a known good unit and retest the system.

   If blink code 4-9 is still active, reinstall the original EGR Valve and replace the EECU.

   If blink code 4-9 is no longer active, replacing the EGR valve corrected the problem.

Test 1520 — Checking the EGR Control Valve

1. Replace the EGR control valve.
2. Road test the vehicle, operating in the full range of loads and engine speeds.

   If blink code 4-9 becomes active, reinstall the original EGR valve and replace the EECU.

   If blink code 4-9 does NOT become active, replacing the EGR control valve corrected the problem.

Test 2048 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the EECU.
3. Visually inspect EECU connectors J1, J2 and J3 for dirt, loose pins or deformed contacts.
4. If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact, replace the EECU and retest the system.

BLINK CODE 4-10 — PARALLEL FAN CIRCUIT (ASET™ IEGR ENGINE)

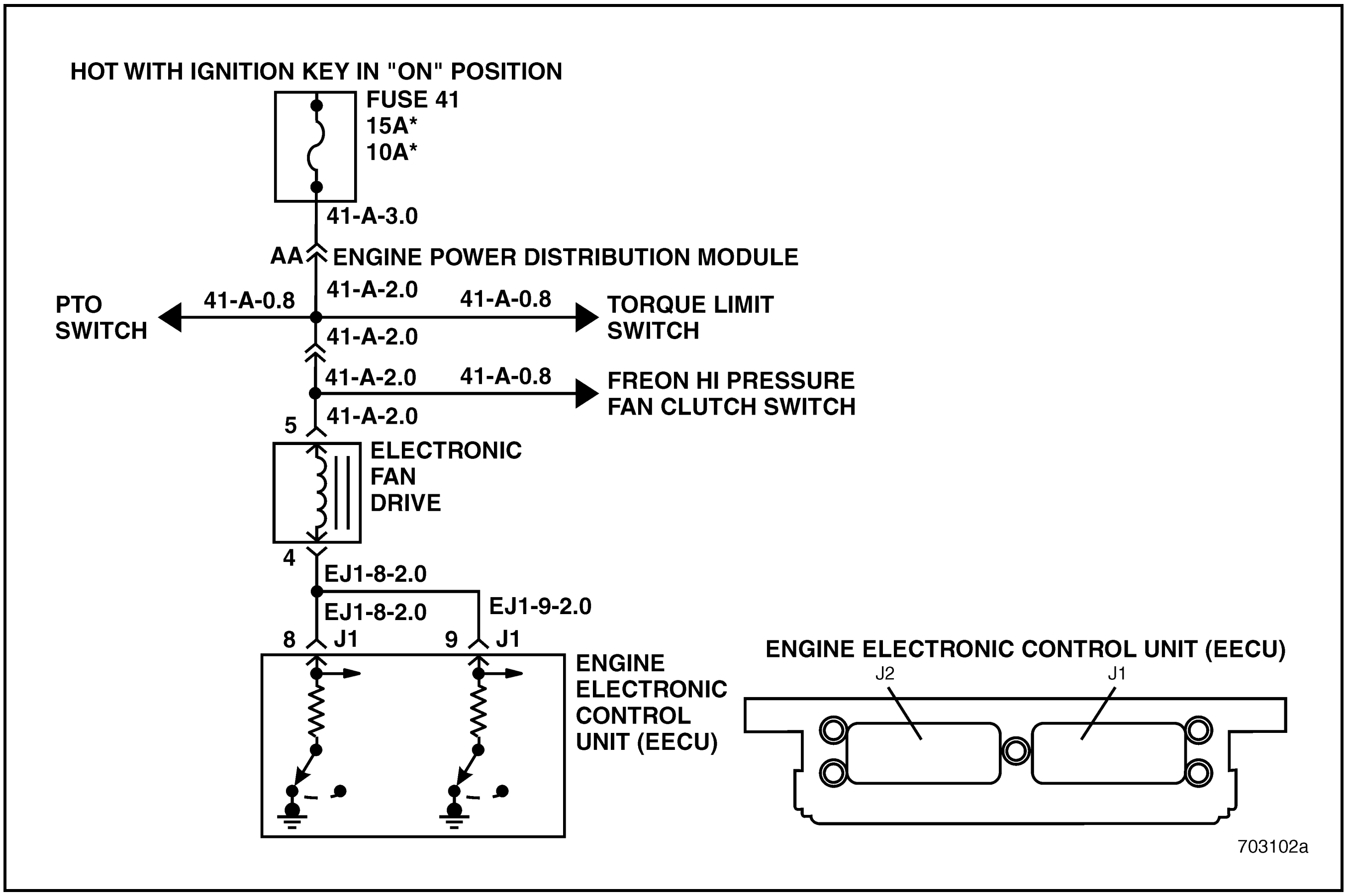


Figure 534 — Parallel Fan Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Open)

Parameter Identification (PID): S153

Message Identification (MID): 128

NOTE

Code 4-10 is only available on certain chassis with version 1MS375 EECU software.

Circuit Description: The Electronic Fan Drive contains a solenoid that controls the flow of fluid between reservoirs in the fan drive housing and cover. The EECU provides the ground circuit for the solenoid, and controls solenoid operation to optimize the fan speed based on coolant temperature, intake air temperature and A/C load. Due to current flow limitations within the EECU, parallel fan drive circuits are provided on circuits EJ1-8 and EJ1-9.

Location: The Electronic Fan Drive is bolted to the drive pulley on the front of the engine.

Code Setting Conditions: When the Engine Electronic Control Unit (EECU) has requested the cooling fan to engage, and has detected less than 0.5 volts for more than 1 second at EECU terminal EJ1-8, the Electronic Malfunction Lamp (EML) will turn on and code 4-10 will set with an FMI of 4 or 5. The EECU will log FMI 3 if the fan drive is requested to engage and the EECU detects high current.

Additional Symptoms: Higher than normal coolant temperatures, lower than normal coolant temperatures, and poor air conditioning performance may be experienced.

NOTE

If a customer complains that the fan clutch does not disengage and code 4-10 has not been logged in the EECU, the problem may be due to a mechanical failure in the fan drive.

⚠ DANGER

The fan can engage without warning. Hands, arms and personal items can easily be entangled in the belts or fan blades. Keep arms, hair, clothing, jewelry, etc. clear from the fan and belts when the engine is running.

Test 1 — Checking for Code 4-10

1. Verify that code 4-10 is set.

   If code 4-10 is set, go to test "Test 2 — Checking for a 12 Volt Supply to the Electronic Fan Drive" on page 415.

   If code 4-10 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Electronic Fan Drive harness connector and wires for frayed or loose connections.

Test 2 — Checking for a 12 Volt Supply to the Electronic Fan Drive

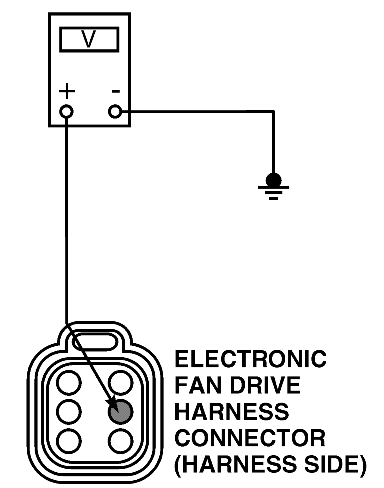


Figure 535

1. Turn the ignition key OFF.
2. Disconnect the Electronic Fan Drive harness connector.
3. Turn the ignition key ON.
4. Measure the voltage between pin 5 of the Electronic Fan Drive harness connector and a good ground (see Figure 535).

   If the measured voltage is equal to system voltage, go to test "Test 4 — Checking for an Open Solenoid" on page 416.

   If the measured voltage is less than system voltage, locate and repair the short circuit to ground in the circuit between Fuse 41 and the Electronic Fan Drive.

Test 4 — Checking for an Open Solenoid

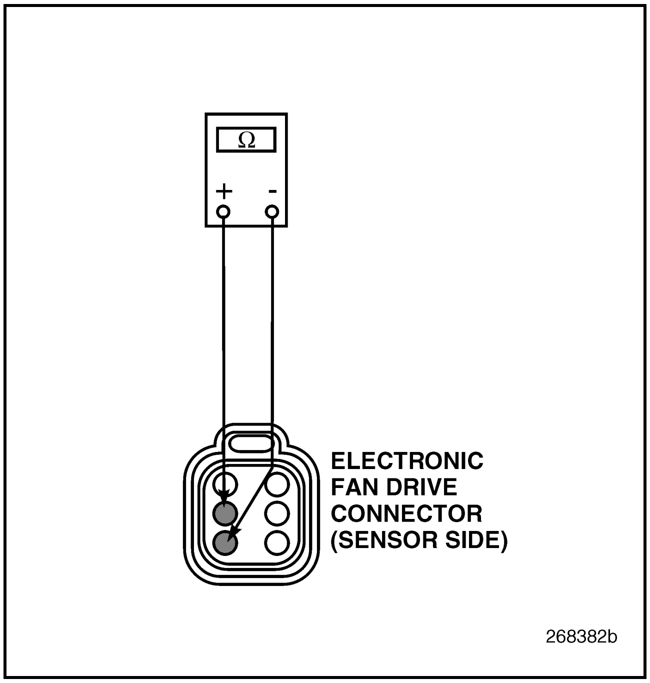


Figure 536

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid or Electronic Fan Drive connector.
3. Check for continuity between Electronic Fan Drive connector pins 4 and 5 (see Figure 536).

   If continuity exists, go to test "Test 8 — Checking for an Open Control Line" on page 416.

   If there is NO continuity, replace the Electronic Fan Drive and retest the system.

Test 8 — Checking for an Open Control Line

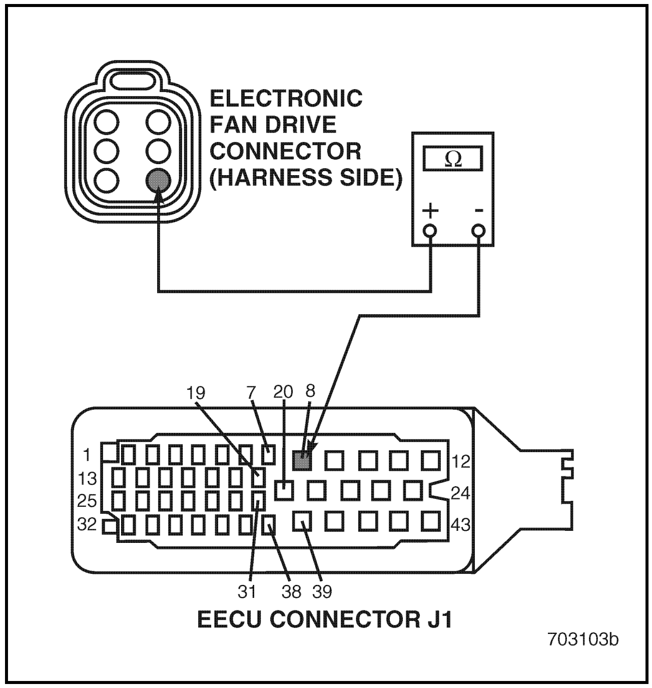


Figure 537

1. Turn the ignition key OFF.
2. Disconnect the Fan Clutch Solenoid connector.
3. Disconnect EECU connector J1.
4. Check for continuity between pin 4 of the Electronic Fan Drive harness connector and EECU connector J1 pin 8 (see Figure 537).

   If continuity exists, go to test "Test 16 — Checking for a Short Circuit to Voltage in the Control Line" on page 417.

   If there is NO continuity, locate and repair the open circuit between the Electronic Fan Drive harness connector and EECU connector J1 pin 8.

Test 16 — Checking for a Short Circuit to Voltage in the Control Line

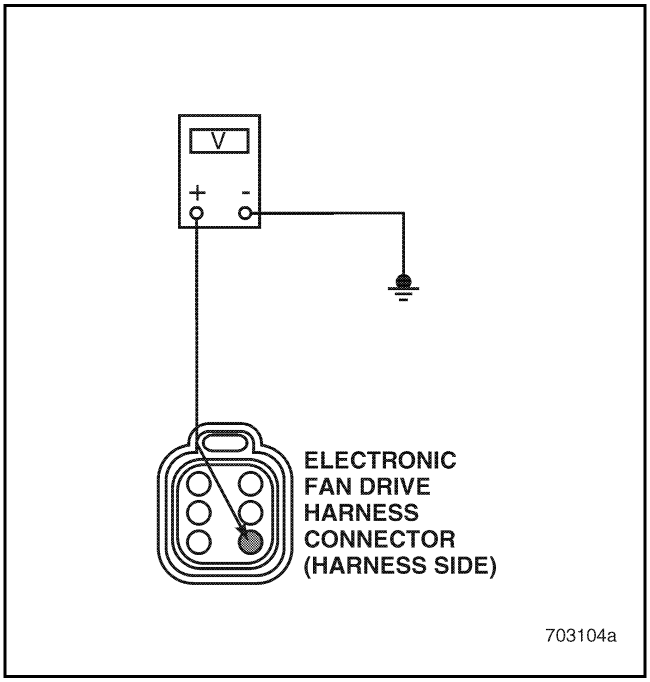


Figure 538

1. Turn the ignition key OFF.
2. Disconnect the Electronic Fan Drive harness connector.
3. Disconnect EECU connector J1.
4. Turn the ignition key ON.
5. Measure the voltage between Electronic Fan Drive harness connector pin 4 and a good ground (see Figure 538).

   If measurable voltage is present, locate and repair the short circuit to voltage between the Electronic Fan Drive and EECU connector J1 pin 8.

   If there is NO measurable voltage present, go to test "Test 32 — Checking for a Short Circuit to Ground" on page 417.

Test 32 — Checking for a Short Circuit to Ground

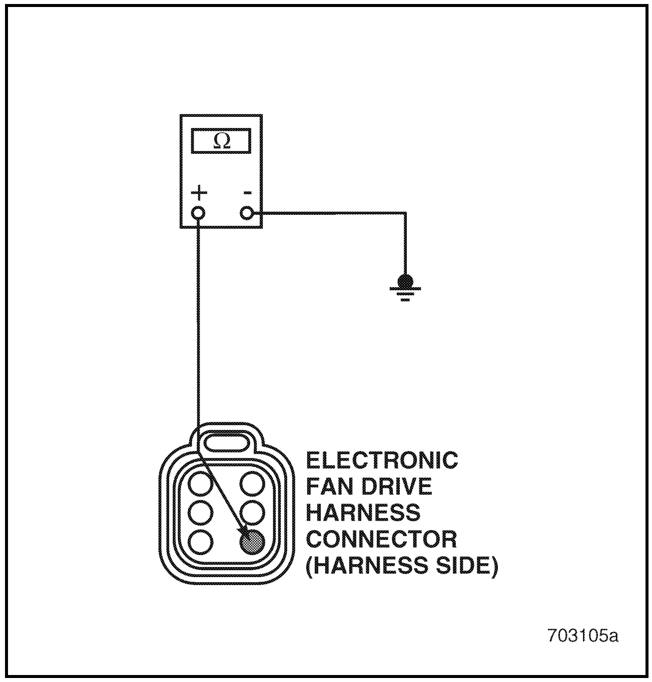


Figure 539

1. Turn the ignition key OFF.
2. Disconnect the Electronic Fan Drive harness connector.
3. Disconnect EECU connector J1.
4. Check for continuity between Electronic Fan Drive harness connector pin 4 and a good ground (see Figure 539).

   If there is NO continuity, go to test "Test 64 — Checking for a Damaged EECU Connector" on page 418.

   If continuity exists to ground, locate and repair the short circuit to ground between the Electronic Fan Drive and EECU connector J1 pin 8.

Test 64 — Checking for a Damaged EECU Connector

1. Connect the Fan Clutch Solenoid connector.
2. Connect EECU connectors J1 and J2.
3. Turn the ignition key ON.

   If blink code 4-10 is still active, check the EECU and harness connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the EECU and retest the system.

   If blink code 4-10 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 5-1 — THROTTLE POSITION (TP) SENSOR

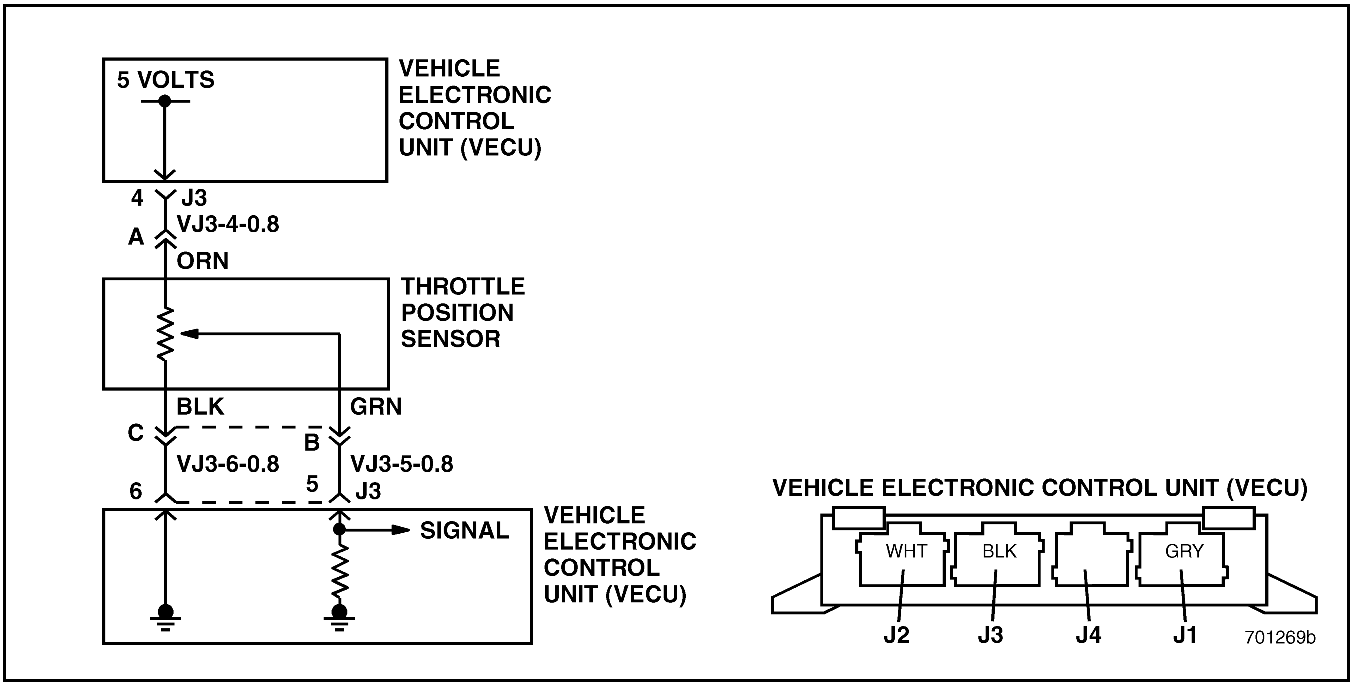


Figure 540 — Throttle Position Sensor Circuit

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open), 14 (Invalid)

Parameter Identification (PID): P91

Message Identification (MID): 142

Circuit Description: The Throttle Position (TP) Sensor is a potentiometer that is mechanically linked to the accelerator pedal. When the accelerator pedal is depressed during normal operation, the TP Sensor signal voltage to the Vehicle Electronic Control Unit (VECU) increases. The Vehicle Electronic Control Unit (VECU) monitors the TP Sensor signal voltage and uses the signal to calculate engine fuel requirements.

Location: The Throttle Position (TP) Sensor is located beneath the accelerator pedal. The TP Sensor pigtail connector is located under the dash above the accelerator pedal. The Vehicle Control Unit (VECU) is typically located under the dashboard in front of the passenger seat.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 5-1 will set when the Vehicle Electronic Control Unit TP Sensor signal voltage is less than 0.4 volts or greater than 4.5 volts for 0.25 seconds. If the signal voltage returns to between 0.4 volts and 4.5 volts for 0.25 seconds, the fault will become inactive. When code 5-1 is active, engine speed will default to 900 RPM.

Additional Symptoms: Accelerator pedal is unresponsive. Engine stumbles if the fault is intermittent.

Normal TP Sensor Parameters:

Resistance pin C to pin A	2000–3000 Ω
Resistance pin C to pin B	200–800 Ω (accelerator pedal not depressed)
Resistance pin C to sensor case	Over 100,000 Ω

Test 1 — Checking for Code 5-1

1. Verify that code 5-1 is set.

   If code 5-1 is set, go to test “Test 2 — Checking TP Sensor Operation” on page 420.

   If code 5-1 is not set, wiggle the harness and connectors to try to set the code. Pay particular attention to the connector at the base of the accelerator pedal and to the main pedal connector located behind the interior floor trim, on the right side of the accelerator pedal.

Test 2 — Checking TP Sensor Operation

1. Turn the ignition key ON.
2. Use a diagnostic computer to monitor the throttle pedal percent parameter while depressing and releasing the throttle pedal

   If the throttle pedal position displayed on the diagnostic tool accurately reflects the actual pedal position, and the fault has become inactive, check the connector at the base of the accelerator pedal, the main pedal connector located behind the interior floor trim on the right side of the accelerator pedal, and VECU connector J3 for proper connections.

   If the throttle pedal position displayed on the diagnostic tool does NOT accurately reflect the actual pedal position, go to test “Test 4 — Checking the Failure Mode Identifier (FMI)” on page 420.

Test 4 — Checking the Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic PC.

   If the FMI is 4 (voltage low/open), go to test “Test 8 — Checking for Proper Voltage to the TP Sensor” on page 420.

   If the FMI is 3 (voltage high) go to test “Test 9 — Checking for a Change in the FMI with the Sensor Removed” on page 420.

   If the FMI is 14 (invalid) refer to the Cummins engine service manual.

Test 8 — Checking for Proper Voltage to the TP Sensor

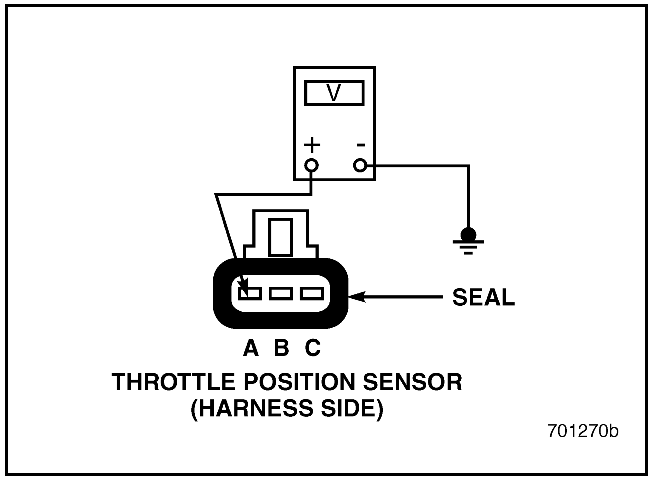


Figure 541

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Throttle Position (TP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between pin A on the harness side of the TP Sensor connector and a good ground (see Figure 541).

   If the measured voltage is greater than 4.35 volts, go to test “Test 16 — Checking for a Short to Ground in the Signal Line” on page 421.

   If the measured voltage is less than 4.35 volts, go to test “Test 17 — Checking for Continuity in the Harness” on page 421.

Test 9 — Checking for a Change in the FMI with the Sensor Removed

1. Turn the ignition key OFF.
2. Connect the diagnostic computer.
3. Disconnect the Throttle Position (TP) Sensor.
4. Turn the ignition key ON.

   If the FMI code 3 has changed to FMI code 4, go to test “Test 18 — Checking for Proper Voltage to the TP Sensor” on page 422.

If the FMI code does NOT change, go to test "Test 19 — Checking for a Short Circuit to Voltage in the Sensor Signal Line" on page 422.

Test 16 — Checking for a Short to Ground in the Signal Line

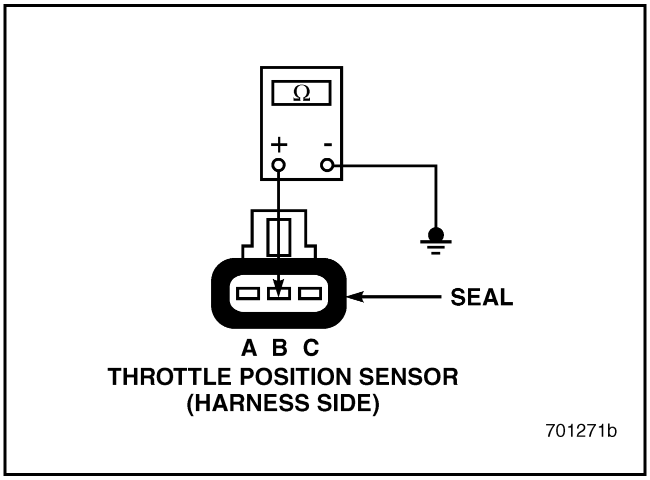


Figure 542

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Check for continuity between pin B on the harness side of the TP Sensor and a good ground (see Figure 542).

   If there is NO continuity, go to test "Test 32 — Checking for an Open in the Sensor Signal Line" on page 423.

   If continuity exists, go to test "Test 33 — Checking for a Pin to Pin Short Circuit in the Harness" on page 423.

Test 17 — Checking for Continuity in the Harness

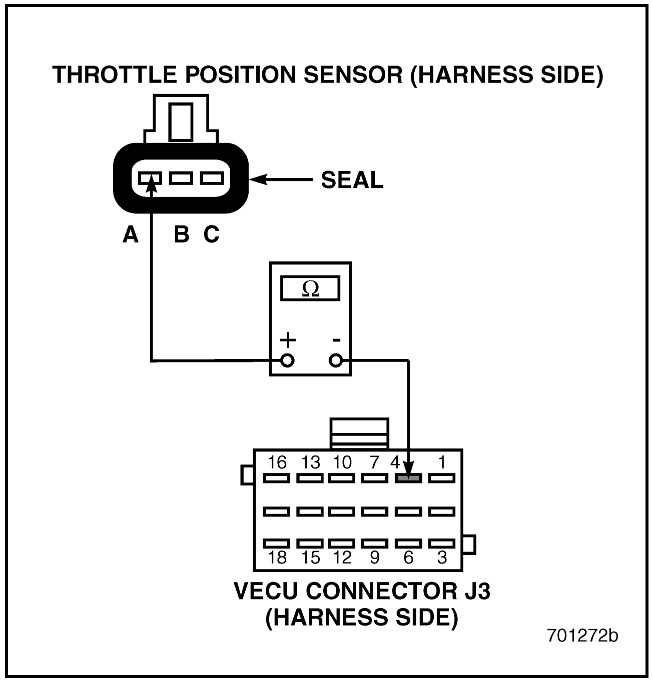


Figure 543

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Check for continuity between VECU connector J3 pin 4 and TP Sensor harness connector pin A (see Figure 543).

   If continuity exists, go to test "Test 34 — Checking for a Short Circuit to Ground in the Voltage Reference Line" on page 424.

   If there is NO continuity, locate and repair the open between TP Sensor connector pin A and VECU connector J3 pin 4.

Test 18 — Checking for Proper Voltage to the TP Sensor

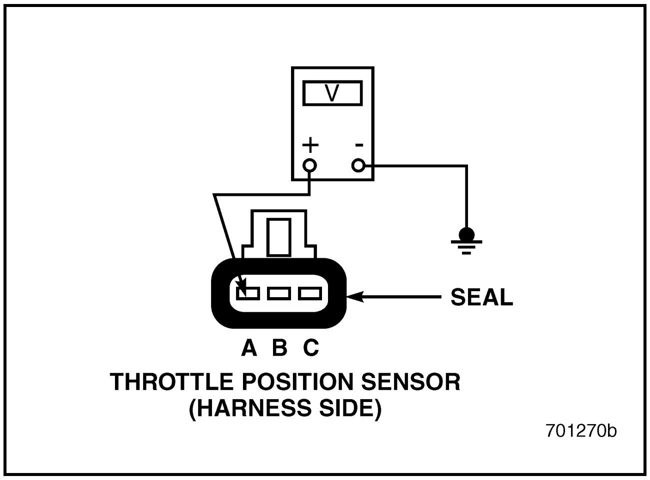


Figure 544

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Throttle Position (TP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between pin A on the harness side of the TP Sensor and a good ground (see Figure 544).

   If the measured voltage is less than 5.5 volts, go to test "Test 36 — Checking for Voltage on the Sensor Return Line" on page 424.

   If the measured voltage is greater than 5.5 volts, go to test "Test 37 — Checking for a Short Circuit to Voltage in the Voltage Reference Line" on page 425.

Test 19 — Checking for a Short Circuit to Voltage in the Sensor Signal Line

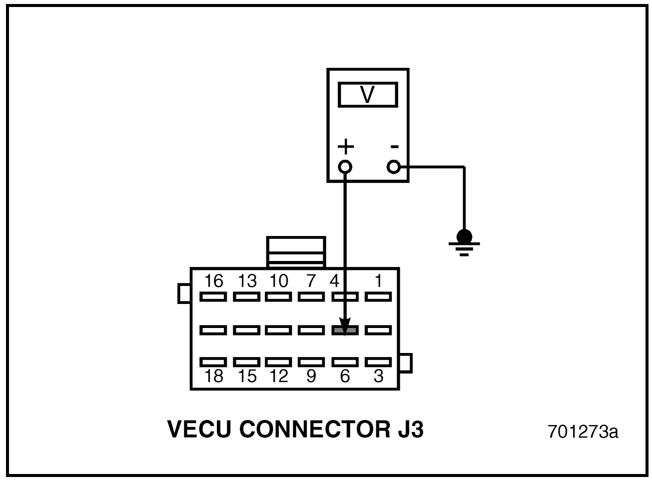


Figure 545

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect the Serial Link Jumper to the Serial Communications Port.
5. Measure the voltage between VECU connector J3 pin 5 and a good ground (see Figure 545).

   If there is NO voltage present, go to test "Test 38 — Checking for a Pin to Pin Short in the Signal Line" on page 425.

   If the measured voltage is greater than 0.5 volts, the signal line is shorted to voltage. Go to test "Test 39 — Isolating the Short Circuit to Voltage in the Sensor Signal Line" on page 426.

Test 32 — Checking for an Open in the Sensor Signal Line

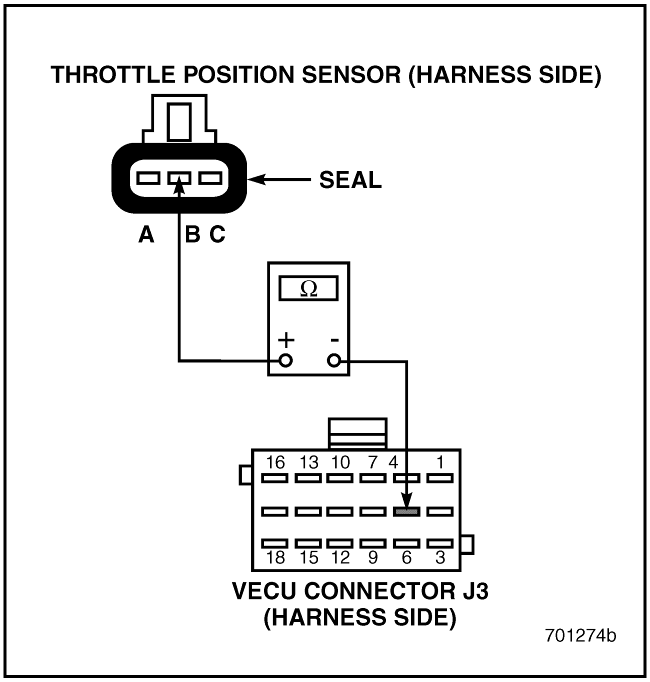


Figure 546

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Check for continuity between VECU connector J3 pin 5 and TP Sensor harness connector pin B (see Figure 546).

   If continuity exists, go to test "Test 64 — Checking for a Pin to Pin Short in the Harness" on page 426.

   If there is NO continuity, locate and repair the open in the TP Sensor signal line.

Test 33 — Checking for a Pin to Pin Short Circuit in the Harness

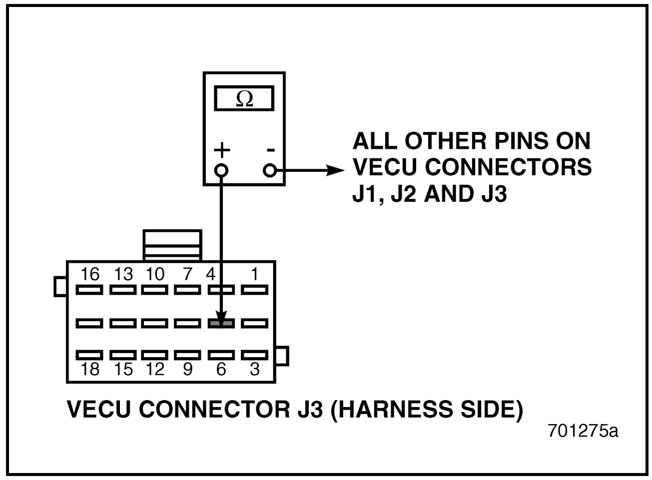


Figure 547

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Control Unit (VECU) connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 5 and all the other pins on VECU connectors J1, J2 and J3 (see Figure 547).

   If continuity exists, the signal line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, there is a short circuit to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 34 — Checking for a Short Circuit to Ground in the Voltage Reference Line

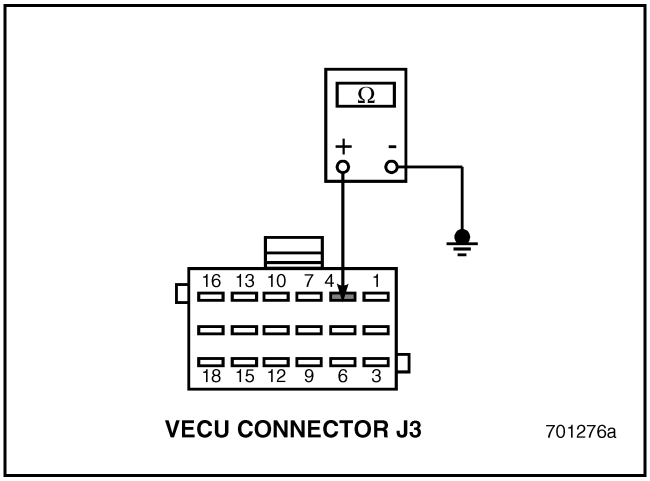


Figure 548

1. Turn the ignition key OFF.
2. Disconnect the TP Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Check for continuity between VECU connector J3 pin 4 and a good ground (see Figure 548).

   If continuity exists, locate and repair the short circuit to ground in the voltage reference line.

   If there is NO continuity, go to test “Test 68 — Checking for a Pin to Pin Short Circuit in the Harness” on page 427.

Test 36 — Checking for Voltage on the Sensor Return Line

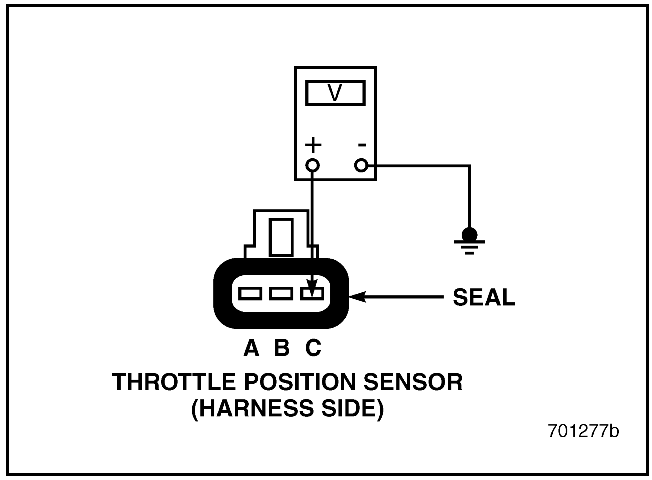


Figure 549

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor harness connector.
3. Turn the ignition key ON.
4. Measure the voltage between TP Sensor harness connector pin C and a good ground (see Figure 549).

   If there is NO voltage present, go to test “Test 72 — Checking for an Open in the Sensor Return Line” on page 427.

   If the measured voltage is greater than 0.5 volts, go to test “Test 73 — Checking for a Short Circuit to Voltage in the Sensor Return Line” on page 428.

Test 37 — Checking for a Short Circuit to Voltage in the Voltage Reference Line

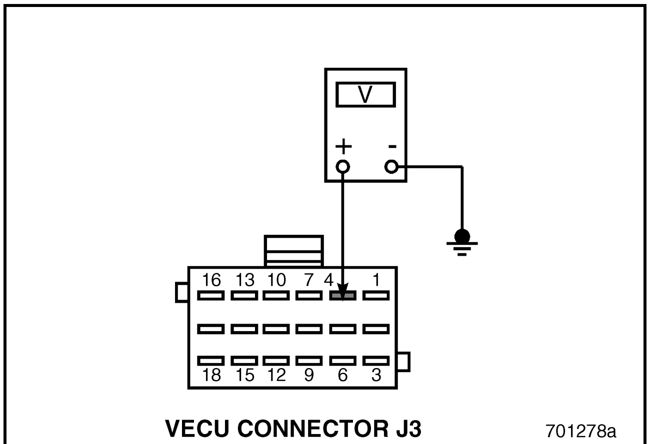


Figure 550

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between VECU connector J3 pin 4 and a good ground (see Figure 550).

   If there is NO voltage present, go to test "Test 74 — Checking for a Pin to Pin Short in the Harness or VECU" on page 428.

   If the measured voltage is greater than 0.5 volts present, the pedal voltage reference line is shorted to voltage. Locate and repair the short circuit to voltage.

Test 38 — Checking for a Pin to Pin Short in the Signal Line

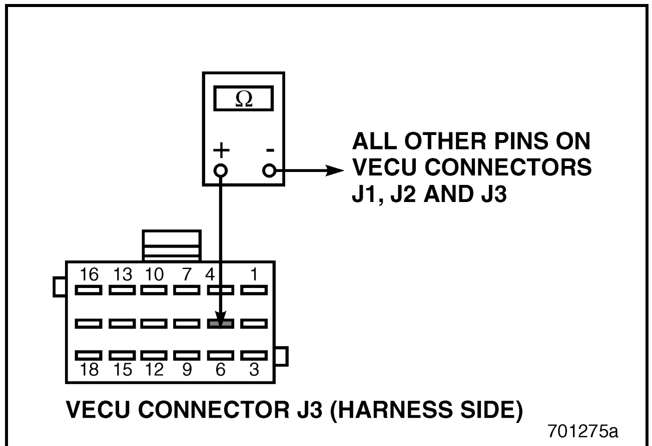


Figure 551

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect the Throttle Position (TP) Sensor harness connector.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 5 and all other pins on VECU connectors J1, J2 and J3 (see Figure 551).

   If continuity exists, VECU connector J3 pin 5 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, replace the VECU and retest the system.

Test 39 — Isolating the Short Circuit to Voltage in the Sensor Signal Line

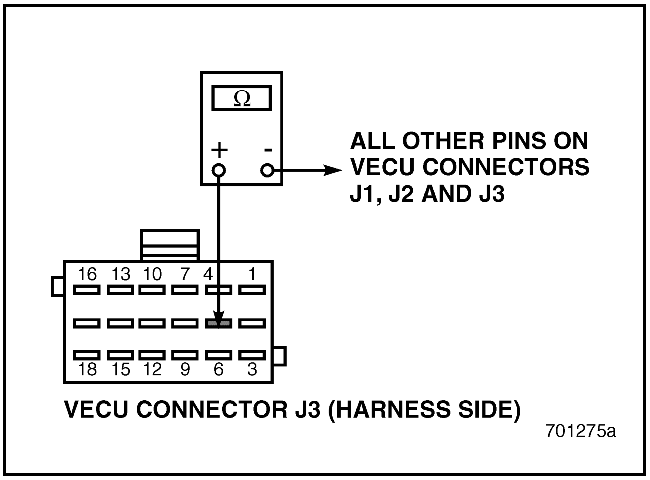


Figure 552

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect the Throttle Position (TP) Sensor harness connector.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 5 and all other pins on VECU connectors J1, J2 and J3 (see Figure 552).

   If continuity exists, VECU connector J3 pin 5 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the sensor signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 64 — Checking for a Pin to Pin Short in the Harness

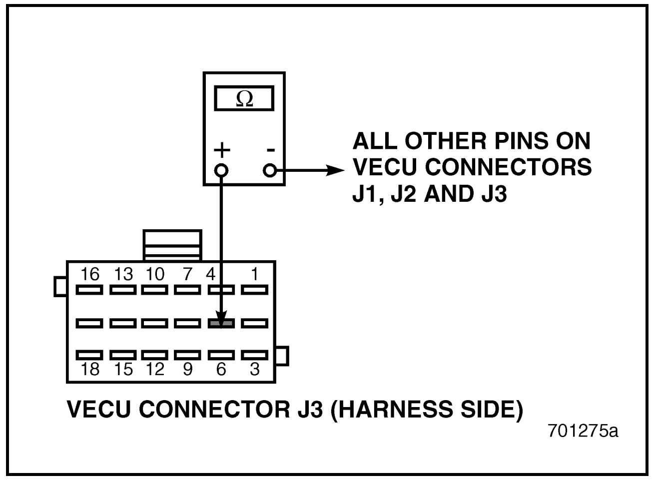


Figure 553

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 5 and all other pins on VECU connectors J1, J2 and J3 (see Figure 553).

   If there is NO continuity, go to test “Test 128 — Checking for a Fault in the Sensor Connector” on page 429.

   If continuity exists, the signal line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 68 — Checking for a Pin to Pin Short Circuit in the Harness

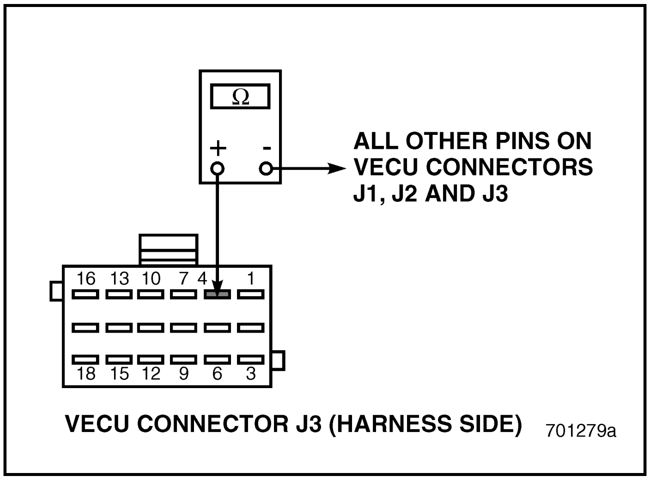


Figure 554

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 4 and all the other pins on VECU connectors J1, J2 and J3 (see Figure 554).

   If continuity exists, pin 4 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 136 — Checking for an Open or Short Circuit at the VECU Connector” on page 429.

Test 72 — Checking for an Open in the Sensor Return Line

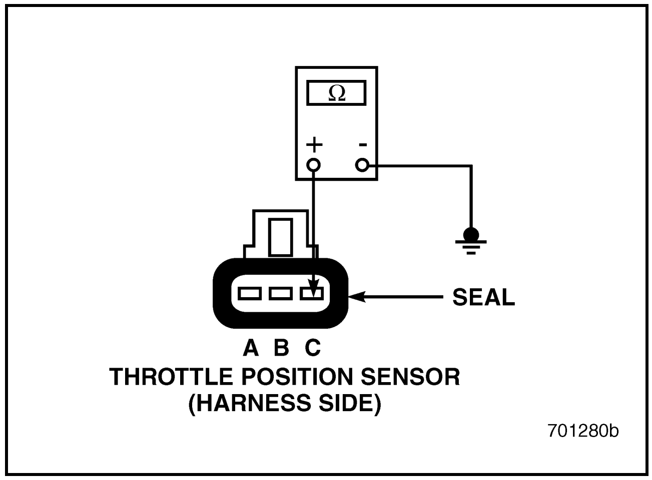


Figure 555

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Check for continuity between pin C on the harness side of the TP Sensor connector and a good ground (see Figure 555).

   If continuity exists, go to test “Test 144 — Checking for a Faulty Sensor Connection” on page 429.

   If there is NO continuity, go to test “Test 145 — Checking for an Open Sensor Return Line” on page 430.

Test 73 — Checking for a Short Circuit to Voltage in the Sensor Return Line

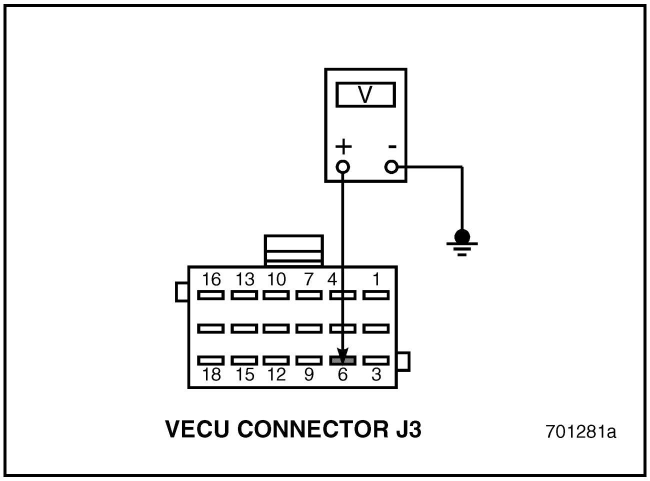


Figure 556

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect the Serial Link Jumper to the Serial Communications Port.
5. Measure the voltage between VECU connector J3 pin 6 and a good ground (see Figure 556).

   If there is NO voltage, go to test "Test 146 — Checking for Pin to Pin Continuity with the Sensor Return Line" on page 430.

   If the measured voltage is greater than 0.5 volts, the sensor return line is shorted to voltage. Locate and repair the short circuit and replace the VECU.

Test 74 — Checking for a Pin to Pin Short in the Harness or VECU

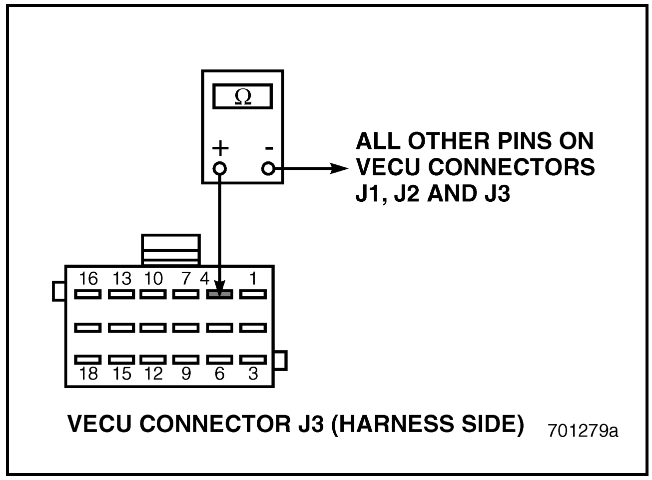


Figure 557

1. Disconnect the Serial Link Jumper.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 4 and all other pins on VECU connectors J1, J2 and J3 (see Figure 557).

   If continuity exists, the voltage reference line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, replace the VECU and retest the system.

Test 128 — Checking for a Fault in the Sensor Connector

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Visually inspect both sides of the TP Sensor connector for a repairable open.
4. Find the purple male test lead from the J 38581 V-MAC Jumper Wire Kit. On the harness side of the TP Sensor connector, align the male test lead with one of the rectangular female pins in the harness connector. Gently push the test lead into the harness connector pins. Repeat this process for the remaining two female pins.

   If any of the pins in the connector feels loose, repair the connector. If the connector is not repairable, replace the connector.
5. Find the purple female test lead from the J 38581 V-MAC Jumper Wire Kit. On the sensor side of the TP Sensor connector, align the female test lead with one of the rectangular male pins in the Throttle Position Sensor Connector. Gently push the test lead over the pin. Repeat this process for the remaining two male pins.

   If any of the pins in the connector feels loose, repair the connector. If the connector is not repairable, replace the TP Sensor.

   If the pins in the connector are making good contact, go to test “Test 256 — Checking for an Open in the Vehicle Electronic Control Unit (VECU)” on page 431.

Test 136 — Checking for an Open or Short Circuit at the VECU Connector

1. Visually inspect VECU connector J3 pin 4 for dirt, loose or shorted pins or deformed contacts.
2. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pin 4. Gently push the test lead into the harness connector terminal and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU harness connector J3.

   If the test lead is making good contact with VECU connector J3 pin 4, go to test “Test 272 — Checking for Blink Code 5-1” on page 431.

Test 144 — Checking for a Faulty Sensor Connection

1. Connect the Throttle Position (TP) Sensor.
2. Connect the diagnostic computer.
3. Turn the ignition key ON.
4. Flex the TP Sensor connector and harness section near the connector.

   If blink code 5-1 FMI 3 is still active, go to test “Test 288 — Checking for a Faulty TP Sensor” on page 431.

   If blink code 5-1 is NOT present, the ground circuit in Pin C of the TP Sensor or harness connector may have been loose. Repair the loose connection.

   If there is now an active fault, FMI code 4, there is poor contact in the sensor connector mating pins. Repair the loose connections.

Test 145 — Checking for an Open Sensor Return Line

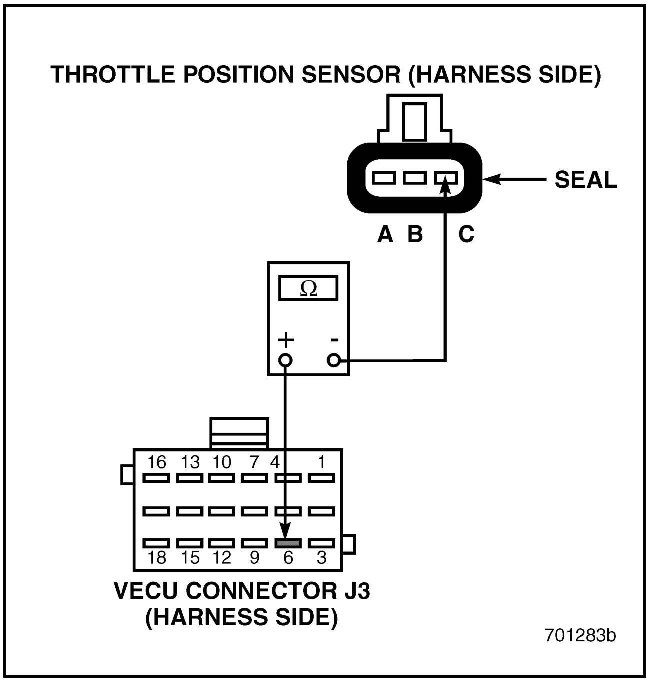


Figure 558

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. On the harness side of the TP Sensor connector, check for continuity between VECU connector J3 pin 6 and TP Sensor connector pin C (see Figure 558).

   If continuity exists, go to test "Test 290 — Checking for an Open in the VECU or Harness Connector" on page 432.

   If there is NO continuity, there is an open in the sensor return line. Locate and repair the open circuit.

Test 146 — Checking for Pin to Pin Continuity with the Sensor Return Line

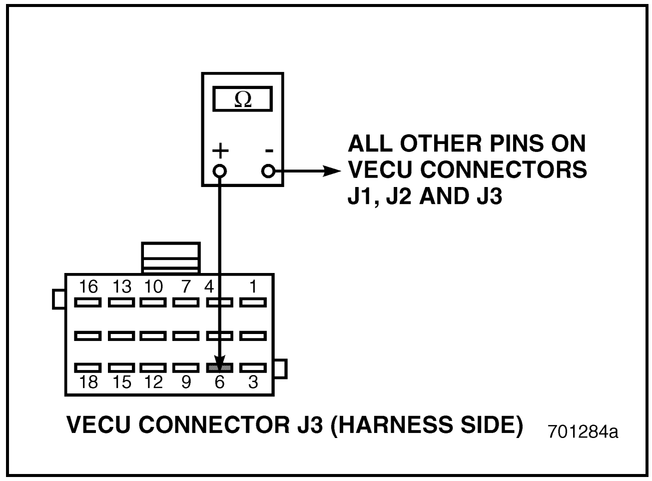


Figure 559

1. Disconnect the Serial Link Jumper.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 6 and all other pins on VECU connectors J1, J2 and J3 (see Figure 559).

   If continuity exists, pin 6 is shorted to voltage on one of the other VECU circuits. Locate and repair the short circuit and replace the VECU.

   If there is NO continuity, replace the VECU and retest the system.

Test 256 — Checking for an Open in the Vehicle Electronic Control Unit (VECU)

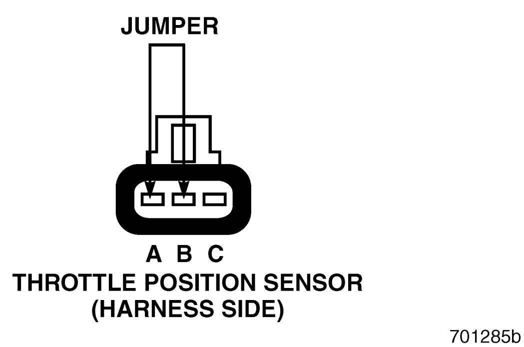


Figure 560

1. Turn the ignition key OFF.
2. Connect the diagnostic computer.
3. Disconnect the Throttle Position (TP) Sensor.
4. Connect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. On the harness side of the TP Sensor connector, connect a jumper between the voltage reference line pin A and the signal line pin B (see Figure 560).
6. Turn the ignition key ON.

   If the active fault changes from voltage low FMI 4 to voltage high FMI 3, go to test "Test 512 — Checking for Poor Contact in the Sensor Connector" on page 432.

   If the active fault does NOT change, go to test "Test 513 — Checking the VECU Connector for an Open or Short" on page 432.

Test 272 — Checking for Blink Code 5-1

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Connect the TP Sensor connector.
4. Turn the ignition key ON.

   If blink code 5-1 is still active, replace the VECU and retest the system.

   If blink code 5-1 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 288 — Checking for a Faulty TP Sensor

1. Turn the ignition key OFF.
2. Replace the Throttle Position (TP) Sensor.
3. Turn the ignition key ON.

   If fault 5-1 is still active, reinstall the original TP Sensor and replace the Vehicle Electronic Control Unit (VECU).

   If fault 5-1 is NOT present, replacing the TP Sensor has solved the problem. Check all connectors to ensure proper connections.

Test 290 — Checking for an Open in the VECU or Harness Connector

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Visually inspect both sides of the VECU connector J3 pin 6 for a repairable open. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J1 pin 3. Gently push the test lead into the harness connector terminal and check for looseness.

   If the pin feels loose, repair the connector. If the connector is NOT repairable, replace the J3 connector.

   If the pin is making good contact, replace the VECU and retest the system.

Test 512 — Checking for Poor Contact in the Sensor Connector

1. Turn the ignition key OFF.
2. Connect the diagnostic computer.
3. Connect the Throttle Position (TP) Sensor.
4. Start the engine and flex the harness near the sensor.

   If fault 5-1 becomes inactive, repair or replace the sensor connector.

   If fault 5-1 does NOT become inactive, replace the Throttle Position (TP) Sensor.

Test 513 — Checking the VECU Connector for an Open or Short

1. Visually inspect VECU connector J3 pin 5 for dirt, loose or shorted pins or deformed contacts.
2. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pin 5. Gently push the test lead into the harness connector terminal and check for looseness.

   If a repairable open or short is found, or the terminal feels loose, repair VECU harness connector J3.

   If the test lead is making good contact with VECU connector J1 pin 5 and there are no shorted pins, go to test “Test 1026 — Checking for Blink Code 5-1” on page 432.

Test 1026 — Checking for Blink Code 5-1

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Connect the TP Sensor connector.
4. Turn the ignition key ON.

   If blink code 5-1 is still active, replace the VECU and retest the system.

   If blink code 5-1 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper contact.

BLINK CODE 5-2 —THROTTLE POSITION (TP) SENSOR REFERENCE VOLTAGE

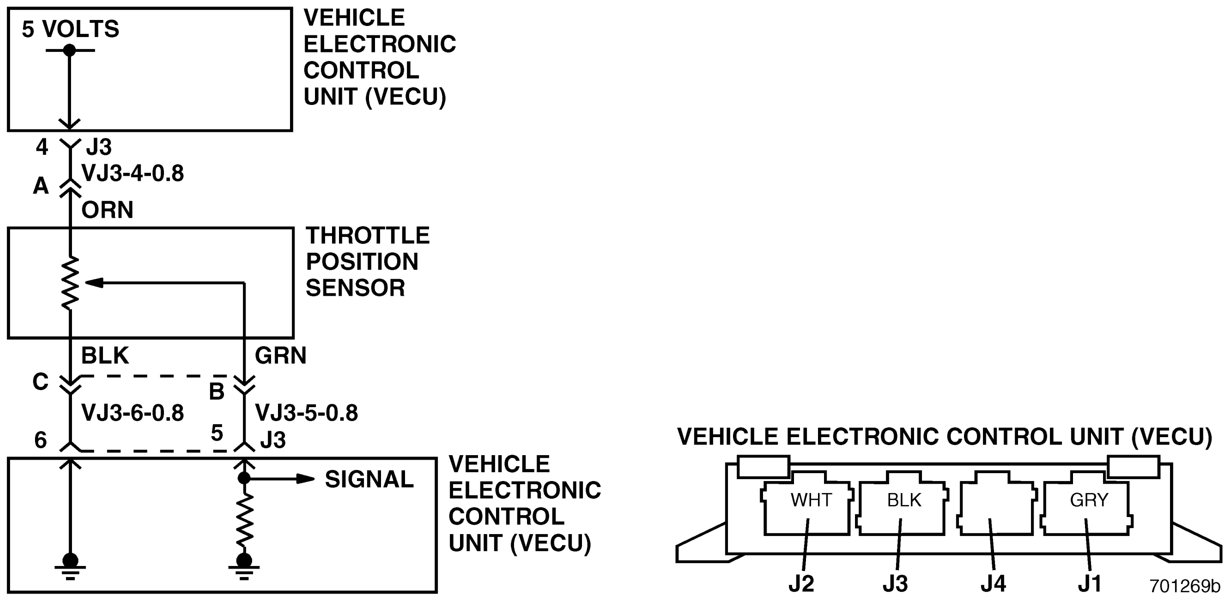


Figure 561 — Throttle Position Sensor Circuit

N O T E

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S232

Message Identification (MID): 142

Circuit Description: The Throttle Position (TP) Sensor circuit requires a constant 5 volt reference input to operate properly. If the reference voltage line is shorted to a ground line or to a voltage source greater than 5 volts, the throttle position signal will not accurately reflect the driver's fuel request. If the Vehicle Electronic Control Unit (VECU) senses a short circuit on the Throttle Position (TP) Sensor voltage reference line, a reference voltage fault will be logged instead of a Throttle Position (TP) Sensor (5-1) fault.

Location: The Throttle Position (TP) Sensor is located beneath the accelerator pedal. The TP Sensor pigtail connector is located under the dash above the accelerator pedal. The Vehicle Control Unit (VECU) is typically located under the dashboard in front of the passenger seat.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 5-2 will set when the Vehicle Electronic Control Unit (VECU) senses a TP Sensor reference voltage less than 4.15 volts or greater than 5.5 volts for 0.25 seconds. If the reference voltage returns to between 4.15 volts and 5.5 volts for 0.25 seconds, the fault will become inactive. When code 5-2 is active, the Throttle Position (TP) Sensor blink code (5-1) is suspended.

Test 1 — Checking for Code 5-2

1. Verify that code 5-2 is set.

   If code 5-2 is set, go to test “Test 2 — Checking the Failure Mode” on page 434.

   If code 5-2 is not set, wiggle the harness and connectors to try to set the code. Visually inspect the Throttle Position (TP) Sensor harness connector for poor contact.

Test 2 — Checking the Failure Mode

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) go to test “Test 4 — Checking the Voltage on the TP Sensor Reference Voltage Line” on page 434.

   If the FMI is 4 (voltage low), go to test “Test 5 — Checking the Voltage on the TP Sensor Reference Voltage Line” on page 434.

Test 4 — Checking the Voltage on the TP Sensor Reference Voltage Line

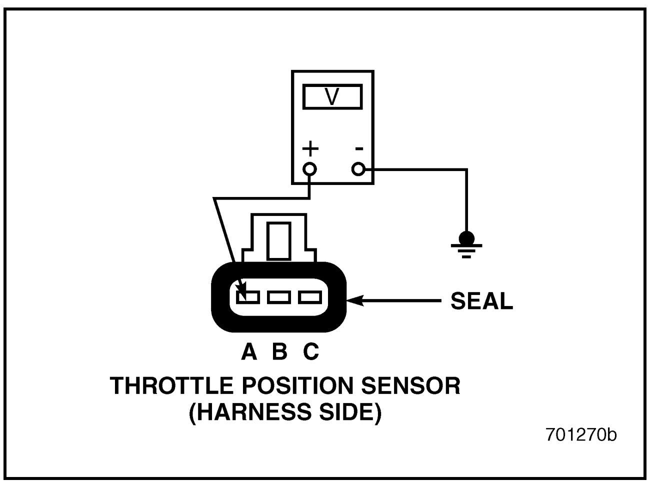


Figure 562

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Throttle Position (TP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between pin A on the harness side of the TP Sensor connector and a good ground (see Figure 562).

   If the measured voltage is less than 5.5 volts, go to test “Test 8 — Checking the Voltage on the TP Sensor Signal and Return Lines” on page 435.

   If the measured voltage is greater than 5.5 volts, go to test “Test 9 — Checking for a Short Circuit to Voltage in the Reference Voltage Line” on page 435.

Test 5 — Checking the Voltage on the TP Sensor Reference Voltage Line

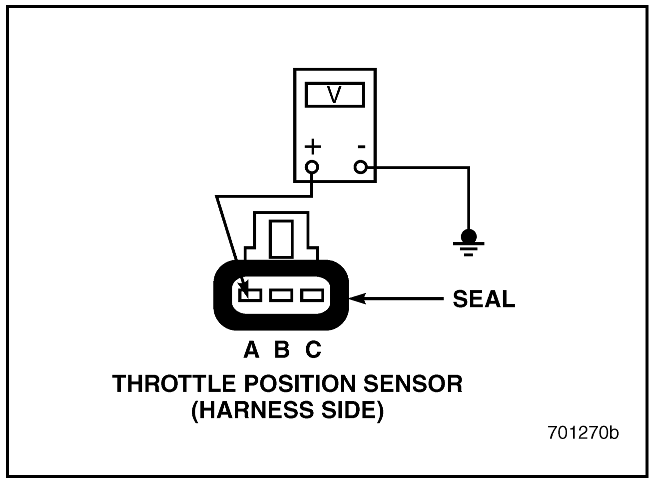


Figure 563

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Throttle Position (TP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between pin A on the harness side of the TP Sensor connector and a good ground (see Figure 563).

   If the measured voltage is less than 4.15 volts, go to test “Test 10 — Checking for a Short Circuit to Ground in the Reference Voltage Line” on page 436.

   If the measured voltage is greater than 4.15 volts, go to test “Test 11 — Checking for a Short Circuit to Ground in the TP Sensor” on page 436.

Test 8 — Checking the Voltage on the TP Sensor Signal and Return Lines

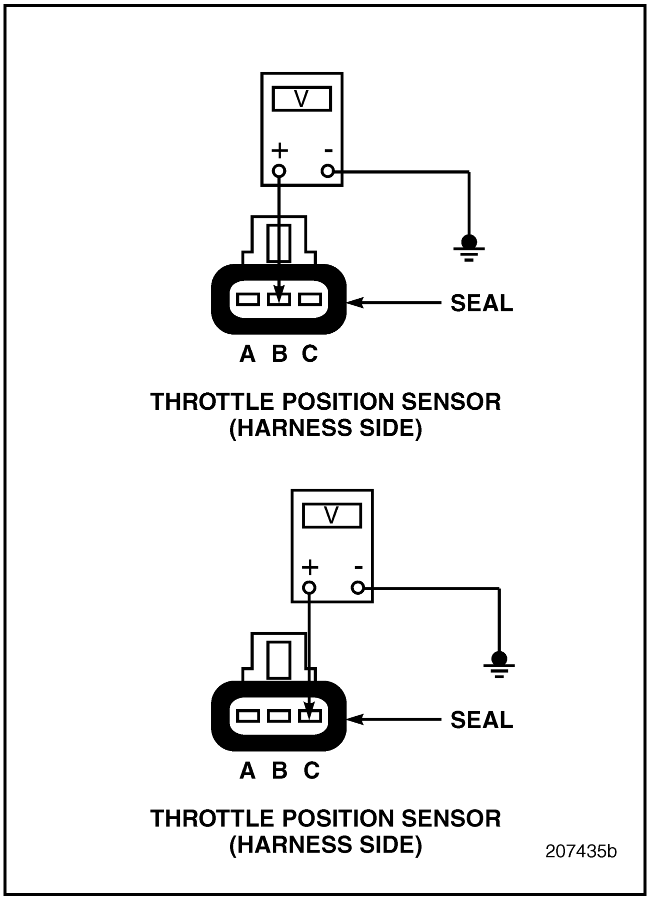


Figure 564

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Throttle Position (TP) Sensor.
3. Turn the ignition key ON.
4. Measure the voltage between pin B on the harness side of the TP Sensor connector and a good ground. Measure the voltage between pin C on the harness side of the TP Sensor connector and a good ground (see Figure 564).

   If the measured voltage is less than 0.5 volts, go to test "Test 16 — Checking the VECU Connector" on page 436.

   If the measured voltage is greater than 0.5 volts, go to test "Test 17 — Checking for a Short Circuit to Voltage in the Sensor Signal and Return Lines" on page 437.

Test 9 — Checking for a Short Circuit to Voltage in the Reference Voltage Line

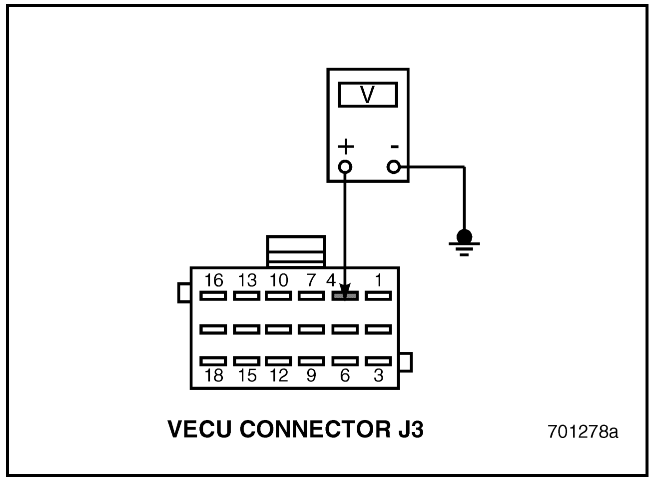


Figure 565

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Install the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between Vehicle Electronic Control Unit (VECU) connector J3 pin 4 and a good ground (see Figure 565).

   If there is NO voltage present at pin 4, go to test "Test 18 — Checking the VECU Connector" on page 437.

   If voltage is present, there is a short to voltage in the TP Sensor harness. Locate and repair the short circuit to voltage.

Test 10 — Checking for a Short Circuit to Ground in the Reference Voltage Line

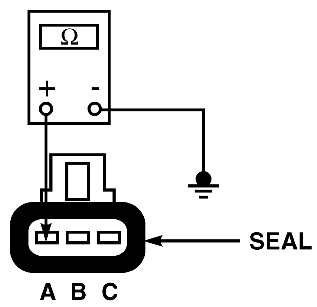


Figure 566

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor connector.
3. Check for continuity between TP Sensor harness connector pin A and a good ground (see Figure 566).

   If continuity exists, the reference voltage line is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity to ground, go to test "Test 20 — Checking for a Pin to Pin Short to Voltage in the Reference Voltage Line" on page 438.

Test 11 — Checking for a Short Circuit to Ground in the TP Sensor

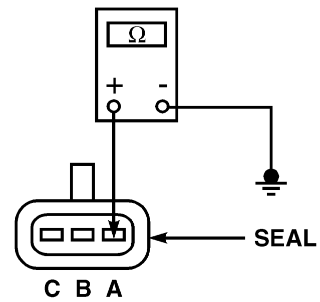


Figure 567

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Throttle Position (TP) Sensor.
3. Check for continuity between TP Sensor pin A and a good ground (see Figure 567).

   If there is NO continuity, go to test "Test 22 — Checking the VECU Connector" on page 438.

   If continuity exists, the TP Sensor has an internal short circuit to ground. Replace the TP Sensor.

Test 16 — Checking the VECU Connector

1. Turn the ignition key OFF.
2. Connect the Throttle Position (TP) Sensor connector.
3. Turn the ignition key ON.

   If blink code 5-2 is still active, check the VECU and harness connectors J1, J2 and J3 for dirt, loose or shorted pins, and any other repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-2 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 17 — Checking for a Short Circuit to Voltage in the Sensor Signal and Return Lines

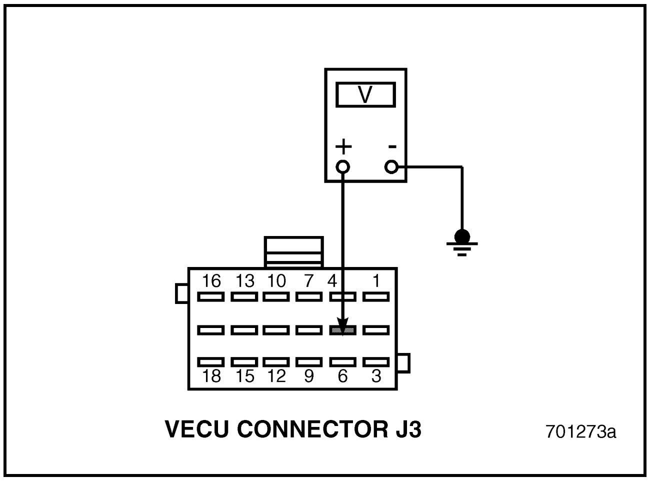


Figure 568

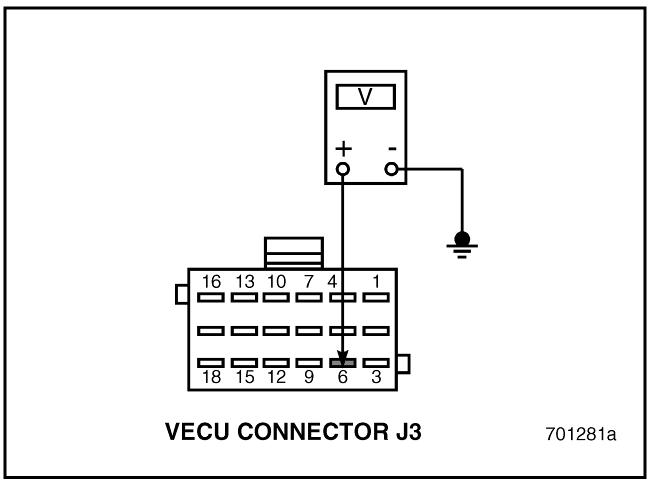


Figure 569

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Install the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between VECU harness connector J3 pin 5 and a good ground. (see Figure 568).
6. Measure the voltage between VECU harness connector J3 pin 6 and a good ground (see Figure 569).

   If there is NO voltage present at either pin, go to test “Test 34 — Checking the VECU Connector” on page 438.

   If there is voltage present, locate and repair the short circuit to voltage. If the short to voltage was on connector J3 pin 6, replace the VECU and retest the system.

Test 18 — Checking the VECU Connector

1. Turn the ignition key OFF.
2. Connect the Throttle Position (TP) Sensor connector.
3. Connect VECU harness connectors J1, J2, and J3.
4. Turn the ignition key ON.

   If blink code 5-2 is still active, check the VECU and harness connectors J1, J2 and J3 for dirt, loose or shorted pins, and any other repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-2 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 20 — Checking for a Pin to Pin Short to Voltage in the Reference Voltage Line

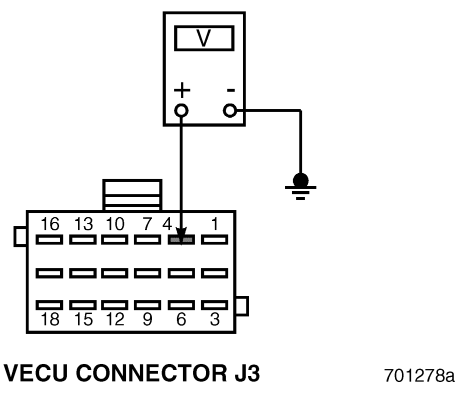


Figure 570

1. Turn the ignition key OFF.
2. Disconnect the Throttle Position (TP) Sensor.
3. Disconnect Vehicle Control Unit (VECU) connectors J1, J2 and J3.
4. Install the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between VECU connector J3 pin 4 and a good ground (see Figure 570).

   If there is NO voltage present at pin 4, go to test "Test 40 — Checking the VECU Connector" on page 439.

   If voltage is present, there is a short to voltage somewhere in the harness. Locate and repair the short circuit to voltage.

Test 22 — Checking the VECU Connector

1. Turn the ignition key OFF.
2. Connect the Throttle Position (TP) Sensor connector.
3. Connect VECU harness connectors J1, J2, and J3.
4. Turn the ignition key ON.

   If blink code 5-2 is still active, check the VECU and harness connectors J1, J2 and J3 for dirt, loose or shorted pins, and any other repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-2 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 34 — Checking the VECU Connector

1. Turn the ignition key OFF.
2. Connect the Throttle Position (TP) Sensor connector.
3. Connect VECU harness connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If blink code 5-2 is still active, check the VECU and harness connectors J1, J2 and J3 for dirt, loose or shorted pins, and any other repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-2 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 40 — Checking the VECU Connector

1. Turn the ignition key OFF.
2. Connect the Throttle Position (TP) Sensor connector.
3. Connect VECU harness connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If blink code 5-2 is still active, check the VECU and harness connectors J1, J2 and J3 for dirt, loose or shorted pins, and any other repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-2 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 5-3 — SHUTDOWN LAMP AND DRIVER ALARM

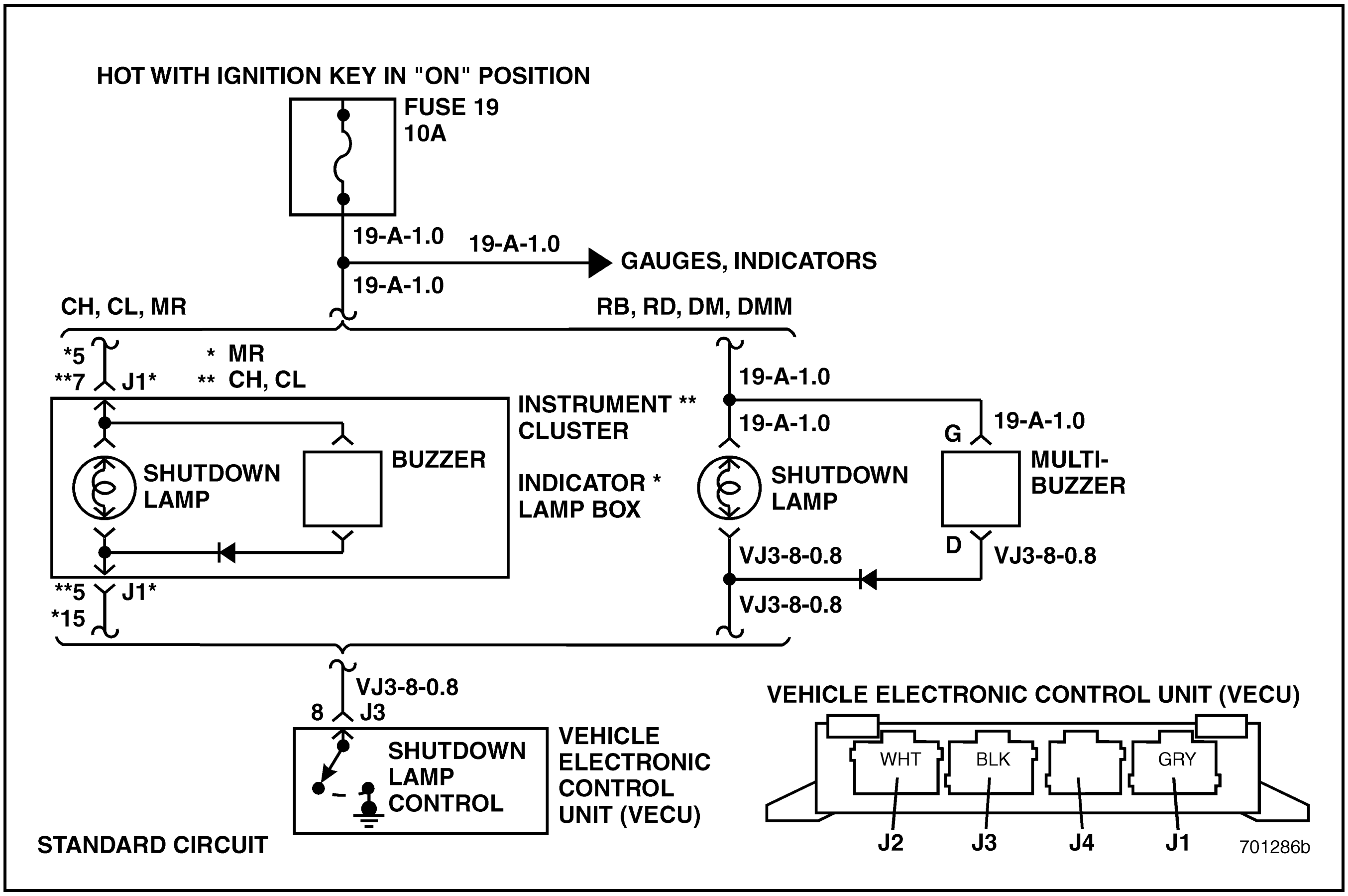


Figure 571 — Shutdown Lamp and Driver Alarm Standard Circuit

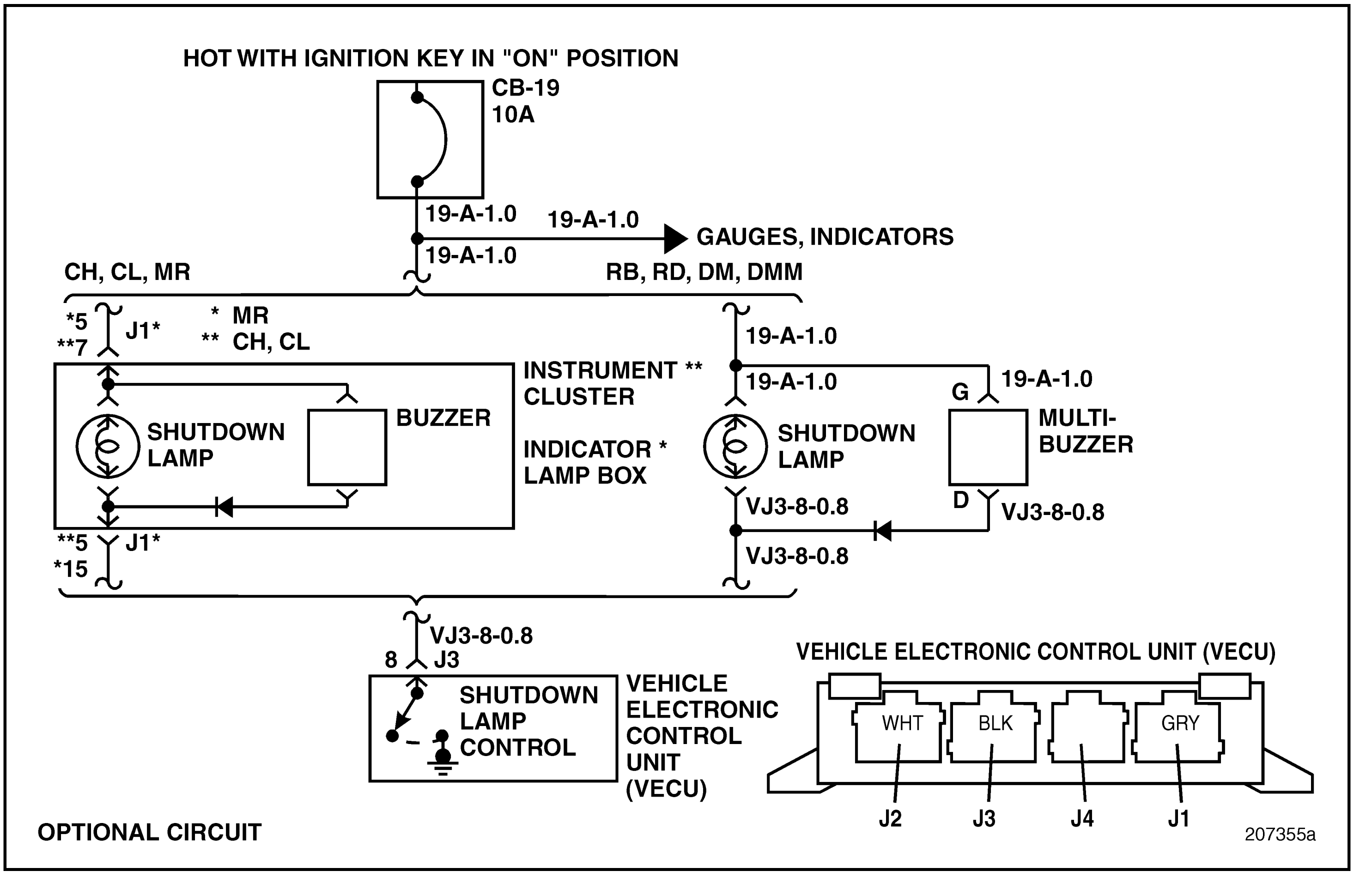


Figure 572 — Shutdown Lamp and Driver Alarm Optional Circuit

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S238

Message Identification (MID): 142

Circuit Description: The engine is equipped with a shutdown system that may prevent engine damage when a condition such as a loss of oil pressure, loss of coolant or engine overheating occurs. If the system detects a condition that will initiate engine shutdown, the shutdown warning indicator and driver alarm will activate to alert the driver 30 seconds before shutdown occurs. By pushing the Shutdown Override switch within 30 seconds of a shutdown warning, the driver can extend the shutdown time so the vehicle can be moved to a safe location.

Code Setting Conditions: Code 5-3 will set with an FMI of 3 (voltage high), if the Vehicle Electronic Control Unit (VECU) senses voltage is greater than 9 volts at VECU connector J3 pin 8 for more than 10 seconds when the VECU is attempting to turn the shutdown lamp ON. If the fault is active and the voltage drops to less than 9 volts for more than 10 seconds the fault will become inactive. Code 5-3 will set with an FMI of 4 (voltage low), if the VECU senses voltage less than 0.5 volts at VECU connector J3 pin 8. If the fault is active and the voltage goes above 0.5 volts for more than 10 seconds, the fault will become inactive.

Additional Symptoms: The Electronic Malfunction Lamp (EML) will turn ON and remain ON until the ignition key switch is turned OFF, even if blink code 5-3 becomes inactive. In the event of a short circuit to ground, the shutdown lamp and driver alarm will go ON and remain ON until the ignition key is turned OFF or the fault becomes inactive.

Test 1 — Checking for Code 5-3

1. Verify that code 5-3 is set.

   If code 5-3 is set, go to test “Test 2 — Checking the FMI” on page 442.

   If code 5-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Vehicle Electronic Control Unit (VECU) connectors and other circuit connectors for frayed, loose or corroded connections.

Test 2 — Checking the FMI

1. Check Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI code is 4 (voltage low) go to test “Test 4 — Checking for Continuous Operation” on page 442.

   If the FMI code is 3 (voltage high) go to test “Test 5 — Checking for Continuous Operation” on page 442.

Test 4 — Checking for Continuous Operation

1. Connect a diagnostic computer.
2. Turn the ignition key ON.

   If fault 5-3 becomes active and the shutdown lamp and alarm stay ON continuously, go to test “Test 8 — Checking for a Short to Ground” on page 442.

   If fault 5-3 becomes active but the shutdown lamp and driver alarm do NOT stay on continuously, go to test “Test 9 — Checking the Power Supply Circuit” on page 443.

   If fault 5-3 does NOT become active and either the shutdown lamp or driver alarm is inoperative, replace the inoperative component and retest the system.

Test 5 — Checking for Continuous Operation

NOTE

This diagnostic will detect a short to voltage only if the VECU is attempting to turn the shutdown lamp and alarm ON.

1. Turn the ignition key ON.
2. Disconnect the Coolant Level Sensor. This will set fault 1-7 and attempt to turn the shutdown lamp ON.
3. After fault 1-7 has become active, reconnect the Coolant Level Sensor.
4. After 30 seconds observe the electronic malfunction indicator and Active Fault Table.
5. Does the Electronic Malfunction Lamp (EML) remain ON and is fault 5-3 active?

   If NO, based on the information obtained to this point the problem may be intermittent in nature and hard to diagnose. Check connections at the shutdown lamp and alarm and VECU connector J3 for a short to voltage.

   If the Electronic Malfunction Lamp (EML) remains ON and fault 5-3 is active, go to test “Test 10 — Checking for a Short Circuit to Voltage” on page 443.

Test 8 — Checking for a Short to Ground

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.

   If the shutdown lamp and driver alarm come ON, there is a short to ground in circuit VJ3-8-0.8. Go to test “Test 16 — Isolating the Short Circuit to Ground” on page 443.

   If the shutdown lamp and driver alarm do not come ON, there is a short to ground in the VECU. Go to test “Test 17 — Checking for Blink Code 5-3” on page 444.

Test 9 — Checking the Power Supply Circuit

Circuit 19-A-1.0 provides power to a significant number of other gauges and indicators in the dash. An open or short to ground in circuit 19-A-1.0 MAY cause problems with these shared components. Other components powered by circuit 19-A-1.0 are the voltmeter, coolant temperature gauge, fuel gauge, speedometer, tachometer and the Electronic Malfunction Lamp (EML).

If there are no other obvious electrical problems with components in the gauge panel, go to test "Test 18 — Checking for Battery Voltage" on page 444.

If the vehicle is experiencing electrical problems with components in the dash, there may be an open or short to ground in circuit 19-A-1.0. Locate and repair the open or short to ground.

Test 10 — Checking for a Short Circuit to Voltage

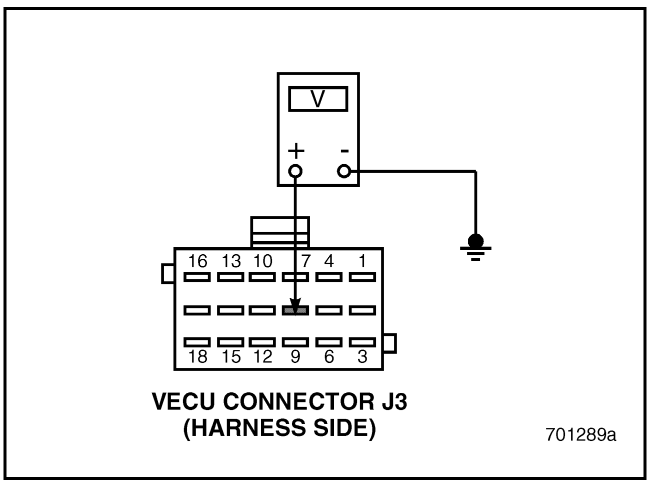


Figure 573

1. Turn the ignition key OFF.
2. Remove the shutdown lamp bulb and disconnect the buzzer.
3. Disconnect VECU connector J3.
4. Connect the Serial Link Jumper into the Serial Communications Port.
5. Measure the voltage between VECU connector J3 pin 8 and a good ground (see Figure 573).

   If the measured voltage is greater than 0.5 volts, there is a short circuit to voltage. Go to test "Test 20 — Isolating the Short Circuit to Voltage" on page 444.

   If the measured voltage is less than 0.5 volts, go to test "Test 21 — Checking the VECU" on page 445.

Test 16 — Isolating the Short Circuit to Ground

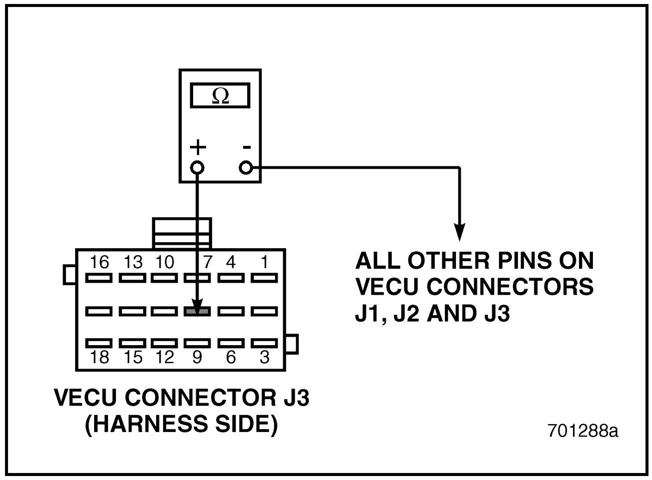


Figure 574

1. Disconnect the Serial Link Jumper.
2. Remove the shutdown lamp and disconnect the driver alarm buzzer.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 8 and all other pins on VECU connectors J1, J2 and J3 (see Figure 574).

   If continuity exists, pin 8 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If continuity does NOT exist, go to test "Test 32 — Checking for a Failed Unit" on page 445.

Test 17 — Checking for Blink Code 5-3

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 5-3 is still active, check the VECU and connector J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 5-3 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 18 — Checking for Battery Voltage

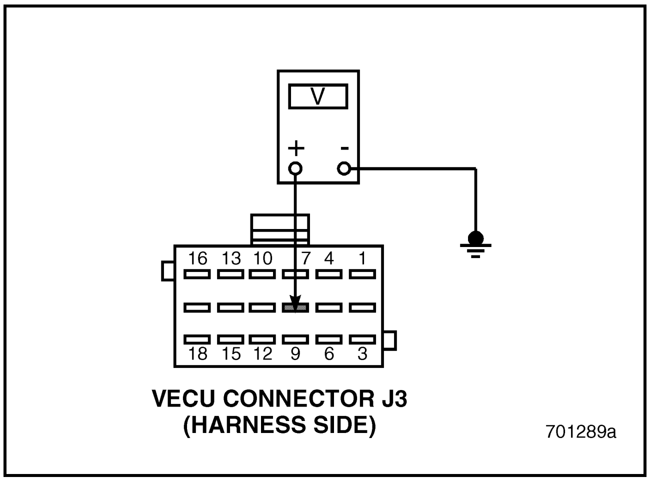


Figure 575

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.
4. Measure the voltage between VECU connector J3 pin 8 and a good ground (see Figure 575).

   If battery voltage is present, go to test “Test 36 — Checking the VECU Connector for an Open Circuit” on page 445.

   If battery voltage is NOT present, check circuit VJ3-8-0.8 for an open. If circuit VJ3-8-0.8 is NOT open, check power circuit 19-A-1.0 for an open circuit.

Test 20 — Isolating the Short Circuit to Voltage

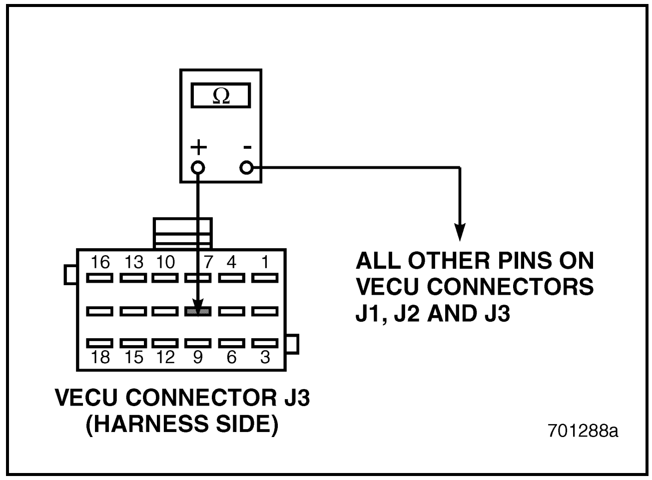


Figure 576

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Remove the shutdown lamp and disconnect the driver alarm.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3 pin 8 and all other pins on VECU connectors J1, J2 and J3 (see Figure 576).

   If continuity exists, VECU connector J3 pin 8 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, VECU connector J3 pin 8 is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage.

Test 21 — Checking the VECU

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Connect VECU connector J3.
3. Install the shutdown lamp and connect the driver alarm.
4. Turn the ignition key ON.
5. Disconnect the Coolant Level Sensor. This will set fault code 1-7 and attempt to turn on the shutdown lamp.
6. After fault 1-7 has become active, reconnect the Coolant Level Sensor.
7. After 30 seconds, observe the Electronic Malfunction Lamp (EML) and Active Fault Table.

   If the Electronic Malfunction Lamp (EML) does not turn ON, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connection.

   If the malfunction indicator turns ON, and code 5-3 is active, check the VECU and connectors for repairable damage. If no damage is found or is not repairable, replace the VECU and retest the system.

Test 32 — Checking for a Failed Unit

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Connect VECU connector J3.
3. Replace the shutdown lamp bulb with a known good bulb.
4. Turn the ignition key ON.

   If the fault does not become active, the old lamp had a short to ground and replacing the lamp has corrected the problem.

   If the fault becomes active, replace the alarm with a known good unit. If the fault does not become active then the old alarm had a short to ground and replacing the alarm has corrected the problem.

   If the fault is still active after replacing the driver alarm, there is a short to ground somewhere else in the harness. Locate and repair the short to ground.

Test 36 — Checking the VECU Connector for an Open Circuit

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Visually inspect VECU connector J3 pin 8 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pin 8. Gently push the test lead into pin 8 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU harness connector J3.

   If the test lead is making good contact with VECU connector J3 pin 8, go to test “Test 72 — Checking the VECU” on page 445.

Test 72 — Checking the VECU

1. Turn the ignition key OFF.
2. Connect VECU connector J3.
3. Turn the ignition key ON.

   If blink code 5-3 becomes active, check the VECU for dirt, loose or broken pins, or repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-3 does NOT become active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 5-5 — ELECTRONIC MALFUNCTION LAMP (EML)

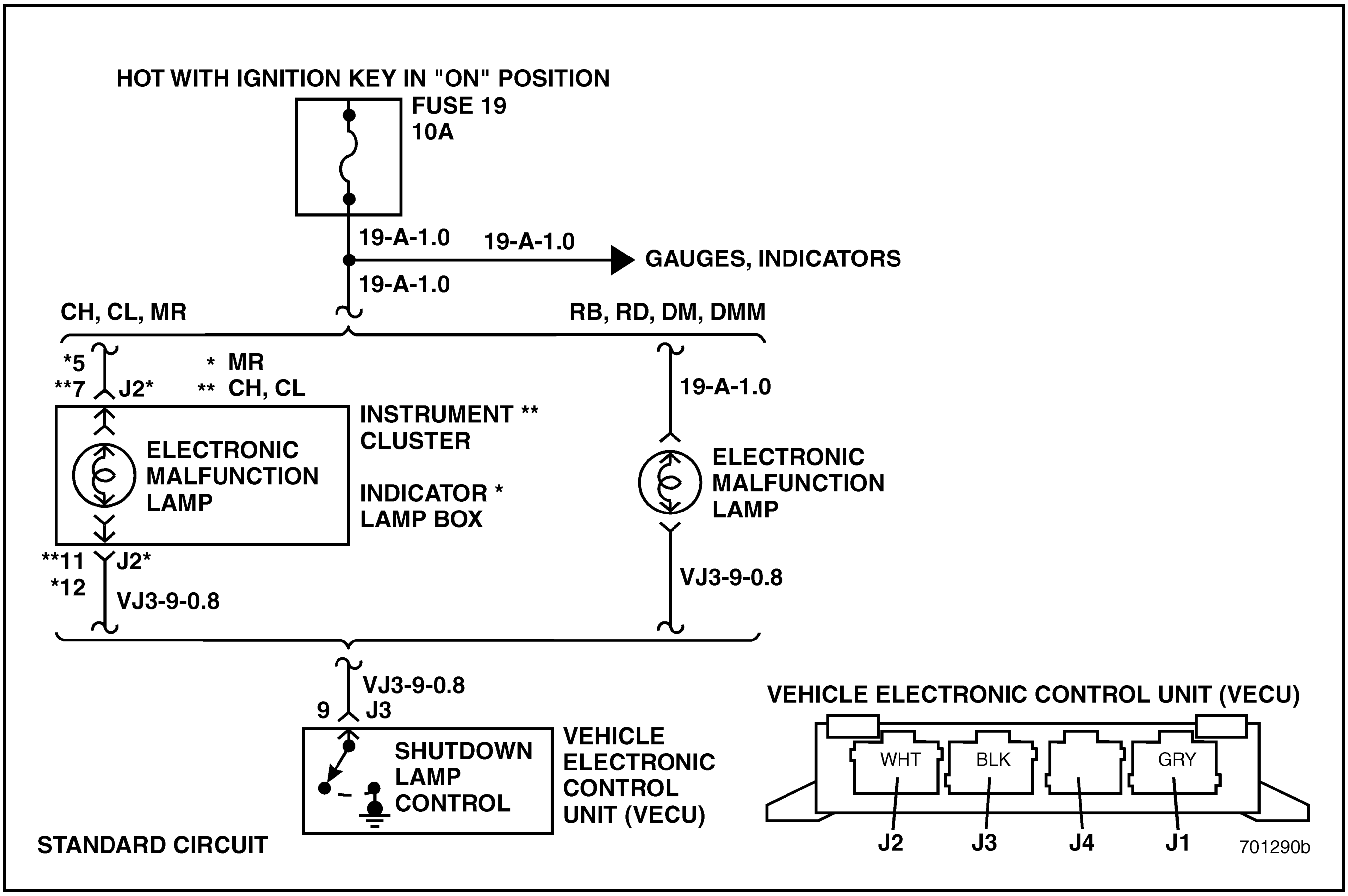


Figure 577 — Electronic Malfunction Lamp (EML) Standard Circuit

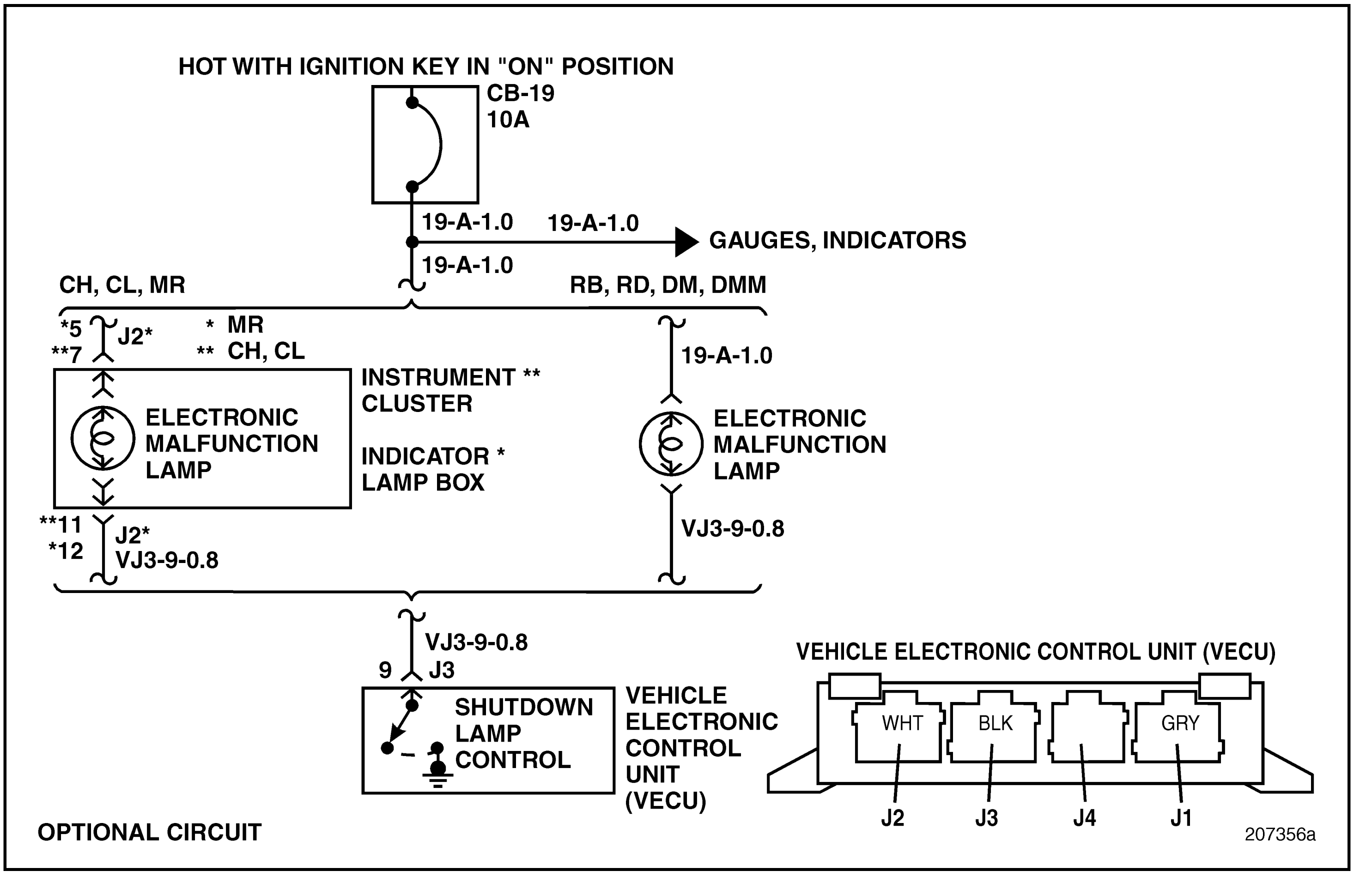


Figure 578 — Electronic Malfunction Lamp (EML) Optional Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier FMI: 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification PID: S239

Message Identification MID: 142

Circuit Description: The V-MAC III system is capable of displaying a two digit blink code for any detectable active fault in the V-MAC III system. Blink codes are displayed on the Electronic Malfunction Lamp (EML), which is located on the gauge panel. The primary function of the Electronic Malfunction Lamp (EML) is to alert the operator of a system failure and to allow for quick diagnosis of an active fault in the system without an expensive troubleshooting tool. Inactive fault codes cannot be accessed through the EML.

Code Setting Conditions: Code 5-5 will set with an FMI of 3 (voltage high), if the Vehicle Electronic Control Unit (VECU) senses voltage greater than 9 volts at VECU connector J3 pin 9 for more than 1 second when the VECU is attempting to turn the Electronic Malfunction Lamp (EML) ON. If the fault is active and the voltage drops to less than 9 volts for more than 1 second the fault will become inactive. Code 5-5 will set with an FMI of 4 (voltage low), if the VECU senses voltage less than 0.5 volts at VECU connector J3 pin 9. If the fault is active and the voltage goes above 0.5 volts for more than 1 second, the fault will become inactive. The Electronic Malfunction Lamp (EML) will not provide any blink codes while fault 5-5 is active.

Additional Symptoms: In the event of a short to ground, the Electronic Malfunction Lamp (EML) will remain ON (fault active) even if the short to ground is intermittent (fault inactive). In the event of an open circuit (fault active) the Electronic Malfunction Lamp (EML) will be unable to turn ON until the fault becomes inactive. When the fault becomes inactive the EML will remain ON until the ignition key is turned OFF. In the event of a short to voltage, the EML will be OFF and will remain OFF even if the fault becomes inactive.

NOTE

The Electronic Malfunction Lamp (EML) will not provide a blink code while fault 5-5 is active.

If code 5-5 is active with an FMI of 3, the Electronic Malfunction Lamp (EML) will be OFF and will remain OFF even if code 5-5 becomes inactive.

Test 1 — Checking for Code 5-5

1. Verify that code 5-5 is set.

   If code 5-5 is set, go to test "Test 2 — Checking Blink Code 5-5 Failure Mode Identifier (FMI)" on page 448.

   If code 5-5 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Vehicle Electronic Control Unit (VECU) connectors and instrument cluster connectors for loose or corroded connections.

Test 2 — Checking Blink Code 5-5 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI code is 4 (voltage low or open) go to test "Test 4 — Checking for a Short to Ground" on page 448.

   If the FMI code is 3 (voltage high) go to test "Test 5 — Checking for Continuous Operation" on page 448.

Test 4 — Checking for a Short to Ground

1. Turn the ignition key ON.

   If code 5-5 becomes active and the Electronic Malfunction Lamp (EML) stays ON continuously, go to test "Test 8 — Checking Voltage at the Vehicle Electronic Control Unit (VECU)" on page 449.

   If code 5-5 becomes active but the Electronic Malfunction Lamp (EML) does not come ON, go to test "Test 9 — Checking the Power Supply Circuit" on page 449.

   If code 5-5 is inactive and the Electronic Malfunction Lamp (EML) stays ON continuously, there is an intermittent short to ground on circuit VJ3-9-0.8. Wiggle the harness and connectors to try to make the fault active.

   If code 5-5 does NOT become active and the Electronic Malfunction Lamp (EML) comes ON for 2 seconds and then goes out, the system is functioning properly and the problem may be intermittent. Check the connectors at the VECU and instrument cluster for secure connections.

Test 5 — Checking for Continuous Operation

NOTE

This test will detect a short to voltage only if the VECU is attempting to turn the Electronic Malfunction Lamp (EML) ON.

1. Turn the ignition key ON.
2. Disconnect the Coolant Level Sensor. This will set fault code 1-7 and attempt to turn the Electronic Malfunction Lamp (EML) ON.
3. After fault code 1-7 has become active, reconnect the Coolant Level Sensor.
4. Check the Active Fault Table to see if blink code 5-5 is active.

   If blink code 5-5 is NOT active, the problem may be intermittent in nature and hard to diagnose. Check connections at the Electronic Malfunction Lamp and VECU connector J3 for a short to voltage.

   If blink code 5-5 is active, go to test "Test 10 — Checking for a Short to Voltage" on page 449.

Test 8 — Checking Voltage at the Vehicle Electronic Control Unit (VECU)

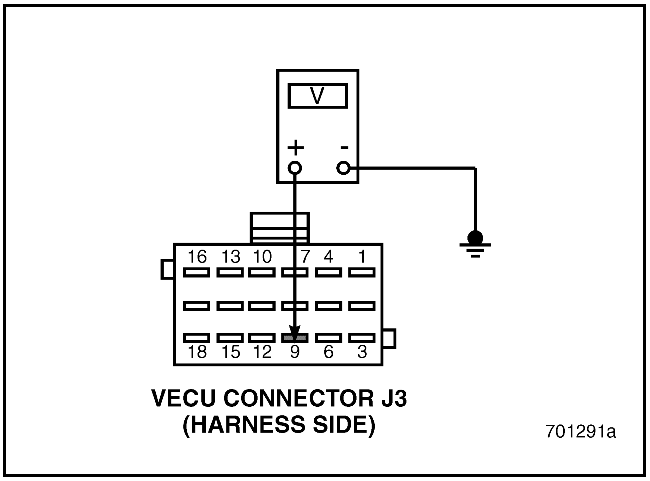


Figure 579

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.
4. Measure the voltage between VECU connector J3 pin 9 and a good ground (see Figure 579).

   If battery voltage is present, go to test "Test 16 — Checking for a Short Circuit in the VECU" on page 450.

   If battery voltage is NOT present, go to test "Test 17 — Isolating the Short to Ground" on page 450.

Test 9 — Checking the Power Supply Circuit

Circuit 19-A-1.0 provides power to a significant number of other gauges and indicators in the gauge panel. An open or short to ground in circuit 19-A-1.0 MAY cause problems with shared components. Other components powered by circuit 19-A-1.0 are the voltmeter, coolant temperature gauge, fuel gauge, speedometer, tachometer and the shutdown lamp and buzzer.

If there are no other problems with components in the gauge panel, go to test "Test 18 — Checking for an Open Circuit" on page 450.

If the vehicle is experiencing other problems with components in the gauge panel, there may be an open or short to ground on circuit 19-A-1.0. Locate and repair the open or short to ground.

Test 10 — Checking for a Short to Voltage

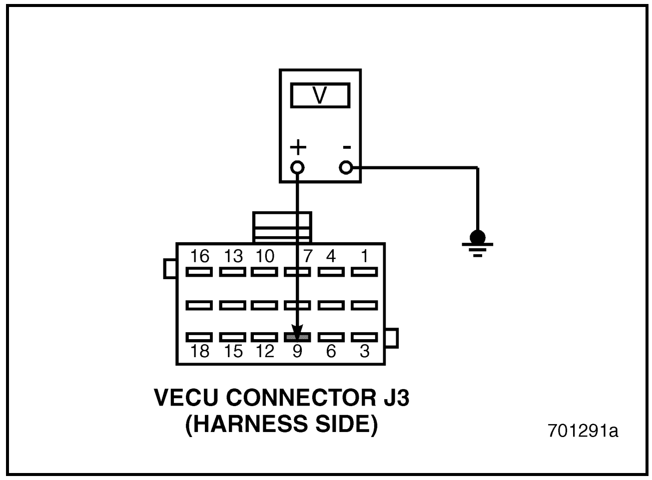


Figure 580

1. Turn the ignition key OFF.
2. Remove the Electronic Malfunction Lamp (EML) and disconnect VECU connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.
4. Measure the voltage between VECU connector J3 pin 9 and a good ground (see Figure 580).

   If the measured voltage is greater than 0.5 volts, go to test "Test 20 — Isolating the Short to Voltage" on page 451.

   If the measured voltage is less than 0.5 volts, go to test "Test 21 — Checking the VECU" on page 451.

Test 16 — Checking for a Short Circuit in the VECU

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Visually inspect VECU connector J3 for dirt, loose or shorted pins or any other repairable damage.

   If damage is evident, repair the damage and retest the system.

   If no damage is evident or is not repairable, replace the VECU and retest the system.

Test 17 — Isolating the Short to Ground

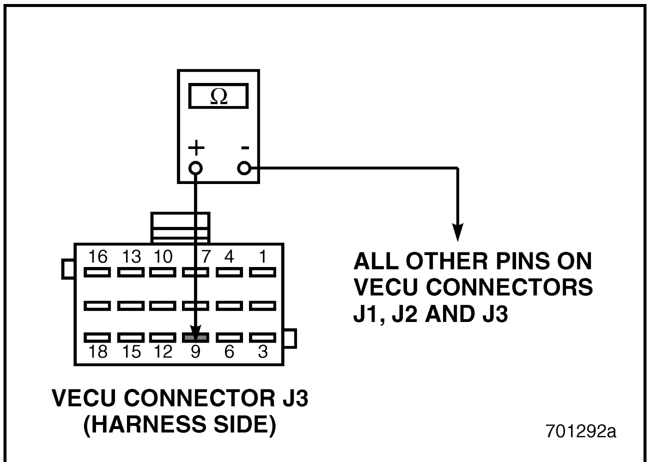


Figure 581

1. Turn the ignition key OFF.
2. Remove the Electronic Malfunction Lamp (EML) and disconnect VECU connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 9 and all other pins on VECU connectors J1, J2 and J3 (see Figure 581).

   If continuity exists, pin 9 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If continuity does NOT exist, pin 9 is shorted to ground somewhere else in the harness. Locate and repair the short to ground.

Test 18 — Checking for an Open Circuit

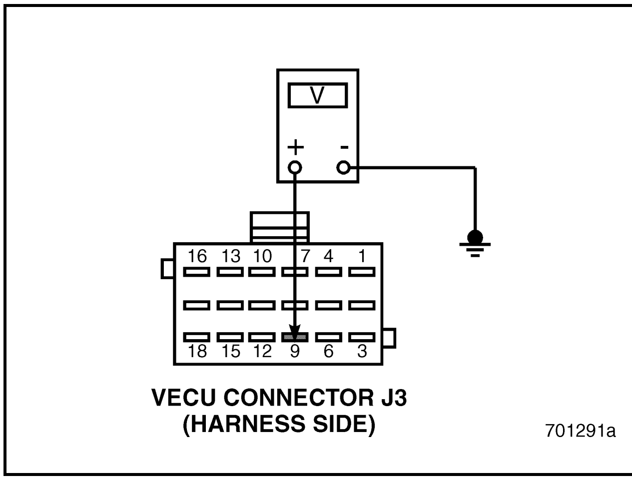


Figure 582

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.
4. Measure the voltage between VECU connector J3 pin 9 and a good ground (see Figure 582).

   If battery voltage is present, go to test “Test 36 — Checking the VECU Connectors for an Open Circuit” on page 451.

   If battery voltage is NOT present, check circuit VJ3-9-0.8 for an open circuit between the VECU and the Electronic Malfunction Lamp (EML). If circuit VJ3-9-0.8 is NOT open, go to test “Test 37 — Checking Supply Voltage” on page 452.

Test 20 — Isolating the Short to Voltage

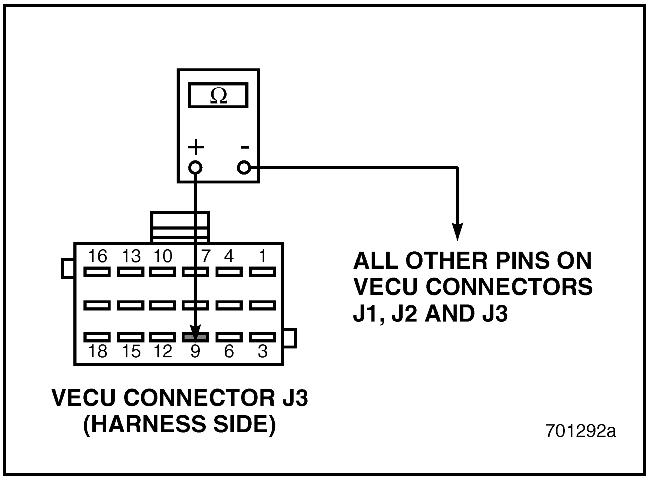


Figure 583

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Remove the Electronic Malfunction Lamp (EML) and disconnect VECU connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 9 and all other pins on VECU connectors J1, J2 and J3 (see Figure 583).

   If continuity exists, VECU connector J3 pin 9 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, VECU connector J3 pin 9 is shorted to voltage somewhere else in the harness. Locate and repair the short to voltage.

Test 21 — Checking the VECU

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Connect VECU connector J3 and install the Electronic Malfunction Lamp (EML).
3. Turn the ignition key ON.
4. Disconnect the Coolant Level Sensor. This will set fault code 1-7 and attempt to turn on the shutdown lamp.
5. After fault code 1-7 has become active, reconnect the Coolant Level Sensor.
6. After 30 seconds, observe the Electronic Malfunction Lamp (EML) and Active Fault Table.

   If blink code 5-5 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

   If blink code 5-5 is active, check the VECU and connectors for repairable damage. If no damage is found or is not repairable, replace the VECU and retest the system.

Test 36 — Checking the VECU Connectors for an Open Circuit

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect VECU connector J3.
3. Visually inspect VECU connector J3 pin 9 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pin 9. Gently push the test lead into pin 9 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU harness connector J3.

   If the test lead is making good contact with VECU connector J3 pin 9, go to test “Test 72 — Checking the VECU” on page 452.

Test 37 — Checking Supply Voltage

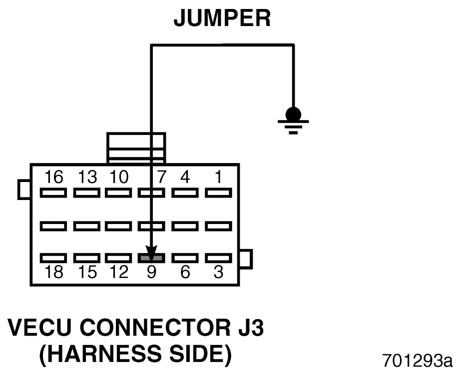


Figure 584

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Replace the Electronic Malfunction Lamp (EML) with a known good lamp.
3. Disconnect Vehicle Control Unit (VECU) connector J3.
4. Connect a jumper between VECU connector J3 pin 9 and a good ground (see Figure 584).
5. Connect the Serial Link Jumper to the Serial Communications Port.

   If the Electronic Malfunction Lamp (EML) lights, the old lamp was faulty and replacing the lamp has corrected the problem.

   If the Electronic Malfunction Lamp (EML) does NOT light, there is an open in supply circuit 19-A-1.0. Locate and repair the open circuit.

Test 72 — Checking the VECU

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Connect VECU connector J3.
3. Turn the ignition key ON.

   If blink code 5-5 becomes active, check the VECU for dirt, loose or broken pins, or repairable damage. If no problems are evident, or they are not repairable, replace the VECU and retest the system.

   If blink code 5-5 does NOT become active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 5-6 — SPARE RELAY #3

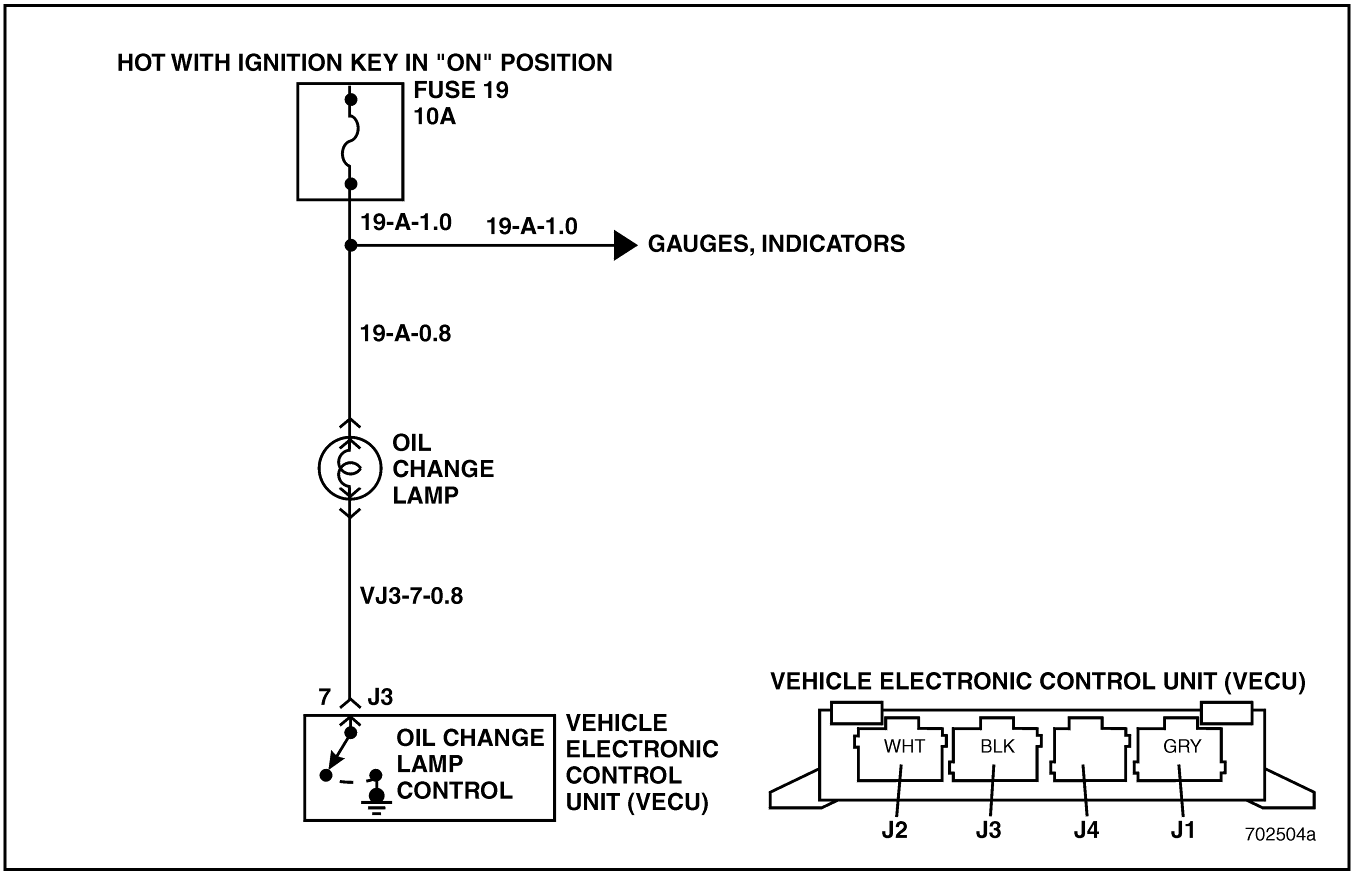


Figure 585 — Oil Change Lamp Circuit

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): S12

Message Identification (MID): 142

Circuit Description: The Vehicle Electronic Control Unit (VECU) can be programmed to track intervals for up to fifteen scheduled maintenance procedures, and alert the driver to upcoming or overdue maintenance requirements. On some vehicles, the driver alert is transmitted over the J1587 data lines to the electronic instrument cluster, or Co-Pilot or Vehicle Information Profiler dash display. Vehicles not equipped with a dash display unit may have an oil change lamp installed to alert the driver.

Code Setting Conditions: Code 5-6 will set with an FMI of 3 (voltage high), if the Vehicle Electronic Control Unit (VECU) senses voltage is greater than 9 volts at VECU connector J3, pin 7, for more than 10 seconds when the VECU is attempting to turn the oil change lamp ON. If the fault is active and the voltage drops to less than 9 volts for more than 10 seconds the fault will become inactive. Code 5-6 will set with an FMI of 4 (voltage low/open), if the VECU senses voltage less than 0.5 volts at VECU connector J3, pin 7. If the fault is active and the voltage goes above 0.5 volts for more than 10 seconds, the fault will become inactive.

NOTE

Vehicles with an oil change lamp installed must have the lamp enabled in the Options Data section of the Vehicle Electronic Control Unit (VECU). Maintenance intervals are defined and reset in the Fleet Data section of the VECU. If this fault code is observed on a vehicle that is equipped with and electronic instrument cluster, Co-Pilot or Vehicle Information Profiler, the VECU may contain an incorrect data file, which must be reprogrammed. There will not be a wire (VJ3-7-0.8) at the VJ3 pin 7 cavity.

Test 1 — Checking for Code 5-6

1. Verify that code 5-6 is set.

   If code 5-6 is set, go to test “Test 2 — Checking Code 5-6 Failure Mode Identifier (FMI)” on page 454.

   If code 5-6 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Vehicle Electronic Control Unit (VECU) connectors and other circuit connectors for frayed, loose or corroded connections.

Test 2 — Checking Code 5-6 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI code is 4 (voltage low/open) go to test “Test 4 — Checking for Continuous Operation” on page 454.

   If the FMI code is 3 (voltage high) go to test “Test 5 — Checking for a Short Circuit to Voltage in the Control Circuit” on page 454.

Test 4 — Checking for Continuous Operation

1. Turn the ignition key ON.

   If the oil change lamp stays ON continuously, go to test “Test 8 — Checking for a Short to Ground” on page 455.

   If the oil change lamp does NOT turn ON at all, go to test “Test 9 — Checking the Power Supply Circuit” on page 455.

Test 5 — Checking for a Short Circuit to Voltage in the Control Circuit

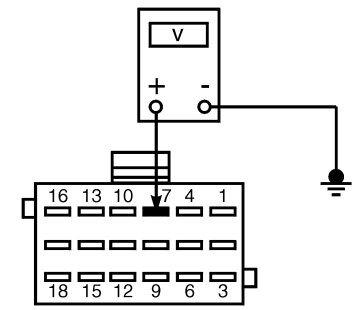


Figure 586

NOTE

The VECU will detect a short to voltage only if it is attempting to turn the oil change lamp ON.

1. Turn the ignition key OFF.
2. Remove Fuse 19 from the Electrical Equipment Panel.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Turn the ignition key ON.
5. Measure the voltage between VECU connector J3, pin 7 and a good ground (see Figure 586).

   If the measured voltage is greater than 0.5 volts, go to test “Test 10 — Isolating the Short to Voltage” on page 455.

   If the measured voltage is less than 0.5 volts, go to test “Test 11 — Checking the VECU” on page 456.

Test 8 — Checking for a Short to Ground

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.

   If the oil change lamp comes ON, there is a short to ground in circuit VJ3-7-0.8. Go to test “Test 16 — Isolating the Short to Ground” on page 456.

   If the oil change lamp does not come ON, there is a short to ground in the VECU. Go to test “Test 17 — Checking for Blink Code 5-6” on page 456.

Test 9 — Checking the Power Supply Circuit

Circuit 19-A-1.0 provides power to a significant number of other gauges and indicators in the dash. An open or short to ground in circuit 19-A-1.0 MAY cause problems with these shared components. Other components powered by circuit 19-A-1.0 include the voltmeter, coolant temperature gauge, fuel gauge, speedometer, tachometer and the Electronic Malfunction Lamp (EML).

If there are no other obvious electrical problems with components in the gauge panel, go to test “Test 18 — Checking for Battery Voltage” on page 456.

If the vehicle is experiencing electrical problems with components in the dash, there may be an open in circuit 19-A-1.0. Locate and repair the open circuit.

Test 10 — Isolating the Short to Voltage

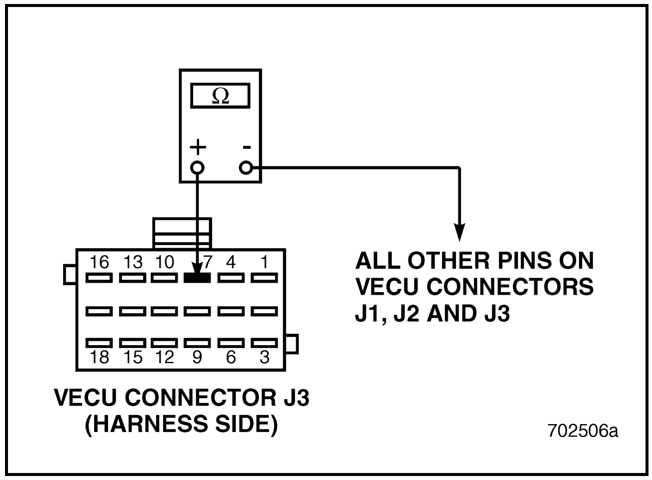


Figure 587

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Remove the shutdown lamp and disconnect the driver alarm.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3, pin 7 and all other pins on VECU connectors J1, J2 and J3 (see Figure 587).

   If continuity exists, VECU connector J3, pin 7 is shorted to one of the other VECU circuits. Locate and repair the short.

   If there is NO continuity, VECU connector J3, pin 7 is shorted to voltage somewhere else in the harness. Locate and repair the short to voltage.

Test 11 — Checking the VECU

1. Turn the ignition key OFF.
2. Connect VECU connector J3.
3. Turn the ignition key ON.

   If blink code 5-6 becomes active, check the VECU for dirt, loose or broken pins, or repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-6 does NOT become active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 16 — Isolating the Short to Ground

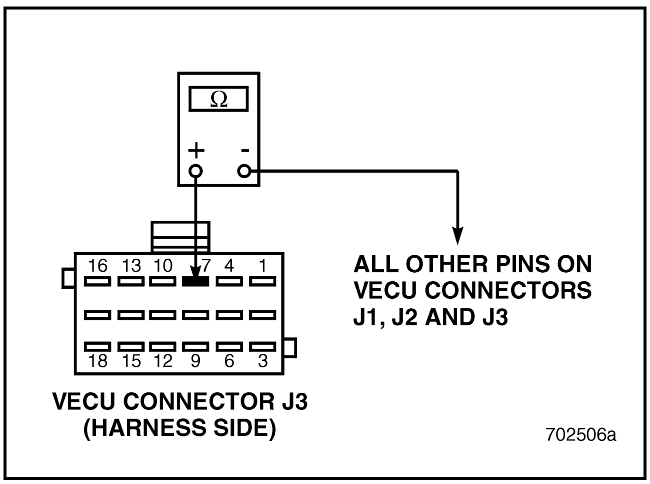


Figure 588

1. Disconnect the Serial Link Jumper.
2. Remove the bulb from the oil change lamp.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J3, pin 7 and all other pins on VECU connectors J1, J2 and J3 (see Figure 588).

   If continuity exists, pin 7 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If continuity does NOT exist, go to test “Test 32 — Checking for a Failed Unit” on page 457.

Test 17 — Checking for Blink Code 5-6

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 5-6 is still active, check the VECU and connector J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 5-6 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 18 — Checking for Battery Voltage

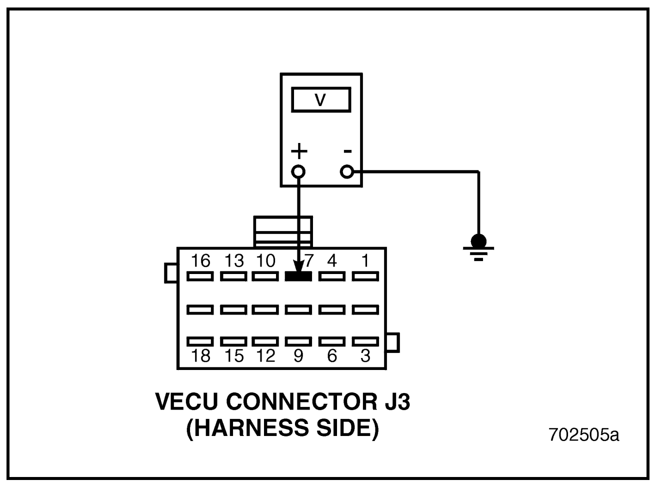


Figure 589

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.

4. Measure the voltage between VECU connector J3, pin 7 and a good ground (see Figure 589).

   If battery voltage is present, go to test "Test 36 — Checking the VECU Connector for an Open Circuit" on page 457.

   If battery voltage is NOT present, check circuit VJ3-7-0.8 for an open. If circuit VJ3-7-0.8 is NOT open, check power circuit 19-A-1.0 for an open between the oil change lamp and the common splice.

Test 32 — Checking for a Failed Unit

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Connect VECU connector J3.
3. Replace the oil change lamp bulb with a known good bulb.
4. Turn the ignition key ON.

   If the fault does NOT remain active, the old bulb had a short to ground and replacing the bulb has corrected the problem.

   If the fault DOES remain active after replacing the bulb, there is a short to ground somewhere else in the harness. Locate and repair the short to ground.

Test 36 — Checking the VECU Connector for an Open Circuit

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Visually inspect VECU connector J3 pin 7 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pin 7. Gently push the test lead into pin 7 and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU harness connector J3.

   If the test lead is making good contact with VECU connector J3 pin 7, go to test "Test 72 — Checking the VECU" on page 457.

Test 72 — Checking the VECU

1. Turn the ignition key OFF.
2. Connect VECU connector J3.
3. Turn the ignition key ON.

   If blink code 5-6 becomes active, check the VECU for dirt, loose or broken pins, or repairable damage. If no problems are evident, or if they are not repairable, replace the VECU and retest the system.

   If blink code 5-6 does NOT become active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 5-8 — EGR TEMPERATURE (ASET™ CEGR ENGINE)

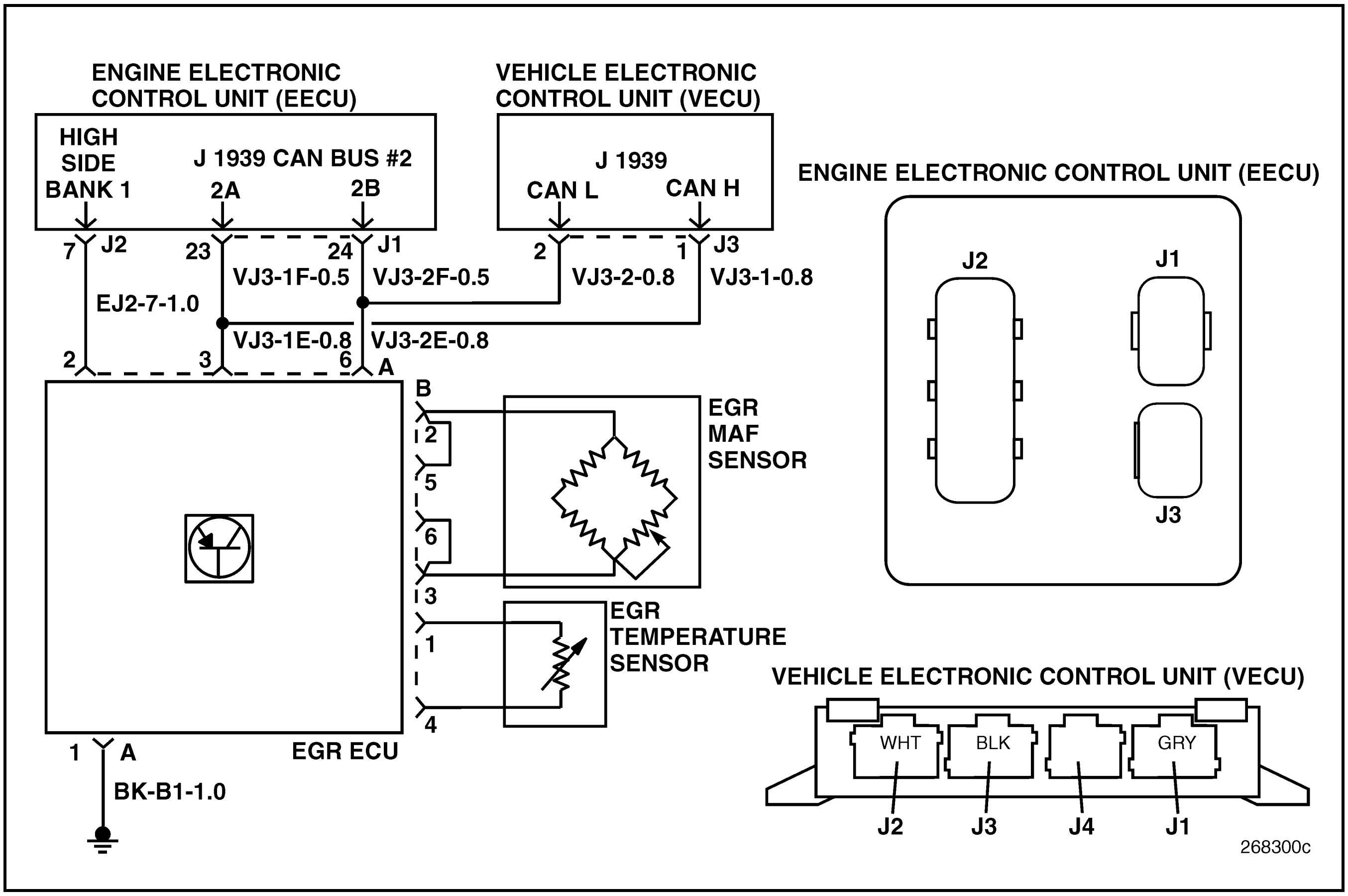


Figure 590 — EGR Mass Air Flow (EGRMAF) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 0 (Temperature High), 3 (Voltage High), 4 (Voltage Low), 5 (Open), 9 (Data Absent), 12 (Failed Unit)

Parameter Identification (PID): 412

Message Identification (MID): 128

Circuit Description: The EGR Mass Air Flow (EGRMAF) Sensor consists of an exhaust gas temperature probe, a heater probe, and a dedicated electronic processor. The EGR Electronic Control Unit (EGR ECU) supplies the heater probe with a 12 volt power source. The EGR ECU then monitors the amount of current required to maintain the heater probe at 752°F (400°C). The EGR ECU also monitors the exhaust gas temperature signal from the temperature probe and uses this signal and the heater current signal to calculate EGR flow. The EGR ECU transmits error messages and EGR Mass Air Flow data to the Engine Electronic Control Unit (EECU) over the J1939 serial data lines.

Location: The EGR temperature probe and heater probe are located in the EGR tube between the EGR cooler and the intake manifold. The EGR ECU is mounted to the rear face of the Engine Electronic Control Unit (EECU) mounting plate. The EGR Mass Flow Sensor assembly is supplied from by the manufacturer as a single calibrated unit. The components of the sensor are not to be replaced individually.

Code Setting Conditions: Code 5-8 will set with FMI 0 if the EGR ECU detects a cooled exhaust gas temperature greater than 250 to 500°F (121.1 to 260°C). Code 5-8 will set with FMI 3 if the EGR ECU detects a short circuit to voltage in the exhaust gas temperature probe circuit. Code 5-8 will set with FMI 4 if the EGR ECU detects a short circuit to ground in the exhaust gas temperature probe circuit. Code 5-8 will set with FMI 5 if the EGR ECU detects an open in the exhaust gas temperature probe circuit. Code 5-8 will set with FMI 9 if the EGR ECU signal is missing on the J1939 serial data lines. Code 5-8 will set with FMI 12 if the EGR ECU detects an internal failure.

NOTE

On vehicles equipped with EECU software part numbers 1MS334 or 1MS334A, blink code 5-8, FMI 9 will be logged multiple times as an inactive fault. This is an intermittent error that is normal for this level of software.

NOTE

If blink code 5-9 is also set with FMI 9 or FMI 12, diagnose and repair the cause of blink code 5-9 before attempting to diagnose blink code 5-8.

Test 1 — Checking for Code 5-8

1. Verify that code 5-8 is set.

   If code 5-8 is set, go to test "Test 2 — Checking Code 5-8 Failure Mode Identifier (FMI)" on page 459.

   If code 5-8 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the exhaust gas temperature probe connector and wires for poor connections.

Test 2 — Checking Code 5-8 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 0 (temperature high) check for a faulty EGR cooler.

   If the FMI is 3 (voltage high), 5 (open) or 12 (failed unit), replace the EGR Mass Flow Sensor assembly and retest the system.

   If the FMI is 4 (voltage low), inspect the harness that connects the exhaust gas temperature probe to the EGR ECU, looking for any areas where the insulation has worn through and is touching ground. Repair the short to ground if possible; otherwise replace the EGR Mass Flow Sensor assembly.

   If the FMI is 9 (data absent), go to test "Test 4 — Checking for Other Blink Codes" on page 459.

Test 4 — Checking for Other Blink Codes

1. Is blink code 6-4 or 6-7 also set?

   If blink code 6-4 or 6-7 is also set, perform the diagnostic procedures for the code, then retest the system.

   If blink code 6-4 or 6-7 is NOT set, go to test "Test 8 — Checking for Power to the EGR Electronic Control Unit (EGR ECU)" on page 460.

Test 8 — Checking for Power to the EGR Electronic Control Unit (EGR ECU)

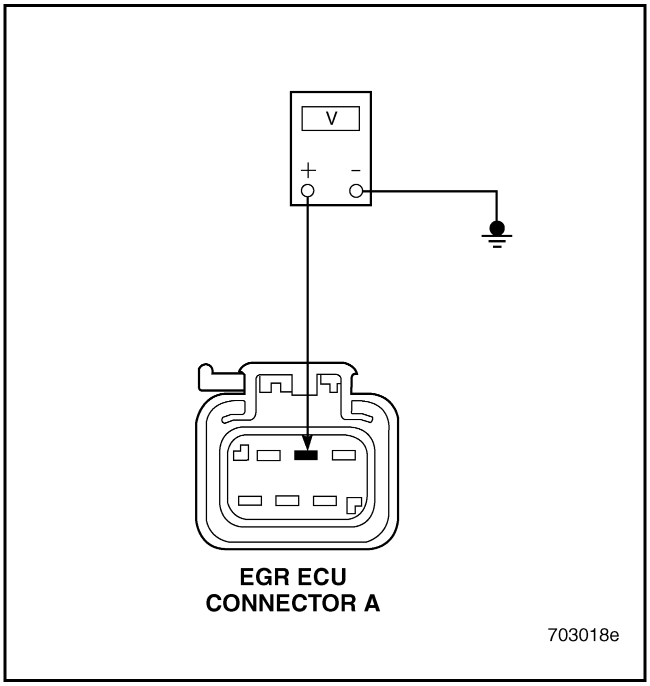


Figure 591

1. Remove connector A from the EGR ECU.
2. Turn the ignition key ON.
3. Check for battery voltage (+12V) between pin 2 of EGR ECU connector A and a known good ground (see Figure 591).

   If battery voltage is present, go to test “Test 16 — Checking for EGR Electronic Control Unit (EGR ECU) Ground” on page 460.

   If battery voltage is NOT present, a problem exists between EGR ECU connector A pin 2 and EECU connector J2 pin 7. Inspect the EGR ECU and EECU connectors for damaged or loose pins. If the connectors are in good condition, locate and repair the open circuit, and retest the system.

Test 16 — Checking for EGR Electronic Control Unit (EGR ECU) Ground

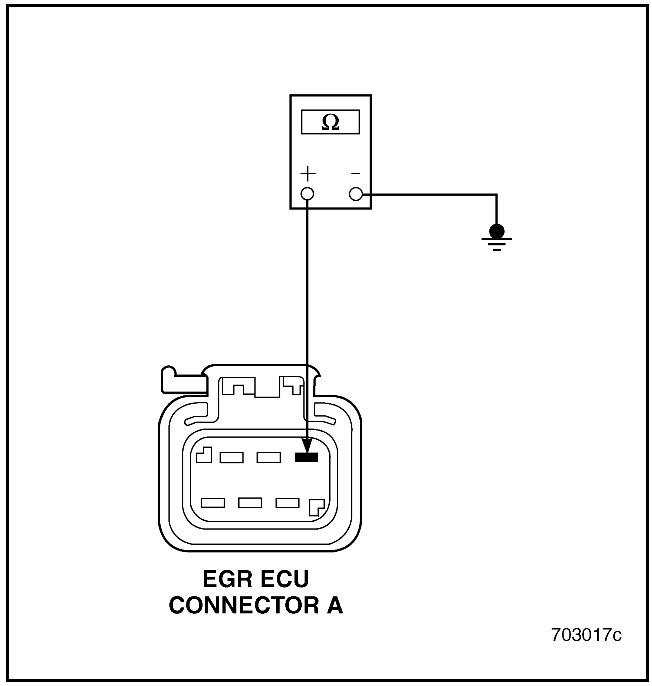


Figure 592

1. Turn the ignition key OFF.
2. Remove connector A from the EGR ECU.
3. Measure the resistance between EGR ECU connector A pin 1 and a known good ground (see Figure 592).

   If the measured resistance indicates acceptable continuity to ground, go to test “Test 32 — Checking for an Open Serial Data Line” on page 461.

   If the measured resistance does NOT indicate acceptable continuity to ground, a problem exists between EGR ECU connector A and ground. Locate and repair the problem and retest the system.

Test 32 — Checking for an Open Serial Data Line

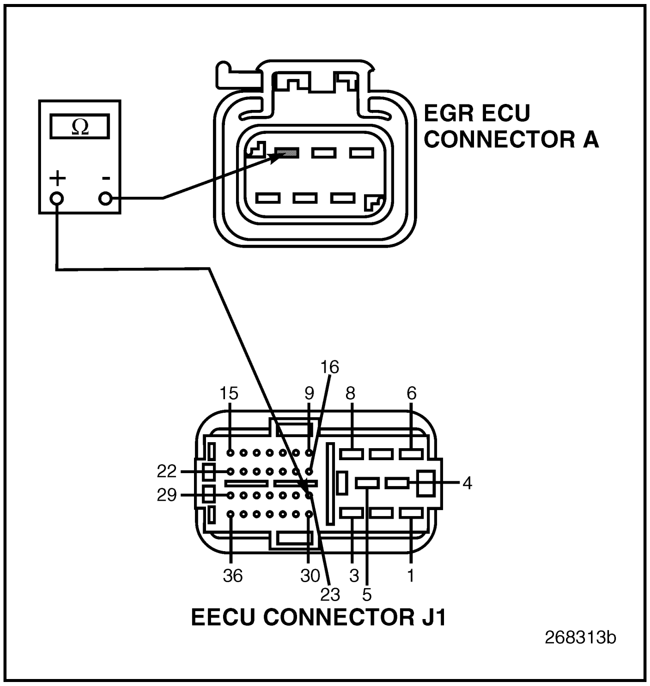


Figure 593

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Remove connector A from the EGR ECU.
4. Measure the resistance between EECU connector J1 pin 23 and EGR ECU connector A pin 3 (see Figure 593).

   If the measured resistance indicates continuity, go to test "Test 64 — Checking for an Open Serial Data Line" on page 461.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 high circuit between the EECU and the EGR ECU.

Test 64 — Checking for an Open Serial Data Line

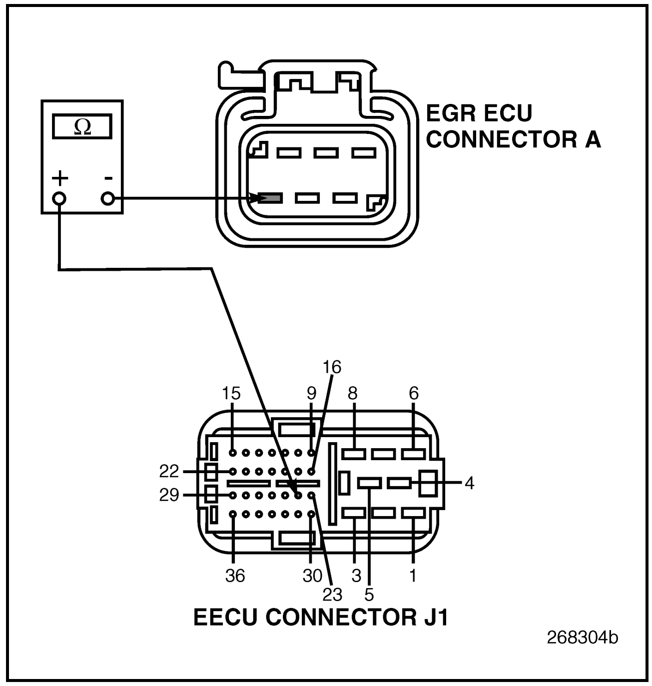


Figure 594

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Remove connector A from the EGR ECU.
4. Measure the resistance between EECU connector J1 pin 24 and EGR ECU connector A pin 6 (see Figure 594).

   If the measured resistance indicates continuity, go to test "Test 128 — Checking for an Open Serial Data Line" on page 462.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 low circuit between the EECU and the EGR ECU.

Test 128 — Checking for an Open Serial Data Line

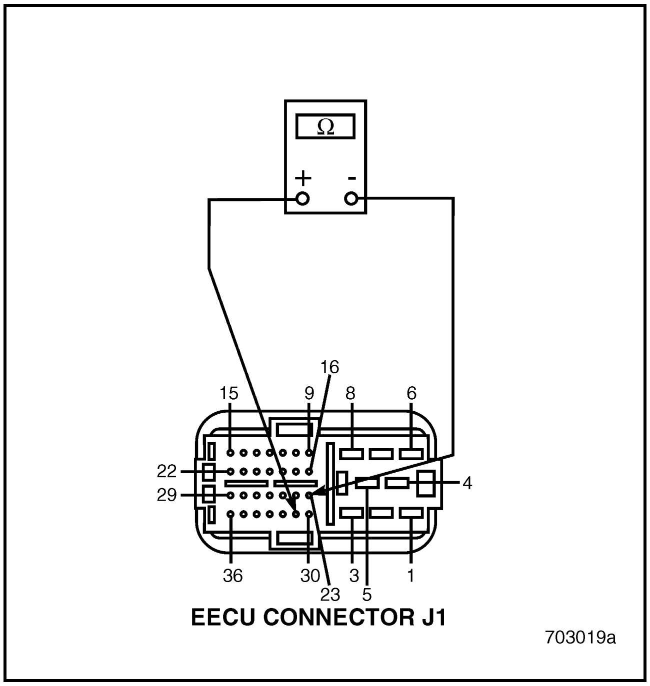


Figure 595

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Measure the resistance between EECU connector J1 pin 23 and EECU connector J1 pin 31 (see Figure 595).

   If the measured resistance indicates continuity, go to test “Test 256 — Checking for an Open Serial Data Line” on page 462.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 high circuit.

Test 256 — Checking for an Open Serial Data Line

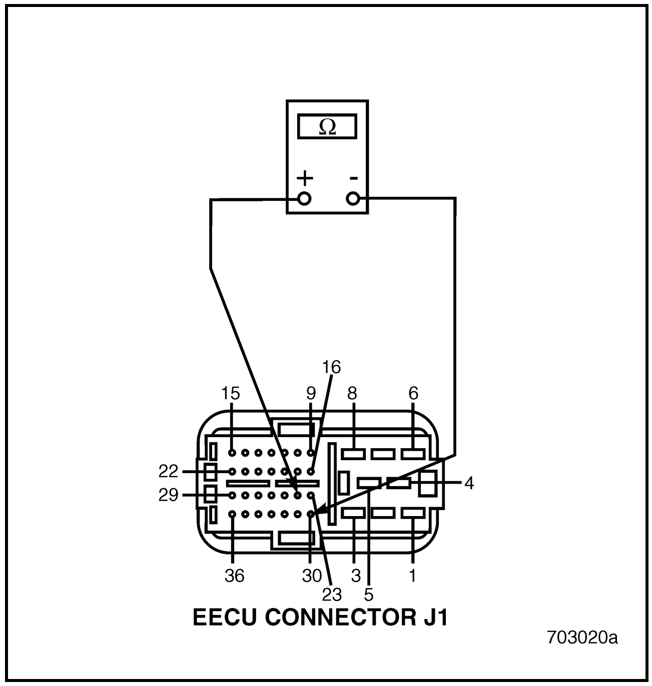


Figure 596

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Measure the resistance between EECU connector J1 pin 24 and EECU connector J1 pin 30 (see Figure 596).

   If the measured resistance indicates continuity, go to test “Test 512 — Checking for a Faulty EGR Electronic Control Unit (EGR ECU)” on page 463.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 low circuit.

Test 512 — Checking for a Faulty EGR Electronic Control Unit (EGR ECU)

1. Turn the ignition key OFF.
2. Replace the EGR ECU and Mass Air Flow Sensor Assembly with a known good unit.
3. Check the system for blink codes.

   If code 5-8 is still set, reinstall the original EGR ECU and Mass Air Flow Sensor Assembly and replace the Engine Electronic Control Unit (EECU). Retest the system.

   If code 5-8 is NOT set, replacing the EGR ECU and Mass Air Flow Sensor Assembly corrected the problem.

BLINK CODE 5-9 — EGR MASS AIR FLOW (ASET™ CEGR ENGINE)

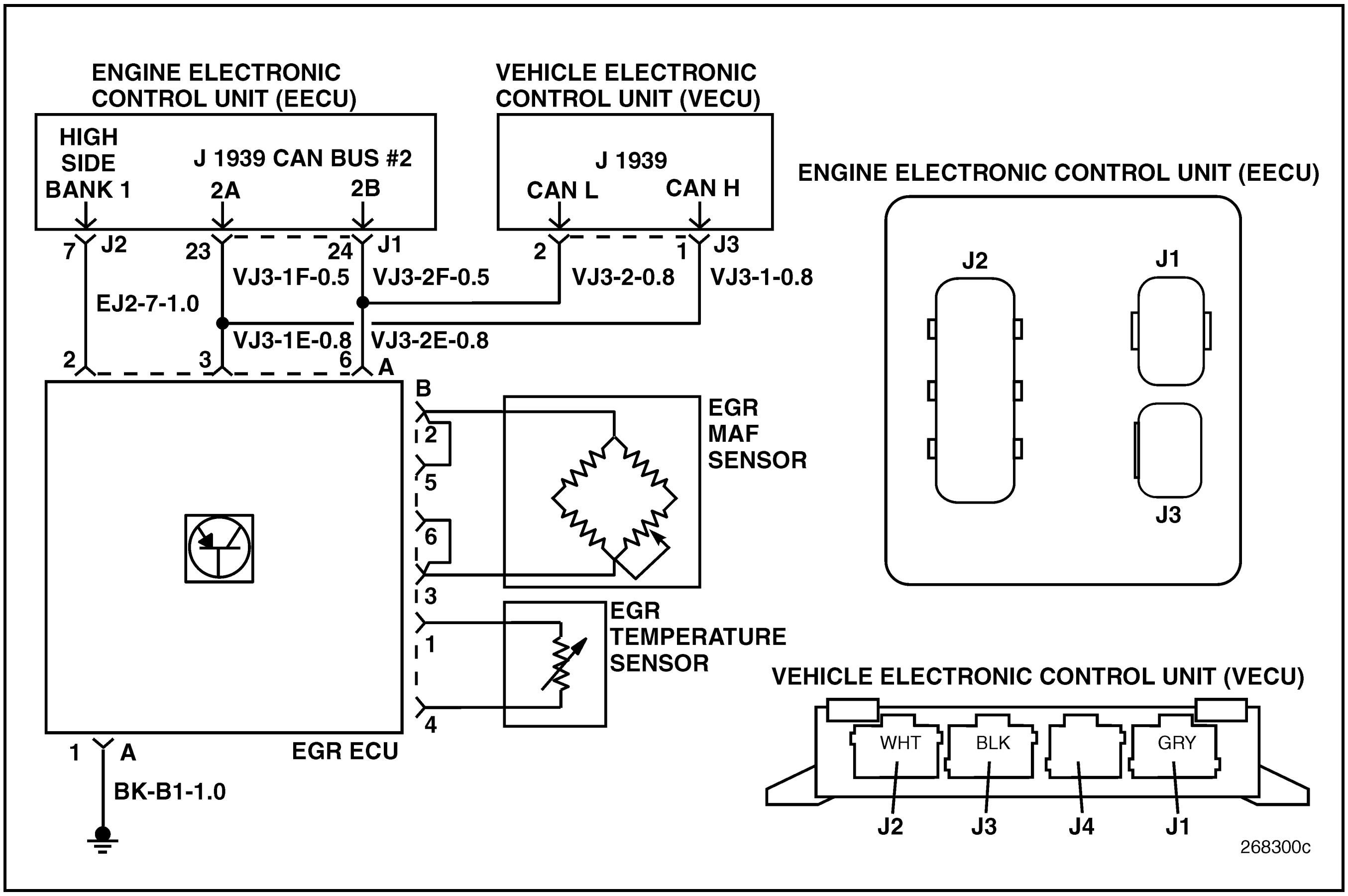


Figure 597 — EGR Mass Air Flow (EGRMAF) Sensor Circuit (ASET™ CEGR Engine)

NOTE
When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Open), 9 (Data Absent), 12 (Failed Unit)

Parameter Identification (PID): S277

Message Identification (MID): 128

Circuit Description: The EGR Mass Air Flow (EGRMAF) Sensor consists of an exhaust gas temperature probe, a heater probe, and a dedicated electronic processor. The EGR Electronic Control Unit (EGR ECU) supplies the heater probe with a 12 volt power source. The EGR ECU then monitors the amount of current required to maintain the heater probe at 752°F (400°C). The EGR ECU also monitors the exhaust gas temperature signal from the temperature probe and uses this signal and the heater current signal to calculate EGR flow. The EGR ECU transmits error messages and EGR Mass Air Flow data to the Engine Electronic Control Unit (EECU) over the J1939 serial data lines.

Location: The EGR temperature probe and heater probe are located in the EGR tube between the EGR cooler and the intake manifold. The EGR ECU is mounted to the rear face of the Engine Electronic Control Unit (EECU) mounting plate. The EGR Mass Flow Sensor assembly is supplied from by the manufacturer as a single calibrated unit. The components of the sensor are not to be replaced individually.

Code Setting Conditions: Code 5-9 will set with FMI 3 if the EGR ECU detects a short circuit to voltage in the heater probe circuit. Code 5-9 will set with FMI 4 if the EGR ECU detects a short circuit to ground in the heater probe circuit. Code 5-9 will set with FMI 5 if the EGR ECU detects an open heater probe circuit. Code 5-9 will set with FMI 9 if the EGR ECU signal is missing on the J1939 serial data lines. Code 5-9 will set with FMI 12 if the EGR ECU detects an internal failure.

NOTE

On vehicles programmed with EECU software part numbers 1MS334 or 1MS334A, blink code 5-9, FMI 9 will be logged multiple times as an inactive fault. This is an intermittent error that is normal for this level of software.

Test 1 — Checking for Code 5-9

1. Verify that code 5-9 is set.

   If code 5-9 is set, go to test “Test 2 — Checking Code 5-9 Failure Mode Identifier (FMI)” on page 465.

   If code 5-9 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the heater probe connector and wires for poor connections.

Test 2 — Checking Code 5-9 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 9 (data absent), go to test “Test 4 — Checking for Other Blink Codes” on page 465.

   If the FMI is 3 (voltage high), 5 (open) or 12 (failed unit), replace the EGR Mass Flow Sensor assembly and retest the system.

   If the FMI is 4 (voltage low), inspect the harness that connects the heater probe to the EGR ECU, looking for any areas where the insulation has worn through and is touching ground. Repair the short to ground if possible; otherwise replace the EGR Mass Flow Sensor assembly.

Test 4 — Checking for Other Blink Codes

1. Is blink code 6-4 also set?

   If blink code 6-4 is also set, perform the diagnostic procedures for code 6-4.

   If blink code 6-4 is NOT set, go to test “Test 8 — Checking for Power to the EGR Electronic Control Unit (EGR ECU)” on page 465.

Test 8 — Checking for Power to the EGR Electronic Control Unit (EGR ECU)

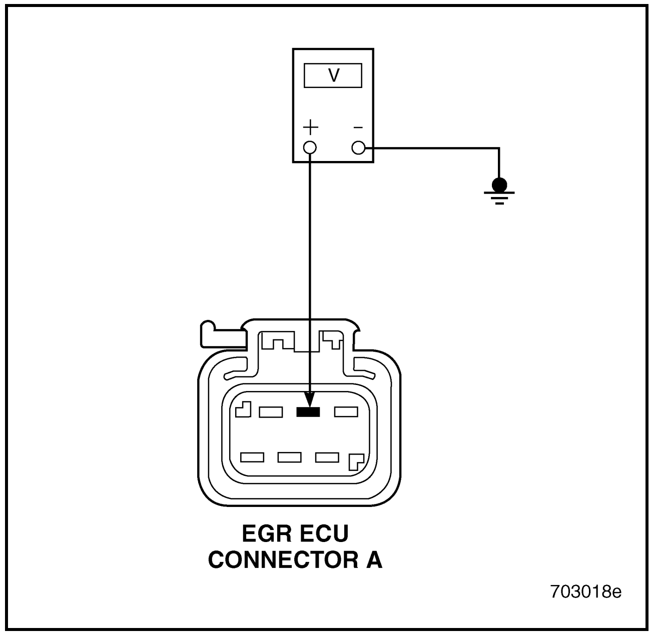


Figure 598

1. Remove connector A from the EGR ECU.
2. Turn the ignition key ON.
3. Check for battery voltage (+12V) between pin 2 of EGR ECU connector A and a known good ground (see Figure 598).

   If battery voltage is present, go to test “Test 16 — Checking for EGR Electronic Control Unit (EGR ECU) Ground” on page 466.

   If battery voltage is NOT present, a problem exists between EGR ECU connector A pin 2 and EECU connector J2 pin 7. Inspect the EGR ECU and EECU connectors for damaged or loose pins. If the connectors are in good condition, locate and repair the open circuit, and retest the system.

Test 16 — Checking for EGR Electronic Control Unit (EGR ECU) Ground

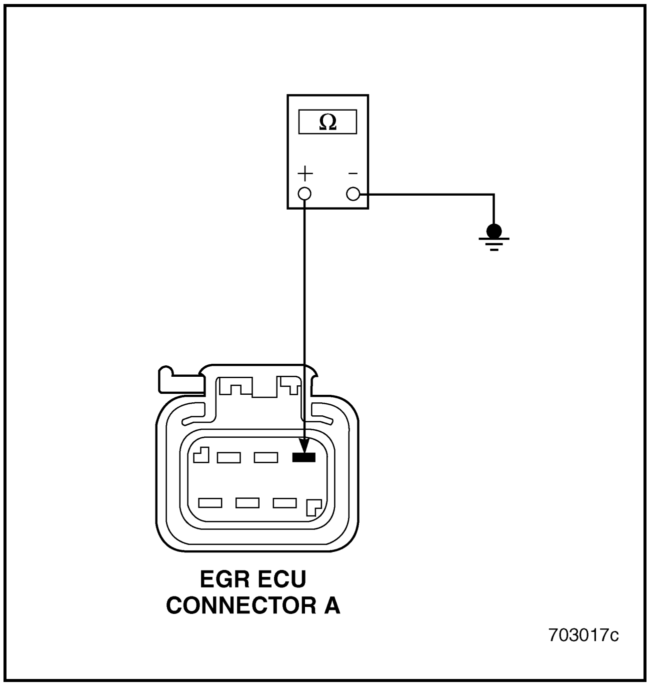


Figure 599

1. Turn the ignition key OFF.
2. Remove connector A from the EGR ECU.
3. Measure the resistance between EGR ECU connector A pin 1 and a known good ground (see Figure 599.

   If the measured resistance indicates acceptable continuity to ground, go to test “Test 32 — Checking for an Open Serial Data Line” on page 466.

   If the measured resistance does NOT indicate acceptable continuity to ground, a problem exists between EGR ECU connector A and ground. Locate and repair the problem and retest the system.

Test 32 — Checking for an Open Serial Data Line

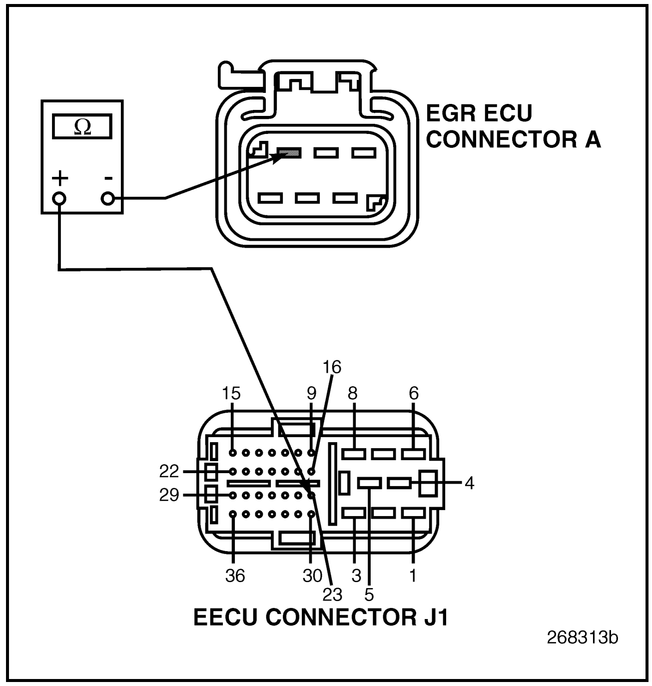


Figure 600

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Remove connector A from the EGR ECU.
4. Measure the resistance between EECU connector J1 pin 23 and EGR ECU connector A pin 3 (see Figure 600).

   If the measured resistance indicates continuity, go to test “Test 64 — Checking for an Open Serial Data Line” on page 467.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 high circuit between the EECU and the EGR ECU.

Test 64 — Checking for an Open Serial Data Line

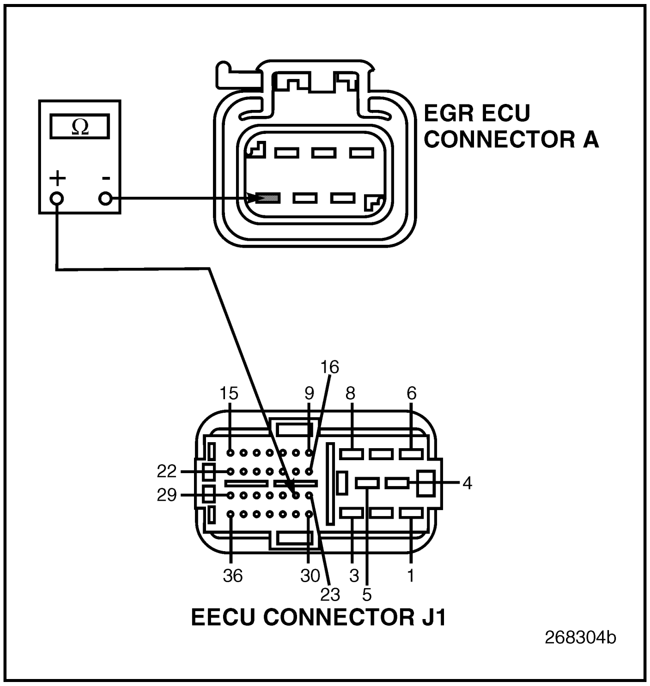


Figure 601

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Remove connector A from the EGR ECU.
4. Measure the resistance between EECU connector J1 pin 24 and EGR ECU connector A pin 6 (see Figure 601).

   If the measured resistance indicates continuity, go to test “Test 128 — Checking for an Open Serial Data Line” on page 467.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 low circuit between the EECU and the EGR ECU.

Test 128 — Checking for an Open Serial Data Line

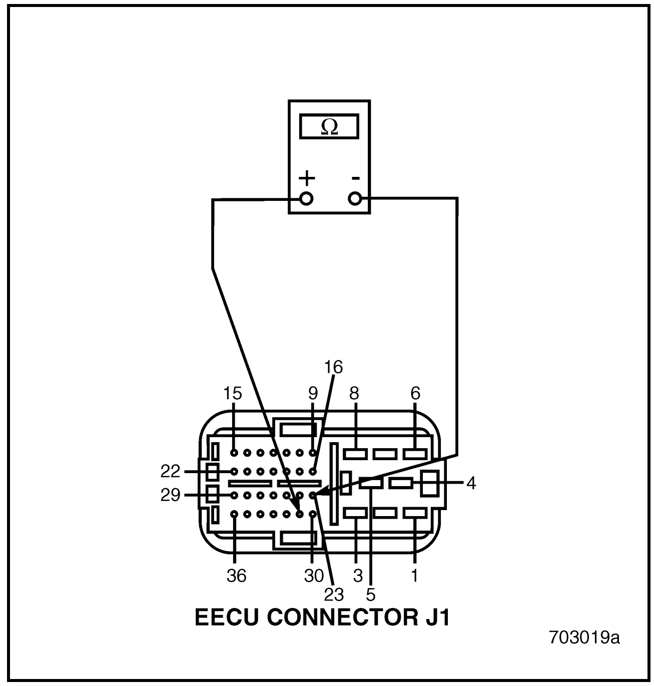


Figure 602

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Measure the resistance between EECU connector J1 pin 23 and EECU connector J1 pin 31 (see Figure 602).

   If the measured resistance indicates continuity, go to test “Test 256 — Checking for an Open Serial Data Line” on page 468.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 high circuit.

Test 256 — Checking for an Open Serial Data Line

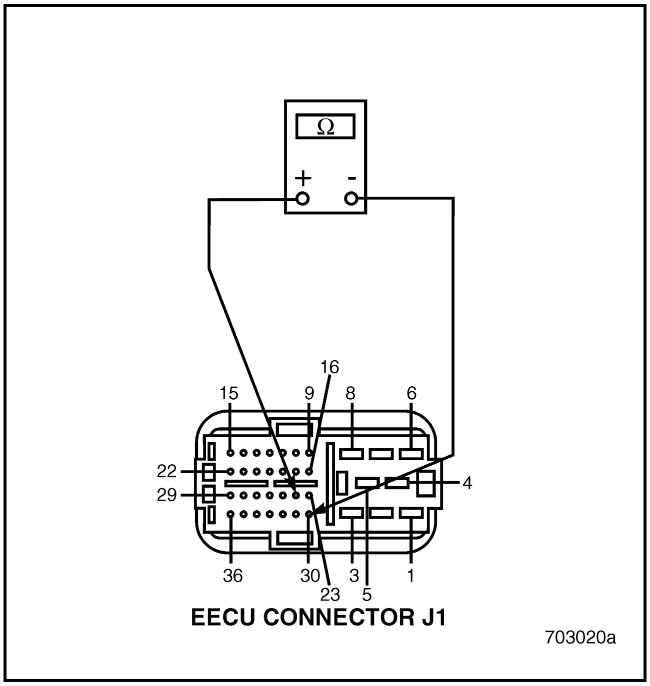


Figure 603

1. Turn the ignition key OFF.
2. Disconnect harness connector J1 from the Engine Electronic Control Unit (EECU).
3. Measure the resistance between EECU connector J1 pin 24 and EECU connector J1 pin 30 (see Figure 603.

   If the measured resistance indicates continuity, go to test "Test 512 — Checking for a Faulty EGR Electronic Control Unit (EGR ECU)" on page 468.

   If the measured resistance does NOT indicate continuity, locate and repair the open circuit in the J1939 low circuit.

Test 512 — Checking for a Faulty EGR Electronic Control Unit (EGR ECU)

1. Turn the ignition key OFF.
2. Replace the EGR ECU and Mass Air Flow Sensor Assembly with a known good unit.
3. Check the system for blink codes.

   If code 5-9 is still set, reinstall the original EGR ECU and replace the Engine Electronic Control Unit (EECU). Retest the system.

   If code 5-9 is NOT set, replacing the EGR ECU and Mass Air Flow Sensor Assembly corrected the problem.

BLINK CODE 6-1 — FUEL LEVEL (FL) SENSOR

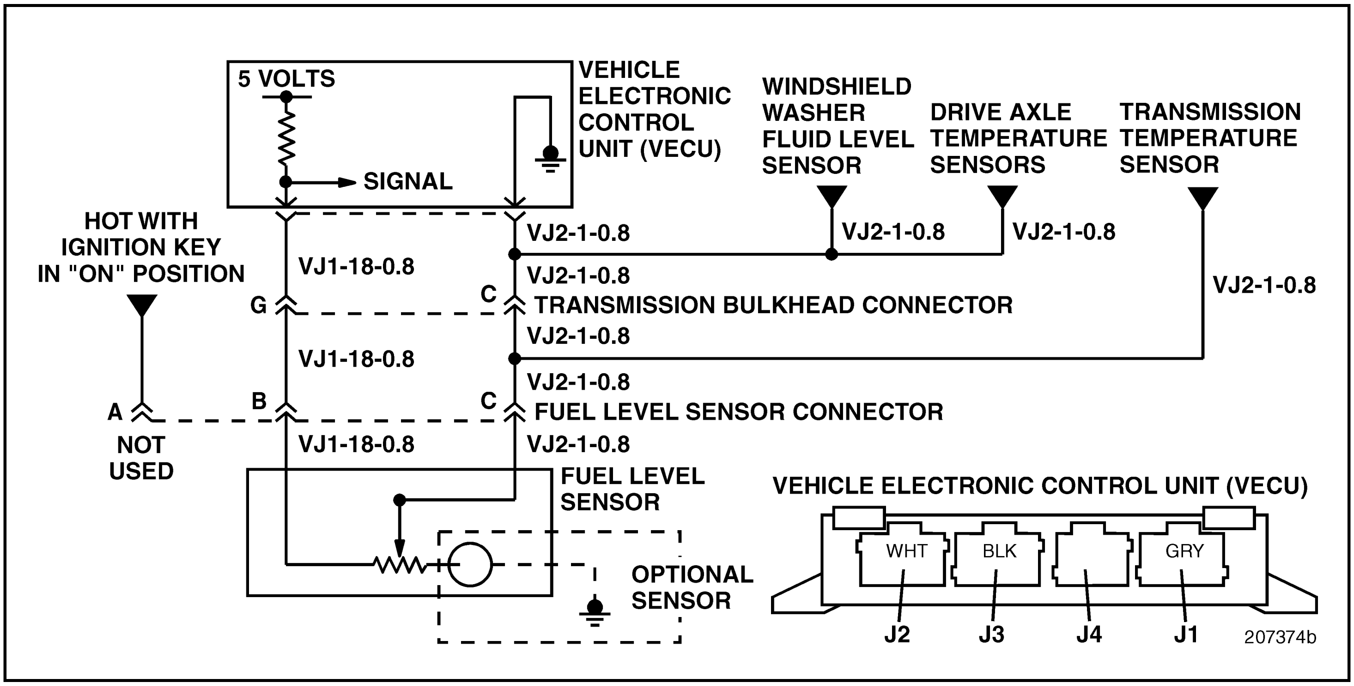


Figure 604 — Fuel Level (FL) Sensor Circuit

N O T E

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): P96

Message Identification (MID): 142

Circuit Description: The Fuel Level (FL) Sensor is a potentiometer that is mechanically linked to a float, typically in the left side fuel tank. The Fuel Level (FL) Sensor signal voltage to the Vehicle Electronic Control Unit (VECU) increases as the fuel level in the fuel tank drops. The Vehicle Electronic Control Unit (VECU) monitors the Fuel Level Sensor signal voltage and uses the signal to calculate fuel economy in the trip log. The VECU places both fuel level and fuel economy signals on the J1587 line for use by the gauge panel, Vehicle Information Profiler, and the Co-Pilot display.

Location: The Fuel Level (FL) Sensor is typically located in the left side fuel tank. The Vehicle Electronic Control Unit (VECU) is typically located under the dashboard in front of the passenger seat.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and fault code 6-1 will set when the Fuel Level (FL) Sensor signal voltage is less than 0.25 volts or greater than 4.5 volts for 2 seconds. If the signal voltage returns to between 0.25 volts and 4.5 volts for 2 seconds, the fault will become inactive. This fault code is only applicable to vehicles equipped with an electronic gauge panel.

Additional Symptoms: Fuel gauge inoperative.

Test 1 — Checking for Code 6-1

1. Verify that code 6-1 is set.

   If code 6-1 is set, go to test “Test 2 — Checking Blink Code 6-1 Failure Mode Identifier (FMI)” on page 470.

   If code 6-1 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking Blink Code 6-1 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic PC.

   If the FMI is 4 (voltage low), go to test “Test 4 — Checking for a Short Circuit to Ground in the Signal Line” on page 470.

   If the FMI is 3 (voltage high) go to test “Test 5 — Checking for an Open in the Fuel Level (FL) Sensor Circuit” on page 470.

Test 4 — Checking for a Short Circuit to Ground in the Signal Line

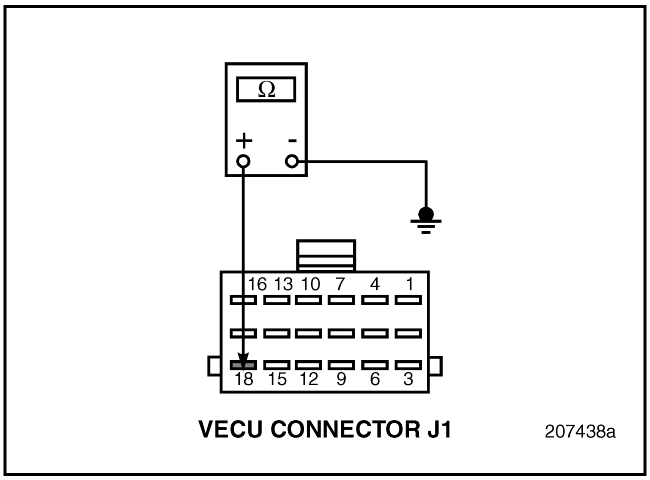


Figure 605

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Fuel Level (FL) Sensor.
3. Disconnect VECU connector J1.
4. Check for continuity between VECU connector J1 pin 18 and a good ground (see Figure 605).

   If continuity exists between pin 18 and ground, go to test “Test 8 — Isolating the Short Circuit to Ground in the Signal Line” on page 471.

   If NO continuity exists, go to test “Test 9 — Checking the Sensor for a Short Circuit to Ground” on page 471.

Test 5 — Checking for an Open in the Fuel Level (FL) Sensor Circuit

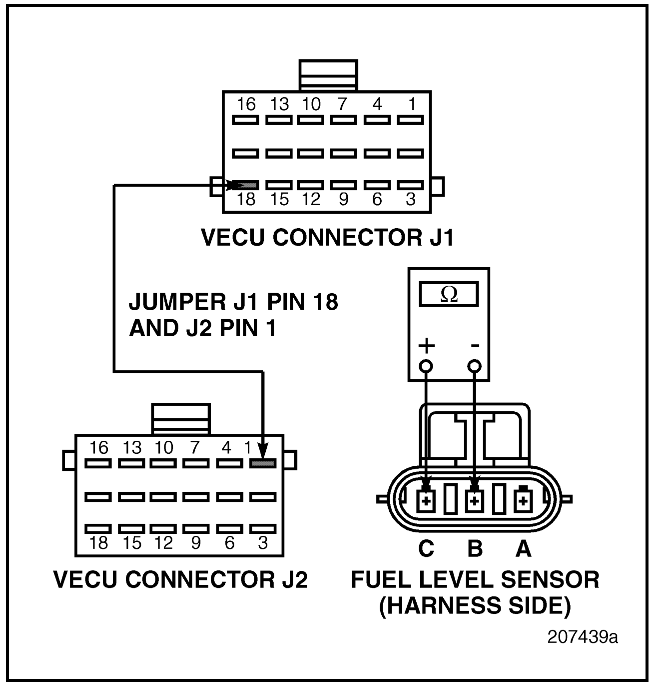


Figure 606

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Fuel Level (FL) Sensor.
3. Disconnect VECU connectors J1 and J2.
4. Install a jumper wire between VECU connector J1 pin 18 and connector J2 pin 1.
5. Check for continuity between Fuel Level (FL) Sensor harness connector pins B and C (see Figure 606).

   If continuity exists, go to test “Test 10 — Checking for a Short to Voltage in the Sensor Signal Line” on page 472.

   If there is NO continuity, go to test “Test 11 — Isolating the Open Circuit” on page 472.

Test 8 — Isolating the Short Circuit to Ground in the Signal Line

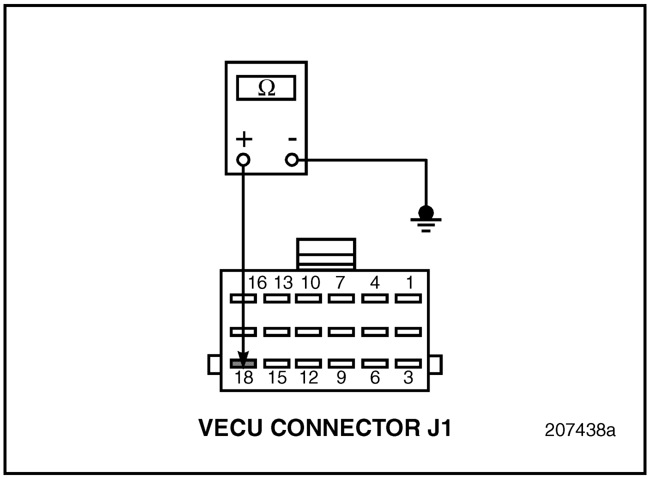


Figure 607

1. Turn the ignition key OFF.
2. Disconnect the transmission bulkhead connector.
3. Check for continuity between VECU connector J1 pin 18 and a good ground (see Figure 607).

   If continuity exists between pin 18 and ground, go to test “Test 16 — Checking for a Faulty Fuel Gauge” on page 473.

   If no continuity exists, locate and repair the short to ground in the harness between the Fuel Level (FL) Sensor and the bulkhead connector.

Test 9 — Checking the Sensor for a Short Circuit to Ground

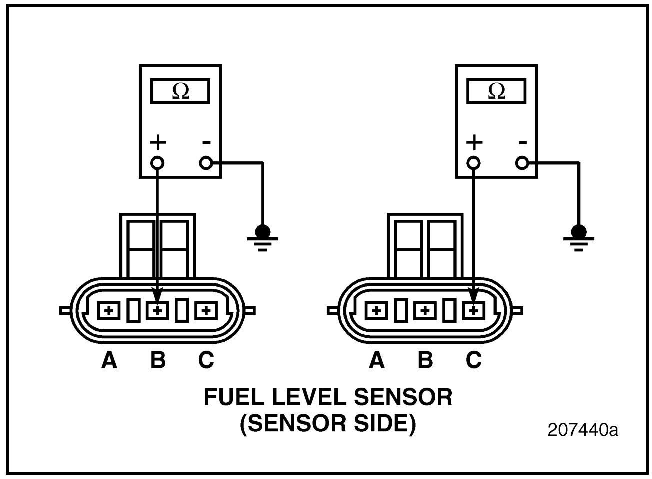


Figure 608

1. Turn the ignition key OFF.
2. Disconnect the Fuel Level (FL) Sensor.
3. Check for continuity between pins B and C of the Fuel Level (FL) Sensor pigtail connector and a good ground (see Figure 608).

   If there is NO continuity between either pin and ground, go to test “Test 18 — Checking for a Faulty VECU or Connector” on page 473.

   If continuity exists between either pin and ground, replace the Fuel Level (FL) Sensor.

Test 10 — Checking for a Short to Voltage in the Sensor Signal Line

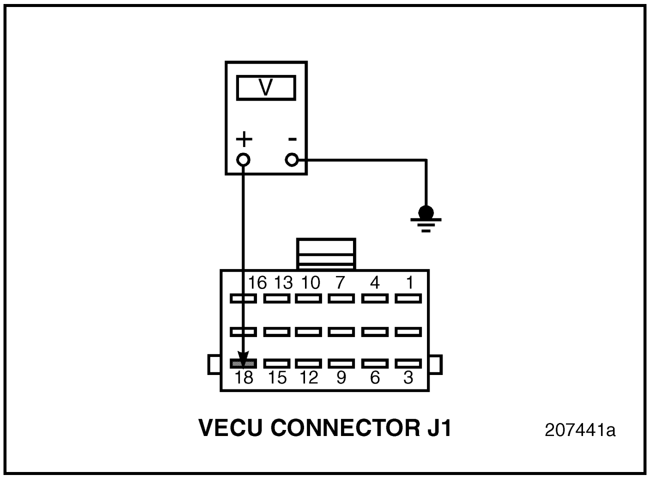


Figure 609

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Fuel Level (FL) Sensor.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1 and J2.
4. Turn the ignition key ON.
5. Measure the voltage between Vehicle Electronic Control Unit (VECU) connector J1 pin 18 and a good ground (see Figure 609).

   If NO voltage is present, go to test "Test 20 — Checking for Voltage on the Sensor Return Line" on page 473.

   If voltage is present, locate and repair the short to voltage in the sensor signal line.

Test 11 — Isolating the Open Circuit

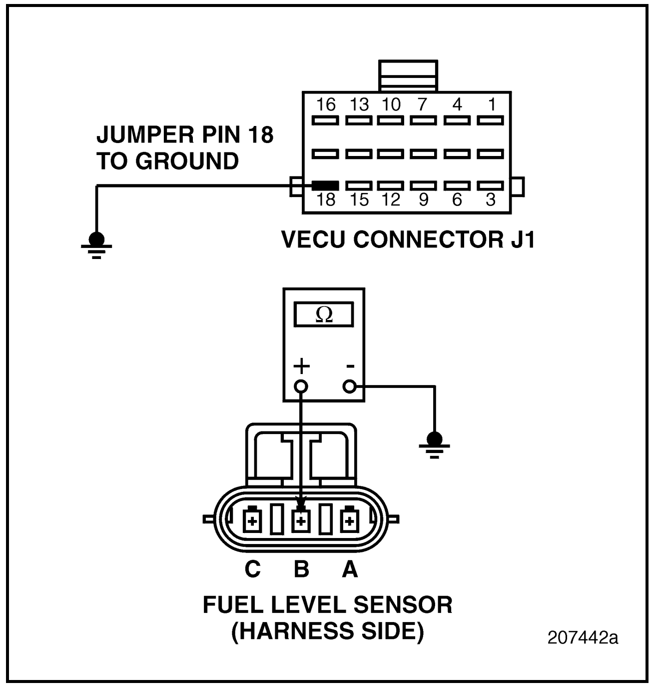


Figure 610

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Fuel Level (FL) Sensor.
3. Disconnect VECU connector J1.
4. Install a jumper wire between VECU connector J1 pin 18 and a good ground.
5. Check for continuity between Fuel Level (FL) Sensor harness connector pin B and a good ground (see Figure 610).

   If continuity exists, go to test "Test 22 — Checking for an Open Sensor" on page 474.

   If there is NO continuity, locate and repair the open circuit in the Fuel Level (FL) Sensor signal line.

Test 16 — Checking for a Faulty Fuel Gauge

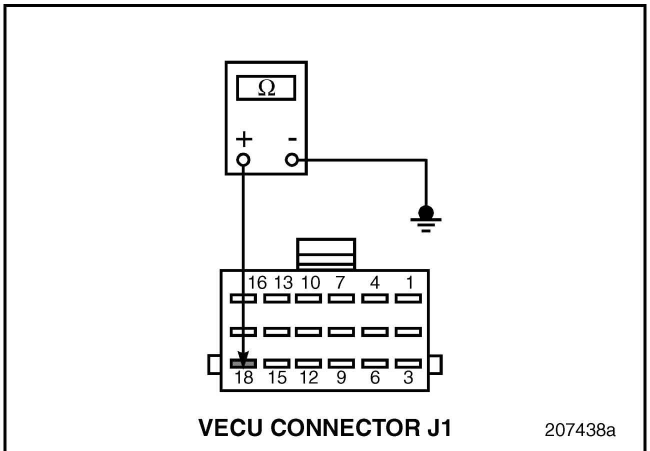


Figure 611

1. Turn the ignition key OFF.
2. Disconnect connector A from the A-B-C Gauge Panel Cluster (if so equipped).
3. Check for continuity between VECU connector J1 pin 18 and a good ground (see Figure 611).

   If continuity exists between pin 18 and ground, locate and repair the short circuit between the VECU and the bulkhead connector.

   If no continuity exists, replace the fuel gauge.

Test 18 — Checking for a Faulty VECU or Connector

1. Turn the ignition key OFF.
2. Visually inspect VECU connector J1 for dirt, loose or shorted pins or deformed contacts.
3. If a repairable short circuit is found, repair VECU harness connector J1.

   If there is NO repairable short circuit in the connector, go to test “Test 36 — Checking for Blink Code 6-1” on page 474.

Test 20 — Checking for Voltage on the Sensor Return Line

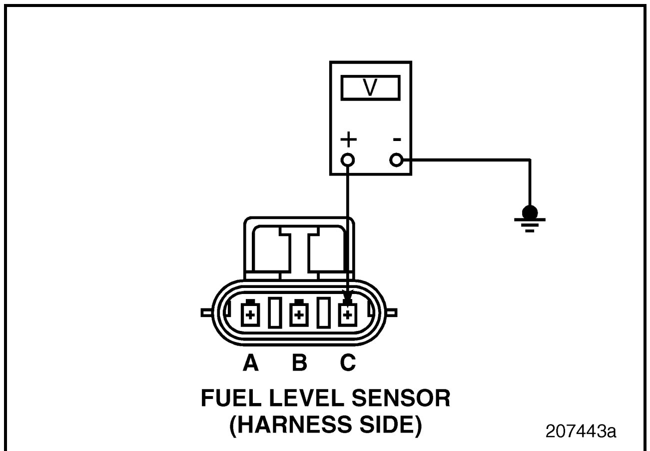


Figure 612

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1 and J2.
3. Disconnect the Fuel Level (FL) Sensor harness connector.
4. Turn the ignition key ON.
5. Measure the voltage between Fuel Level (FL) Sensor harness connector pin C and a good ground (see Figure 612).

   If there is NO voltage present, replace the Fuel Level (FL) Sensor.

   If the measured voltage is greater than 0.5 volts, locate and repair the short to voltage in the Fuel Level (FL) Sensor return line.

Test 22 — Checking for an Open Sensor

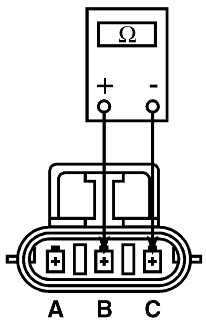


Figure 613

1. Turn the ignition key OFF.
2. Disconnect the Fuel Level (FL) Sensor harness connector.
3. Check for continuity between pins B and C on the Fuel Level (FL) Sensor pigtail connector (see Figure 613).

   If continuity exists between pins B and C, go to test "Test 44 — Checking for a Faulty VECU or Connector" on page 474.

   If there is NO continuity, replace the Fuel Level (FL) Sensor.

Test 36 — Checking for Blink Code 6-1

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Connect the Fuel Level (FL) Sensor connector.
4. Turn the ignition key ON.

   If blink code 6-1 is still active, replace the VECU and retest the system.

   If blink code 6-1 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper contact.

Test 44 — Checking for a Faulty VECU or Connector

1. Turn the ignition key OFF.
2. Visually inspect VECU connector J1 for dirt, loose or shorted pins or deformed contacts.
3. If a repairable short circuit is found, repair VECU harness connector J1.

   If there is NO repairable short circuit in the connector, replace the VECU and retest the system.

Test 88 — Checking for Blink Code 6-1

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Connect the Fuel Level (FL) Sensor connector.
4. Turn the ignition key ON.

   If blink code 6-1 is still active, replace the VECU and retest the system.

   If blink code 6-1 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper contact.

BLINK CODE 6-2 — TURBOCHARGER WHEEL SPEED (TWS) SENSOR (ASET™ CEGR ENGINE)

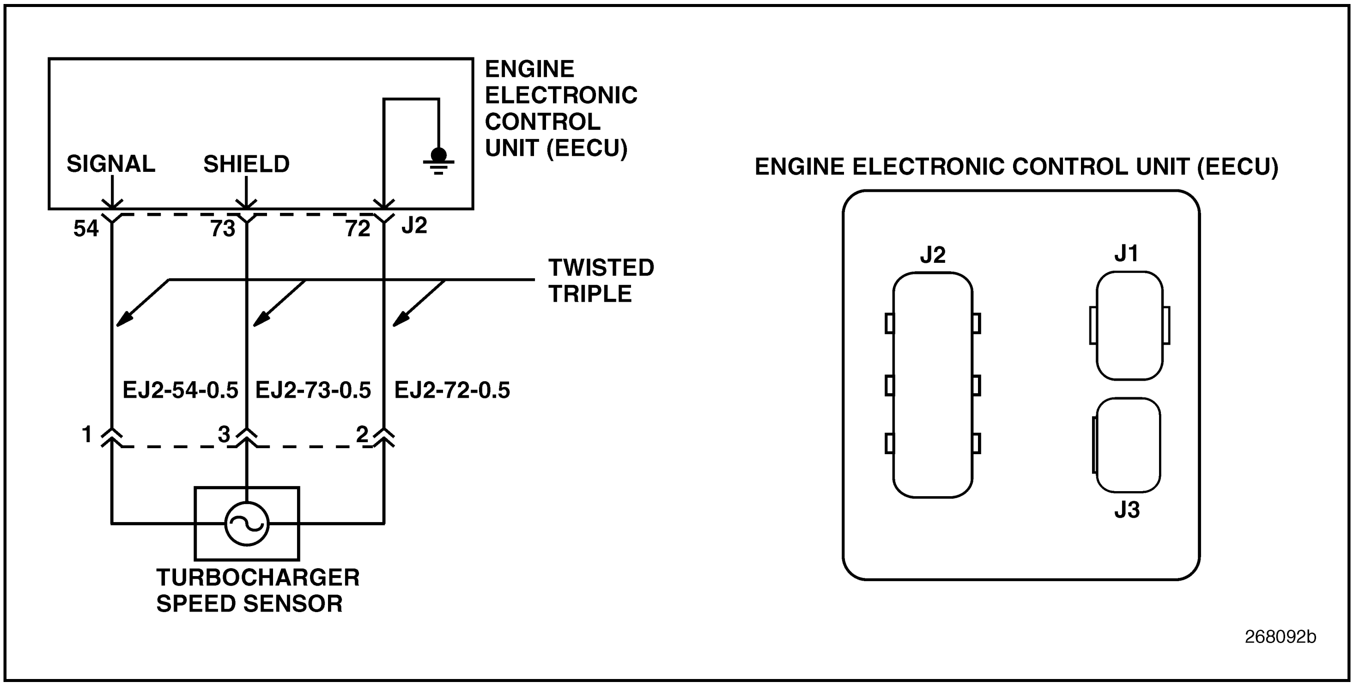


Figure 614 — Turbocharger Wheel Speed (TWS) Sensor Circuit

Failure Mode Identifier (FMI): 0 (Data Valid, but Greater Than Normal), 1 (Data Valid, but Less Than Normal), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 8 (Abnormal)

Parameter Identification (PID): P103

Message Identification (MID): 128

Circuit Description: The Turbocharger Wheel Speed (TWS) Sensor is an inductive sensor. When the engine is running, the turbocharger shaft rotates past the TWS Sensor tip and a pulsed voltage signal is generated. The Engine Electronic Control Unit monitors the frequency of the signal generated by the TWS Sensor to calculate the turbo speed.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) detects an open, short to ground or short to voltage in the Turbocharger Wheel Speed (TWS) sensor signal circuit, the Electronic Malfunction Lamp (EML) will turn ON and blink code 6-2 will set. Code 6-2 will also set if the turbocharger wheel speed is not within the predetermined limits at a given engine speed.

Location: The Turbocharger Wheel Speed (TWS) Sensor is located on the right side of the engine, mounted in the turbocharger.

Normal TWS Sensor Parameters: The Turbocharger Wheel Speed (TWS) Sensor has a resistance of 638–1062 ohms.

Additional Symptoms: Power is reduced if the TWS Sensor signal indicates shaft speed in excess of 112,000 rpm at sea level or 120,000 rpm at 5000 feet (1524 meters).

Test 1 — Checking for Code 6-2

1. Verify that code 6-2 is set.

   If code 6-2 is set, go to test “Test 2 — Checking Code 6-2 Failure Mode Identifier (FMI)” on page 476.

   If code 6-2 is not set, the code is intermittent. Wiggle the wires and connectors to try to set the code. Visually inspect the Turbocharger Wheel Speed (TWS) Sensor connector and wires for poor connections.

Test 2 — Checking Code 6-2 Failure Mode Identifier (FMI)

1. Turn the ignition key ON.
2. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 0, check the Vehicle Electronic Control Unit (VECU) fault table for severe engine overspeed events. Also, check for a stuck VTG actuator, major air system leak, and that the inlet air cleaner boot is making full contact with the hood, ensuring only outside air is entering the air cleaner. Refer to the applicable ASET™ Service Manual.

   If the FMI is 1, check for a mechanical problem with the turbocharger. Test drive the vehicle to ensure there is sufficient boost pressure under load. Also, check the turbocharger wheel speed at idle. If the speed is less than approximately 12,000 rpm at idle, or the fault is active but a valid reading is observed at high engine speeds, a problem may exist with the EGR valve or EGR mass airflow system. Refer to code 4-9 for further troubleshooting procedures.

   If the FMI is 3, 4, 5 or 8, go to test “Test 4 — Checking for an Open Sensor” on page 476.

Test 4 — Checking for an Open Sensor

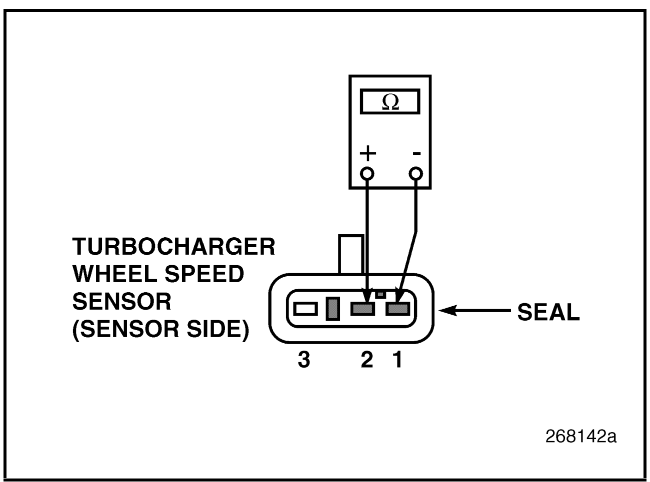


Figure 615

1. Turn the ignition key OFF.
2. Disconnect the Turbocharger Wheel Speed (TWS) Sensor connector.
3. Measure the resistance across the terminals on the sensor side of the connector (see Figure 615).

   If the resistance is between 638–1062 ohms, proceed to test 8.

   If the resistance is NOT between 638–1062 ohms, inspect the TWS Sensor connector for damage. If no damage is evident, replace the TWS Sensor.

Test 8 — Checking for a Short Circuit to Ground in the Sensor

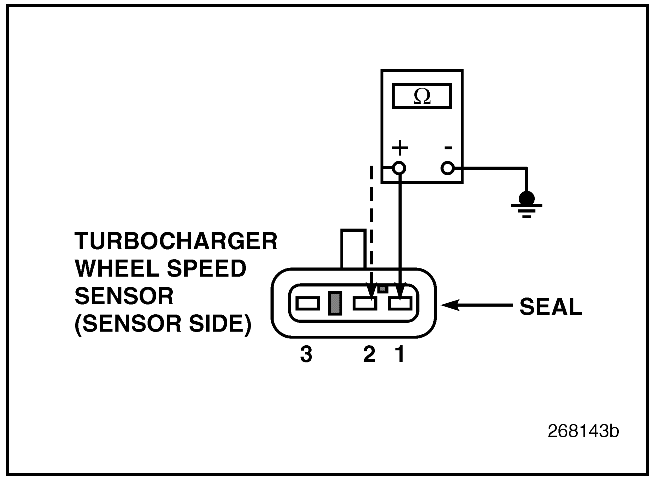


Figure 616

1. Turn the ignition key OFF.
2. Disconnect the Turbocharger Wheel Speed (TWS) Sensor connector.
3. Check for continuity between pins 1 and 2 of the TWS Sensor and a good ground (see Figure 616).

   If continuity exists, replace the TWS Sensor.

   If there is NO continuity, go to test “Test 16 — Checking for Continuity Between the TWS Sensor and the EECU” on page 477.

Test 16 — Checking for Continuity Between the TWS Sensor and the EECU

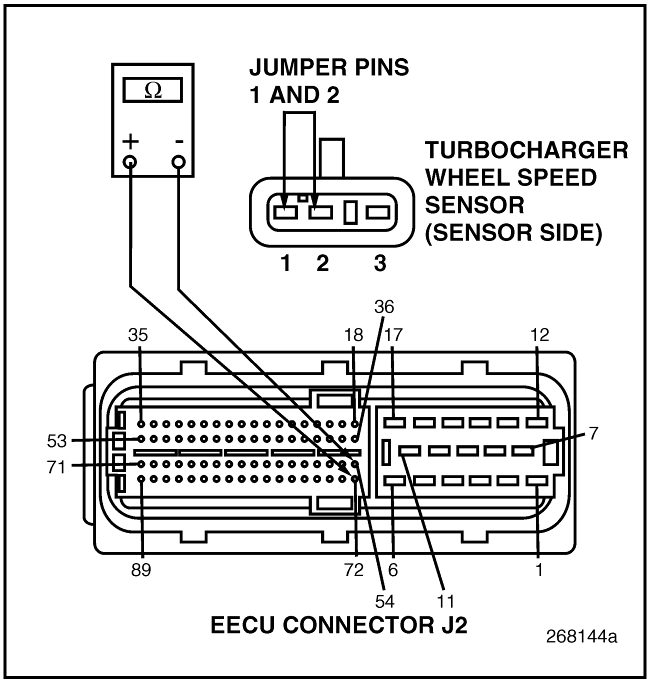


Figure 617

1. Turn the ignition key OFF.
2. Disconnect the TWS Sensor connector.
3. Disconnect Engine Electronic Control Unit (EECU) connector J2.
4. Install a jumper between pins 1 and 2 of the TWS Sensor harness connector.
5. Check for continuity between EECU connector J2 pins 54 and 72 (see Figure 617).

   If continuity exists, go to test “Test 32 — Checking for a Short to Ground in the Harness” on page 477.

   If there is NO continuity, there is an open in one of the circuits between the TWS Sensor and the EECU connector J2. Locate and repair the open circuit.

Test 32 — Checking for a Short to Ground in the Harness

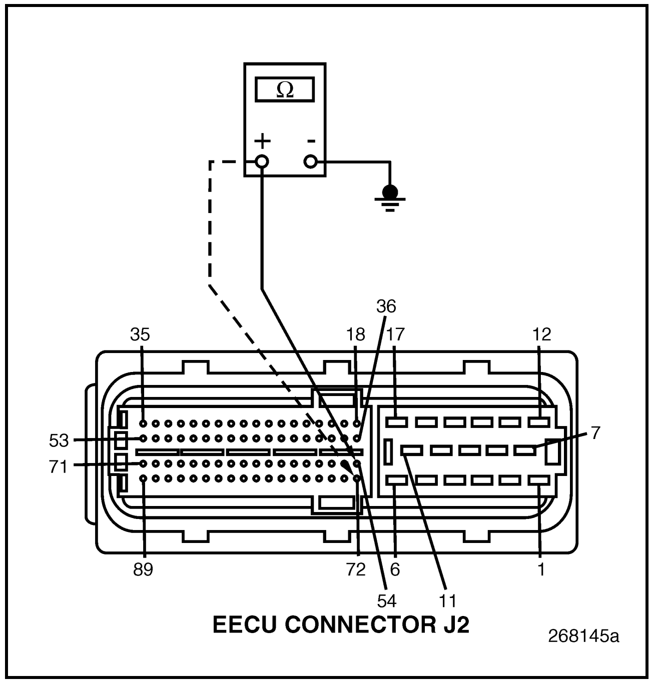


Figure 618

1. Turn the ignition key OFF.
2. Disconnect the TWS Sensor connector.
3. Remove the jumper from the TWS Sensor harness connector.
4. Disconnect EECU connector J2.
5. Check for continuity between EECU connector J2 pin 54 and a good ground (see Figure 618).

   Check for continuity between EECU connector J2 pin 72 and a good ground (see Figure 618).

   If continuity exists between either pin and ground, there is short to ground in one of the circuits between the TWS Sensor and the EECU connector J2. Locate and repair the short to ground.

   If there is NO continuity, go to test “Test 64 — Checking for a Short Circuit to Voltage in the Harness” on page 478.

Test 64 — Checking for a Short Circuit to Voltage in the Harness

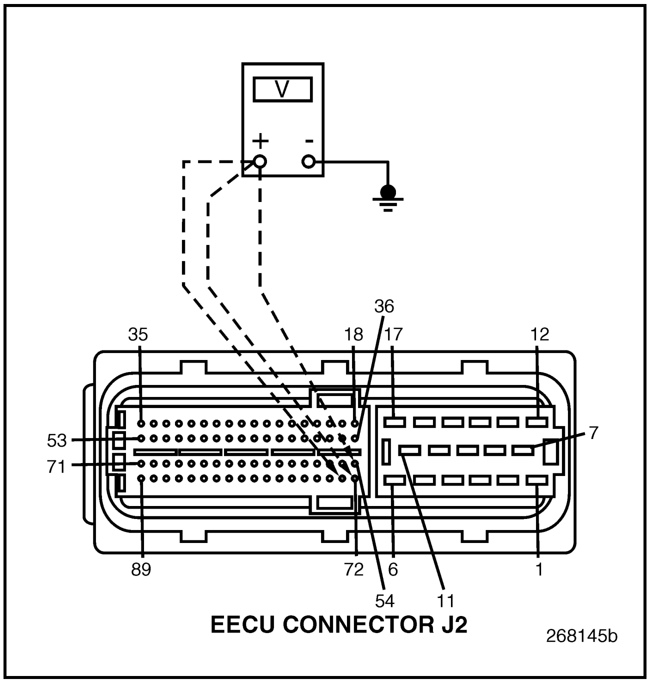


Figure 619

1. Turn the ignition key OFF.
2. Disconnect the TWS Sensor connector.
3. Disconnect EECU connector J2.
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J2 pins 54, 72 and 73 versus a good ground (see Figure 619).

   If there is NO voltage present, go to test “Test 128 — Checking for a Pin to Pin Short in the Harness” on page 478.

   If the measured voltage is greater than 0.5 volts, there is short to voltage in one of the circuits between the TWS Sensor and the EECU connector J2. Locate and repair the short to voltage.

Test 128 — Checking for a Pin to Pin Short in the Harness

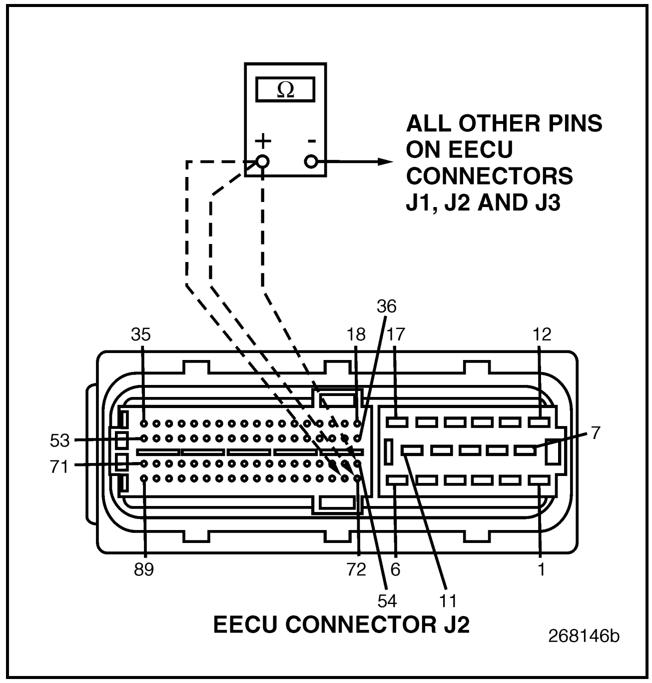


Figure 620

1. Turn the ignition key OFF.
2. Disconnect EECU connectors J1, J2 and J3.
3. Disconnect the TWS Sensor connector.
4. Check for continuity between EECU connector J2 pins 54, 72 and 73 versus all other pins on EECU connectors J1, J2 and J3 (see Figure 620).

   If continuity exists, there is short to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 256 — Checking for a Faulty EECU” on page 479.

Test 256 — Checking for a Faulty EECU

1. Connect the TWS Sensor harness connector.
2. Connect connectors J1, J2 and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 6-2 is still active, replace the EECU and retest the system.

   If blink code 6-2 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 6-3 — J1587 SERIAL DATA LINE (ASET™ IEGR ENGINE)

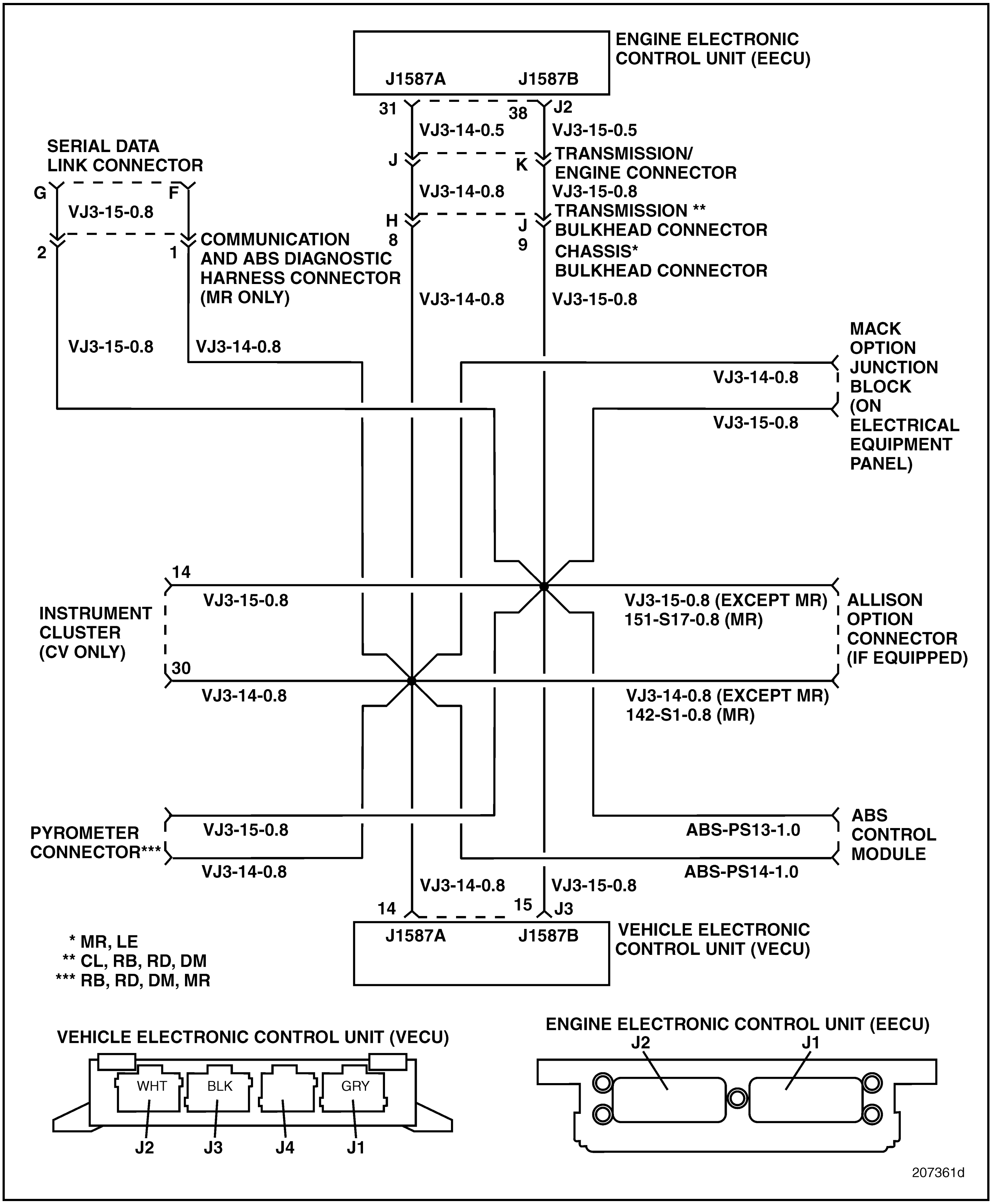


Figure 621 — J1587 Serial Data Line Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 8 (Abnormal)

Parameter Identification (PID): S250

Message Identification (MID): 128, 142

Circuit Description: The J1587 serial data lines are used as the standard communication link for on-board vehicle instrumentation and off-board service diagnostics and fleet management. The V-MAC® III control units broadcast data across the J1587 serial data lines to operate electronic instrumentation, the electronic gauge panel, and the Co-Pilot display, and to communicate with the ABS, Allison Transmission and Eaton Transmission control units, depending upon the vehicle model and options. The diagnostic computer communicates with the V-MAC® III control units through the J1587 Serial Communications Port.

Location: The Serial Communications Port is located under the dash, to the left of the steering column.

Code Setting Conditions: If either the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU) loses communication through the J1587 serial data lines for more than 1 second, code 6-3 will set and the Electronic Malfunction Lamp (EML) will turn ON. The fault will become inactive if communication resumes for at least 1 second.

NOTE

If code 6-3 sets intermittently or is accompanied by other fault codes, check for secure connections at the 135 amp ground circuit breaker posts. The ground circuit breaker is located on the left side of the bulkhead.

Additional Symptoms: The engine will not start if communication is lost on both the J1587 and J1939 data lines.

Test 1 — Checking for Code 6-3

1. Verify that code 6-3 is set.

   If code 6-3 is set, go to test "Test 2 — Checking for a Fault in an External Device" on page 481.

   If code 6-3 is NOT set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for a Fault in an External Device

1. Turn the ignition key OFF.
2. Disconnect any diagnostic tools connected to the Serial Communications Port under the dash, including the VIP or Co-Pilot dash display.
3. One at a time, disconnect any external units using the SAE/ATA serial data line at the Mack Option Junction Block. The junction block is located on the Dash Electrical Equipment Panel.

NOTE

Removing the fuse or circuit breaker that powers an external device is NOT a substitute for disconnecting the device from the J1587 data bus. Some electronic units will pull the J1587 bus to ground when they are not powered up, therefore, simply removing the fuse or circuit breaker could cause a misdiagnosis.

4. Turn the ignition key ON, and check if fault 6-3 is still active.

   If the fault is still active, repeat step 3 until all external units have been disconnected. If the fault is still active after all external units have been disconnected, go to test "Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)" on page 482.

NOTE

Before continuing to test 4 make sure that the Engine Electronic Control Unit (EECU) and the Vehicle Electronic Control Unit (VECU) are the only components connected to the J1587 Serial Data Bus.

If the fault is no longer active, there is a short circuit is in the harness or component of one of the external units. Locate and repair the faulty harness or component.

Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF for five seconds.
2. Disconnect the Serial Link Jumper from the Serial Communications Port if connected.
3. Turn the ignition key ON.

   If the Electronic Malfunction Lamp (EML), Driver Alarm or Shutdown Lamp turn ON for approximately 2 seconds and then turn OFF, go to test “Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)” on page 482.

   If the Electronic Malfunction Lamp (EML), Driver Alarm and Shutdown Lamp do NOT turn on, check the VECU power and ground connections. Check VECU connectors J1 and J3 for damaged/broken or corroded pins. Check the VECU for physical damage or corrosion and repair or replace as necessary.

Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)

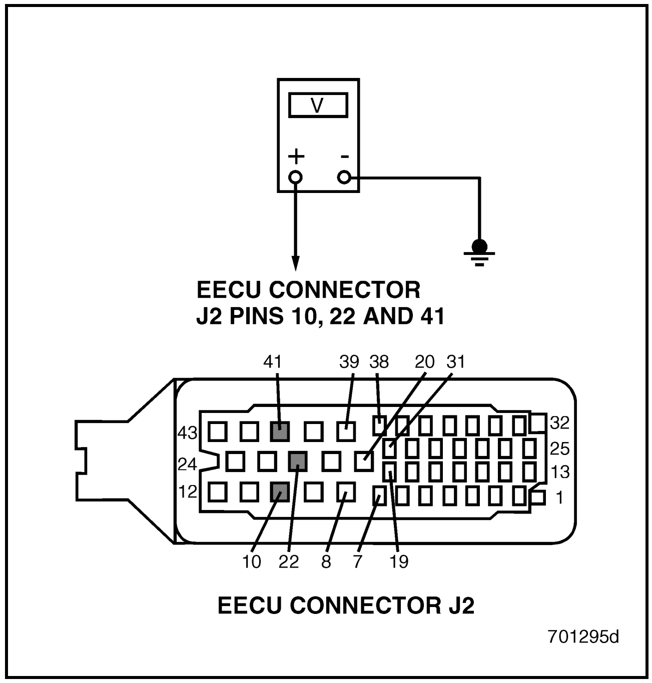


Figure 622

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pins 10, 22 and 41 and a good ground (see Figure 622).

   If battery voltage is present at all pins, go to test “Test 16 — Checking for an External Short to Voltage in the Harness” on page 483.

   If battery voltage is NOT present on ANY pins, check fuse 40 for an open. Check individual power circuits for an open or short circuit to ground. If battery voltage is NOT present on an individual pin, check the suspect circuit for an open or short circuit to ground.

Test 16 — Checking for an External Short to Voltage in the Harness

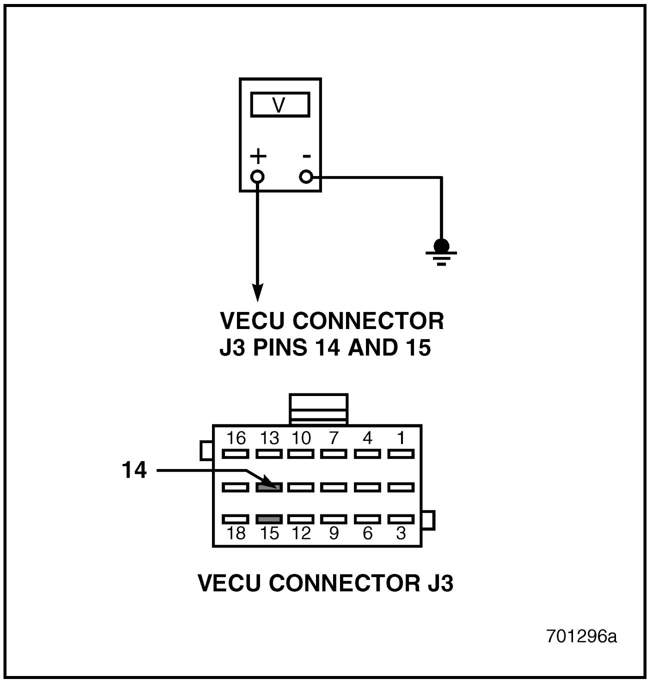


Figure 623

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3 and Engine Electronic Control Unit (EECU) connector J2.
3. Connect the Serial Link Jumper into the Serial Communications Port.
4. Measure the voltage between Vehicle Electronic Control Unit (VECU) connector J3 pins 14 and 15 and a good ground (see Figure 623).

   If there is NO voltage on either line, go to test "Test 32 — Checking for a Pin to Pin Short in the VECU Harness" on page 483.

   If there is voltage on either line, the pin that showed voltage has a short circuit to voltage, go to test "Test 33 — Checking for a Pin to Pin Short in the VECU Harness" on page 484.

Test 32 — Checking for a Pin to Pin Short in the VECU Harness

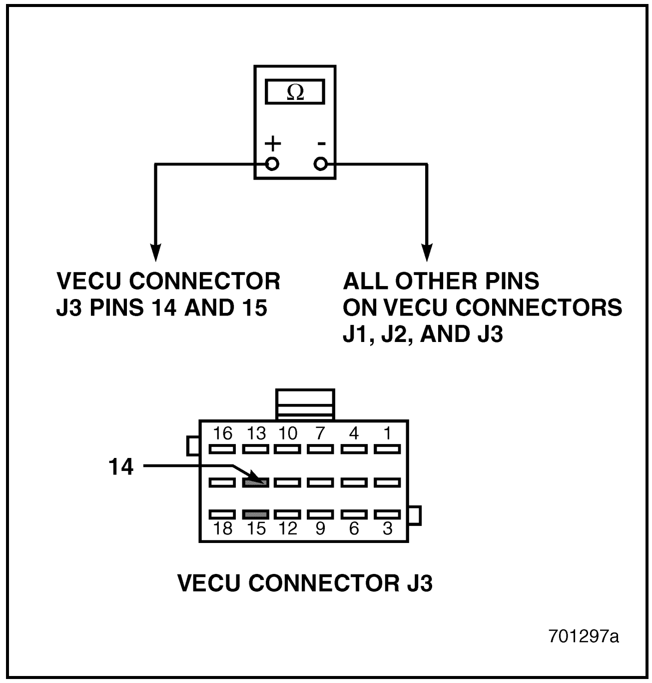


Figure 624

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between VECU connector J3 pins 14 and 15 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 624).

   If there is NO continuity, go to test "Test 64 — Checking for a Pin to Pin Short in the EECU Harness" on page 484.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 33 — Checking for a Pin to Pin Short in the VECU Harness

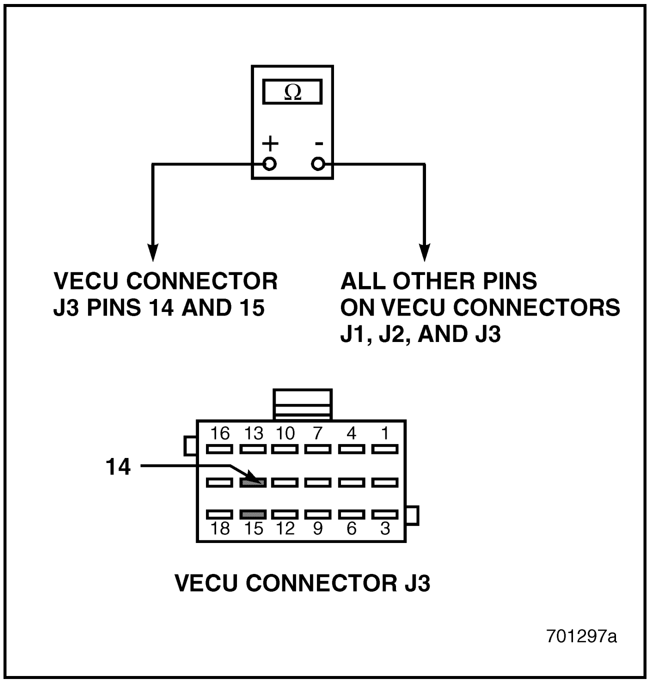


Figure 625

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J3 pins 14 and 15 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 625).

   If there is NO continuity, go to test "Test 66 — Checking for a Pin to Pin Short in the EECU Harness" on page 485.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 64 — Checking for a Pin to Pin Short in the EECU Harness

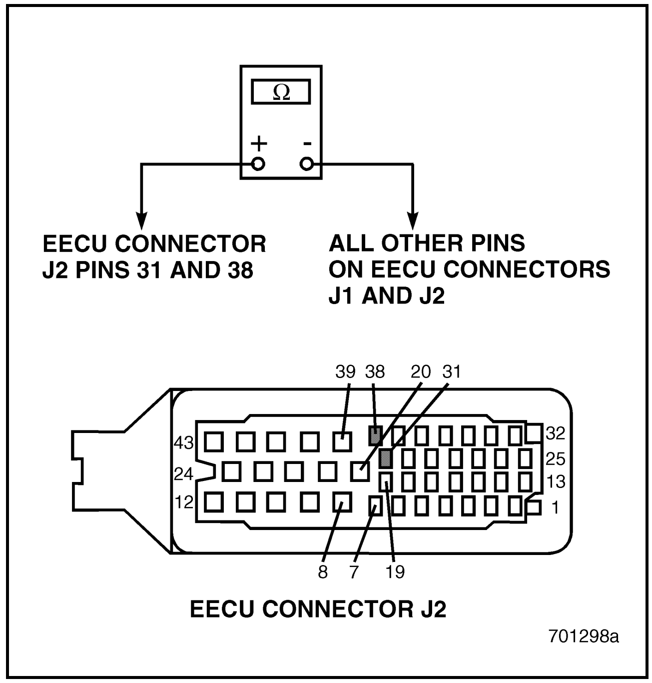


Figure 626

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
5. Check for continuity between EECU connector J2 pins 31 and 38 versus all other pins on EECU connectors J1 and J2 (see Figure 626).

   If there is NO continuity, go to test "Test 128 — Checking for an Open in the Harness" on page 485.

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 66 — Checking for a Pin to Pin Short in the EECU Harness

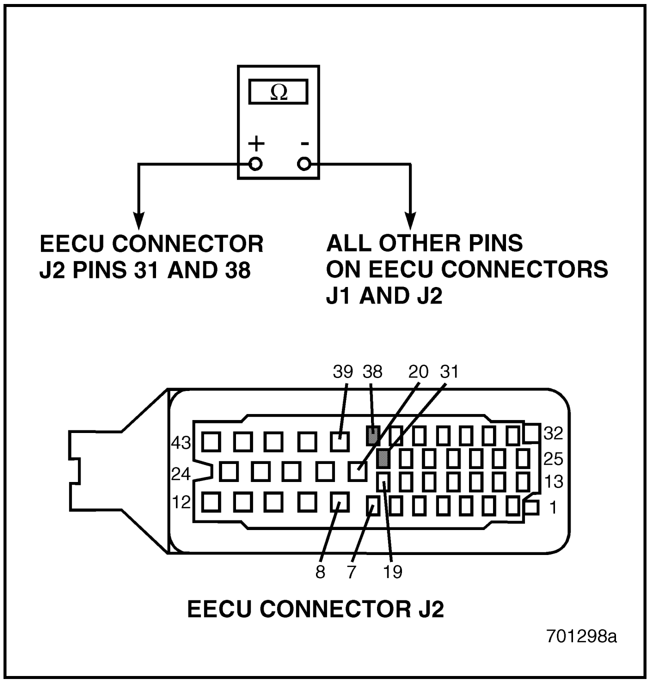


Figure 627

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
5. Check for continuity between EECU connector J2 pins 31 and 38 and all other pins on EECU connectors J1 and J2 (see Figure 627).

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short.

   If there is NO continuity, the pin that showed voltage in test 16 is shorted to voltage somewhere else in the harness. Locate and repair the short to voltage.

Test 128 — Checking for an Open in the Harness

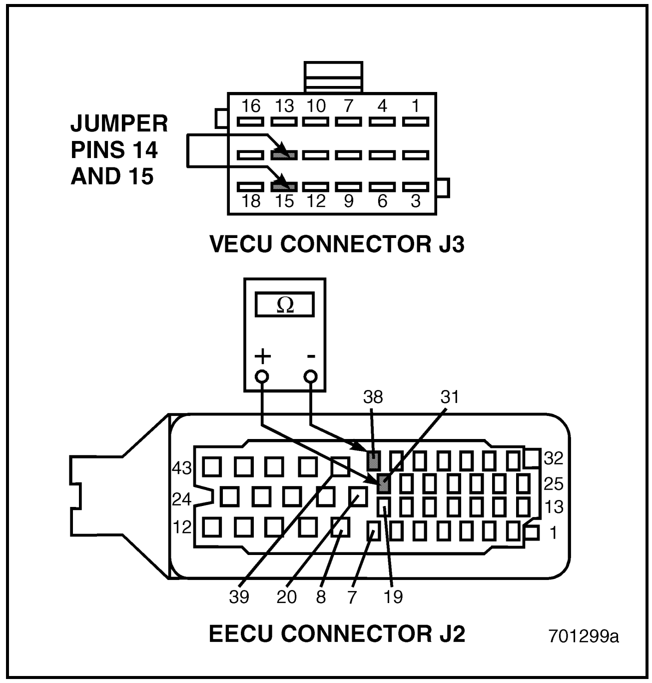


Figure 628

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Disconnect Engine Electronic Control Unit (EECU) connector J2.
5. Connect a jumper wire between Vehicle Electronic Control Unit (VECU) connector J3 pins 14 and 15.
6. Check for continuity between Engine Electronic Control Unit (EECU) connector J2 pin 31 and pin 38 (see Figure 628).

   If continuity exists, go to test “Test 256 — Checking for a Loose Connector” on page 486.

   If there is NO continuity, go to test “Test 257 — Checking for an Open Circuit in the Serial Data Line” on page 486.

Test 256 — Checking for a Loose Connector

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Connect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Connect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Turn the ignition key ON.

   If fault 6-3 is still active, go to test "Test 512 — Checking for a Faulty Control Unit" on page 486.

   If fault 6-3 is now inactive, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 257 — Checking for an Open Circuit in the Serial Data Line

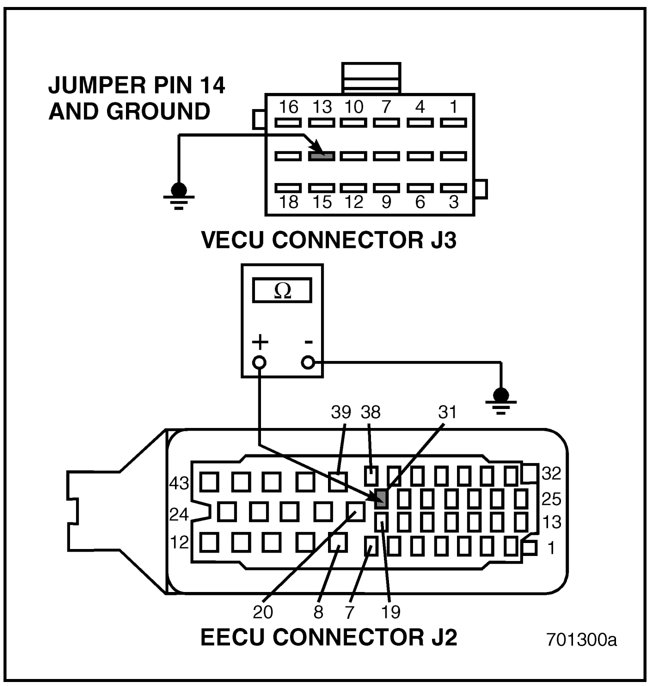


Figure 629

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect a jumper wire between Vehicle Electronic Control Unit (VECU) connector J3 pin 14 and a good ground.
5. Check for continuity between Engine Electronic Control Unit (EECU) connector J2 pin 31 and a good ground (see Figure 629).

   If continuity exists, serial data line B is open between VECU connector J3 pin 15 and EECU connector J2 pin 38. Locate and repair the open circuit.

   If there is NO continuity, serial line A is open between VECU connector J3 pin 14 and EECU connector J2 pin 31. Locate and repair the open circuit.

Test 512 — Checking for a Faulty Control Unit

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2 and Vehicle Electronic Control Unit (VECU) connector J3.
3. Inspect Engine Electronic Control Unit (EECU) connector J2 and Vehicle Electronic Control Unit (VECU) connector J3 for shorted or open pins.

   If there is evidence of a short or open circuit repair the connector.

   If there is NO evidence of a short or open pin, replace the Vehicle Electronic Control Unit (VECU).
4. Reconnect all connectors.
5. Turn the ignition key ON.

   If blink code 6-3 is still present, the Engine Electronic Control Unit (EECU) is faulty. Turn the ignition key OFF. Reinstall the original Vehicle Electronic Control Unit (VECU) and replace the Engine Electronic Control Unit (EECU). Reconnect all connectors and turn the ignition key ON.

   If blink code 6-3 is NOT present, replacement of the Engine Electronic Control Unit (EECU) has corrected the problem.

BLINK CODE 6-3 — J1587 SERIAL DATA LINE (ASET™ CEGR ENGINE)

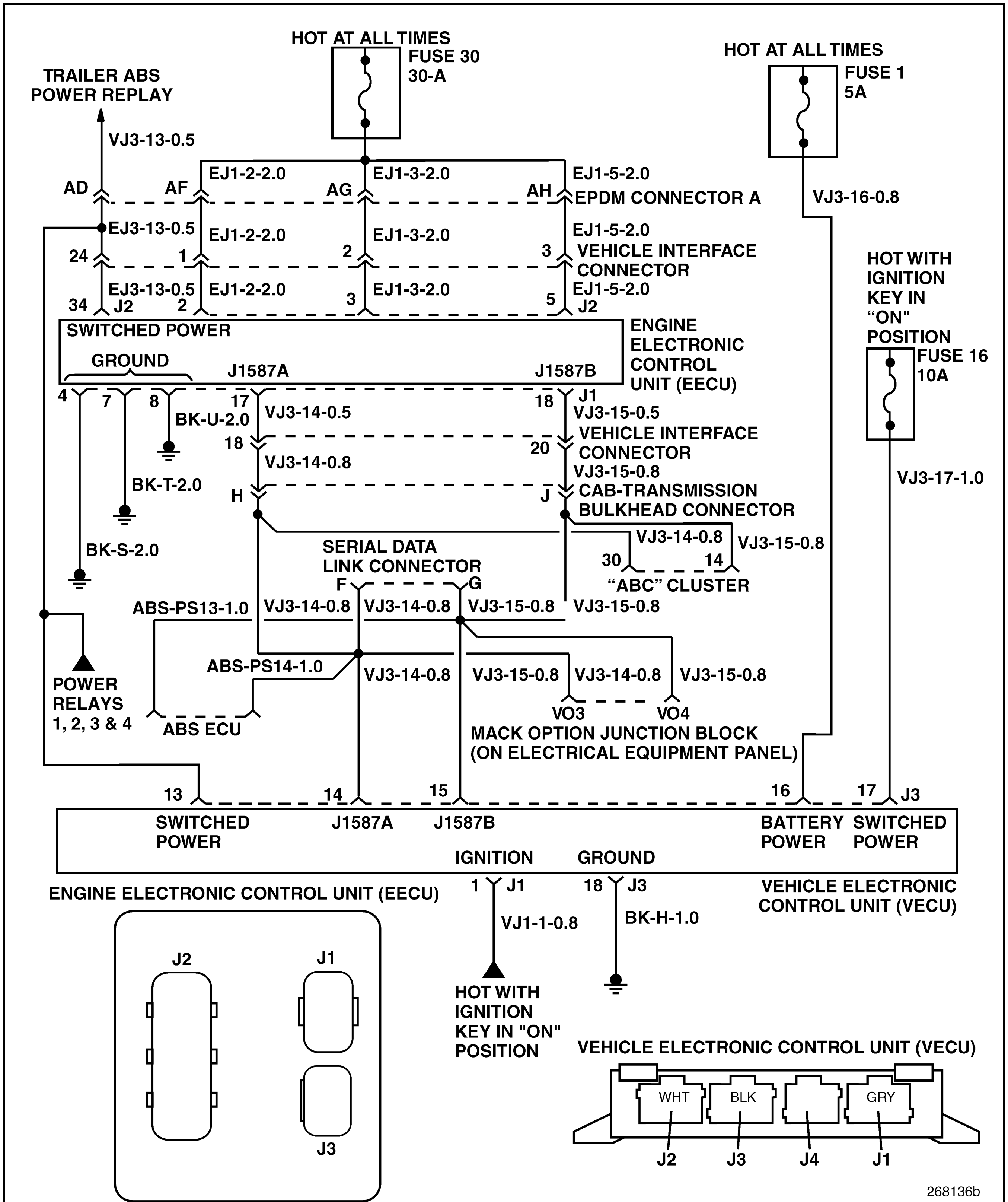


Figure 630 — J1587 Serial Data Line Circuit (ASET™ CEGR Engine)

BLINK CODE 6-3 (CEGR ENGINE)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 8 (Abnormal)

Parameter Identification (PID): S250

Message Identification (MID): 128, 142

Circuit Description: The J1587 serial data lines are used as the standard communication link for on-board vehicle instrumentation and off-board service diagnostics and fleet management. The V-MAC® III control units broadcast data across the J1587 serial data lines to operate electronic instrumentation, the electronic gauge panel, and the Co-Pilot display, and to communicate with the ABS, Allison Transmission and Eaton Transmission control units, depending upon the vehicle model and options. The diagnostic computer communicates with the V-MAC® III control units through the J1587 Serial Communications Port.

Location: The Serial Communications Port is located under the dash, to the left of the steering column.

Code Setting Conditions: If either the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU) loses communication through the J1587 serial data lines for more than 1 second, code 6-3 will set and the Electronic Malfunction Lamp (EML) will turn ON. The fault will become inactive if communication resumes for at least 1 second.

NOTE

If code 6-3 sets intermittently or is accompanied by other fault codes, check for secure connections at the 135 amp ground circuit breaker posts. The ground circuit breaker is located on the left side of the bulkhead.

Additional Symptoms: The engine will not start if communication is lost on both the J1587 and J1939 data lines.

Test 1 — Checking for Code 6-3

1. Verify that code 6-3 is set.

   If code 6-3 is set, go to test “Test 2 — Checking for a Fault in an External Device” on page 488.

   If code 6-3 is NOT set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for a Fault in an External Device

1. Turn the ignition key OFF.
2. Disconnect any diagnostic tools connected to the Serial Communications Port under the dash, including the Co-Pilot dash display.
3. One at a time, disconnect any external units using the SAE/ATA serial data line at the Mack Option Junction Block. The junction block is located on the Dash Electrical Equipment Panel.

NOTE

Removing the fuse or circuit breaker that powers an external device is NOT a substitute for disconnecting the device from the J1587 data bus. Some electronic units will pull the J1587 bus to ground when they are not powered up, therefore, simply removing the fuse or circuit breaker could cause a misdiagnosis.

4. Turn the ignition key ON, and check if fault 6-3 is still active.

   If the fault is still active, repeat step 3 until all external units have been disconnected. If the fault is still active after all external units have been disconnected, go to test “Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)” on page 489.

NOTE

Before continuing to test 4 make sure that the Engine Electronic Control Unit (EECU) and the Vehicle Electronic Control Unit (VECU) are the only components connected to the J1587 Serial Data Bus.

   If the fault is no longer active, there is a short circuit is in the harness or component of one of the external units. Locate and repair the faulty harness or component.

Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF for five seconds.
2. Disconnect the Serial Link Jumper from the Serial Communications Port if connected.
3. Turn the ignition key ON.

   If the Electronic Malfunction Lamp (EML), Driver Alarm or Shutdown Lamp turn ON for approximately 2 seconds and then turn OFF, go to test "Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)" on page 489.

   If the Electronic Malfunction Lamp (EML), Driver Alarm and Shutdown Lamp do NOT turn on, check the VECU power and ground connections. Check VECU connectors J1 and J3 for damaged/broken or corroded pins. Check the VECU for physical damage or corrosion and repair or replace as necessary.

Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)

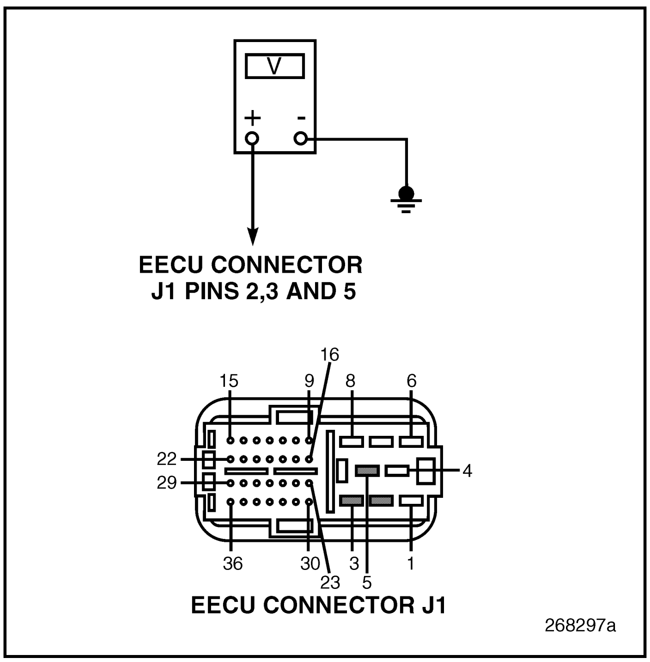


Figure 631

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pins 2, 3 and 5 versus a good ground (see Figure 631).

   If battery voltage is present, go to test "Test 16 — Checking for an External Short to Voltage in the Harness" on page 489.

   If battery voltage is NOT present, check fuse 38 for an open. Check individual power circuits for an open or short circuit to ground. If battery voltage is NOT present on an individual pin, check the suspect circuit for an open or short circuit to ground.

Test 16 — Checking for an External Short to Voltage in the Harness

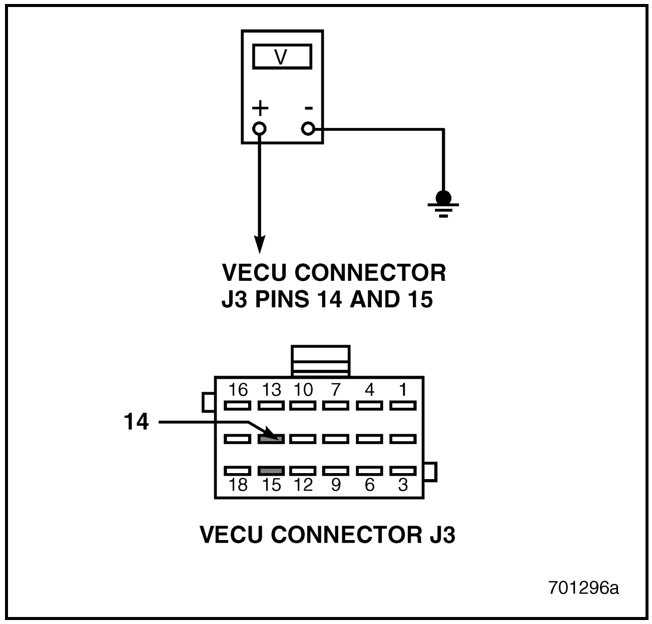


Figure 632

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3 and Engine Electronic Control Unit (EECU) connector J1.
3. Connect the Serial Link Jumper into the Serial Communications Port.
4. Measure the voltage between Vehicle Electronic Control Unit (VECU) connector J3 pins 14 and 15 and a good ground (see Figure 632).

   If there is NO voltage on either line, go to test "Test 32 — Checking for a Pin to Pin Short in the VECU Harness" on page 490.

   If there is voltage on either line, the pin that showed voltage has a short circuit to voltage, go to test "Test 33 — Checking for a Pin to Pin Short in the VECU Harness" on page 490.

Test 32 — Checking for a Pin to Pin Short in the VECU Harness

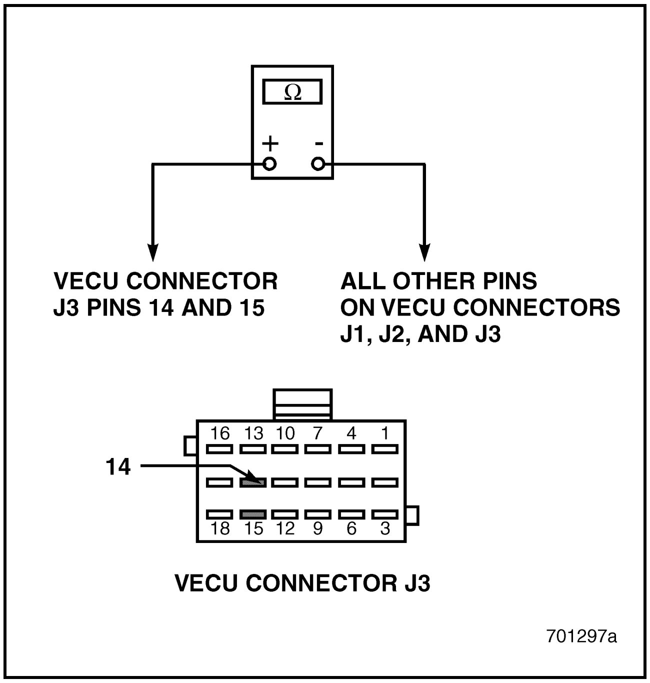


Figure 633

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between VECU connector J3 pins 14 and 15 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 633).

   If there is NO continuity, go to test “Test 64 — Checking for a Pin to Pin Short in the EECU Harness” on page 491.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 33 — Checking for a Pin to Pin Short in the VECU Harness

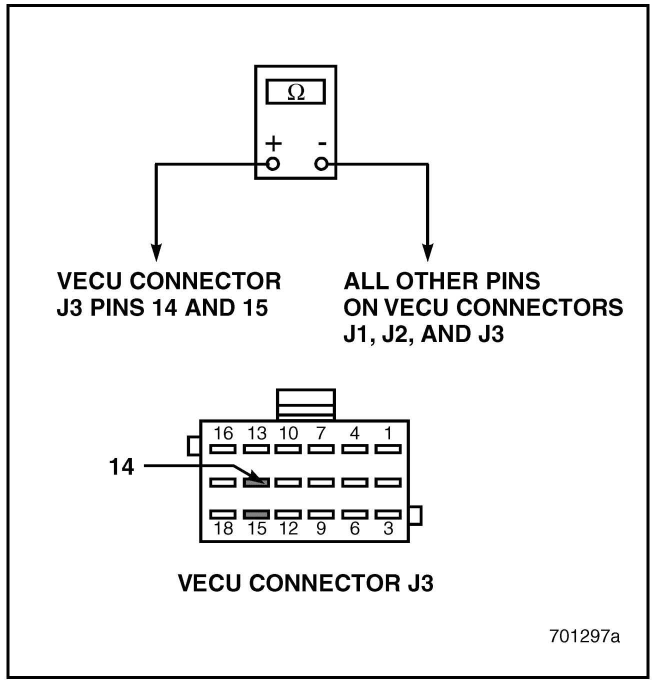


Figure 634

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between Vehicle Electronic Control Unit (VECU) connector J3 pins 14 and 15 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 634).

   If there is NO continuity, go to test “Test 66 — Checking for a Pin to Pin Short in the EECU Harness” on page 491.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 64 — Checking for a Pin to Pin Short in the EECU Harness

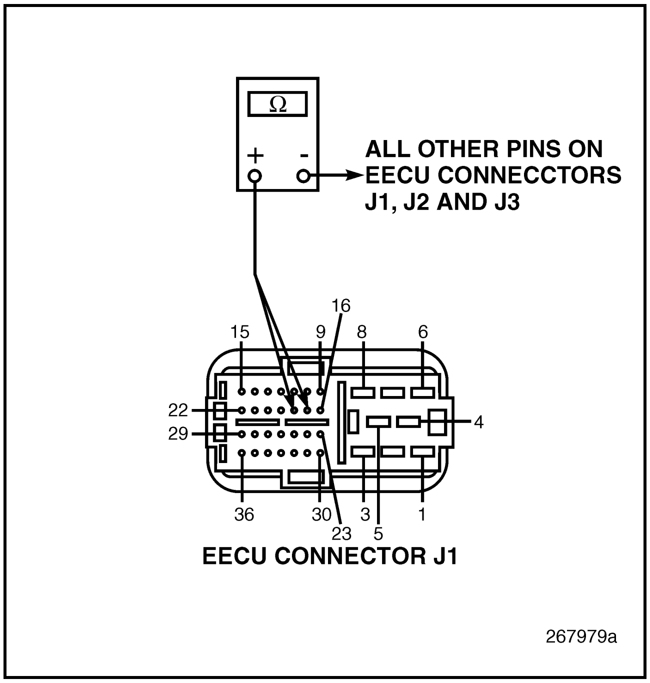


Figure 635

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 J3.
5. Check for continuity between EECU connector J1 pins 17 and 18 versus all other pins on EECU connectors J1, J2 and J3 (see Figure 635).

   If there is NO continuity, go to test "Test 128 — Checking for an Open in the Harness" on page 492.

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 66 — Checking for a Pin to Pin Short in the EECU Harness

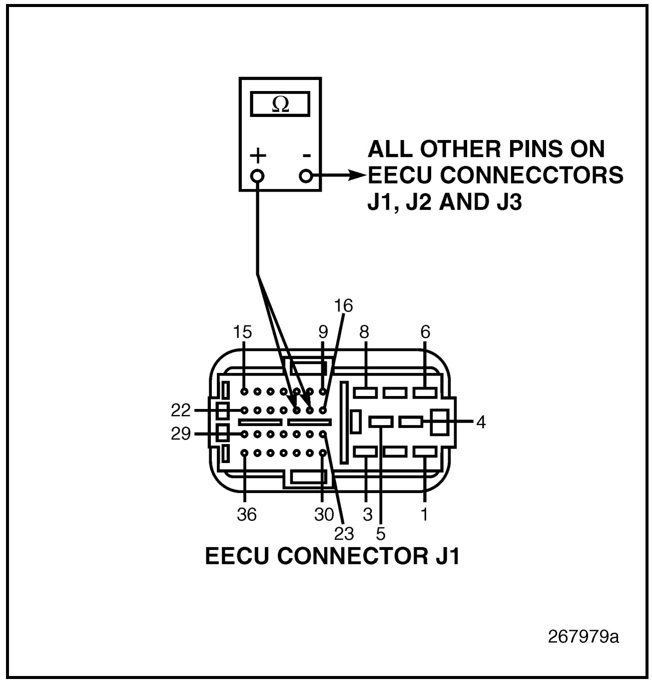


Figure 636

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
5. Check for continuity between EECU connector J1 pins 17 and 18 and all other pins on EECU connectors J1, J2 and J3 (see Figure 636).

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short.

   If there is NO continuity, the pin that showed voltage in test 16 is shorted to voltage somewhere else in the harness. Locate and repair the short to voltage.

Test 128 — Checking for an Open in the Harness

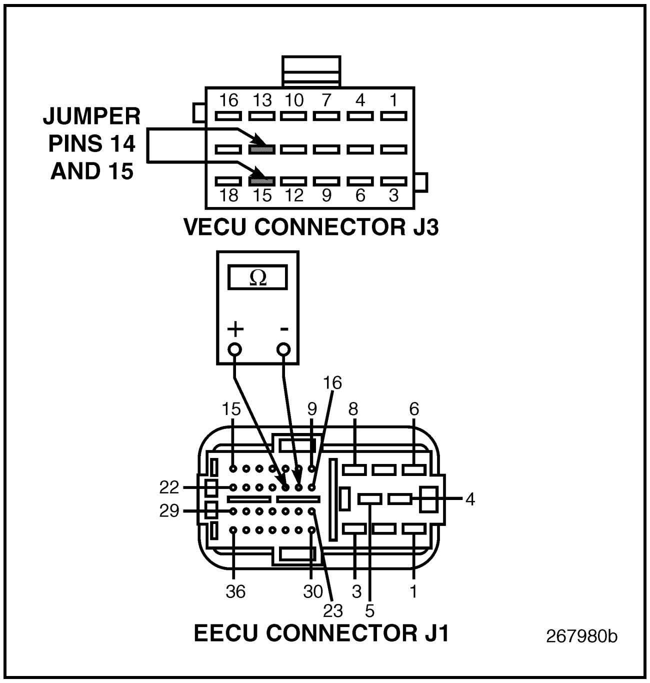


Figure 637

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect any external units using the serial data line, at the Mack Option Junction Block.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Disconnect Engine Electronic Control Unit (EECU) connector J1.
5. Connect a jumper wire between Vehicle Electronic Control Unit (VECU) connector J3 pins 14 and 15.
6. Check for continuity between Engine Electronic Control Unit (EECU) connector J1 pin 17 and pin 18 (see Figure 637).

   If continuity exists, go to test "Test 256 — Checking for a Loose Connector" on page 492.

   If there is NO continuity, go to test "Test 257 — Checking for an Open Circuit in the Serial Data Line" on page 493.

Test 256 — Checking for a Loose Connector

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Connect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If fault 6-3 is still active, go to test "Test 512 — Checking for a Faulty Control Unit" on page 493.

   If fault 6-3 is now inactive, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 257 — Checking for an Open Circuit in the Serial Data Line

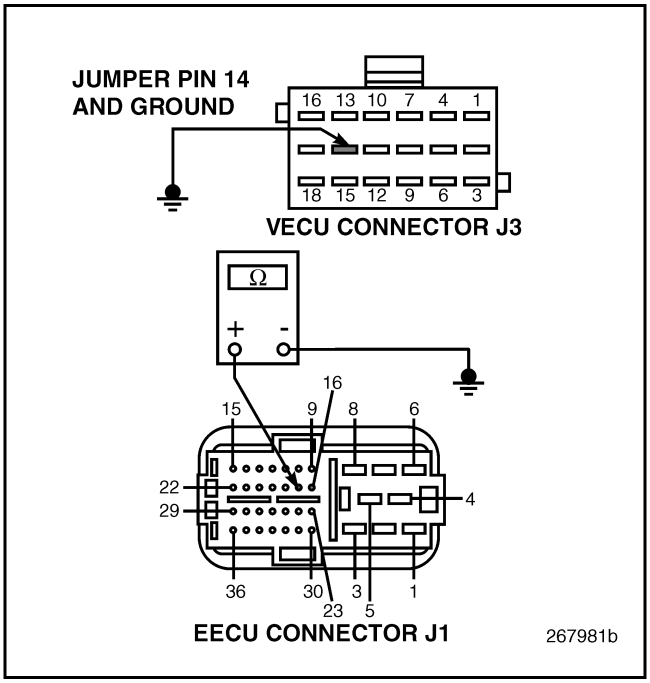


Figure 638

1. Disconnect the Serial Link Jumper from the Serial Communications Port.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect a jumper wire between Vehicle Electronic Control Unit (VECU) connector J3 pin 14 and a good ground.
5. Check for continuity between Engine Electronic Control Unit (EECU) connector J1 pin 17 and a good ground (see Figure 638).

   If continuity exists, serial data line B is open between VECU connector J3 pin 15 and EECU connector J1 pin 18. Locate and repair the open circuit.

   If there is NO continuity, serial line A is open between VECU connector J3 pin 14 and EECU connector J1 pin 17. Locate and repair the open circuit.

Test 512 — Checking for a Faulty Control Unit

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1 and Vehicle Electronic Control Unit (VECU) connector J3.
3. Inspect Engine Electronic Control Unit (EECU) connector J1 and Vehicle Electronic Control Unit (VECU) connector J3 for shorted or open pins.

   If there is evidence of a short or open circuit repair the connector.

   If there is NO evidence of a short or open pin, replace the Vehicle Electronic Control Unit (VECU).
4. Reconnect all connectors.
5. Turn the ignition key ON.

   If blink code 6-3 is still present, the Engine Electronic Control Unit (EECU) is faulty. Turn the ignition key OFF. Reinstall the original Vehicle Electronic Control Unit (VECU) and replace the Engine Electronic Control Unit (EECU). Reconnect all connectors and turn the ignition key ON.

   If blink code 6-3 is NOT present, replacement of the Engine Electronic Control Unit (EECU) has corrected the problem.

BLINK CODE 6-4 — J1939 SERIAL DATA LINE

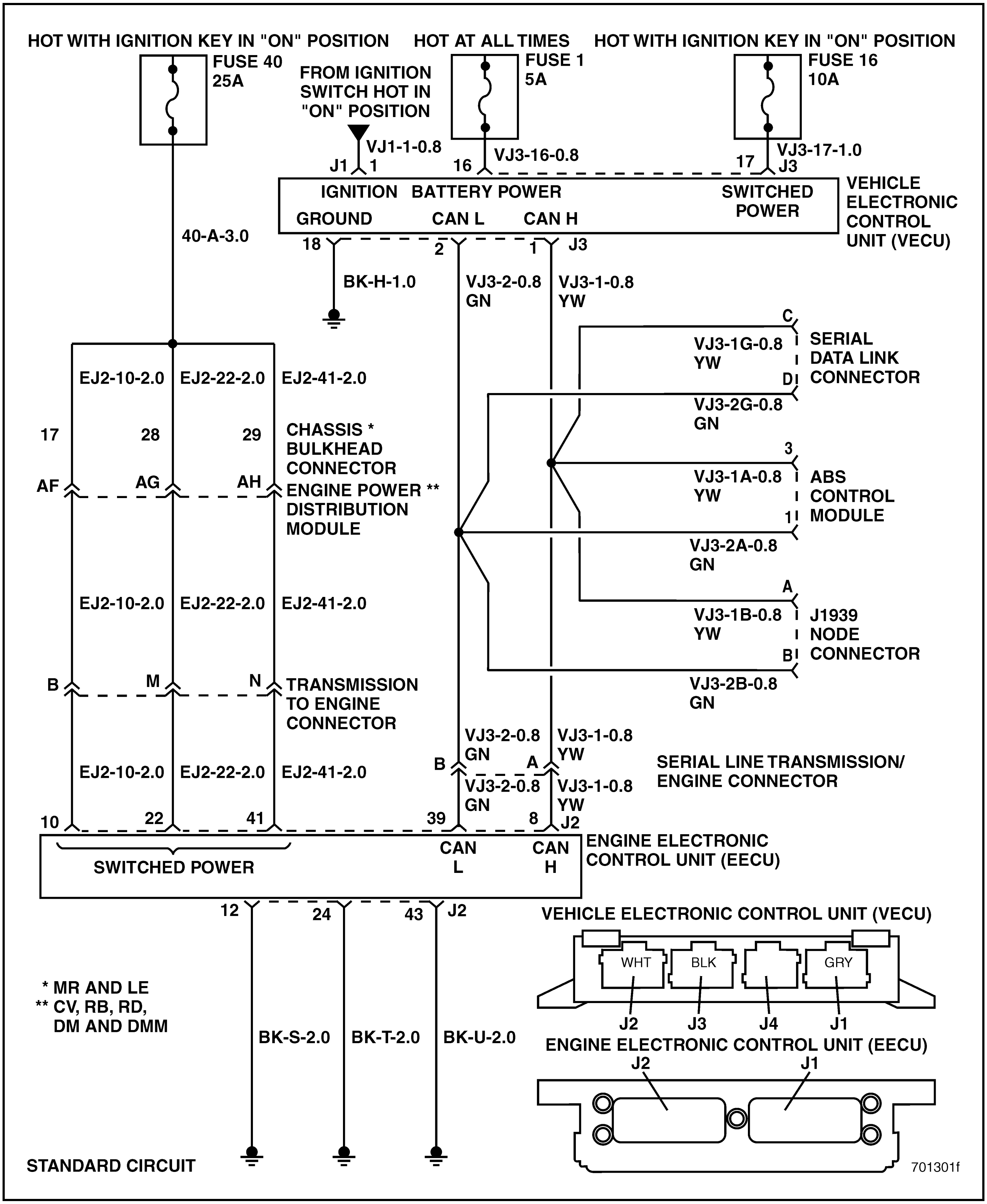


Figure 639 — J1939 Serial Data Line Standard Circuit (ASET™ IEGR Engine)

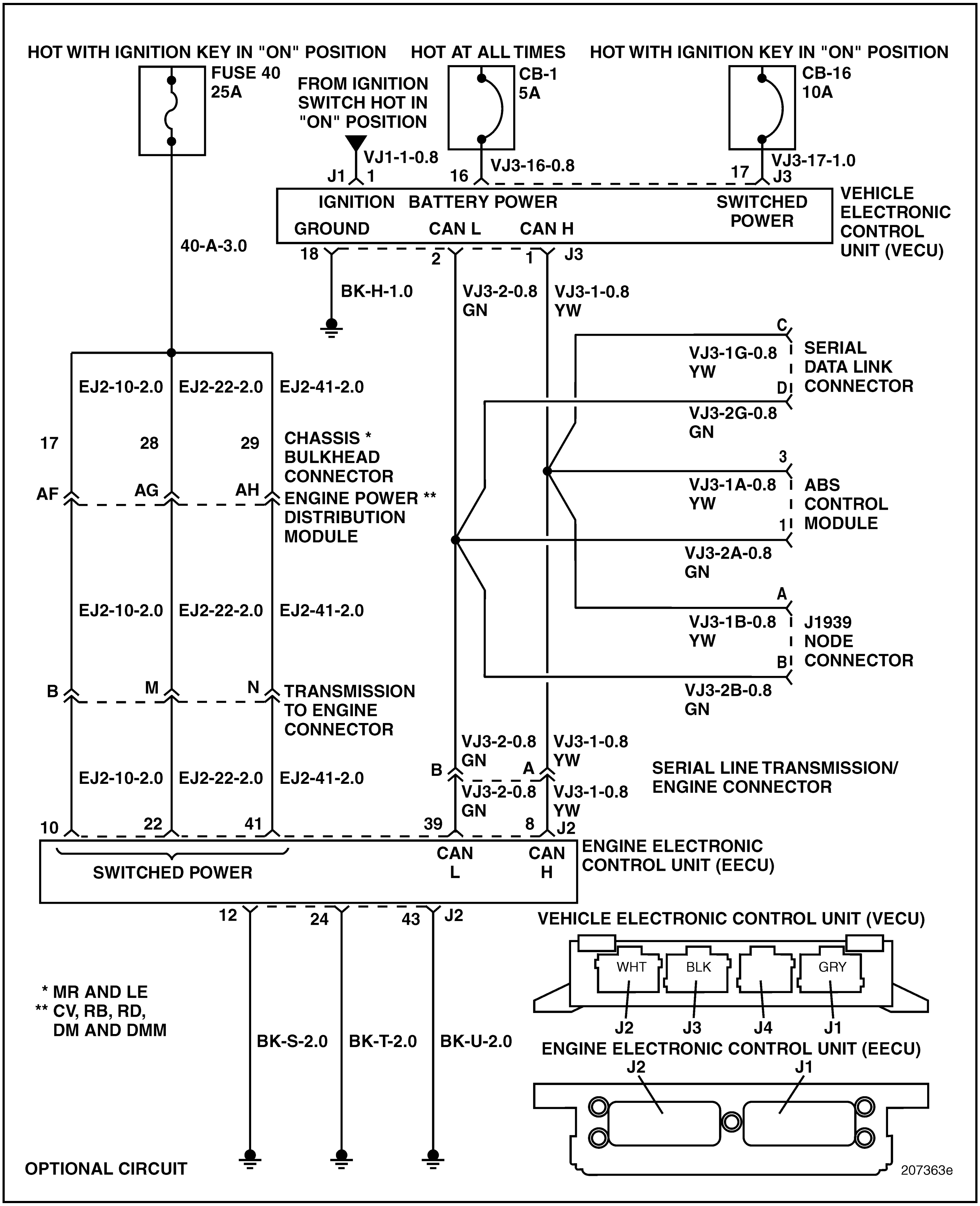


Figure 640 — J1939 Serial Data Line Optional Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier FMI: 8 (Abnormal)

Parameter Identification: S231

Message Identification MID: 128 (Abnormal), 142 (Abnormal)

Circuit Description: The V-MAC III system uses the J1939 data line to control communication between the Vehicle Electronic Control Unit (VECU), Engine Electronic Control Unit (EECU), Anti-lock Brake System Control Unit, Allison Transmission Control Unit, and accessory systems, depending on vehicle model and option content. The J1939 data line is an expandable data bus, allowing the addition of accessory control modules (Collision Avoidance, Traction Control, etc.) to be connected to the circuit. The J1939 data line is comprised of two circuits; the L circuit and the H circuit. The two wires are twisted together to prevent outside electrical noise from interfering with the data being carried by the L and H circuits. The V-MAC III system is designed to allow continued engine operation with the loss of the J1939 data line signal as long as the J1587 data line is still operational.

Code Setting Conditions: If either the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU) loses communication on the J1939 data line for more than one half second, code 6-4 will set and the Electronic Malfunction Lamp (EML) will turn on. The fault will become inactive if communication resumes for at least on half second. When code 6-4 is active, engine speed will default to 900 RPM. If communication is lost on both the J1587 and J1939 data lines the engine will not run.

NOTE

Fault code 6-4 will set for some mismatches of VECU and EECU software levels. Blink code 6-4 will also set while the VECU is in the programming mode for Customer Data, Fleet Data, or Mack Data. This code setting condition is normal and the code will become inactive after the ignition key is cycled.

NOTE

Fault code 6-4 may log, without illuminating the Electronic Malfunction Lamp (EML), on vehicles equipped with Eaton/Bosch ABS/ATC module # 7MN54M2. This nuisance code will not affect the performance of the vehicle. When a vehicle equipped with this ABS/ATC module is being diagnosed for an inactive code 6-4, contact Mack Trucks Service Engineering.

Additional Symptoms: The engine will not start, if communication is lost on both the J1587 and J1939 data lines. If communication is lost on just the J1939 line, the engine will only run at 900 RPM.

Test 1 — Checking for Code 6-4

1. Verify that code 6-4 is set.

   If code 6-4 is set, go to test "Test 2 — Checking for a Fault in an External Device" on page 497.

   If code 6-4 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for a Fault in an External Device

1. Turn the ignition key OFF.
2. Disconnect each of the external electronic modules from the J1939 T connector one at a time and proceed to the next step. Do not disconnect the Engine Electronic Control Unit (EECU) or the Vehicle Electronic Control Unit (VECU).
3. Turn the ignition key ON and check if fault 6-4 is still active.

   If the fault is still active, repeat steps two and three until all external modules have been disconnected. If the fault is still active after all modules have been disconnected, go to test “Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)” on page 497.

   If the fault is no longer active, the short circuit is in the harness or component of one of the external systems. Locate and repair the short circuit.

Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF for five seconds.
2. Disconnect the Serial Link Jumper from the Serial Communications Port if connected.
3. Turn the ignition key ON.

   If the Driver Alarm and Shutdown Lamp turn ON for approximately 2 seconds and then turn OFF, go to test “Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)” on page 497.

   If the Driver Alarm and Shutdown Lamp do NOT turn on, check Vehicle Electronic Control Unit (VECU) power and ground connections. Check VECU connectors J1 and J3 for damaged/broken or corroded pins. Check the VECU for physical damage or corrosion.

Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)

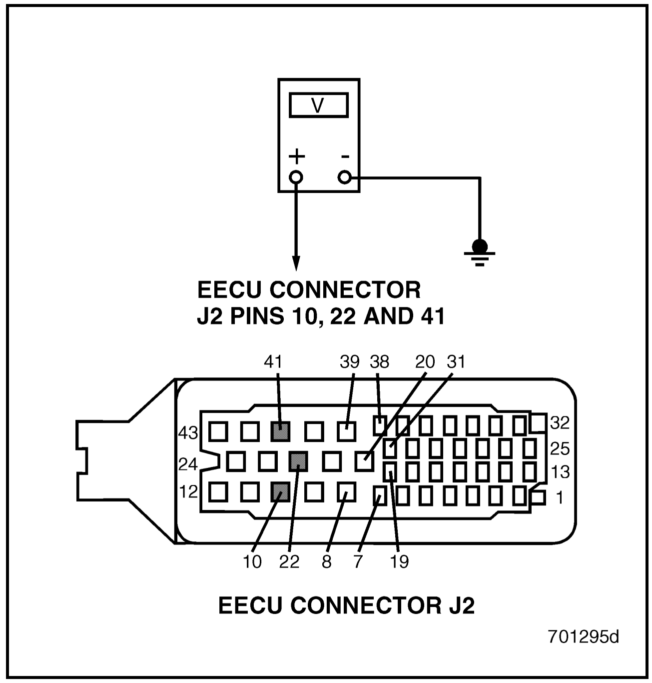


Figure 641

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pins 10, 22 and 41 versus a good ground (see Figure 641).

   If battery voltage is present at all pins, go to test “Test 16 — Checking for a Short to Voltage in the Harness” on page 498.

   If battery voltage is NOT present on ANY pins, check fuse 40 for an open. Check individual power circuits for an open or short circuit to ground. If battery voltage is NOT present on an individual pin, check the suspect circuit for an open or short circuit to ground.

Test 16 — Checking for a Short to Voltage in the Harness

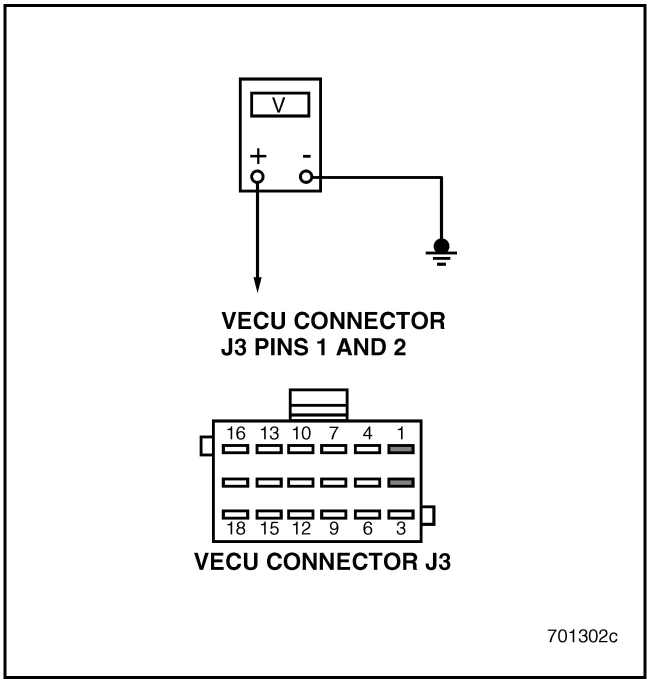


Figure 642

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.
4. Measure the voltage between VECU connector J3 pins 1 and 2 versus a good ground (see Figure 642).

   If there is NO voltage on either line, go to test “Test 32 — Checking for a Pin to Pin Short in the VECU Harness” on page 498.

   If there is voltage on either line, the pin that showed voltage has a short to voltage, go to test “Test 33 — Checking for a Pin to Pin Short in the VECU Harness” on page 499.

Test 32 — Checking for a Pin to Pin Short in the VECU Harness

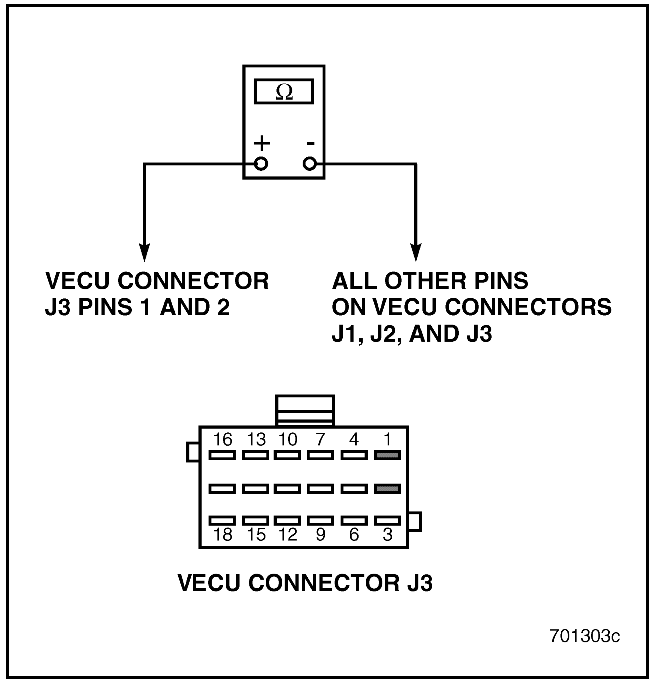


Figure 643

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between VECU connector J3 pins 1 and 2 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 643).

   If there is NO continuity, go to test “Test 64 — Checking for a Pin to Pin Short in the EECU Harness” on page 499.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 33 — Checking for a Pin to Pin Short in the VECU Harness

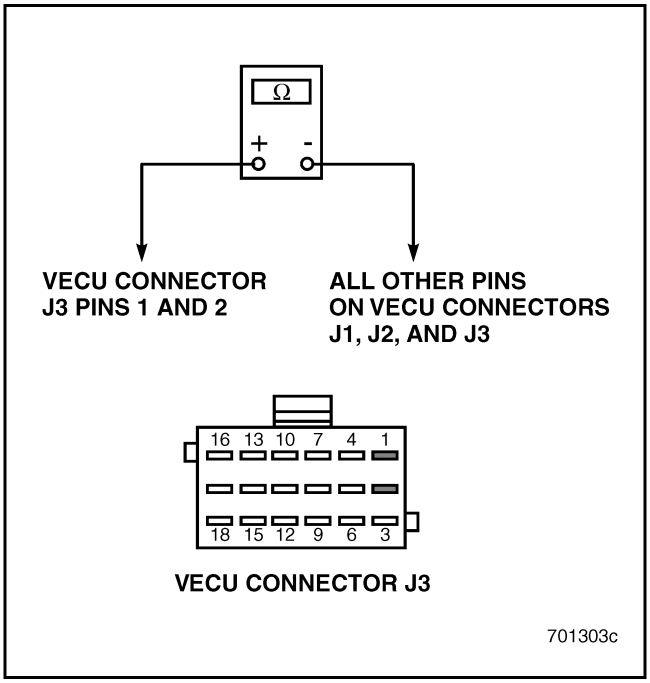


Figure 644

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Disconnect VECU connectors J1, J2 and J3.
5. Check for continuity between VECU connector J3 pins 1 and 2 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 644).

   If there is NO continuity, go to test "Test 66 — Checking for a Pin to Pin Short in the EECU Harness" on page 500.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 64 — Checking for a Pin to Pin Short in the EECU Harness

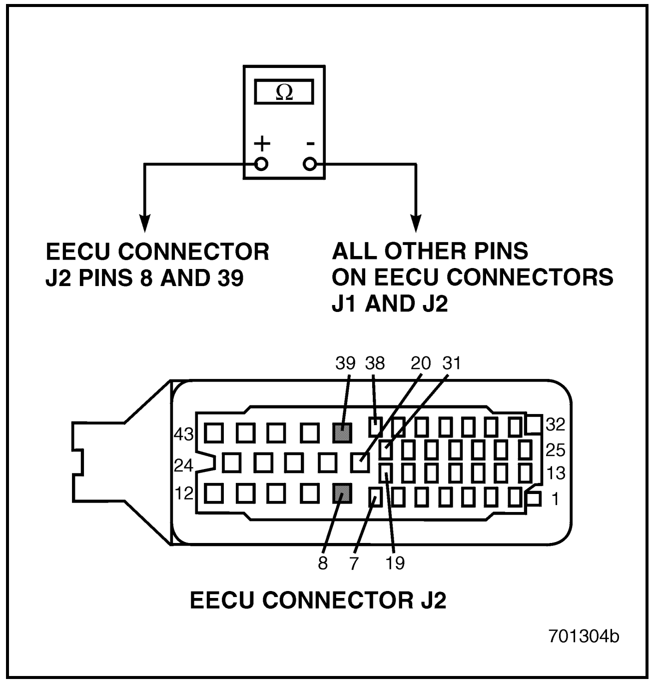


Figure 645

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
5. Check for continuity between EECU connector J2 pins 8 and 39 versus all other pins on EECU connectors J1 and J2 (see Figure 645).

   If there is NO continuity, go to test "Test 128 — Checking for an Open in the Harness" on page 500.

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 66 — Checking for a Pin to Pin Short in the EECU Harness

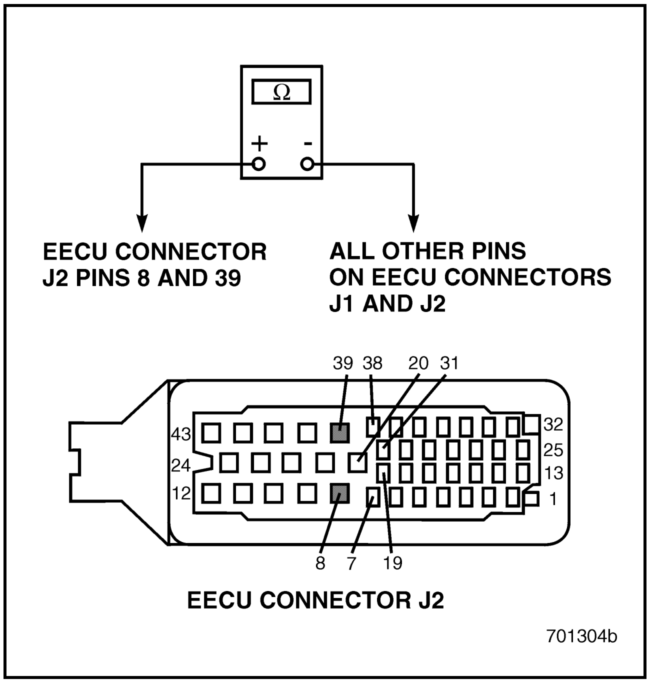


Figure 646

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Control Unit (EECU) connectors J1 and J2.
5. Check for continuity between EECU connector J2 pins 8 and 39 versus all other pins on EECU connectors J1 and J2 (see Figure 646).

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the pin that showed voltage in test 16 is shorted to voltage somewhere outside of the VECU or EECU harness. Locate and repair the short to voltage.

Test 128 — Checking for an Open in the Harness

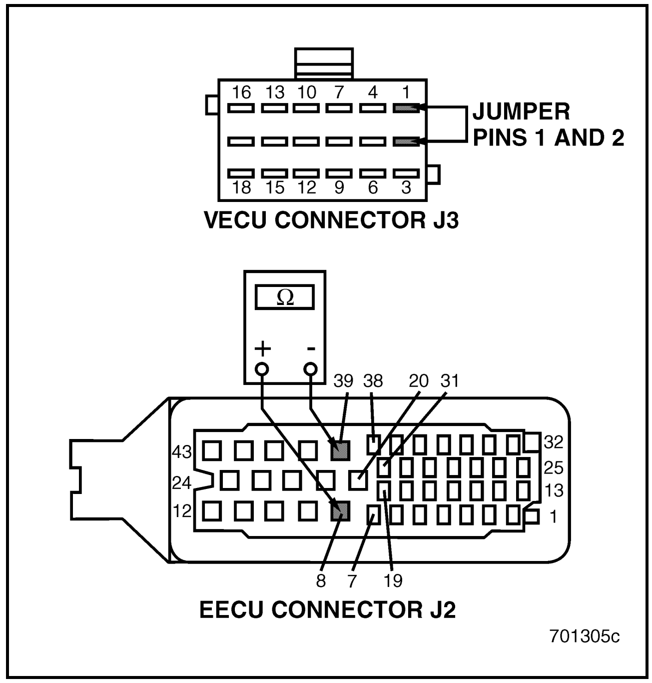


Figure 647

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect a jumper between VECU connector J3 pins 1 and 2.
5. Check for continuity between EECU connector J2 pin 8 and pin 39 (see Figure 647).

   If continuity exists, go to test “Test 256 — Checking for a Loose Connector” on page 501.

   If there is NO continuity, go to test “Test 257 — Checking for an Open Serial Data Line” on page 501.

Test 256 — Checking for a Loose Connector

1. Turn the ignition key OFF.
2. Connect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Connect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If fault 6-4 is still active, go to test “Test 512 — Checking for a Faulty Control Unit” on page 501.

   If fault 6-4 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 257 — Checking for an Open Serial Data Line

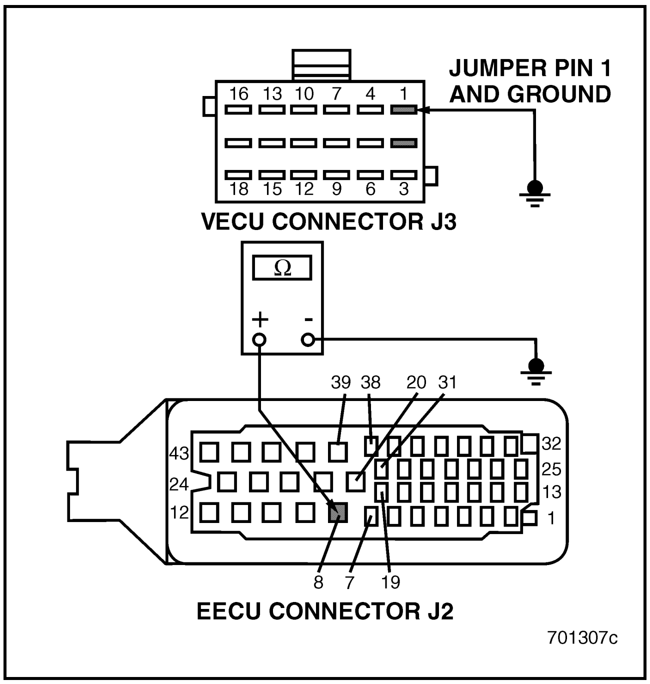


Figure 648

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect a jumper wire between VECU connector J3 pin 1 and a good ground.
5. Check for continuity between EECU connector J2 pin 8 and a good ground (see Figure 648).

   If continuity exists, the low line (L) circuit (VJ3-2-0.5) is open between the VECU and the EECU. Locate and repair the open circuit.

   If there is NO continuity, the high line (H) circuit (VJ3-1-0.5) is open between the VECU and EECU. Locate and repair the open circuit.

Test 512 — Checking for a Faulty Control Unit

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2 and Vehicle Electronic Control Unit (VECU) connector J3.
3. Inspect EECU connector J2 and VECU connector J3 for shorted or open pins.

   If there is evidence of a short or open repair the connector.

   If there is NO evidence of a short or open pin, replace the Vehicle Electronic Control Unit (VECU).
4. Reconnect all connectors.
5. Turn the ignition key ON.

   If blink code 6-4 is still present, the Engine Electronic Control Unit (EECU) is faulty. Turn the ignition key OFF. Reinstall the original Vehicle Electronic Control Unit (VECU) and replace the Engine Electronic Control Unit (EECU). Reconnect all connectors and turn the ignition key ON.

   If blink code 6-4 is NOT present, replacement of the Engine Electronic Control Unit (EECU) has corrected the problem.

BLINK CODE 6-4 — J1939 SERIAL DATA LINE (ASET™ CEGR ENGINE)

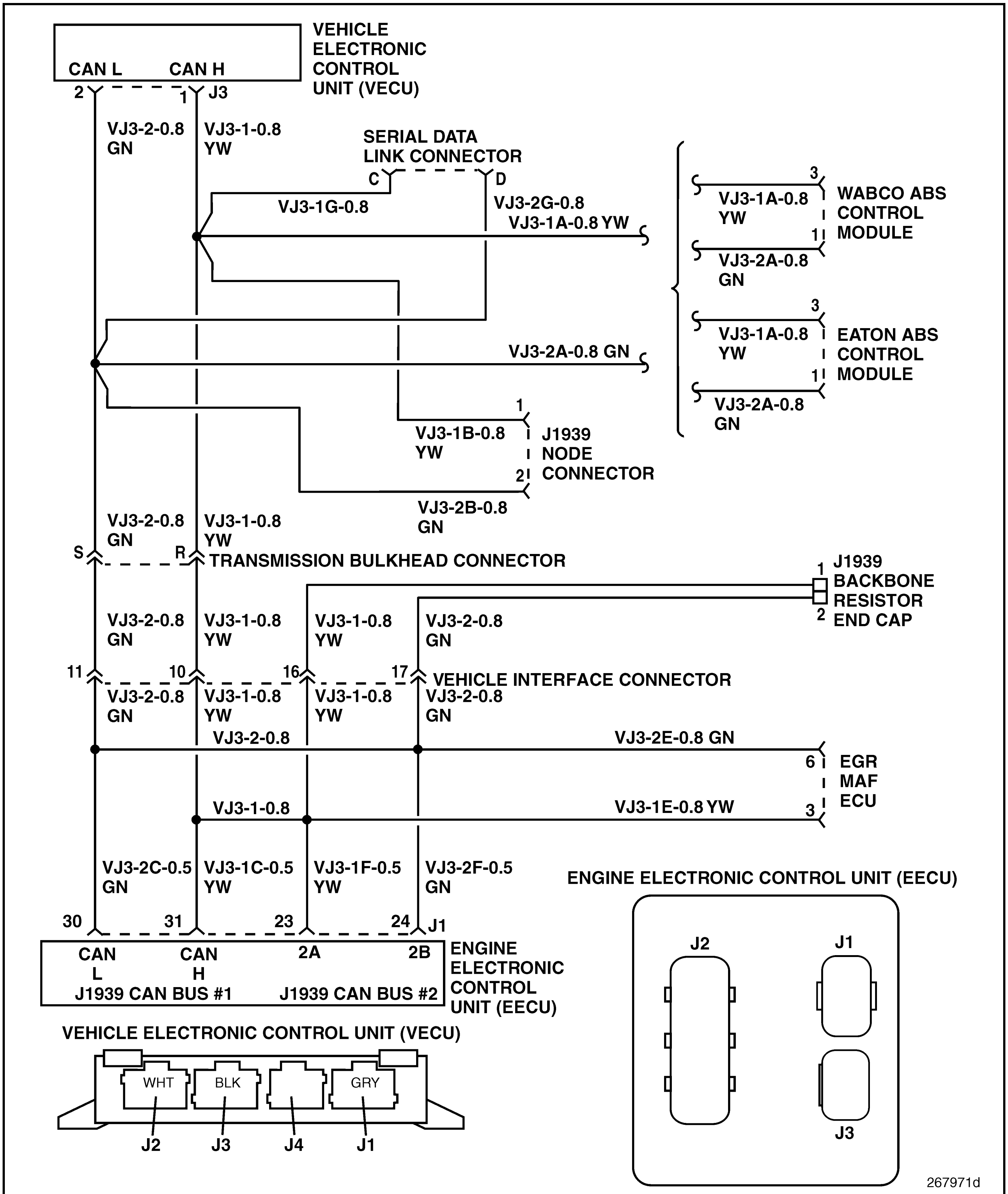


Figure 649 — J1939 Serial Data Line Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier FMI: 8 (Abnormal)

Parameter Identification: S231

Message Identification MID: 128, 142

Circuit Description: The V-MAC III system uses the J1939 data line to control communication between the Vehicle Electronic Control Unit (VECU), Engine Electronic Control Unit (EECU), Anti-lock Brake System Control Unit, Allison Transmission Control Unit, and accessory systems, depending on vehicle model and option content. The J1939 data line is an expandable data bus, allowing the addition of accessory control modules (Collision Avoidance, Traction Control, etc.) to be connected to the circuit. The J1939 data line is comprised of two circuits; the L circuit and the H circuit. The two wires are twisted together to prevent outside electrical noise from interfering with the data being carried by the L and H circuits. The V-MAC III system is designed to allow continued engine operation with the loss of the J1939 data line signal as long as the J1587 data line is still operational.

Code Setting Conditions: If either the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU) loses communication on the J1939 data line for more than one half second, code 6-4 will set and the Electronic Malfunction Lamp (EML) will turn on. The fault will become inactive if communication resumes for at least on half second. When code 6-4 is active, engine speed will default to 900 RPM. If communication is lost on both the J1587 and J1939 data lines the engine will not run.

NOTE

Fault code 6-4 will set for some mismatches of VECU and EECU software levels. Blink code 6-4 will also set while the VECU is in the programming mode for Customer Data, Fleet Data, or Mack Data. This code setting condition is normal and the code will become inactive after the ignition key is cycled.

NOTE

Fault code 6-4 may log, without illuminating the Electronic Malfunction Lamp (EML), on vehicles equipped with Eaton/Bosch ABS/ATC module #7MN54M2. This nuisance code will not affect the performance of the vehicle. When a vehicle equipped with this ABS/ATC module is being diagnosed for an inactive code 6-4, contact Mack Trucks Service Engineering.

Additional Symptoms: The engine will not start, if communication is lost on both the J1587 and J1939 data lines. If communication is lost on just the J1939 line, the engine will only run at 900 RPM.

Test 1 — Checking for Code 6-4

1. Verify that code 6-4 is set.

   If code 6-4 is set, go to test “Test 2 — Checking for a Fault in an External Device” on page 504.

   If code 6-4 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for a Fault in an External Device

1. Turn the ignition key OFF.
2. Disconnect each of the external electronic modules from the J1939 T connector one at a time and proceed to the next step. Do not disconnect the Engine Electronic Control Unit (EECU) or the Vehicle Electronic Control Unit (VECU).
3. Turn the ignition key ON and check if fault 6-4 is still active.

   If the fault is still active, repeat steps two and three until all external modules have been disconnected. If the fault is still active after all modules have been disconnected, go to test "Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)" on page 504.

   If the fault is no longer active, the short circuit is in the harness or component of one of the external systems. Locate and repair the short circuit.

Test 4 — Checking for Power to the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF for five seconds.
2. Disconnect the Serial Link Jumper from the Serial Communications Port if connected.
3. Turn the ignition key ON.

   If the Driver Alarm and Shutdown Lamp turn ON for approximately 2 seconds and then turn OFF, go to test "Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)" on page 504.

   If the Driver Alarm and Shutdown Lamp do NOT turn on, check Vehicle Electronic Control Unit (VECU) power and ground connections. Check VECU connectors J1 and J3 for damaged/broken or corroded pins. Check the VECU for physical damage or corrosion.

Test 8 — Checking for Power to the Engine Electronic Control Unit (EECU)

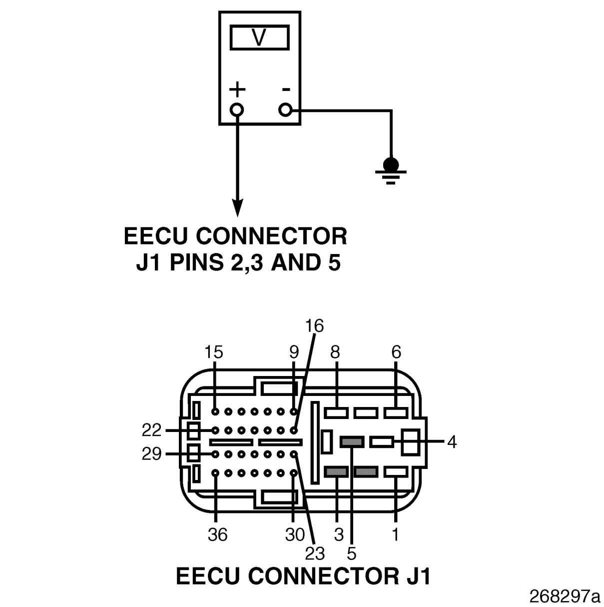


Figure 650

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pins 2, 3 and 5 versus a good ground (see Figure 650).

   If battery voltage is present at all pins, go to test "Test 16 — Checking for a Short to Voltage in the Harness" on page 505.

   If battery voltage is NOT present on ANY pins, check fuse 38 for an open. Check individual power circuits for an open or short circuit to ground. If battery voltage is NOT present on an individual pin, check the suspect circuit for an open or short circuit to ground.

Test 16 — Checking for a Short to Voltage in the Harness

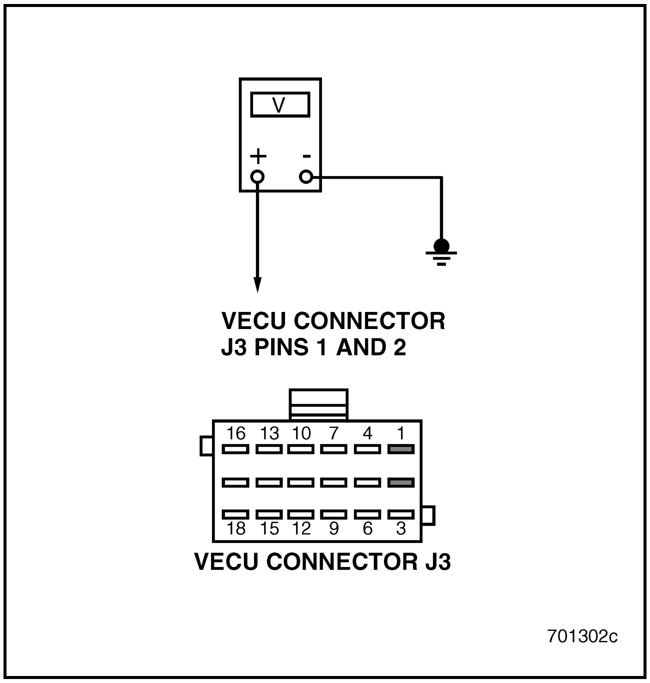


Figure 651

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Connect the Serial Link Jumper to the Serial Communications Port.
4. Measure the voltage between VECU connector J3 pins 1 and 2 versus a good ground (see Figure 651).

   If there is NO voltage on either line, go to test "Test 32 — Checking for a Pin to Pin Short in the VECU Harness" on page 505.

   If there is voltage on either line, the pin that showed voltage has a short to voltage, go to test "Test 33 — Checking for a Pin to Pin Short in the VECU Harness" on page 506.

Test 32 — Checking for a Pin to Pin Short in the VECU Harness

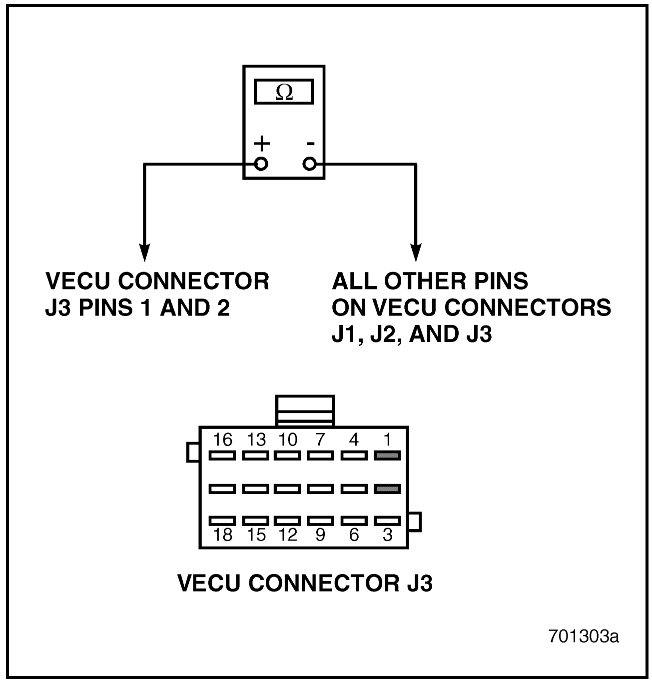


Figure 652

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
5. Check for continuity between VECU connector J3 pins 1 and 2 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 652).

   If there is NO continuity, go to test "Test 64 — Checking for a Pin to Pin Short in the EECU Harness" on page 506.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 33 — Checking for a Pin to Pin Short in the VECU Harness

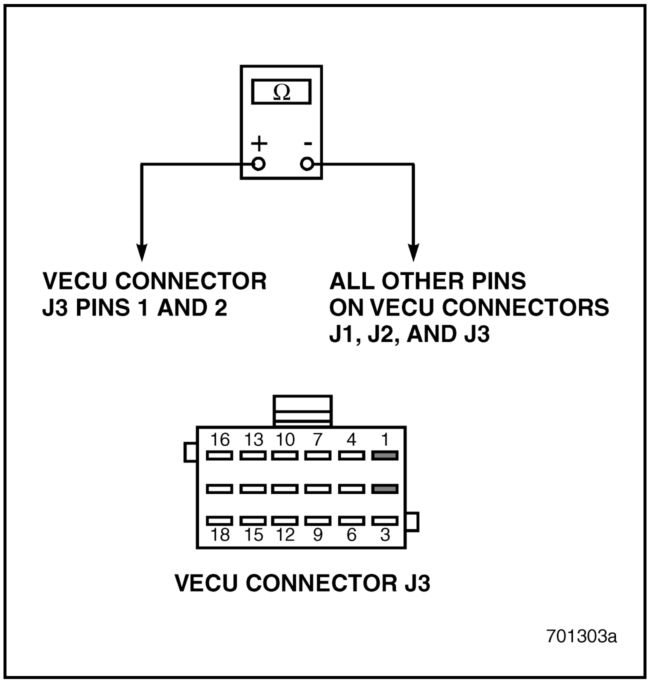


Figure 653

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Disconnect VECU connectors J1, J2 and J3.
5. Check for continuity between VECU connector J3 pins 1 and 2 versus all other pins on VECU connectors J1, J2 and J3 (see Figure 653).

   If there is NO continuity, go to test “Test 66 — Checking for a Pin to Pin Short in the EECU Harness” on page 507.

   If continuity exists, the serial data line is shorted to one of the other VECU circuits. Locate and repair the short circuit.

Test 64 — Checking for a Pin to Pin Short in the EECU Harness

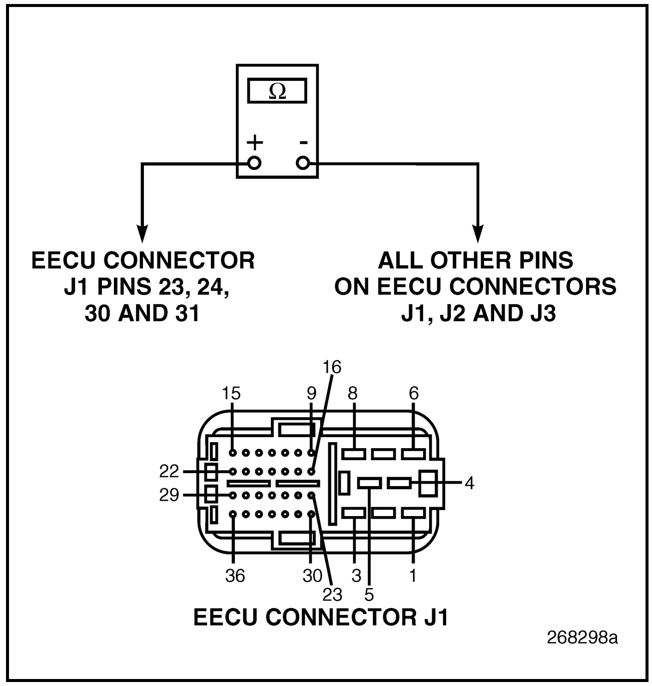


Figure 654

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
5. Check for continuity between EECU connector J1 pins 23, 24 30 and 31 versus all other pins on EECU connectors J1, J2 and J3 (see Figure 654).

   If there is NO continuity, go to test “Test 128 — Checking for an Open in the Harness” on page 507.

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 66 — Checking for a Pin to Pin Short in the EECU Harness

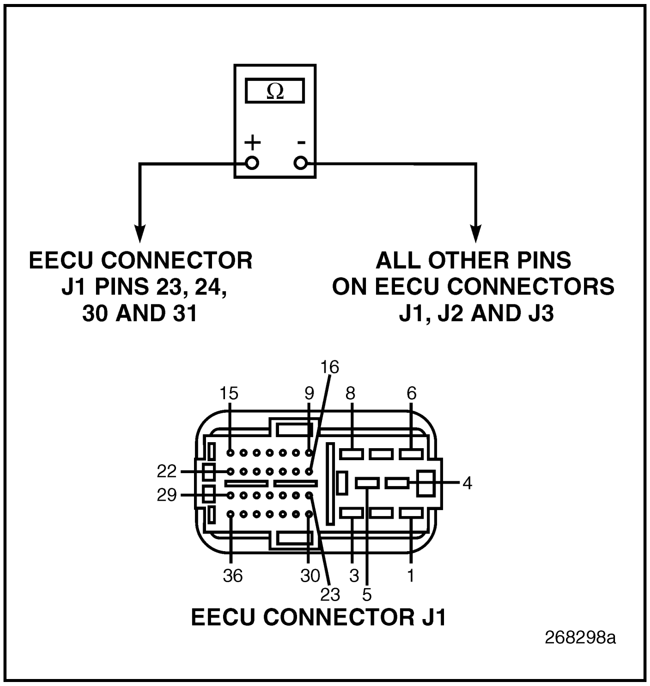


Figure 655

1. Turn the ignition key OFF.
2. Disconnect all external J1939 circuits at the J1939 connectors in the harness.
3. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Disconnect Engine Control Unit (EECU) connectors J1, J2 and J3.
5. Check for continuity between EECU connector J1 pins 23, 24 30 and 31 versus all other pins on EECU connectors J1, J2 and J3 (see Figure 655).

   If continuity exists, the serial data line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the pin that showed voltage in test 16 is shorted to voltage somewhere outside of the VECU or EECU harness. Locate and repair the short to voltage.

Test 128 — Checking for an Open in the Harness

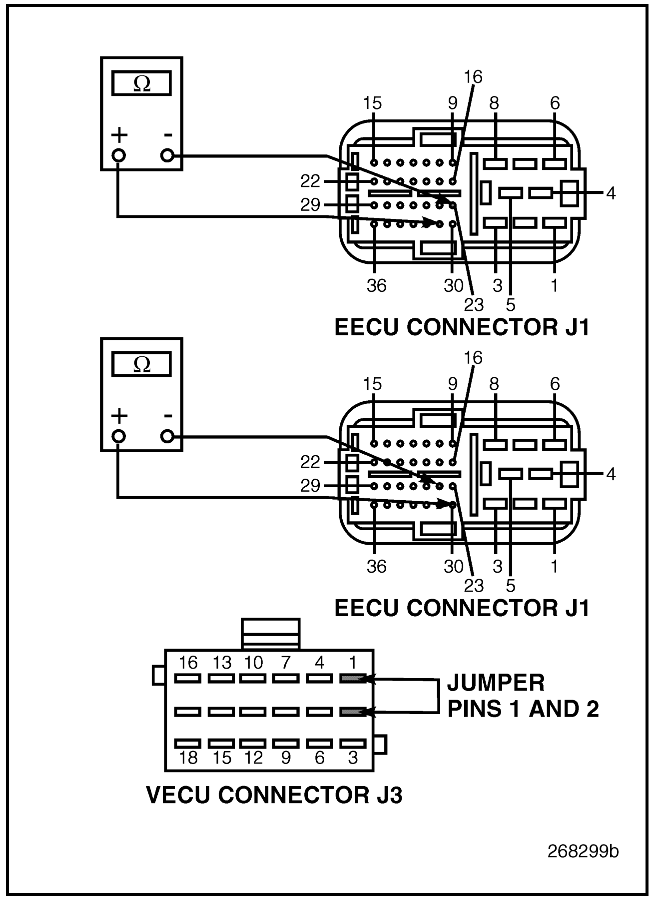


Figure 656

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect a jumper between VECU connector J3 pins 1 and 2.
5. Check for continuity between EECU connector J1 pins 23/24 and 30/31 (see Figure 656).

   If continuity exists, go to test “Test 256 — Checking for a Loose Connector” on page 508.

   If there is NO continuity, go to test “Test 257 — Checking for an Open Serial Data Line” on page 508.

Test 256 — Checking for a Loose Connector

1. Turn the ignition key OFF.
2. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Connect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If fault 6-4 is still active, go to test “Test 512 — Checking for a Faulty Control Unit” on page 508.

   If fault 6-4 is no longer active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 257 — Checking for an Open Serial Data Line

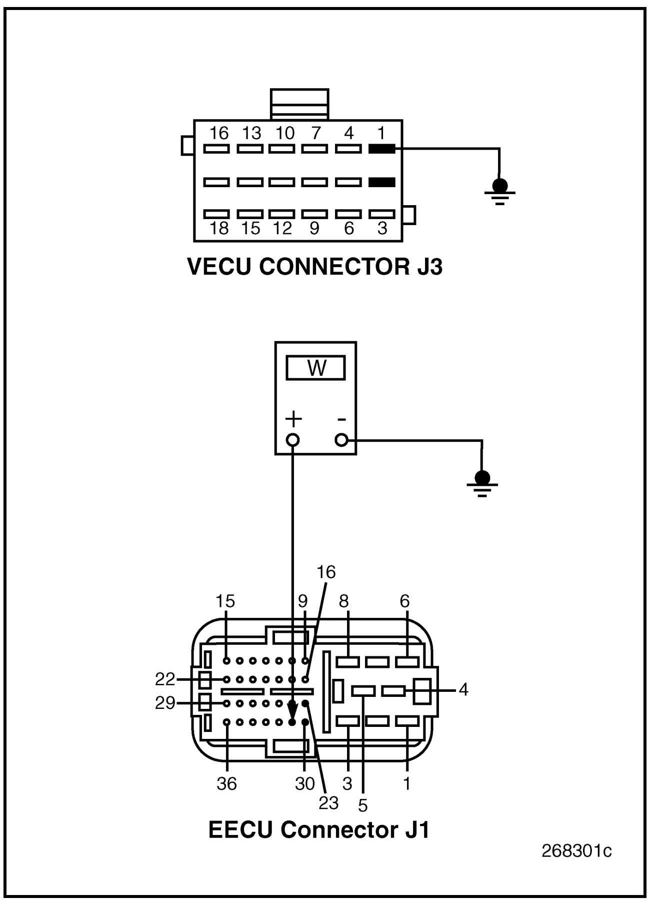


Figure 657

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
4. Connect a jumper wire between VECU connector J3 pin 1 and a good ground.
5. Check for continuity between EECU connector J1 pin 31 and a good ground (see Figure 657).

   If continuity exists, the low line (L) circuit (VJ3-2-0.8) is open between the VECU and the EECU. Locate and repair the open circuit.

   If there is NO continuity, the high line (H) circuit (VJ3-1-0.8) is open between the VECU and EECU. Locate and repair the open circuit.

Test 512 — Checking for a Faulty Control Unit

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1 and Vehicle Electronic Control Unit (VECU) connector J3.
3. Inspect EECU connector J1 and VECU connector J3 for shorted or open pins.

   If there is evidence of a short or open repair the connector.

   If there is NO evidence of a short or open pin, replace the Vehicle Electronic Control Unit (VECU).
4. Reconnect all connectors.
5. Turn the ignition key ON.

   If blink code 6-4 is still present, the Engine Electronic Control Unit (EECU) is faulty. Turn the ignition key OFF. Reinstall the original Vehicle Electronic Control Unit (VECU) and replace the Engine Electronic Control Unit (EECU). Reconnect all connectors and turn the ignition key ON.

   If blink code 6-4 is NOT present, replacement of the Engine Electronic Control Unit (EECU) has corrected the problem.

BLINK CODE 6-5 — LOSS OF SERIAL DATA COMMUNICATION (ASET™ IEGR ENGINE)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 8

Parameter Identification (PID): S254

Message Identification (MID): 128

Circuit Description: The J1587 and J1939 serial data lines are used for communication between the Vehicle Electronic Control Unit (VECU), Engine Electronic Control Unit (EECU), ABS System Control Unit, Allison Transmission Control Unit, electronic gauge panel, and accessory systems. The J1587 and J1939 lines are redundant in that if one data line fails the VECU and the EECU can communicate over the functioning data line. The J1939 data line is a high speed data line and operates at a faster speed than the J1587 data line.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set code 6-5 if it has lost communications with the Vehicle Electronic Control Unit (VECU) on the J1587 serial data line and the J1939 serial data line.

Additional Symptoms: The engine will shutdown if communication is lost on both serial data lines.

NOTE

On older V-MAC III versions, code 6-5 could be logged (but remain inactive) during VECU programming. If this is the case, ignore the code and clear it from memory.

NOTE

Diagnostic code 6-5 will almost always be seen as an inactive code. When all serial communication is lost, the EECU has no way of communicating that a fault exists.

NOTE

Before proceeding with the following tests, make sure that the Vehicle Control Unit (VECU) and Engine Electronic Control Unit (EECU) connectors are properly connected and that power is supplied to both units.

Test 1 — Checking for Other Blink Codes

Is blink code 6-3, J1587 Serial Data Line or code 6-4, J1939 Serial Data Line also set?

If either blink code 6-3 or blink code 6-4 is set, follow the diagnostic procedures for code 6-3.

If neither blink code 6-3 or blink code 6-4 is set, go to test “Test 2 — Confirming J1587 Data Line Operation” on page 509.

Test 2 — Confirming J1587 Data Line Operation

1. Turn the ignition key ON.
2. Connect a diagnostic computer and attempt to request data from the Vehicle Electronic Control Unit (VECU).

   If communication or data can be obtained from the VECU, go to test “Test 4 — Checking the Engine Electronic Control Unit (EECU)” on page 510.

   If communication or data can not be obtained from the VECU, go to test “Test 5 — Checking VECU Connector J3 for Poor Connection” on page 510.

Test 4 — Checking the Engine Electronic Control Unit (EECU)

1. Clear blink code 6-5 from memory.
2. Start the engine and then turn the ignition key OFF.
3. Check if any blink codes are set.

   If blink code 6-5 is set, check the EECU module and connectors J1 and J2 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the EECU and retest the system.

   If blink code 6-5 is NOT active and codes 6-3 or 6-4 are not set, serial communications have been reestablished. The diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 5 — Checking VECU Connector J3 for Poor Connection

1. Visually inspect VECU connector J3 pins 1, 2, 3, 14 and 15 for dirt, loose pins or deformed contacts.
2. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pins 1, 2, 3, 14 and 15. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or any of the terminals feel loose, repair VECU harness connector J3.

   If the test lead is making good contact with all of the terminals, go to test “Test 10 — Checking the Vehicle Electronic Control Unit (VECU)” on page 510.

Test 10 — Checking the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF.
2. Connect VECU connector J3.
3. Clear blink code 6-5 from memory.
4. Turn the ignition key ON.
5. Check if blink code 6-5 is set and if the vehicle electrical system has powered up.

   If blink code 6-5 is set, check the VECU module and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 6-5 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 6-5 — LOSS OF SERIAL DATA COMMUNICATION (ASET™ CEGR ENGINE)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 8

Parameter Identification (PID): S254

Message Identification (MID): 128

Circuit Description: The J1587 and J1939 serial data lines are used for communication between the Vehicle Electronic Control Unit (VECU), Engine Electronic Control Unit (EECU), ABS System Control Unit, Allison Transmission Control Unit, electronic gauge panel, and accessory systems. The J1587 and J1939 lines are redundant in that if one data line fails the VECU and the EECU can communicate over the functioning data line. The J1939 data line is a high speed data line and operates at a faster speed than the J1587 data line.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set code 6-5 if it has lost communications with the Vehicle Electronic Control Unit (VECU) on the J1587 serial data line and the J1939 serial data line.

Additional Symptoms: The engine will shutdown if communication is lost on both serial data lines.

NOTE

Diagnostic code 6-5 will almost always be seen as an inactive code. When all serial communication is lost, the EECU has no way of communicating that a fault exists.

NOTE

Before proceeding with the following tests, make sure that the Vehicle Control Unit (VECU) and Engine Electronic Control Unit (EECU) connectors are properly connected and that power is supplied to both units.

Test 1 — Checking for Other Blink Codes

Is blink code 6-3, J1587 Serial Data Line or code 6-4, J1939 Serial Data Line also set?

If either blink code 6-3 or blink code 6-4 is set, follow the diagnostic procedures for code 6-3.

If neither blink code 6-3 or blink code 6-4 is set, go to test “Test 2 — Confirming J1587 Data Line Operation” on page 511.

Test 2 — Confirming J1587 Data Line Operation

1. Turn the ignition key ON.
2. Connect a diagnostic computer and attempt to request data from the Vehicle Electronic Control Unit (VECU).

   If communication or data can be obtained from the VECU, go to test “Test 4 — Checking the Engine Electronic Control Unit (EECU)” on page 512.

   If communication or data can not be obtained from the VECU, go to test “Test 5 — Checking VECU Connector J3 for Poor Connection” on page 512.

Test 4 — Checking the Engine Electronic Control Unit (EECU)

1. Clear blink code 6-5 from memory.
2. Start the engine and then turn the ignition key OFF.
3. Check if any blink codes are set.

   If blink code 6-5 is set, check the EECU module and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the EECU and retest the system.

   If blink code 6-5 is NOT active and codes 6-3 or 6-4 are not set, serial communications have been reestablished. The diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 5 — Checking VECU Connector J3 for Poor Connection

1. Visually inspect VECU connector J3 pins 1, 2, 3, 14 and 15 for dirt, loose pins or deformed contacts.
2. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pins 1, 2, 3, 14 and 15. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or any of the terminals feel loose, repair VECU harness connector J3.

   If the test lead is making good contact with all of the terminals, go to test “Test 10 — Checking the Vehicle Electronic Control Unit (VECU)” on page 512.

Test 10 — Checking the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF.
2. Connect VECU connector J3.
3. Clear blink code 6-5 from memory.
4. Turn the ignition key ON.
5. Check if blink code 6-5 is set and if the vehicle electrical system has powered up.

   If blink code 6-5 is set, check the VECU module and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 6-5 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 6-6 — INTERNAL COMMUNICATIONS

Failure Mode Identifier (FMI): 12 (Failed Device)

Parameter Identification (PID): S233

Message Identification (MID): 128

NOTE

The Engine Electronic Control Unit (EECU) is having an internal communication problem but self diagnosis cannot be performed. If the code is active and the engine will start, start the engine and shut it down with the key. Wait 10 seconds and start the engine again. Once more, shut the engine down with the key, wait 10 seconds, and restart the engine. The fault should go inactive after several seconds. The Engine Electronic Control Unit (EECU) may have detected a power failure without the key switch being turned off. Check all power and ground connections to the Engine Electronic Control Unit (EECU).

If the fault does not go inactive or if the engine will not start, attempt to clear the code from memory and check if the code resets. If the blink code 6-6 resets, contact Mack Trucks Service Engineering.

BLINK CODE 6-7 — ENGINE ELECTRONIC CONTROL UNIT (EECU) POWER RELAY (CV, LE, MR) (ASET™ IEGR ENGINE)

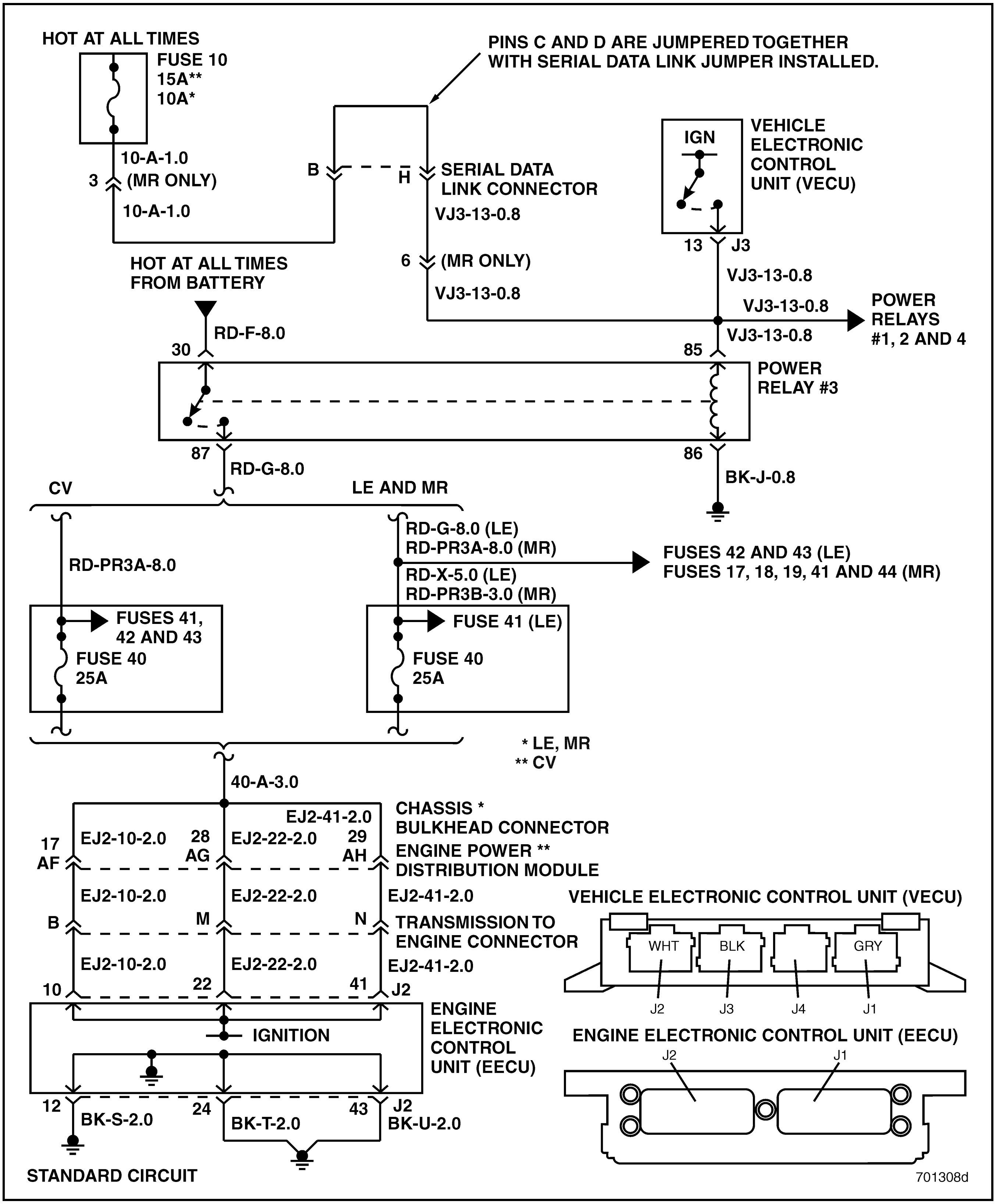


Figure 658 — EECU Power Relay Standard Circuit (CV, LE and MR ASET™ IEGR Engine)

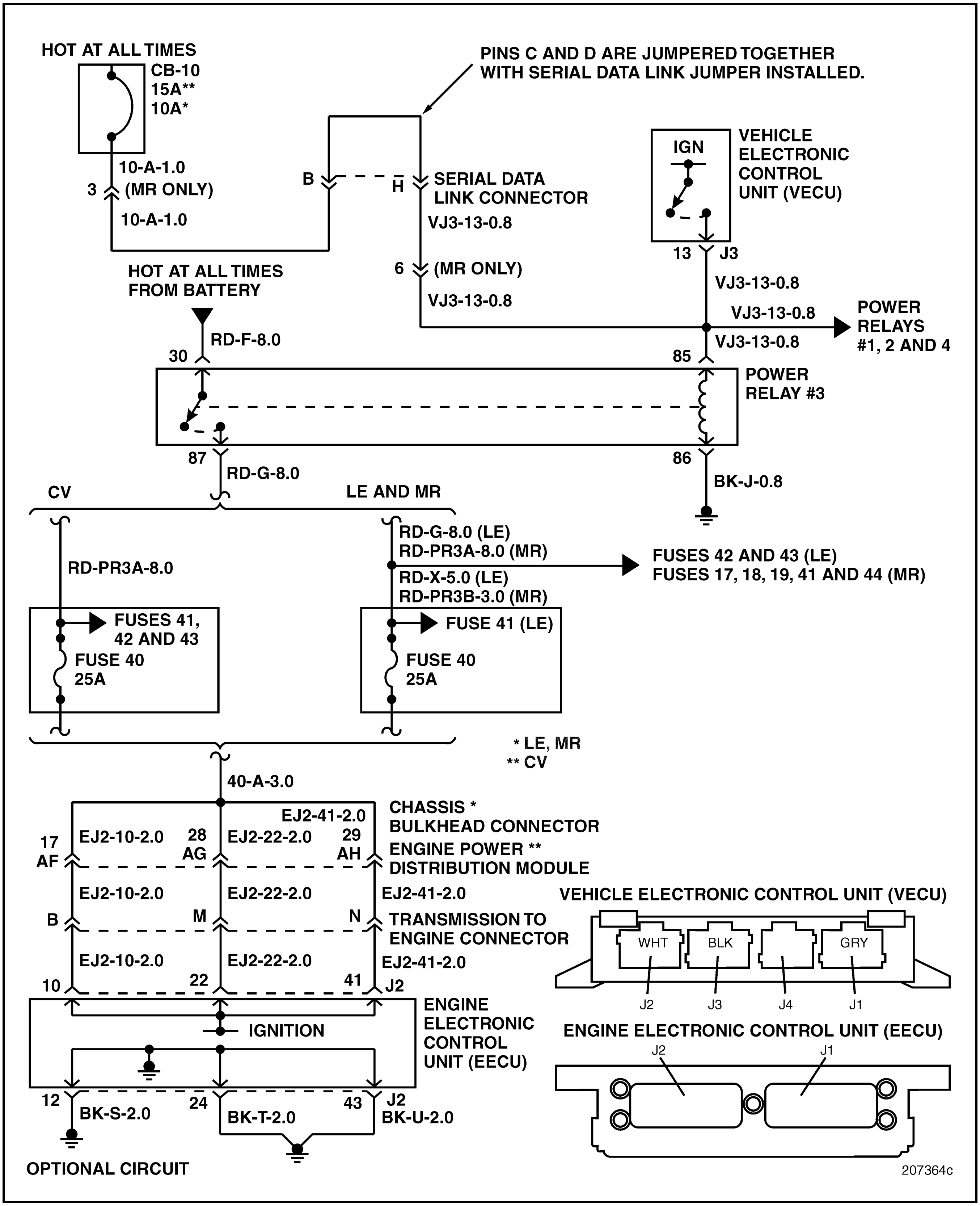


Figure 659 — EECU Power Relay Optional Circuit (CV, LE and MR ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic)

Parameter Identification (PID): S236

Message Identification (MID): 128

Circuit Description: When the ignition key is turned ON, battery voltage is supplied to the ignition input of the Vehicle Electronic Control Unit (VECU) at connector J1 pin 1. This signals the VECU to energize the vehicle's power relays through VECU connector J3 terminal 13. After the relays power up, relay #2 (CV and MR) or relay #1 (LE) delivers system voltage to VECU connector J3 pin 17. When the ignition key is turned OFF, the VECU starts an internal timer that removes power from the power relays after approximately six seconds. The power relays de-energize and remove power from most of the vehicle's electrical system.

Location: Power Relay #3 is located in the dash electrical equipment panel.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set fault 6-7 if the Vehicle Electronic Control Unit (VECU) sends a shutdown engine command to the EECU over the J1939 serial data line and then, after 6 seconds, the EECU still senses voltage at connector J2 pins 10, 22 and 41. This fault indicates that the Vehicle Electronic Control Unit (VECU) requested a complete shutdown from the Engine Electronic Control Unit (EECU) but the switched power did not shut off at the correct time.

Additional Symptoms: Other electrical systems or circuits may be powered up with the ignition key in the OFF position.

NOTE

Code 6-7 is logged in the EECU but is rarely seen as active. Under normal circumstances, the EECU has no means of communicating that the fault is active.

Test 1 — Checking for a Short to Voltage at Power Relay #3

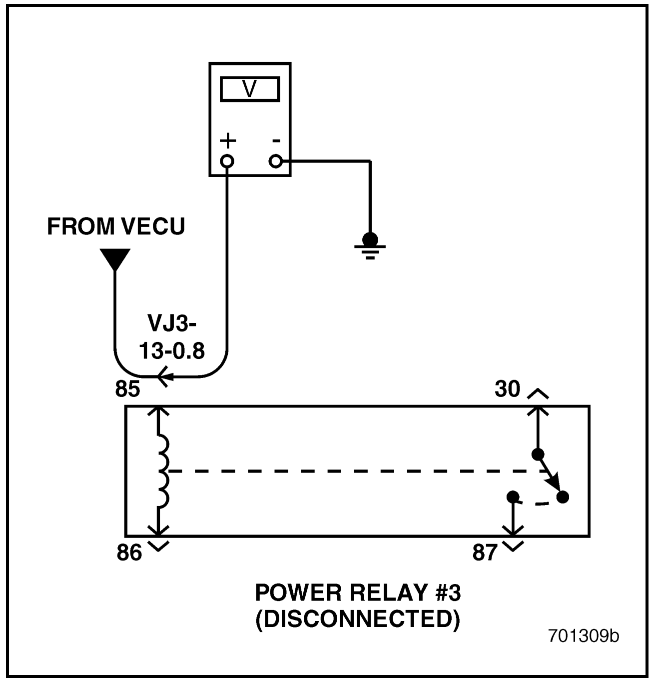


Figure 660

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper if it installed. Wait at least ten seconds to be sure the electrical system has powered down.
3. Disconnect Power Relay #3.
4. Measure the voltage between pin 85 of the Power Relay #3 harness connector and a known good ground (see Figure 658 and Figure 660).

   If voltage is present, go to test "Test 2 — Checking the VECU Switched Power Output Circuit for a Short to Voltage" on page 517.

   If voltage is less than 0.5 volts, go to test "Test 3 — Checking the Power Relay #3 Output Circuit for a Short to Voltage" on page 517.

Test 2 — Checking the VECU Switched Power Output Circuit for a Short to Voltage

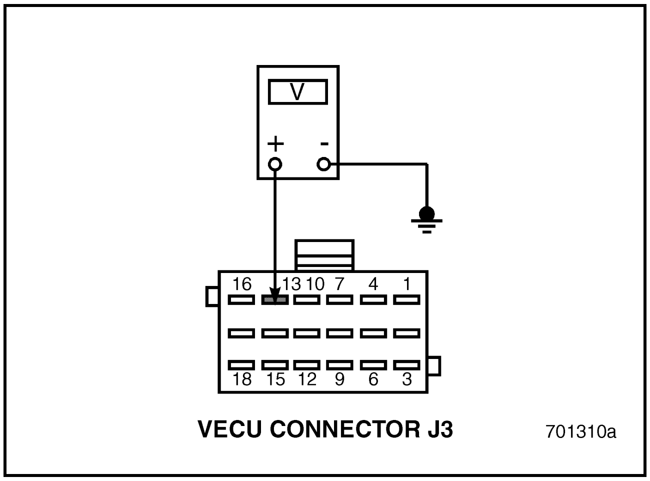


Figure 661

1. Turn the ignition key OFF. Wait at least 10 seconds to be sure the system has powered down.
2. Disconnect Power Relay #3.
3. Disconnect Vehicle Electronic Control Unit Connector (VECU) connector J3.
4. Measure the voltage between VECU connector J3 pin 13 and known good ground (see Figure 661).

   If voltage is present, locate and repair the short to voltage. Make sure the Serial Link Jumper is not connected and that Serial Communications Port terminals B and H are not shorted together.

   If voltage is less than 0.5 volts, go to test “Test 4 — Checking the Vehicle Electronic Control Unit (VECU)” on page 518.

Test 3 — Checking the Power Relay #3 Output Circuit for a Short to Voltage

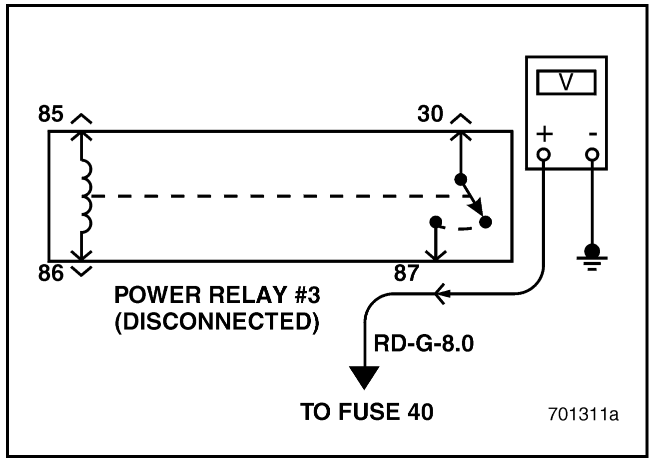


Figure 662

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper if it is installed. Wait at least ten seconds to be sure the electrical system has powered down.
3. Disconnect Power Relay #3.
4. Measure the voltage between pin 87 of the Power Relay #3 harness connector and a good ground (see Figure 658 and Figure 662).

   If voltage is present, go to test “Test 6 — Isolating the Short to Voltage in the Power Relay #3 Output Circuit” on page 518.

   If voltage is less than 0.5 volts, go to test “Test 7 — Checking Power Relay #3 for Shorted Switch Contacts” on page 518.

Test 4 — Checking the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF.
2. Connect VECU connector J3 and Power Relay #3.
3. Clear blink code 6-7 from memory.
4. Disconnect Serial Link Jumper.
5. Start the engine and then turn ignition key OFF.
6. Check if blink code 6-7 is set and if the vehicle electrical system has powered down.

   If blink code 6-7 is set and the electrical system is powered up, check the VECU module and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 6-7 is NOT active and the electrical system has powered down, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 6 — Isolating the Short to Voltage in the Power Relay #3 Output Circuit

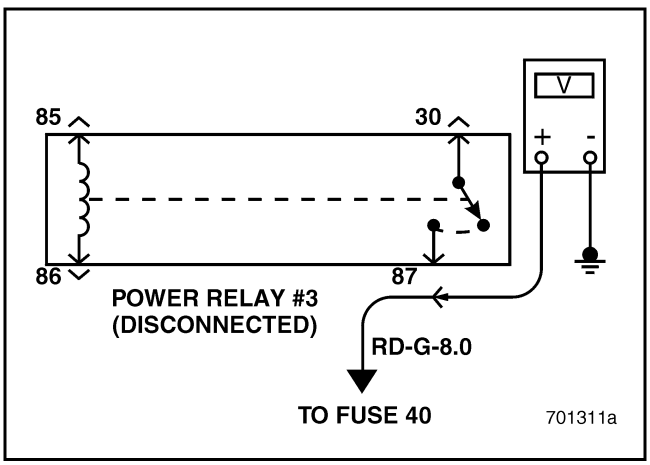


Figure 663

1. Turn the ignition key OFF.
2. Remove Fuse 40 from the Engine Power Distribution Module (CV) or the Electrical Equipment Panel (MR and LE).
3. Disconnect the Serial Link Jumper if it is installed. Wait at least ten seconds to be sure the electrical system has powered down.
4. Disconnect Power Relay #3.
5. Measure the voltage between pin 87 of the Power Relay #3 harness connector and a known good ground (see Figure 658 and Figure 663).

   If system voltage is present, repair the short to voltage in the wire between Fuse 40 and Power Relay #3.

   If the measured voltage is less than 0.5 volts, go to test “Test 12 — Checking the EECU Ignition Input Circuit for a Short to Voltage” on page 519.

Test 7 — Checking Power Relay #3 for Shorted Switch Contacts

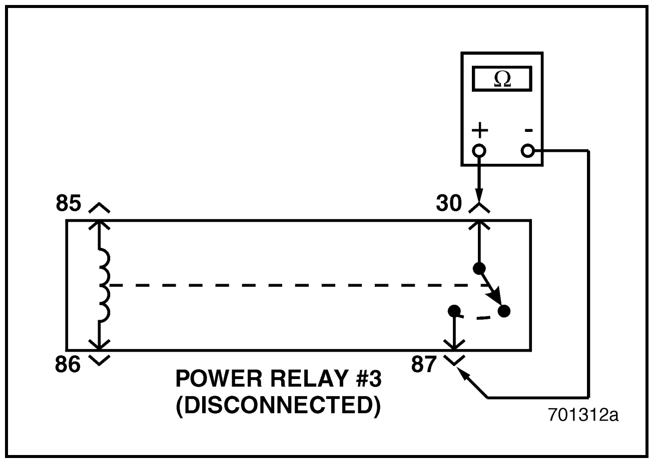


Figure 664

1. Turn the ignition key OFF.
2. Disconnect Power Relay #3.
3. Check for continuity between the Power Relay pins 30 and 87 (see Figure 658 and Figure 664).

   If there is NO continuity, check the Power Relay terminals and connector for evidence of a short circuit. Clean and repair the terminals and connector as necessary.

   If continuity exists, the relay switch contacts are stuck closed, replace Power Relay #3.

Test 12 — Checking the EECU Ignition Input Circuit for a Short to Voltage

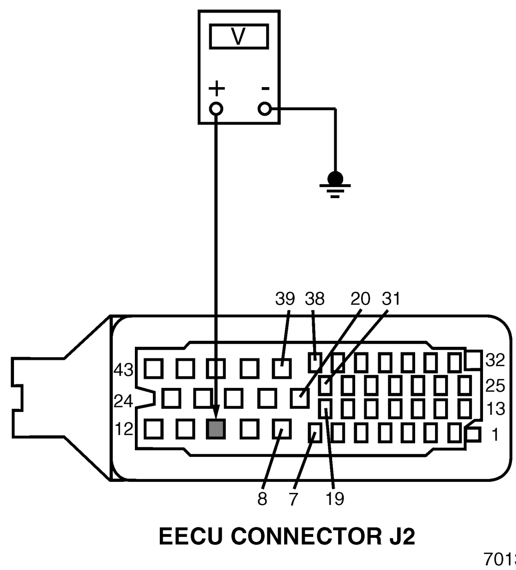


Figure 665

1. Turn the ignition key OFF.
2. Remove Fuse 40 from the Engine Power Distribution Module (CV) or the Electrical Equipment Panel (MR and LE).
3. Disconnect the Serial Link Jumper if it is installed. Wait at least ten seconds to be sure the electrical system has powered down.
4. Disconnect EECU Connector J2.
5. Measure the voltage between the EECU connector J2 pin 10 and a good ground (see Figure 665).

   If voltage is present, locate and the repair short to voltage in the ignition input circuit.

   If voltage is less than 0.5 volts, go to test “Test 24 — Checking the Engine Electronic Control Unit (EECU)” on page 519.

Test 24 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Clear blink code 6-7 from memory.
4. Disconnect the Serial Link Jumper if it is installed.
5. Start the engine and then turn the ignition key OFF.
6. Check if blink code 6-7 is set and if the vehicle electrical system has powered down.

   If blink code 6-7 is set, check the EECU module and connectors J1 and J2 for dirt, loose or shorted pins or any other repairable damage. If NO problems are evident, replace the EECU and retest the system.

   If blink code 6-7 is NOT active and the electrical system has powered down, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 6-7 — ENGINE ELECTRONIC CONTROL UNIT (EECU) POWER RELAY (DM, RB, RD) (ASET™ IEGR ENGINE)

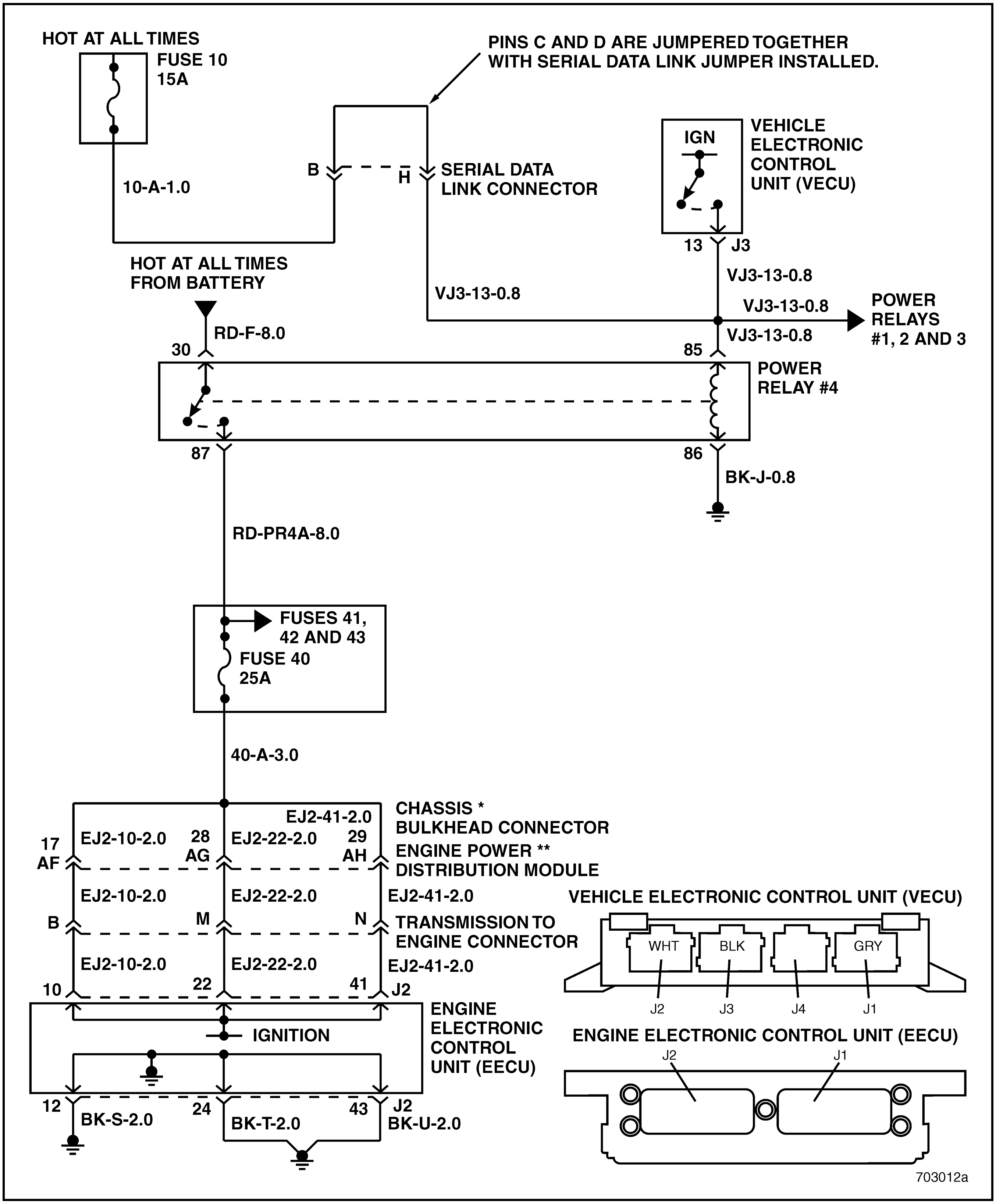


Figure 666 — EECU Power Relay Circuit (DM, RD) (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic)

Parameter Identification (PID): S236

Message Identification (MID): 128

Circuit Description: When the ignition key is turned ON, battery voltage is supplied to the ignition input of the Vehicle Electronic Control Unit (VECU) at connector J1 pin 1. This signals the VECU to energize the vehicle's power relays through VECU connector J3 terminal 13. After the relays power up, relay #2 delivers system voltage to VECU connector J3 pin 17. When the ignition key is turned OFF, the VECU starts an internal timer that removes power from the power relays after approximately six seconds. The power relays de-energize and remove power from most of the vehicle's electrical system.

Location: Power Relay #4 is located in the dash electrical equipment panel.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set fault 6-7 if the Vehicle Electronic Control Unit (VECU) sends a shutdown engine command to the EECU over the J1939 serial data line and then, after 6 seconds, the EECU still senses voltage at connector J2 pins 10, 22 and 41. This fault indicates that the Vehicle Electronic Control Unit (VECU) requested a complete shutdown from the Engine Electronic Control Unit (EECU) but the switched power did not shut off at the correct time.

Additional Symptoms: Other electrical systems or circuits may be powered up with the ignition key in the OFF position.

NOTE

Code 6-7 is logged in the EECU but is rarely seen as active. Under normal circumstances, the EECU has no means of communicating that the fault is active.

Test 1 — Checking for a Short to Voltage at Power Relay #4

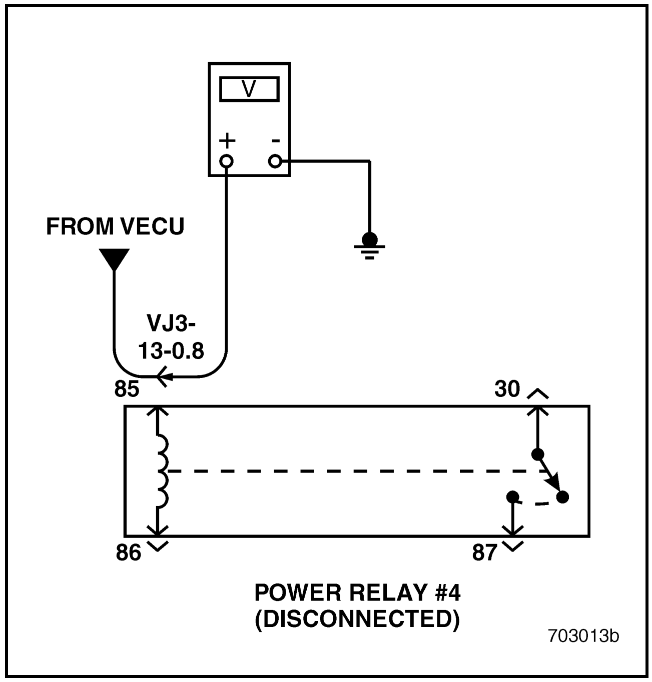


Figure 667

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper if it installed. Wait at least ten seconds to be sure the electrical system has powered down.
3. Disconnect Power Relay #4.
4. Measure the voltage between pin 85 of the Power Relay #4 harness connector and a known good ground (see Figure 666 and Figure 667).

   If voltage is present, go to test "Test 2 — Checking the VECU Switched Power Output Circuit for a Short to Voltage" on page 522.

   If voltage is less than 0.5 volts, go to test "Test 3 — Checking the Power Relay #4 Output Circuit for a Short to Voltage" on page 522.

Test 2 — Checking the VECU Switched Power Output Circuit for a Short to Voltage

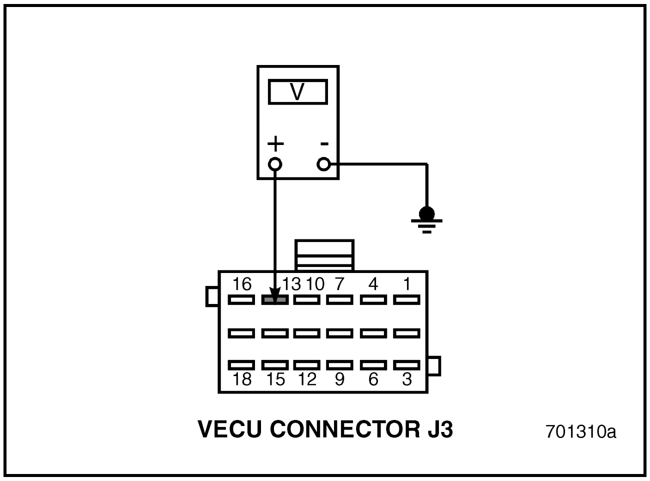


Figure 668

1. Turn the ignition key OFF. Wait at least 10 seconds to be sure the system has powered down.
2. Disconnect Power Relay #4.
3. Disconnect Vehicle Electronic Control Unit Connector (VECU) connector J3.
4. Measure the voltage between VECU connector J3 pin 13 and known good ground (see Figure 668).

   If voltage is present, locate and repair the short to voltage. Make sure the Serial Link Jumper is not connected and that Serial Communications Port terminals B and H are not shorted together.

   If voltage is less than 0.5 volts, go to test “Test 4 — Checking the Vehicle Electronic Control Unit (VECU)” on page 523.

Test 3 — Checking the Power Relay #4 Output Circuit for a Short to Voltage

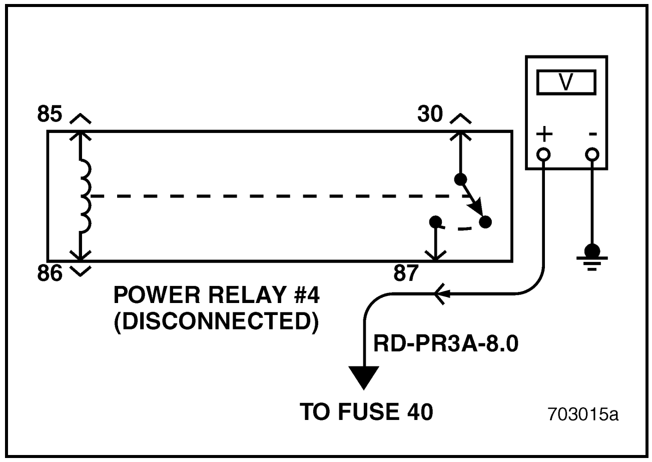


Figure 669

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper if it is installed. Wait at least ten seconds to be sure the electrical system has powered down.
3. Disconnect Power Relay #4.
4. Measure the voltage between pin 87 of the Power Relay #4 harness connector and a good ground (see Figure 666 and Figure 669).

   If voltage is present, go to test “Test 6 — Isolating the Short to Voltage in the Power Relay #4 Output Circuit” on page 523.

   If voltage is less than 0.5 volts, go to test “Test 7 — Checking Power Relay #4 for Shorted Switch Contacts” on page 523.

Test 4 — Checking the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF.
2. Connect VECU connector J3 and Power Relay #4.
3. Clear blink code 6-7 from memory.
4. Disconnect Serial Link Jumper.
5. Start the engine and then turn ignition key OFF.
6. Check if blink code 6-7 is set and if the vehicle electrical system has powered down.

   If blink code 6-7 is set and the electrical system is powered up, check the VECU module and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 6-7 is NOT active and the electrical system has powered down, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 6 — Isolating the Short to Voltage in the Power Relay #4 Output Circuit

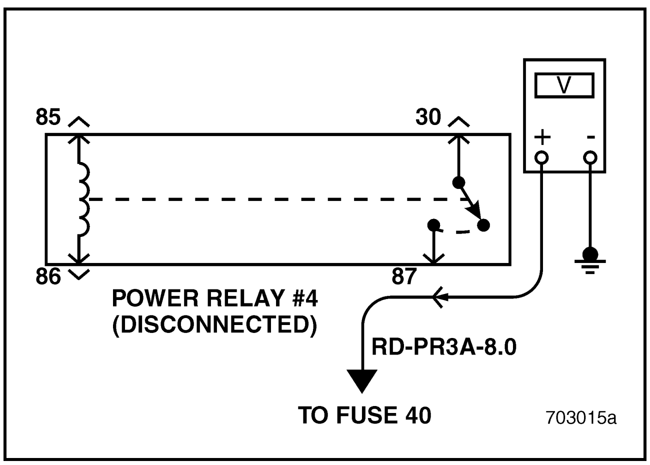


Figure 670

1. Turn the ignition key OFF.
2. Remove Fuse 40 from the Engine Power Distribution Module.
3. Disconnect the Serial Link Jumper if it is installed. Wait at least ten seconds to be sure the electrical system has powered down.
4. Disconnect Power Relay #4.
5. Measure the voltage between pin 87 of the Power Relay #4 harness connector and a known good ground (see Figure 666 and Figure 670).

   If system voltage is present, repair the short to voltage in the wire between Fuse 40 and Power Relay #4.

   If the measured voltage is less than 0.5 volts, go to test “Test 12 — Checking the EECU Ignition Input Circuit for a Short to Voltage” on page 524.

Test 7 — Checking Power Relay #4 for Shorted Switch Contacts

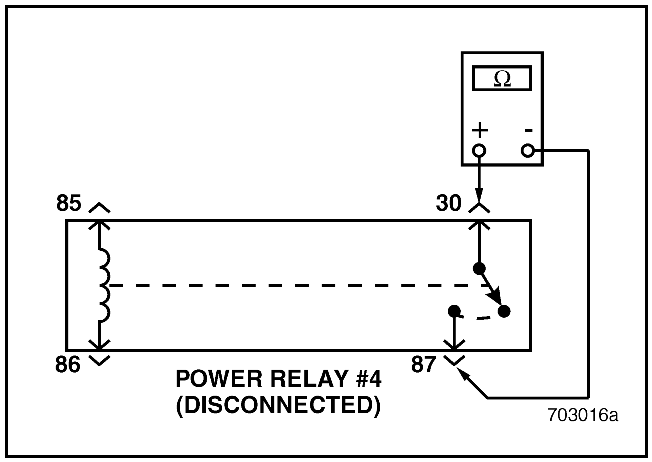


Figure 671

1. Turn the ignition key OFF.
2. Disconnect Power Relay #4.
3. Check for continuity between the Power Relay pins 30 and 87 (see Figure 666 and Figure 671).

   If there is NO continuity, check the Power Relay terminals and connector for evidence of a short circuit. Clean and repair the terminals and connector as necessary.

   If continuity exists, the relay switch contacts are stuck closed, replace Power Relay #4.

Test 12 — Checking the EECU Ignition Input Circuit for a Short to Voltage

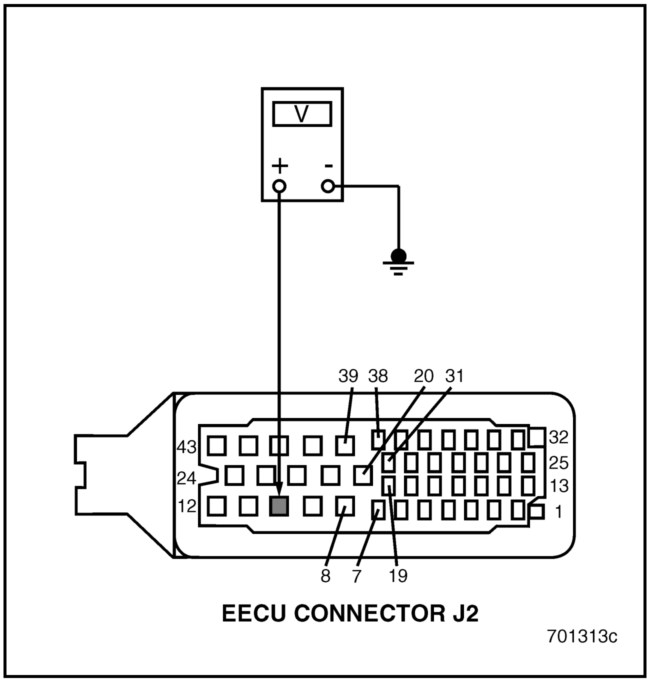


Figure 672

1. Turn the ignition key OFF.
2. Remove Fuse 40 from the Engine Power Distribution Module.
3. Disconnect the Serial Link Jumper if it is installed. Wait at least ten seconds to be sure the electrical system has powered down.
4. Disconnect EECU Connector J2.
5. Measure the voltage between the EECU connector J2 pin 10 and a good ground (see Figure 672).

   If voltage is present, locate and the repair short to voltage in the ignition input circuit.

   If voltage is less than 0.5 volts, go to test “Test 24 — Checking the Engine Electronic Control Unit (EECU)” on page 524.

Test 24 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Clear blink code 6-7 from memory.
4. Disconnect the Serial Link Jumper if it is installed.
5. Start the engine and then turn the ignition key OFF.
6. Check if blink code 6-7 is set and if the vehicle electrical system has powered down.

   If blink code 6-7 is set, check the EECU module and connectors J1 and J2 for dirt, loose or shorted pins or any other repairable damage. If NO problems are evident, replace the EECU and retest the system.

   If blink code 6-7 is NOT active and the electrical system has powered down, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 6-7 — ENGINE ELECTRONIC CONTROL UNIT (EECU) POWER RELAY (ASET™ CEGR ENGINE)

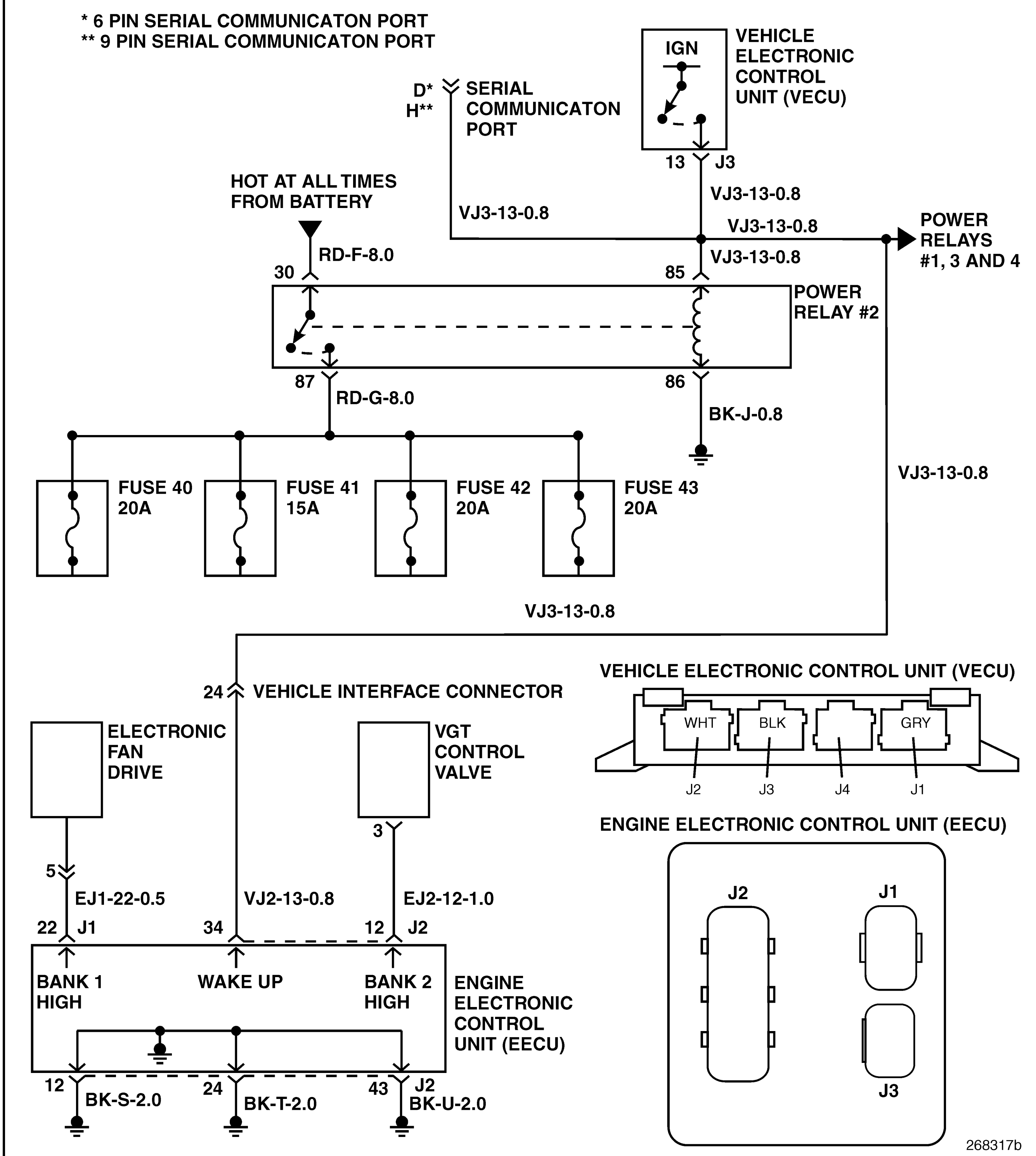


Figure 673 — EECU Power Relay Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Erratic), 4 (Voltage Low), 8 (Abnormal Frequency)

Parameter Identification (PID): S236

Message Identification (MID): 128

Circuit Description: When the ignition key is turned ON, battery voltage is supplied to the ignition input of the Vehicle Electronic Control Unit (VECU) at connector J1 pin 1. This signals the VECU to energize the vehicle's power relays through VECU connector J3 terminal 13. After the relays power up, relay #2 delivers system voltage to VECU connector J3 pin 17. When the ignition key is turned OFF, the VECU starts an internal timer that removes power from the power relays after approximately six seconds. The power relays de-energize and remove power from most of the vehicle's electrical system.

Location: Power Relay #2 is located in the dash electrical equipment panel.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set fault 6-7 if the Vehicle Electronic Control Unit (VECU) sends a shutdown engine command to the EECU over the J1939 serial data line and then, after 6 seconds, the EECU still senses voltage at connector J2 pin 34. This fault indicates that the Vehicle Electronic Control Unit (VECU) requested a complete shutdown from the Engine Electronic Control Unit (EECU) but the switched power did not shut off at the correct time. Code 6-7 will also set if the EECU senses a short circuit to ground in the power feed circuits for the VTG Control Valve or the Electronic Fan Drive.

Additional Symptoms: Other electrical systems or circuits may be powered up with the ignition key in the OFF position.

NOTE

Code 6-7 with FMI 2 is logged in the EECU but is rarely seen as active. Under normal circumstances, the EECU has no means of communicating that the fault is active.

Test 1 — Checking the Code 6-7 FMI

1. Check the blink code 6-7 FMI in the EECU fault table.

   If blink code 6-7 is logged with FMI 2, go to test "Test 2 — Checking for a Short to Voltage at Power Relay #2" on page 526.

   If blink code 6-7 is set with FMI 4 or FMI 8, go to test "Test 3 — Checking for Other Codes" on page 527.

Test 2 — Checking for a Short to Voltage at Power Relay #2

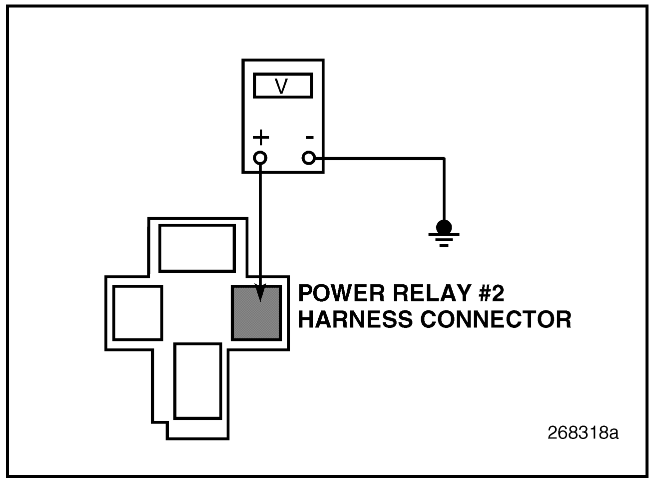


Figure 674

1. Turn the ignition key OFF.
2. Disconnect the Serial Link Jumper if it is installed. Wait at least ten seconds to be sure the electrical system has powered down.
3. Disconnect Power Relay #2.
4. Measure the voltage between pin 85 of the Power Relay #2 harness connector and a known good ground (see Figure 674).

   If voltage is present, go to test "Test 4 — Checking the VECU Switched Power Output Circuit for a Short to Voltage" on page 527.

   If voltage is less than 0.5 volts, go to test "Test 5 — Checking the Engine Electronic Control Unit (EECU)" on page 527.

Test 3 — Checking for Other Codes

1. Check if blink code 5-9 or 7-9 is also set.

   If blink code 7-9 is set and code 6-7 was set with FMI 8, follow the diagnostic routine for blink code 7-9.

   If blink code 5-9 is set and code 6-7 was set with FMI 4, follow the diagnostic routine for blink code 5-9.

   If blink code 5-9 or 7-9 is NOT set, go to test “Test 6 — Checking for a Short to Ground in the Electronic Fan Drive Power Feed Circuit” on page 528.

Test 4 — Checking the VECU Switched Power Output Circuit for a Short to Voltage

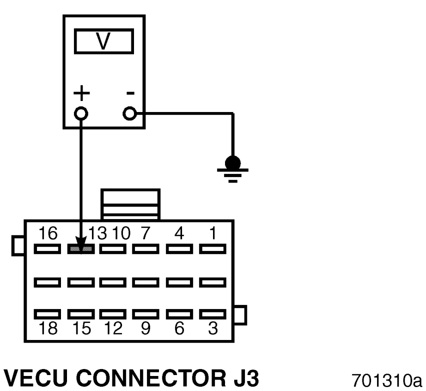


Figure 675

1. Turn the ignition key OFF. Wait at least ten seconds to be sure the system has powered down.
2. Disconnect Vehicle Electronic Control Unit Connector (VECU) connector J3.
3. Measure the voltage between VECU connector J3 pin 13 and known good ground (see Figure 675).

   If voltage is present, locate and repair the short circuit to voltage.

   If voltage is less than 0.5 volts, go to test “Test 8 — Checking the Vehicle Electronic Control Unit (VECU)” on page 528.

Test 5 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Restore all electrical connections.
3. Clear blink code 6-7 from memory.
4. Start the engine and then turn ignition key OFF.
5. Check if blink code 6-7 is set.

   If blink code 6-7 is set, check the EECU and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the EECU and retest the system.

   If blink code 6-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 6 — Checking for a Short to Ground in the Electronic Fan Drive Power Feed Circuit

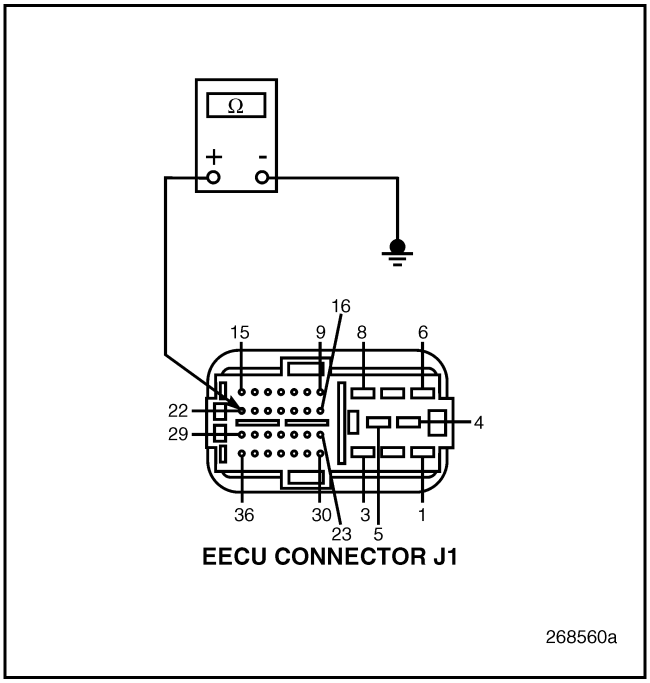


Figure 676

1. Turn the ignition key OFF.
2. Disconnect EECU harness connector J1.
3. Disconnect the Electronic Fan Drive harness connector.
4. Check for continuity between EECU harness connector J1 pin 22 and a good ground (see Figure 676).

   If continuity exists, locate and repair the short circuit to ground in the Electronic Fan Drive power feed circuit.

   If continuity does NOT exist, got to test "Test 12 — Checking for a Short to Ground in the EGR Mass Air Flow (EGR MAF) ECU Power Feed Circuit" on page 529.

Test 8 — Checking the Vehicle Electronic Control Unit (VECU)

1. Turn the ignition key OFF.
2. Connect VECU connector J3 and Power Relay #2.
3. Clear blink code 6-7 from memory.
4. Start the engine and then turn ignition key OFF.
5. Check if blink code 6-7 is set and if the vehicle electrical system has powered down.

   If blink code 6-7 is set and the electrical system is powered up, check the VECU module and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 6-7 is NOT active and the electrical system has powered down, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 12 — Checking for a Short to Ground in the EGR Mass Air Flow (EGR MAF) ECU Power Feed Circuit

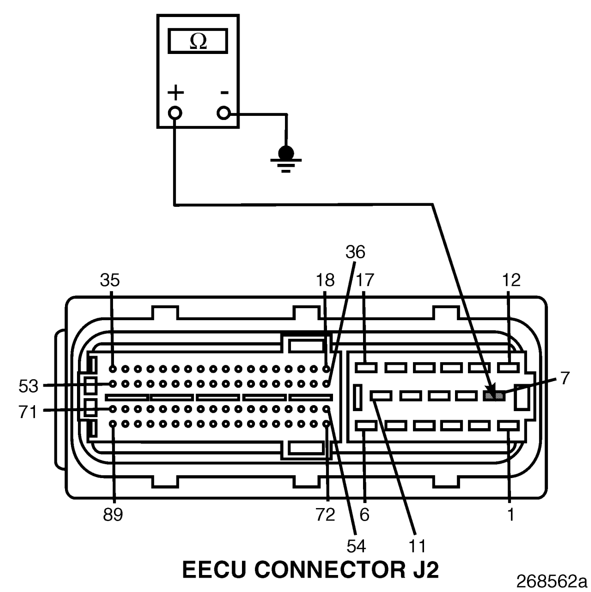


Figure 677

1. Turn the ignition key OFF.
2. Disconnect EECU harness connector J2.
3. Disconnect connector A from the EGR ECU.
4. Check for continuity between EECU harness connector J2 pin 7 and a good ground (see Figure 677).

   If continuity exists, locate and repair the short circuit to ground in the EGR MAF ECU power feed circuit.

   If continuity does NOT exist, go to test “Test 24 — Checking Engine Electrical Control Unit (EECU)” on page 529.

Test 24 — Checking Engine Electrical Control Unit (EECU)

1. Turn the ignition key OFF.
2. Restore all electrical connections.
3. Clear blink code 6-7 from memory.
4. Start the engine and then turn ignition key OFF.
5. Check if blink code 6-7 is set.

   If blink code 6-7 is set, check the EECU and connectors J1, J2 and J3 for dirt, loose or shorted pins or any other repairable damage. If no problems are evident, or are not repairable, replace the EECU and retest the system.

   If blink code 6-7 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 6-8 — ALLISON HD TRANSMISSION J1939 SERIAL DATA LINE

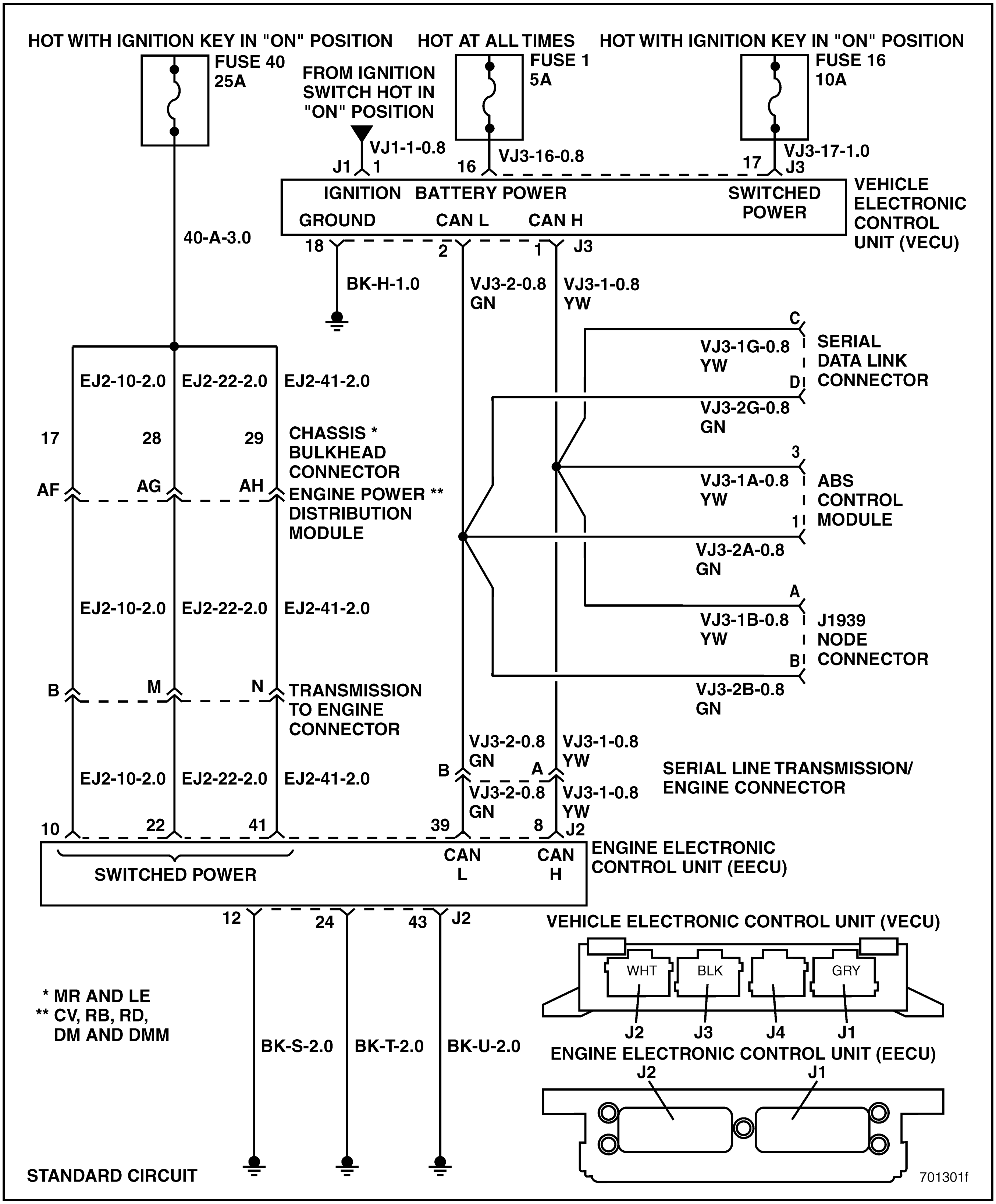


Figure 678 — J1939 Serial Data Line Standard Circuit (ASET™ IEGR ENGINE)

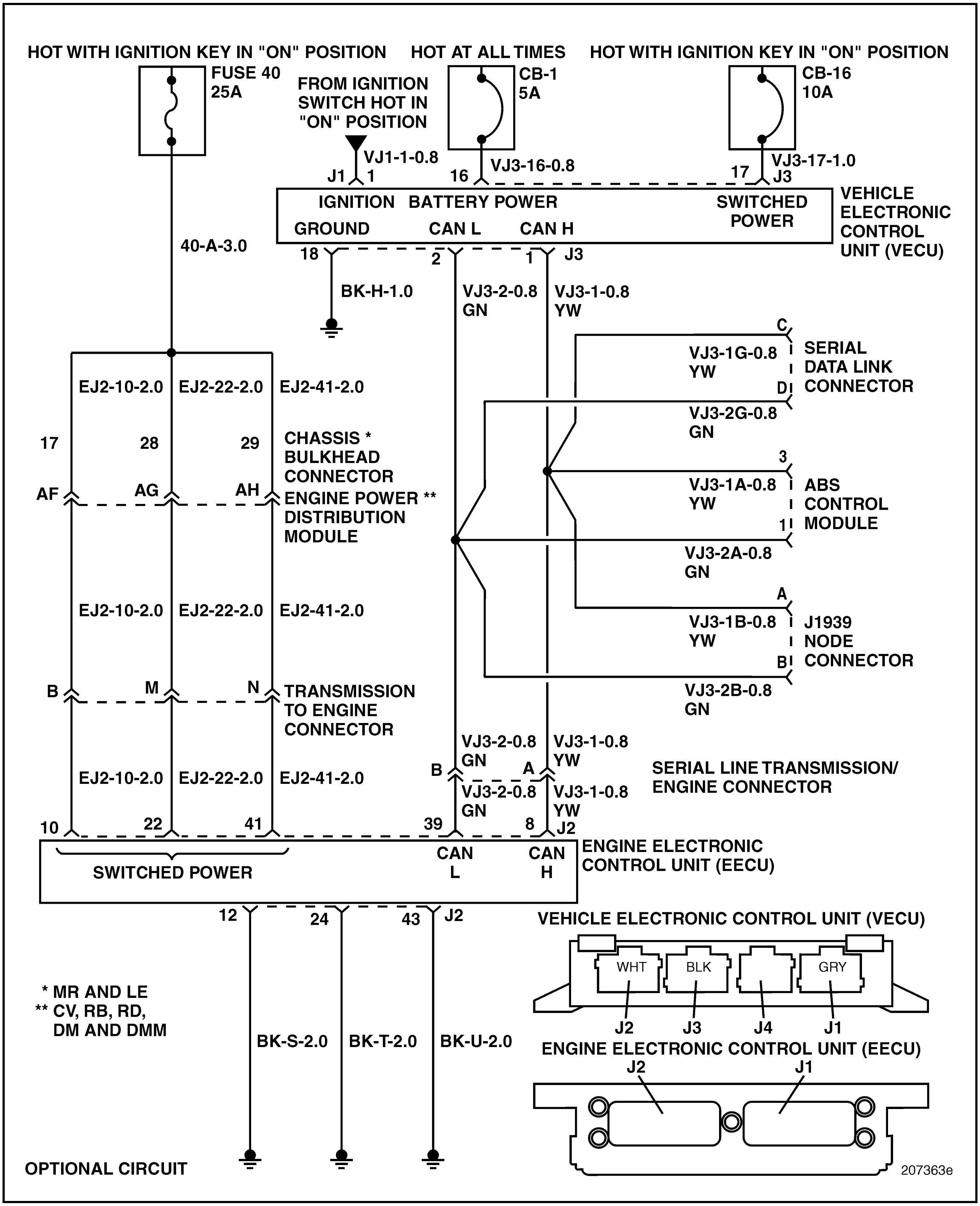


Figure 679 — J1939 Serial Data Line Optional Circuit (ASET™ IEGR ENGINE)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier FMI: 14 (Lost Contact)

Parameter Identification: S231

Message Identification MID: 142

Circuit Description: The V-MAC III system uses the J1939 data line to control communication between the Vehicle Electronic Control Unit (VECU), Engine Electronic Control Unit (EECU), Anti-lock Brake System Control Unit, Allison Transmission Control Unit, and accessory systems, depending on vehicle model and option content. The J1939 data line is an expandable data bus, allowing the addition of accessory control modules (Collision Avoidance, Traction Control, etc.) to be connected to the circuit. The J1939 data line is comprised of two circuits; the L circuit and the H circuit. The two wires are twisted together to prevent outside electrical noise from interfering with the data being carried by the L and H circuits. The V-MAC III system is designed to allow continued engine operation with the loss of the J1939 data line signal as long as the J1587 data line is still operational.

Code Setting Conditions: Code 6-8 will set and the Electronic Malfunction Lamp (EML) will turn on if the Vehicle Electronic Control Unit (VECU) loses communication with the Allison HD transmission on the J1939 data line. Code 6-8 can only be logged if the "Use J1939 Tailshaft Speed Sensor" option is enabled in the VECU data file.

NOTE

Code 6-8 will always be accompanied by Code 4-1 (Loss of Road Speed Signal) with FMI 2. Always repair Code 6-8 before attempting to repair the Code 4-1 fault.

Test 1 — Checking for Code 6-8

1. Verify that code 6-8 is set.

   If code 6-8 is set, go to test "Test 2 — Checking for Code 6-4" on page 532.

   If code 6-8 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for Code 6-4

1. Check for other fault codes.

   If fault code 6-4 is set, locate and repair the open circuit in the J1939 serial data line between the Vehicle Electronic Control Unit (VECU) and the J1939 transmission connector.

   If fault code 6-4 is NOT set, locate and repair the open circuit in the J1939 serial data line in the transmission harness.

BLINK CODE 6-9 — OTHER ECU AFFECTING OPERATION

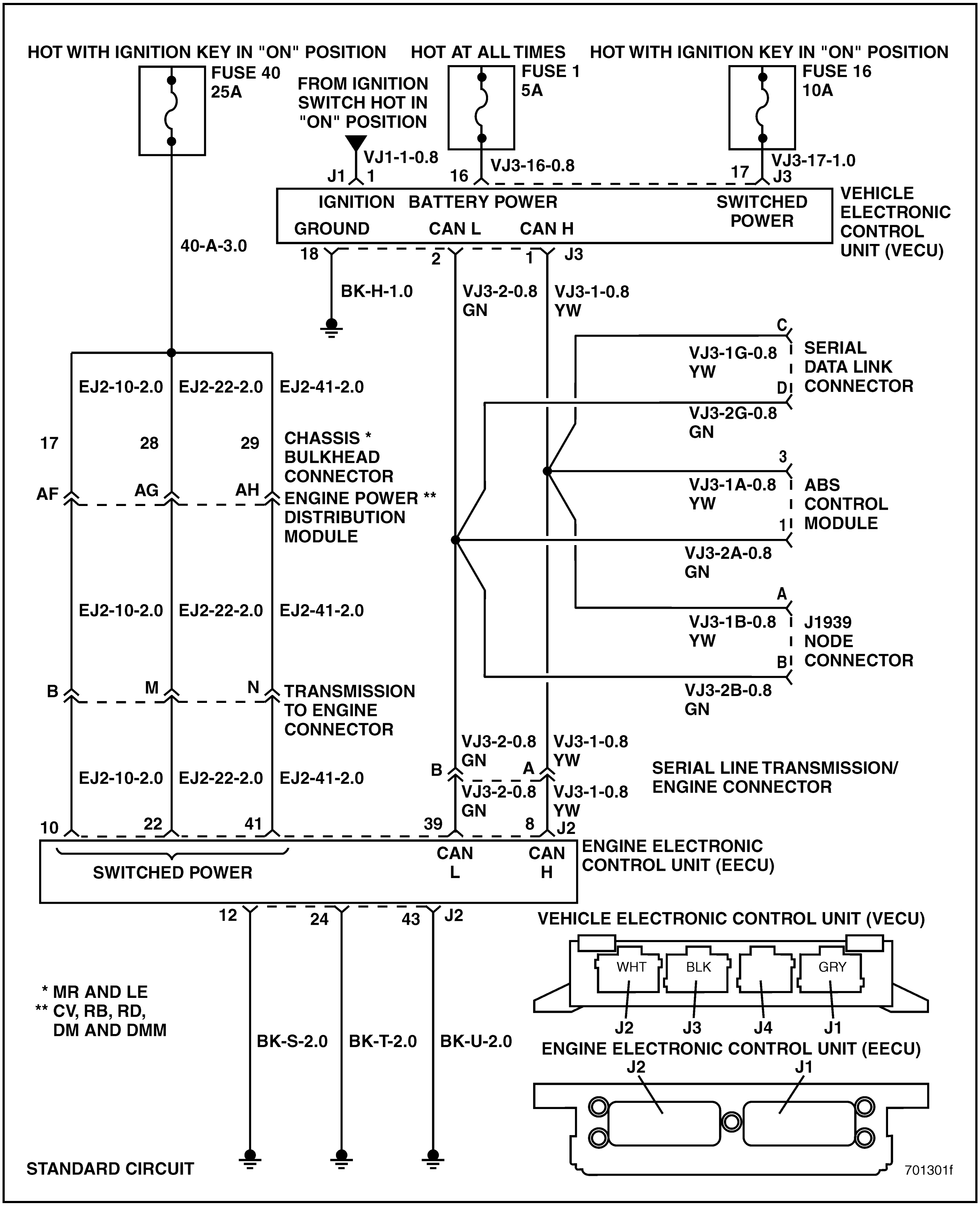


Figure 680 — J1939 Serial Data Line Standard Circuit (ASET™ IEGR ENGINE)

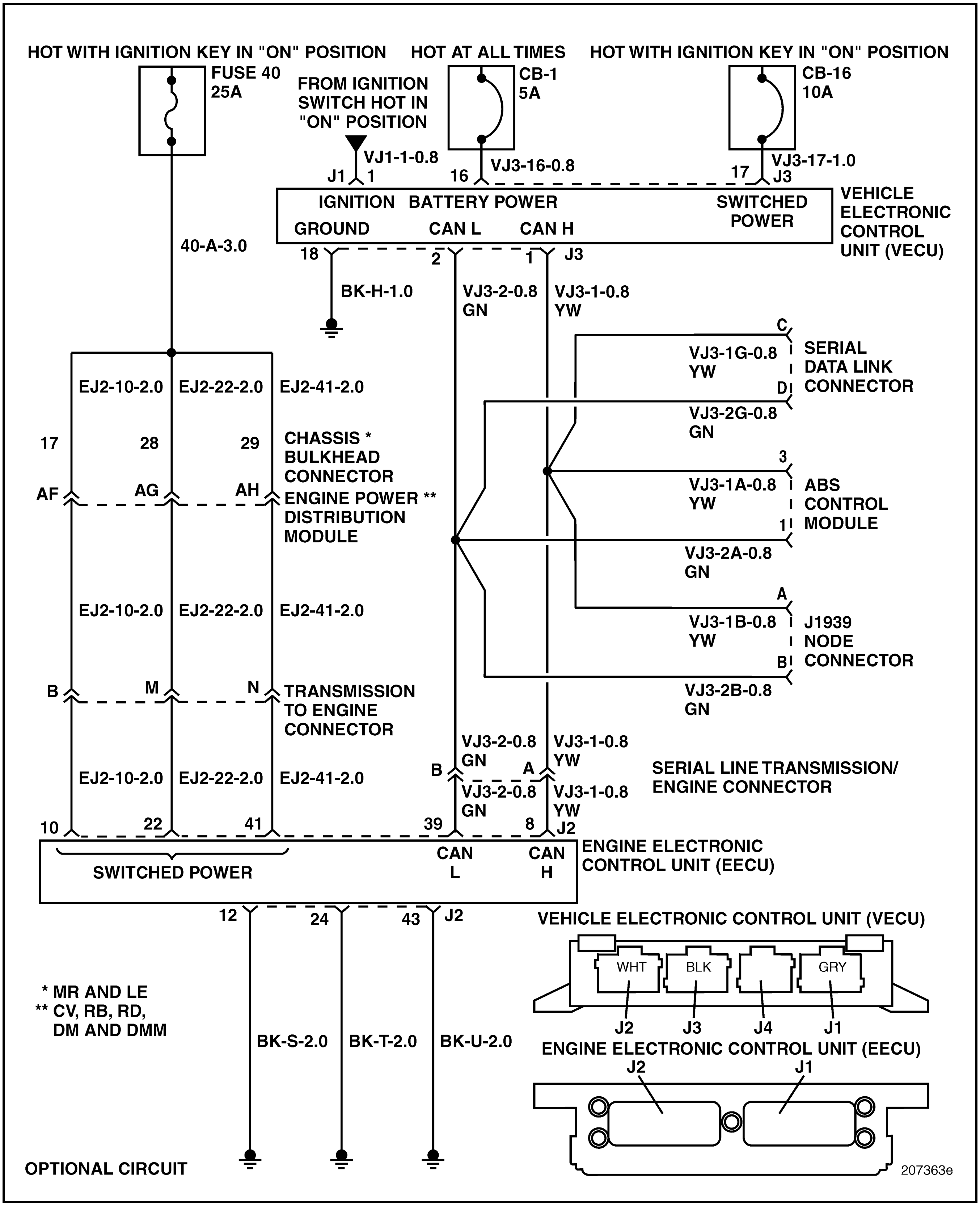


Figure 681 — J1939 Serial Data Line Optional Circuit (ASET™ IEGR ENGINE)

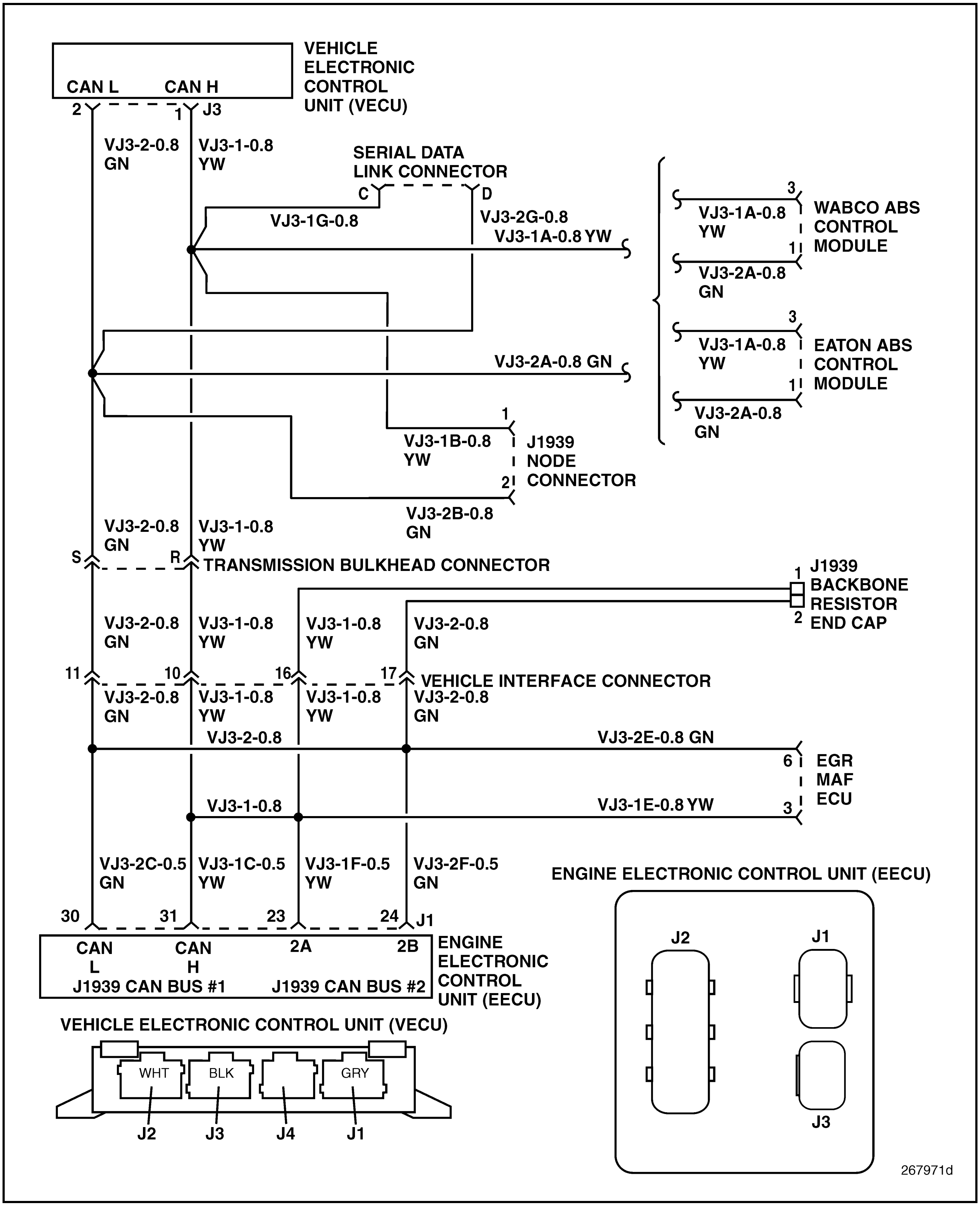


Figure 682 — J1939 Serial Data Line Optional Circuit (ASET™ CEGR ENGINE)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier FMI: 12 (Other ECU Affecting Operation)

Parameter Identification: S216

Message Identification MID: 142

Circuit Description: The V-MAC III system uses the J1939 data line to control communication between the Vehicle Electronic Control Unit (VECU), Engine Electronic Control Unit (EECU), Anti-lock Brake System Control Unit, Allison Transmission Control Unit, and accessory systems, depending on vehicle model and option content. The J1939 data line is an expandable data bus, allowing the addition of accessory control modules (Collision Avoidance, Traction Control, etc.) to be connected to the circuit. The J1939 data line is comprised of three circuits; the L circuit and the H circuit. The two wires are twisted together to prevent outside electrical noise from interfering with the data being carried by the L and H circuits. The V-MAC III system is designed to allow continued engine operation with the loss of the J1939 data line signal as long as the J1587 data line is still operational.

The Eaton Vorad SmartCruise® system reduces the cruise control road speed setting when sensor signals indicate approaching traffic. The original road speed setting is restored when sensor signals indicate that traffic has cleared. Communication between the Vehicle Electronic Control Unit (VECU) and the Eaton Vorad SmartCruise® controller is accomplished over the J1939 serial data line.

Code Setting Conditions: Code 6-9 will set and the Electronic Malfunction Lamp (EML) will turn on if the Vehicle Electronic Control Unit (VECU) senses a fault in, or loses communication with the Eaton Vorad SmartCruise® controller.

Additional Symptoms: The cruise control system will not operate while code 6-9 is active.

NOTE

Cruise control can be restored using a diagnostic service tool, however SmartCruise® will be disabled until the fault is repaired and code 6-9 is cleared from the VECU fault table.

Test 1 — Checking for Code 6-9

1. Verify that code 6-9 is set.

   If code 6-9 is set, go to test "Test 2 — Checking the SmartCruise® System" on page 536.

   If code 6-9 is not set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking the SmartCruise® System

1. Perform SmartCruise® diagnostics and repairs in accordance with Eaton service literature.

   If Eaton diagnostics indicate a fault in the SmartCruise® system, repair the fault, clear code 6-9 from the VECU, and retest the system.

   If Eaton diagnostics do NOT indicate a fault, locate and repair the open circuit in the J1939 serial data line between the VECU and the Eaton Vorad SmartCruise® controller. Be sure to check all connectors for proper mating and snug fit.

⚠ DANGER

If the vehicle must be returned to the customer before repairs are completed, it is essential that the customer is aware that the SmartCruise® system is disabled.

BLINK CODE 7-1 — SERVICE BRAKE

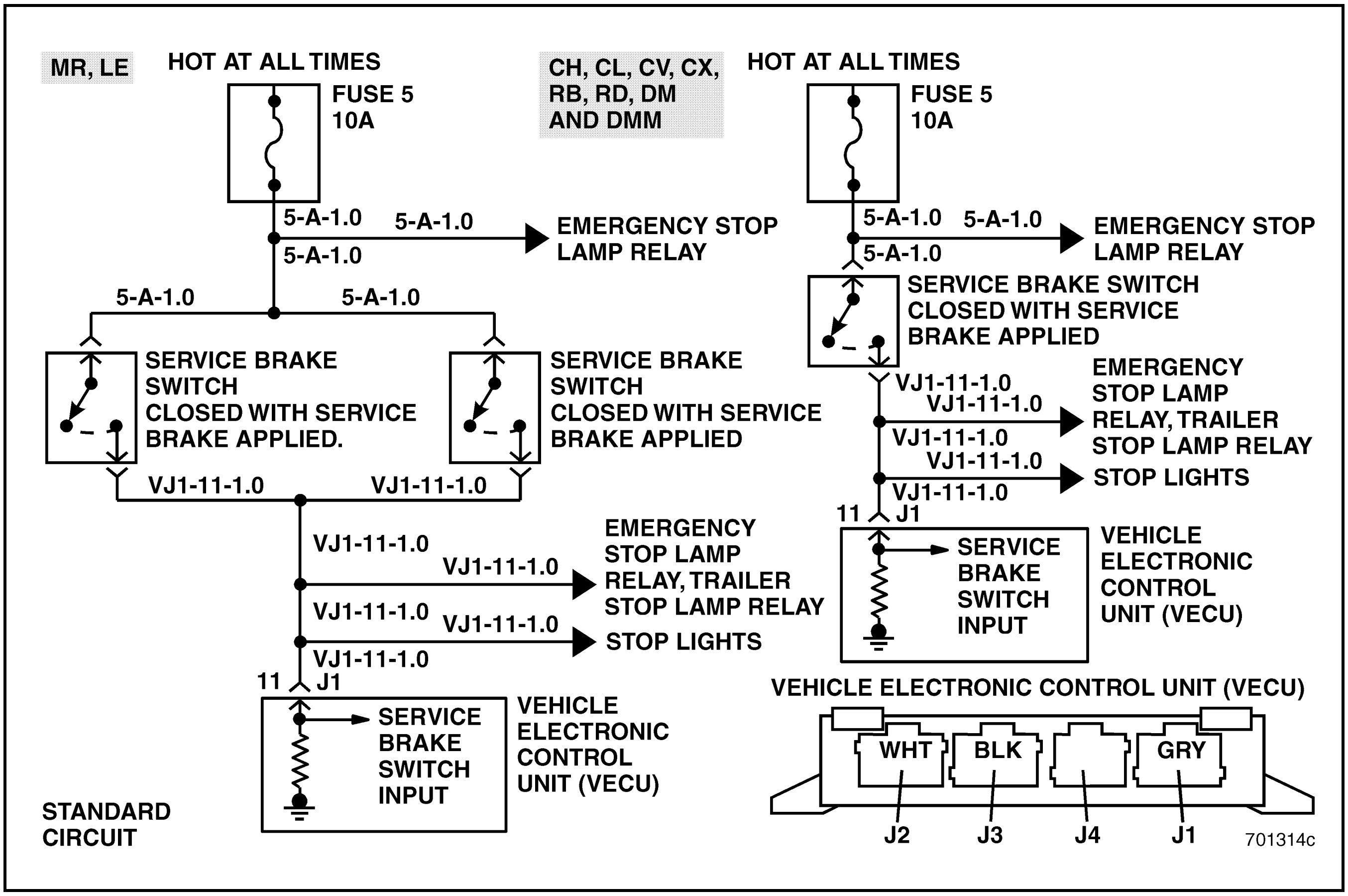


Figure 683 — Service Brake Standard Circuit

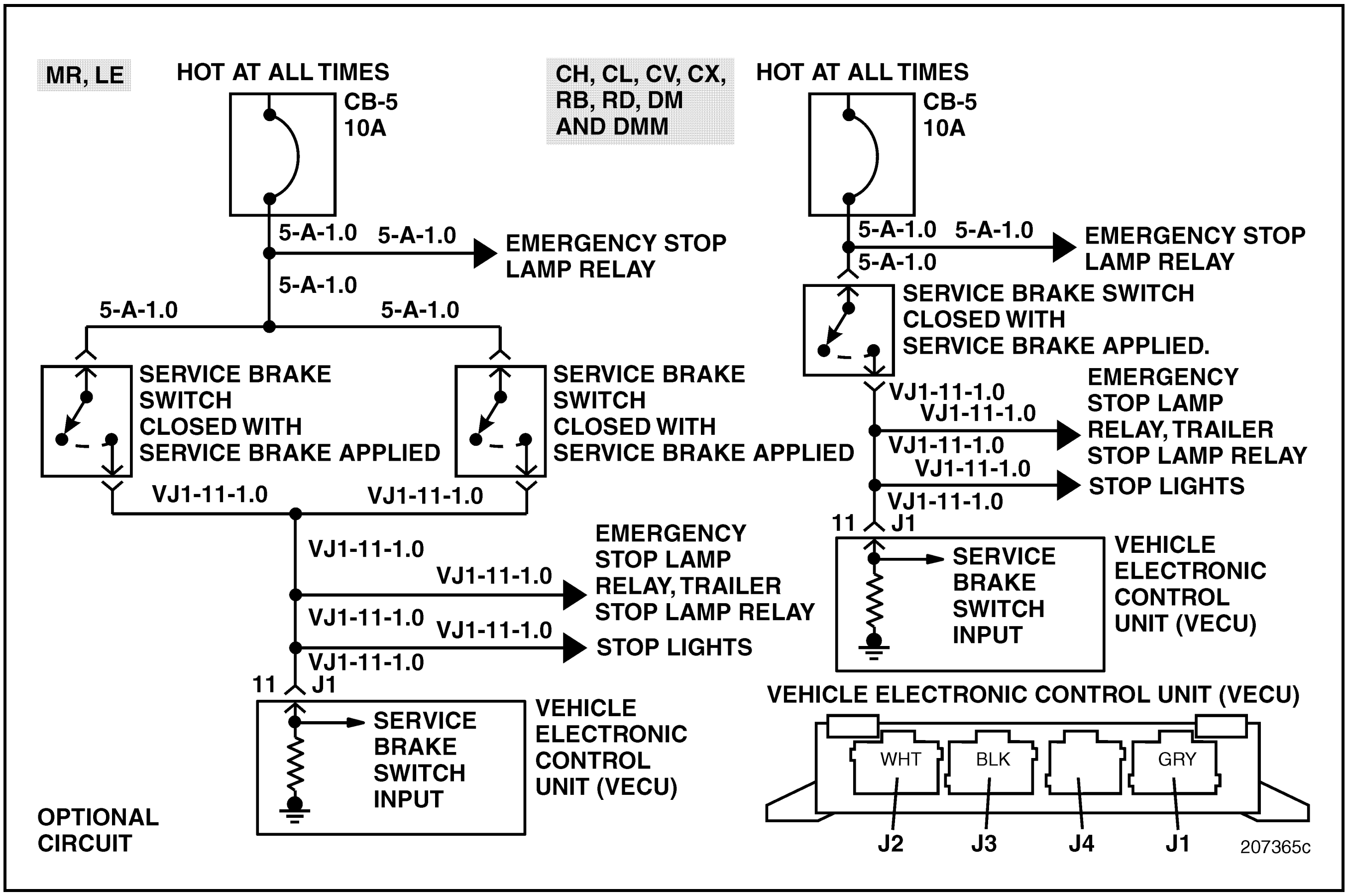


Figure 684 — Service Brake Optional Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 4 (Voltage Low/Open)

Parameter Identification (PID): S246

Message Identification (MID): 142

Circuit Description: Voltage from fuse (circuit breaker) 5 is applied to the Service Brake Switch at all times. When the service brake is applied, voltage is applied to the tractor stop lights, the trailer stop lamp relay and to Vehicle Electronic Control Unit (VECU) connector J1 pin 11. If the vehicle is in cruise control mode and the VECU senses voltage at connector J1 pin 11 (service brake applied), the VECU will disengage the cruise control system.

Location: The Service Brake Switch is located under the left side of the dash, on the air brake valve.

Code Setting Conditions: Fault 7-1 becomes active when the Vehicle Electronic Control Unit (VECU) detects a sudden decrease in vehicle speed while in cruise control mode without a service brake signal input.

Additional Symptoms: Loss of cruise control drop out and possibly stop lamps.

NOTE

If this fault becomes active while on a chassis dynamometer, make the fault go inactive by applying the service brake for one second. Using a service tool, activate the Chassis Dynamometer Mode and rerun the dynamometer test. Once the test is completed, turn the ignition key off for three seconds to restore the standard operating mode.

Test 1 — Check for Code 7-1

1. Verify that code 7-1 is set.

   If code 7-1 is set, go to test “Test 2 — Checking Switch Operation” on page 539.

   If code 7-1 is NOT set, road test the vehicle to attempt to set the code. Visually inspect the Service Brake Switch harness connector(s) and wires for frayed or loose connections.

Test 2 — Checking Switch Operation

1. Use a diagnostic computer to check the status of the service brake switch as you engage and disengage the service brake with the ignition key ON. Engage the service brake for at least 1 second.

   If the service brake signal displayed on the service tool toggles properly and the fault is still active, replace the Vehicle Electronic Control Unit (VECU).

   If the service brake signal displayed on the service tool toggles properly and the fault is inactive, go to test “Test 4 — Checking the Vehicle Speed (MPH) Sensor (VSS) Adjustment” on page 539.

   If the service brake signal displayed on the service tool does not toggle properly, always remaining OFF, go to test “Test 5 — Checking for an Open Circuit” on page 539.

Test 4 — Checking the Vehicle Speed (MPH) Sensor (VSS) Adjustment

NOTE

The Vehicle Speed Sensor (VSS) on Allison HD transmissions is not adjustable. Skip step 1 and proceed to step 2.

1. For Mack T200/300 transmissions, check the Vehicle Speed (MPH) Sensor (VSS) adjustment. Turn the sensor in by hand until it bottoms and then back it out exactly one turn. Torque the jam nut to 15 lb-ft (20 N•m).
2. Drive the vehicle while monitoring road speed with a service tool. If the road speed on the Service Tool is erratic, replace the VSS and retest the system. If the road speed is NOT erratic, go to test “Test 8 — Checking Brake Switch Connections” on page 539.

Test 5 — Checking for an Open Circuit

1. Turn the ignition key ON.
2. Engage the service brake and observe the stop lights.

   If the stop lights operate properly, go to test “Test 10 — Checking for an Open Circuit” on page 540.

   If the stop lights do NOT operate, go to test “Test 11 — Checking for Voltage to the Switch” on page 540.

Test 8 — Checking Brake Switch Connections

1. Check for good electrical connections at the brake switch. Also purge the air tanks to remove any moisture which may have contaminated the switch, causing it to malfunction.

Test 10 — Checking for an Open Circuit

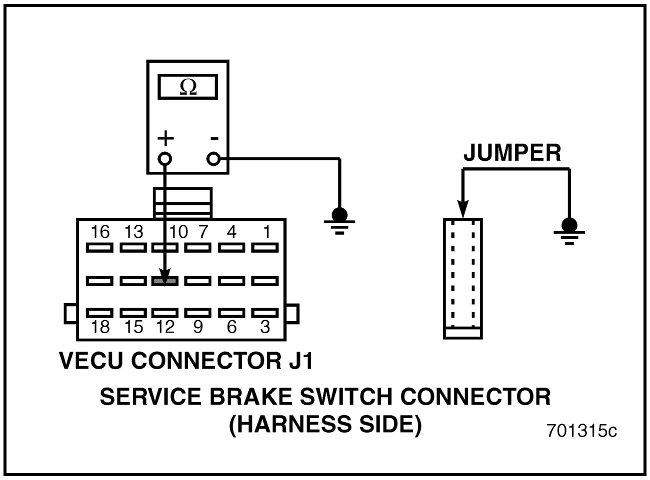


Figure 685

1. Turn the ignition key OFF.
2. Disconnect VECU connector J1.
3. Disconnect the Service Brake Switch connector (14RD-WE).
4. Connect a jumper wire between the Service Brake Switch connector (14RD-WE) and ground.
5. Check for continuity between VECU connector J1 pin 11 and a good ground (see Figure 685).

   If continuity exists, go to test “Test 20 — Checking VECU Connector J1” on page 541.

   If there is NO continuity, an open circuit exists between the common splice for the stop lights and VECU connector J1 pin 11.

Test 11 — Checking for Voltage to the Switch

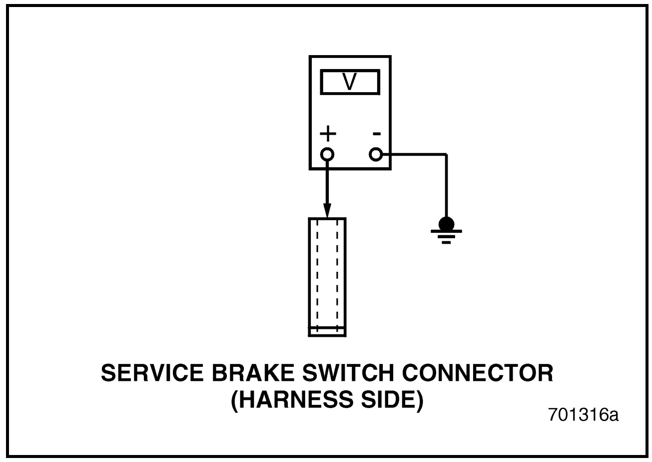


Figure 686

1. Turn the ignition key OFF.
2. Disconnect the service brake switch harness connector(s).
3. Turn the ignition key ON.
4. Measure the voltage between the service brake switch voltage supply connector (5-A-1.0 or 14WE-BN) and a good ground (see Figure 683 and Figure 686).

   If battery voltage is present, go to test “Test 22 — Checking for Proper Switch Operation” on page 541.

   If battery voltage is NOT present, there is a loss of power to the switch. Locate and repair the open or short to ground.

Test 20 — Checking VECU Connector J1

1. Turn the ignition key OFF.
2. Disconnect VECU connector J1.
3. Visually inspect VECU connector J1 pin 11 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J1 pin 11. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or if the terminal feels loose, repair the VECU harness connector J1.

   If the test lead is making good contact with VECU connector J1 terminal 11, go to test "Test 40 — Checking for a Faulty VECU" on page 541.

Test 22 — Checking for Proper Switch Operation

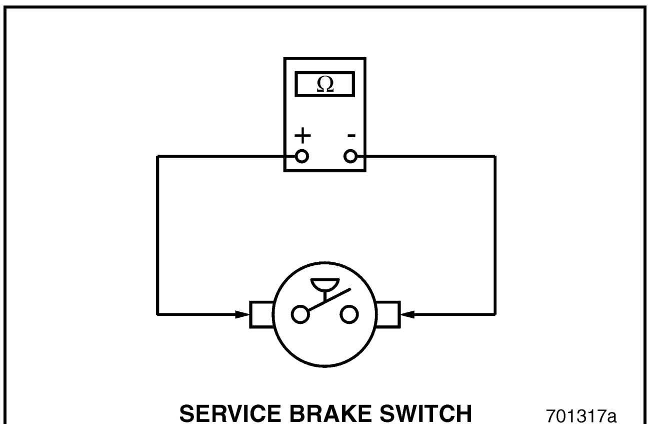


Figure 687

1. Turn the ignition key OFF.
2. Disconnect the Service Brake Switch connector.
3. Engage the Service Brake Switch.
4. Check for continuity across the two terminals of the service brake switch (see Figure 687).

   If continuity exists, go to test "Test 44 — Checking for a Short to Ground" on page 542.

   If there is NO continuity, replace the switch and retest the system.

Test 40 — Checking for a Faulty VECU

1. Turn the ignition key OFF.
2. Connect the Service Brake Switch connector(s).
3. Connect connectors J1, J2 and J3 to the VECU.
4. Turn the ignition key ON.
5. Apply the service brake while observing the switch status on the service tool.

   If the switch does NOT toggle or the fault is still active, replace the VECU and retest the system.

   If the switch toggles properly and the fault is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 44 — Checking for a Short to Ground

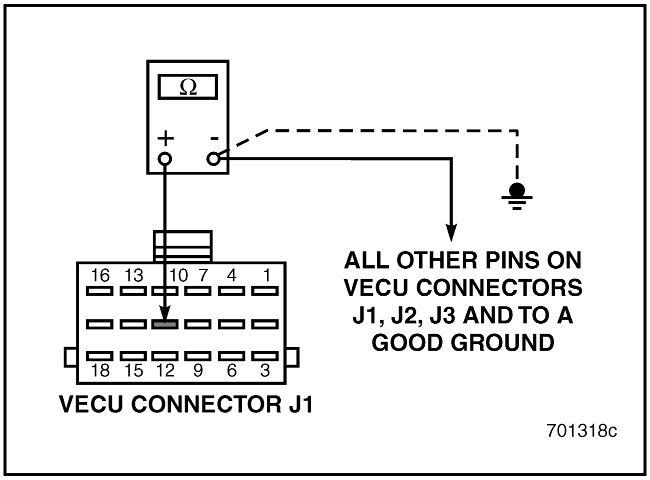


Figure 688

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Disconnect the connectors from both Stop/Turn lights.
4. Disconnect the Trailer Stop Lamp relay.
5. Check for continuity between VECU connector J1 pin 11 and all other pins on VECU connectors J1, J2 and J3 (see Figure 688). Also check for continuity between VECU connector J1 pin 11 and a good ground.

   If continuity exists with another pin or to ground, locate and repair the short in the harness.

   If there is NO continuity, go to test “Test 88 — Checking for a Short to Ground in the Switch” on page 542.

Test 88 — Checking for a Short to Ground in the Switch

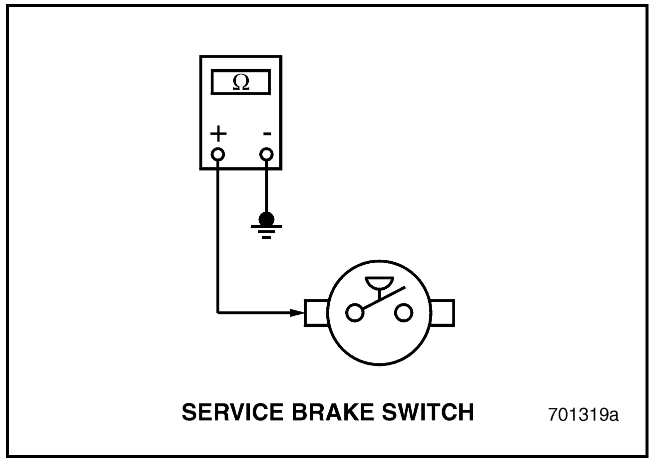


Figure 689

1. Turn the ignition key OFF.
2. Disconnect the Service Brake Switch connector(s).
3. Check for continuity between either terminal of the service brake switch and a good ground (see Figure 689). Engage and disengage the service brake.

   If at any time there is continuity between the switch and ground, replace the Service Brake Switch and retest the system.

   If there is NO continuity with ground, there is an open in the wire between the VECU and the Service Brake Switch. Locate and repair the open circuit.

BLINK CODE 7-2 — PARK BRAKE (MR)

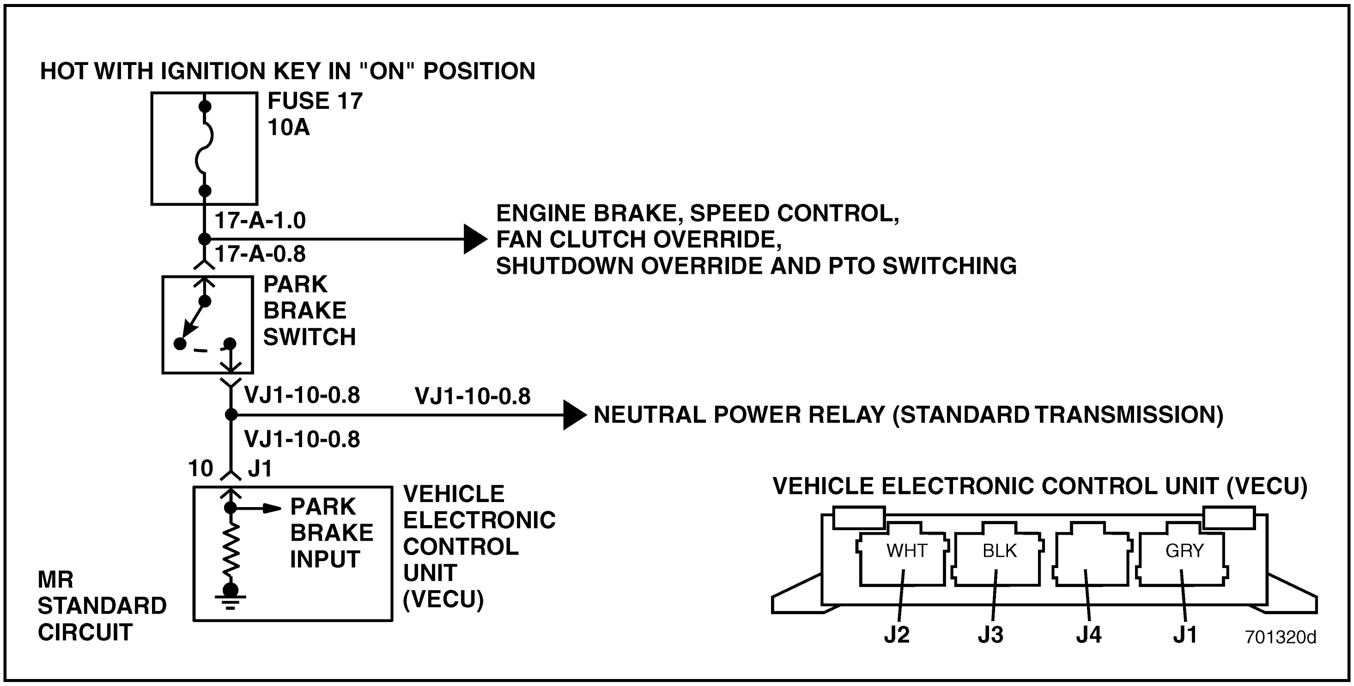


Figure 690 — Park Brake Switch Standard Circuit (MR)

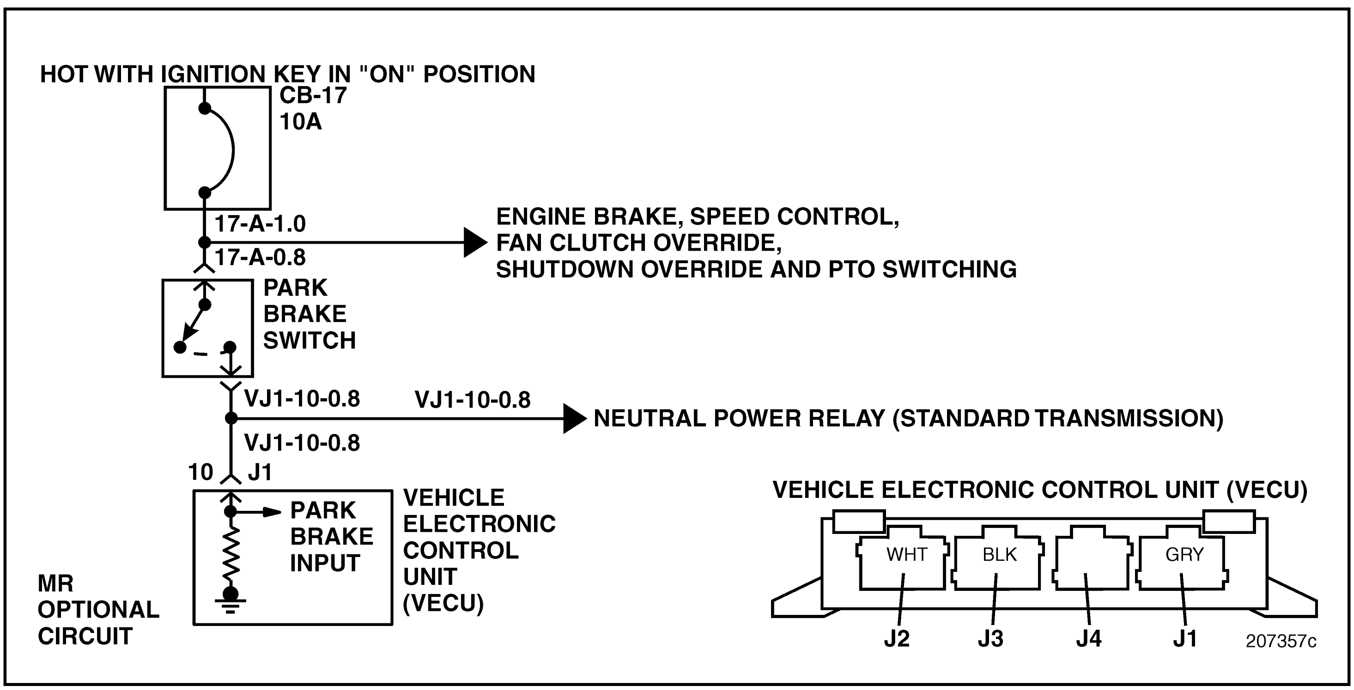


Figure 691 — Park Brake Switch Optional Circuit (MR)

NOTE

To diagnose blink code 7-2 on CH, CL, CV, CX, DM, LE, RB and RD chassis models, see “BLINK CODE 7-2 — PARK BRAKE (CH, CL, CV, CX, DM, LE, RD)” on page 547.

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High)

Parameter Identification (PID): S235

Message Identification (MID): 142

Circuit Description: On MR chassis models, voltage from circuit breaker 17 is applied to the Park Brake Switch when the ignition switch is in the ON position. When the park brake is applied, voltage is applied to the Park Brake Indicator and to Vehicle Electronic Control Unit (VECU) connector J1 pin 10. If the vehicle is in motion and the VECU senses voltage at connector J1 pin 10, the VECU will set code 7-2.

Location: The Park Brake Switch is located under the left side of the dash, on the air brake valve.

Code Setting Conditions: This fault becomes active when the Vehicle Electronic Control Unit (VECU) detects that the park brake is set (voltage at VECU connector J1 pin 10) and the vehicle is in motion. Code 7-2 may set because of a park brake switch malfunction or a short circuit to voltage in the cab harness. Code 7-2 is only active while the vehicle is in motion.

Additional Symptoms: Brake indicator remains ON with park brake disengaged.

Test 1 — Check for Code 7-2

1. Verify that code 7-2 is set.

   If code 7-2 is set, go to test “Test 2 — Checking Switch Operation” on page 544.

   If code 7-2 is NOT set, attempt to move the vehicle with the parking brake set to try to set the code. Visually inspect the park brake switch harness connector(s) and wires for frayed or loose connections.

Test 2 — Checking Switch Operation

1. Turn the ignition key ON.
2. Use a diagnostic computer to check the status of the Park Brake Switch while engaging and disengaging the park brake.

   If the Park brake signal displayed on the service tool toggles properly and the fault is still active, replace the Vehicle Electronic Control Unit (VECU).

   If the Park brake signal displayed on the service tool toggles properly, and the fault has become inactive, check for good electrical connections at the park brake switch. Also purge the air tanks to remove any moisture which may have contaminated the switch, causing it to malfunction.

   If the Park brake signal displayed on the service tool always remains ON, go to test “Test 4 — Checking for Proper Switch Operation” on page 545.

Test 4 — Checking for Proper Switch Operation

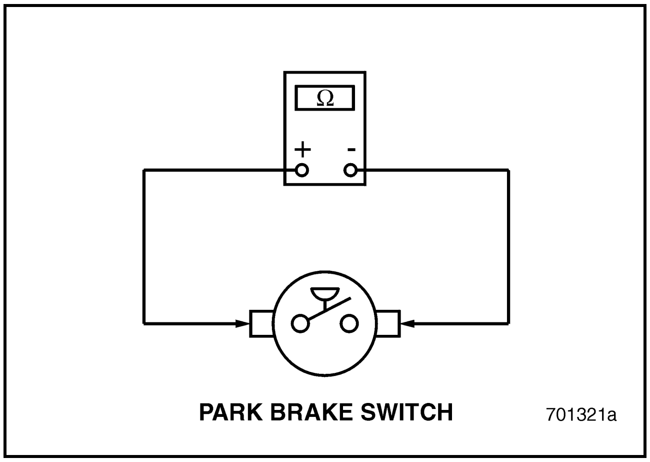


Figure 692

1. Turn the ignition key OFF.
2. Disconnect the Park Brake Switch connectors.
3. Release the park brake.
4. Check for continuity across the two terminals of the Park Brake Switch (see Figure 692).

   If continuity exists, replace the Park Brake Switch and retest the system.

   If there is NO continuity, go to test “Test 8 — Checking for a Short to Voltage” on page 545.

Test 8 — Checking for a Short to Voltage

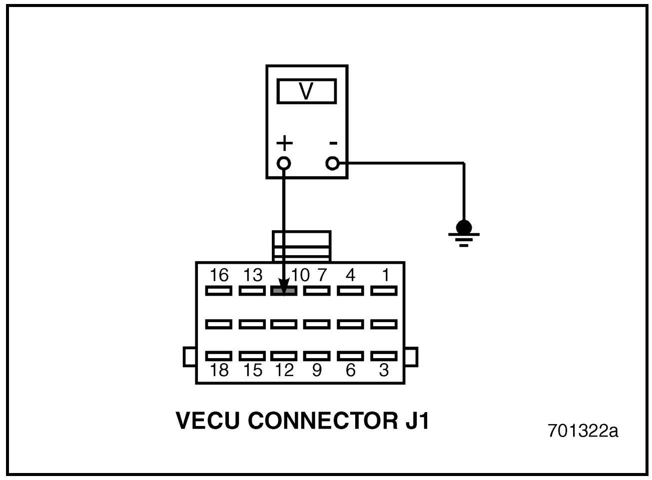


Figure 693

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J1.
3. Turn the ignition key ON.
4. Measure the voltage between VECU connector J1 pin 10 and a good ground (see Figure 693).

   If the measured voltage is greater than 0.5 volts, there is a short to voltage in the harness or connectors. Go to test “Test 16 — Isolating the Short to Voltage” on page 546.

   If the measured voltage is less than 0.5 volts, go to test “Test 17 — Checking the VECU” on page 546.

Test 16 — Isolating the Short to Voltage

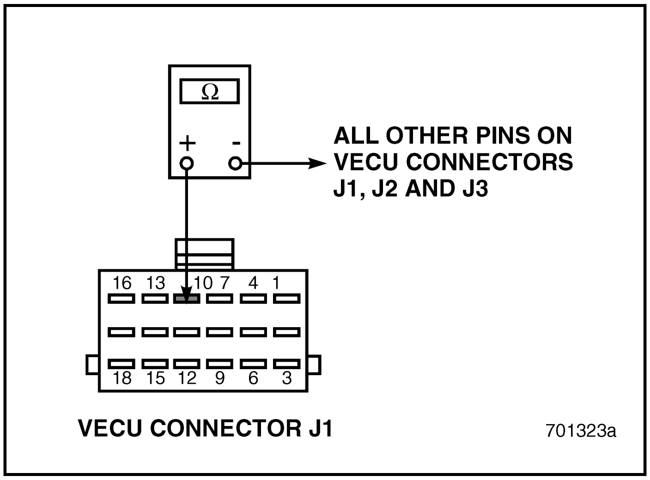


Figure 694

1. Turn the ignition key OFF.
2. Disconnect the Park Brake Switch and remove the park brake indicator bulb.
3. Disconnect VECU connectors J1, J2 and J3.
4. Check for continuity between VECU connector J1 pin 10 and all other pins on VECU connectors J1, J2 and J3 (see Figure 694).

   If continuity exists, VECU connector J1 pin 10 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, there is a short to voltage somewhere else in the cab harness between the Park Brake Switch and the VECU. Locate and repair the short to voltage.

Test 17 — Checking the VECU

1. Turn the ignition key OFF.
2. Reconnect the connectors to the Park Brake Switch.
3. Reconnect VECU connectors J1, J2 and J3.
4. Turn the ignition key ON and move the vehicle a short distance.

   If blink code 7-2 is still active, check VECU connector J1 for dirt, shorted or corroded pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

BLINK CODE 7-2 — PARK BRAKE (CH, CL, CV, CX, DM, LE, RD)

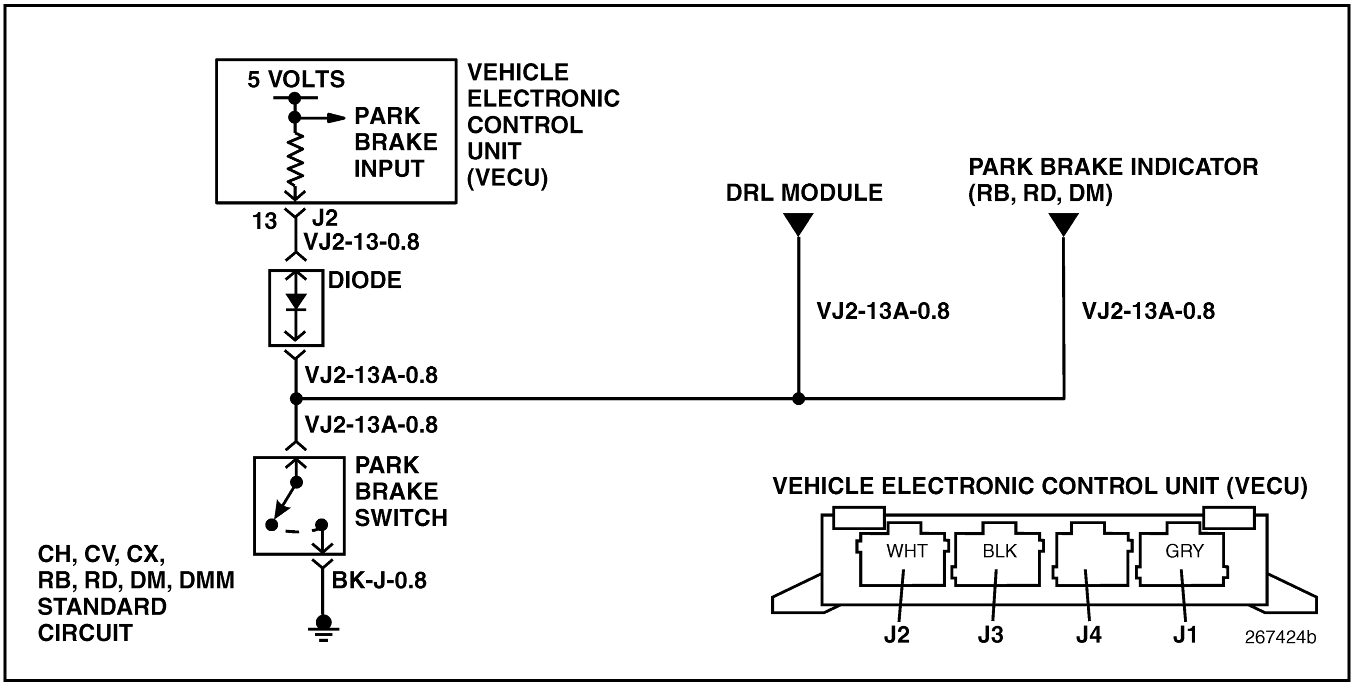


Figure 695 — Park Brake Switch Circuit (CH, CL, CV, CX, DM, LE, RB, RD)

NOTE

To diagnose blink code 7-2 on MR chassis models, see "BLINK CODE 7-2 — PARK BRAKE (MR)" on page 543.

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High)

Parameter Identification (PID): S235

Message Identification (MID): 142

Circuit Description: When the park brake is applied, the park brake switch closes providing a 0 volt (ground) signal to the Daytime Running Lights (DRL) module and the Vehicle Electronic Control Unit (VECU). The DRL module and the VECU are electrically isolated from each other by diodes in the circuit. On RD and DM chassis models, the park brake switch also provides the ground circuit for the park brake indicator.

Location: The Park Brake Switch is located under the left side of the dash, on the air brake valve.

Code Setting Conditions: Blink code 7-2 becomes active when the Vehicle Electronic Control Unit (VECU) detects that the park brake is set (0 volts at VECU connector J2 pin 13) and the vehicle is in motion. Code 7-2 may set because of a park brake switch malfunction or a short circuit to ground in the cab harness. Code 7-2 is only active while the vehicle is in motion.

Additional Symptoms: Brake indicator remains ON with park brake disengaged.

Test 1 — Check for Code 7-2

1. Verify that code 7-2 is set.

   If code 7-2 is set, go to test “Test 2 — Checking Switch Operation” on page 548.

   If code 7-2 is NOT set, attempt to move the vehicle with the parking brake applied to try to set the code. Visually inspect the park brake switch harness connector(s) and wires for frayed or loose connections.

Test 2 — Checking Switch Operation

1. Turn the ignition key ON.
2. Use a diagnostic computer to check the status of the Park Brake Switch while engaging and disengaging the park brake.

   If the Park brake signal displayed on the service tool toggles properly and the fault is still active, replace the Vehicle Electronic Control Unit (VECU).

   If the Park brake signal displayed on the service tool toggles properly, and the fault has become inactive, check for good electrical connections at the park brake switch. Also purge the air tanks to remove any moisture which may have contaminated the switch, causing it to malfunction.

   If the Park brake signal displayed on the service tool always remains ON, go to test “Test 4 — Checking for Proper Switch Operation” on page 548.

Test 4 — Checking for Proper Switch Operation

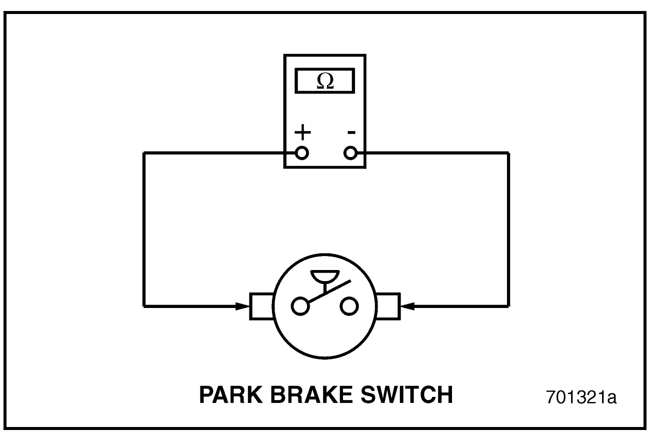


Figure 696

1. Turn the ignition key OFF.
2. Disconnect the Park Brake Switch connectors.
3. Chock the tires and release the park brake.
4. Check for continuity across the two terminals of the Park Brake Switch (see Figure 696).

   If continuity exists, replace the Park Brake Switch and retest the system.

   If there is NO continuity, go to test “Test 8 — Checking for a Short to Ground” on page 548.

Test 8 — Checking for a Short to Ground

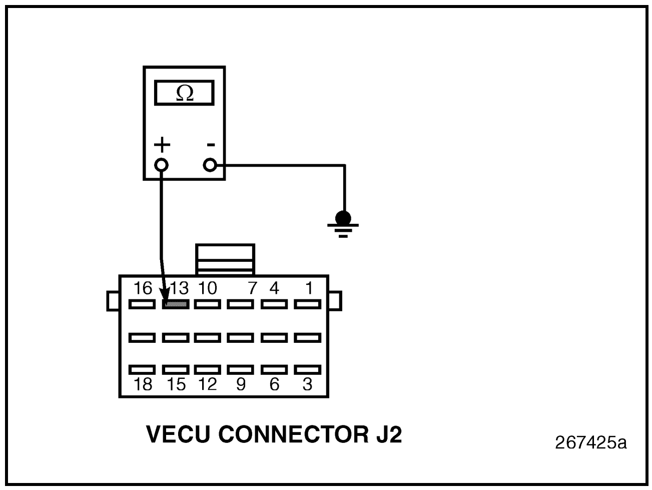


Figure 697

1. Turn the ignition key OFF.
2. Connect the harness connectors to the park brake switch.
3. Chock the tires and release the park brake.
4. Disconnect Vehicle Electronic Control Unit (VECU) connector J2.
5. Check for continuity between VECU connector J2 pin 13 and a good ground (see Figure 697).

   If continuity exists, go to test “Test 16 — Isolating the Short to Ground” on page 549.

   If there is NO continuity to ground, replace the VECU and retest the system.

Test 16 — Isolating the Short to Ground

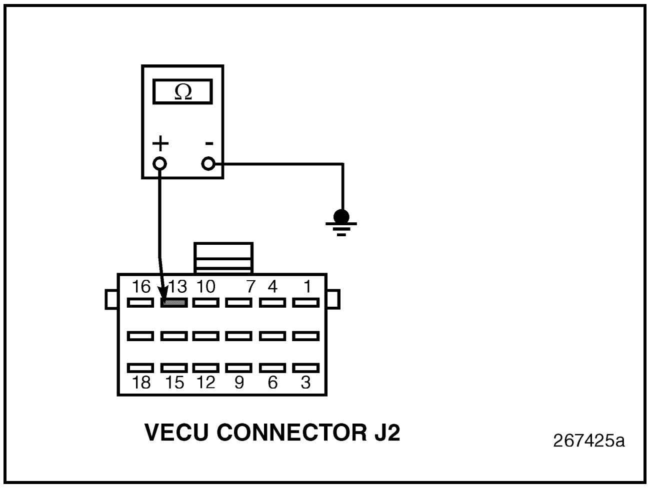


Figure 698

1. Remove the DRL module from the electrical equipment panel.
2. Check for continuity between VECU connector J2 pin 13 and a good ground (see Figure 698).

   If continuity exists, Circuit VJ2-13A is shorted to ground somewhere in the harness. Locate and repair the short circuit.

   If there is NO continuity, the DRL module has an internal short circuit to ground. Replace the DRL module.

BLINK CODE 7-3 — SPEED CONTROL SET SWITCH

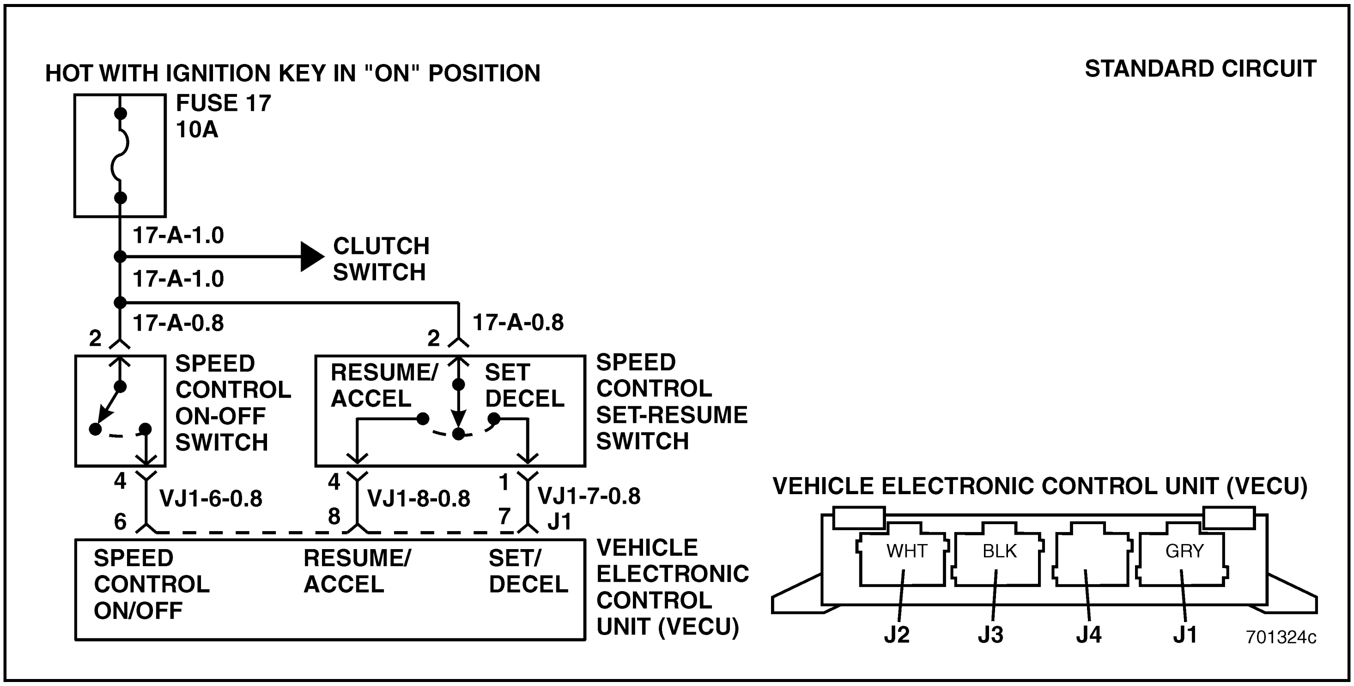


Figure 699 — Speed Control Set/Resume Switch Standard Circuit

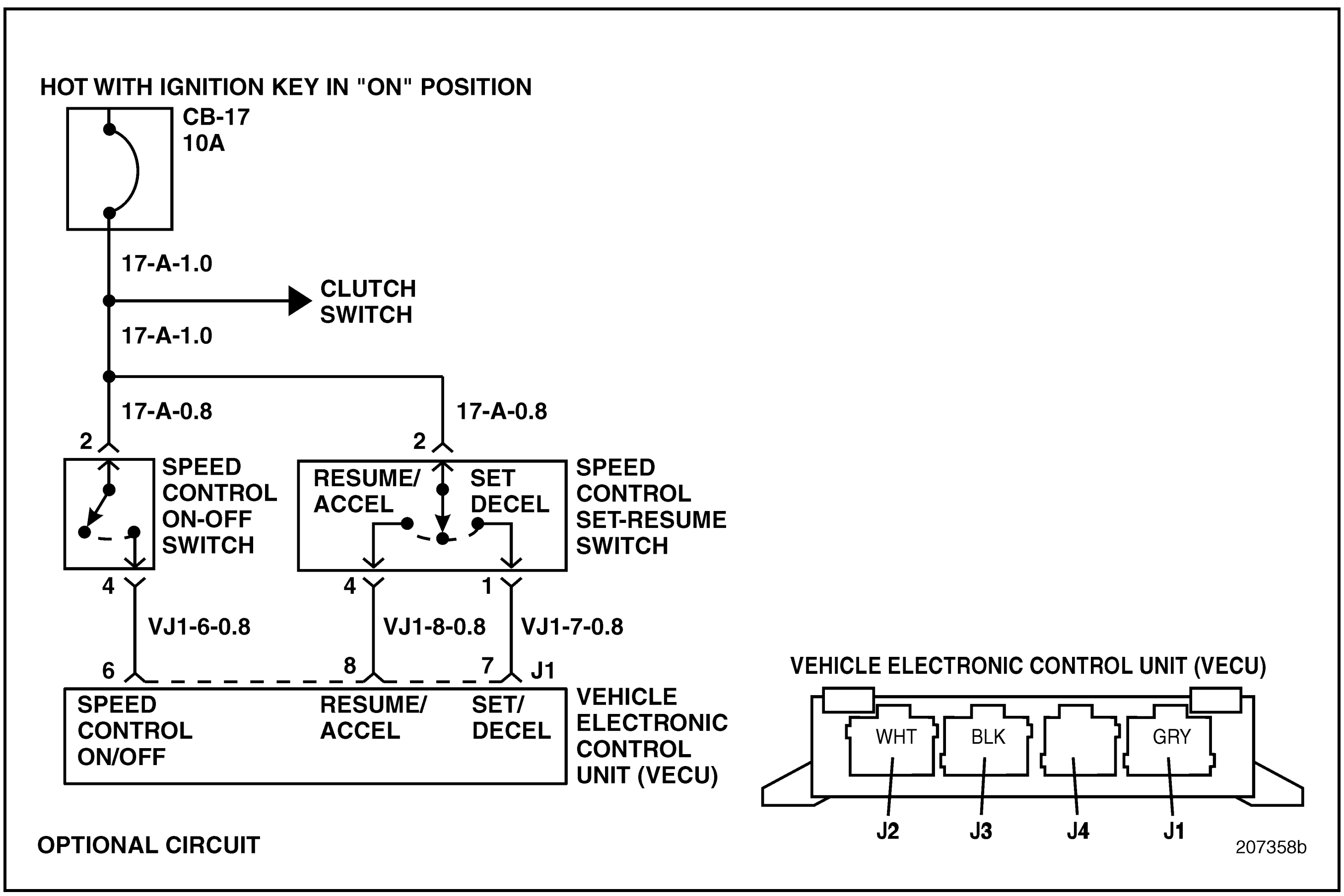


Figure 700 — Speed Control Set/Resume Switch Optional Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High)

Parameter Identification (PID): S243

Message Identification (MID): 142

Circuit Description: Cruise Control and Engine Speed Control are controlled by the Vehicle Electronic Control Unit (VECU). By monitoring the inputs from the Speed Control On/Off Switch, Speed Control Set/Resume Switch, Clutch Switch, Service Brake Switch, PTO switches, RPM and Vehicle Speed Sensor (VSS), the VECU can maintain the vehicle or engine speed requested by the operator. The Speed Control Set/Resume Switch is a spring loaded rocker switch that allows the operator to resume/accelerate the engine or vehicle speed by pressing the top of the switch or set/lower engine or vehicle speed by pressing the bottom of the switch. The Speed Control On/Off Switch must be ON for the Speed Control Set/Resume Switch to function. With the ignition switch in the ON position, battery voltage is applied to the Speed Control Set/Resume Switch through circuit breaker 17. Pressing the bottom of the switch and releasing it will momentarily apply battery voltage to the Vehicle Control Unit (VECU) at connector J1 pin 7.

NOTE

The Resume/Accel and Set/Decel switches may be programmed to function as Resume/Decel and Set/Accel switches in the Customer Data area of the VECU. Other dashboard switches (or combinations of switches) may also be assigned speed control functions.

Location: Center of dashboard.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 7-3 will set when the Vehicle Electronic Control Unit senses a voltage of 9 volts or greater at the Set/Decel input terminal VJ1-7 for a period of 20 seconds. If the voltage returns to between 0 volts and 8.9 volts for more than 20 seconds, the fault will become inactive. This fault is usually caused by a stuck or shorted Set/Decel Switch.

NOTE

Fault code 7-3 will be logged if the Set/Decel Switch diagnostic is enabled in the Customer Data area of the VECU, and the switch is shorted to system voltage for 20 seconds. Code 7-3 will become inactive if the switch voltage returns to 0 volts for 5 seconds. The fault code 7-3 diagnostic may need to be disabled in the Customer Data area of the VECU for some speed control applications.

Additional Symptoms: Cruise Control System will not operate.

Test 1 — Check for Code 7-3

1. Verify code 7-3 is set.

   If code 7-3 is set, go to test “Test 2 — Checking Switch Operation” on page 551.

   If code 7-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Speed Control Set/Decel Switch harness connector and wires for frayed or loose connections.

Test 2 — Checking Switch Operation

1. Turn the ignition key ON.
2. Use a diagnostic computer to check the status of the Speed Control Set/Resume Switch while pressing and releasing the switch.

   If the switch signal displayed on the service tool toggles properly, and the fault is still active, replace the Vehicle Electronic Control Unit (VECU).

   If the switch signal displayed on the service tool toggles properly, but the fault is now inactive, check for good connections at the Speed Control Set/ Decel Switch.

   If the Speed Set signal displayed on the service tool does not toggle properly and remains ON, go to test “Test 4 — Checking for a Short to Voltage” on page 552.

Test 4 — Checking for a Short to Voltage

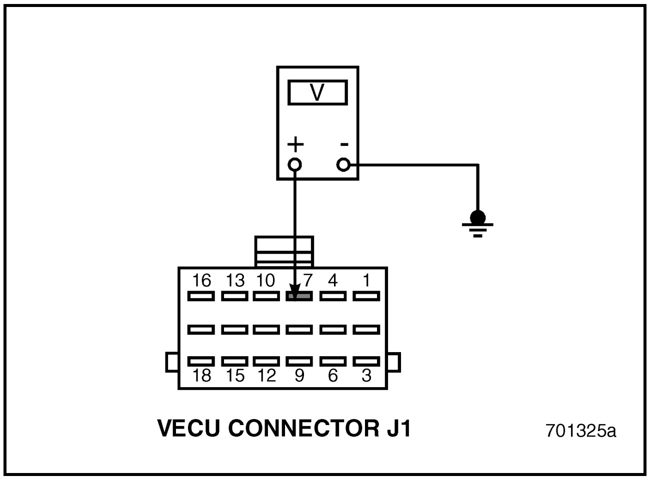


Figure 701

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1 and J2.
3. Turn the ignition key ON.
4. With the Speed Control Set/Decel Switch OFF, measure the voltage between VECU connector J1 pin 7 and a good ground (see Figure 701).

   If the measured voltage is less than 0.5 volts, then the circuit is working properly. Go to test “Test 8 — Checking for a Faulty VECU” on page 552.

   If the measured voltage is greater than 0.5 volts, go to test “Test 9 — Checking the Speed Control SET/DECEL Switch” on page 552.

Test 8 — Checking for a Faulty VECU

1. Turn the ignition key OFF.
2. Connect VECU connector J1.
3. Turn the ignition key ON.
4. Using a diagnostic computer, check the status of the Speed Control Set/Decel Switch while pressing and releasing the switch.

   If the switch signal displayed on the service tool now toggles properly, then the diagnostic procedures have corrected the problem. Check for good connections at the Speed Control Set/Decel Switch.

   If the Speed Set signal displayed on the service tool does NOT toggle properly and remains ON, replace the Vehicle Control Unit (VECU).

Test 9 — Checking the Speed Control SET/DECEL Switch

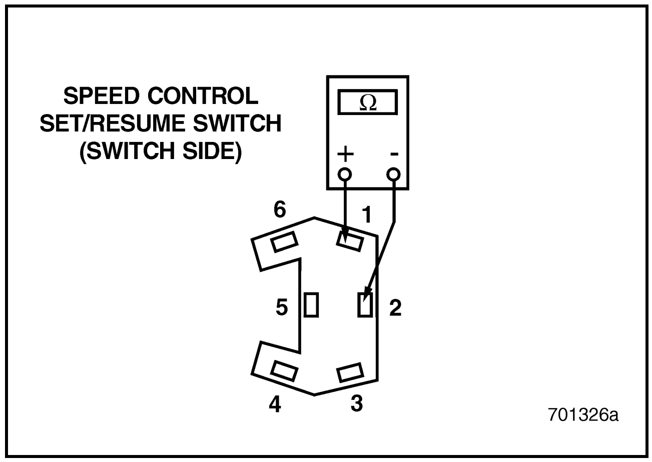


Figure 702

1. Turn the ignition key OFF.
2. Disconnect the connector from the Speed Control Set/Resume Switch.
3. With the Speed Control Set/Decel Switch OFF, check for continuity between pins 1 and 2 of the Speed Control Set/Decel Switch (see Figure 702).

   If continuity exists, replace the Speed Control Set/Decel Switch.

   If there is NO continuity, go to test “Test 18 — Checking for a Short to Voltage in the Harness” on page 553.

Test 18 — Checking for a Short to Voltage in the Harness

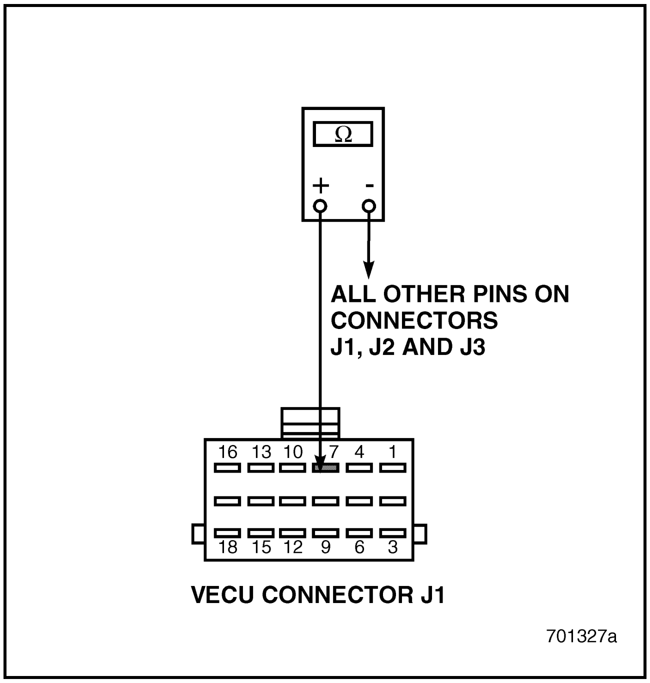


Figure 703

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Check for continuity between VECU connector J1 pin 7 and all other pins on VECU connectors J1, J2 and J3 (see Figure 703.

   If continuity exists, VECU connector J1 pin 7 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 36 — Checking the VECU Connectors for a Short Circuit” on page 553.

Test 36 — Checking the VECU Connectors for a Short Circuit

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Turn the ignition key ON.

   If blink code 7-3 is still active, check the VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 7-3 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 7-4 — SPEED CONTROL RESUME SWITCH

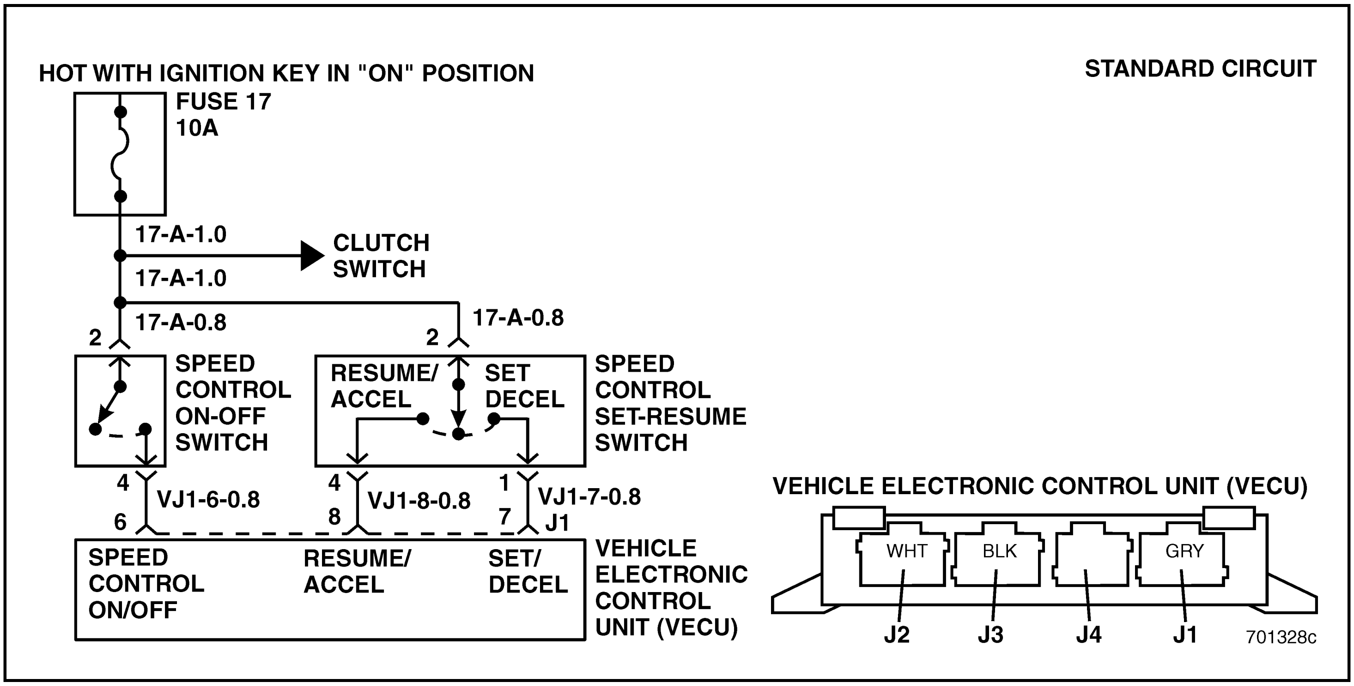


Figure 704 — Speed Control Set/Resume Switch Standard Circuit

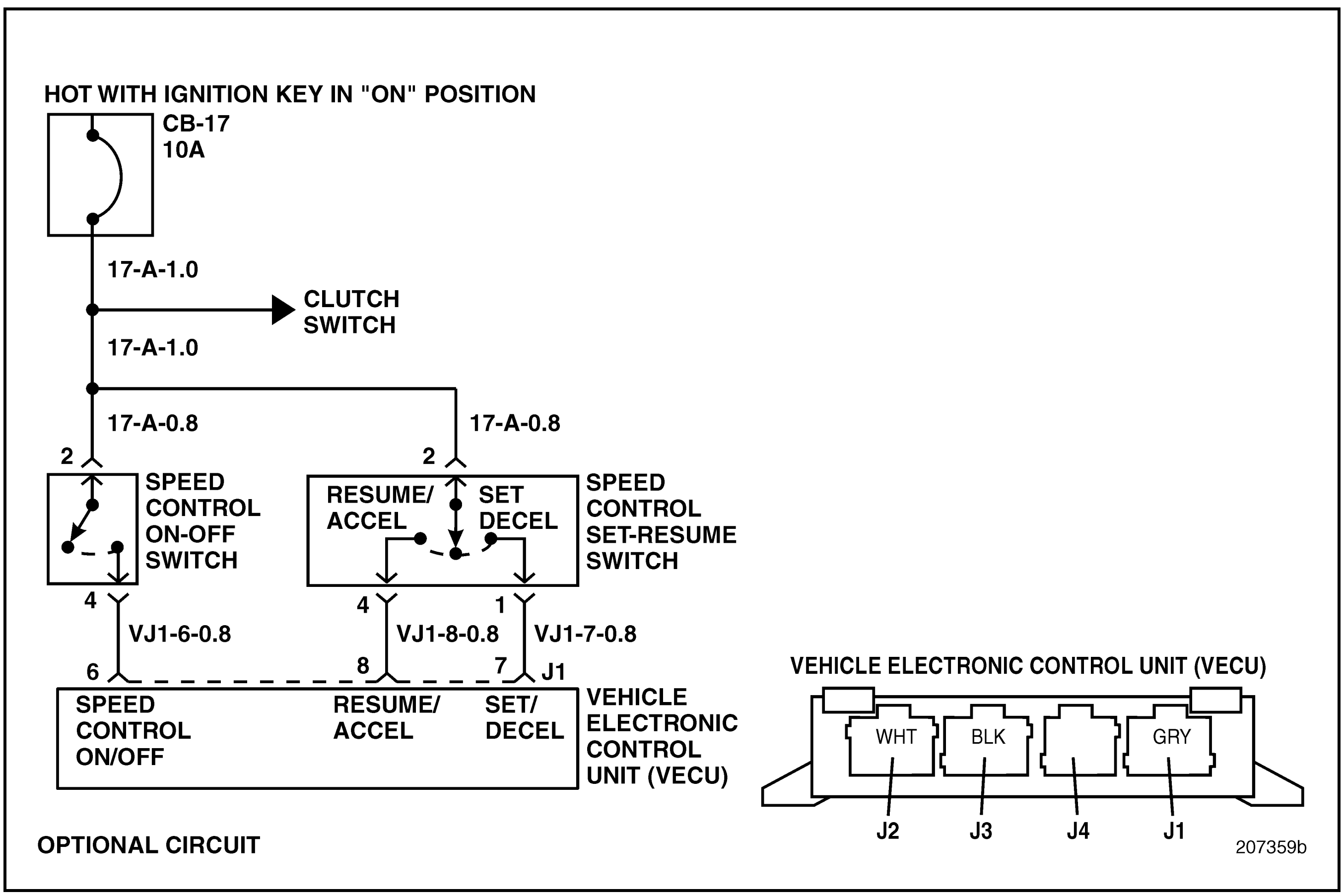


Figure 705 — Speed Control Set/Resume Switch Optional Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High)

Parameter Identification (PID): S242

Message Identification (MID): 142

Circuit Description: Cruise Control and Engine Speed Control are controlled by the Vehicle Electronic Control Unit (VECU). By monitoring the inputs from the Speed Control On/Off Switch, Speed Control Set/Resume Switch, Clutch Switch, Service Brake Switch, PTO Switches, RPM Sensor and Vehicle Speed Sensor (VSS) the VECU can maintain the vehicle or engine speed requested by the operator. The Speed Control Set/Resume switch is a spring loaded rocker switch that allows the operator to resume or accelerate the engine or vehicle speed by pressing the top of the switch or to set or decelerate engine or vehicle speed by pressing the bottom of the switch. The Speed Control On/Off Switch must be ON for the Speed Control Set/Resume Switch to function. With the ignition switch in the ON position, battery voltage is applied to the Speed Control Set/Resume Switch through circuit breaker 17. Pressing the bottom of the switch and releasing it will momentarily apply battery voltage to the Vehicle Electronic Control Unit (VECU) at connector J1 pin 8.

NOTE

The Resume/Accel and Set/Decel switches may be programmed to function as Resume/Decel and Set/Accel switches in the Customer Data area of the VECU. Other dashboard switches (or combinations of switches) may also be assigned speed control functions.

Location: Center of dashboard.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 7-4 will set when the Vehicle Electronic Control Unit senses a voltage of 9 volts or greater at the Resume/Accel input terminal VJ1-8 for a period of 20 seconds. If the voltage returns to between 0 volts and 8.9 volts for more than 20 seconds, the fault will become inactive. This fault is usually caused by a stuck or shorted Resume/Accel switch.

NOTE

Fault code 7-4 will be logged if the Resume/Accel Switch diagnostic is enabled in the Customer Data area of the VECU, and the switch is shorted to system voltage for 6 seconds. Code 7-4 will become inactive if the switch voltage returns to 0 volts for 5 seconds. The fault code 7-4 diagnostic may need to be disabled in the Customer Data area of the VECU for some speed control applications.

Additional Symptoms: Cruise Control System will not operate.

Test 1 — Check for Code 7-4

1. Verify code 7-4 is set.

   If code 7-4 is set, go to test “Test 2 — Checking Switch Operation” on page 555.

   If code 7-4 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Speed Control Resume/Accel Switch harness connector and wires for frayed or loose connections.

Test 2 — Checking Switch Operation

1. Turn the ignition key ON.
2. Using a diagnostic computer, check the status of the Speed Control Set/Resume Switch while pressing and releasing the switch.

   If the switch signal displayed on the service tool toggles properly, and the fault is still active, replace the Vehicle Electronic Control Unit (VECU).

   If the switch signal displayed on the service tool toggles properly, but the fault is now inactive, check for good a connection at the Speed Control Resume/Accel Switch.

   If the Speed Set signal displayed on the service tool does not toggle properly and remains ON, go to test “Test 4 — Checking for Stray Voltage at the Module” on page 556.

Test 4 — Checking for Stray Voltage at the Module

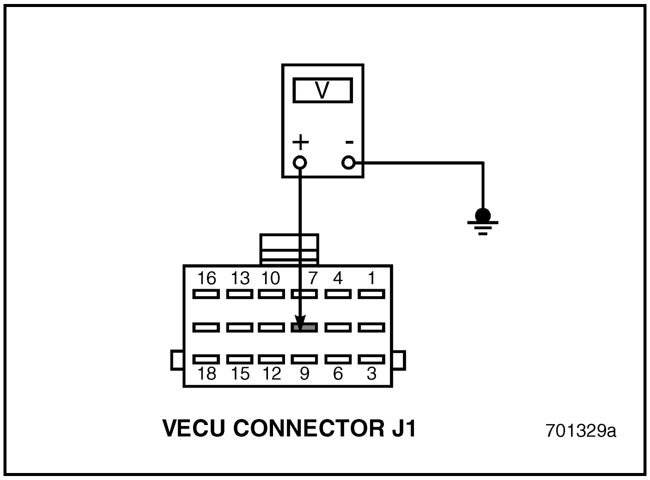


Figure 706

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J1.
3. Turn the ignition key ON.
4. With the Speed Control Resume/Accel Switch OFF, measure the voltage between VECU connector J1 pin 8 and a good ground (see Figure 706).

   If the voltage is less than 0.5 volts, then the circuit is working properly. Go to test “Test 8 — Checking the VECU” on page 556.

   If there is more than 0.5 volts present, go to test “Test 9 — Checking the Speed Control Set/Resume Switch” on page 556.

Test 8 — Checking the VECU

1. Turn the ignition key OFF.
2. Connect VECU connector J1.
3. Turn the ignition key ON.
4. Using a diagnostic computer, check the status of the Speed Control Resume/Accel Switch while pressing and releasing the switch.

   If the switch signal displayed on the service tool now toggles properly, then the diagnostic procedures have corrected the problem. Check for good connections at the Speed Control Resume/Accel Switch.

   If the Speed Set signal displayed on the service tool does NOT toggle properly and remains ON, replace the Vehicle Electronic Control Unit (VECU).

Test 9 — Checking the Speed Control Set/Resume Switch

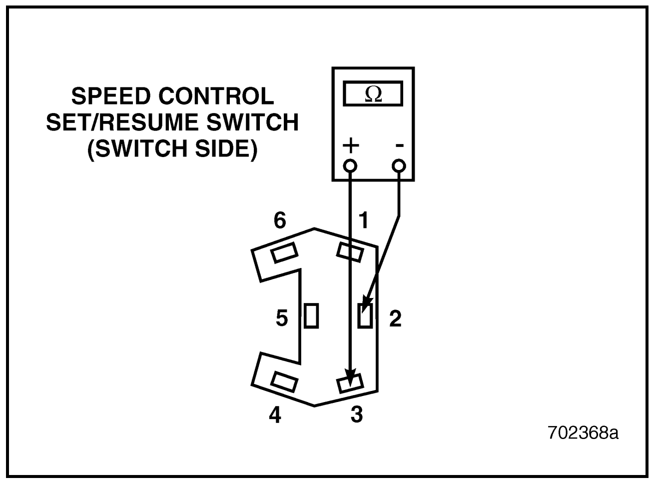


Figure 707

1. Turn the ignition key OFF.
2. Disconnect the connector from the Speed Control Resume/Accel Switch.
3. With the Speed Control Resume/Accel Switch OFF, check for continuity between pins 2 and 3 of the Speed Control Resume/Accel Switch (see Figure 707).

   If continuity exists, replace the Speed Control Resume/Accel Switch.

   If there is NO continuity, go to test “Test 18 — Checking for a Short to Voltage in the Harness” on page 557.

Test 18 — Checking for a Short to Voltage in the Harness

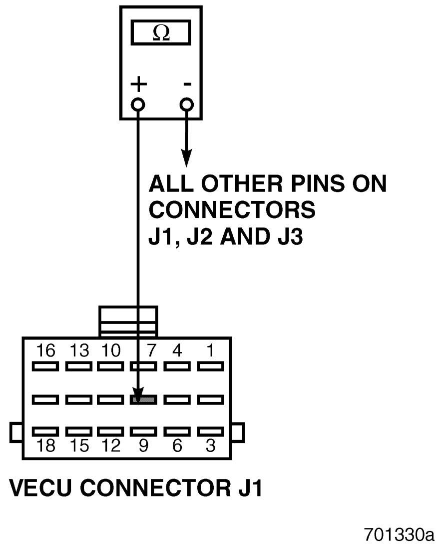


Figure 708

1. Turn the ignition key OFF.
2. Disconnect VECU connectors J1, J2 and J3.
3. Check for continuity between VECU connector J1 pin 8 and all other pins on VECU connectors J1, J2 and J3 (see Figure 708).

   If continuity exists, VECU connector J1 pin 8 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 36 — Checking the VECU Connector for a Short Circuit” on page 557.

Test 36 — Checking the VECU Connector for a Short Circuit

1. Turn the ignition key OFF.
2. Connect VECU connectors J1, J2 and J3.
3. Turn the ignition key ON.

   If blink code 7-4 is still active, check VECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are not repairable, replace the VECU and retest the system.

   If blink code 7-4 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 7-5 — VEHICLE ELECTRONIC CONTROL UNIT (VECU) INPUT VOLTAGE

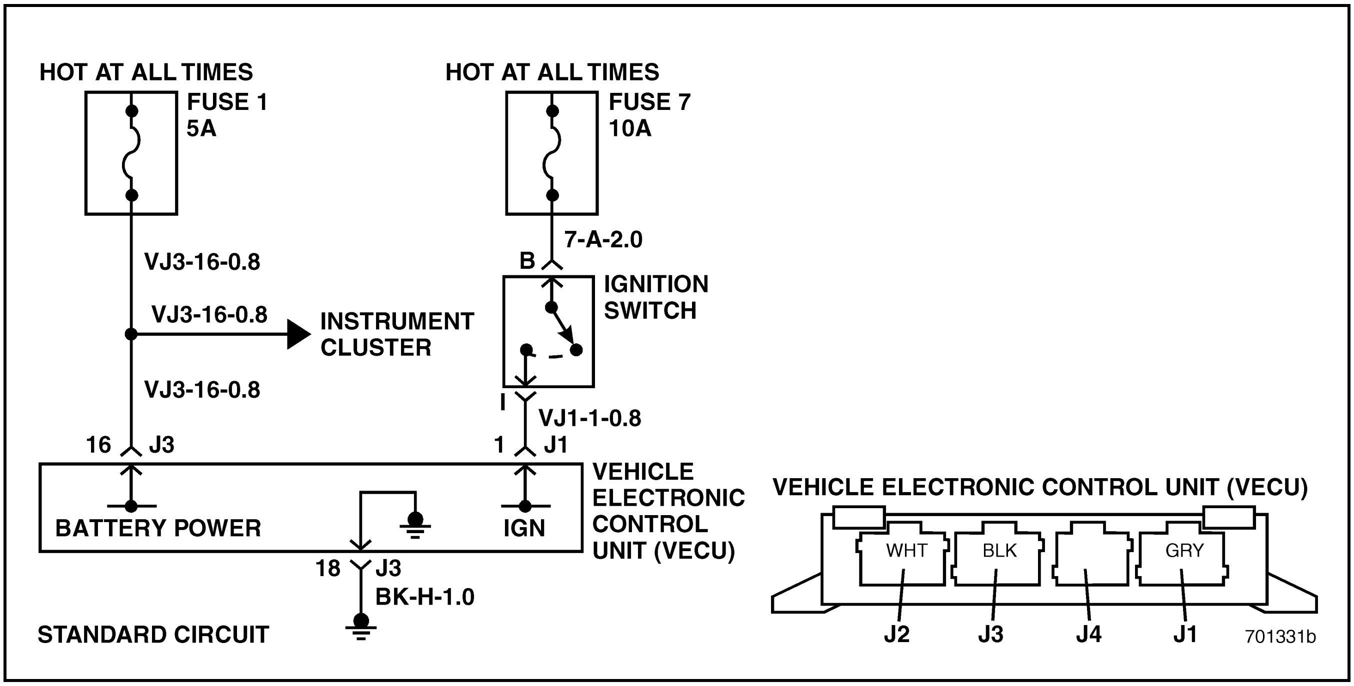


Figure 709 — VECU Battery Voltage Standard Circuit

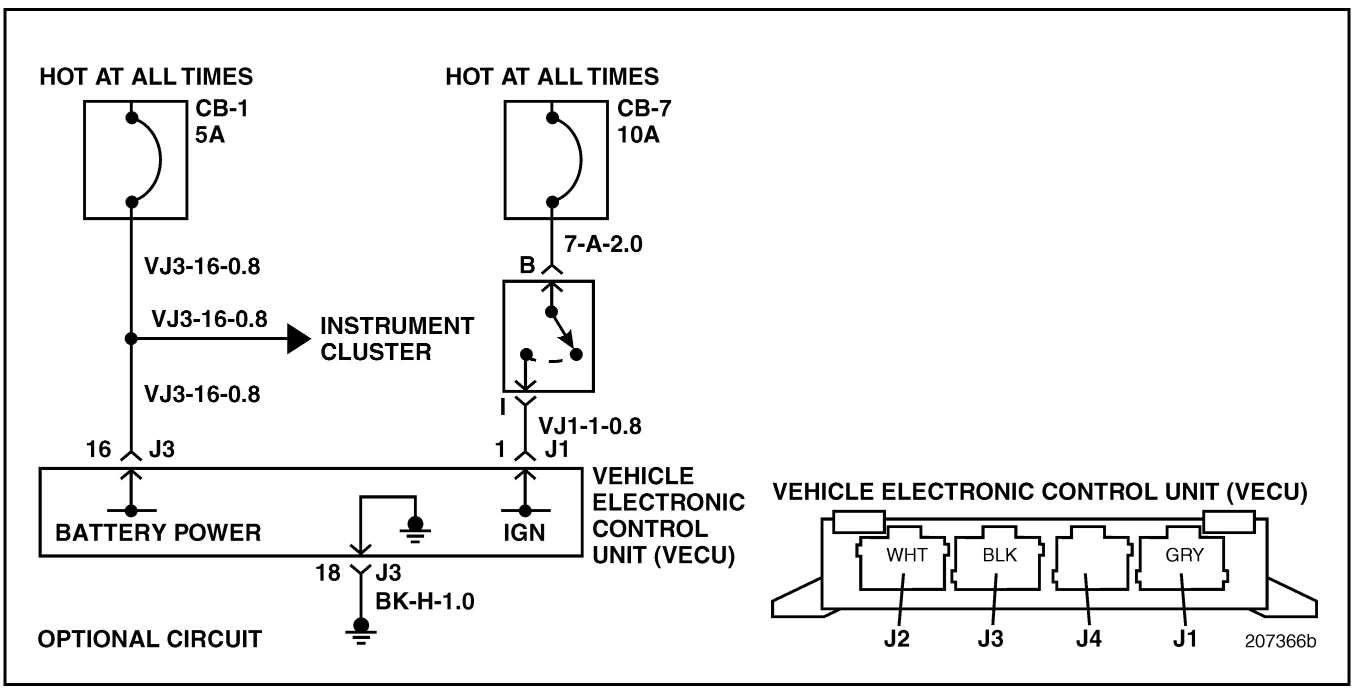


Figure 710 — VECU Battery Voltage Optional Circuit

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 0 (Valid but Above Normal), 1 (Valid but Below Normal)

Parameter Identification (PID): 167, 168

Message Identification (MID): 142

Circuit Description: The Vehicle Electronic Control Unit (VECU) receives and monitors vehicle system voltage at connector J3 pin 16. Thresholds for battery voltage (engine not running) and alternator voltage (engine running) can be programmed in the Customer Data area of the VECU.

Location: The Vehicle Electronic Control Unit is typically located in the cab, behind the right side dash panel.

Code Setting Conditions: Code 7-5 will set with a PID of 168 if the Vehicle Electronic Control Unit (VECU) senses that system voltage to the module has dropped to less than the programmed threshold for 10 seconds with the engine not running. Code 7-5 will set with a PID of 167 if the Vehicle Electronic Control Unit (VECU) senses that system voltage to the module is not between the programmed limits for 10 seconds with the engine running. If the system voltage returns to normal for 1 second, code 7-5 will become inactive.

Test 1 — Checking for Code 7-5

1. Check that code 7-5 is set.

   If code 7-5 is set, go to test “Test 2 — Checking Code 7-5 PID” on page 559.

   If code 7-5 is NOT set, wiggle the harness and connectors to try and set the code. Check the connections at the Vehicle Electronic Control Unit (VECU) for frayed wires or loose connections.

Test 2 — Checking Code 7-5 PID

NOTE

In older V-MAC III versions, blink code 7-5 was only displayed with a PID of 168. If code 7-5 is inactive with the engine OFF but becomes active with the engine running, treat the PID as 167.

1. Turn the ignition key OFF.
2. Connect a diagnostic computer to the vehicle.
3. Check the PID for fault code 7-5.

   If fault code 7-5 is set with a PID of 167, go to test “Test 4 — Checking Code 7-5 FMI” on page 559.

   If fault code 7-5 is set with a PID of 168, go to test “Test 5 — Checking the System Voltage Settings” on page 559.

Test 4 — Checking Code 7-5 FMI

1. Turn the ignition key OFF.
2. Connect a diagnostic computer to the vehicle.
3. Check the FMI for fault code 7-5.

   If the FMI is 0 (valid high), go to test “Test 8 — Checking the System Voltage Settings” on page 560.

   If the FMI is 1 (valid low), go to test “Test 9 — Checking the System Voltage Settings” on page 560.

Test 5 — Checking the System Voltage Settings

1. Access the VECU Customer Data area.
2. Select SYSTEM VOLTAGE SETTINGS.
3. Record the BATTERY LOW VOLTAGE THRESHOLD and go to test “Test 10 — Checking Battery Voltage” on page 560.

Test 8 — Checking the System Voltage Settings

1. Access the VECU Customer Data area.
2. Select SYSTEM VOLTAGE SETTINGS.
3. Record the ALTERNATOR HIGH VOLTAGE THRESHOLD and go to test “Test 16 — Checking Alternator Output” on page 560.

Test 9 — Checking the System Voltage Settings

1. Access the VECU Customer Data area.
2. Select SYSTEM VOLTAGE SETTINGS.
3. Record the ALTERNATOR LOW VOLTAGE THRESHOLD and go to test “Test 18 — Checking Alternator Output” on page 560.

Test 10 — Checking Battery Voltage

1. Measure the voltage between the BATT stud on the Mack Option Junction Block and a good ground.

   If the measured voltage is greater than the BATTERY LOW VOLTAGE THRESHOLD, go to test “Test 20 — Checking for Battery Voltage at the VECU” on page 561.

   If the measured voltage is less than the BATTERY LOW VOLTAGE THRESHOLD, determine the cause of the low battery voltage.

Test 16 — Checking Alternator Output

1. Start the engine and allow it idle.
2. Measure the voltage between the BATT stud on the Mack Option Junction Block and a good ground.

   If the measured voltage is less than the ALTERNATOR HIGH VOLTAGE THRESHOLD, go to test “Test 32 — Checking for a Pin to Pin Short in the Harness” on page 561.

   If the measured voltage is greater than the ALTERNATOR HIGH VOLTAGE THRESHOLD, check the charging system for a malfunction.

Test 18 — Checking Alternator Output

1. Start the engine and let it idle.
2. Measure the voltage between the BATT stud on the Mack Option Junction Block and a good ground.

   If the measured voltage is greater than the ALTERNATOR LOW VOLTAGE THRESHOLD, go to test “Test 36 — Checking for Battery Voltage at the VECU” on page 562.

   If the measured voltage is less than the ALTERNATOR LOW VOLTAGE THRESHOLD, check the charging system for a malfunction.

Test 20 — Checking for Battery Voltage at the VECU

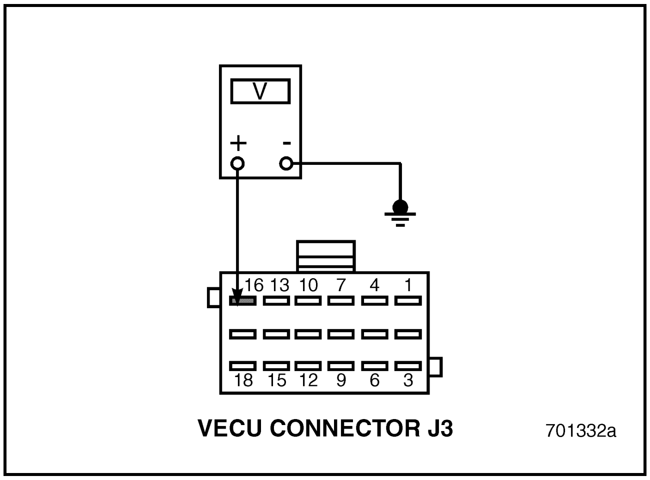


Figure 711

NOTE

The VECU battery voltage can also be read directly from a diagnostic computer in the Monitor Parameters area (VECU Voltage).

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Measure the voltage between VECU connector J3 pin 16 and a good ground (see Figure 711).

   If battery voltage is present, go to test “Test 40 — Checking the VECU Ground Circuit” on page 562.

   If the voltage measured differs significantly from the voltage measured in test 10, go to test “Test 41 — Checking for a Pin to Pin Short in the Harness” on page 563.

Test 32 — Checking for a Pin to Pin Short in the Harness

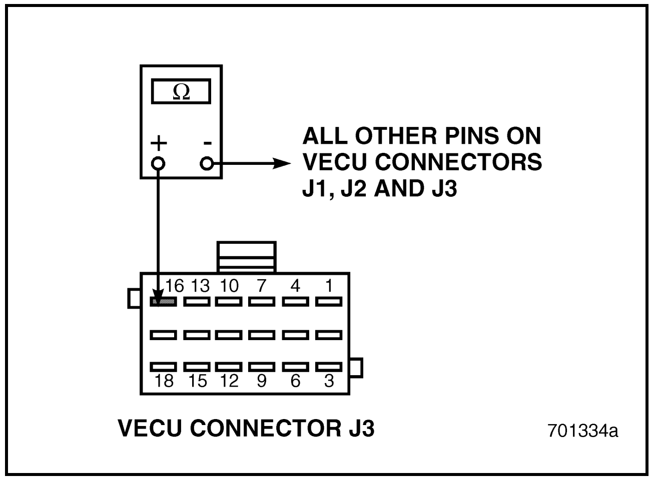


Figure 712

1. Turn the ignition key OFF and remove fuse (circuit breaker) 1.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 16 and all other pins on VECU connectors J1, J2 and J3 (see Figure 712).

   If continuity exists, pin 16 is shorted to one of the other VECU circuits. Locate and repair the short.

   If there is NO continuity, go to test “Test 64 — Checking for Blink Code 7-5” on page 563.

Test 36 — Checking for Battery Voltage at the VECU

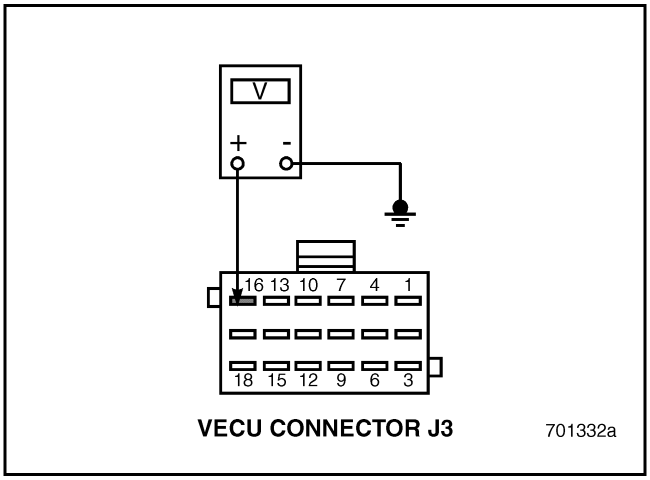


Figure 713

N O T E

The VECU battery voltage can also be read directly from a diagnostic computer in the Monitor Parameters area (VECU Voltage).

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Measure the voltage between VECU connector J3 pin 16 and a good ground (see Figure 713).

   If battery voltage is present, go to test “Test 72 — Checking the VECU Ground Circuit” on page 564.

   If the voltage measured differs significantly from the voltage measured in test 18, go to test “Test 73 — Checking for a Pin to Pin Short in the Harness” on page 564.

Test 40 — Checking the VECU Ground Circuit

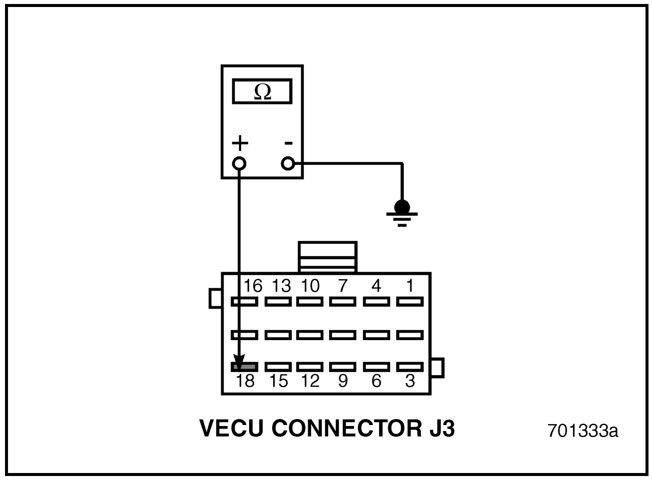


Figure 714

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Check for continuity between VECU connector J3 pin 18 and a good ground (see Figure 714).

   If continuity exists, go to test “Test 80 — Checking for a Pin to Pin Short Circuit” on page 565.

   If there is NO continuity, there is an open in the VECU ground circuit. Locate and repair the open circuit.

Test 41 — Checking for a Pin to Pin Short in the Harness

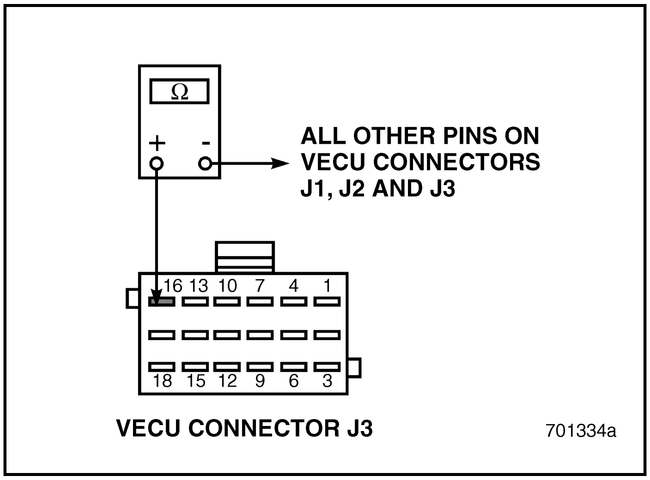


Figure 715

1. Turn the ignition key OFF and remove fuse (circuit breaker) 1.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 16 and all other pins on VECU connectors J1, J2 and J3 (see Figure 715).

   If continuity exists, pin 16 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 82 — Checking for Loose Pins or a Faulty VECU” on page 565.

Test 64 — Checking for Blink Code 7-5

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 7-5 is still active, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 7-5 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 65 — Checking for a Pin to Pin Short in the Harness

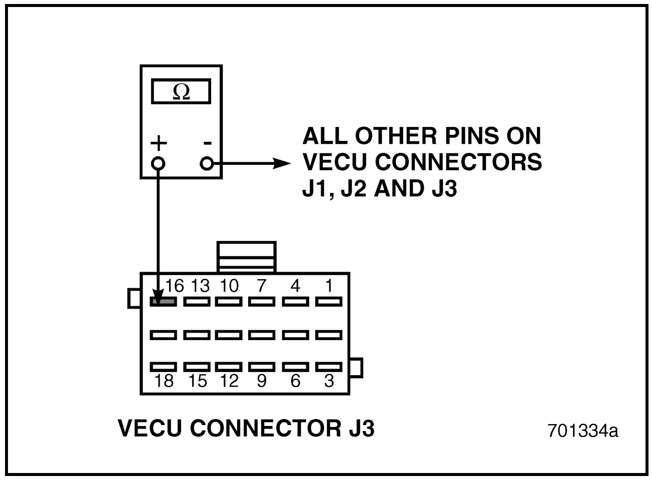


Figure 716

1. Turn the ignition key OFF and remove fuse (circuit breaker) 1.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 16 and all other pins on VECU connectors J1, J2 and J3 (see Figure 716).

   If continuity exists, pin 16 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 130 — Checking for Blink Code 7-5” on page 565.

Test 72 — Checking the VECU Ground Circuit

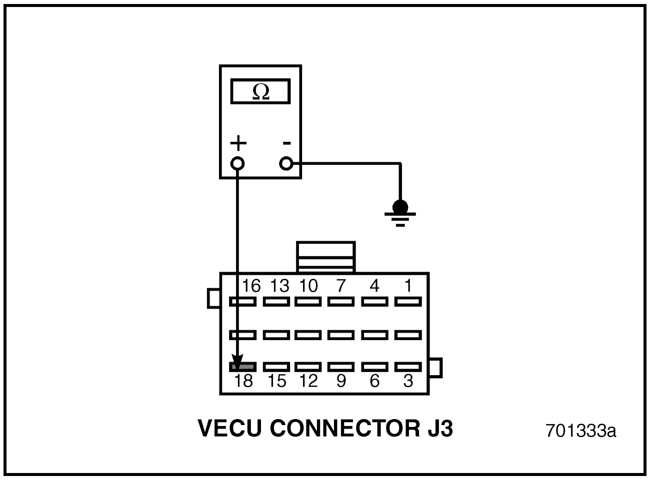


Figure 717

1. Turn the ignition key OFF.
2. Disconnect Vehicle Electronic Control Unit (VECU) connector J3.
3. Check for continuity between VECU connector J3 pin 18 and a good ground (see Figure 717).

   If continuity exists, go to test "Test 144 — Checking for a Pin to Pin Short in the Harness" on page 566.

   If there is NO continuity, there is an open in the VECU ground circuit. Locate and repair the open circuit.

Test 73 — Checking for a Pin to Pin Short in the Harness

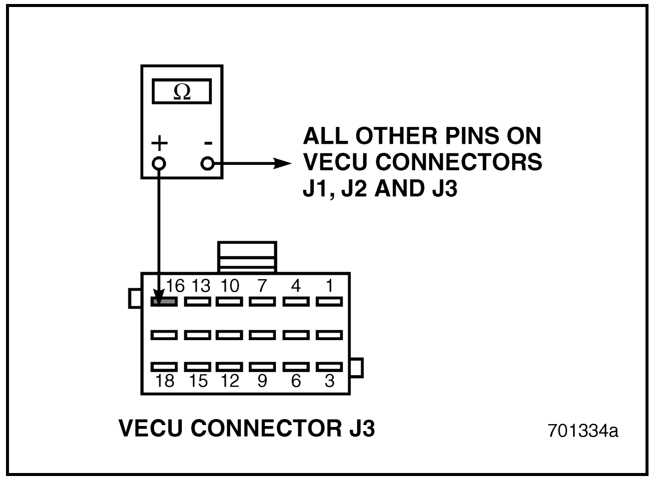


Figure 718

1. Turn the ignition key OFF and remove fuse (circuit breaker) 1.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 16 and all other pins on VECU connectors J1, J2 and J3 (see Figure 718).

   If continuity exists, pin 16 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 146 — Checking for Loose Pins or a Faulty VECU" on page 566.

Test 80 — Checking for a Pin to Pin Short Circuit

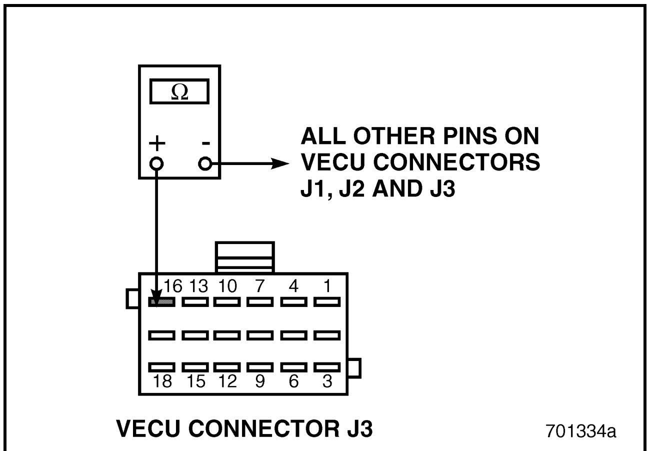


Figure 719

1. Turn the ignition key OFF and remove fuse (circuit breaker) 1.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 16 and all other pins on VECU connectors J1, J2 and J3 (see Figure 719).

   If continuity exists, pin 16 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 160 — Checking for Loose Pins or a Faulty VECU" on page 566.

Test 82 — Checking for Loose Pins or a Faulty VECU

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Visually inspect VECU connector J3 pins 16 and 18 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pins 16 and 18. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU connector J3. If the connector is not repairable, replace connector J3.

   If the test lead is making good contact with VECU connector J3 pins 16 and 18, go to test "Test 164 — Checking for Blink Code 7-5" on page 567.

Test 130 — Checking for Blink Code 7-5

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 7-5 is still active, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 7-5 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 144 — Checking for a Pin to Pin Short in the Harness

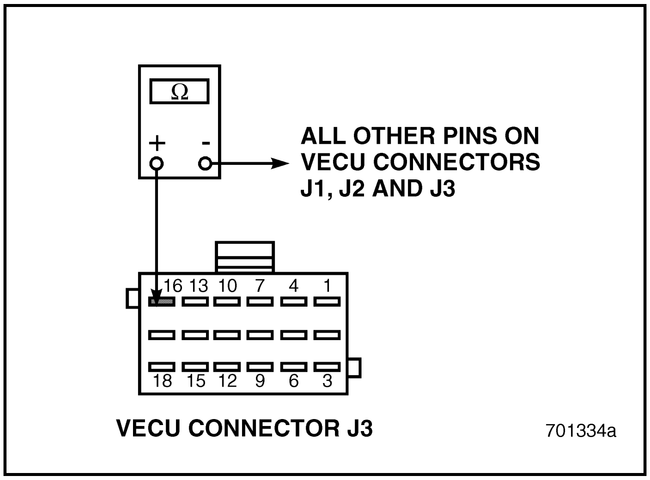


Figure 720

1. Turn the ignition key OFF and remove fuse (circuit breaker) 1.
2. Disconnect Vehicle Electronic Control Unit (VECU) connectors J1, J2 and J3.
3. Check for continuity between VECU connector J3 pin 16 and all other pins on VECU connectors J1, J2 and J3 (see Figure 720).

   If continuity exists, pin 16 is shorted to one of the other VECU circuits. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 288 — Checking for Loose Pins or a Faulty VECU” on page 567.

Test 146 — Checking for Loose Pins or a Faulty VECU

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Visually inspect VECU connector J3 pins 16 and 18 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pins 16 and 18. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU connector J3. If the connector is not repairable, replace connector J3.

   If the test lead is making good contact with VECU connector J3 pins 16 and 18, go to test “Test 292 — Checking for Blink Code 7-5” on page 567.

Test 160 — Checking for Loose Pins or a Faulty VECU

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Visually inspect VECU connector J3 pins 16 and 18 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pins 16 and 18. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU connector J3. If the connector is NOT repairable, replace connector J3.

   If the test lead is making good contact with VECU connector J3 pins 16 and 18, go to test “Test 320 — Checking for Blink Code 7-5” on page 567.

Test 164 — Checking for Blink Code 7-5

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 7-5 is still active, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 7-5 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 288 — Checking for Loose Pins or a Faulty VECU

1. Turn the ignition key OFF.
2. Disconnect VECU connector J3.
3. Visually inspect VECU connector J3 pins 16 and 18 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with VECU harness connector J3 pins 16 and 18. Gently push the test lead into each harness connector terminal individually and check for looseness.

   If a repairable open is found or the terminal feels loose, repair VECU connector J3. If the connector is NOT repairable, replace connector J3.

   If the test lead is making good contact with VECU connector J3 pins 16 and 18, go to test "Test 576 — Checking for Blink Code 7-5" on page 567.

Test 292 — Checking for Blink Code 7-5

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 7-5 is still active, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 7-5 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 320 — Checking for Blink Code 7-5

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 7-5 is still active, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 7-5 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 576 — Checking for Blink Code 7-5

1. Turn the ignition key OFF.
2. Connect Vehicle Electronic Control Unit (VECU) connector J3.
3. Turn the ignition key ON.

   If blink code 7-5 is still active, replace the Vehicle Electronic Control Unit (VECU) and retest the system.

   If blink code 7-5 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 7-6 — ENGINE ELECTRONIC CONTROL UNIT (EECU) SWITCHED VOLTAGE (ASET™ IEGR ENGINE)

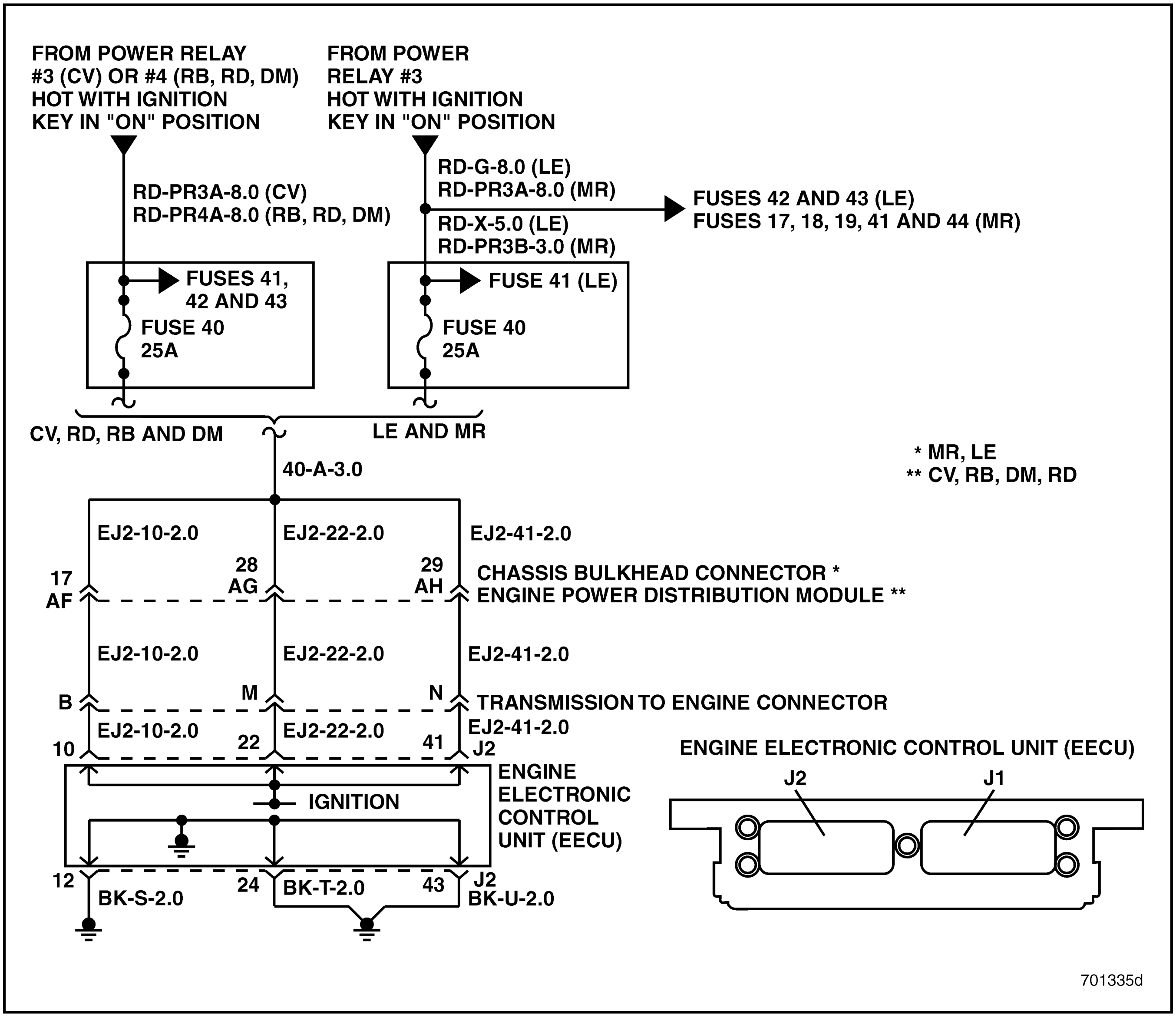


Figure 721 — Engine Electronic Control Unit (EECU) Voltage Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 4 (Voltage Low/Open)

Parameter Identification (PID): 158

Message Identification (MID): 128

Circuit Description: The Engine Electronic Control Unit (EECU) receives a switched voltage signal from Power Relay #3. The switched voltage signal is applied to the EECU at connector J2 pins 10, 22 and 41.

Code Setting Conditions: Code 7-6 will become active if the Engine Electronic Control Unit (EECU) senses a switched voltage signal less than 5.5 volts at EECU connector J2 pins 10, 22 and 41 for 10 seconds. Code 7-6 will become inactive if the switched voltage signal returns to greater than 5.5 volts at EECU connector J2 pins 10, 22 and 41 for 1 second.

Additional Symptoms: Poor performance, low power or no start. If fault 7-6 is active and fault code 7-5 is not active, it may be impossible for the Engine Electronic Control Unit (EECU) to control the Electronic Unit Pumps (EUPs).

Test 1 — Checking for Fault Codes

1. Check if code 7-6 is set.
2. Check if code 7-5 is also set.

   If code 7-5 is also set, go to the Code 7-5 diagnostic routine.

   If only code 7-6 is set, go to test "Test 2 — Checking the EECU Supply Voltage" on page 569.

   If code 7-6 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Electronic Control Unit (EECU) connectors for frayed wires and loose or corroded connections.

Test 2 — Checking the EECU Supply Voltage

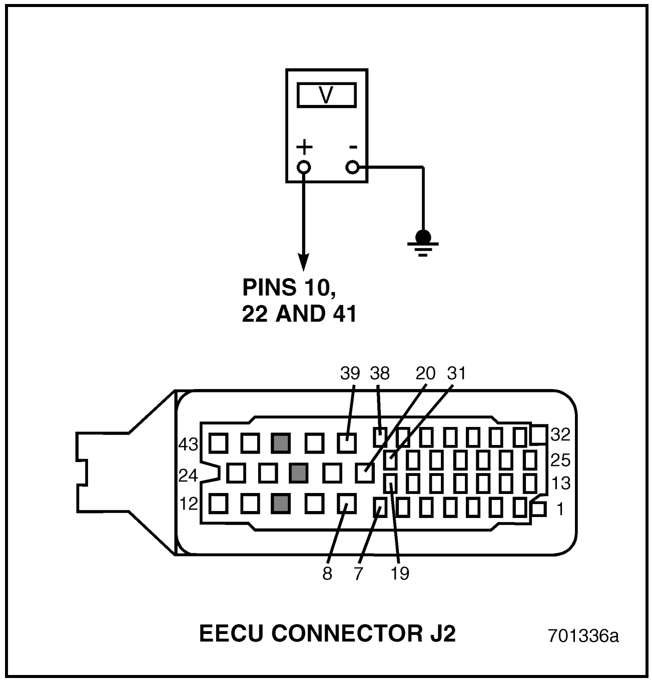


Figure 722

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pins 10, 22, and 41 versus a good ground (see Figure 722).

   If battery voltage is NOT present at any pins, go to test "Test 4 — Checking the Power Distribution Circuit" on page 570.

   If battery voltage is present at ALL pins, go to test "Test 5 — Checking the EECU Ground Circuits" on page 570.

   If battery voltage is NOT present at one pin, check the suspect circuit for an open.

Test 4 — Checking the Power Distribution Circuit

1. Turn the ignition key OFF and remove fuse 40.
2. Turn the ignition key ON.
3. Measure the voltage between the fuse 40 power supply cavity and a good ground (see Figure 721).

   If battery voltage is present, there is an open in circuit 40-A-3.0 between fuse 40 and the common splice for circuits EJ2-10-2.0, EJ2-22-2.0 and EJ2-41-2.0, go to test “Test 8 — Checking Fuse 40 for an Open Circuit” on page 570.

   If battery voltage is NOT present, there is an open or short to ground in the fuse power distribution circuit. Check the contacts and coil of Power Relay #3 (CV, LE, MR) or Power Relay #4 (RB, RD, DM) in the cab electrical equipment panel. Locate and repair the open or short to ground.

Test 5 — Checking the EECU Ground Circuits

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit connectors J1 and J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pins 12, 24 and 43 versus a good ground (see Figure 723).

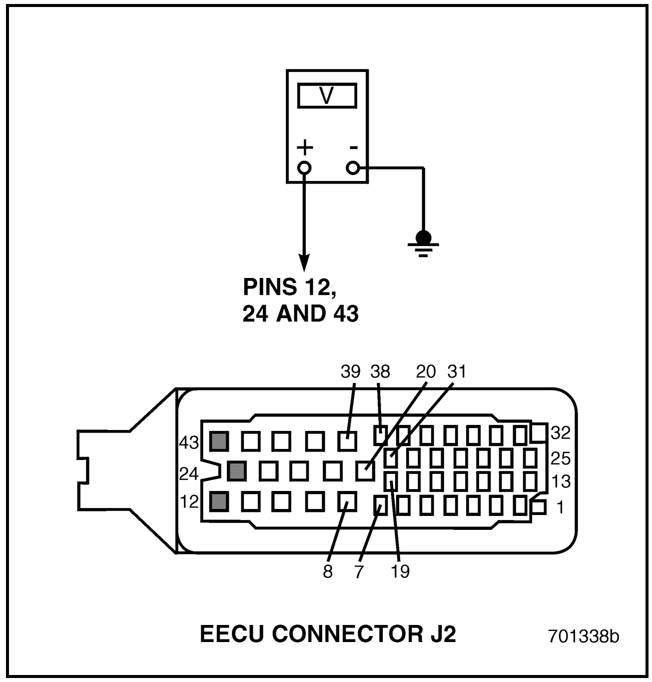


Figure 723

If the measured voltage is greater than 0.5 volts on any of the pins, the suspect ground circuit is shorted to voltage. Locate and repair the short to voltage.

If voltage is NOT present on ANY pins, go to test “Test 10 — Checking for an Open Ground Circuit” on page 571.

Test 8 — Checking Fuse 40 for an Open Circuit

1. Turn the ignition key OFF.
2. Visually inspect fuse 40 for an open circuit.

   If fuse 40 is open, go to test “Test 16 — Checking for a Short to Ground” on page 571.

   If fuse 40 is NOT open, there is an open in circuit 40-A-3.0 between fuse 40 and the common splice for circuits EJ2-10-2.0, EJ2-22-2.0 and EJ2-41-2.0.

Test 10 — Checking for an Open Ground Circuit

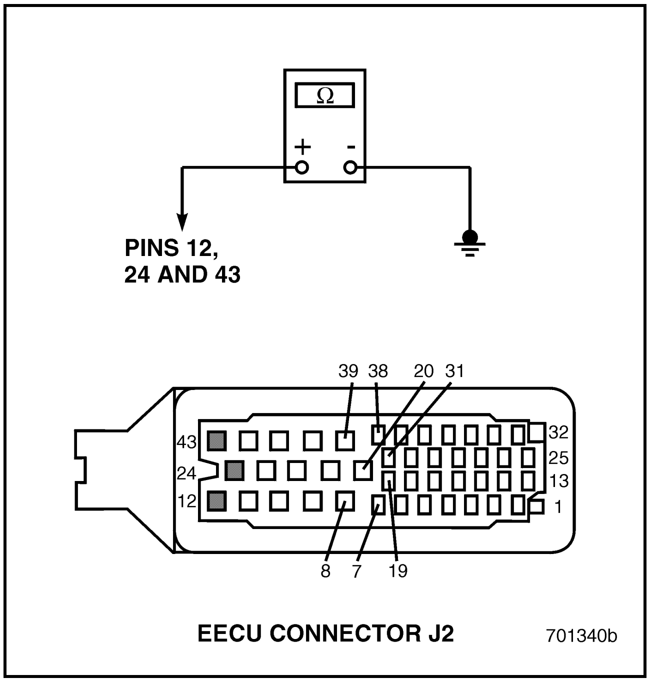


Figure 724

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J2.
3. Check for continuity between EECU connector J2 pins 12, 24 and 43 versus a good ground (see Figure 724).

   If continuity exists between ALL pins and ground, go to test "Test 20 — Checking for Blink Code 7-6" on page 572.

   If there is NO continuity, check the suspect circuit for an open.

Test 16 — Checking for a Short to Ground

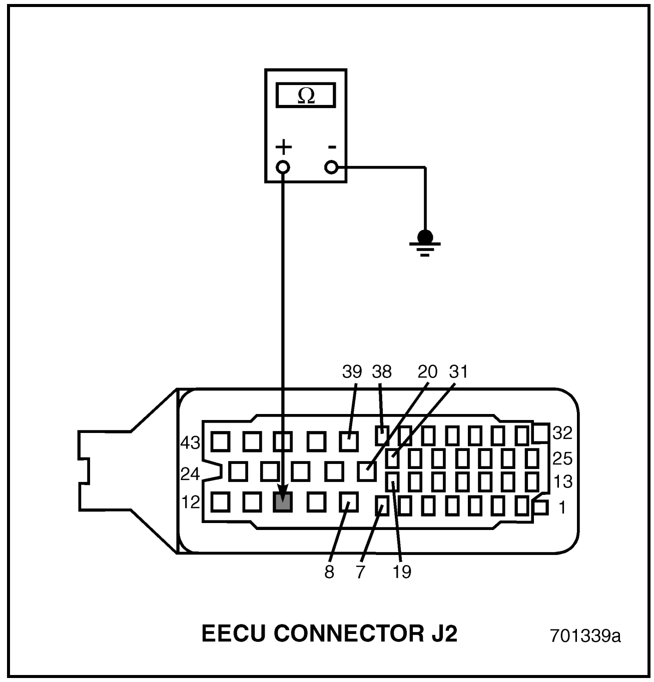


Figure 725

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2 and remove fuse 40.
3. Check for continuity between EECU connector J2 pin 10 and a good ground (see Figure 725).

   If continuity is found, one of the voltage supply circuits (EJ2-10-2.0, EJ2-22-2.0 or EJ2-41-2.0) is shorted to ground. Locate and repair the short circuit. After repairing the short circuit, replace fuse 40.

   If there is NO continuity, go to test "Test 32 — Checking for a Pin to Pin Short in the Harness" on page 572.

Test 20 — Checking for Blink Code 7-6

1. Turn the ignition key OFF.
2. Connect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Turn the ignition key ON.

   If blink code 7-6 is still active, check the EECU and connectors for dirt, loose or shorted pins or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If blink code 7-6 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors for proper connections.

Test 32 — Checking for a Pin to Pin Short in the Harness

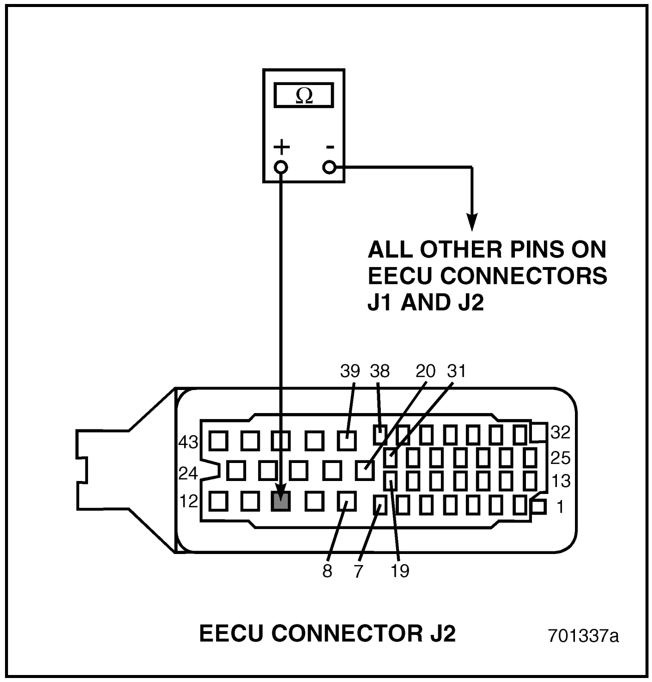


Figure 726

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2 and remove fuse 40.
3. Check for continuity between EECU connector J2 pin 10 and all other pins on EECU connectors J1 and J2. Do not check pins 22 and 41 on EECU connector J2 (see Figure 726).

   If continuity exists, one of the voltage supply circuits (EJ2-10-2.0, EJ2-22-2.0 or EJ2-41-2.0) is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, replace the EECU and retest the system.

BLINK CODE 7-6 — ENGINE ELECTRONIC CONTROL UNIT (EECU) SWITCHED VOLTAGE (ASET™ CEGR ENGINE)

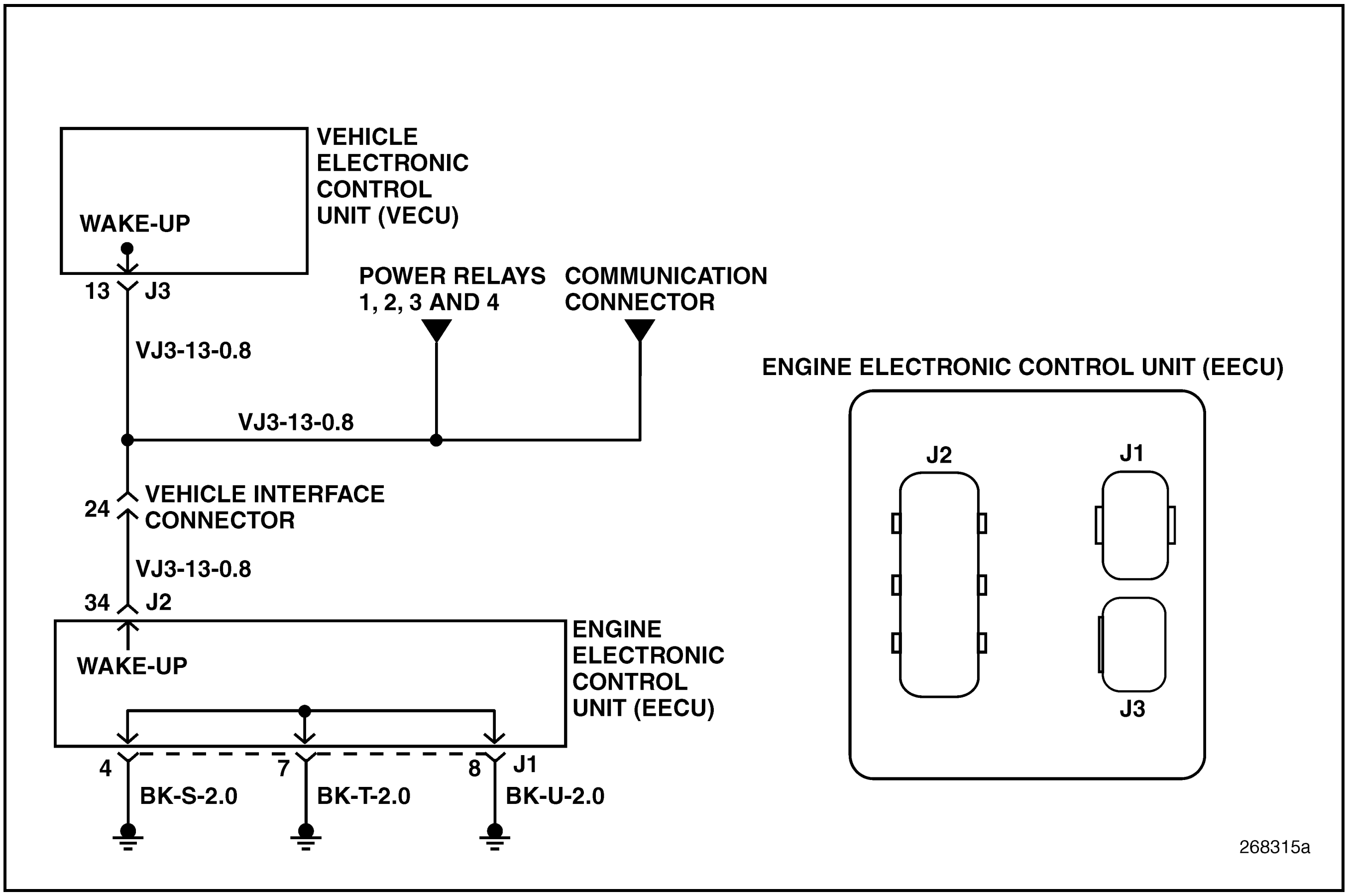


Figure 727 — Engine Electronic Control Unit (EECU) Voltage Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 4 (Voltage Low/Open)

Parameter Identification (PID): 158

Message Identification (MID): 128

Circuit Description: The Engine Electronic Control Unit (EECU) receives a wake-up signal from the Vehicle Electronic Control Unit (VECU). The switched voltage signal is applied to the EECU at connector J2 pin 34.

Code Setting Conditions: Code 7-6 will become active if the Engine Electronic Control Unit (EECU) senses a signal less than 5.5 volts at EECU connector J2 pin 34 for 10 seconds. Code 7-6 will become inactive if the switched voltage signal returns to greater than 5.5 volts at EECU connector J2 pin 34 for 1 second.

Additional Symptoms: Poor performance, low power or no start. If fault 7-6 is active and fault code 7-5 is not active, it may be impossible for the Engine Electronic Control Unit (EECU) to control the Electronic Unit Pumps (EUPs).

Test 1 — Checking for Fault Codes

1. Check if code 7-6 is set.
2. Check if code 7-5 is also set.

   If code 7-5 is also set, go to the Code 7-5 diagnostic routine.

   If only code 7-6 is set, go to test “Test 2 — Checking the EECU Wake-Up Signal Voltage” on page 574.

   If code 7-6 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Electronic Control Unit (EECU) connectors for frayed wires and loose or corroded connections.

Test 2 — Checking the EECU Wake-Up Signal Voltage

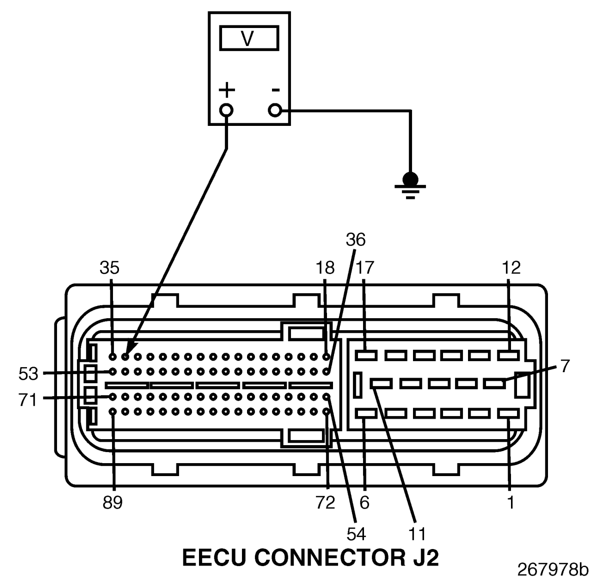


Figure 728

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 34 versus a good ground (see Figure 728).

   If battery voltage is NOT present, there is an open in circuit VJ3-13-0.8 between EECU and the splice for VECU. Locate and repair the open circuit.

   If battery voltage is present, go to test “Test 5 — Checking the EECU Ground Circuits” on page 574.

Test 5 — Checking the EECU Ground Circuits

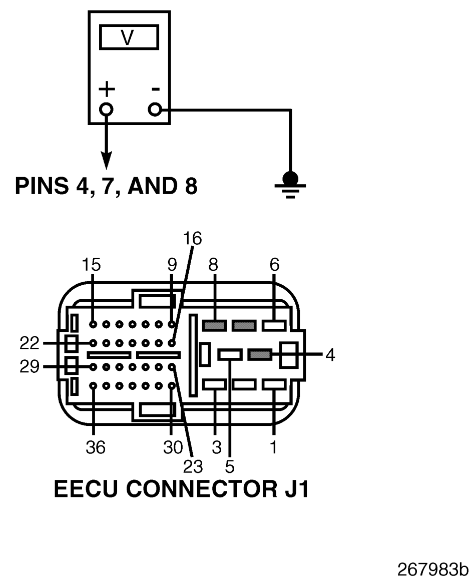


Figure 729

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit connectors J1, J2 and J3.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pins 4, 7 and 8 versus a good ground (see Figure 729).

   If the measured voltage is greater than 0.5 volts on any of the pins, the suspect ground circuit is shorted to voltage. Locate and repair the short to voltage.

   If voltage is NOT present on ANY pins, go to test “Test 10 — Checking for an Open Ground Circuit” on page 575.

Test 10 — Checking for an Open Ground Circuit

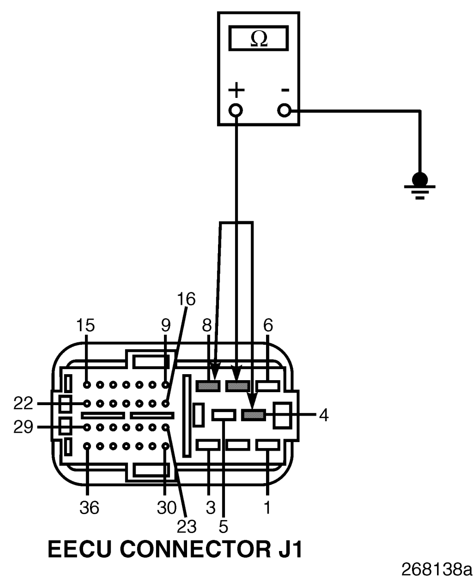


Figure 730

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connector J1.
3. Check for continuity between EECU connector J1 pins 4, 7 and 8 versus a good ground (see Figure 730).

   If continuity exists between ALL pins and ground, go to test “Test 20 — Checking for Blink Code 7-6” on page 575.

   If there is NO continuity, check the suspect circuit for an open.

Test 20 — Checking for Blink Code 7-6

1. Turn the ignition key OFF.
2. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Turn the ignition key ON.

   If blink code 7-6 is still active, check the EECU and connectors for dirt, loose or shorted pins or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If blink code 7-6 is NOT active, the diagnostic procedures have corrected the problem. Check all connectors for proper connections.

BLINK CODE 7-7 — EXHAUST TEMPERATURE REFERENCE THERMOCOUPLE

Failure Mode Identifier (FMI): 8 (Failed Device)

Parameter Identification (PID): S254

Message Identification (MID): 142

NOTE

The Exhaust Temperature Reference Thermocouple inside the Vehicle Electronic Control Unit (VECU) has an open circuit. If the code is active, attempt to clear the code from memory and check if the code resets. If the blink code 7-7 resets, replace the VECU and retest the system.

BLINK CODE 7-9 — VARIABLE TURBINE GEOMETRY (VTG) CONTROL VALVE (ASET™ CEGR ENGINE)

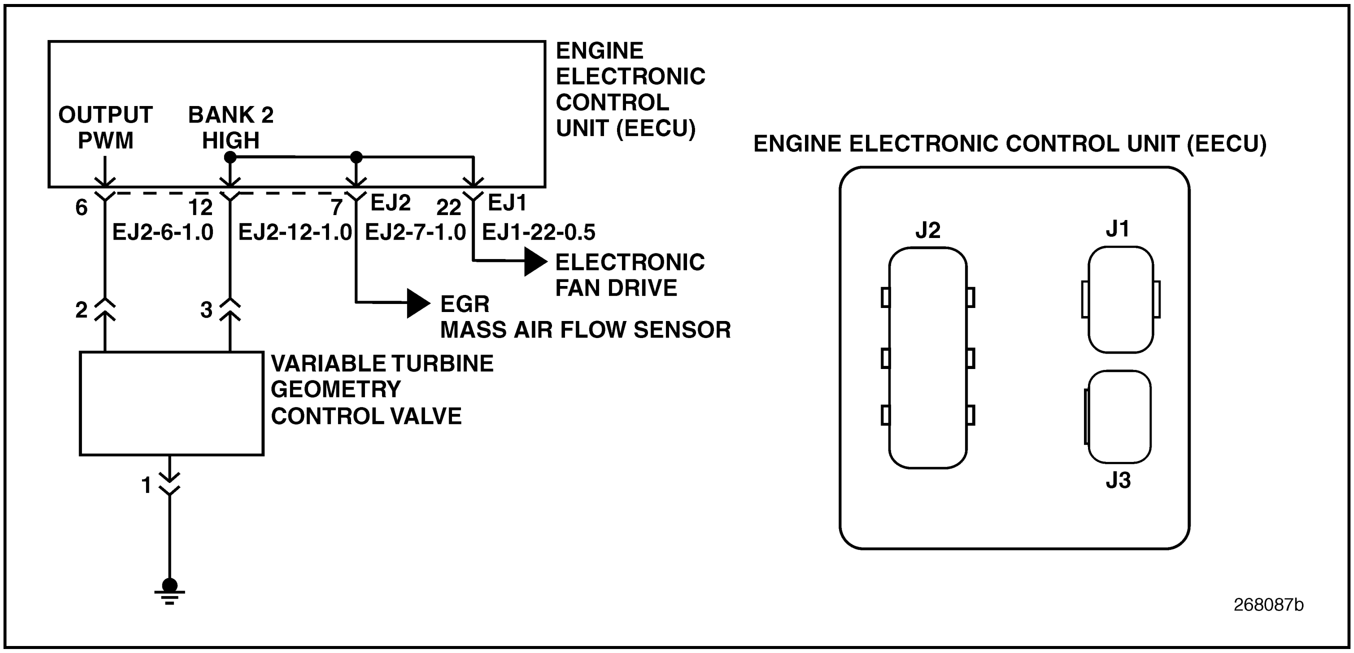


Figure 731 — Variable Turbine Geometry (VTG) Control Valve Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low) or 5 (Current Low/Open)

Parameter Identification (PID): S27

Message Identification (MID): 128

Circuit Description: The Engine Electronic Control Unit (EECU) drives the Variable Turbine Geometry (VTG) Control Valve in response to inputs from the VTG Position Sensor and the Boost Air Pressure (BAP) Sensor. The VTG Control Valve regulates the air pressure to the VTG Actuator by means of a pulsewidth modulated signal from the EECU.

Location: The Variable Turbine Geometry (VTG) Control Valve is located on the left side of the engine, on the air inlet manifold.

Code Setting Conditions: If the Engine Electronic Control Unit (EECU) senses an open, short to ground or short to voltage in the VTG Actuator drive circuit, the Electronic Malfunction Lamp (EML) will turn ON and blink code 7-9 will set. Additionally, if the EECU senses a short to ground or open on the high side circuit, the Electronic Malfunction Lamp (EML) will turn ON and blink code 7-9 will set.

NOTE

When FMI 3 or 4 are logged, the fault will remain active for 1 minute after the conditions which caused the fault are removed, although the Variable Turbine Geometry (VTG) Control Valve will operate during this time.

NOTE

An open ground line will cause the Electronic Malfunction Lamp (EML) will turn ON and blink code 4-5 will set, with FMI 7.

Test 1 — Checking for Fault Codes

1. Check if code 7-9 is set.

   If code 7-9 is set, go to test “Test 2 — Checking Code 7-9 Failure Mode Identifier (FMI)” on page 578.

   If code 7-9 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Electronic Control Unit (EECU) connectors for frayed wires and loose or corroded connections.

Test 2 — Checking Code 7-9 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high), go to test “Test 5 — Checking for a Short to Voltage in the VTG Control Valve Low Side Drive Circuit” on page 578.

   If the FMI is 4 (voltage low) or 5 (current low/open), go to test “Test 4 — Checking for a Short to Ground in the VTG Control Valve Low Side Drive Circuit” on page 578.

Test 4 — Checking for a Short to Ground in the VTG Control Valve Low Side Drive Circuit

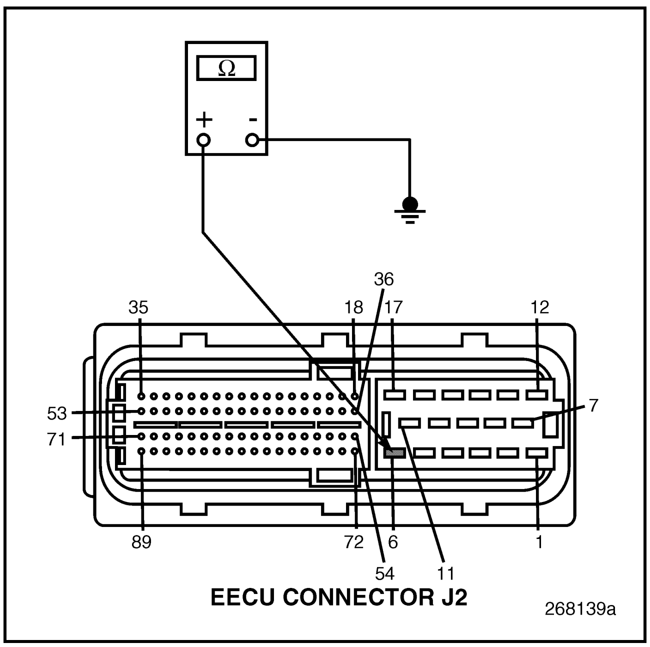


Figure 732

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the VTG Control Valve harness connector.
4. Check for continuity between EECU harness connector J2, pin 6 and a good ground (see Figure 732).

   If there is NO continuity, go to test “Test 8 — Checking for an Open in the VTG Control Valve Low Side Drive Circuit” on page 579.

   If continuity exists, locate and repair the short circuit to ground in circuit EJ2-6-1.0.

Test 5 — Checking for a Short to Voltage in the VTG Control Valve Low Side Drive Circuit

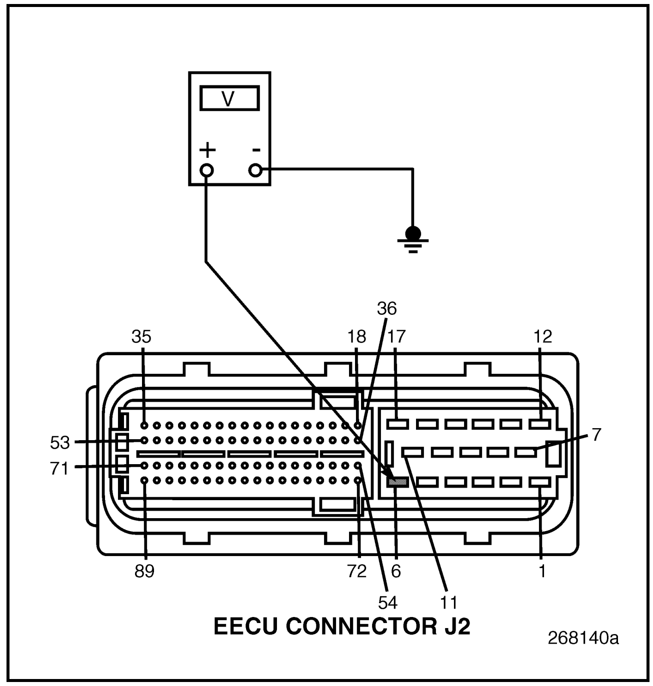


Figure 733

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 6 and a good ground (see Figure 733).

   If voltage is present, locate and repair the short circuit to voltage in circuit EJ2-6-1.0.

   If NO voltage is present, go to test “Test 10 — Checking for a Short Circuit at the EECU Harness Connector” on page 579.

Test 8 — Checking for an Open in the VTG Control Valve Low Side Drive Circuit

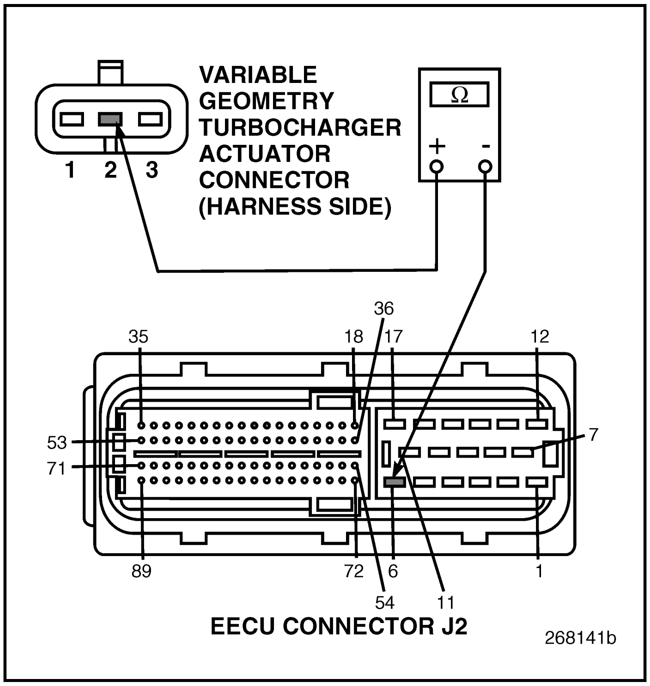


Figure 734

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the VTG Control Valve harness connector.
4. Check for continuity between EECU harness connector J2, pin 6 and the VTG Actuator harness connector pin 2 (see Figure 734).

   If there is NO continuity, locate and repair the open in circuit EJ2-6-1.0.

   If continuity exists, go to test “Test 16 — Checking for a Short to Ground in the VTG Control Valve High Side Circuit” on page 580.

Test 10 — Checking for a Short Circuit at the EECU Harness Connector

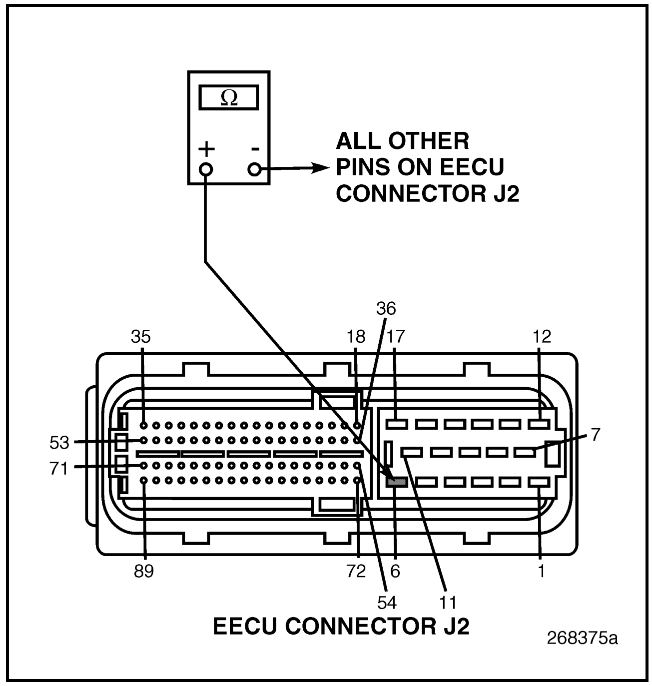


Figure 735

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the VTG Control Valve harness connector.
4. Check for continuity between EECU harness connector J2, pin 6 and all other pins on connector J2 (see Figure 735).

   If continuity exists, locate and repair the short to the circuit that showed continuity.

   If there is NO continuity, go to test “Test 20 — Checking for a Faulty EECU Connector” on page 580.

Test 16 — Checking for a Short to Ground in the VTG Control Valve High Side Circuit

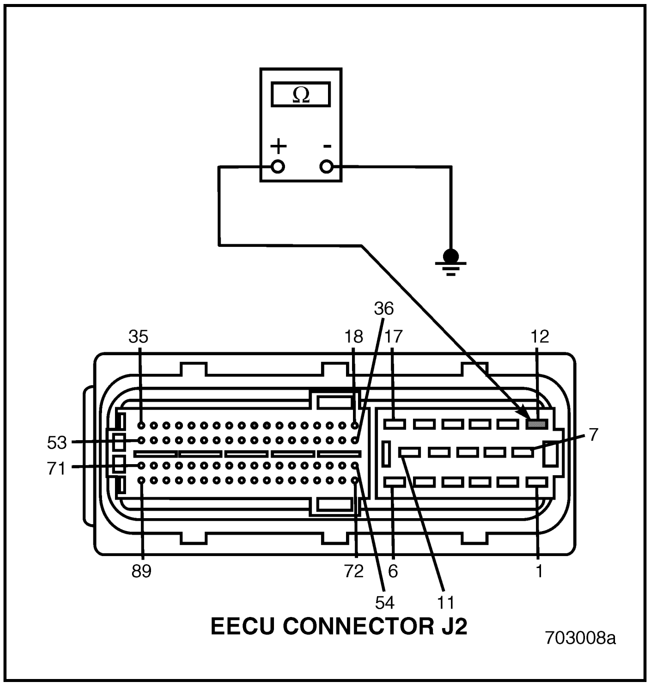


Figure 736

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the VTG Control Valve harness connector.
4. Check for continuity between EECU harness connector J2, pin 12 and a good ground (see Figure 736).

   If there is NO continuity, go to test “Test 32 — Checking for an Open in the VTG Control Valve High Side Circuit” on page 580.

   If continuity exists, locate and repair the short circuit to ground in circuit EJ2-12-1.0.

Test 20 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect EECU connector J2 for dirt, loose pins or deformed contacts.
4. If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the terminals are making good contact, go to test “Test 40 — Checking for a Faulty VTG Control Valve” on page 581.

Test 32 — Checking for an Open in the VTG Control Valve High Side Circuit

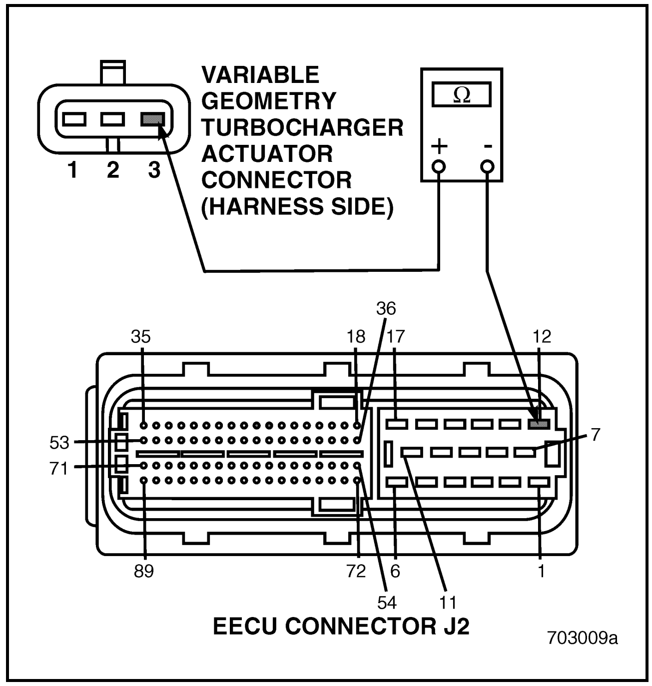


Figure 737

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the VTG Control Valve harness connector.
4. Check for continuity between EECU harness connector J2, pin 12 and the VTG Actuator harness connector pin 3 (see Figure 737).

   If there is NO continuity, locate and repair the open in circuit EJ2-12-1.0.

   If continuity exists, go to test “Test 64 — Checking for a Faulty EECU Connector” on page 581.

Test 40 — Checking for a Faulty VTG Control Valve

1. Turn the ignition key OFF.
2. Replace the VTG Control Valve with a known good unit.
3. Restore all electrical connections and retest the system.

   If code 7-9 is still active, reinstall the original VTG Control Valve and replace the EECU and retest the system.

   If code 7-9 is no longer active, replacing the VTG control valve corrected the problem. Check all electrical connectors to ensure proper connections.

Test 64 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect EECU connector J2 for dirt, loose pins or deformed contacts.
4. If a repairable open is found or the terminal feels loose, repair the harness connector.

   If the terminals are making good contact, go to test "Test 128 — Checking for a Short Circuit in the VTG Control Valve" on page 581.

Test 128 — Checking for a Short Circuit in the VTG Control Valve

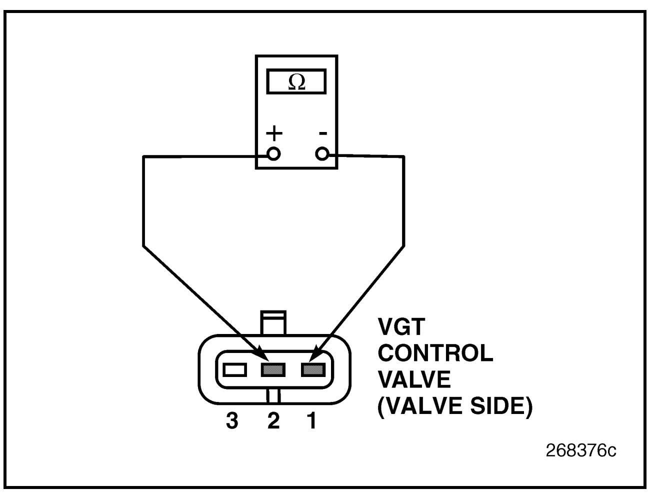


Figure 738

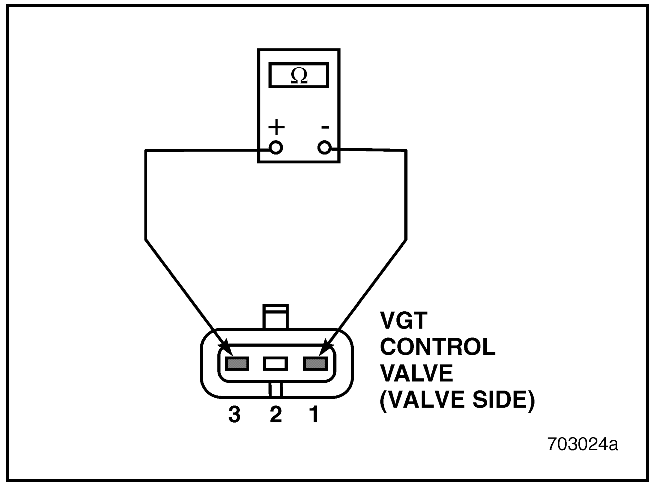


Figure 739

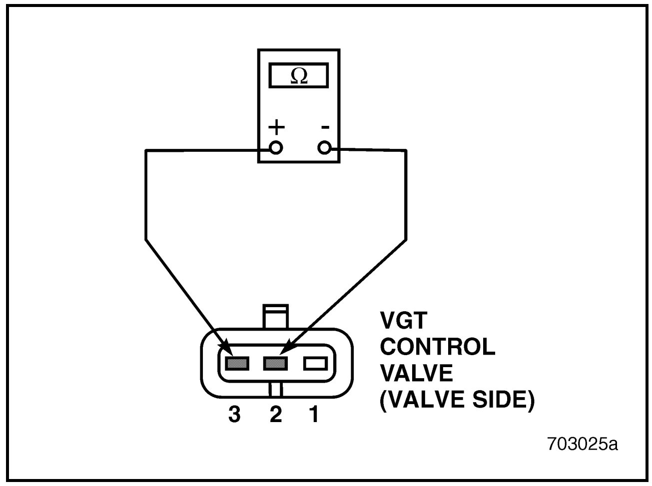


Figure 740

1. Turn the ignition key OFF.
2. Disconnect the VTG Control Valve harness connector.
3. Measure the resistance between terminals 1 and 2 (see Figure 738), 1 and 3 (see Figure 739), and 2 and 3 (see Figure 740) of the VTG Control valve.

   If the measured resistance between each of the terminals indicates a short circuit, replace the VTG Control Valve.

   If the measured resistance between each of the terminals does not indicate a short circuit, go to test "Test 256 — Checking for a Short Circuit to Ground in the VTG Control Valve" on page 582.

Test 256 — Checking for a Short Circuit to Ground in the VTG Control Valve

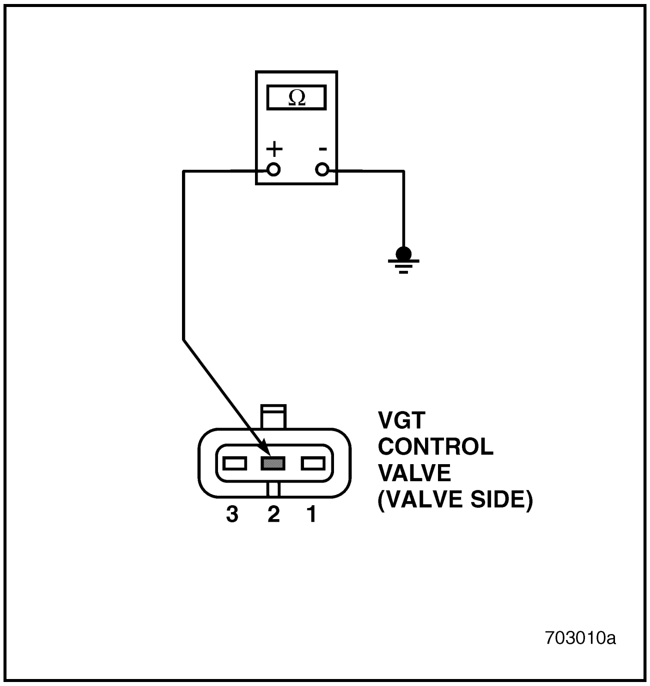


Figure 741

1. Turn the ignition key OFF.
2. Disconnect the VTG Control Valve harness connector.
3. Check for continuity between pin 2 of the VTG Control valve and a good ground (see Figure 741).

   If continuity exists, replace the VTG Control Valve.

   If continuity does NOT exist, go to test “Test 512 — Checking the Engine Electronic Control Unit (EECU)” on page 582.

Test 512 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Connect the VTG Actuator harness connector.
4. Start the engine.

   If blink code 7-9 is still active, replace the EECU and retest the system.

   If blink code 7-9 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODES 8-1 THROUGH 8-6 — ELECTRONIC UNIT PUMP (EUP) (ASET™ IEGR ENGINE)

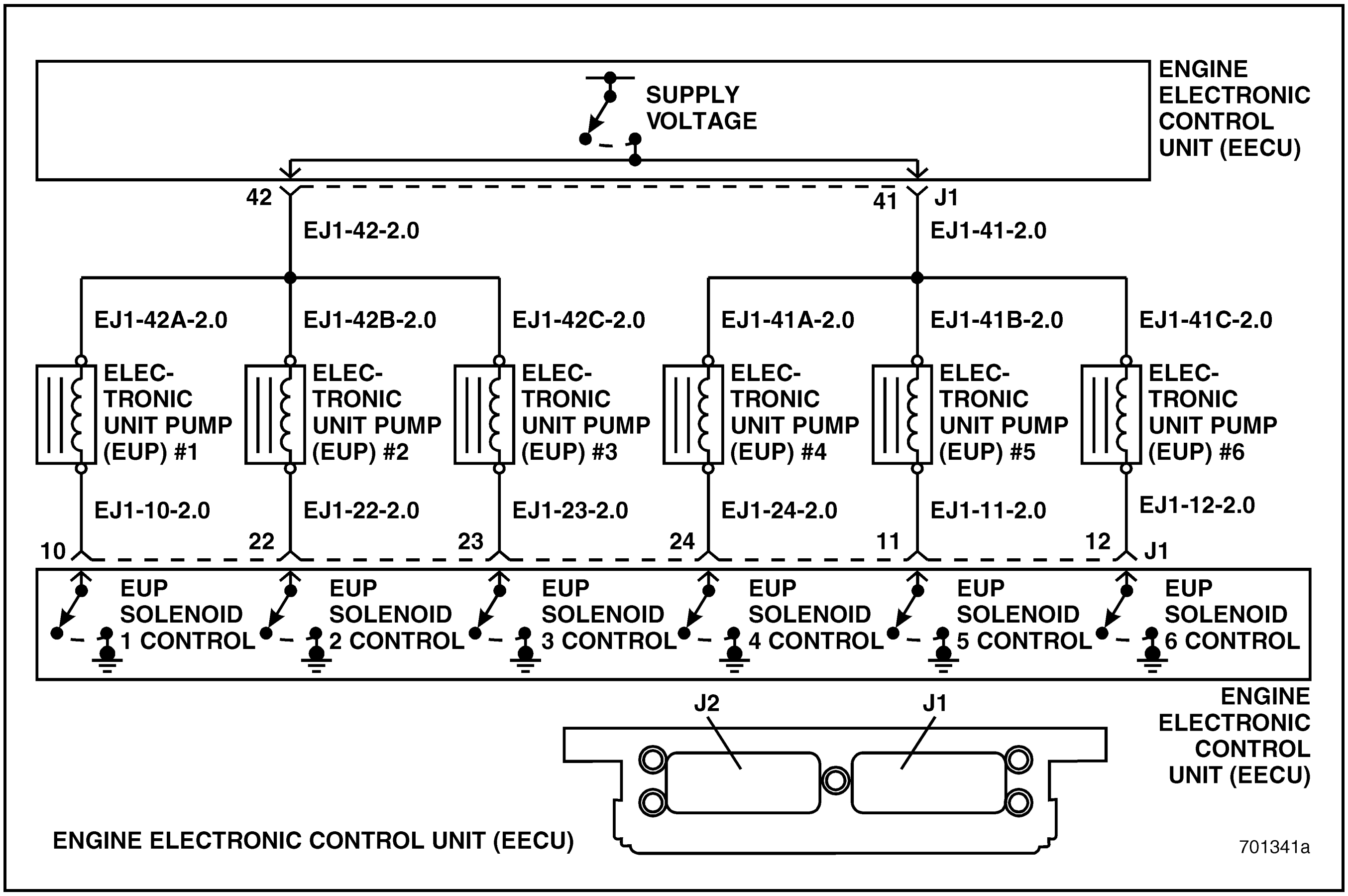


Figure 742 — Electronic Unit Pump (EUP) Circuits (ASET™ IEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open), 2 (Data Erratic), or 8 (Abnormal) — See NOTE below

Parameter Identification (PID): S1 Injector 1, S2 Injector 2, S3 Injector 3, S4 Injector 4, S5 Injector 5, S6 Injector 6

Message Identification (MID): 128

Circuit Description: Individual Electronic Unit Pump (EUP) operation is controlled by the Engine Electronic Control Unit (EECU) using six output transistor drivers that provide the ground circuit for the individual EUP Solenoids. The six EUPs are divided between two banks with each bank sharing a common voltage supply.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set a code if the EECU detects an open, short to ground or short to voltage on an EUP circuit for 25 milliseconds. If an EUP code is set, the EECU will turn on the Electronic Malfunction Lamp (EML) and a loss of one or more EUPs will occur.

Additional Symptoms: Poor performance, low power or no start.

NOTE

It is possible to get an FMI of 2 or 8 for this set of faults. However, the diagnostic procedure remains the same for FMI 2 or 8.

Test 1 — Checking for Codes

1. Verify that one or more of the Electronic Unit Pump (EUP) codes are set. The following chart identifies which EUP circuit has a fault.

   If one of the EUP codes is set, go to test "Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid" on page 584.

   If more than one EUP code is set, the complete EUP bank may be malfunctioning due to a fault in the shared voltage line or a shorted EUP Solenoid. Go to test "Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid" on page 584.

   If none of the EUP codes are set, wiggle the harness connectors to try to set the code. Visually inspect EUP Solenoid wires and terminals for frayed, loose or corroded connections.

Blink Code	Suspect Unit Pump Solenoid
8-1	1
8-2	2
8-3	3
8-4	4
8-5	5
8-6	6

Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from the suspect EUP Solenoid(s).
3. Check for continuity between the terminal posts on the suspect EUP(s).

   If continuity exists, go to test "Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)" on page 584.

   If there is NO continuity at the suspect EUP(s), the solenoid is open and must be replaced.

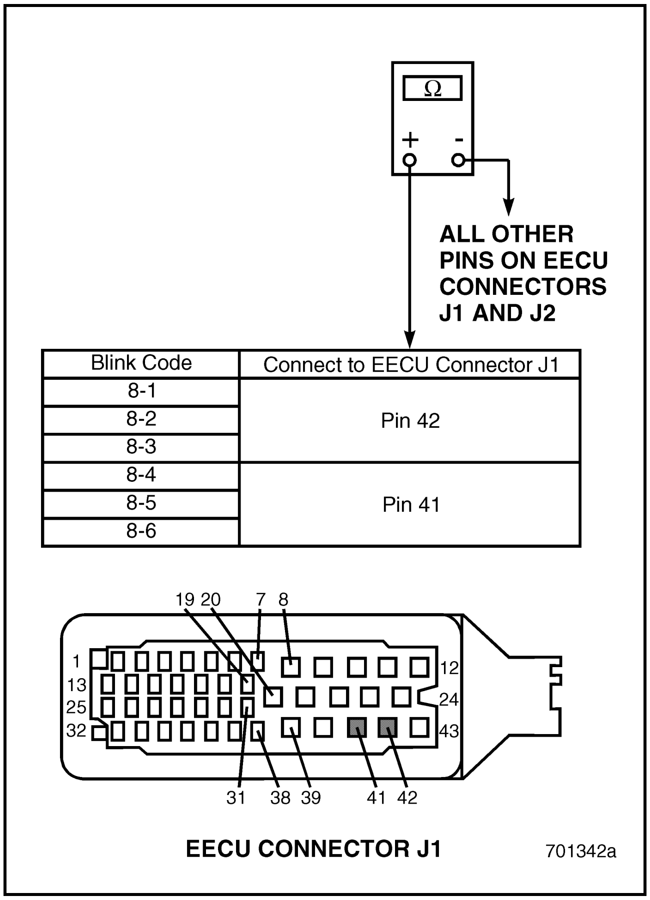
Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from the suspect EUP Solenoid(s) terminals.
3. Check for continuity from either terminal post on the suspect EUP Solenoid(s) to a good ground.

   If there is NO continuity at the suspect EUP Solenoid(s), go to test "Test 8 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 585.

   If continuity exists, the EUP Solenoid is shorted to ground and must be replaced.

Test 8 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line



Blink Code	Connect to EECU Connector J1
8-1	Pin 42
8-2	
8-3	
8-4	Pin 41
8-5	
8-6	

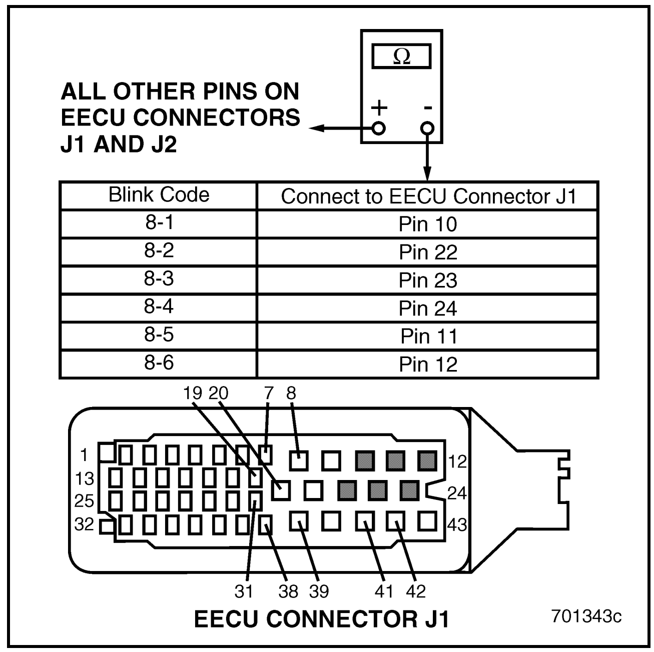
Figure 743

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Electronic Control Unit (EECU).
3. If blink code 8-1, 8-2 or 8-3 is set, disconnect the harness electrical connectors from the EUP solenoids 1, 2 and 3. If blink code 8-4, 8-5 or 8-6 is set, disconnect the harness electrical connectors from EUP solenoids 4, 5 and 6.
4. If blink code 8-1, 8-2 or 8-3 is set, check for continuity between EECU harness connector J1 pin 42 and all other pins on EECU connectors J1 and J2. If blink code 8-4, 8-5 or 8-6 is set, check continuity between EECU harness connector J1 pin 41 and all other pins on EECU connectors J1 and J2 (see Figure 743).

   If there is NO continuity, go to test “Test 16 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 585.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 16 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line



Blink Code	Connect to EECU Connector J1
8-1	Pin 10
8-2	Pin 22
8-3	Pin 23
8-4	Pin 24
8-5	Pin 11
8-6	Pin 12

Figure 744

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from the suspect EUP Solenoid(s).
4. Check for continuity between the EECU J1 harness connector pin for the suspect EUP Solenoid (see chart in Figure 744) and all other pins on EECU connectors J1 and J2.

   If there is NO continuity, go to test “Test 32 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector” on page 586.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

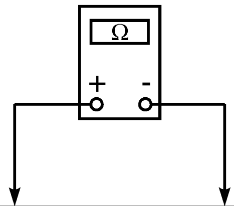
Test 32 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from the suspect EUP Solenoid(s).
4. Check for continuity between each of the suspect EUP Solenoid harness connectors and a good ground.

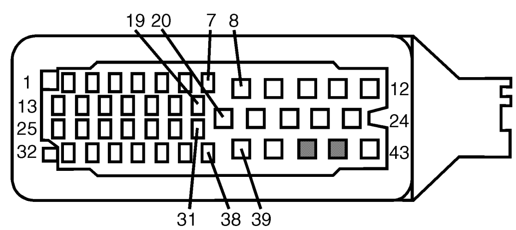
   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 64 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 586.

Test 64 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line



Blink Code	Connect to EECU Connector J1	EUP Circuit # at Solenoid
8-1	Pin 42	EJ1-42A
8-2	Pin 42	EJ1-42B
8-3	Pin 42	EJ1-42C
8-4	Pin 41	EJ1-41A
8-5	Pin 41	EJ1-41B
8-6	Pin 41	EJ1-41C



EECU CONNECTOR J1 701344a

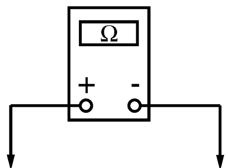
Figure 745

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from the suspect EUP Solenoid(s).
4. If blink code 8-1, 8-2 or 8-3 is set, check for continuity between EECU harness connector J1 pin 42 and the suspect EUP harness connector (see Figure 745). If blink code 8-4, 8-5 or 8-6 is set, check continuity between EECU harness connector J1 pin 41 and the suspect EUP harness connector (see Figure 745).

   If there is NO continuity, repair the open in the suspect circuit.

   If continuity exists, go to test “Test 128 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 587.

Test 128 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line



Injector Code	Connect to EECU Connector J1	EUP Circuit # at Solenoid
8-1	Pin 10	EJ1-10
8-2	Pin 22	EJ1-22
8-3	Pin 23	EJ1-23
8-4	Pin 24	EJ1-24
8-5	Pin 11	EJ1-11
8-6	Pin 12	EJ1-12

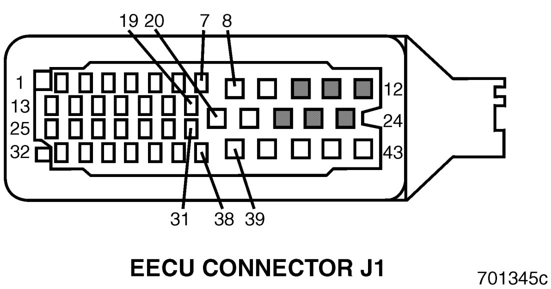


Figure 746

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from the suspect EUP Solenoid(s).
4. Check for continuity between the suspect EUP Solenoid harness connector and EECU harness connector J1 (see chart in Figure 746).

   If there is NO continuity, repair the open in the suspect circuit.

   If continuity exists, go to test "Test 256 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 587.

Test 256 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line

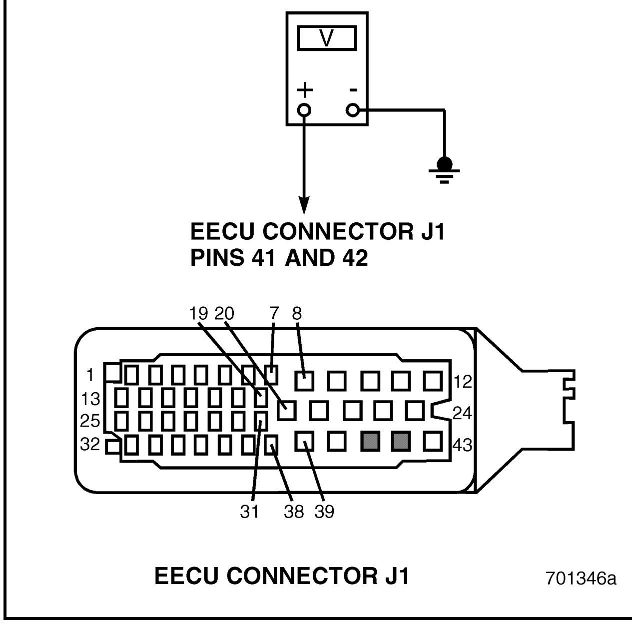


Figure 747

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the Engine Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pins 41 and 42 versus a good ground (see Figure 747).

   If voltage is present, the suspect circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test "Test 512 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 588.

Test 512 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line

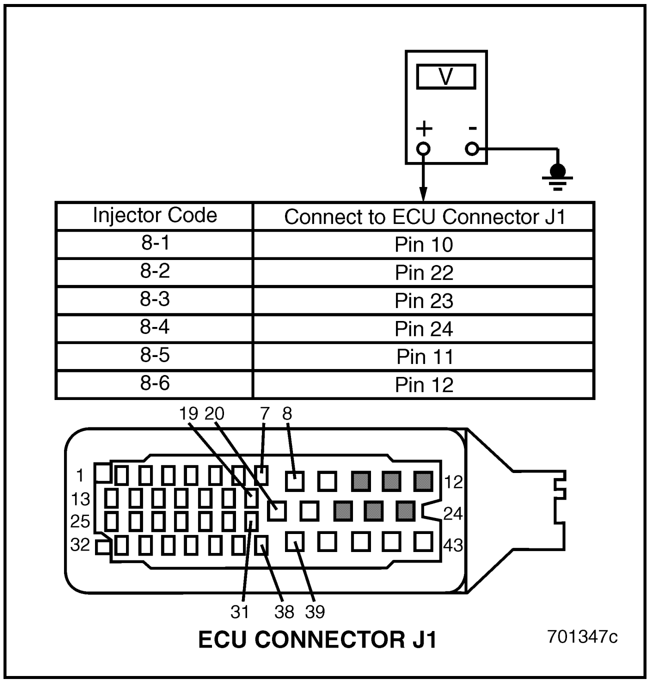


Figure 748

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1 and J2.
3. Disconnect the harness connectors from suspect Electronic Unit Pump (EUP) Solenoid.
4. Turn the ignition key ON.
5. Measure the voltage between the suspect EUP control line at EECU connector J1 and a good ground (see chart in Figure 748).

   If voltage is present, the suspect EUP is shorted to voltage. Locate and repair the short.

   If voltage is NOT present, go to test “Test 1024 — Checking for a Short at the EECU Connector” on page 588.

Test 1024 — Checking for a Short at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1 and J2 from the EECU.
3. Visually inspect EECU connectors J1 and J2 for dirt, loose pins or deformed contacts.
4. Align the purple male test lead found in the J 38581 V-MAC Jumper Wire Kit with EECU harness connector J1, pins 10, 11, 12, 22, 23, and 24. Gently push the test lead into each pin and check for looseness and poor contact.

   If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact and feel tight with the test lead, go to test “Test 2048 — Verifying if the Fault Code is Still Active” on page 589.

Test 2048 — Verifying if the Fault Code is Still Active

1. Turn the ignition key OFF.
2. Connect all harness electrical connectors to the Electronic Unit Pump (EUP) solenoids.
3. Connect Engine Electronic Control Unit (EECU) connectors J1 and J2.
4. Turn the ignition key ON.

   If the blink code is still active, check the Failure Mode Identifier (FMI) using a diagnostic computer. If the FMI is 2 or 8, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident, switch the location of the suspect EUP with that of a fault-free EUP. Reconnect all harness connectors and retest the system. If the PID has changed to the new location of the suspect EUP, replace the EUP, install all EUPs in their original location, and retest the system.

   If one EUP blink code is still active and the FMI is 3 or 4, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If multiple EUP blink codes are still active and the FMI is 3 or 4, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, go to test “Test 4096 — Inspecting the Mechanical Fuel System Components” on page 589.

   If the blink code is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 4096 — Inspecting the Mechanical Fuel System Components

1. Ensure that there is fuel in the fuel tank.
2. Inspect the fuel lines between the tank and the transfer pump for sharp bends or kinks, and repair as needed.
3. Check for air in the fuel system, and repair as needed.
4. Following instructions in the applicable ASET™ Service Manual, check the fuel pressure at the secondary fuel filter outlet.

   If the fuel pressure is NOT within specifications, perform any required fuel system repairs.
5. Remove the suspect EUPs from the engine and inspect for surface rust between the 3 O-rings.

   If rust is present, locate the source of the fuel contamination and replace any damaged components.

   If all of the mechanical fuel system components are in good working order, replace the EECU and retest the system.

BLINK CODE 8-1 — ELECTRONIC UNIT PUMP (EUP) (ASET™ CEGR ENGINE)

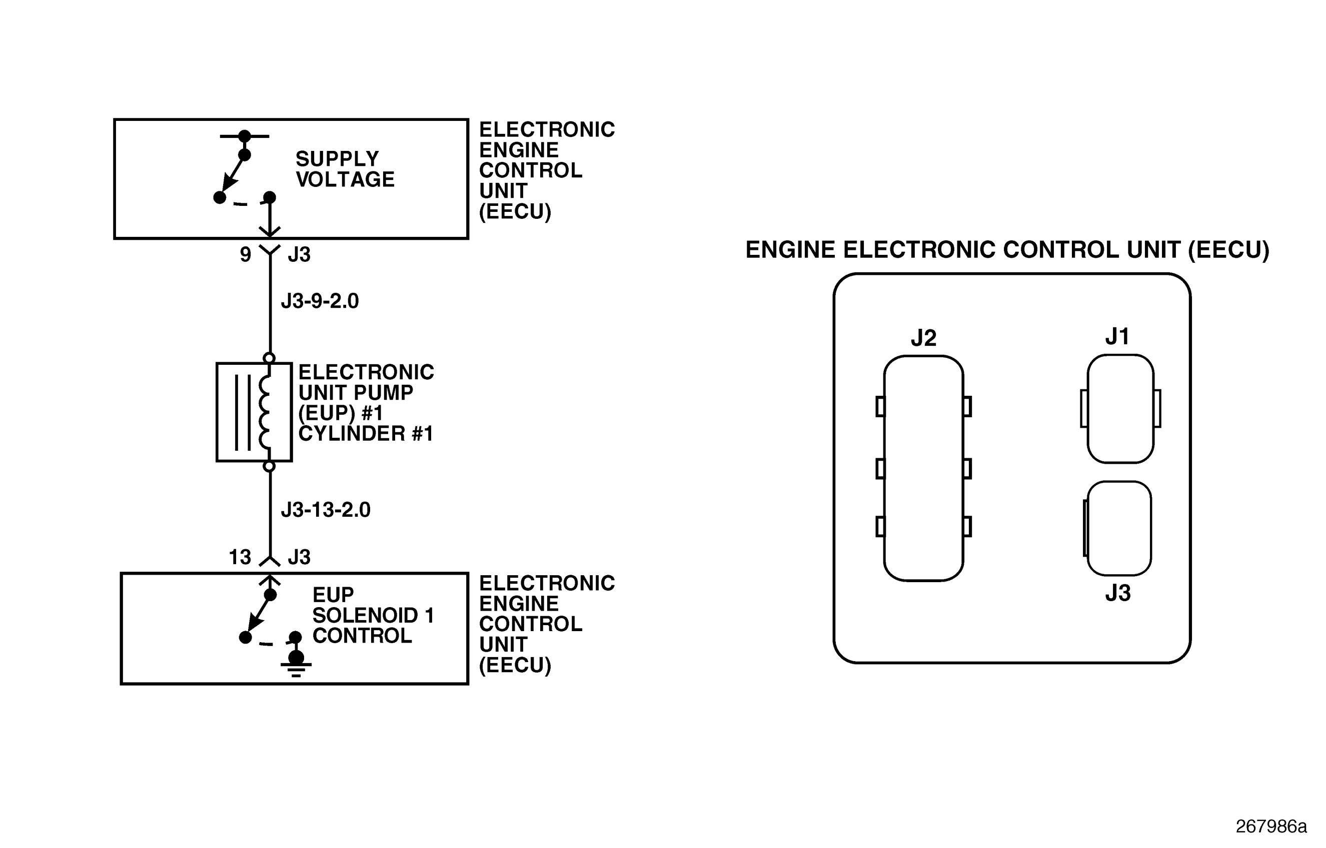


Figure 749 — Electronic Unit Pump (EUP) 1 Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 2 (Data Erratic), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 6 (Current High/Shorted) or 8 (Abnormal)

Parameter Identification (PID): S1 Injector 1

Message Identification (MID): 128

Circuit Description: Individual Electronic Unit Pump (EUP) operation is controlled by the Engine Electronic Control Unit (EECU) using six output transistor drivers that provide the ground circuit for the individual EUP Solenoids.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set a code if the EECU detects an open, short to ground or short to voltage on an EUP circuit for 25 milliseconds. If an EUP code is set, the EECU will turn on the Electronic Malfunction Lamp (EML) and a loss of one or more EUPs will occur.

Additional Symptoms: Poor performance, low power or no start.

Test 1 — Checking for Code 8-1

1. Check that code 8-1 is set.

   If code 8-1 is set, go to test “Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 1” on page 591.

   If code 8-1 is NOT set, wiggle the harness connectors to try to set the code. Visually inspect EUP Solenoid 1 wires and terminals for frayed, loose or corroded connections.

Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 1

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 1.
3. Check for continuity between the terminal posts on EUP Solenoid 1.

   If continuity exists, go to test “Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)” on page 591.

   If there is NO continuity at EUP Solenoid 1, the solenoid is open and must be replaced.

Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 1.
3. Check for continuity from either terminal post on EUP Solenoid 1 to a good ground.

   If there is NO continuity at EUP Solenoid 1, go to test “Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector” on page 591.

   If continuity exists, the EUP Solenoid 1 is shorted to ground and must be replaced.

Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 1.
4. Check for continuity between the EUP Solenoid 1 harness connectors and a good ground.

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 591.

Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line

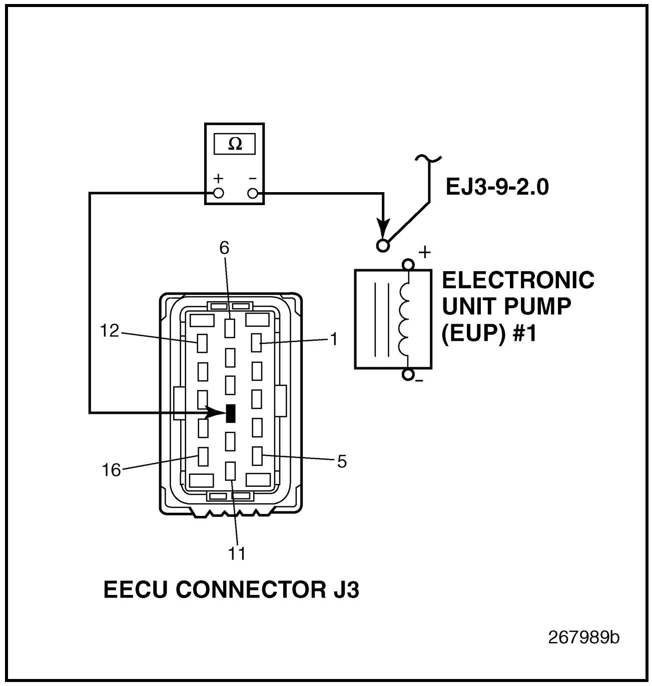


Figure 750

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 1.
4. Check for continuity between EECU harness connector J3 pin 9 and circuit EJ3-9-2.0 at EUP Solenoid 1 (see Figure 750).

   If there is NO continuity, repair the open in circuit EJ3-9-2.0.

   If continuity exists, go to test “Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 592.

Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

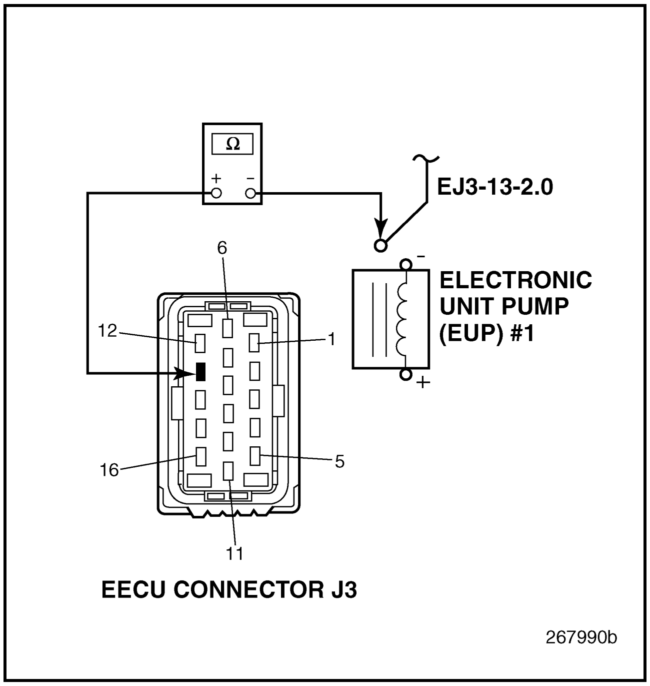


Figure 751

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from EUP Solenoid 1.
4. Check for continuity between circuit EJ3-13-2.0 at the EUP Solenoid 1 and EECU harness connector J3 pin 13 (see Figure 751).

   If there is NO continuity, repair the open in circuit EJ3-13-2.0.

   If continuity exists, go to test "Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 592.

Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line

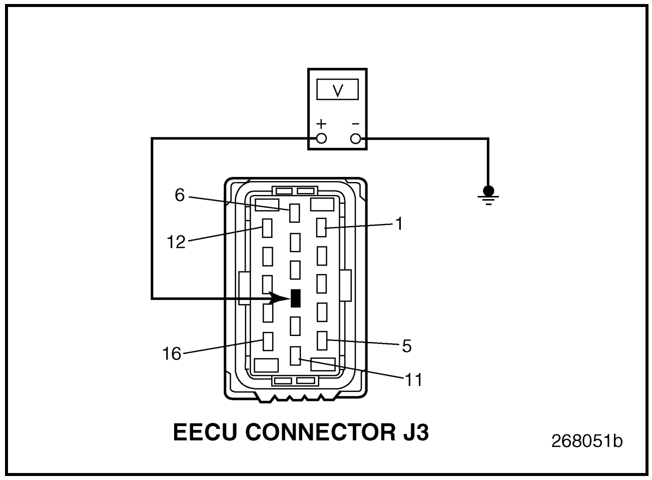


Figure 752

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J3 pin 9 and a good ground (see Figure 752).

   If voltage is present, the voltage supply circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test "Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 593.

Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line

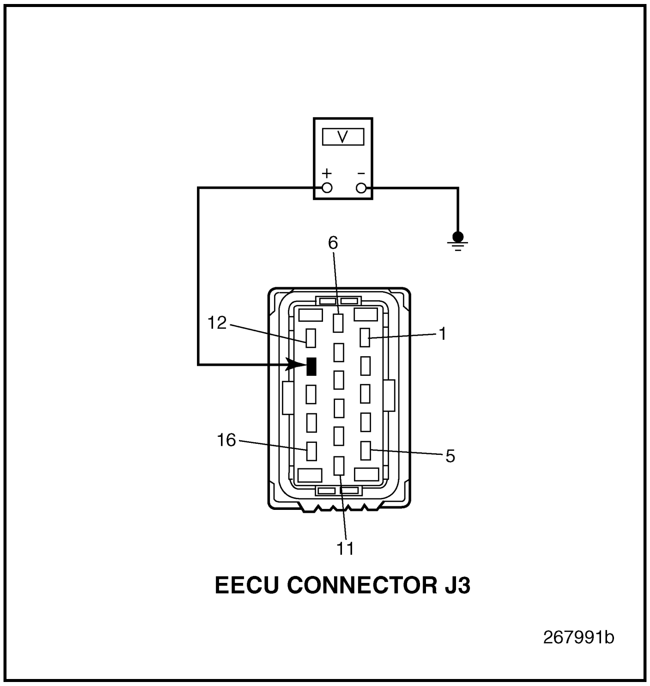


Figure 753

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Disconnect the harness connector from Electronic Unit Pump (EUP) Solenoid 1.
4. Turn the ignition key ON.
5. Measure the voltage between the EECU connector J3 pin 13 and a good ground (see Figure 753).

   If voltage is present, the EUP 1 solenoid control line is shorted to voltage. Locate and repair the short.

   If voltage is NOT present, go to test “Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 593.

Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line

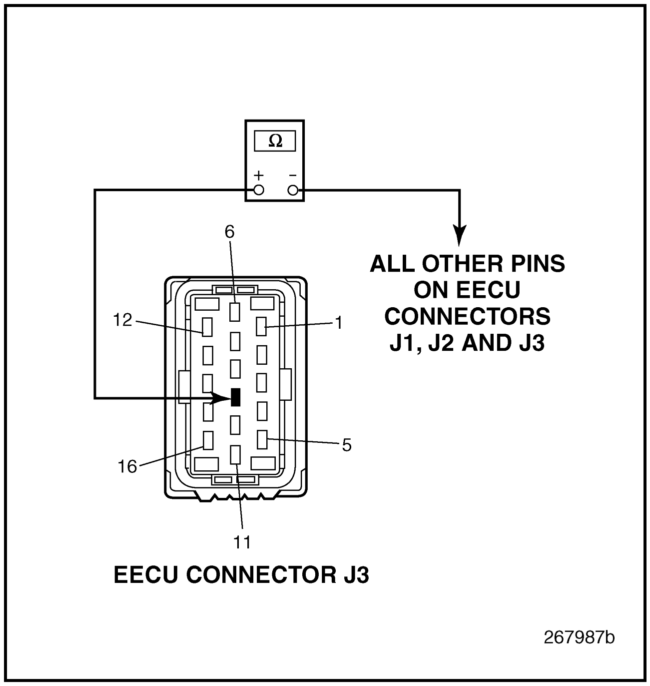


Figure 754

1. Turn the ignition key OFF.
2. Disconnect connector J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from the EUP solenoid 1.
4. Check for continuity between EECU harness connector J3 pin 9 and all other pins on EECU connectors J1, J2 and J3 (see Figure 754).

   If there is NO continuity, go to test “Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 594.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

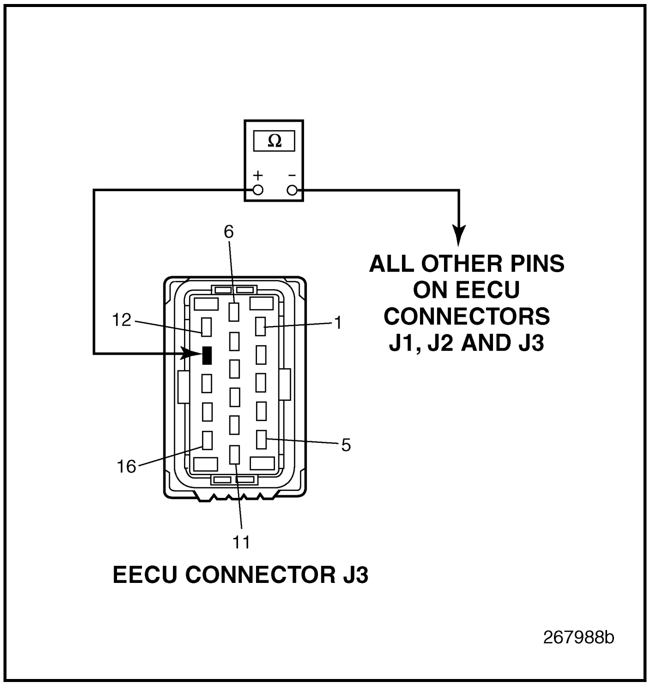


Figure 755

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from EUP Solenoid 1.
4. Check for continuity between the EECU harness connector J3 pin 13 all other pins on EECU connectors J1, J2 and J3 (see Figure 755).

   If there is NO continuity, go to test "Test 1024 — Checking for a Short at the EECU Connector" on page 594.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 1024 — Checking for a Short at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the EECU.
3. Visually inspect EECU connectors J1, J2 and J3 for dirt, loose pins or deformed contacts.
4. If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact and feel tight, go to test "Test 2048 — Verifying if the Fault Code is Still Active" on page 595.

Test 2048 — Verifying if the Fault Code is Still Active

1. Turn the ignition key OFF.
2. Connect all harness electrical connectors to the Electronic Unit Pump (EUP) solenoids.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If the blink code is still active, check the Failure Mode Identifier (FMI) using a diagnostic computer. If the FMI is 8, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident, switch the location of EUP 1 with that of a fault-free EUP. Reconnect all harness connectors and retest the system. If the PID has changed to the new location of the suspect EUP, replace the EUP, install all EUPs in their original location, and retest the system.

   If only the EUP 1 blink code is still active and the FMI is 3, 4, 5 or 6, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If multiple EUP blink codes are still active and the FMI is 3, 4, 5 or 6, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, go to test “Test 4096 — Inspecting the Mechanical Fuel System Components” on page 595.

   If the blink code is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 4096 — Inspecting the Mechanical Fuel System Components

1. Ensure that there is fuel in the fuel tank.
2. Inspect the fuel lines between the tank and the transfer pump for sharp bends or kinks, and repair as needed.
3. Check for air in the fuel system, and repair as needed.
4. Following instructions in the applicable ASET™ Service Manual, check the fuel pressure at the secondary fuel filter outlet.

   If the fuel pressure is NOT within specifications, perform any required fuel system repairs.
5. Remove EUP 1 from the engine and inspect for surface rust between the 3 O-rings.

   If rust is present, locate the source of the fuel contamination and replace any damaged components.

   If all of the mechanical fuel system components are in good working order, replace the EECU and retest the system.

BLINK CODE 8-2 — ELECTRONIC UNIT PUMP (EUP) (ASET™ CEGR ENGINE)

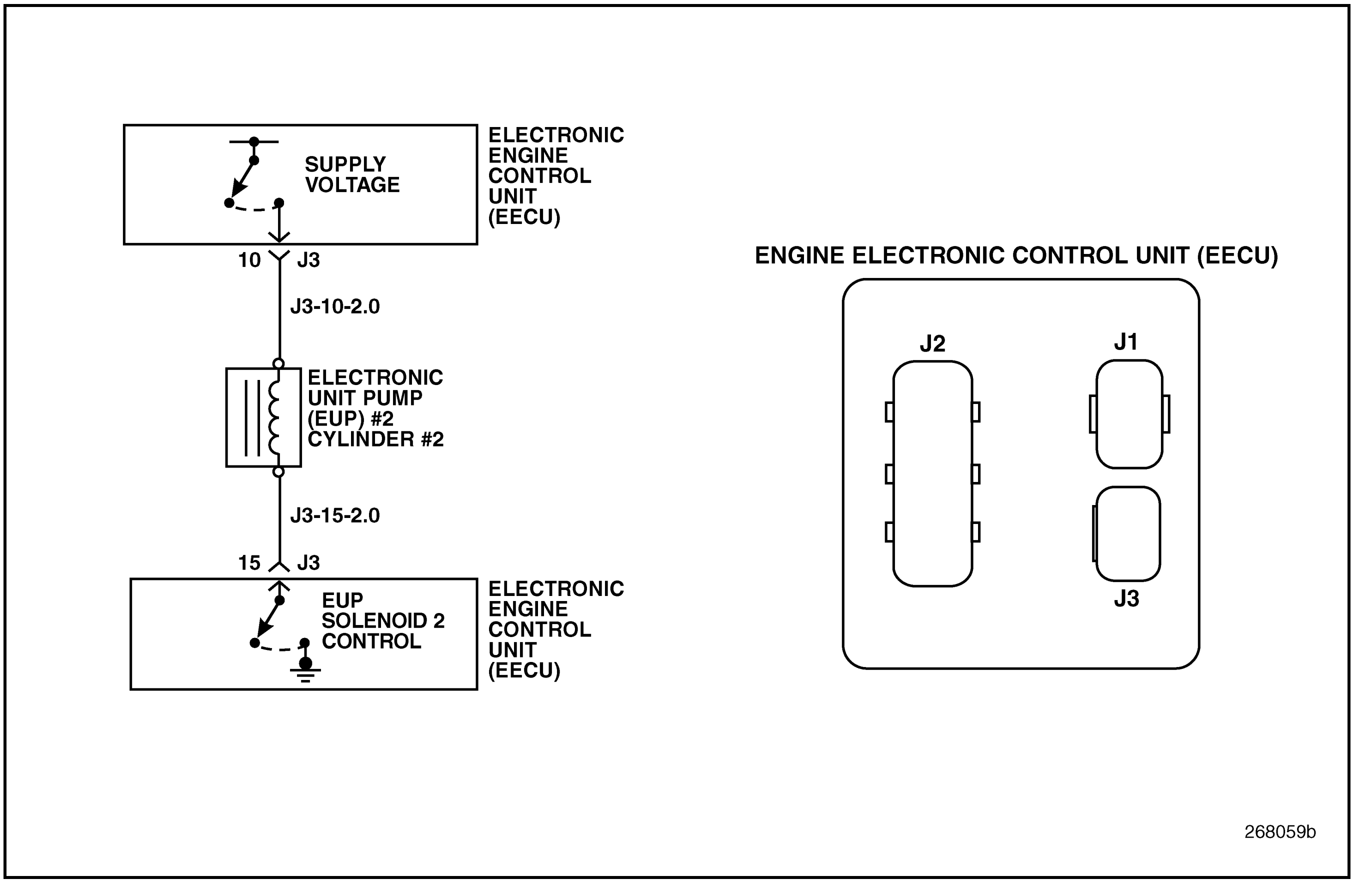


Figure 756 — Electronic Unit Pump (EUP) 2 Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 2 (Data Erratic), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 6 (Current High/Shorted) or 8 (Abnormal)

Parameter Identification (PID): S2 Injector 2

Message Identification (MID): 128

Circuit Description: Individual Electronic Unit Pump (EUP) operation is controlled by the Engine Electronic Control Unit (EECU) using six output transistor drivers that provide the ground circuit for the individual EUP Solenoids.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set a code if the EECU detects an open, short to ground or short to voltage on an EUP circuit for 25 milliseconds. If an EUP code is set, the EECU will turn on the Electronic Malfunction Lamp (EML) and a loss of one or more EUPs will occur.

Additional Symptoms: Poor performance, low power or no start.

Test 1 — Checking for Code 8-2

1. Check that code 8-2 is set.

   If code 8-2 is set, go to test “Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 2” on page 597.

   If code 8-2 is NOT set, wiggle the harness connectors to try to set the code. Visually inspect EUP Solenoid 2 wires and terminals for frayed, loose or corroded connections.

Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 2

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 2.
3. Check for continuity between the terminal posts on EUP Solenoid 2.

   If continuity exists, go to test “Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)” on page 597.

   If there is NO continuity at EUP Solenoid 2, the solenoid is open and must be replaced.

Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 2.
3. Check for continuity from either terminal post on EUP Solenoid 2 to a good ground.

   If there is NO continuity at EUP Solenoid 2, go to test “Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector” on page 597.

   If continuity exists, the EUP Solenoid 2 is shorted to ground and must be replaced.

Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 2.
4. Check for continuity between the EUP Solenoid 2 harness connectors and a good ground.

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 597.

Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line

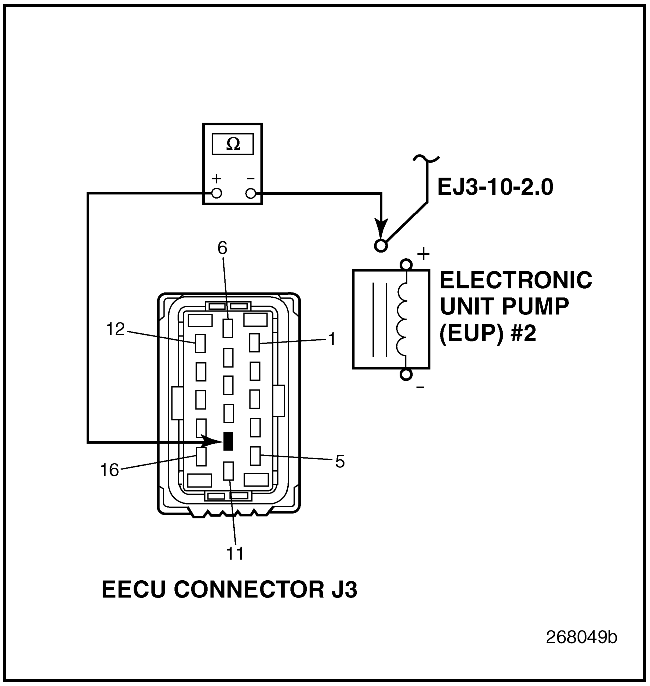


Figure 757

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 2.
4. Check for continuity between EECU harness connector J3 pin 10 and circuit EJ3-10-2.0 at EUP Solenoid 2 (see Figure 757).

   If there is NO continuity, repair the open in circuit EJ3-10-2.0.

   If continuity exists, go to test “Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 598.

Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

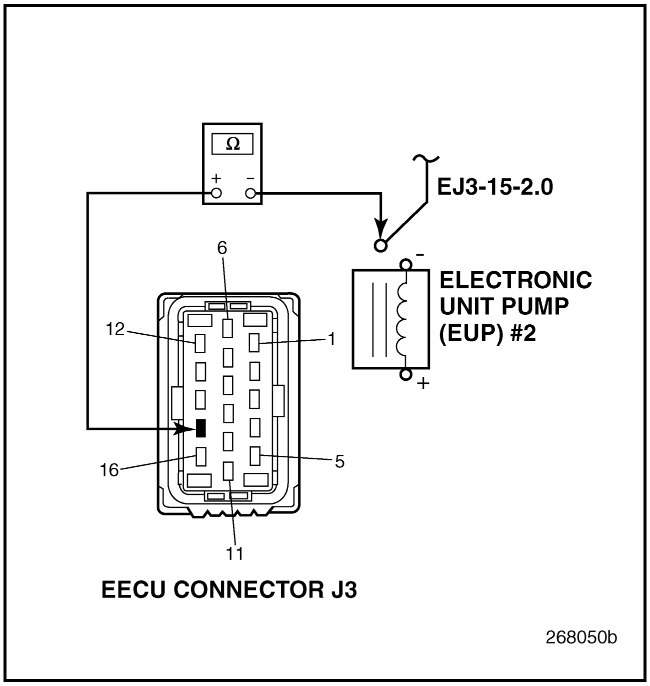


Figure 758

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from EUP Solenoid 2.
4. Check for continuity between circuit EJ3-15-2.0 at the EUP Solenoid 2 and EECU harness connector J3 pin 15 (see Figure 758).

   If there is NO continuity, repair the open in circuit EJ3-15-2.0.

   If continuity exists, go to test "Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 598.

Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line

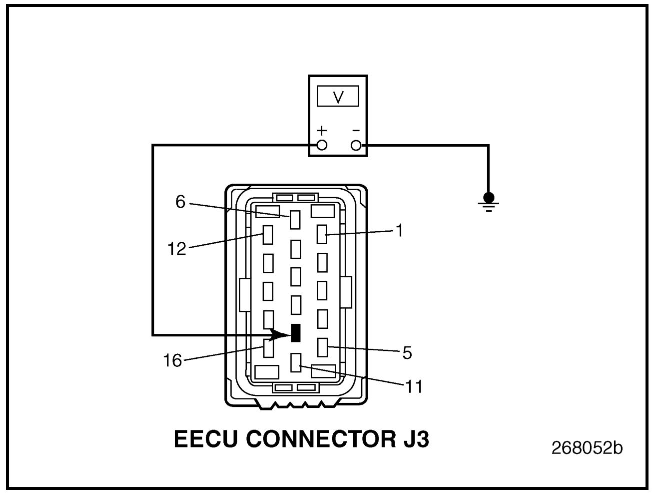


Figure 759

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J3 pin 10 and a good ground (see Figure 759).

   If voltage is present, the voltage supply circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test "Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 599.

Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line

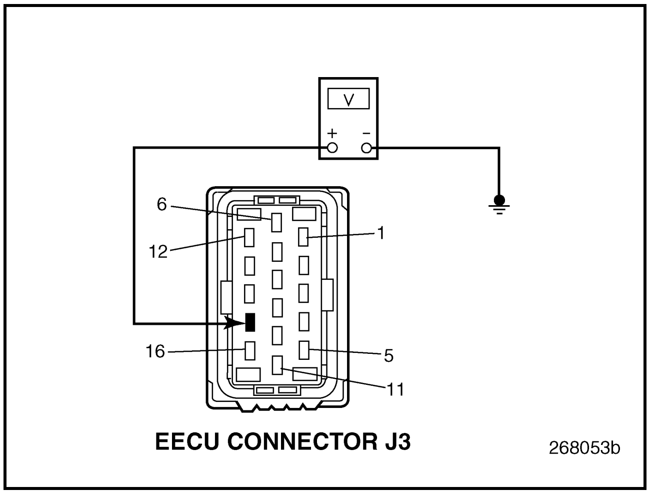


Figure 760

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Disconnect the harness connector from Electronic Unit Pump (EUP) Solenoid 2.
4. Turn the ignition key ON.
5. Measure the voltage between the EECU connector J3 pin 15 and a good ground (see Figure 760).

   If voltage is present, the EUP 2 solenoid control line is shorted to voltage. Locate and repair the short.

   If voltage is NOT present, go to test "Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 599.

Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line

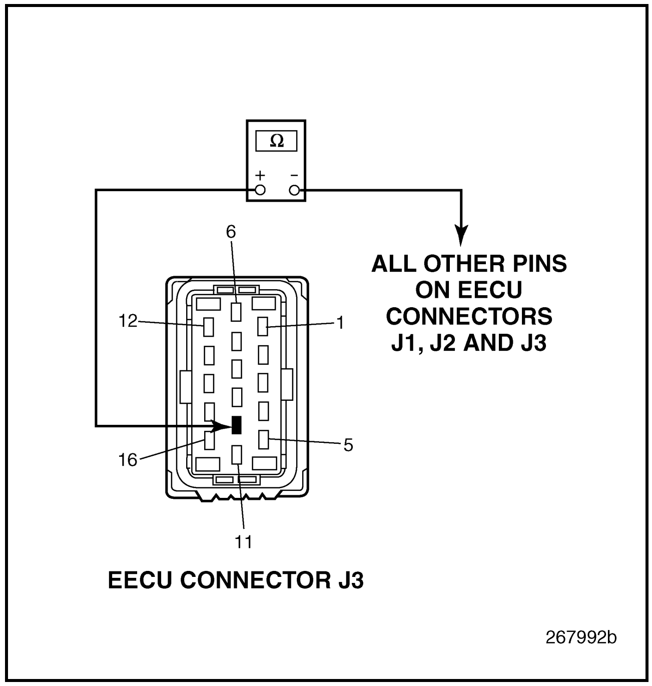


Figure 761

1. Turn the ignition key OFF.
2. Disconnect connector J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from the EUP solenoid 2.
4. Check for continuity between EECU harness connector J3 pin 10 and all other pins on EECU connectors J1, J2 and J3 (see Figure 761).

   If there is NO continuity, go to test "Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 600.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

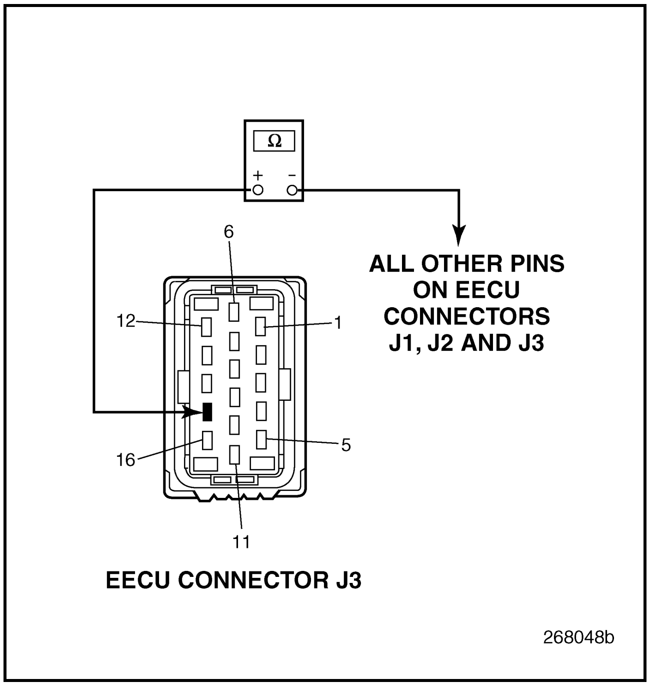


Figure 762

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from EUP Solenoid 2.
4. Check for continuity between the EECU harness connector J3 pin 15 all other pins on EECU connectors J1, J2 and J3 (see Figure 762).

   If there is NO continuity, go to test “Test 1024 — Checking for a Short at the EECU Connector” on page 600.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 1024 — Checking for a Short at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the EECU.
3. Visually inspect EECU connectors J1, J2 and J3 for dirt, loose pins or deformed contacts.
4. If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact, go to test “Test 2048 — Verifying if the Fault Code is Still Active” on page 601.

Test 2048 — Verifying if the Fault Code is Still Active

1. Turn the ignition key OFF.
2. Connect all harness electrical connectors to the Electronic Unit Pump (EUP) solenoids.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If the blink code is still active, check the Failure Mode Identifier (FMI) using a diagnostic computer. If the FMI is 8, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident, switch the location of EUP 2 with that of a fault-free EUP. Reconnect all harness connectors and retest the system. If the PID has changed to the new location of the suspect EUP, replace the EUP, install all EUPs in their original location, and retest the system.

   If only the EUP 2 blink code is still active and the FMI is 3, 4, 5 or 6, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If multiple EUP blink codes are still active and the FMI is 3, 4, 5 or 6, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, go to test “Test 4096 — Inspecting the Mechanical Fuel System Components” on page 601.

   If the blink code is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 4096 — Inspecting the Mechanical Fuel System Components

1. Ensure that there is fuel in the fuel tank.
2. Inspect the fuel lines between the tank and the transfer pump for sharp bends or kinks, and repair as needed.
3. Check for air in the fuel system, and repair as needed.
4. Following instructions in the applicable ASET™ Service Manual, check the fuel pressure at the secondary fuel filter outlet.

   If the fuel pressure is NOT within specifications, perform any required fuel system repairs.
5. Remove EUP 2 from the engine and inspect for surface rust between the 3 O-rings.

   If rust is present, locate the source of the fuel contamination and replace any damaged components.

   If all of the mechanical fuel system components are in good working order, replace the EECU and retest the system.

BLINK CODE 8-3 — ELECTRONIC UNIT PUMP (EUP) (ASET™ CEGR ENGINE)

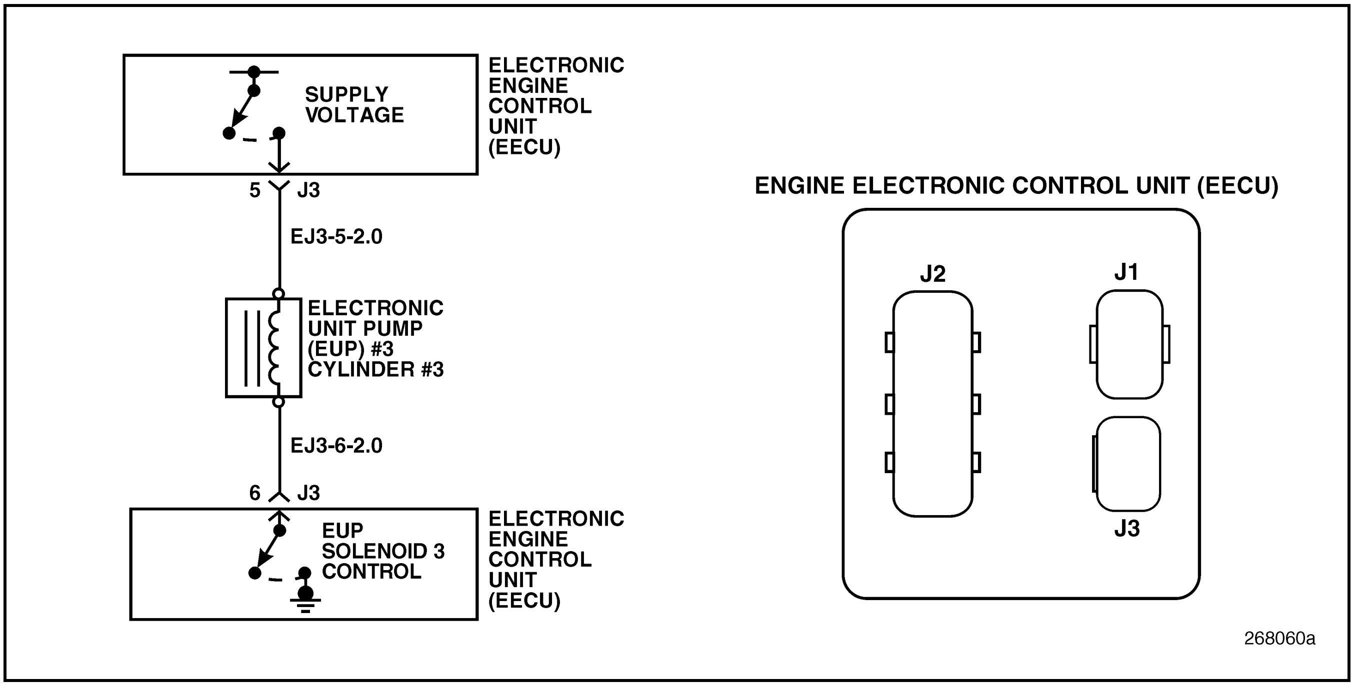


Figure 763 — Electronic Unit Pump (EUP) 3 Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 2 (Data Erratic), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 6 (Current High/Shorted) or 8 (Abnormal)

Parameter Identification (PID): S3 Injector 3

Message Identification (MID): 128

Circuit Description: Individual Electronic Unit Pump (EUP) operation is controlled by the Engine Electronic Control Unit (EECU) using six output transistor drivers that provide the ground circuit for the individual EUP Solenoids.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set a code if the EECU detects an open, short to ground or short to voltage on an EUP circuit for 25 milliseconds. If an EUP code is set, the EECU will turn on the Electronic Malfunction Lamp (EML) and a loss of one or more EUPs will occur.

Additional Symptoms: Poor performance, low power or no start.

Test 1 — Checking for Code 8-3

1. Check that code 8-3 is set.

   If code 8-3 is set, go to test "Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 3" on page 602.

   If code 8-3 is NOT set, wiggle the harness connectors to try to set the code. Visually inspect EUP Solenoid 3 wires and terminals for frayed, loose or corroded connections.

Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 3

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 3.
3. Check for continuity between the terminal posts on EUP Solenoid 3.

   If continuity exists, go to test "Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)" on page 603.

   If there is NO continuity at EUP Solenoid 3, the solenoid is open and must be replaced.

Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 3.
3. Check for continuity from either terminal post on EUP Solenoid 3 to a good ground.

   If there is NO continuity at EUP Solenoid 3, go to test “Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector” on page 603.

   If continuity exists, the EUP Solenoid 3 is shorted to ground and must be replaced.

Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 3.
4. Check for continuity between the EUP Solenoid 3 harness connectors and a good ground.

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 603.

Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line

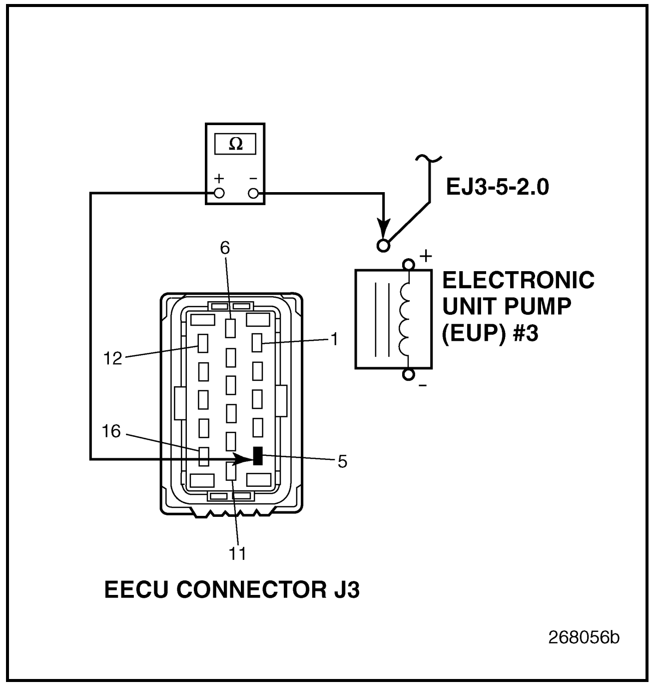


Figure 764

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 3.
4. Check for continuity between EECU harness connector J3 pin 5 and circuit EJ3-5-2.0 at EUP Solenoid 3 (see Figure 764).

   If there is NO continuity, repair the open in circuit EJ3-5-2.0.

   If continuity exists, go to test “Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 604.

Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

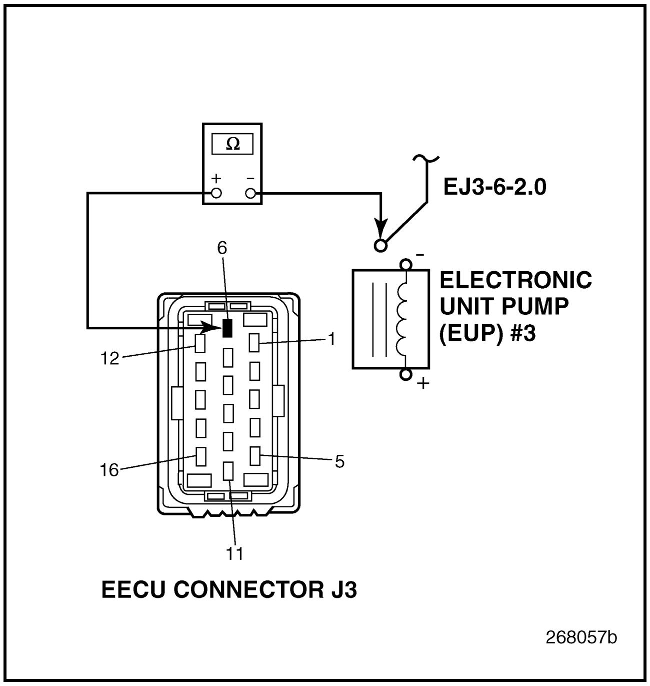


Figure 765

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from EUP Solenoid 3.
4. Check for continuity between circuit EJ3-6-2.0 at the EUP Solenoid 3 and EECU harness connector J3 pin 6 (see Figure 765).

   If there is NO continuity, repair the open in circuit EJ3-6-2.0.

   If continuity exists, go to test “Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 604.

Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line

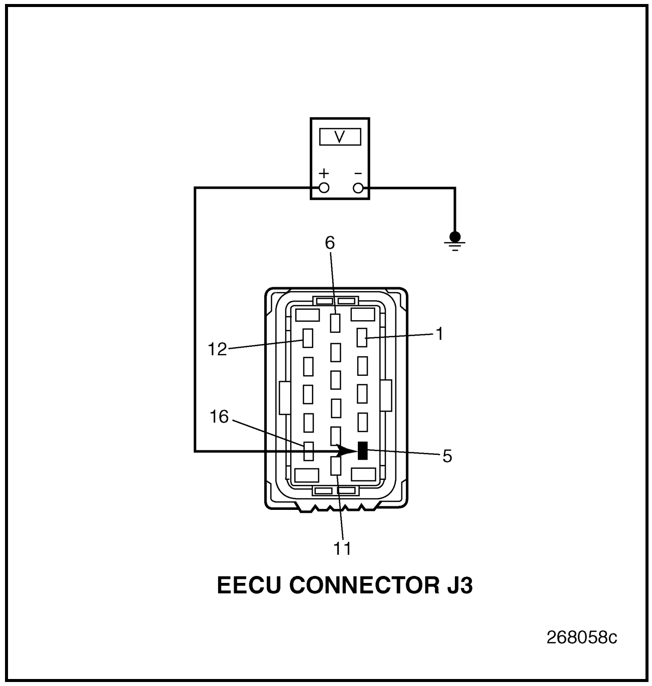


Figure 766

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J3 pin 5 and a good ground (see Figure 766).

   If voltage is present, the voltage supply circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test “Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 605.

Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line

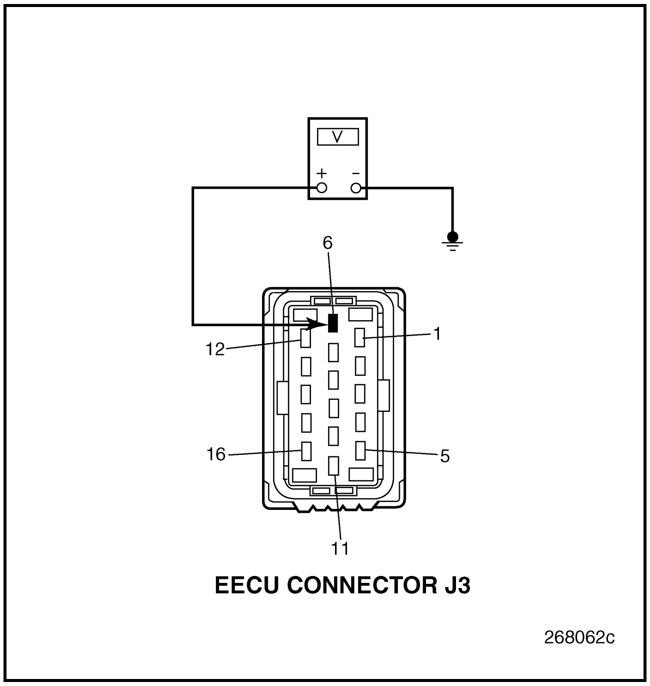


Figure 767

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Disconnect the harness connector from Electronic Unit Pump (EUP) Solenoid 3.
4. Turn the ignition key ON.
5. Measure the voltage between the EECU connector J3 pin 6 and a good ground (see Figure 767).

   If voltage is present, the EUP 3 solenoid control line is shorted to voltage. Locate and repair the short.

   If voltage is NOT present, go to test “Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 605.

Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line

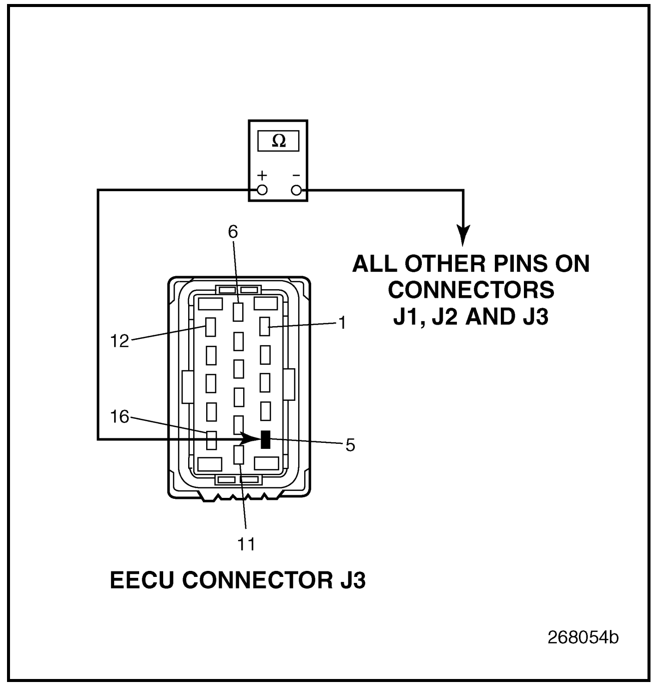


Figure 768

1. Turn the ignition key OFF.
2. Disconnect connector J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from the EUP solenoid 3.
4. Check for continuity between EECU harness connector J3 pin 5 and all other pins on EECU connectors J1, J2 and J3 (see Figure 768).

   If there is NO continuity, go to test “Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 606.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

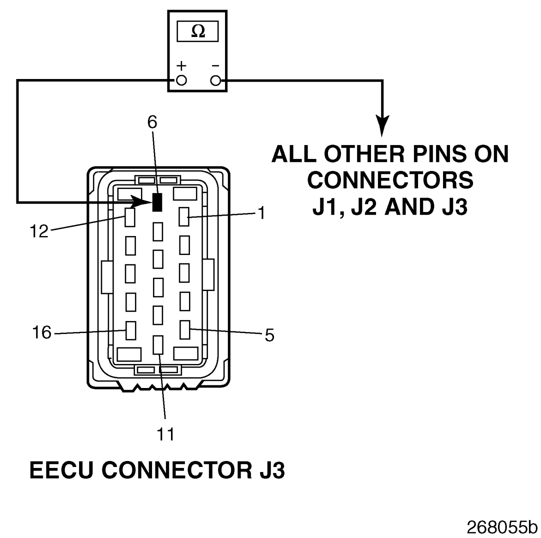


Figure 769

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from EUP Solenoid 3.
4. Check for continuity between the EECU harness connector J3 pin 6 all other pins on EECU connectors J1, J2 and J3 (see Figure 769).

   If there is NO continuity, go to test "Test 1024 — Checking for a Short at the EECU Connector" on page 606.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 1024 — Checking for a Short at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the EECU.
3. Visually inspect EECU connectors J1, J2 and J3 for dirt, loose pins or deformed contacts.
4. If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact, go to test "Test 2048 — Verifying if the Fault Code is Still Active" on page 607.

Test 2048 — Verifying if the Fault Code is Still Active

1. Turn the ignition key OFF.
2. Connect all harness electrical connectors to the Electronic Unit Pump (EUP) solenoids.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If the blink code is still active, check the Failure Mode Identifier (FMI) using a diagnostic computer. If the FMI is 8, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident, switch the location of EUP 3 with that of a fault-free EUP. Reconnect all harness connectors and retest the system. If the PID has changed to the new location of the suspect EUP, replace the EUP, install all EUPs in their original location, and retest the system.

   If only the EUP 3 blink code is still active and the FMI is 3, 4, 5 or 6, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If multiple EUP blink codes are still active and the FMI is 3, 4, 5 or 6, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, go to test “Test 4096 — Inspecting the Mechanical Fuel System Components” on page 607.

   If the blink code is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 4096 — Inspecting the Mechanical Fuel System Components

1. Ensure that there is fuel in the fuel tank.
2. Inspect the fuel lines between the tank and the transfer pump for sharp bends or kinks, and repair as needed.
3. Check for air in the fuel system, and repair as needed.
4. Following instructions in the applicable ASET™ Service Manual, check the fuel pressure at the secondary fuel filter outlet.

   If the fuel pressure is NOT within specifications, perform any required fuel system repairs.
5. Remove EUP 3 from the engine and inspect for surface rust between the 3 O-rings.

   If rust is present, locate the source of the fuel contamination and replace any damaged components.

   If all of the mechanical fuel system components are in good working order, replace the EECU and retest the system.

BLINK CODE 8-4 — ELECTRONIC UNIT PUMP (EUP) (ASET™ CEGR ENGINE)

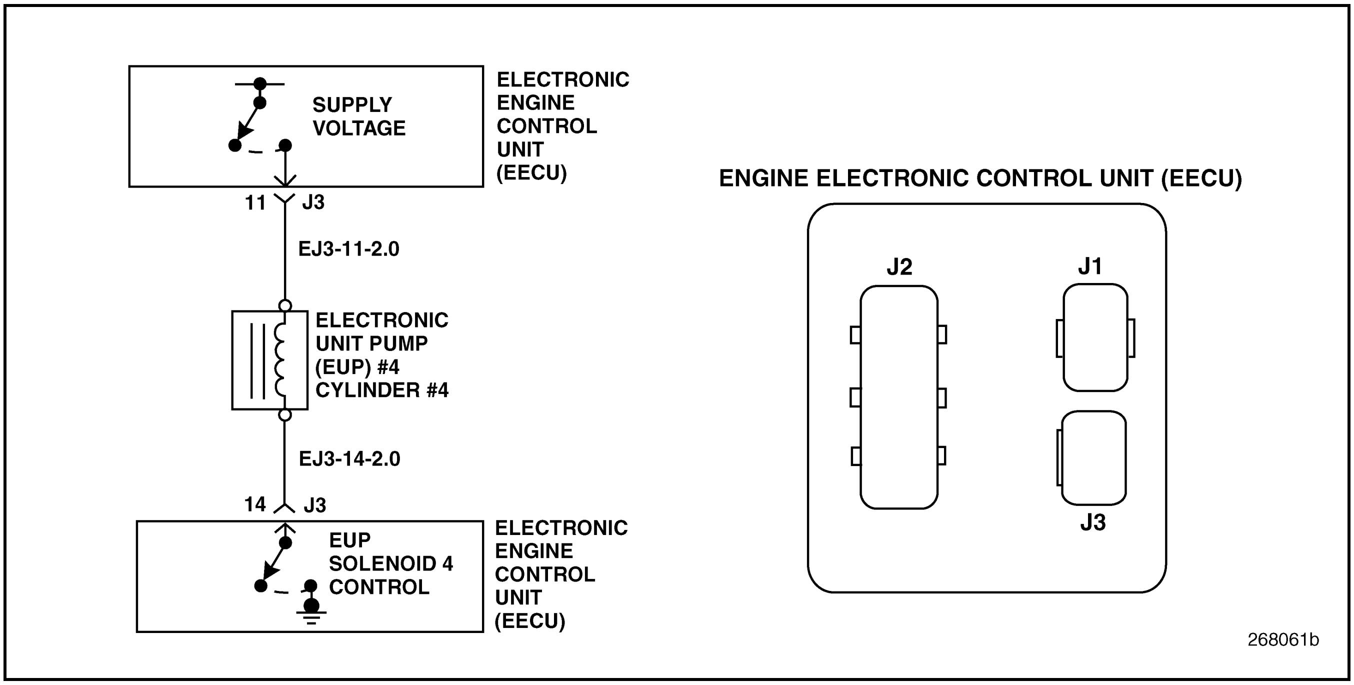


Figure 770 — Electronic Unit Pump (EUP) 4 Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 2 (Data Erratic), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 6 (Current High/Shorted) or 8 (Abnormal)

Parameter Identification (PID): S4 Injector 4

Message Identification (MID): 128

Circuit Description: Individual Electronic Unit Pump (EUP) operation is controlled by the Engine Electronic Control Unit (EECU) using six output transistor drivers that provide the ground circuit for the individual EUP Solenoids.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set a code if the EECU detects an open, short to ground or short to voltage on an EUP circuit for 25 milliseconds. If an EUP code is set, the EECU will turn on the Electronic Malfunction Lamp (EML) and a loss of one or more EUPs will occur.

Additional Symptoms: Poor performance, low power or no start.

Test 1 — Checking for Code 8-4

1. Check that code 8-4 is set.

   If code 8-4 is set, go to test “Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 4” on page 608.

   If code 8-4 is NOT set, wiggle the harness connectors to try to set the code. Visually inspect EUP Solenoid 4 wires and terminals for frayed, loose or corroded connections.

Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 4

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 4.
3. Check for continuity between the terminal posts on EUP Solenoid 4.

   If continuity exists, go to test “Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)” on page 609.

   If there is NO continuity at EUP Solenoid 4, the solenoid is open and must be replaced.

Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 4.
3. Check for continuity from either terminal post on EUP Solenoid 4 to a good ground.

   If there is NO continuity at EUP Solenoid 4, go to test "Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector" on page 609.

   If continuity exists, the EUP Solenoid 4 is shorted to ground and must be replaced.

Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 4.
4. Check for continuity between the EUP Solenoid 4 harness connectors and a good ground.

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 609.

Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line

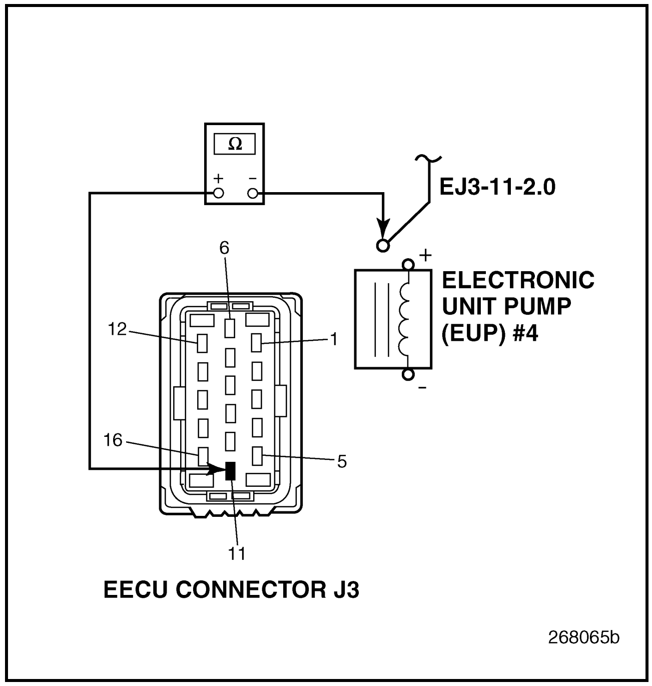


Figure 771

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 4.
4. Check for continuity between EECU harness connector J3 pin 11 and circuit EJ3-11-2.0 at EUP Solenoid 4 (see Figure 771).

   If there is NO continuity, repair the open in circuit EJ3-11-2.0.

   If continuity exists, go to test "Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 610.

Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

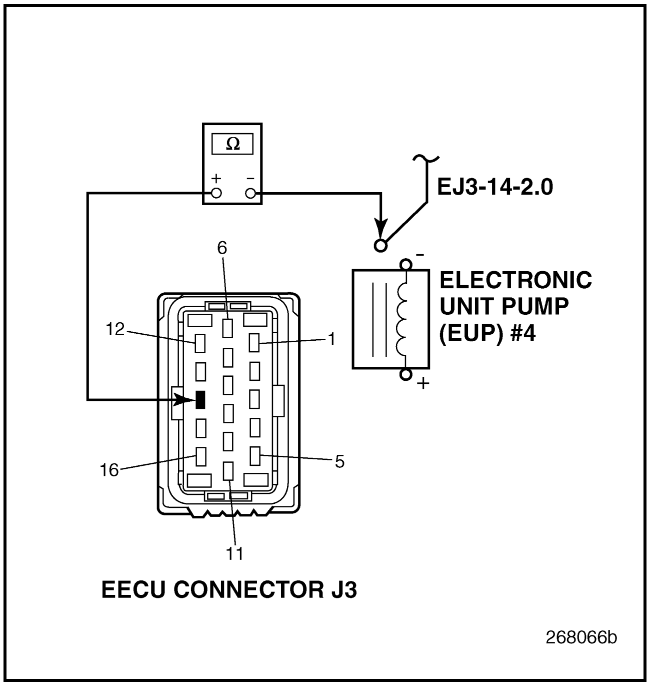


Figure 772

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from EUP Solenoid 4.
4. Check for continuity between circuit EJ3-14-2.0 at the EUP Solenoid 4 and EECU harness connector J3 pin 14 (see Figure 772).

   If there is NO continuity, repair the open in circuit EJ3-14-2.0.

   If continuity exists, go to test “Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 610.

Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line

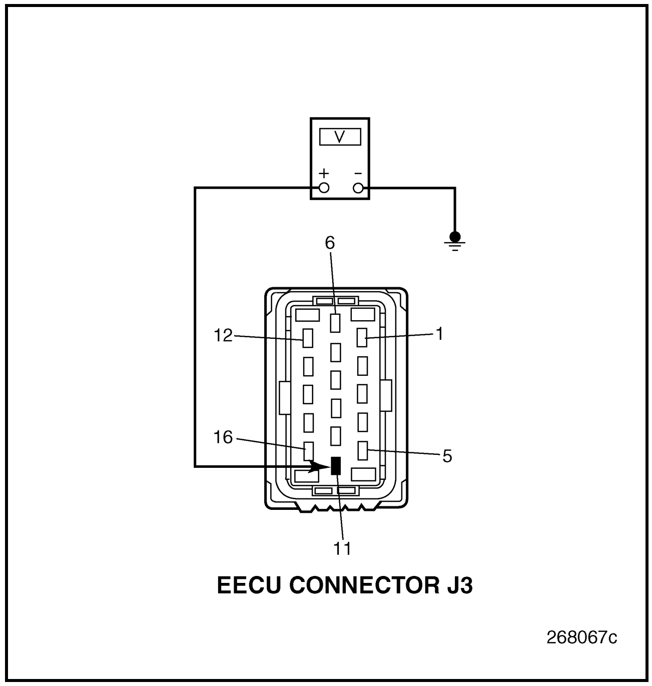


Figure 773

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J3 pin 11 and a good ground (see Figure 773).

   If voltage is present, the voltage supply circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test “Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 611.

Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line

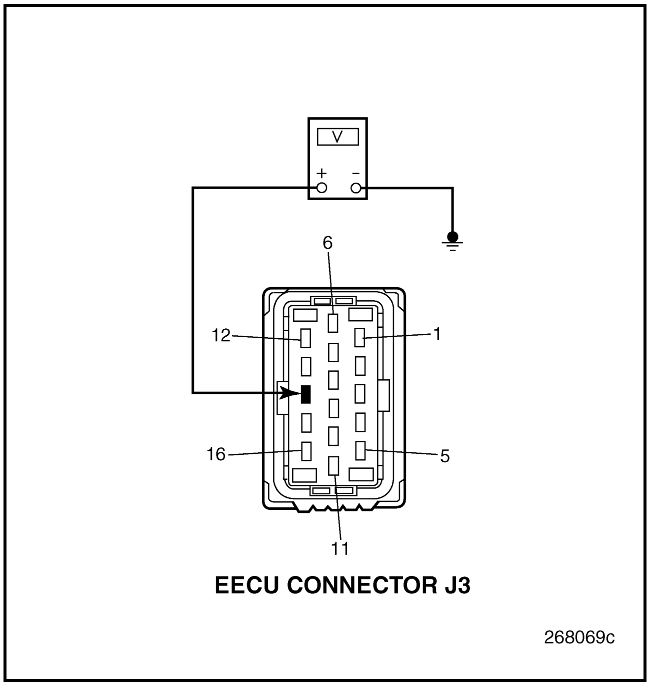


Figure 774

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Disconnect the harness connector from Electronic Unit Pump (EUP) Solenoid 4.
4. Turn the ignition key ON.
5. Measure the voltage between the EECU connector J3 pin 14 and a good ground (see Figure 774).

   If voltage is present, the EUP 4 solenoid control line is shorted to voltage. Locate and repair the short.

   If voltage is NOT present, go to test "Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 611.

Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line

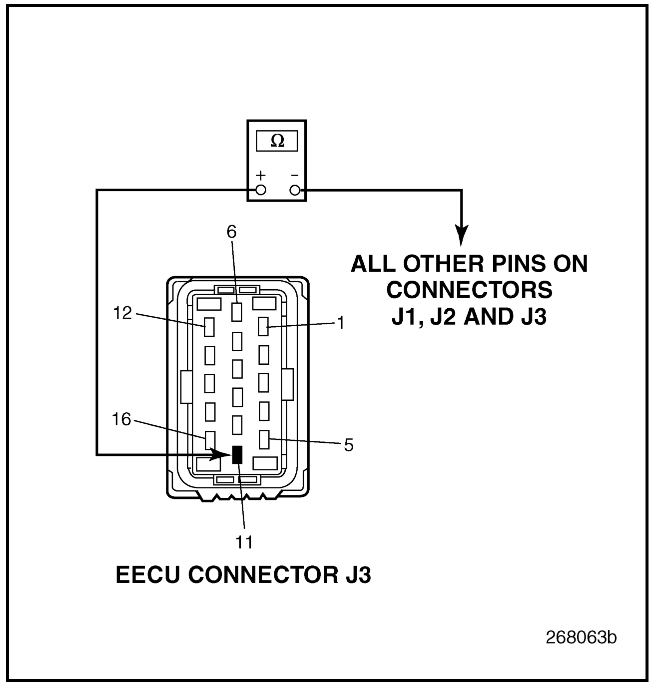


Figure 775

1. Turn the ignition key OFF.
2. Disconnect connector J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from the EUP solenoid 4.
4. Check for continuity between EECU harness connector J3 pin 11 and all other pins on EECU connectors J1, J2 and J3 (see Figure 775).

   If there is NO continuity, go to test "Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 612.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

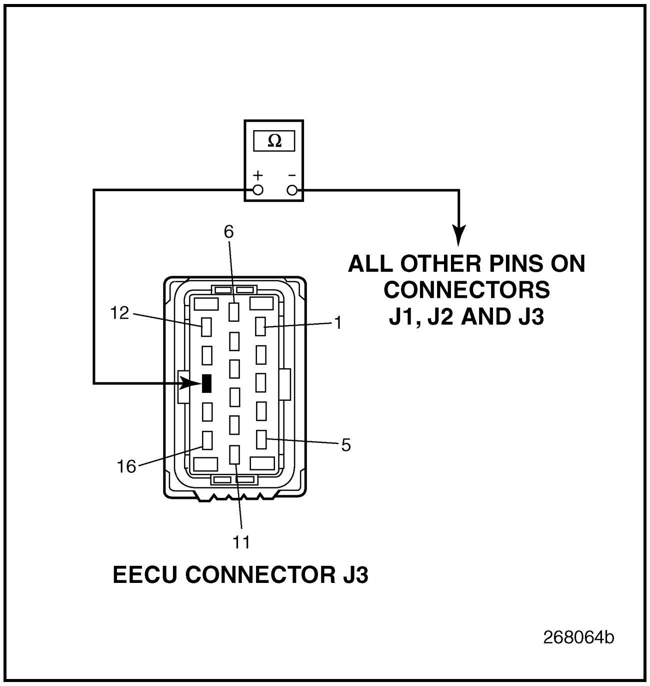


Figure 776

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from EUP Solenoid 4.
4. Check for continuity between the EECU harness connector J3 pin 14 all other pins on EECU connectors J1, J2 and J3 (see Figure 776).

   If there is NO continuity, go to test “Test 1024 — Checking for a Short at the EECU Connector” on page 612.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 1024 — Checking for a Short at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the EECU.
3. Visually inspect EECU connectors J1, J2 and J3 for dirt, loose pins or deformed contacts.
4. If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact, go to test “Test 2048 — Verifying if the Fault Code is Still Active” on page 613.

Test 2048 — Verifying if the Fault Code is Still Active

1. Turn the ignition key OFF.
2. Connect all harness electrical connectors to the Electronic Unit Pump (EUP) solenoids.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If the blink code is still active, check the Failure Mode Identifier (FMI) using a diagnostic computer. If the FMI is 8, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident, switch the location of EUP 4 with that of a fault-free EUP. Reconnect all harness connectors and retest the system. If the PID has changed to the new location of the suspect EUP, replace the EUP, install all EUPs in their original location, and retest the system.

   If only the EUP 4 blink code is still active and the FMI is 3, 4, 5 or 6, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If multiple EUP blink codes are still active and the FMI is 3, 4, 5 or 6, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, go to test “Test 4096 — Inspecting the Mechanical Fuel System Components” on page 613.

   If the blink code is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 4096 — Inspecting the Mechanical Fuel System Components

1. Ensure that there is fuel in the fuel tank.
2. Inspect the fuel lines between the tank and the transfer pump for sharp bends or kinks, and repair as needed.
3. Check for air in the fuel system, and repair as needed.
4. Following instructions in the applicable ASET™ Service Manual, check the fuel pressure at the secondary fuel filter outlet.

   If the fuel pressure is NOT within specifications, perform any required fuel system repairs.
5. Remove EUP 4 from the engine and inspect for surface rust between the 3 O-rings.

   If rust is present, locate the source of the fuel contamination and replace any damaged components.

   If all of the mechanical fuel system components are in good working order, replace the EECU and retest the system.

BLINK CODE 8-5 — ELECTRONIC UNIT PUMP (EUP) (ASET™ CEGR ENGINE)

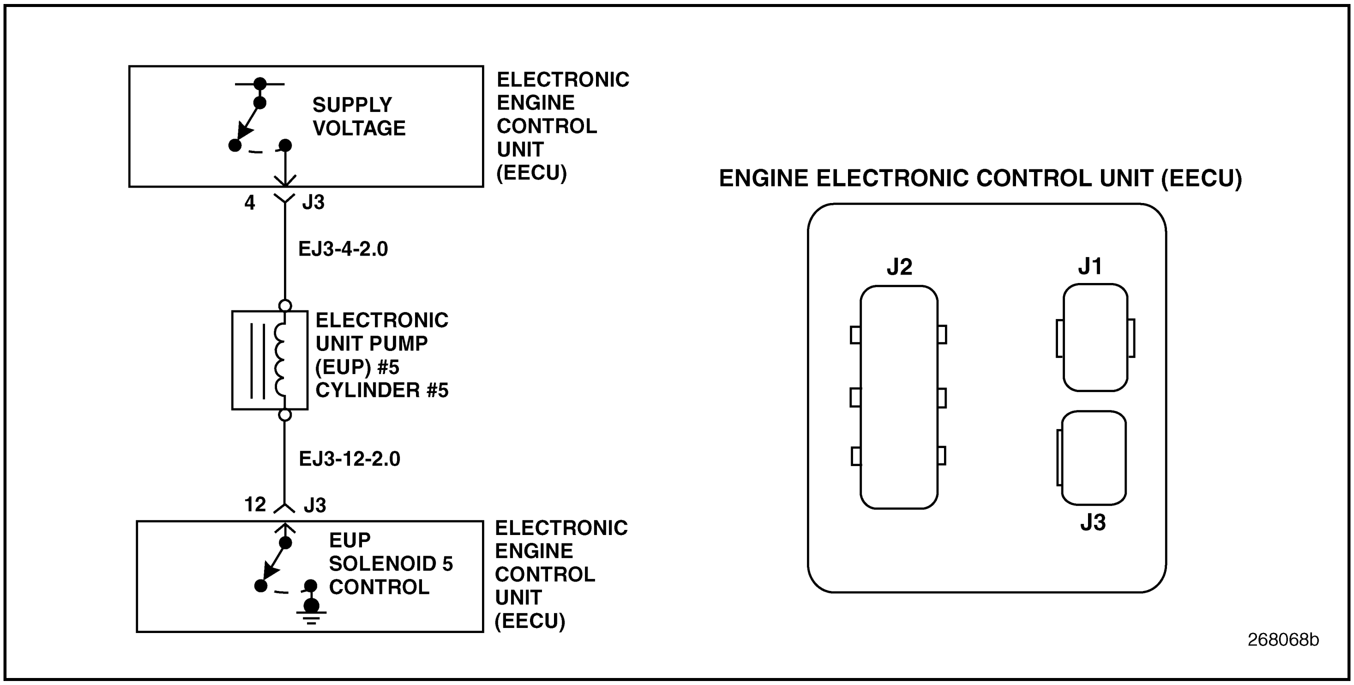


Figure 777 — Electronic Unit Pump (EUP) 5 Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 2 (Data Erratic), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 6 (Current High/Shorted) or 8 (Abnormal)

Parameter Identification (PID): S5 Injector 5

Message Identification (MID): 128

Circuit Description: Individual Electronic Unit Pump (EUP) operation is controlled by the Engine Electronic Control Unit (EECU) using six output transistor drivers that provide the ground circuit for the individual EUP Solenoids.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set a code if the EECU detects an open, short to ground or short to voltage on an EUP circuit for 25 milliseconds. If an EUP code is set, the EECU will turn on the Electronic Malfunction Lamp (EML) and a loss of one or more EUPs will occur.

Additional Symptoms: Poor performance, low power or no start.

Test 1 — Checking for Code 8-5

1. Check that code 8-5 is set.

   If code 8-5 is set, go to test “Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 5” on page 614.

   If code 8-5 is NOT set, wiggle the harness connectors to try to set the code. Visually inspect EUP Solenoid 5 wires and terminals for frayed, loose or corroded connections.

Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 5

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 5.
3. Check for continuity between the terminal posts on EUP Solenoid 5.

   If continuity exists, go to test “Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)” on page 615.

   If there is NO continuity at EUP Solenoid 5, the solenoid is open and must be replaced.

Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 5.
3. Check for continuity from either terminal post on EUP Solenoid 5 to a good ground.

   If there is NO continuity at EUP Solenoid 5, go to test "Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector" on page 615.

   If continuity exists, the EUP Solenoid 5 is shorted to ground and must be replaced.

Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 5.
4. Check for continuity between the EUP Solenoid 5 harness connectors and a good ground.

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test "Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 615.

Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line

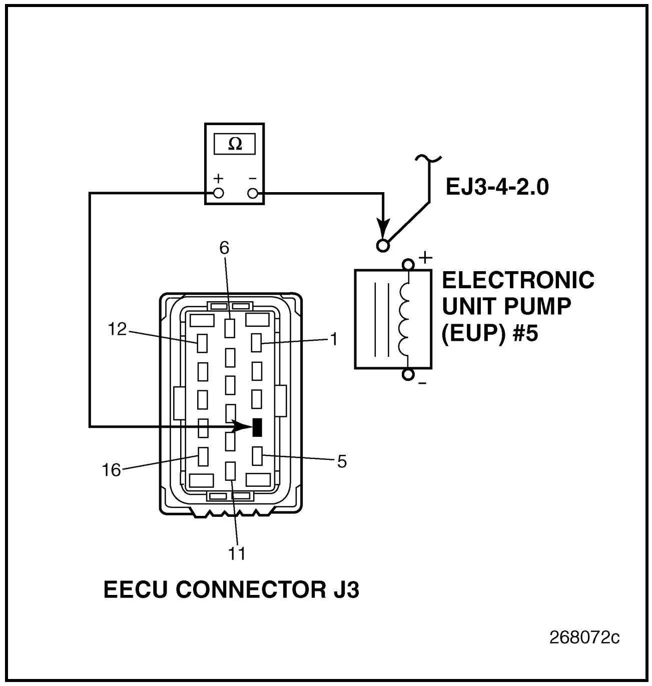


Figure 778

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 5.
4. Check for continuity between EECU harness connector J3 pin 4 and circuit EJ3-4-2.0 at EUP Solenoid 5 (see Figure 778).

   If there is NO continuity, repair the open in circuit EJ3-4-2.0.

   If continuity exists, go to test "Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 616.

Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

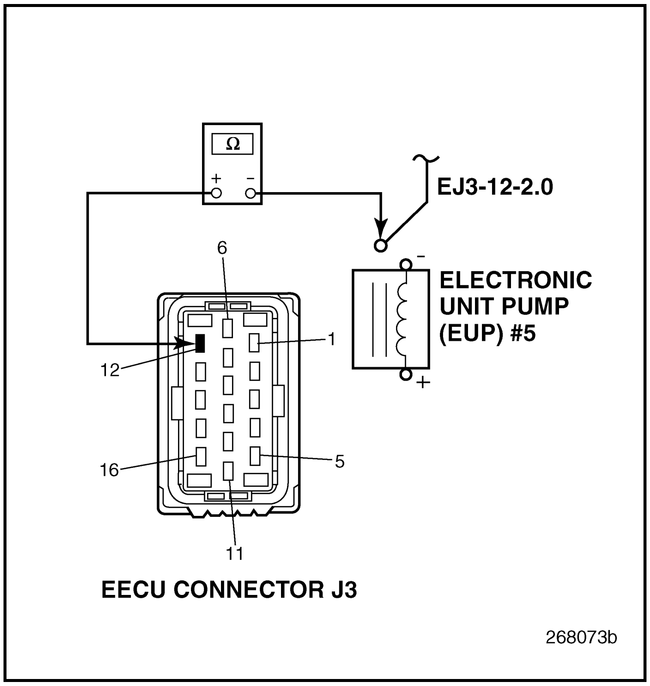


Figure 779

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from EUP Solenoid 5.
4. Check for continuity between circuit EJ3-12-2.0 at the EUP Solenoid 5 and EECU harness connector J3 pin 12 (see Figure 779).

   If there is NO continuity, repair the open in circuit EJ3-12-2.0.

   If continuity exists, go to test “Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 616.

Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line

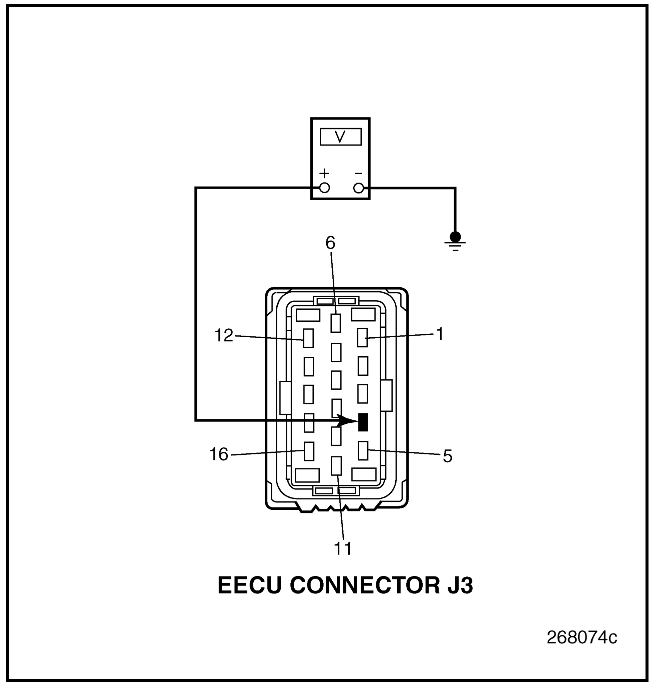


Figure 780

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J3 pin 4 and a good ground (see Figure 780).

   If voltage is present, the voltage supply circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test “Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 617.

Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line

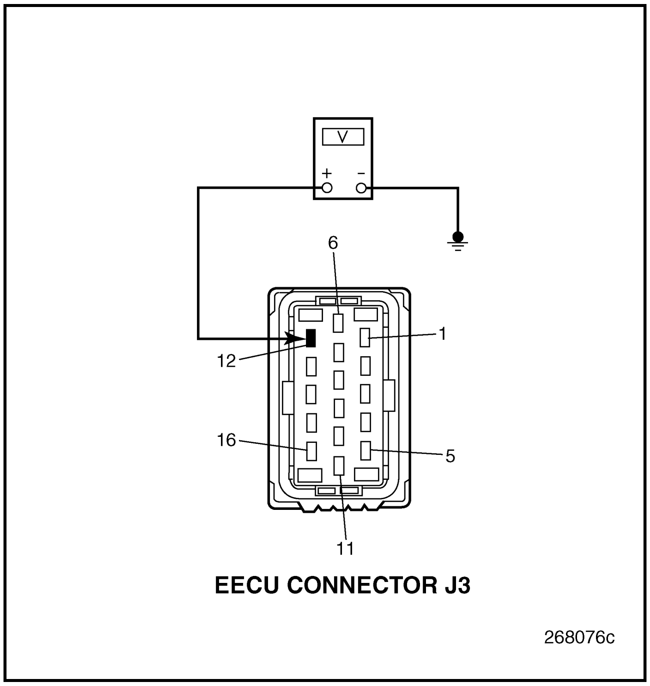


Figure 781

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Disconnect the harness connector from Electronic Unit Pump (EUP) Solenoid 5.
4. Turn the ignition key ON.
5. Measure the voltage between the EECU connector J3 pin 12 and a good ground (see Figure 781).

   If voltage is present, the EUP 5 solenoid control line is shorted to voltage. Locate and repair the short.

   If voltage is NOT present, go to test "Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 617.

Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line

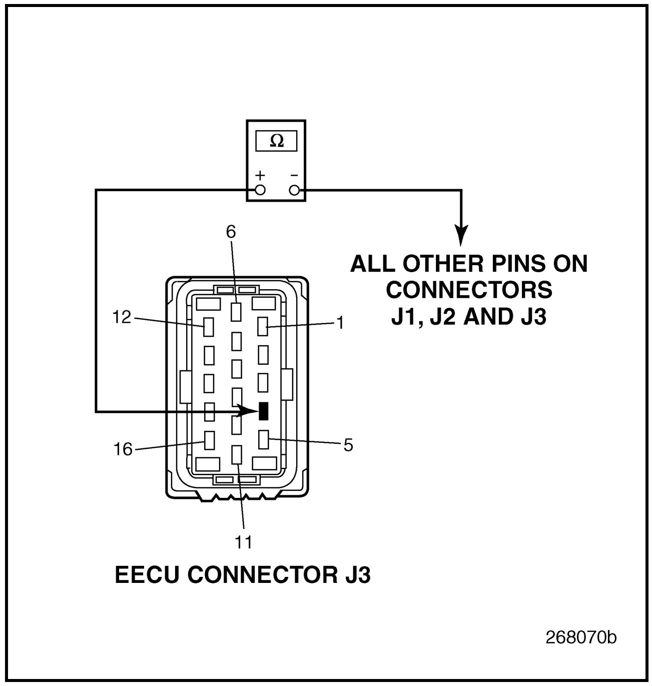


Figure 782

1. Turn the ignition key OFF.
2. Disconnect connector J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from the EUP solenoid 5.
4. Check for continuity between EECU harness connector J3 pin 4 and all other pins on EECU connectors J1, J2 and J3 (see Figure 782).

   If there is NO continuity, go to test "Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 618.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

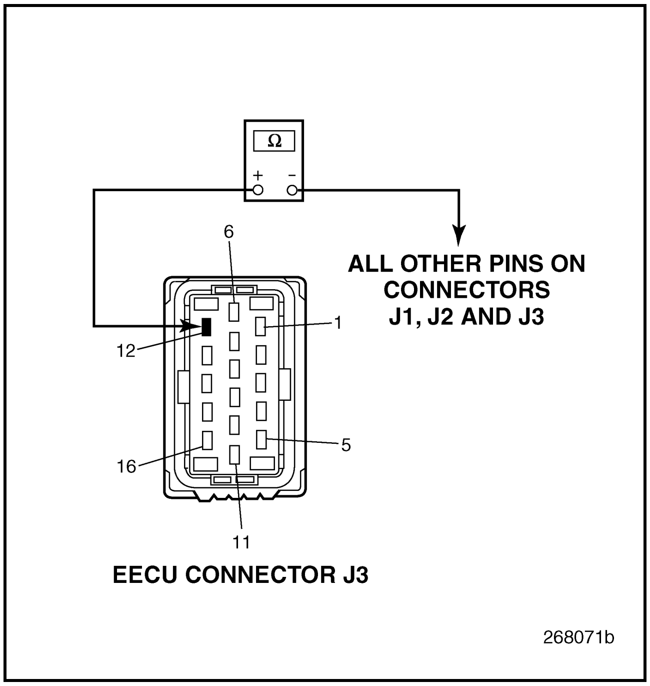


Figure 783

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from EUP Solenoid 5.
4. Check for continuity between the EECU harness connector J3 pin 12 all other pins on EECU connectors J1, J2 and J3 (see Figure 783).

   If there is NO continuity, go to test "Test 1024 — Checking for a Short at the EECU Connector" on page 618.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 1024 — Checking for a Short at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the EECU.
3. Visually inspect EECU connectors J1, J2 and J3 for dirt, loose pins or deformed contacts.
4. If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact, go to test "Test 2048 — Verifying if the Fault Code is Still Active" on page 619.

Test 2048 — Verifying if the Fault Code is Still Active

1. Turn the ignition key OFF.
2. Connect all harness electrical connectors to the Electronic Unit Pump (EUP) solenoids.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If the blink code is still active, check the Failure Mode Identifier (FMI) using a diagnostic computer. If the FMI is 8, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident, switch the location of EUP 5 with that of a fault-free EUP. Reconnect all harness connectors and retest the system. If the PID has changed to the new location of the suspect EUP, replace the EUP, install all EUPs in their original location, and retest the system.

   If only the EUP 5 blink code is still active and the FMI is 3, 4, 5 or 6, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If multiple EUP blink codes are still active and the FMI is 3, 4, 5 or 6, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, go to test “Test 4096 — Inspecting the Mechanical Fuel System Components” on page 619.

   If the blink code is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 4096 — Inspecting the Mechanical Fuel System Components

1. Ensure that there is fuel in the fuel tank.
2. Inspect the fuel lines between the tank and the transfer pump for sharp bends or kinks, and repair as needed.
3. Check for air in the fuel system, and repair as needed.
4. Following instructions in the applicable ASET™ Service Manual, check the fuel pressure at the secondary fuel filter outlet.

   If the fuel pressure is NOT within specifications, perform any required fuel system repairs.
5. Remove EUP 5 from the engine and inspect for surface rust between the 3 O-rings.

   If rust is present, locate the source of the fuel contamination and replace any damaged components.

   If all of the mechanical fuel system components are in good working order, replace the EECU and retest the system.

BLINK CODE 8-6 — ELECTRONIC UNIT PUMP (EUP) (ASET™ CEGR ENGINE)

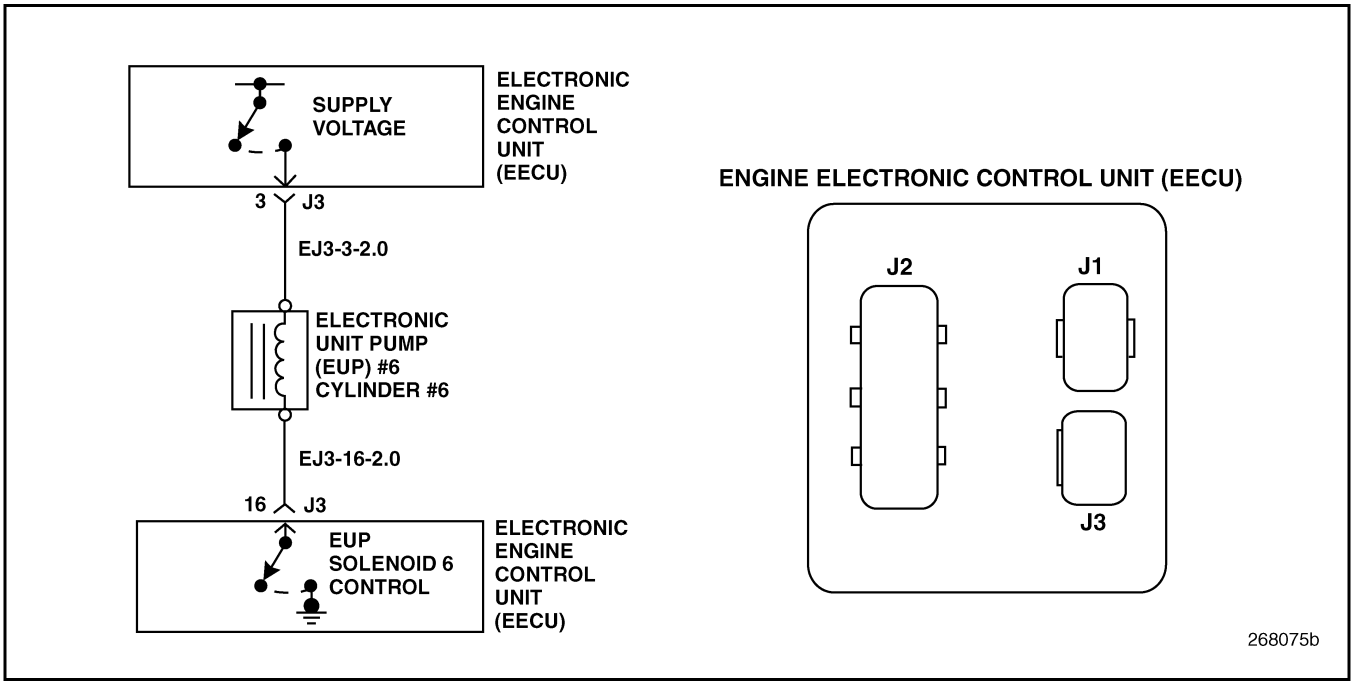


Figure 784 — Electronic Unit Pump (EUP) 6 Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 6 (Current High/Shorted) or 8 (Abnormal)

Parameter Identification (PID): S6 Injector 6

Message Identification (MID): 128

Circuit Description: Individual Electronic Unit Pump (EUP) operation is controlled by the Engine Electronic Control Unit (EECU) using six output transistor drivers that provide the ground circuit for the individual EUP Solenoids.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set a code if the EECU detects an open, short to ground or short to voltage on an EUP circuit for 25 milliseconds. If an EUP code is set, the EECU will turn on the Electronic Malfunction Lamp (EML) and a loss of one or more EUPs will occur.

Additional Symptoms: Poor performance, low power or no start.

Test 1 — Checking for Code 8-6

1. Check that code 8-6 is set.

   If code 8-6 is set, go to test "Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 6" on page 620.

   If code 8-6 is NOT set, wiggle the harness connectors to try to set the code. Visually inspect EUP Solenoid 6 wires and terminals for frayed, loose or corroded connections.

Test 2 — Checking for an Open Electronic Unit Pump (EUP) Solenoid 6

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 6.
3. Check for continuity between the terminal posts on EUP Solenoid 6.

   If continuity exists, go to test "Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)" on page 621.

   If there is NO continuity at EUP Solenoid 6, the solenoid is open and must be replaced.

Test 4 — Checking for a Short to Ground in the Electronic Unit Pump (EUP)

1. Turn the ignition key OFF.
2. Disconnect the harness electrical connectors from EUP Solenoid 6.
3. Check for continuity from either terminal post on EUP Solenoid 6 to a good ground.

   If there is NO continuity at EUP Solenoid 6, go to test “Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector” on page 621.

   If continuity exists, the EUP Solenoid 6 is shorted to ground and must be replaced.

Test 8 — Checking for a Short to Ground at the Electronic Unit Pump (EUP) Harness Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 6.
4. Check for continuity between the EUP Solenoid 6 harness connectors and a good ground.

   If continuity exists, the circuit is shorted to ground. Locate and repair the short circuit.

   If there is NO continuity, go to test “Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 621.

Test 16 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Voltage Line

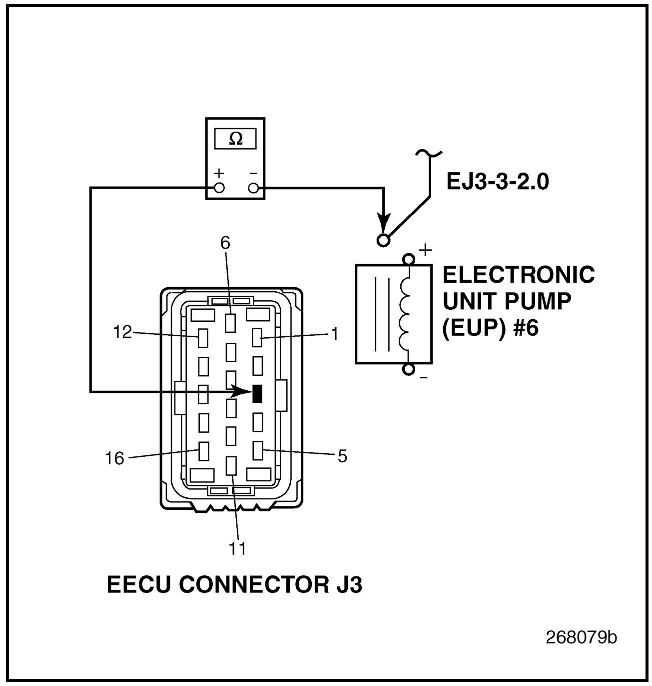


Figure 785

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connector from EUP Solenoid 6.
4. Check for continuity between EECU harness connector J3 pin 3 and circuit EJ3-3-2.0 at EUP Solenoid 6 (see Figure 785).

   If there is NO continuity, repair the open in circuit EJ3-3-2.0.

   If continuity exists, go to test “Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 622.

Test 32 — Checking for an Open Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

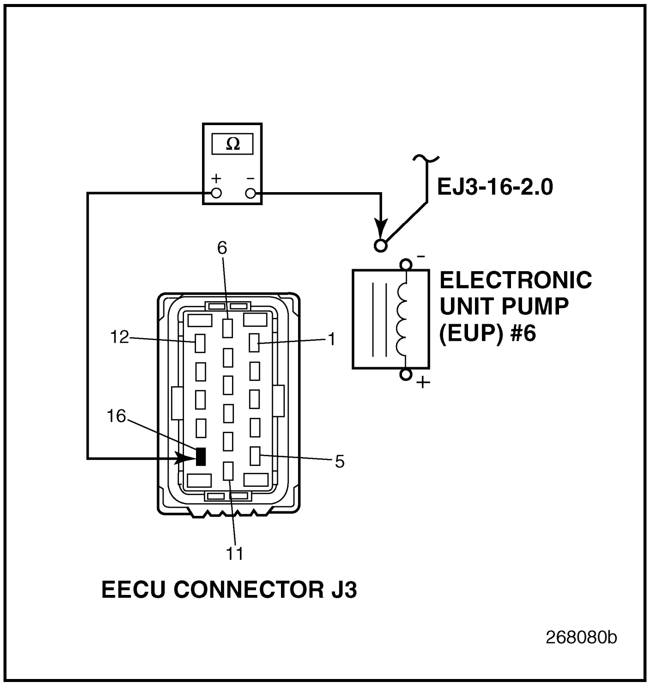


Figure 786

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness connectors from EUP Solenoid 6.
4. Check for continuity between circuit EJ3-16-2.0 at the EUP Solenoid 3 and EECU harness connector J3 pin 16 (see Figure 786).

   If there is NO continuity, repair the open in circuit EJ3-16-2.0.

   If continuity exists, go to test “Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line” on page 622.

Test 64 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Voltage Line

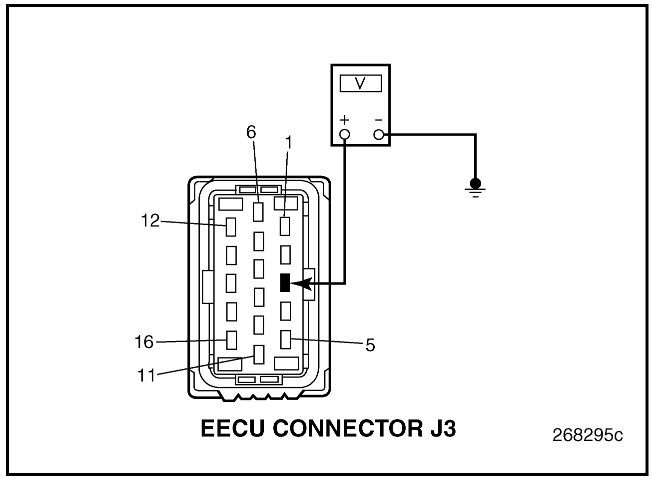


Figure 787

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Control Unit (EECU).
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J3 pin 3 and a good ground (see Figure 787).

   If voltage is present, the voltage supply circuit is shorted to voltage. Locate and repair the short circuit.

   If there is NO voltage present, go to test “Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line” on page 623.

Test 128 — Checking for a Short to Voltage in the Electronic Unit Pump (EUP) Solenoid Control Line

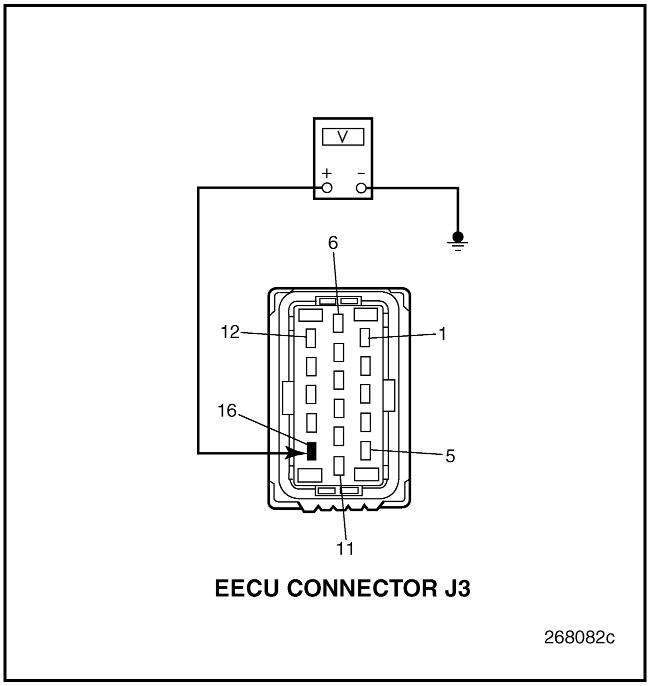


Figure 788

1. Turn the ignition key OFF.
2. Disconnect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
3. Disconnect the harness connector from Electronic Unit Pump (EUP) Solenoid 6.
4. Turn the ignition key ON.
5. Measure the voltage between the EECU connector J3 pin 16 and a good ground (see Figure 788).

   If voltage is present, the EUP 6 solenoid control line is shorted to voltage. Locate and repair the short.

   If voltage is NOT present, go to test "Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line" on page 623.

Test 256 — Isolating a Short in the Electronic Unit Pump (EUP) Solenoid Voltage Line

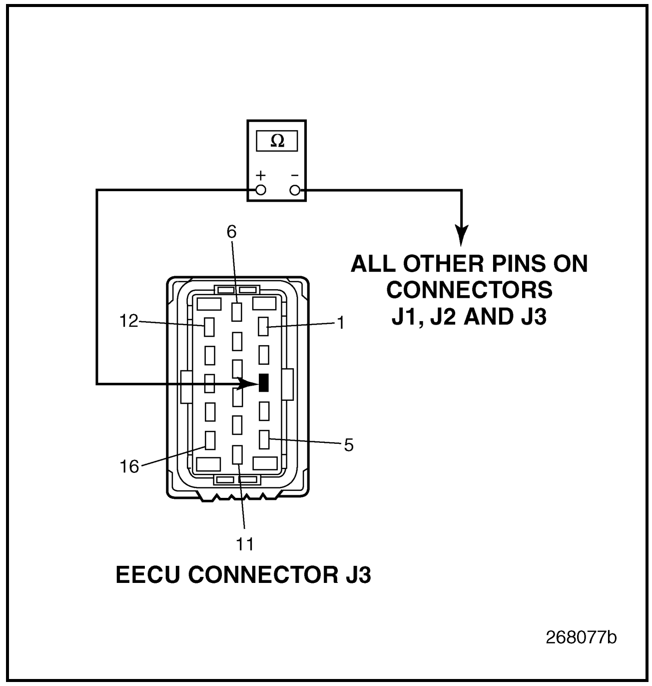


Figure 789

1. Turn the ignition key OFF.
2. Disconnect connector J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from the EUP solenoid 6.
4. Check for continuity between EECU harness connector J3 pin 3 and all other pins on EECU connectors J1, J2 and J3 (see Figure 789).

   If there is NO continuity, go to test "Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line" on page 624.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 512 — Isolating a Short Circuit in the Electronic Unit Pump (EUP) Solenoid Control Line

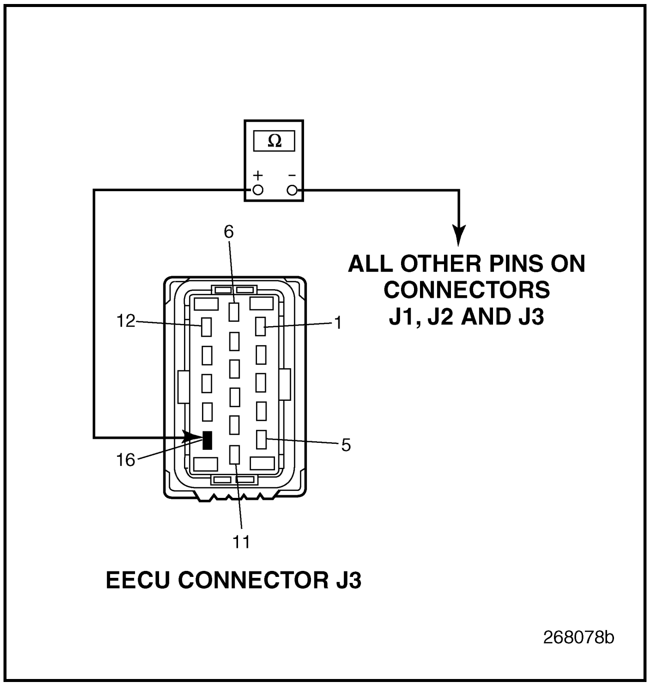


Figure 790

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the Engine Electronic Control Unit (EECU).
3. Disconnect the harness electrical connectors from EUP Solenoid 6.
4. Check for continuity between the EECU harness connector J3 pin 16 all other pins on EECU connectors J1, J2 and J3 (see Figure 790).

   If there is NO continuity, go to test "Test 1024 — Checking for a Short at the EECU Connector" on page 624.

   If continuity exists, the EUP circuit is shorted to one of the other EECU circuits. Locate and repair the short circuit.

Test 1024 — Checking for a Short at the EECU Connector

1. Turn the ignition key OFF.
2. Disconnect connectors J1, J2 and J3 from the EECU.
3. Visually inspect EECU connectors J1, J2 and J3 for dirt, loose pins or deformed contacts.
4. If a terminal feels loose or appears damaged, repair the connector.

   If all the terminals appear to make good contact, go to test "Test 2048 — Verifying if the Fault Code is Still Active" on page 625.

Test 2048 — Verifying if the Fault Code is Still Active

1. Turn the ignition key OFF.
2. Connect all harness electrical connectors to the Electronic Unit Pump (EUP) solenoids.
3. Connect Engine Electronic Control Unit (EECU) connectors J1, J2 and J3.
4. Turn the ignition key ON.

   If the blink code is still active, check the Failure Mode Identifier (FMI) using a diagnostic computer. If the FMI is 8, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident, switch the location of EUP 6 with that of a fault-free EUP. Reconnect all harness connectors and retest the system. If the PID has changed to the new location of the suspect EUP, replace the EUP, install all EUPs in their original location, and retest the system.

   If only the EUP 6 blink code is still active and the FMI is 3, 4, 5 or 6, check the EECU and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, replace the EECU and retest the system.

   If multiple EUP blink codes are still active and the FMI is 3, 4, 5 or 6, check the EECU module and connectors for dirt, loose or shorted pins, or any other repairable damage. If no damage is evident or is not repairable, go to test “Test 4096 — Inspecting the Mechanical Fuel System Components” on page 625.

   If the blink code is NOT active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 4096 — Inspecting the Mechanical Fuel System Components

1. Ensure that there is fuel in the fuel tank.
2. Inspect the fuel lines between the tank and the transfer pump for sharp bends or kinks, and repair as needed.
3. Check for air in the fuel system, and repair as needed.
4. Following instructions in the applicable ASET™ Service Manual, check the fuel pressure at the secondary fuel filter outlet.

   If the fuel pressure is NOT within specifications, perform any required fuel system repairs.
5. Remove EUP 6 from the engine and inspect for surface rust between the 3 O-rings.

   If rust is present, locate the source of the fuel contamination and replace any damaged components.

   If all of the mechanical fuel system components are in good working order, replace the EECU and retest the system.

BLINK CODE 8-9 — ELECTRONIC UNIT PUMP (EUP) SOLENOID BOOST VOLTAGE (ASET™ IEGR ENGINE)

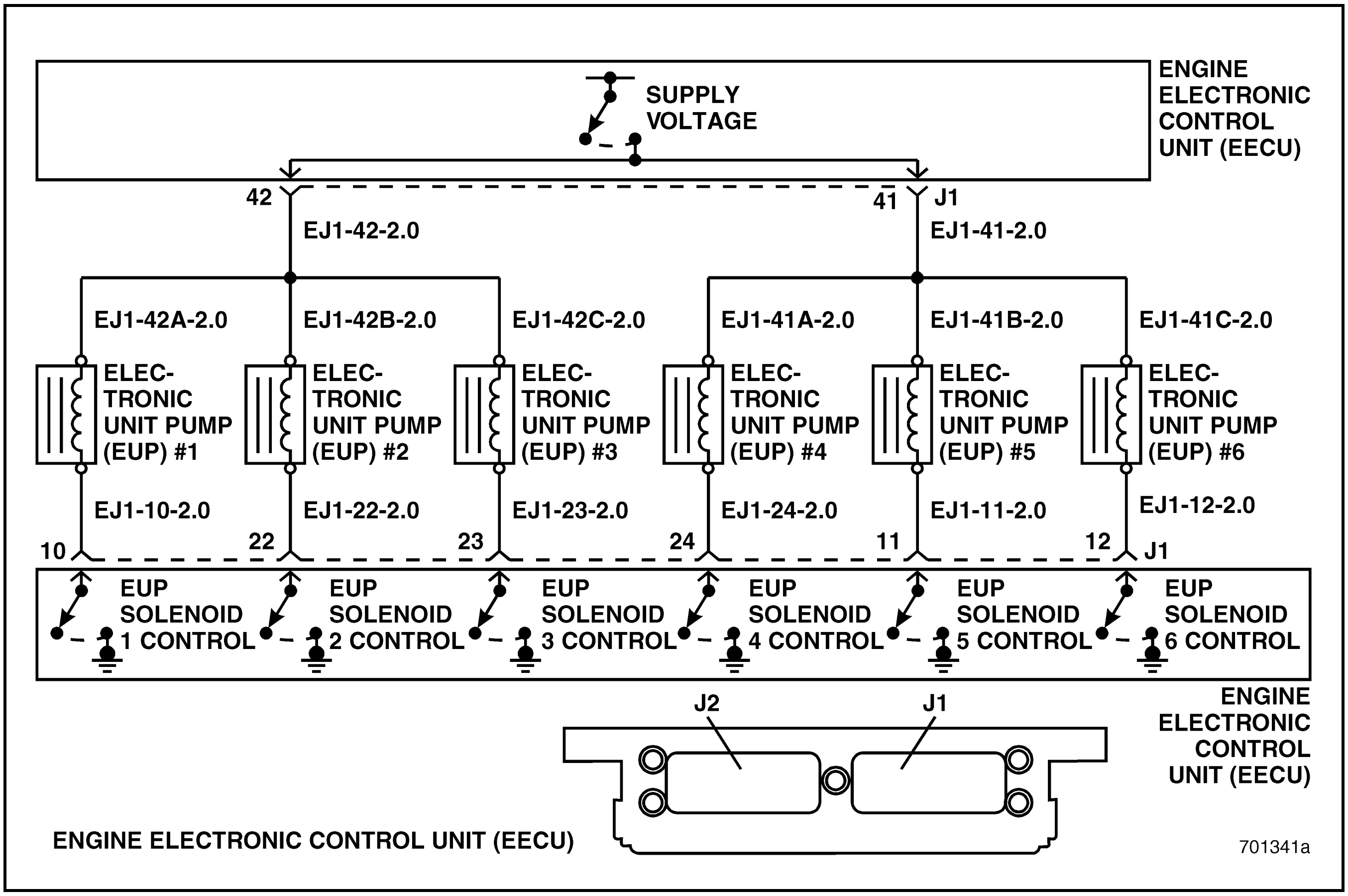


Figure 791 — Electronic Unit Pump (EUP) Circuits (ASET™ IEGR Engine)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S151

Message Identification (MID): 128

Circuit Description: The Engine Electronic Control Unit (EECU) controls the supply voltage to the Electronic Unit Pumps (EUPs) to provide accurate fuel delivery.

Location: The EUP Solenoids are located on the right side of the engine block.

Code Setting Conditions: The Engine Electronic Control Unit (EECU) will set code 8-9 if the EECU is unable to regulate the EUP Solenoid voltage. Fault code 8-9 will set only when the engine is running, or when an attempt is made to start the engine.

Additional Symptoms: Poor performance, low power or no start.

Test 1 — Checking for Code 8-9

1. Verify that code 8-9 is set.

   If code 8-9 is set, go to test "Test 2 — Checking for Other EECU Fault Codes" on page 627.

   If code 8-9 is NOT set, wiggle the harness and connectors at the EUP Solenoids and at the EECU with the engine running. Visually inspect wires and terminals for frayed, loose or corroded connections.

Test 2 — Checking for Other EECU Fault Codes

1. Use a diagnostic computer to check for related fault codes.

   If fault codes 7-5 or 7-6 are active, attempt to repair these faults and retest the system.

   If fault codes 6-6 or 6-7 are active, reprogram the EECU Engine Data File, and retest the system. If reprogramming the EECU does not correct the problem, replace the EECU and retest the system. If the fault is still active, go to test "Test 5 — Isolating the Cause of the Fault Code" on page 627.

Test 5 — Isolating the Cause of the Fault Code

1. The cause of this fault is difficult to isolate. The root cause of this fault may be in one or more EUP Solenoids, in the EECU, in the engine wiring harness, or in other chassis related components.

   Contact Mack Trucks Service Engineering before continuing diagnosis.

BLINK CODE 9-1 — TRANSPORT PROTOCOL PROGRAMMING FAILURE

Failure Mode Identifier (FMI): 14 (Table Programming Failure)

Parameter Identification (PID): S254

Message Identification (MID): 142

Circuit Description: The Vehicle Electronic Control Unit (VECU) can be programmed on the fly using a combination of InfoMax and Qualcomm software. This feature allows dispatchers to change things like road speed limits and cruise control settings to suit driving conditions and speed limit changes at state line crossings.

Code Setting Conditions: The Vehicle Electronic Control Unit (VECU) will set code 9-1 if the dispatcher attempts to program parameters, but the programming is not completed successfully. In the event that this fault occurs, the driver will be alerted by the Electronic Malfunction Lamp (EML) and the dispatcher will be notified via Qualcomm.

NOTE

If this fault occurs, the dispatcher should attempt to reprogram the desired parameters. If a programming error occurs on subsequent attempts, reprogram the parameters using a diagnostic service tool. Once the VECU is reprogrammed, code 9-1 will be erased from the fault table.

BLINK CODE 9-2 — POWER RESET WITHOUT KEY SWITCH (ASET™ IEGR ENGINE)

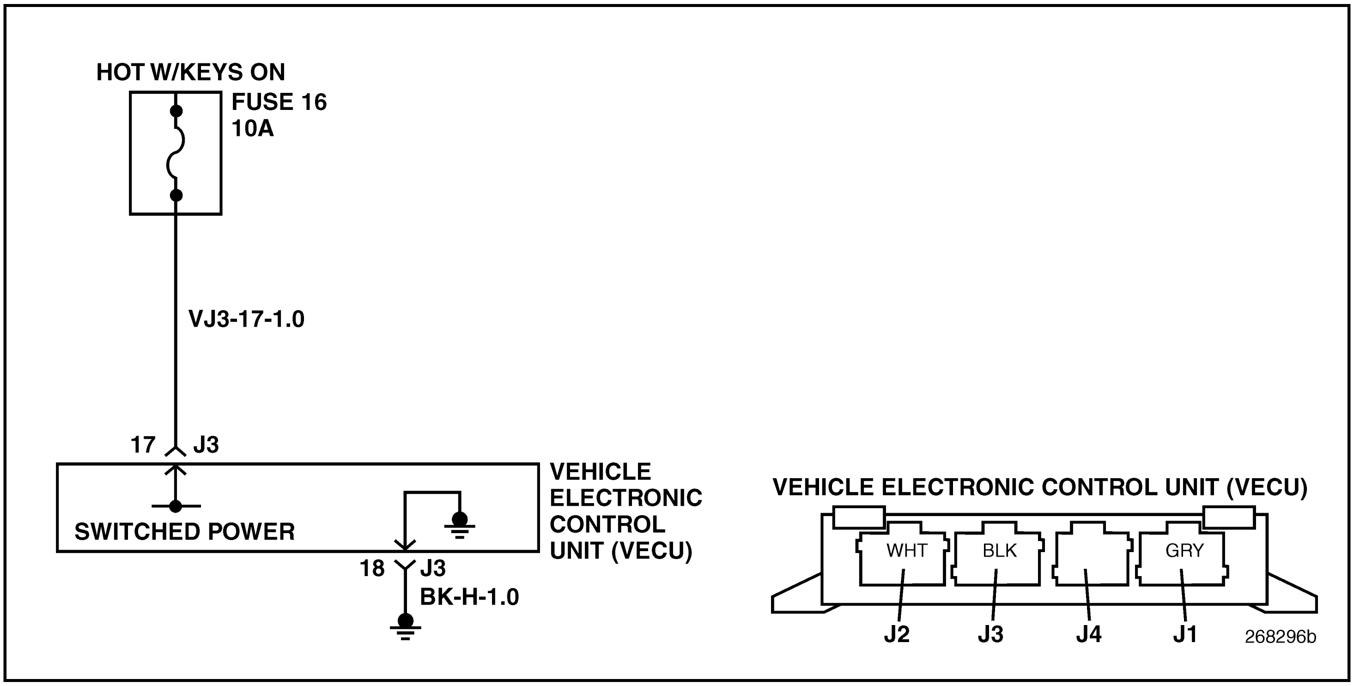


Figure 792 — VECU Switched Power and Ground Standard Circuit

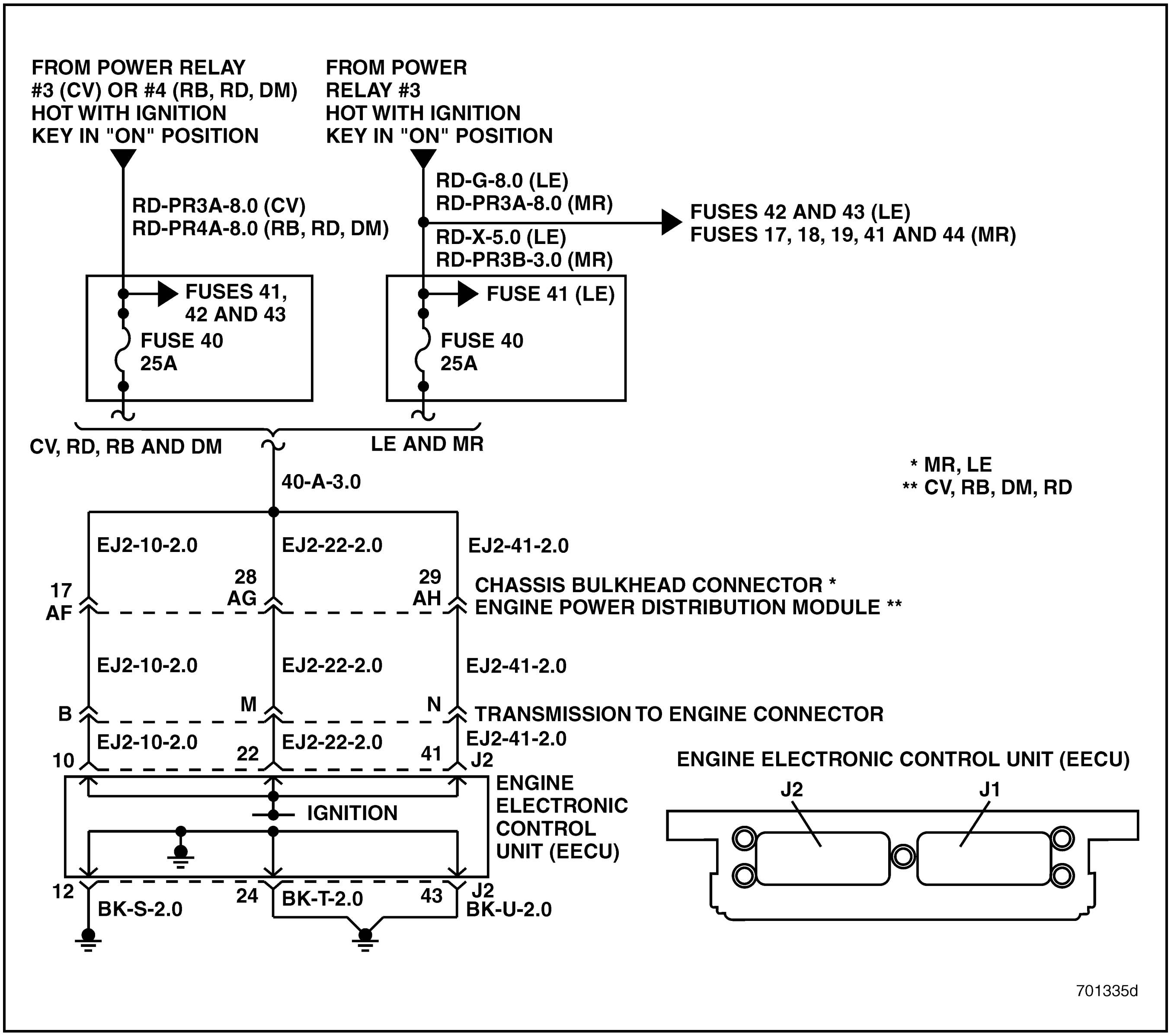


Figure 793 — EECU Power and Ground Circuit (ASET™ IEGR Engine)

Failure Mode Identifier (FMI): 4 (Special Instructions)

Parameter Identification (PID): S254

Message Identification (MID): 128/142

Circuit Description: Switched power is supplied to the Vehicle Electronic Control Unit (VECU) through connector J3, pin 17. The VECU ground is provided at connector J3, pin 18. Switched power is supplied to the Engine Electronic Control Unit (EECU) through connector J2, pins 10, 22, and 41. The EECU ground is provided through connector J2, pins 12, 24, and 43.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will illuminate and code 9-2 will set with MID 142 if the Vehicle Electronic Control Unit (VECU) senses a loss of battery power without the key switch being turned off. The Electronic Malfunction Lamp (EML) will illuminate and code 9-2 will set with MID 128 if the Engine Electronic Control Unit (EECU) senses a loss of switched power without the key switch being turned off. Code 9-2 generally indicates a major vehicle power failure.

NOTE

If code 9-2 is logged, check the following components for corrosion, loose terminals, and/or poor connections:

- Batteries
- Starter Motor
- Engine Ground
- Ground Circuit Breaker
- Left and Right Dashboard Grounds
- Power Relays
- Engine Electronic Control Unit (EECU) Fuse or Circuit Breaker Connections (MID 128)
- Engine Power Distribution Module (EPDM) Connectors (MID 128)
- Engine-to-Transmission Transition Connector (MID 128)
- Vehicle Electronic Control Unit (VECU) Fuse or Circuit Breaker Connections (MID 142)

Clean, repair or replace as necessary.

To clear code 9-2, turn the key switch ON, turn the key switch OFF for 6 seconds, then turn the key switch back ON. The code will clear in several seconds.

NOTE

Refer to Mack Service Bulletin SB-221-032 for more information and advanced diagnostics regarding fault code 9-2.

NOTE

Fault code 9-2 can only be logged in a VECU equipped with 1MS328, 1MS336, 1MS336A, 1MS349, 1MS364, or 1MS369 software. Fault code 9-2 can only be logged in an EECU equipped with 1MS334, 1MS334A or 1MS368 CEGR software, provided that the VECU is equipped with the aforementioned software.

BLINK CODE 9-2 — POWER RESET WITHOUT KEY SWITCH (ASET™ CEGR ENGINE)

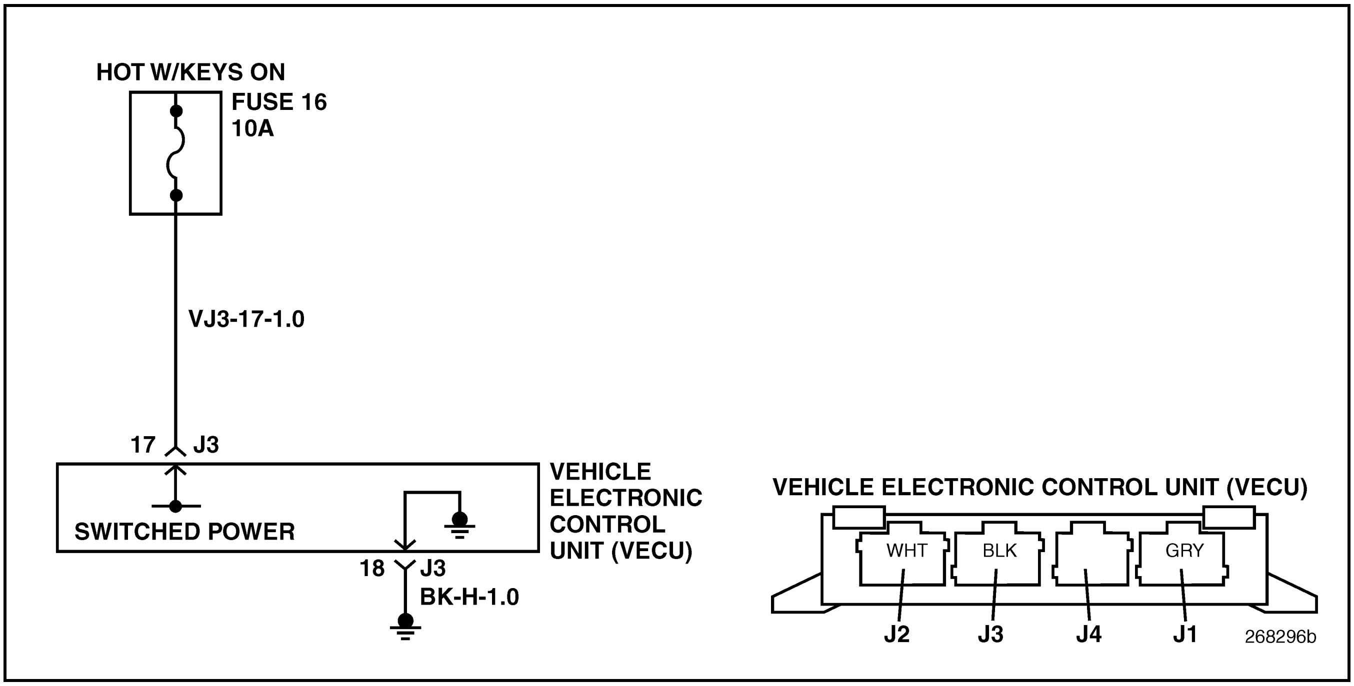


Figure 794 — VECU Switched Power and Ground Standard Circuit

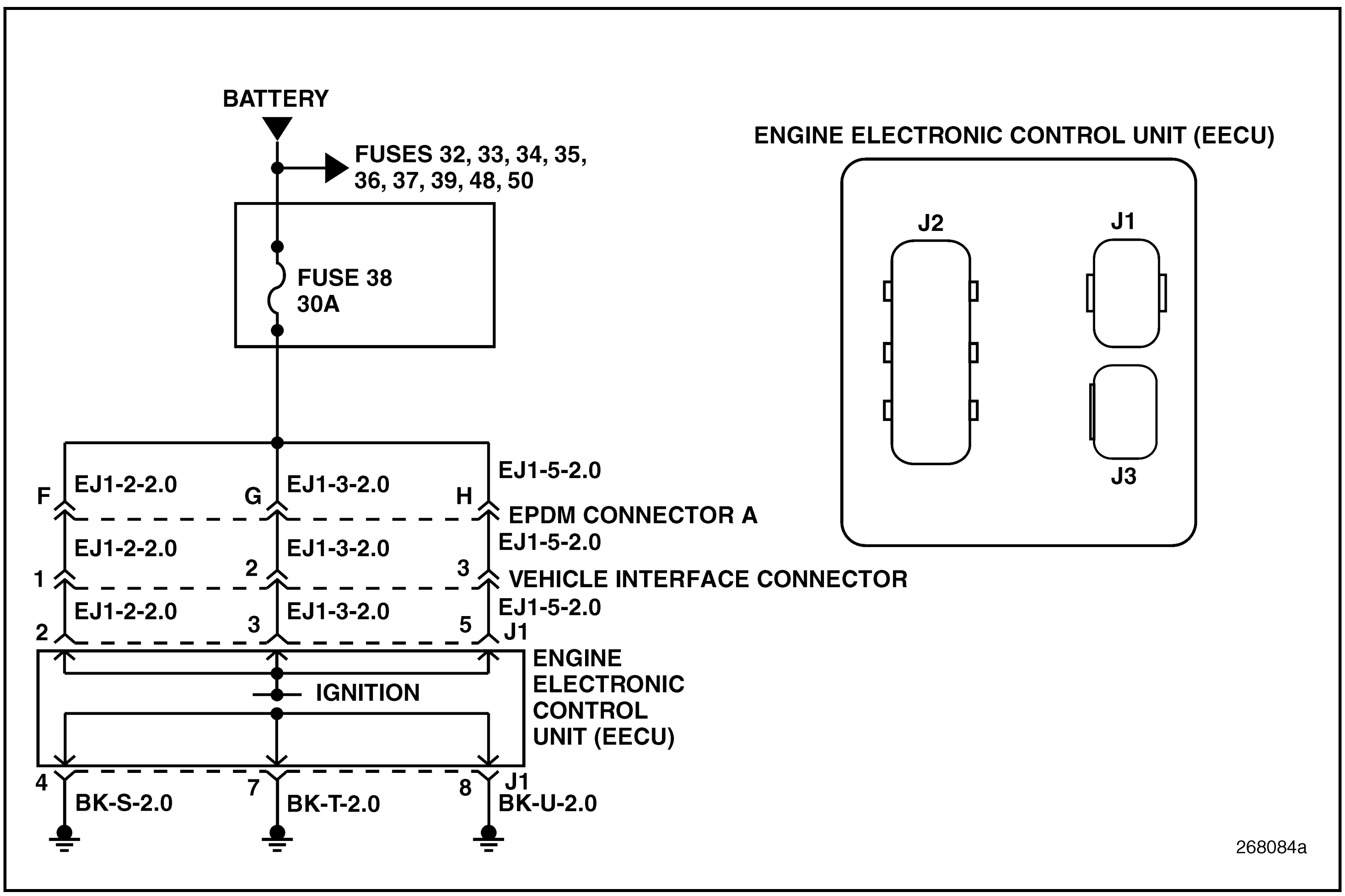


Figure 795 — EECU Power and Ground Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 4 (Special Instructions)

Parameter Identification (PID): S254

Message Identification (MID): 128/142

Circuit Description: Switched power is supplied to the Vehicle Electronic Control Unit (VECU) through connector J3, pin 17. The VECU ground is provided at connector J3, pin 18. Switched power is supplied to the Engine Electronic Control Unit (EECU) through connector J1, pins 2, 3, and 5. The EECU ground is provided through connector J1, pins 4, 7, and 8.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will illuminate and code 9-2 will set with MID 142 if the Vehicle Electronic Control Unit (VECU) senses a loss of battery power without the key switch being turned off. The Electronic Malfunction Lamp (EML) will illuminate and code 9-2 will set with MID 128 if the Engine Electronic Control Unit (EECU) senses a loss of switched power without the key switch being turned off. Code 9-2 generally indicates a major vehicle power failure.

NOTE

If code 9-2 is logged, check the following components for corrosion, loose terminals, and/or poor connections:

- Batteries
- Starter Motor
- Engine Ground
- Ground Circuit Breaker
- Left and Right Dashboard Grounds
- Power Relays
- Engine Electronic Control Unit (EECU) Fuse or Circuit Breaker Connections (MID 128)
- Engine Power Distribution Module (EPDM) Connectors (MID 128)
- Vehicle Interface Connector (MID 128)
- Vehicle Electronic Control Unit (VECU) Fuse or Circuit Breaker Connections (MID 142)

Clean, repair or replace as necessary.

To clear code 9-2, turn the key switch ON, turn the key switch OFF for 6 seconds, then turn the key switch back ON. The code will clear in several seconds.

NOTE

Refer to Mack Service Bulletin SB-221-032 for more information and advanced diagnostics regarding fault code 9-2.

NOTE

Fault code 9-2 can only be logged in a VECU equipped with 1MS328, 1MS336, 1MS336A, 1MS349, 1MS364, or 1MS369 software. Fault code 9-2 can only be logged in an EECU equipped with 1MS334, 1MS334A or 1MS368 CEGR software, provided that the VECU is equipped with the aforementioned software.

BLINK CODE 9-3 — AFTERCOOLER OUTLET TEMPERATURE (AOT) SENSOR (ASET™ CEGR ENGINE)

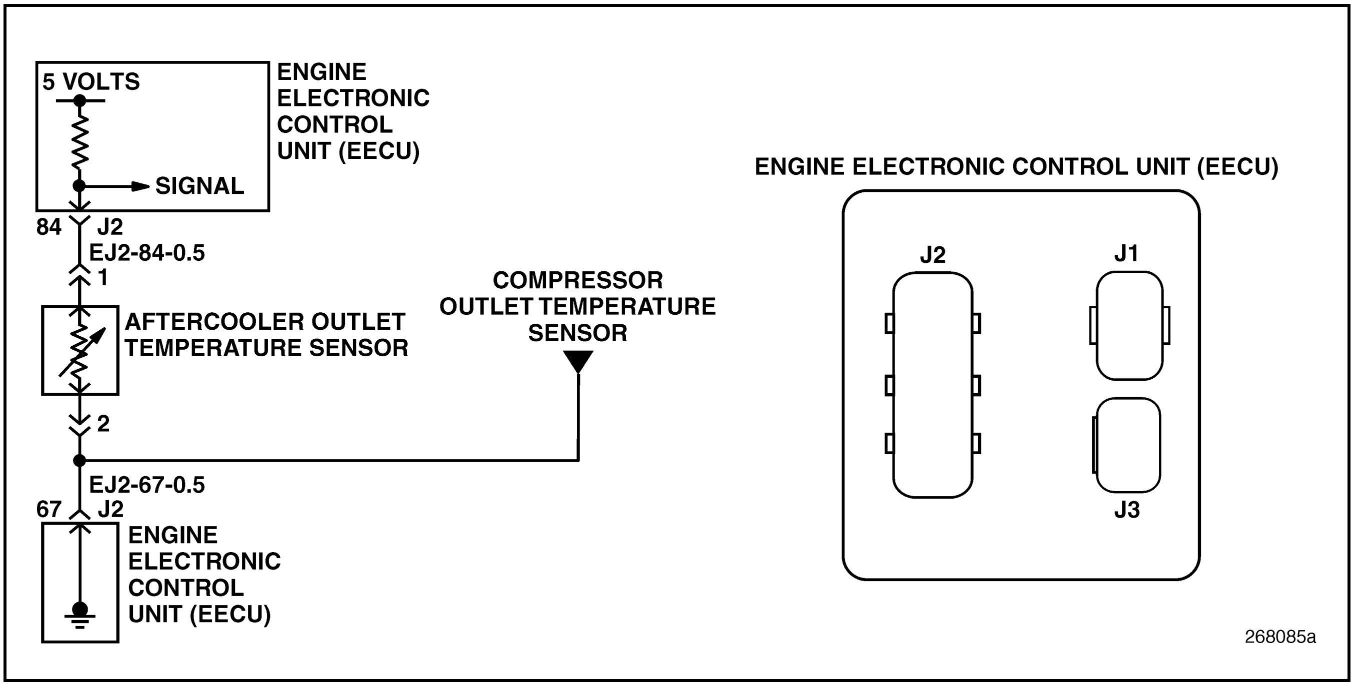


Figure 796 — Aftercooler Outlet Temperature (AOT) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 2 (Data Intermittent)

Parameter Identification (PID): 272

Message Identification (MID): 128

Circuit Description: The Aftercooler Outlet Temperature (AOT) Sensor is a thermistor. The resistance of the AOT Sensor changes inversely to the temperature of the air in the intake air system. When the intake air is cold, the sensor resistance is high. As the temperature of the air increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the AOT Sensor and uses this signal to accurately calculate the air/fuel mixture. The AOT Sensor information is also used for controlling the on/off fan solenoid and the electronic fan drive.

Location: The Aftercooler Outlet Temperature (AOT) Sensor is located on the left side of the engine, in the EGR mixer.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 9-3 will set with FMI 3 when the Engine Electronic Control Unit (EECU) senses the AOT Sensor signal voltage is greater than 4.8 volts for 2 seconds. The EML will turn on and code 9-3 will set with FMI 4 when the EECU senses the AOT Sensor signal voltage is less than 0.15 volts for 2 seconds. If the AOT Sensor voltage returns to between 0.15 volts and 4.8 volts for more than 2 seconds, the fault will become inactive. When the engine returns to ambient temperature after being shut down at normal operating temperature and the key is turned to the ON position (engine not running), the Intake Manifold Temperature (IMT) Sensor, the Aftercooler Outlet Temperature (AOT) Sensor, and the Compressor Discharge Temperature (CDT) Sensor should all indicate the same temperature. Under these conditions, the EML will turn on and code 9-3 will set with FMI 2 if the AOT Sensor signal indicates a temperature that is NOT within 15°F of the average of the three sensors.

NOTE

FMI 2 is only available with EECU version 1MS378 software. Additionally, code 9-3 will only appear as an active fault when the engine is NOT running.

NOTE

FMI 5 is only available with EECU version 1MS368 software. The EML will turn on and code 9-3 will set with FMI 5 when the EECU senses an AOT Sensor signal voltage between 4.4 volts and 4.8 volts, and an inlet manifold temperature greater than 50°F. Additionally, FMI 5 will only appear as an active fault when the engine is running.

Normal AOT Sensor Parameters: The Aftercooler Outlet Temperature (AOT) Sensor has a resistance between 59,500 ohms at 50°F (10°C) and 3,500 ohms at 180°F (82°C).

Test 1 — Checking for Code 9-3

1. Verify that code 9-3 is set.

   If code 9-3 is set, go to test “Test 2 — Checking Code 9-3 Failure Mode Identifier (FMI)” on page 635.

   If code 9-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Aftercooler Outlet Temperature (AOT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 9-3 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test “Test 4 — Checking for Other Codes” on page 635.

   If the FMI is 4 (voltage low) or 2 (data intermittent), go to test “Test 5 — Checking for a Short to Ground in the Sensor” on page 635.

Test 4 — Checking for Other Codes

1. Is code 9-5 also set?

   If code 9-5 is also set, go to test “Test 8 — Checking for an Open in the AOT Sensor Return Line” on page 636.

   If only code 9-3 is set, go to test “Test 9 — Checking Sensor Resistance” on page 636.

Test 5 — Checking for a Short to Ground in the Sensor

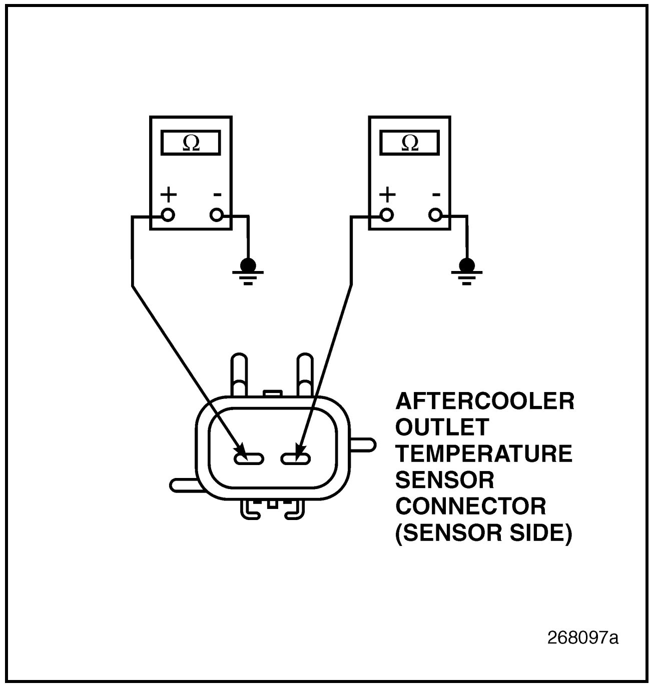


Figure 797

1. Turn the ignition key OFF.
2. Disconnect the Aftercooler Outlet Temperature (AOT) Sensor connector.
3. Check for continuity from either pin of the AOT Sensor to a good ground (see Figure 797).

   If continuity exists, replace the AOT Sensor.

   If there is NO continuity and the FMI was 4, go to test “Test 10 — Checking Sensor Resistance” on page 637.

   If there is NO continuity and the FMI was 2, go to test “Test 11 — Checking for Voltage on the Sensor Return Line” on page 637.

Test 8 — Checking for an Open in the AOT Sensor Return Line

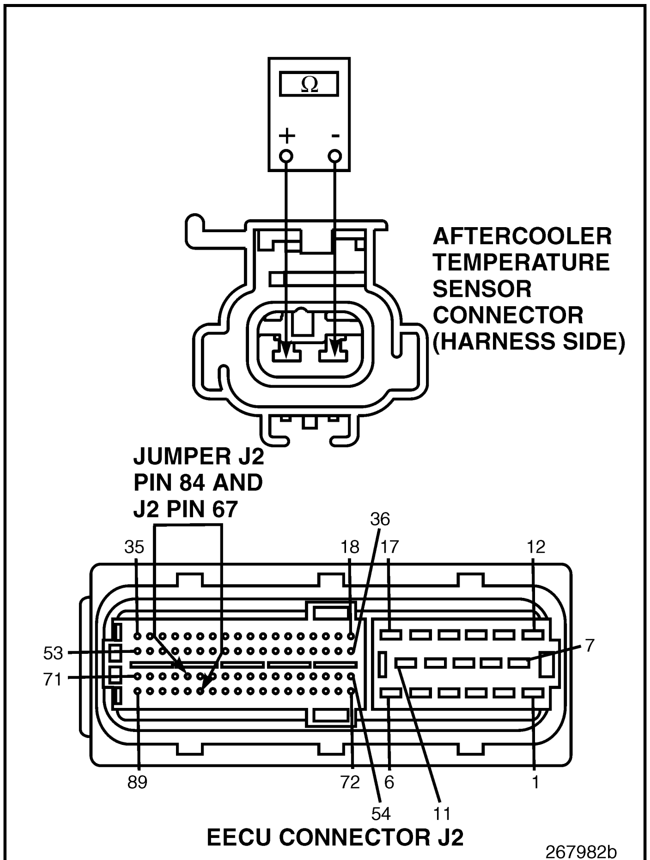


Figure 798

1. Turn the ignition key OFF.
2. Disconnect the Aftercooler Outlet Temperature (AOT) Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between EECU harness connector J2 pins 67 and 84 (see Figure 798).
5. Check for continuity between pin 1 and 2 of the AOT Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 638.

   If there is NO continuity, there is an open in the ground circuit in the harness between the common ground splice of the sensors and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

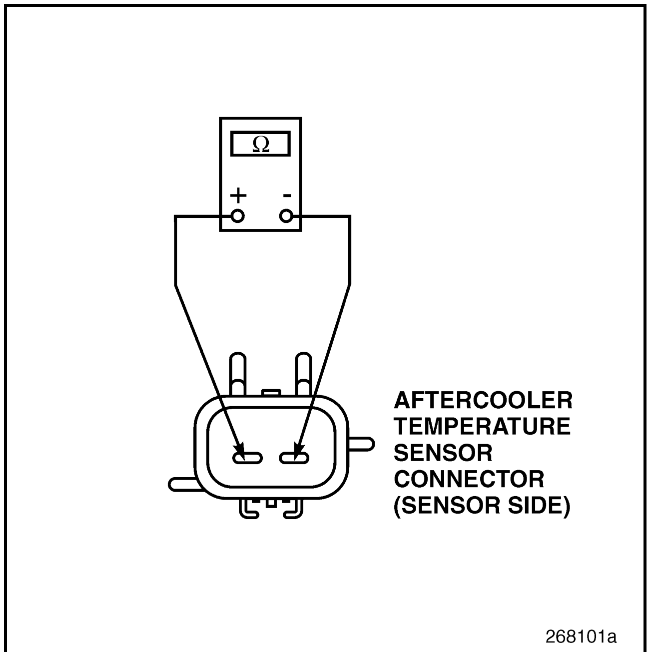


Figure 799

1. Turn the ignition key OFF.
2. Disconnect the Aftercooler Outlet Temperature (AOT) Sensor harness connector.
3. Measure the resistance across the pins of the AOT Sensor with the air temperature between 50° and 180°F (10° and 82°C) (see Figure 799).

   If the resistance of the sensor is between 59,500 and 3,500 ohms or if the resistance is infinite (open circuit), go to test “Test 18 — Checking Signal Line Voltage” on page 638.

   If the resistance of the sensor is not within normal operating parameters (59,500 and 3,500 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

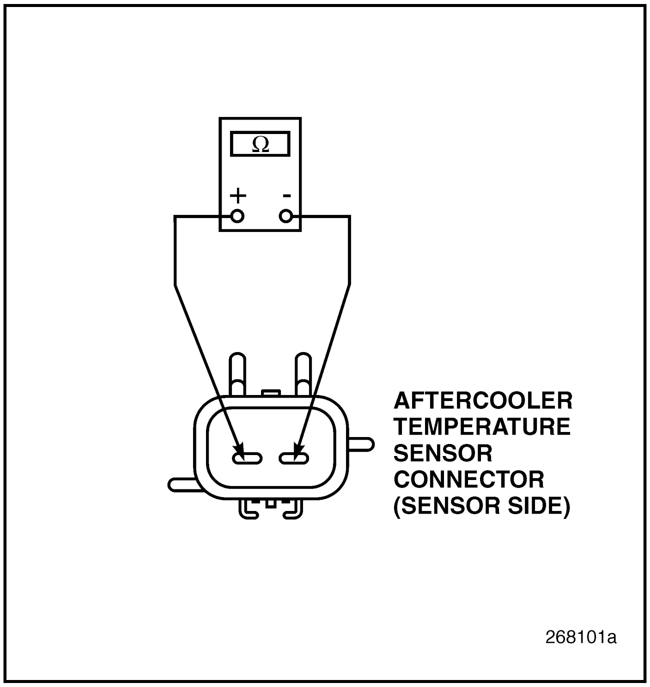


Figure 800

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor connector.
3. Measure the resistance across the pins of the AOT Sensor with the air temperature between 50° and 180°F (10° and 82°C) (see Figure 800).

   If the resistance is between 59,500 and 3,500 ohms, go to test “Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the AOT Sensor” on page 639.

   If the resistance is less than 3,500 ohms, replace the AOT Sensor.

Test 11 — Checking for Voltage on the Sensor Return Line

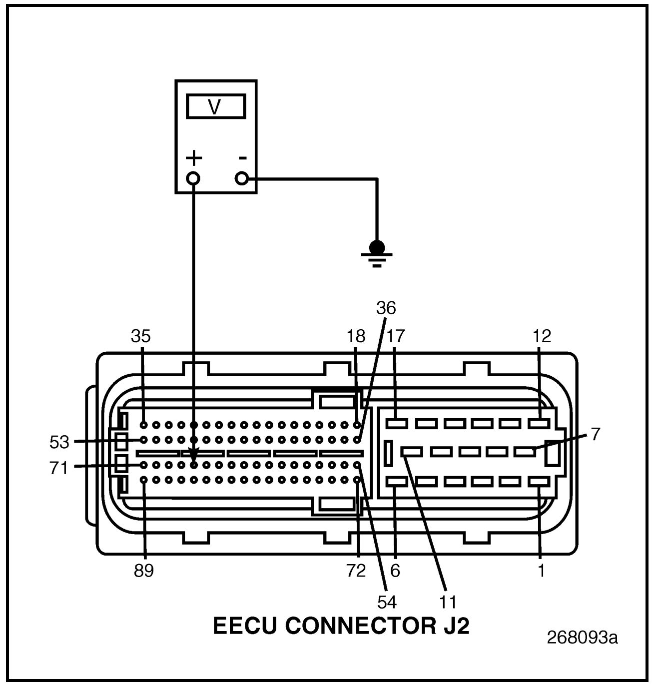


Figure 801

1. Turn the ignition key OFF.
2. Disconnect the Aftercooler Outlet Temperature (AOT) Sensor connector.
3. Disconnect connector J2 from Engine Electronic Control Unit (EECU).
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J2 pin 67 and a good ground (see Figure 801).

   If the measured voltage is less than 0.5 volts, go to test “Test 22 — Checking for a Short Circuit to Ground in the AOT Sensor Signal Line” on page 639.

   If the measured voltage is greater than 0.5 volts, there is a short to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 16 — Checking for Voltage on the Sensor Return Line

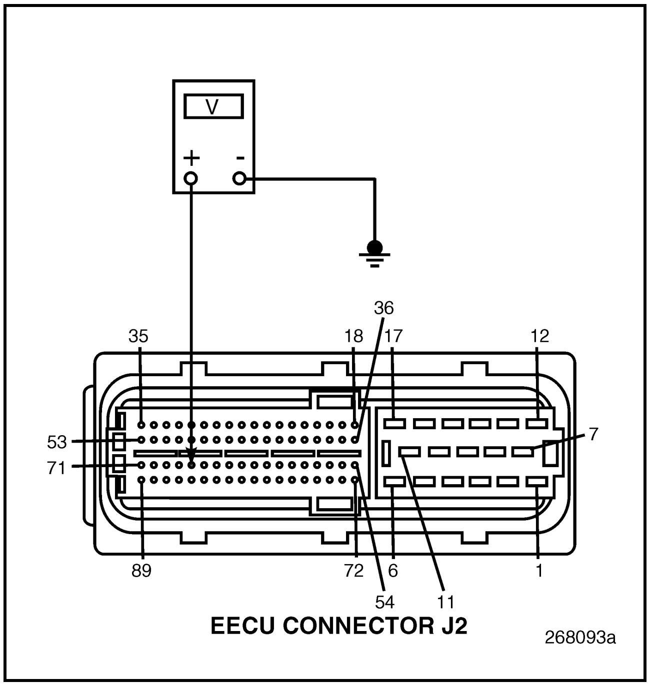


Figure 802

1. Turn the ignition key OFF.
2. Disconnect the Aftercooler Outlet Temperature (AOT) Sensor connector.
3. Disconnect connector J2 from Engine Electronic Control Unit (EECU).
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J2 pin 67 and a good ground (see Figure 802).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking the EECU Connector for an Open AOT Sensor Return Line” on page 640.

   If the measured voltage is greater than 0.5 volts, there is a short to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking Signal Line Voltage

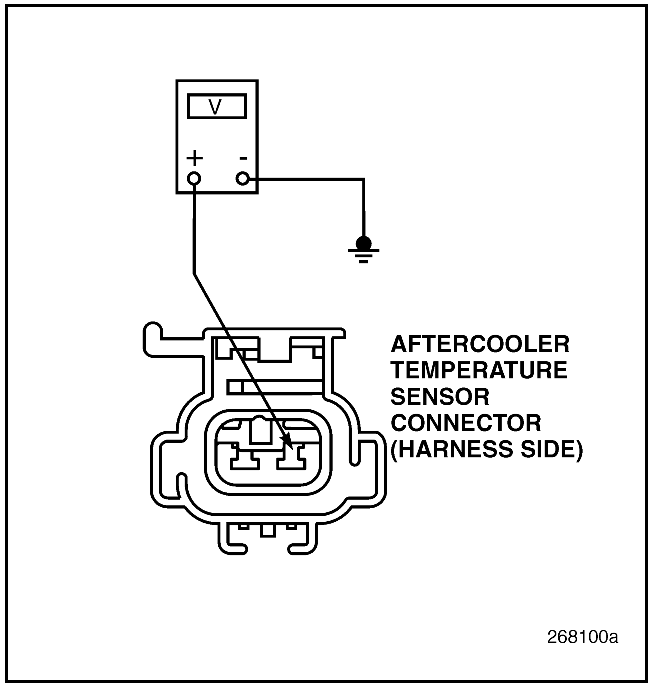


Figure 803

1. Disconnect the AOT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between AOT Sensor harness connector pin 1 and a good ground (see Figure 803).

   If the measured voltage is greater than 6 volts, the AOT Sensor signal line is shorted to voltage; go to test “Test 36 — Checking for a Short Circuit to Voltage in the Signal Line” on page 640.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was NOT open in test 9, go to test “Test 37 — Checking for an Open AOT Sensor Signal Line” on page 640.

Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the AOT Sensor

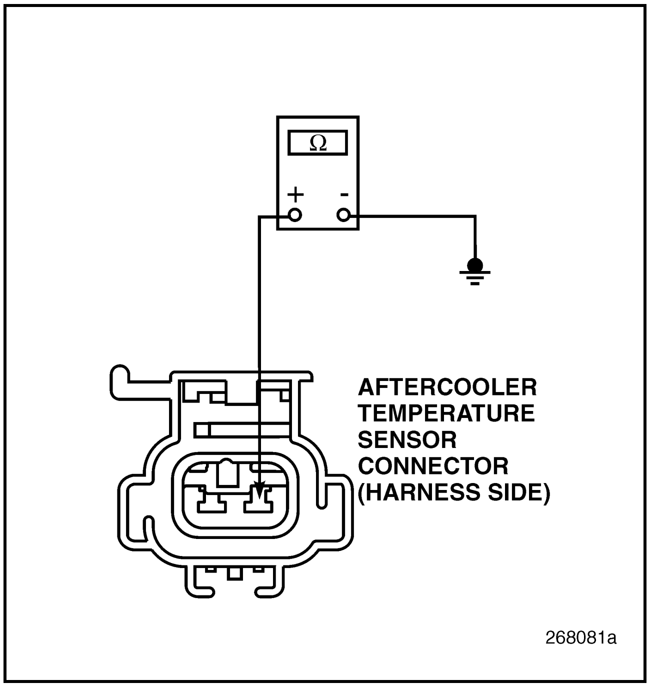


Figure 804

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 1 of the AOT Sensor harness connector and a good ground (see Figure 804).

   If there is NO continuity, go to test “Test 40 — Checking for Proper Supply Voltage to the Sensor” on page 641.

   If continuity exists between pin 1 and ground, go to test “Test 41 — Checking for a Pin to Pin Short in the Harness” on page 641.

Test 22 — Checking for a Short Circuit to Ground in the AOT Sensor Signal Line

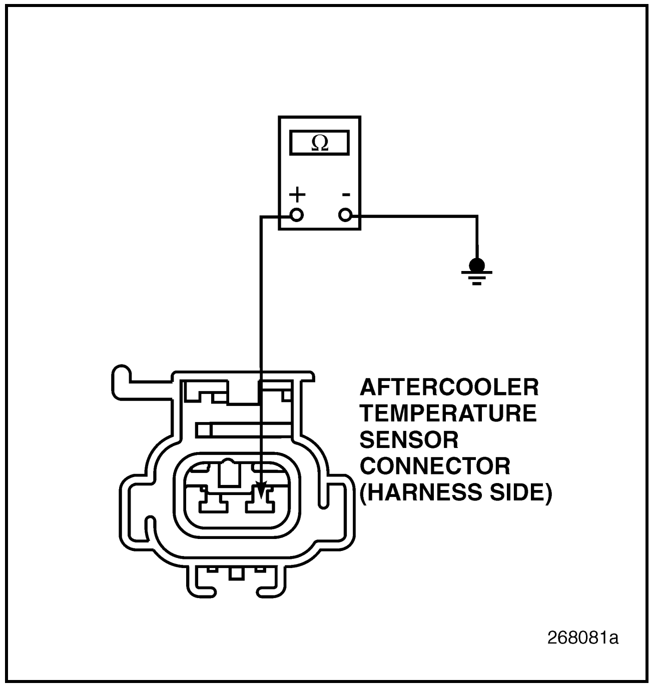


Figure 805

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 1 of the AOT Sensor harness connector and a good ground (see Figure 805).

   If there is NO continuity, replace the AOT Sensor and retest the system. If code 9-3 is still present with FMI 2, go to test “Test 44 — Checking the EECU Connector” on page 642.

   If continuity exists between pin 1 and ground, locate and repair the short circuit to ground in the AOT Sensor signal line.

Test 32 — Checking the EECU Connector for an Open AOT Sensor Return Line

1. Visually inspect EECU harness connector J2 pin 67 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminal is making good contact, go to test "Test 64 — Checking for Blink Code 9-3" on page 642.

Test 36 — Checking for a Short Circuit to Voltage in the Signal Line

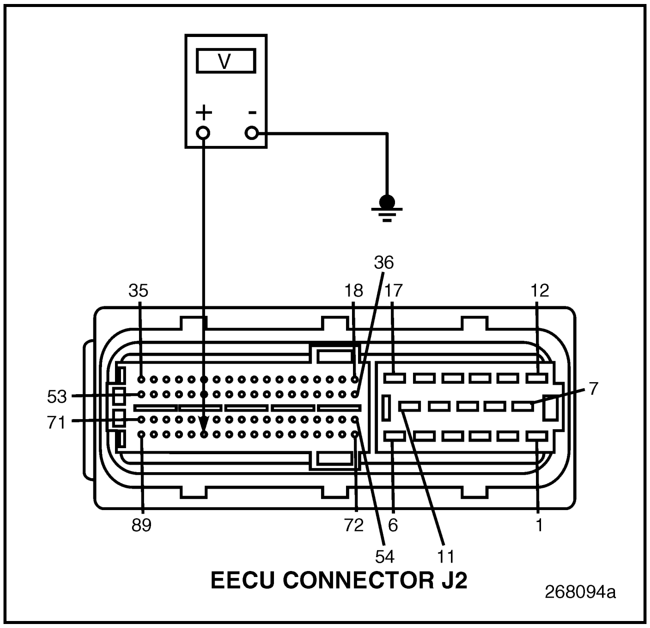


Figure 806

1. Disconnect the AOT Sensor harness connector.
2. Turn the ignition key OFF.
3. Disconnect connector J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage from EECU harness connector J2 pin 84 to a good ground (see Figure 806).

   If there is NO voltage indicated, go to test "Test 72 — Checking for a Short Circuit at the EECU Connector" on page 642.

   If voltage is present, go to test "Test 73 — Checking for a Pin to Pin Short in the Harness" on page 643.

Test 37 — Checking for an Open AOT Sensor Signal Line

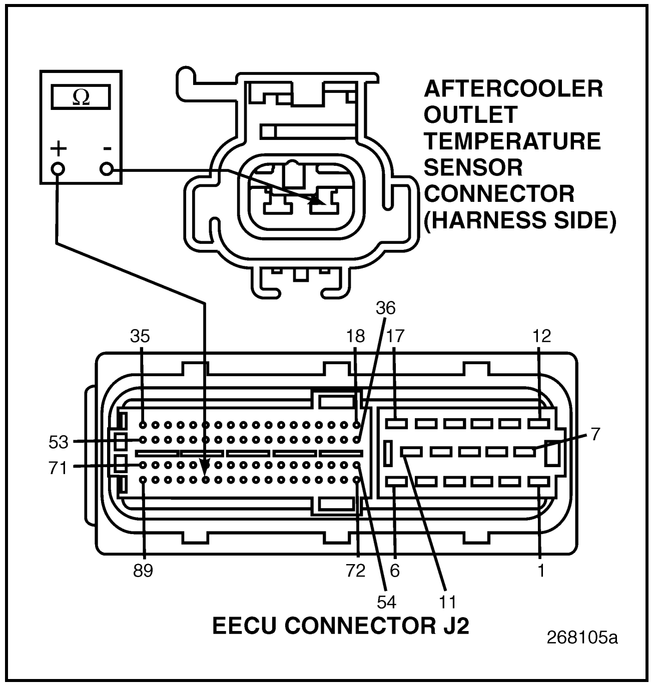


Figure 807

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin 1 of the AOT Sensor harness connector and EECU harness connector J2 pin 84 (see Figure 807).

   If there is NO continuity, locate and repair the open in the signal line between the AOT Sensor harness connector and EECU harness connector J2 pin 84.

   If continuity exists, go to test "Test 74 — Checking for an Open AOT Sensor Return Circuit" on page 643.

Test 40 — Checking for Proper Supply Voltage to the Sensor

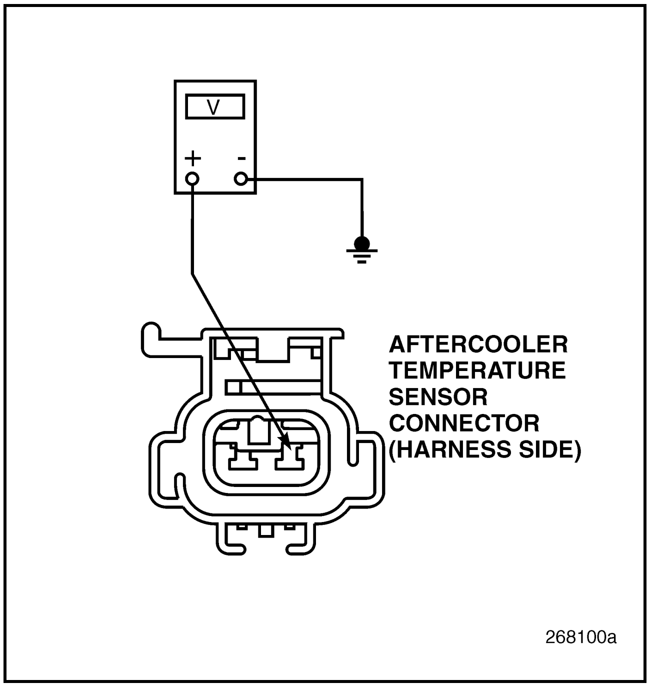


Figure 808

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin 1 of the AOT Sensor harness connector and a good ground (see Figure 808).

   If the measured voltage is between 4.5 and 5.5 volts, check the AOT Sensor harness connector for deformed pins or insufficient contact with the AOT Sensor pins. If the pins are in good shape, replace the AOT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 80 — Checking for a Short Circuit at the EECU Connector” on page 644.

Test 41 — Checking for a Pin to Pin Short in the Harness

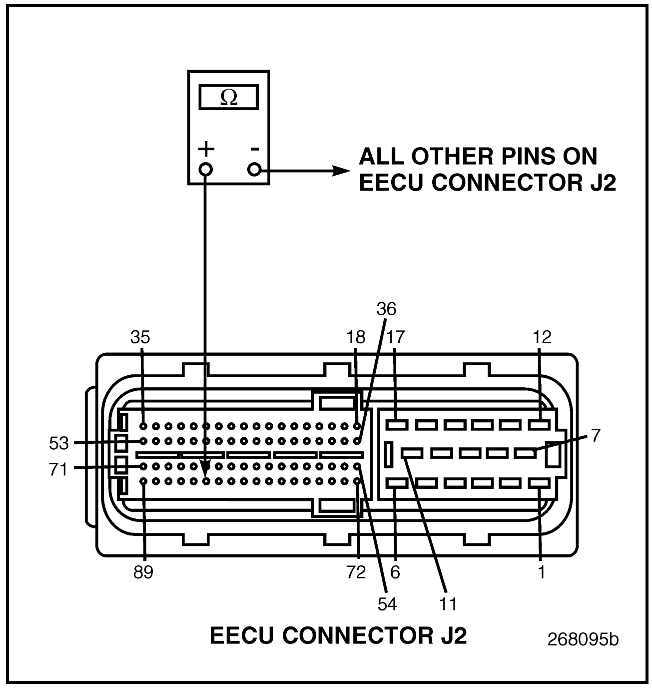


Figure 809

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between EECU harness connector J2 pin 84 and all other pins on EECU connector J2 (see Figure 809).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 44 — Checking the EECU Connector

1. Visually inspect EECU harness connector J2 pins 67 and 84 for dirt, loose pins, or deformed contacts.

   If any damage is found, repair EECU harness connector J2.

   If the terminals are making good contact, replace the EECU.

Test 64 — Checking for Blink Code 9-3

1. Connect the AOT Sensor harness connector.
2. Connect EECU harness connectors J1, J2 and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 9-3 is still active, replace the EECU and retest the system.

   If blink code 9-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Aftercooler Outlet Temperature Sensor was open in test 9, replace the sensor before retesting the circuit.

1. Turn the ignition key OFF.
2. Connect the AOT Sensor harness connector.
3. Connect connectors J1, J2 and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 9-3 is still active, check the EECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 9-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short in the Harness

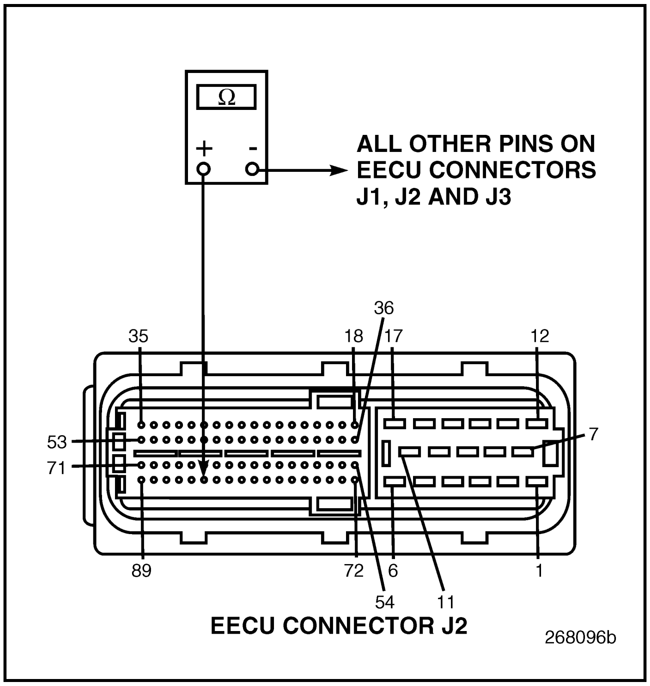


Figure 810

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor harness connector.
3. Disconnect EECU connectors J1, J2 and J3.
4. Check for continuity between EECU harness connector J2 pin 84 and all other pins on EECU connectors J1, J2 and J3 (see Figure 810).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the sensor.

Test 74 — Checking for an Open AOT Sensor Return Circuit

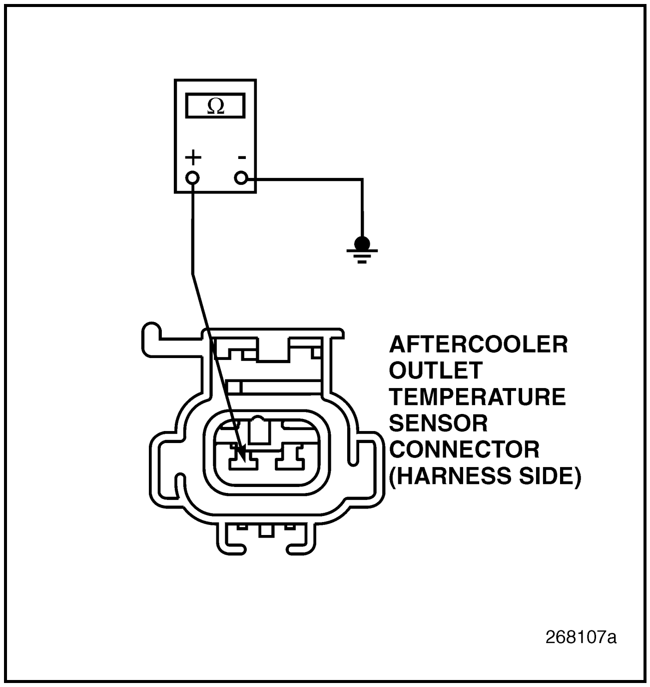


Figure 811

1. Turn the ignition key OFF.
2. Disconnect the AOT Sensor harness connector.
3. Connect EECU connector J2.
4. Check for continuity between pin 2 of the AOT Sensor harness connector and a good ground (see Figure 811).

   If there is NO continuity, locate and repair the open in the harness between the AOT Sensor and the common ground with the Compressor Discharge Temperature (CDT) sensor.

   If continuity exists, check the AOT Sensor harness connector for damaged pins or improper mating with the AOT Sensor. If the AOT Sensor is OK, go to test "Test 148 — Checking the EECU Connector for an Open Circuit" on page 644.

Test 80 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the AOT Sensor connector.
3. Connect connectors J1, J2 and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 9-3 is still active, check the EECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 9-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 67 and 84 for dirt, loose pins or deformed contacts.
2. If a repairable open is found or either of the pins feels loose, repair EECU harness connector J2.

   If the terminals are making good contact, go to test “Test 296 — Checking for an Open Circuit at the EECU Connector” on page 644.

Test 296 — Checking for an Open Circuit at the EECU Connector

1. Connect the AOT Sensor connector.
2. Connect connectors J1, J2 and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 9-3 is still active, replace the EECU and retest the system.

   If blink code 9-3 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 9-5 — COMPRESSOR DISCHARGE TEMPERATURE (CDT) SENSOR (ASET™ CEGR ENGINE)

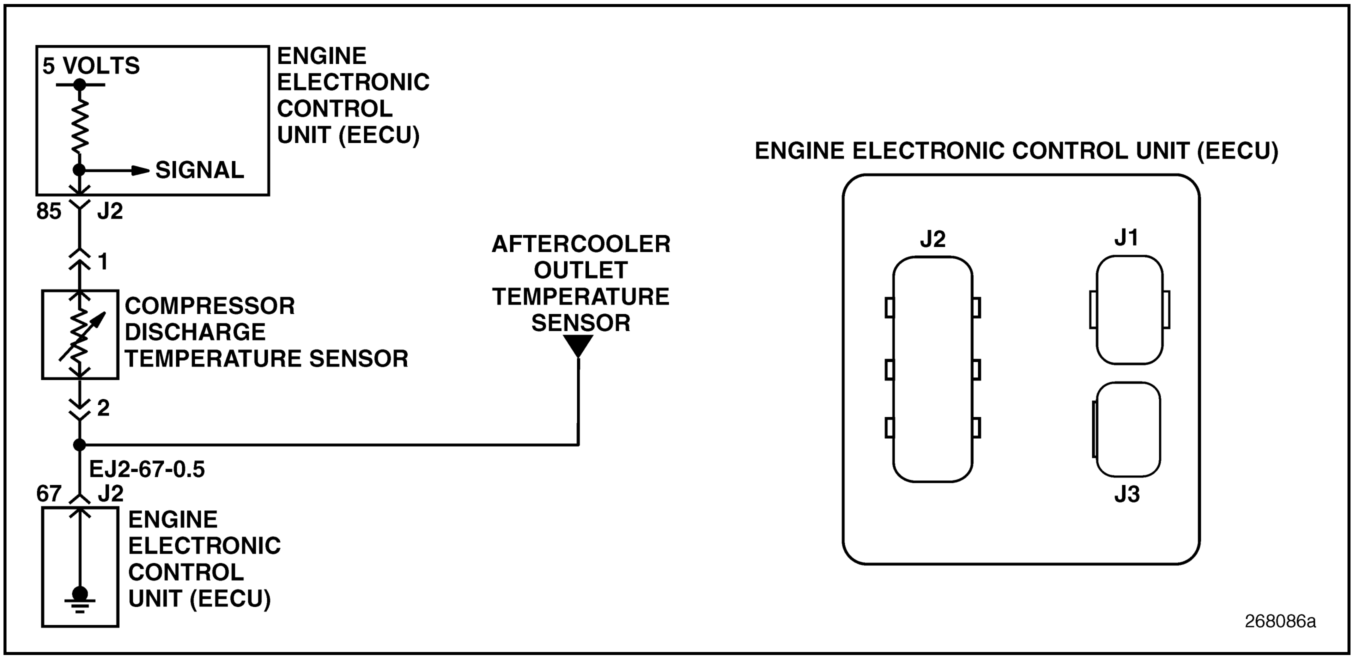


Figure 812 — Compressor Discharge Temperature (CDT) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 0 (Valid High), 3 (Voltage High), 4 (Voltage Low), 5 (Current Low/Open), 2 (Data Intermittent)

Parameter Identification (PID): 270

Message Identification (MID): 128

Circuit Description: The Compressor Discharge Temperature (CDT) Sensor is a thermistor. The resistance of the CDT Sensor changes inversely to the temperature of the air in the intake system. When the intake air is cold, the sensor resistance is high. As the temperature of the air increases, the sensor resistance decreases. The Engine Electronic Control Unit (EECU) monitors the voltage drop across the CDT Sensor and uses this signal to protect the turbocharger and engine from overboost conditions.

Location: The Compressor Discharge Temperature (CDT) Sensor is located at the right side of the engine, in the air intake pipe between the turbocharger and the charge air cooler.

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 9-5 will set with FMI 3 when the Engine Electronic Control Unit (EECU) senses the CDT Sensor signal voltage is greater than 4.8 volts for 2 seconds. The EML will turn on and code 9-5 will set with FMI 4 when the EECU senses the CDT Sensor signal voltage is less than 0.15 volts for 2 seconds. If the CDT Sensor voltage returns to between 0.15 volts and 4.8 volts for more than 2 seconds, the fault will become inactive. When the engine returns to ambient temperature after being shut down at normal operating temperature and the key is turned to the ON position (engine not running), the Intake Manifold Temperature (IMT) Sensor, the Aftercooler Outlet Temperature (AOT) Sensor, and the Compressor Discharge Temperature (CDT) Sensor should all indicate the same temperature. Under these conditions, the EML will turn on and code 9-5 will set with FMI 2 if the CDT Sensor signal indicates a temperature that is NOT within 15°F of the average of the three sensors.

NOTE

FMI 2 is only available with EECU version 1MS378 software. Additionally, code 9-5 will only appear as an active fault when the engine is NOT running.

NOTE

FMI 5 is only available with EECU version 1MS368 software. The EML will turn on and code 9-5 will set with FMI 5 when the EECU senses the CDT Sensor signal voltage is between 4.55 volts and 4.8 volts, and the inlet air temperature is above 110°F. Additionally, FMI 5 will only appear as an active fault when the engine is running.

Normal CDT Sensor Parameters: The Compressor Discharge Temperature (CDT) Sensor has a resistance between 59,500 ohms at 50°F (10°C) and 3,500 ohms at 180°F (82°C).

Additional Symptoms: Power is reduced to 90% when code 9-5 is active. At sea level, the power reduction begins when the Compressor Discharge Temperature exceeds 430°F (221°C) until only 60% is available at 500°F (260°C). Above 5000 feet (1524 meters), the power reduction begins when the Compressor Discharge Temperature exceeds 450°F (232°C) until only 80% is available at 500°F (260°C).

Test 1 — Checking for Code 9-5

1. Verify that code 9-5 is set.

   If code 9-5 is set, go to test "Test 2 — Checking Code 9-5 Failure Mode Identifier (FMI)" on page 646.

   If code 9-5 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Compressor Discharge Temperature (CDT) Sensor connector and wires for poor connections.

Test 2 — Checking Code 9-5 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 0 (valid high), check for a stuck VTG actuator, major air system leak, and that the inlet air cleaner boot is making full contact with the hood, ensuring only outside air is entering the air cleaner. Refer to the applicable ASET™ Service Manual.

NOTE

With the vehicle moving at a moderate speed, the compressor inlet temperature should be no more than 20°F above ambient air temperature using the Advanced Diagnostics screen of Customer Data Programming.

   If the FMI is 3 (voltage high) or 5 (current low/open), go to test "Test 4 — Checking for Other Codes" on page 646.

   If the FMI is 4 (voltage low) or 2 (data intermittent), go to test "Test 5 — Checking for a Short to Ground in the Sensor" on page 647.

Test 4 — Checking for Other Codes

1. Is code 9-3 also set?

   If code 9-3 is also set, go to test "Test 8 — Checking for an Open in the CDT Sensor Return Line" on page 647.

   If only code 9-5 is set, go to test "Test 9 — Checking Sensor Resistance" on page 648.

Test 5 — Checking for a Short to Ground in the Sensor

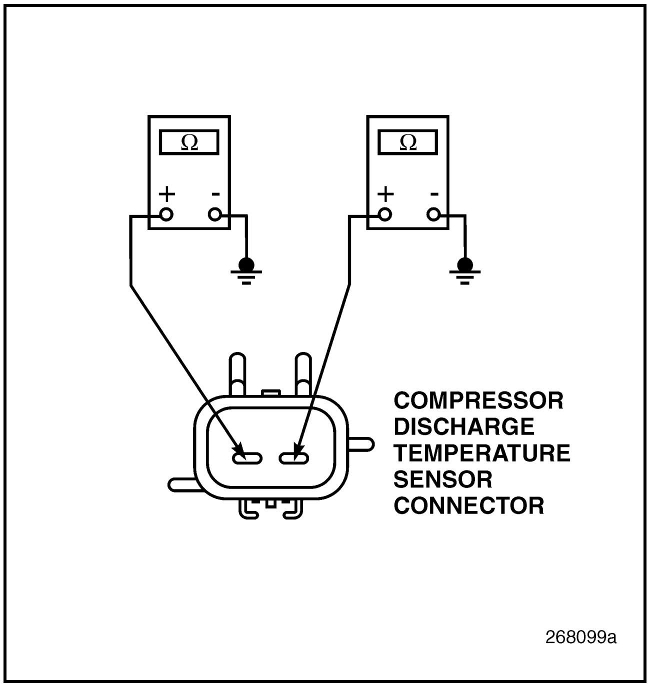


Figure 813

1. Turn the ignition key OFF.
2. Disconnect the Compressor Discharge Temperature (CDT) Sensor connector.
3. Check for continuity from either pin of the CDT Sensor to a good ground (see Figure 813).

   If continuity exists, replace the CDT Sensor.

   If there is NO continuity and the FMI was 4, go to test “Test 10 — Checking Sensor Resistance” on page 648.

   If there is NO continuity and the FMI was 2, go to test “Test 11 — Checking for Voltage on the Sensor Return Line” on page 649.

Test 8 — Checking for an Open in the CDT Sensor Return Line

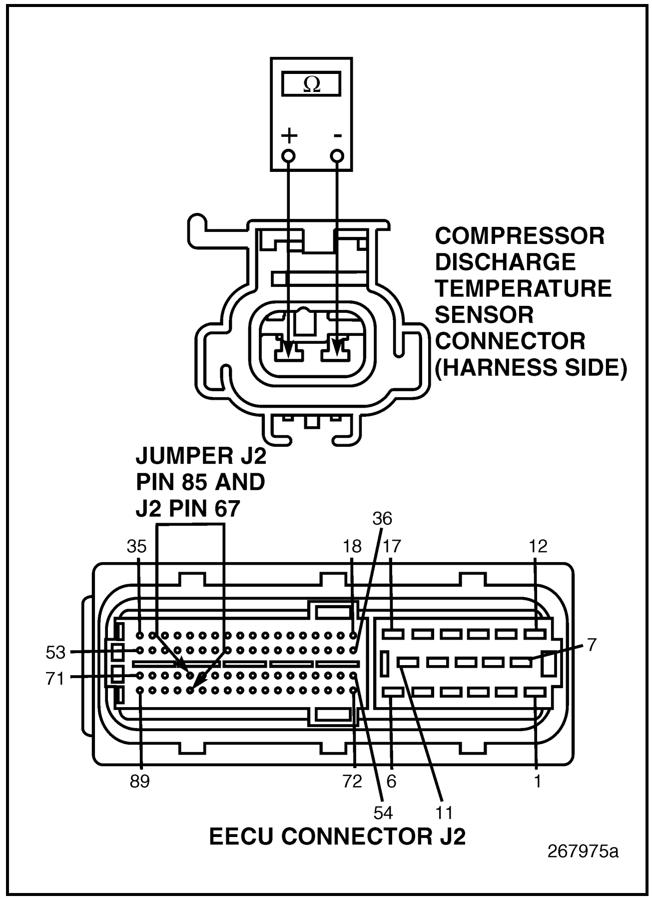


Figure 814

1. Turn the ignition key OFF.
2. Disconnect the Compressor Discharge Temperature (CDT) Sensor connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Connect a jumper between EECU harness connector J2 pins 67 and 85 (see Figure 814).
5. Check for continuity between pin 1 and 2 of the CDT Sensor harness connector.

   If continuity exists, go to test “Test 16 — Checking for Voltage on the Sensor Return Line” on page 649.

   If there is NO continuity, there is an open in the ground circuit in the harness between the common ground splice of the sensors and the EECU. Locate and repair the open circuit.

Test 9 — Checking Sensor Resistance

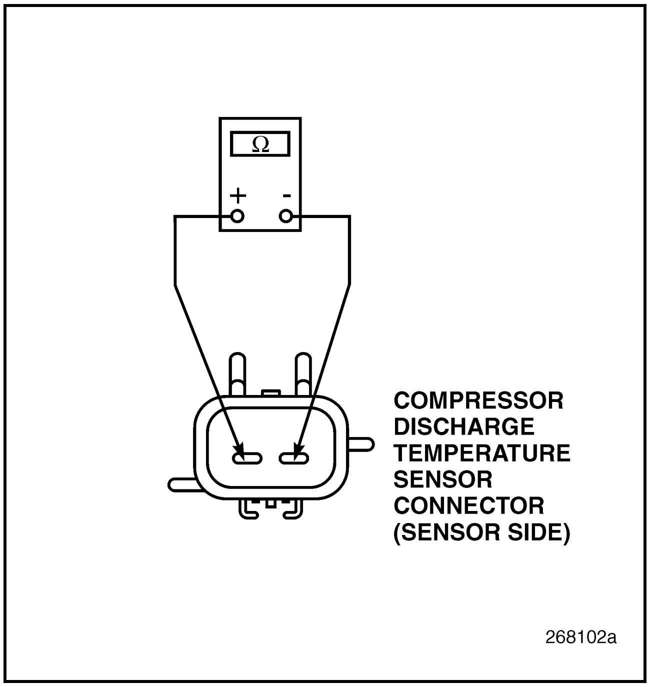


Figure 815

1. Turn the ignition key OFF.
2. Disconnect the Compressor Discharge Temperature (CDT) Sensor harness connector.
3. Measure the resistance across the pins of the CDT Sensor with the air temperature between 50° and 180°F (10° and 82°C) (see Figure 815).

   If the resistance of the sensor is between 59,500 and 3,500 ohms or if the resistance is infinite (open circuit), go to test "Test 18 — Checking Signal Line Voltage" on page 650.

   If the resistance of the sensor is not within normal operating parameters (59,500 and 3,500 ohms), but is not an open circuit (infinite resistance), replace the sensor.

Test 10 — Checking Sensor Resistance

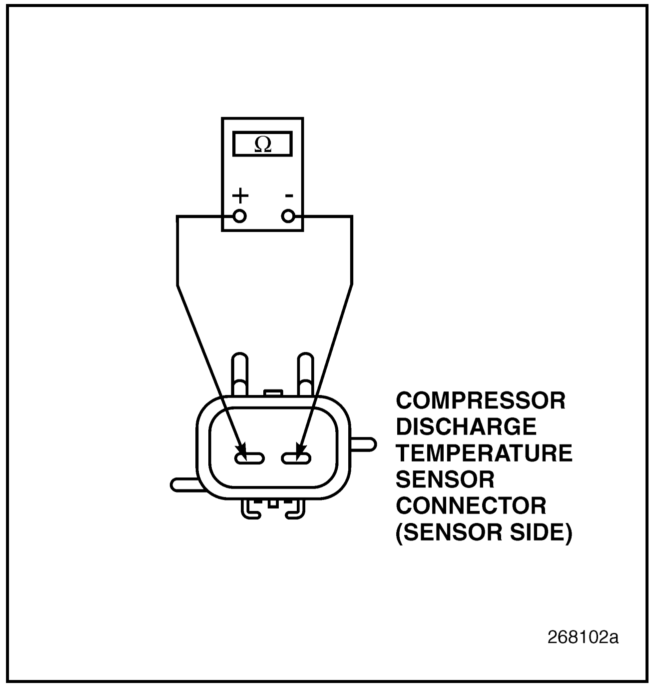


Figure 816

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor connector.
3. Measure the resistance across the pins of the CDT Sensor with the air temperature between 50° and 180°F (10° and 82°C) (see Figure 815).

   If the resistance of the sensor is between 59,500 and 3,500 ohms, go to test "Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the CDT Sensor" on page 650.

   If the resistance of the sensor is less than 3,500 ohms, replace the CDT Sensor.

Test 11 — Checking for Voltage on the Sensor Return Line

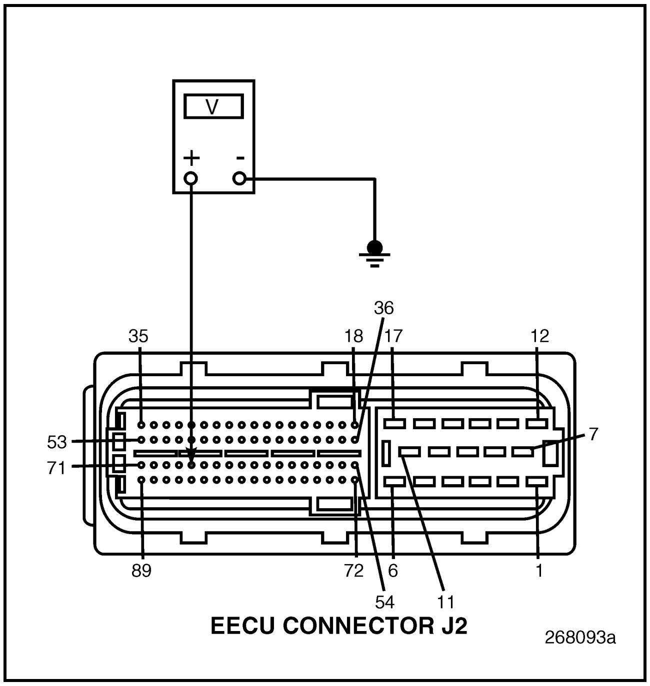


Figure 817

1. Turn the ignition key OFF.
2. Disconnect the Compressor Discharge Temperature (CDT) Sensor connector.
3. Disconnect connector J2 from Engine Electronic Control Unit (EECU).
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J2 pin 67 and a good ground (see Figure 817).

   If the measured voltage is less than 0.5 volts, go to test “Test 22 — Checking for a Short Circuit to Ground the CDT Sensor Signal Line” on page 651.

   If the measured voltage is greater than 0.5 volts, there is a short to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 16 — Checking for Voltage on the Sensor Return Line

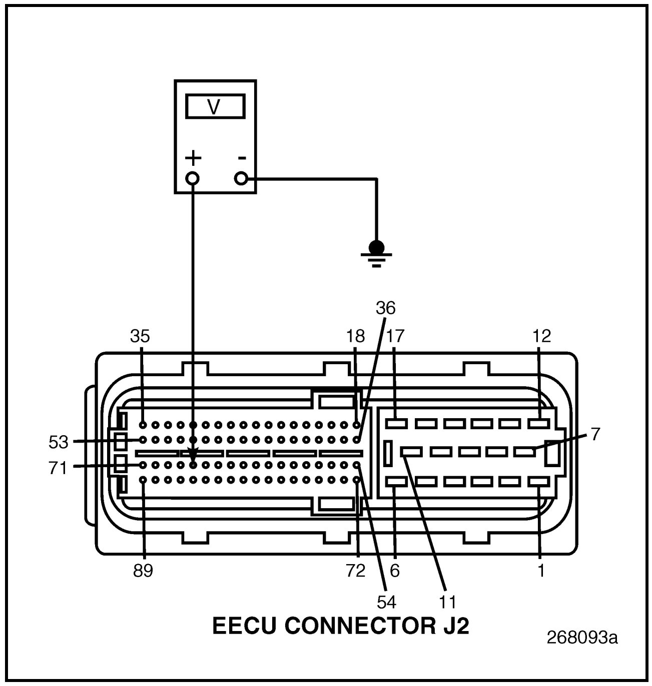


Figure 818

1. Turn the ignition key OFF.
2. Disconnect the Compressor Discharge Temperature (CDT) Sensor connector.
3. Disconnect connector J2 from Engine Electronic Control Unit (EECU).
4. Turn the ignition key ON.
5. Measure the voltage between EECU connector J2 pin 67 and a good ground (see Figure 818).

   If the measured voltage is less than 0.5 volts, go to test “Test 32 — Checking the EECU Connector for an Open CDT Sensor Return Line” on page 651.

   If the measured voltage is greater than 0.5 volts, there is a short to voltage in the sensor return line. Locate and repair the short circuit to voltage.

Test 18 — Checking Signal Line Voltage

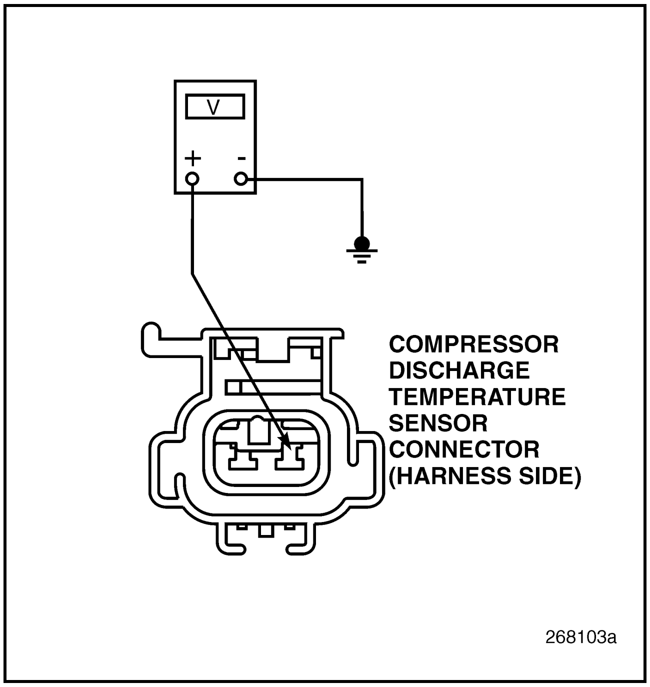


Figure 819

1. Disconnect the CDT Sensor connector.
2. Turn the ignition key ON.
3. Measure the voltage between CDT Sensor harness connector pin 1 and a good ground (see Figure 819).

   If the measured voltage is greater than 6 volts, the CDT Sensor signal line is shorted to voltage; go to test "Test 36 — Checking for a Short Circuit to Voltage in the Signal Line" on page 651.

   If the measured voltage is less than 6 volts, and the sensor was open (infinite resistance) in test 9, replace the sensor.

   If the measured voltage is less than 6 volts, and the sensor was NOT open in test 9, go to test "Test 37 — Checking for an Open CDT Sensor Signal Line" on page 652.

Test 20 — Checking for a Short in the Harness Between the Engine Electronic Control Unit (EECU) and the CDT Sensor

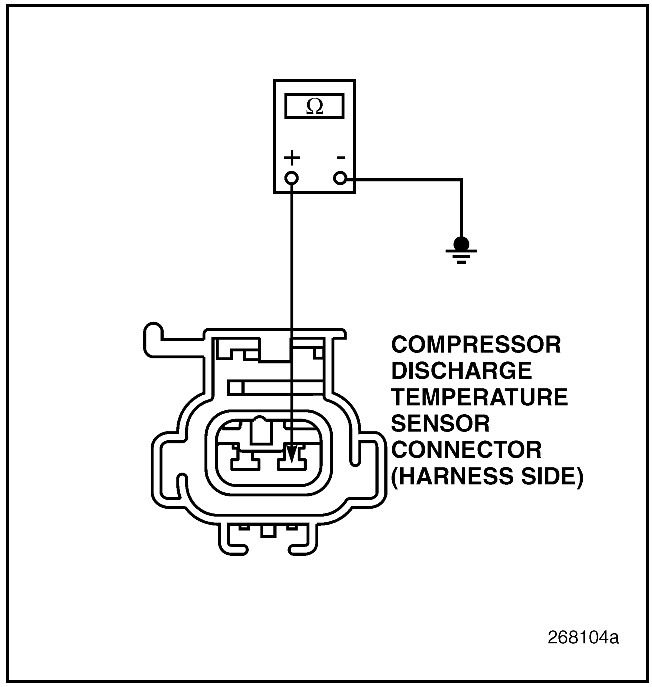


Figure 820

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 1 of the CDT Sensor harness connector and a good ground (see Figure 820).

   If continuity exists between pin 1 and ground, go to test "Test 40 — Checking for a Pin to Pin Short in the Harness" on page 652.

   If there is NO continuity, go to test "Test 41 — Checking for Proper Supply Voltage to the Sensor" on page 653.

Test 22 — Checking for a Short Circuit to Ground the CDT Sensor Signal Line

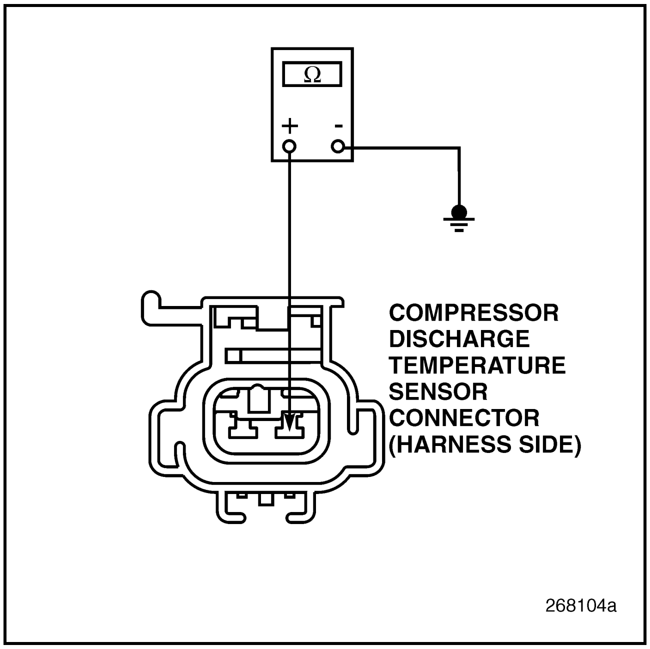


Figure 821

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor harness connector.
3. Disconnect connector J2 from the Engine Electronic Control Unit (EECU).
4. Check for continuity between pin 1 of the CDT Sensor harness connector and a good ground (see Figure 821).

   If continuity exists between pin 1 and ground, locate and repair the short circuit to ground in the CDT Sensor signal line.

   If there is NO continuity, replace the CDT Sensor and retest the system. If code 9-5 is still present with FMI 2, go to test “Test 44 — Checking the EECU Connector” on page 653.

Test 32 — Checking the EECU Connector for an Open CDT Sensor Return Line

1. Visually inspect EECU harness connector J2 pin 67 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminal is making good contact with EECU harness connector J2 pin 67, go to test “Test 64 — Checking for Blink Code 9-5” on page 653.

Test 36 — Checking for a Short Circuit to Voltage in the Signal Line

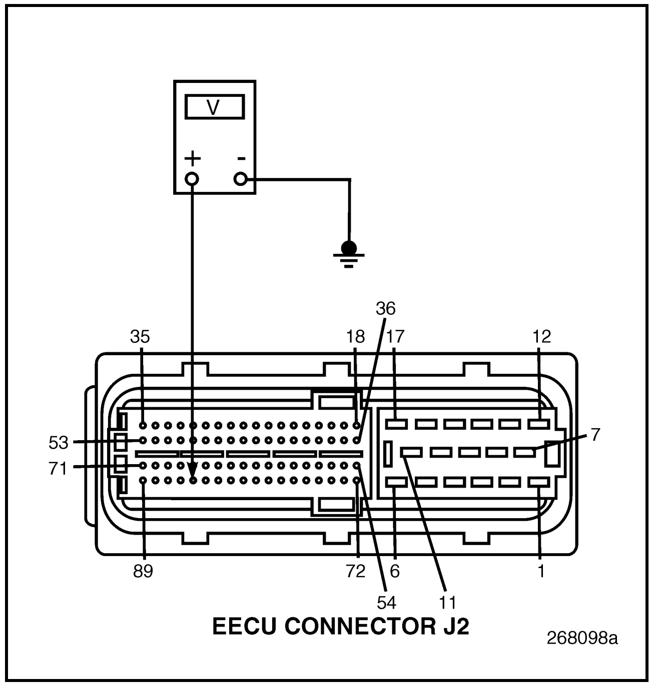


Figure 822

1. Disconnect the CDT Sensor harness connector.
2. Turn the ignition key OFF.
3. Disconnect connector J2 from the EECU.
4. Turn the ignition key ON.
5. Measure the voltage from EECU harness connector J2 pin 85 to a good ground (see Figure 822).

   If there is NO voltage indicated, go to test “Test 72 — Checking for a Short Circuit at the EECU Connector” on page 654.

   If voltage is present, go to test “Test 73 — Checking for a Pin to Pin Short in the Harness” on page 654.

Test 37 — Checking for an Open CDT Sensor Signal Line

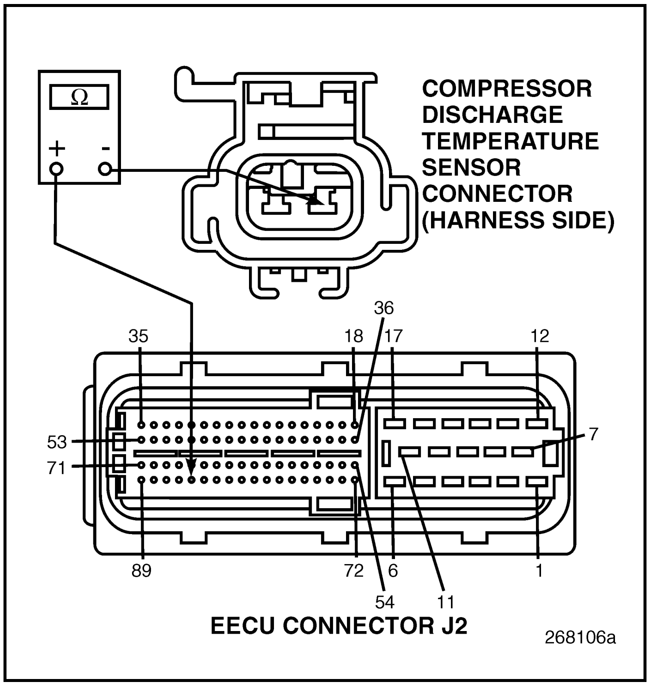


Figure 823

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between pin 1 of the CDT Sensor harness connector and EECU harness connector J2 pin 85 (see Figure 823).

   If there is NO continuity, locate and repair the open in the signal line between the CDT Sensor harness connector and EECU harness connector J2 pin 85.

   If continuity exists, go to test "Test 74 — Checking for an Open CDT Sensor Return Circuit" on page 655.

Test 40 — Checking for a Pin to Pin Short in the Harness

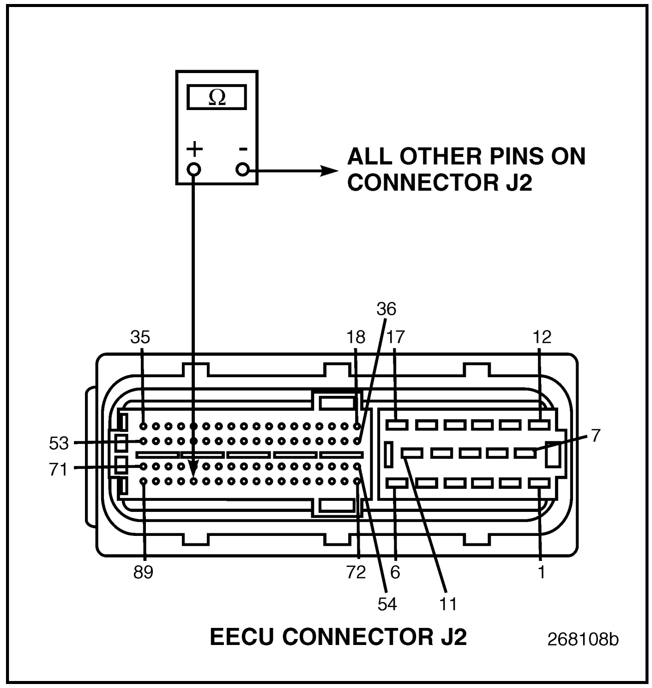


Figure 824

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between EECU harness connector J2 pin 85 and all other pins on EECU connector J2 (see Figure 824).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit.

   If there is NO continuity, the signal line is shorted to ground somewhere else in the harness. Locate and repair the short circuit to ground.

Test 41 — Checking for Proper Supply Voltage to the Sensor

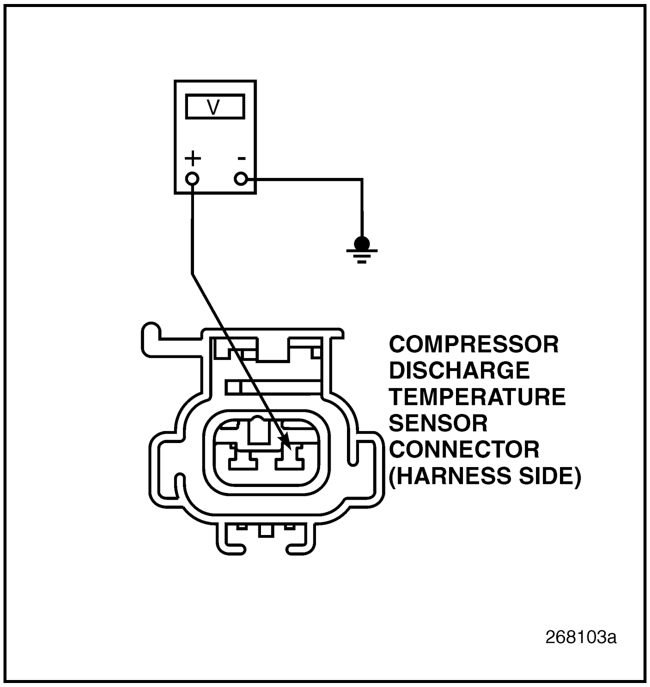


Figure 825

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.
5. Measure the voltage between pin 1 of the CDT Sensor harness connector and a good ground (see Figure 825).

   If the measured voltage is between 4.5 and 5.5 volts, check the CDT Sensor harness connector for deformed pins or insufficient contact with the CDT Sensor pins. If the pins are in good shape, replace the CDT Sensor.

   If the measured voltage is less than 4.5 volts, go to test “Test 82 — Checking for a Short Circuit at the EECU Connector” on page 655.

Test 44 — Checking the EECU Connector

1. Visually inspect EECU harness connector J2 pins 67 and 85 for dirt, loose pins, or deformed contacts.

   If any damage is found, repair EECU harness connector J2.

   If the terminals are making good contact, replace the EECU.

Test 64 — Checking for Blink Code 9-5

1. Connect the CDT Sensor harness connector.
2. Connect EECU harness connectors J1, J2 and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 9-5 is still active, replace the EECU and retest the system.

   If blink code 9-5 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 72 — Checking for a Short Circuit at the EECU Connector

NOTE

If the Compressor Discharge Temperature (CDT) Sensor was open in test 9, replace the sensor before retesting the circuit.

1. Turn the ignition key OFF.
2. Connect the CDT Sensor harness connector.
3. Connect connector J2 to the EECU.
4. Turn the ignition key ON.

   If blink code 9-5 is still active, check the EECU and connector J2 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 9-5 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 73 — Checking for a Pin to Pin Short in the Harness

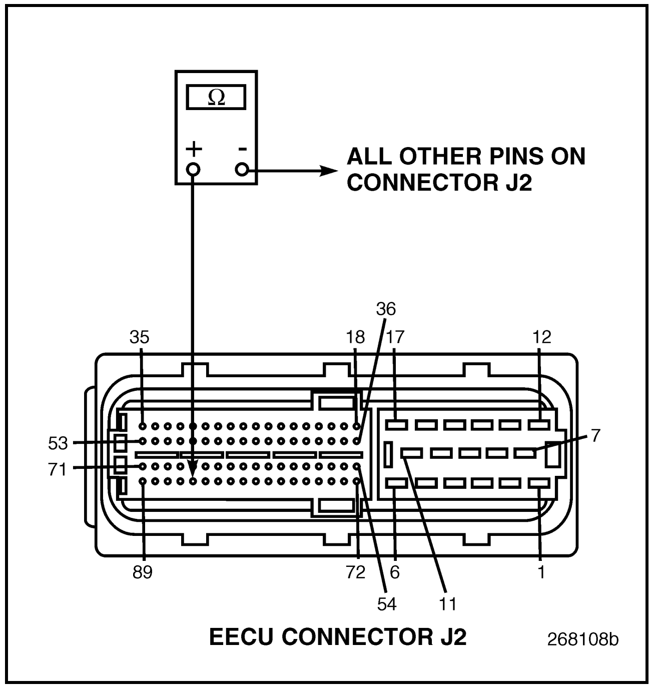


Figure 826

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor harness connector.
3. Disconnect EECU connector J2.
4. Check for continuity between EECU harness connector J2 pin 85 and all other pins on EECU connector J2 (see Figure 826).

   If continuity exists, the signal line is shorted to one of the other EECU circuits. Locate and repair the short circuit to voltage, then replace the CDT Sensor.

   If there is NO continuity, the signal line is shorted to voltage somewhere else in the harness. Locate and repair the short circuit to voltage, then replace the CDT Sensor.

Test 74 — Checking for an Open CDT Sensor Return Circuit

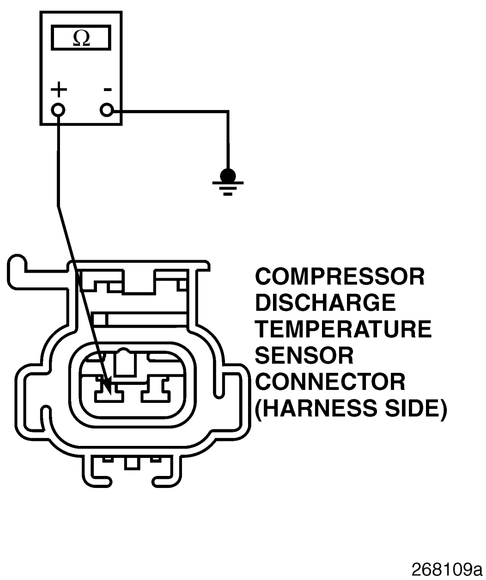


Figure 827

1. Turn the ignition key OFF.
2. Disconnect the CDT Sensor harness connector.
3. Connect EECU connector J2.
4. Check for continuity between pin 2 of the CDT Sensor harness connector and a good ground (see Figure 827).

   If there is NO continuity, locate and repair the open in the harness between the CDT Sensor and the common ground with the Aftercooler Outlet Temperature (AOT) Sensor.

   If continuity exists, check the CDT Sensor harness connector for damaged pins or improper mating with the CDT Sensor. If the CDT Sensor is OK, go to test “Test 148 — Checking the EECU Connector for an Open Circuit” on page 655.

Test 82 — Checking for a Short Circuit at the EECU Connector

1. Turn the ignition key OFF.
2. Connect the CDT Sensor connector.
3. Connect connectors J1, J2 and J3 to the EECU.
4. Turn the ignition key ON.

   If blink code 9-5 is still active, check the EECU and connectors J1, J2 and J3 for dirt, loose or shorted pins, or any other repairable damage. If no problems are evident, or are NOT repairable, replace the EECU and retest the system.

   If blink code 9-5 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 148 — Checking the EECU Connector for an Open Circuit

1. Visually inspect EECU harness connector J2 pins 67 and 85 for dirt, loose pins or deformed contacts.
2. If a repairable open is found, repair EECU harness connector J2.

   If the terminals are making good contact, go to test “Test 296 — Checking for an Open Circuit at the EECU Connector” on page 655.

Test 296 — Checking for an Open Circuit at the EECU Connector

1. Connect the CDT Sensor connector.
2. Connect connectors J1, J2 and J3 to the EECU.
3. Turn the ignition key ON.

   If blink code 9-5 is still active, replace the EECU and retest the system.

   If blink code 9-5 is NOT active, the procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 9-8 — AUXILIARY OUTPUT DEVICE #1 (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): S26

Message Identification (MID): 128

NOTE

If this fault occurs, contact Mack Trucks Service Engineering.

BLINK CODE 9-9 — AUXILIARY OUTPUT DEVICE #2 (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): S40

Message Identification (MID): 128

NOTE

If this fault occurs, contact Mack Trucks Service Engineering.

BLINK CODE 9-10 — AUXILIARY OUTPUT DEVICE #3 (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): S51

Message Identification (MID): 128

NOTE

If this fault occurs, contact Mack Trucks Service Engineering.

BLINK CODE 10-1 — INTERNAL SENSOR VOLTAGE (ASET™ CEGR ENGINE)

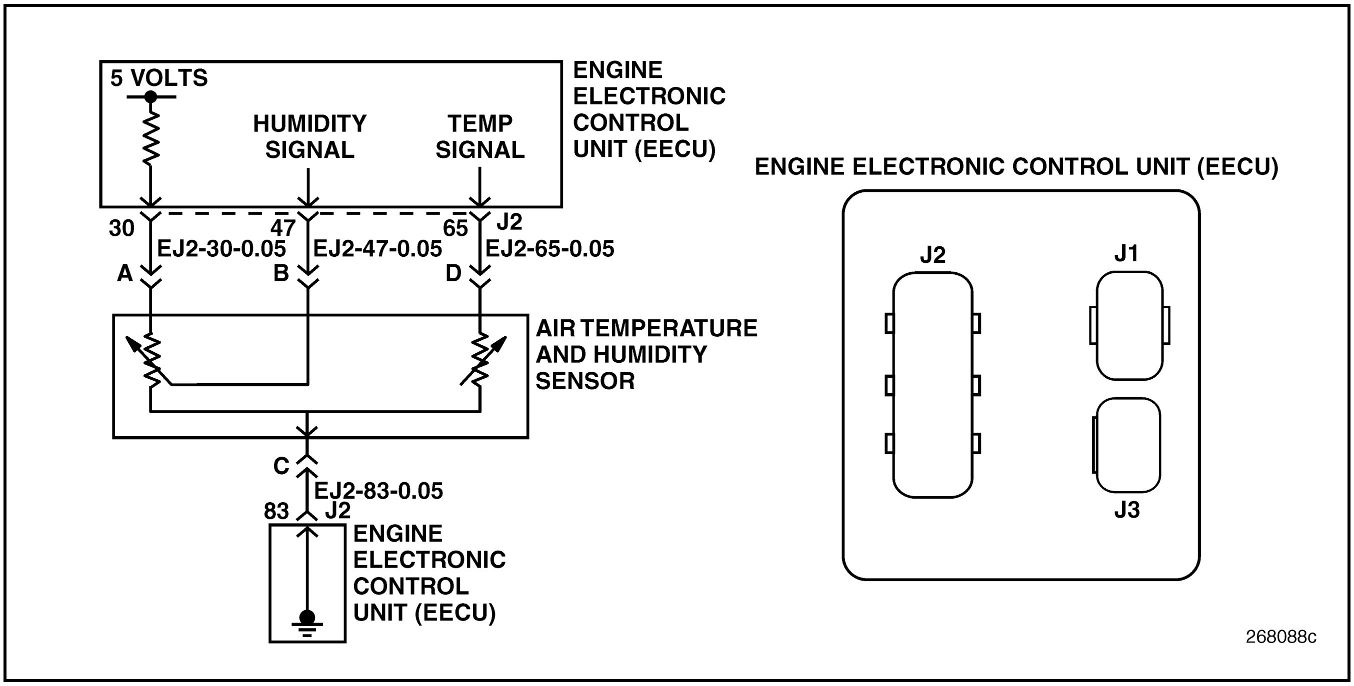


Figure 828 — Air Humidity and Temperature Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S221

Message Identification (MID): 128

Circuit Description: This fault code is used to detect a short circuit in the 5 volt supply to the Intake Air Temperature and Humidity (IATH) Sensor.

Location: Internal to the Engine Electronic Control Unit (EECU).

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 10-1 will set when the Air Humidity and Temperature Sensor's supply voltage is less than 5 volts or greater than 5 volts. If the voltage returns to 5 volts, the fault will become inactive.

Test 1 — Checking for Fault Codes

1. Check if code 10-1 is set.
2. Check if codes 2-8 or 2-9 are also set.

   If codes 2-8 or 2-9 are also set, go to the diagnostic routine for the appropriate code.

   If only code 10-1 is set, go to test "Test 2 — Checking Code 10-1 Failure Mode Identifier (FMI)" on page 660.

   If code 10-1 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Electronic Control Unit (EECU) connectors for frayed wires and loose or corroded connections.

Test 2 — Checking Code 10-1 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (Voltage Low), go to test "Test 4 — Checking for a Short to Ground in the Intake Air Temperature and Humidity Sensor Supply Voltage Circuit" on page 660.

   If the FMI is 3 (Voltage High), go to test "Test 5 — Checking for a Short Circuit to Voltage" on page 660.

Test 4 — Checking for a Short to Ground in the Intake Air Temperature and Humidity Sensor Supply Voltage Circuit

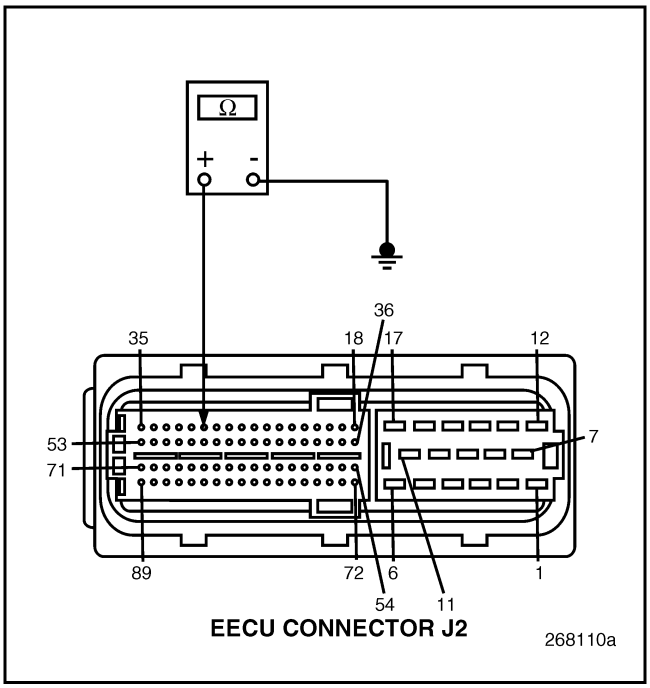


Figure 829

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the Intake Air Temperature and Humidity Sensor harness connector.
4. Check for continuity between EECU harness connector J2, pin 30 and a good ground (see Figure 829).

   If there is NO continuity, go to test "Test 8 — Checking for a Short Circuit in the Intake Air Temperature and Humidity Sensor" on page 661.

   If continuity exists, locate and repair the short circuit to ground in circuit EJ2-30-0.5.

Test 5 — Checking for a Short Circuit to Voltage

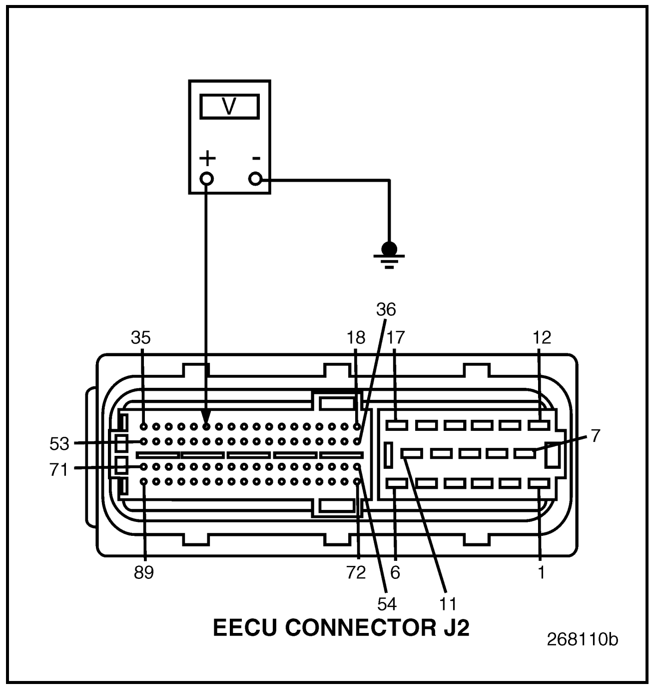


Figure 830

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 30 and a good ground (see Figure 830).

   If voltage is present, locate and repair the short circuit to voltage in circuit EJ2-30-0.5.

   If NO voltage is present, go to test "Test 10 — Checking for a Faulty EECU Connector" on page 661.

Test 8 — Checking for a Short Circuit in the Intake Air Temperature and Humidity Sensor

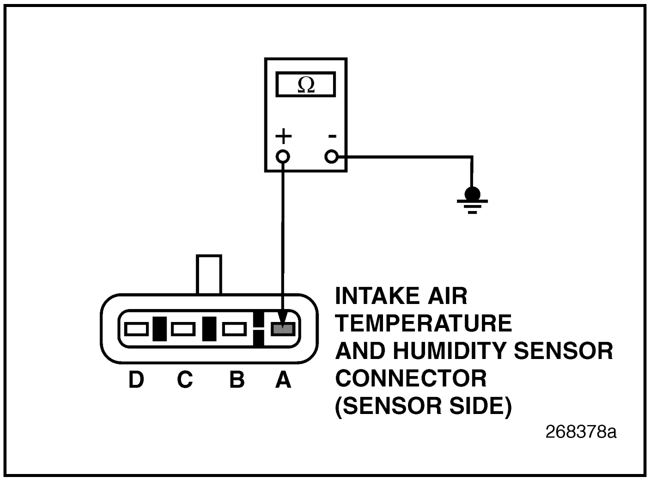


Figure 831

1. Turn the ignition key OFF.
2. Disconnect the Intake Air Temperature and Humidity Sensor harness connector.
3. Check for continuity between Intake Air Temperature and Humidity Sensor pin A and a good ground (see Figure 831).

   If there is NO continuity, go to test “Test 16 — Checking for a Faulty EECU Connector” on page 661.

   If continuity exists, replace the Intake Air Temperature and Humidity Sensor.

Test 10 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect EECU connector J2 for dirt, loose pins or deformed contacts.
4. If a repairable short circuit is found or if any of the terminals feels loose, repair the harness connector.

   If the terminals are making good contact, go to test “Test 20 — Checking the Engine Electronic Control Unit (EECU)” on page 661.

Test 16 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect EECU connector J2 for dirt, loose pins or deformed contacts.
4. If a repairable open is found or if any of the terminals feels loose, repair the harness connector.

   If the terminals are making good contact, go to test “Test 32 — Checking the Engine Electronic Control Unit (EECU)” on page 661.

Test 20 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Connect the Intake Air Temperature and Humidity Sensor harness connector.
4. Start the truck.

   If blink code 10-1 is still active, replace the EECU and retest the system.

   If blink code 10-1 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Connect the Intake Air Temperature and Humidity Sensor harness connector.
4. Start the truck.

   If blink code 10-1 is still active, replace the EECU and retest the system.

   If blink code 10-1 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 10-2 — 5 VOLT SUPPLY (ASET™ CEGR ENGINE)

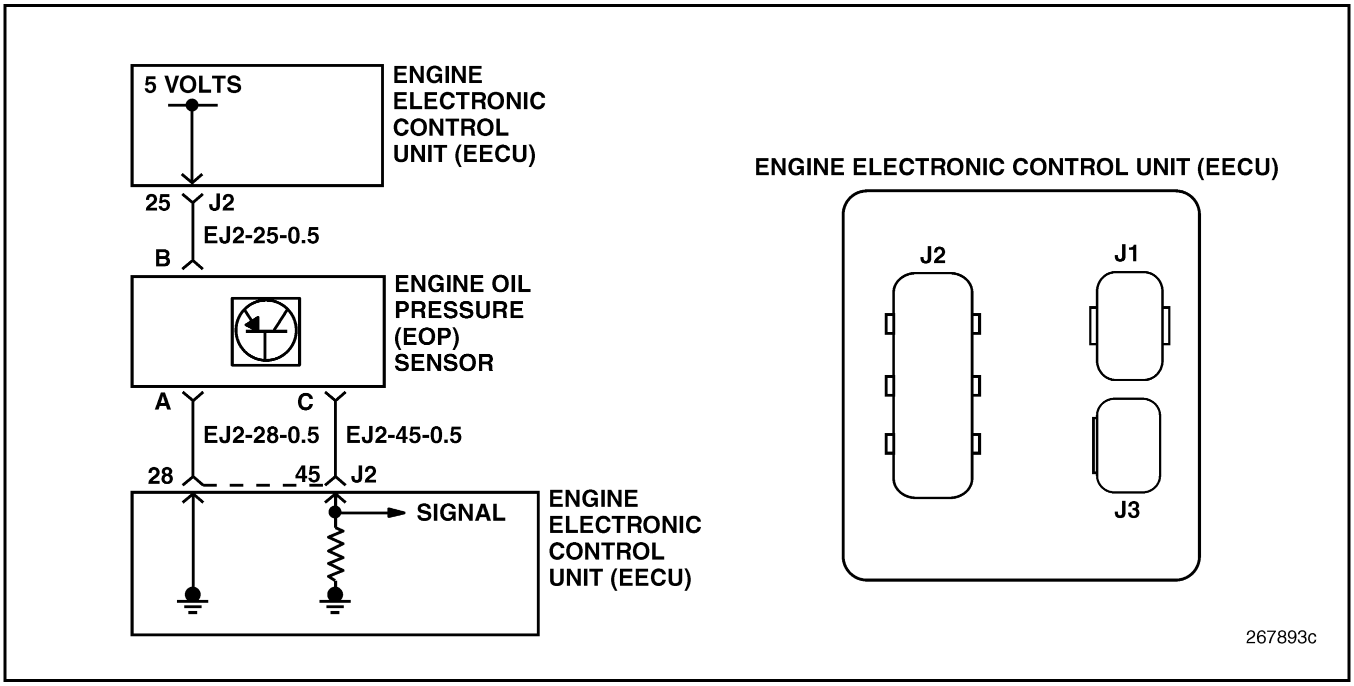


Figure 832 — Oil Pressure Sensor Circuit (ASET™ CEGR Engine)

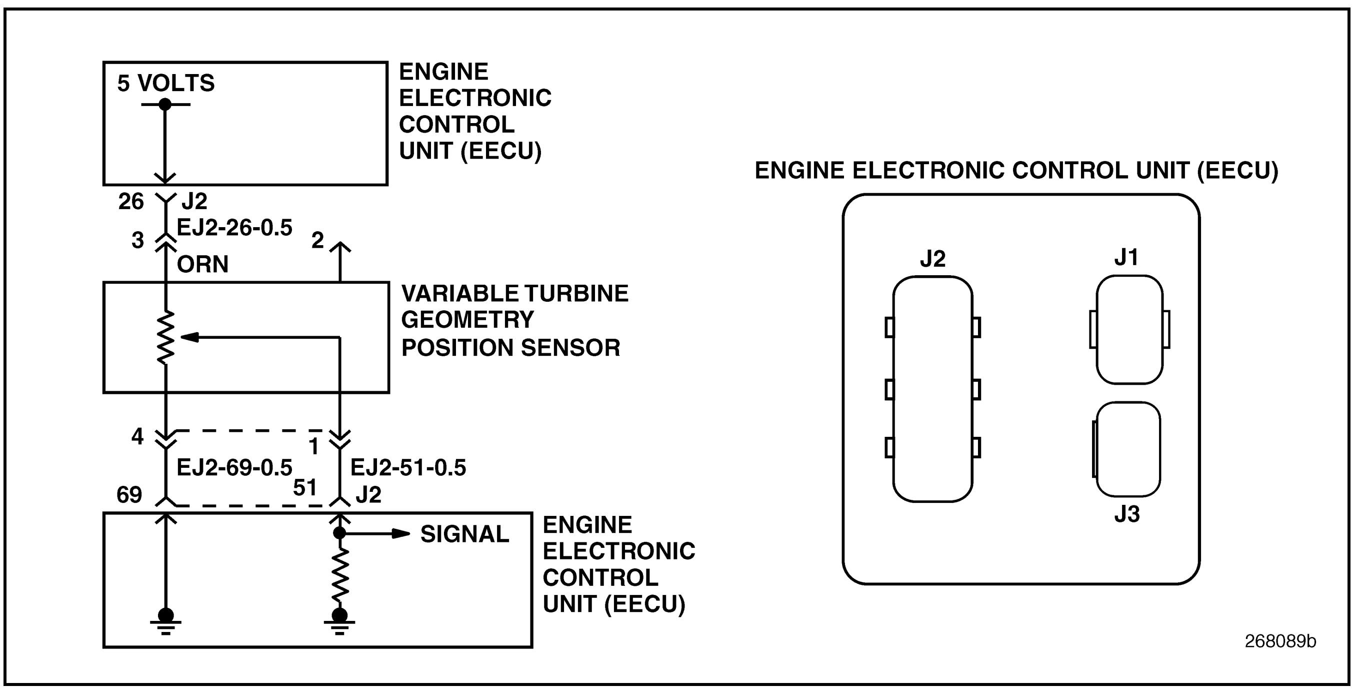


Figure 833 — VTG Position Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S232

Message Identification (MID): 128

Circuit Description: This fault code is used to detect a short circuit in the 5 volt supply to the Engine Oil Pressure (EOP) Sensor and the VTG Position Sensor.

Location: Internal to the Engine Electronic Control Unit (EECU).

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 10-2 will set when the Oil Pressure and VTG Position Sensor's reference voltage is less than 5 volts or greater than 5 volts. If the voltage returns to 5 volts, the fault will become inactive.

Test 1 — Checking for Fault Codes

1. Check if code 10-2 is set.
2. Check if codes 1-1 or 4-5 are also set.

   If codes 1-1 or 4-5 are also set, go to the diagnostic routine for the appropriate code.

   If only code 10-2 is set, go to test "Test 2 — Checking Code 10-2 Failure Mode Identifier (FMI)" on page 663.

   If code 10-2 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Electronic Control Unit (EECU) connectors for frayed wires and loose or corroded connections.

Test 2 — Checking Code 10-2 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (Voltage Low), go to test "Test 4 — Checking for a Short to Ground in the Engine Oil Pressure and VTG Position Sensors Reference Voltage Circuits" on page 664.

   If the FMI is 3 (Voltage High), go to test "Test 5 — Checking for a Short Circuit to Voltage" on page 664.

Test 4 — Checking for a Short to Ground in the Engine Oil Pressure and VTG Position Sensors Reference Voltage Circuits

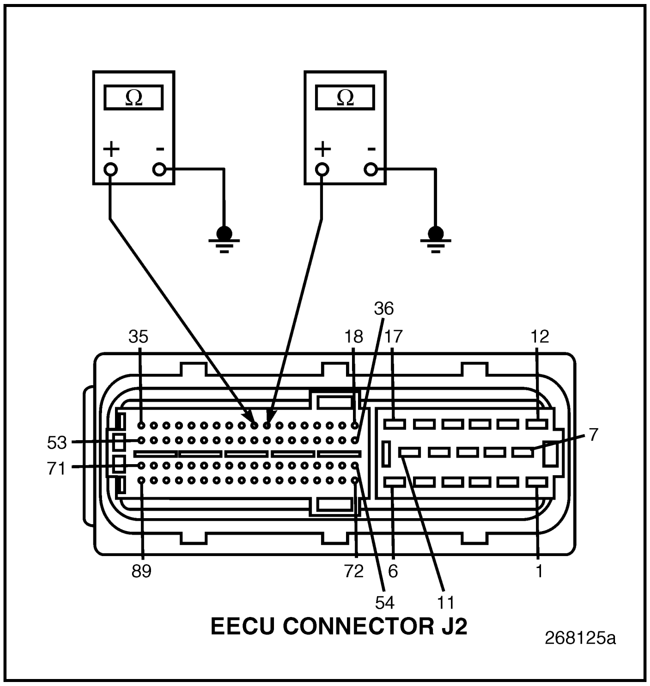


Figure 834

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the Engine Oil Pressure Sensor and VTG Position Sensor harness connectors.
4. Check for continuity between EECU harness connector J2, pins 25 and 26 and a good ground (see Figure 834).

   If there is NO continuity, go to test “Test 8 — Checking for a Short Circuit to Ground in the Oil Pressure and VTG Position Sensors” on page 665.

   If continuity exists, locate and repair the short circuit to ground.

Test 5 — Checking for a Short Circuit to Voltage

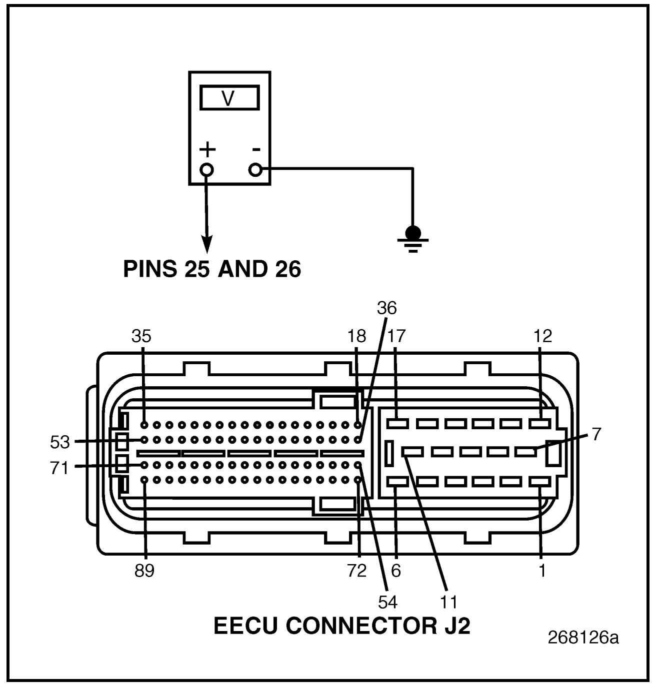


Figure 835

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2, pins 25 and 26 and a good ground (see Figure 835).

   If voltage is present, locate and repair the short circuit to voltage in circuit EJ2-25-0.5 or EJ2-26-0.5.

   If NO voltage is present, go to test “Test 10 — Checking for a Faulty EECU Connector” on page 665.

Test 8 — Checking for a Short Circuit to Ground in the Oil Pressure and VTG Position Sensors

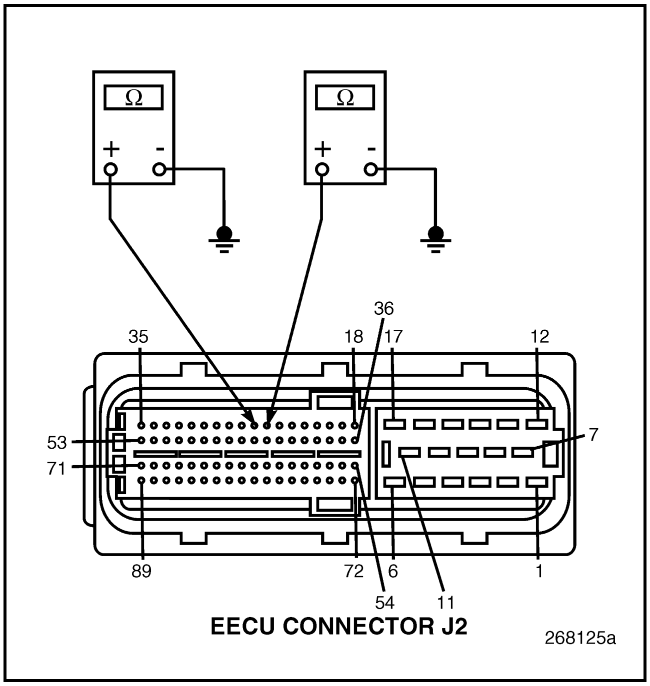


Figure 836

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Connect the Oil Pressure Sensor and VTG Position Sensor harness connectors.
4. Check for continuity between EECU harness connector J2, pins 25 and 26 and a good ground (see Figure 836).

   If there is NO continuity on either circuit, go to test "Test 16 — Checking for a Faulty EECU Connector" on page 665.

   If continuity exists between J2 pin 25 and ground, replace the EOP sensor.

   If continuity exists between J2 pin 26 and ground, replace the VTG Position sensor.

Test 10 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect EECU connector J2 for dirt, loose pins or deformed contacts.
4. If a repairable short circuit or damaged pins are found, repair or replace the harness connector.

   If the terminals are making good contact, go to test "Test 20 — Checking the Engine Electronic Control Unit (EECU)" on page 665.

Test 16 — Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect EECU connector J2 for dirt, loose pins or deformed contacts.

   If a repairable short circuit or damaged pins are found, repair or replace the harness connector.

   If the terminals are making good contact, go to test "Test 32 — Checking the Engine Electronic Control Unit (EECU)" on page 666.

Test 20 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Connect the Oil Pressure Sensor and VTG Position Sensor harness connectors.
4. Start the engine.

   If blink code 10-2 is still active, replace the EECU and retest the system.

   If blink code 10-2 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Connect the Oil Pressure Sensor and VTG Position Sensor harness connectors.
4. Start the engine.

   If blink code 10-2 is still active, replace the EECU and retest the system.

   If blink code 10-2 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 10-3 — SENSOR SUPPLY VOLTAGE #1 (ASET™ CEGR ENGINE)

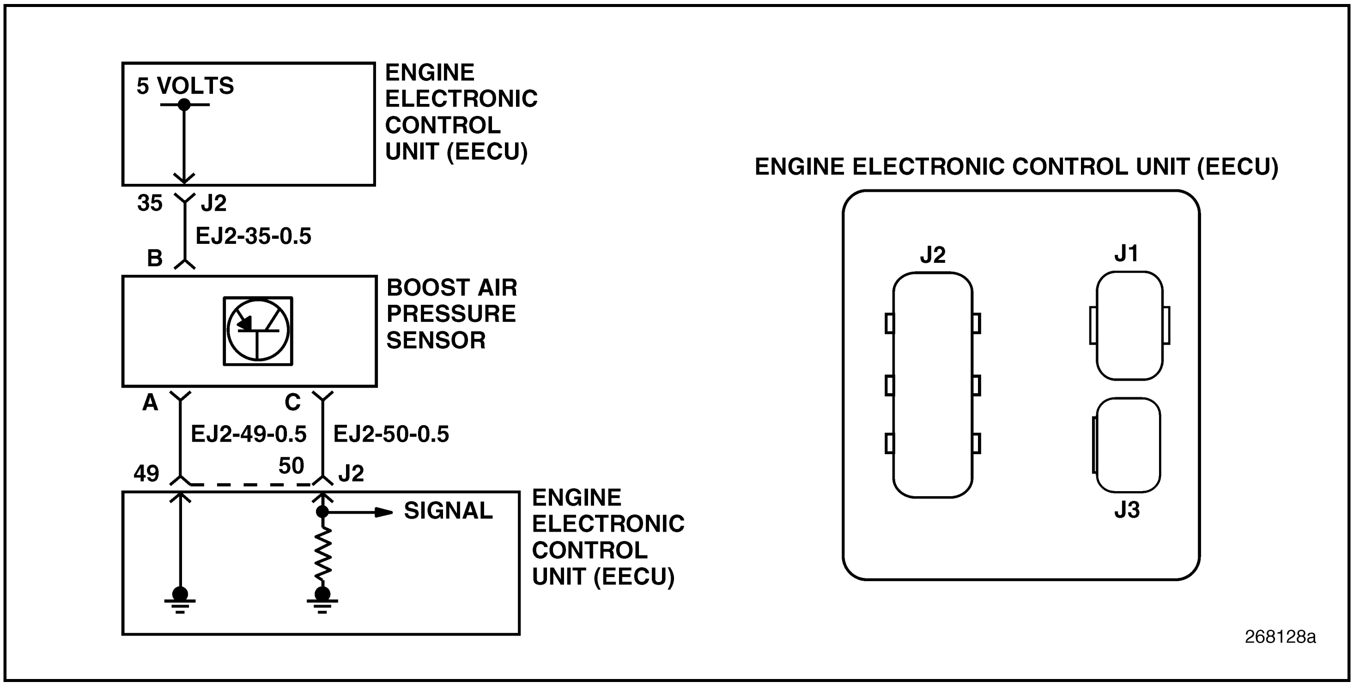


Figure 837 — Aftercooler Outlet Pressure (AOP) Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S212

Message Identification (MID): 128

Circuit Description: This fault code is used to detect a short circuit in the 5 volt supply to the Boost Air Pressure (BAP) Sensor.

Location: Internal to the Engine Electronic Control Unit (EECU).

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 10-3 will set when the Boost Air Pressure (BAP) Sensor's reference voltage is less than 5 volts or greater than 5 volts. If the voltage returns to 5 volts, the fault will become inactive.

Test 1 — Checking for Fault Codes

1. Check if code 10-3 is set.
2. Check if code 2-2 is also set.

   If code 2-2 is set, go to the diagnostic routine for blink code 2-2.

   If only code 10-3 is set, go to test "Test 2 — Checking Code 10-3 Failure Mode Identifier (FMI)" on page 668.

   If code 10-3 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Electronic Control Unit (EECU) connectors for frayed wires and loose or corroded connections.

Test 2 — Checking Code 10-3 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (Voltage Low), go to test "Test 4 — Checking for a Short to Ground in the Boost Air Pressure (BAP) Sensor Reference Voltage Circuit" on page 668.

   If the FMI is 3 (Voltage High), go to test "Test 5 — Checking for a Short Circuit to Voltage" on page 668.

Test 4 — Checking for a Short to Ground in the Boost Air Pressure (BAP) Sensor Reference Voltage Circuit

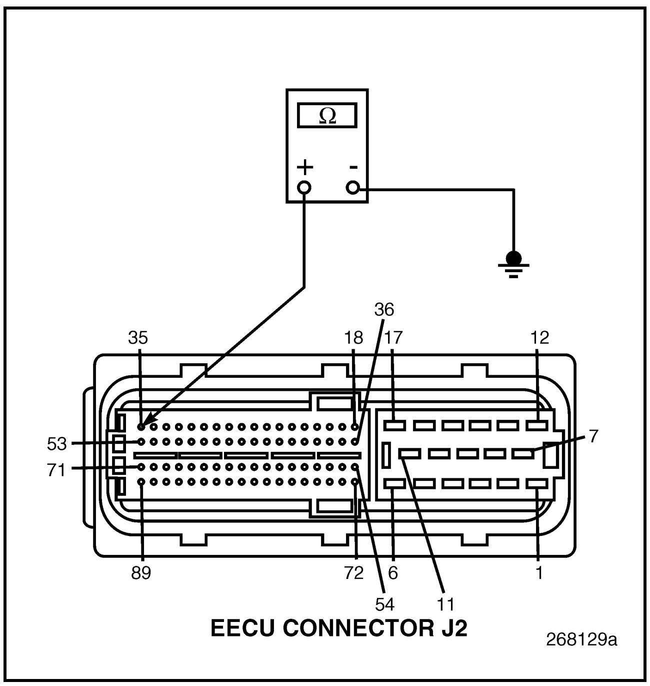


Figure 838

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Disconnect the Boost Air Pressure (BAP) Sensor harness connector.
4. Check for continuity between EECU harness connector J2, pin 35 and a good ground (see Figure 838).

   If there is NO continuity, go to test "Test 8 — Checking for a Short Circuit to Ground in the Boost Air Pressure (BAP) Sensor" on page 669.

   If continuity exists, locate and repair the short circuit to ground in circuit EJ2-35-0.5.

Test 5 — Checking for a Short Circuit to Voltage

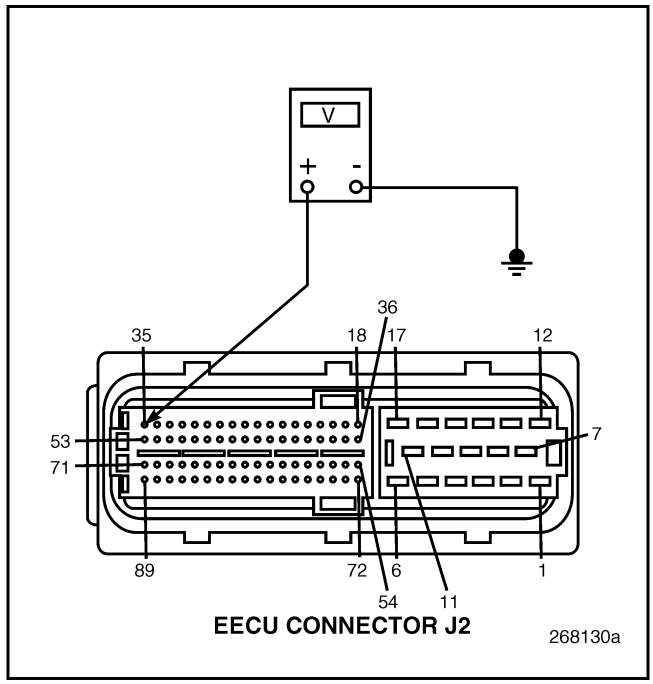


Figure 839

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J2 pin 35 and a good ground (see Figure 839).

   If voltage is present, locate and repair the short circuit to voltage in circuit EJ2-35-0.5.

   If NO voltage is present, go to test "Test 10 — Checking for Checking for a Faulty EECU Connector" on page 669.

Test 8 — Checking for a Short Circuit to Ground in the Boost Air Pressure (BAP) Sensor

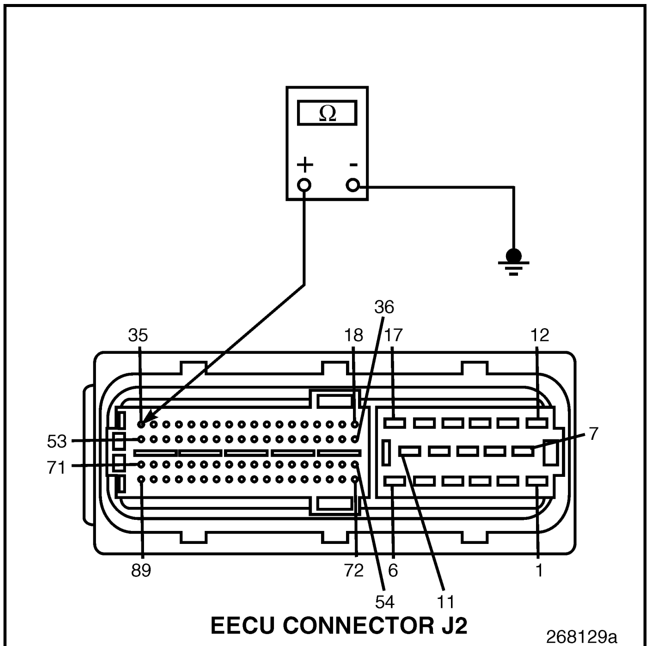


Figure 840

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Connect the Boost Air Pressure (BAP) Sensor harness connector.
4. Check for continuity between EECU harness connector J2, pin 35 and a good ground (see Figure 840).

   If there is NO continuity, go to test "Test 16 — Checking for Checking for a Faulty EECU Connector" on page 669.

   If continuity exists, replace the Boost Air Pressure (BAP) Sensor.

Test 10 — Checking for Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2, pin 35.

   If a repairable short circuit or damaged pins are found, repair or replace the harness connector.

   If the terminals are making good contact, go to test "Test 20 — Checking the Engine Electronic Control Unit (EECU)" on page 670.

Test 16 — Checking for Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J2.
3. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2, pin 35.

   If a repairable short circuit or damaged pins are found, repair or replace the harness connector.

   If the terminals are making good contact, go to test "Test 32 — Checking the Engine Electronic Control Unit (EECU)" on page 670.

Test 20 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Connect the Boost Air Pressure (BAP) Sensor harness connector.
4. Start the engine.

   If blink code 10-3 is still active, replace the EECU and retest the system.

   If blink code 10-3 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J2.
3. Connect the Boost Air Pressure (BAP) Sensor harness connector.
4. Start the engine.

   If blink code 10-3 is still active, replace the EECU and retest the system.

   If blink code 10-3 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 10-4 — SENSOR SUPPLY VOLTAGE #2 (ASET™ CEGR ENGINE)

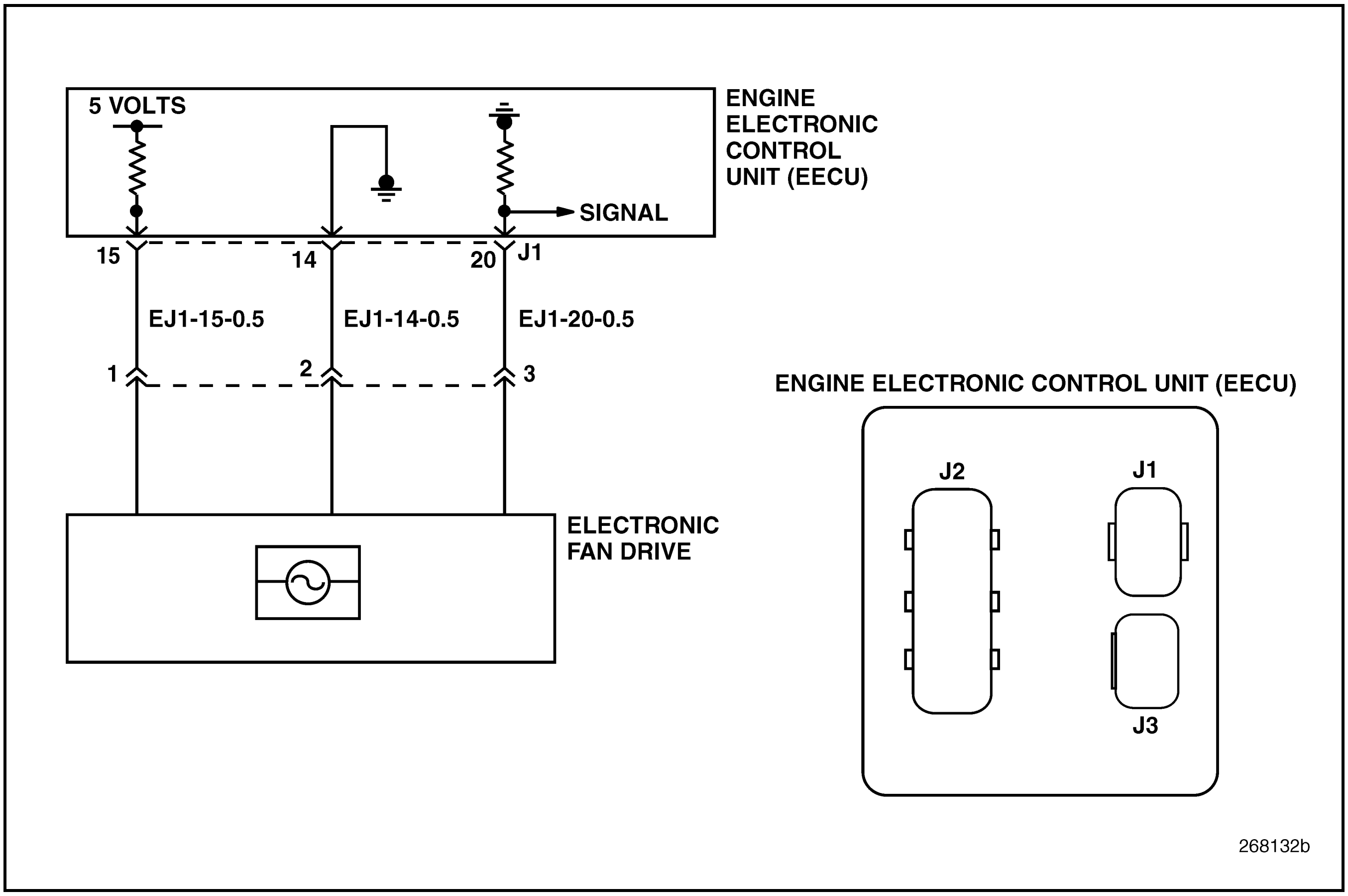


Figure 841 — Electronic Fan Speed Sensor Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low)

Parameter Identification (PID): S211

Message Identification (MID): 128

Circuit Description: This fault code is used to detect a short circuit in the 5 volt supply to the Electronic Fan Speed Sensor.

Location: Internal to the Engine Electronic Control Unit (EECU).

Code Setting Conditions: The Electronic Malfunction Lamp (EML) will turn on and code 10-4 will set when the Electronic Fan Speed Sensor's reference voltage is less than 5 volts or greater than 5 volts. If the voltage returns to 5 volts, the fault will become inactive.

Test 1 — Checking for Fault Codes

1. Check if code 10-4 is set.
2. Check if code 1-8 is also set.

   If code 1-8 is set, go to the diagnostic routine for blink code 1-8.

   If only code 10-4 is set, go to test “Test 2 — Checking Code 10-4 Failure Mode Identifier (FMI)” on page 672.

   If code 10-4 is NOT set, wiggle the harness and connectors to try to set the code. Visually inspect the Engine Electronic Control Unit (EECU) connectors for frayed wires and loose or corroded connections.

Test 2 — Checking Code 10-4 Failure Mode Identifier (FMI)

1. Check the Failure Mode Identifier (FMI) using a diagnostic computer.

   If the FMI is 4 (Voltage Low), go to test “Test 4 — Checking for a Short to Ground in the Electronic Fan Speed Sensor Reference Voltage Circuit” on page 672.

   If the FMI is 3 (Voltage High), go to test “Test 5 — Checking for a Short Circuit to Voltage” on page 673.

Test 4 — Checking for a Short to Ground in the Electronic Fan Speed Sensor Reference Voltage Circuit

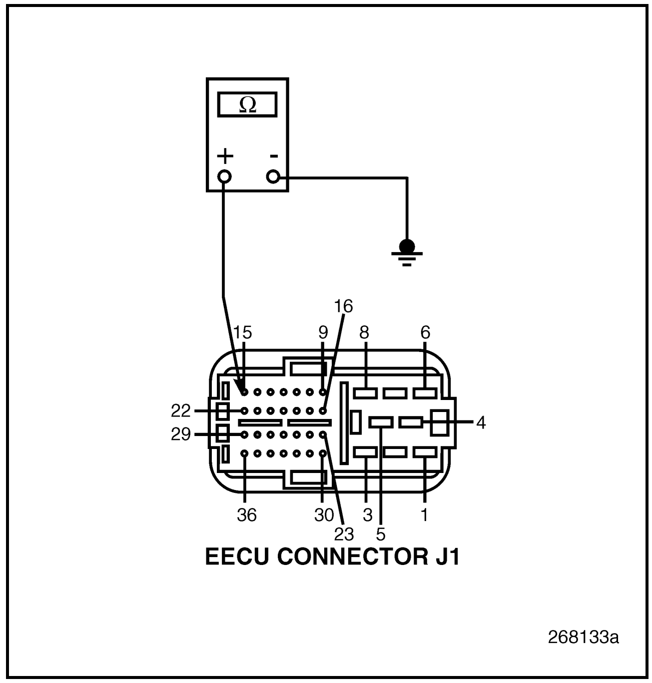


Figure 842

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Disconnect the Electronic Fan Drive harness connector.
4. Check for continuity between EECU harness connector J1, pin 15 and a good ground (see Figure 842).

   If there is NO continuity, go to test “Test 8 — Checking for an Open in the Electronic Fan Speed Sensor Reference Voltage Circuit” on page 673.

   If continuity exists, locate and repair the short circuit to ground in circuit EJ1-15-0.5.

Test 5 — Checking for a Short Circuit to Voltage

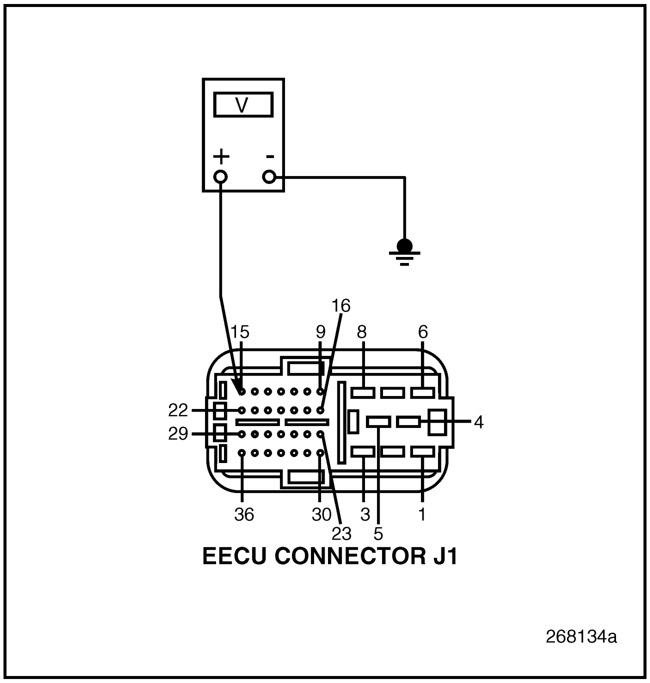


Figure 843

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Turn the ignition key ON.
4. Measure the voltage between EECU connector J1 pin 15 and a good ground (see Figure 843).

   If voltage is present, locate and repair the short circuit to voltage in circuit EJ1-15-0.5.

   If NO voltage is present, go to test “Test 10 — Checking for Checking for a Faulty EECU Connector” on page 674.

Test 8 — Checking for an Open in the Electronic Fan Speed Sensor Reference Voltage Circuit

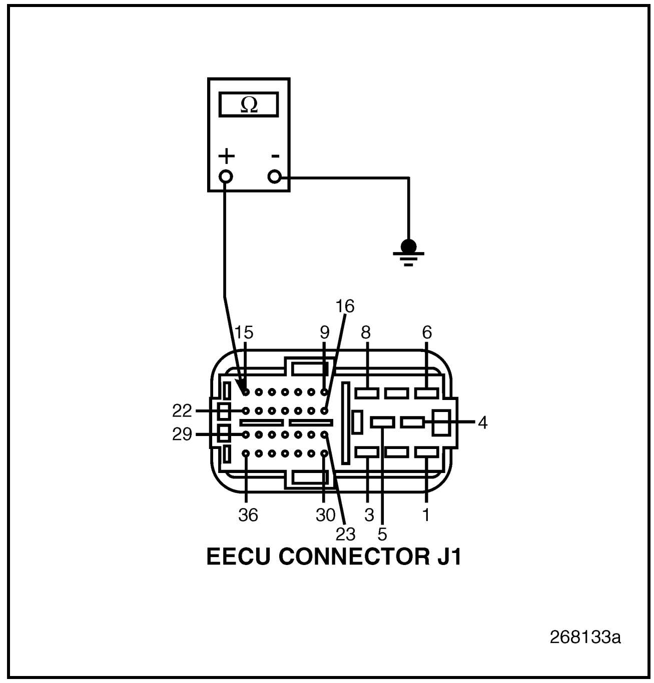


Figure 844

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Connect the Electronic Fan Drive harness connector.
4. Check for continuity between EECU harness connector J1, pin 15 and a good ground (see Figure 842).

   If there is NO continuity, go to test “Test 16 — Checking for Checking for a Faulty EECU Connector” on page 674.

   If continuity exists, replace the Electronic Fan Drive Speed Sensor.

Test 10 — Checking for Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2, pin 35.

   If a repairable short circuit or damaged pins are found, repair or replace the harness connector.

   If the terminals are making good contact, go to test “Test 20 — Checking the Engine Electronic Control Unit (EECU)” on page 674.

Test 16 — Checking for Checking for a Faulty EECU Connector

1. Turn the ignition key OFF.
2. Disconnect EECU connector J1.
3. Visually inspect both sides of Engine Electronic Control Unit (EECU) connector J2, pin 35.

   If a repairable short circuit or damaged pins are found, repair or replace the harness connector.

   If the terminals are making good contact, go to test “Test 32 — Checking the Engine Electronic Control Unit (EECU)” on page 674.

Test 20 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Connect the Electronic Fan Drive harness connector.
4. Start the engine.

   If blink code 10-4 is still active, replace the EECU and retest the system.

   If blink code 10-4 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

Test 32 — Checking the Engine Electronic Control Unit (EECU)

1. Turn the ignition key OFF.
2. Connect EECU connector J1.
3. Connect the Electronic Fan Drive harness connector.
4. Start the engine.

   If blink code 10-4 is still active, replace the EECU and retest the system.

   If blink code 10-4 is not active, the diagnostic procedures have corrected the problem. Check all connectors to ensure proper connections.

BLINK CODE 10-5 — FUEL FILTER DIFFERENTIAL PRESSURE (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): P95

Message Identification (MID): 128

NOTE

If this fault occurs, contact Mack Trucks Service Engineering.

BLINK CODE 10-6 — FUEL DELIVERY PRESSURE (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 3 (Voltage High), 4 (Voltage Low/Open)

Parameter Identification (PID): P94

Message Identification (MID): 128

NOTE

If this fault occurs, contact Mack Trucks Service Engineering.

BLINK CODE 10-7 — ODOMETER SAVE AREA FAILURE

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data Incorrect)

Parameter Identification (PID): S253

Message Identification (MID): 142

Circuit Description: Odometer data is stored internally in multiple locations of the Vehicle Electronic Control Unit (VECU).

Location: Internal to the Vehicle Electronic Control Unit (VECU).

Code Setting Conditions: In the rare event that ALL odometer data storage areas in the VECU become corrupted, the odometer can no longer be considered correct, and code 10-7 will set.

Test 1 — Checking for Code 10-7

1. Verify code 10-7 is set.

   If code 10-7 is set, there are no diagnostic procedures available to correct the problem. Replace the Vehicle Electronic Control Unit (VECU).

BLINK CODE 10-8 — GPS POSITION DATA NOT RECEIVED

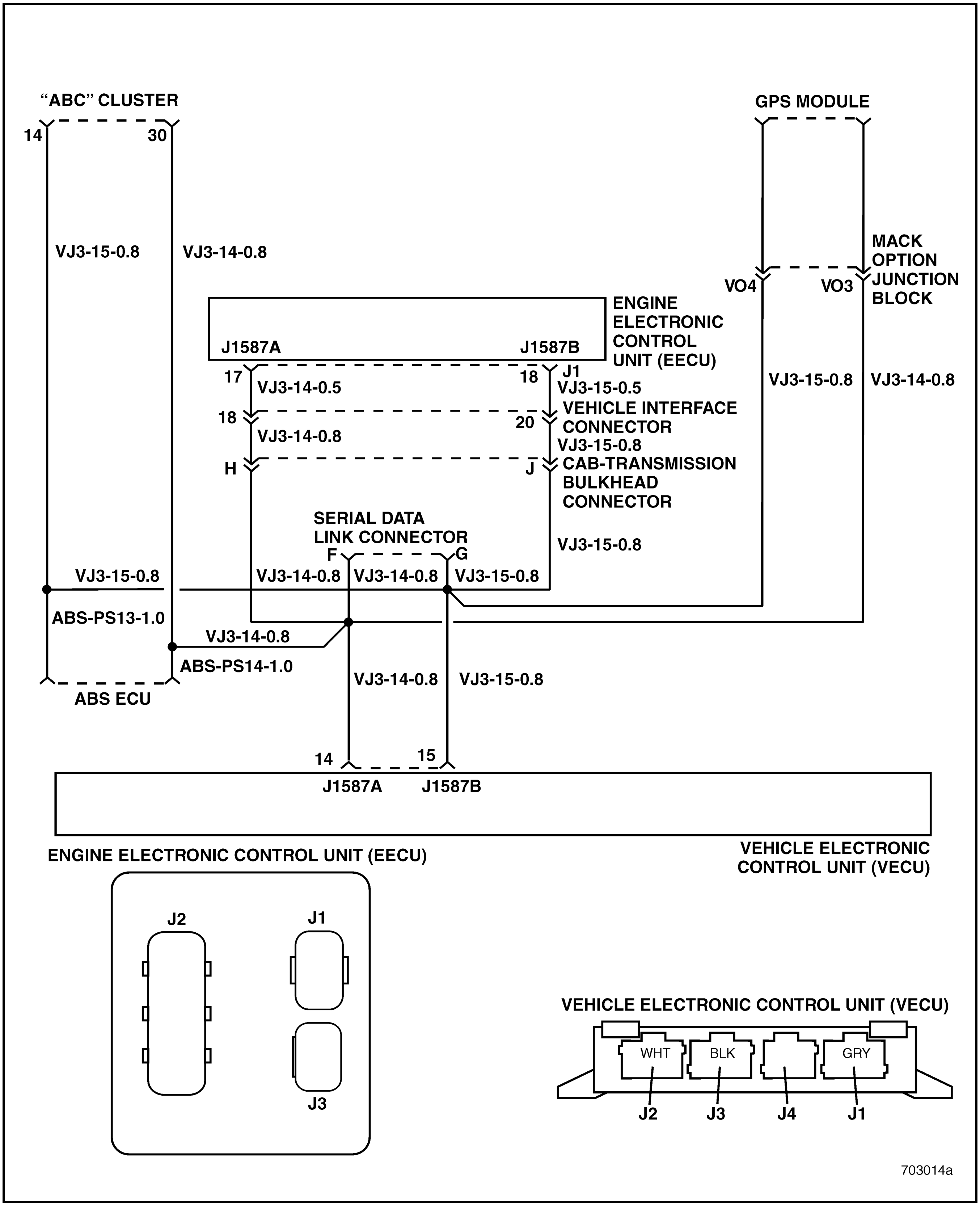


Figure 845 — J1587 Serial Data Line Circuit (ASET™ CEGR Engine)

NOTE

When performing electrical tests, wiggle the wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 2 (Data erratic, intermittent, or incorrect)

Parameter Identification (PID): P239

Message Identification (MID): 142

Circuit Description: The Vehicle Electronic Control Unit (VECU) receives a signal from the GPS system through J1587 low-speed data lines.

Location: The Vehicle Electronic Control Unit (VECU) is typically located under the dashboard, in front of the passenger seat. The Serial Communications Port is located under the dash, to the left of the steering column. The GPS system antenna is typically located on the upper rear of the cab. The Mack Option Junction Block is located on the Dash Electrical Equipment Panel.

Code Setting Conditions: If the GPS Fuel Tax Log is in use, and the Vehicle Electronic Control Unit (VECU) loses a communication signal with the GPS system, code 10-8 will set.

NOTE

Tunnels or other extreme topography may cause a temporary loss of a GPS signal to the VECU, causing 10-8 to set. Also, if the Fuel Tax Log is enabled without a GPS system present, OR if the wrong Message Identifier (MID) is used while enabling the system, code 10-8 will set.

Test 1 — Checking for Code 10-8

1. Verify that code 10-8 is set.

   If code 10-8 is set, go to test “Test 2 — Checking for Code 6-3” on page 679.

   If code 10-8 is NOT set, wiggle the harness and connectors to try to set the code.

Test 2 — Checking for Code 6-3

1. Turn the ignition key ON.
2. Check for code 6-3.

   If Code 6-3 is set in addition to 10-8, a problem exists with the J1587 data lines between the GPS module and the Vehicle Electronic Control Unit (VECU). Refer to code 6-3 for diagnostic procedures.

   If Code 6-3 is NOT set, check the connections that supply power and ground to the GPS module, and the connections between the GPS module and the antenna. If any faults are found, repair any faulty connectors, shorted or open wires and retest the system.

BLINK CODE 10-9 — VECU WATCHDOG TIMER RESET (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 11 (Special Instructions)

Parameter Identification (PID): S254

Message Identification (MID): 142

Code Setting Conditions: Occasionally, a series of electrical events inside the Vehicle Electronic Control Unit (VECU) causes the VECU to reset. While this is a very rare occurrence, it is a recoverable event that does not require diagnosis. If this fault is logged more than three times, replace the VECU and notify Mack Trucks Service Engineering.

NOTE

If this fault occurs, contact Mack Trucks Service Engineering immediately. Do NOT flash and reprogram the VECU.

BLINK CODE 10-10 — EECU WATCHDOG TIMER RESET (ASET™ CEGR ENGINE)

Failure Mode Identifier (FMI): 3 (Voltage High)

Parameter Identification (PID): S152

Message Identification (MID): 128

Code Setting Conditions: Occasionally, a series of electrical events inside the Engine Electronic Control Unit (EECU) causes the EECU to reset. While this is a very rare occurrence, it is a recoverable event that does not require diagnosis. If this fault is logged more than three times, replace the EECU and notify Mack Trucks Service Engineering.

NOTE

If this fault occurs, contact Mack Trucks Service Engineering immediately. Do NOT flash and reprogram the EECU.

INTERMITTENT PROBLEMS NO DIAGNOSTIC BLINK CODE

This section of the manual is intended to provide troubleshooting tips for intermittent problems. In some instances there may not be a diagnostic blink code or an inactive fault logged in the Vehicle Electronic Control Unit (VECU) or Engine Electronic Control Unit (EECU), to assist in troubleshooting.

The guidelines listed below for general V-MAC III troubleshooting should be followed.

1. Verify that the electronic malfunction and engine shutdown lamps work properly. When the ignition key is turned ON, both lamps should light for two seconds.
2. Check for inactive faults, or active faults if the Electronic Malfunction Lamp (EML) was replaced.
3. Review the “V-MAC III System Diagnostics” section at the front of this book.
4. Start troubleshooting at the sensor, switch, or other device, then check the harness, then finally check the Vehicle Electronic Control Unit (VECU) or Engine Electronic Control Unit (EECU). Eliminate all other possible faults and repeat the procedure before replacing the EECU or VECU.
5. Check sensors, connectors and other components for broken pins, dirt, corrosion, loose terminals, excessive resistance, moisture and poor grounds.
6. If a sensor or other component is suspected as being faulty, disconnect, clean and reconnect all terminals to that component. Retest the system to see if the problem has been corrected.
7. If a sensor or other component is suspected as being faulty, try to isolate it from the system. When a faulty component is disconnected from the system, vehicle performance may change. If the performance does not change with the component disconnected, the component may not be faulty.
8. When checking the harness, refer to the wiring diagrams in this book. Check each wire between the component and Electronic Control Unit for a short to ground, a short to power, and continuity with other wires. Also, check for continuity between both ends of each wire.
9. All “ground check” tests should be performed with a known good ground.
10. Continuity checks cannot be performed if there is any current flowing. Make sure the ignition key is OFF before performing any continuity checks.
11. The ignition key must be in the OFF position before disconnecting the harness to the module. Failure to have the key OFF may result in internal electrical damage to the control unit.
12. Turning the ignition key ON will result in an active fault if a sensor is disconnected, if Vehicle Electronic Control Unit (VECU) connector J2 is disconnected with the J3 connector connected, or if Engine Electronic Control Unit (EECU) connector J1 is disconnected with connector J2 connected.
13. Turning the ignition key ON with Vehicle Electronic Control Unit (VECU) connector J3 disconnected will prevent the accessory relay from being energized and providing a switched 12 volts. To provide a switched 12 volts in this condition, connect the Serial Link Jumper into the Serial Communications Port.
14. If an Engine Electronic Control Unit (EECU) or Vehicle Electronic Control Unit (VECU) failure is suspected, verify that there is power from the fuse or circuit breaker to the suspect EECU or VECU.
15. DO NOT open an Engine Electronic Control Unit (EECU) or Vehicle Electronic Control Unit (VECU), or make measurements at the EECU or VECU pins. If an EECU or VECU failure is suspected, visually inspect the EECU or VECU’s pins for repairable problems.

16. As a final test before replacing an Engine Electronic Control Unit (EECU) or Vehicle Electronic Control Unit (VECU), reconnect the suspect EECU or VECU and confirm that the fault still exists.
17. If an Engine Electronic Control Unit (EECU) or Vehicle Electronic Control Unit (VECU) is replaced, verify that the new EECU or VECU has corrected the problem.
18. Do not reprogram a replacement Engine Electronic Control Unit (EECU) or Vehicle Electronic Control Unit (VECU) until it has been verified that the problem has been corrected.

ENGINE SPEED HIGH NO DIAGNOSTIC BLINK CODE

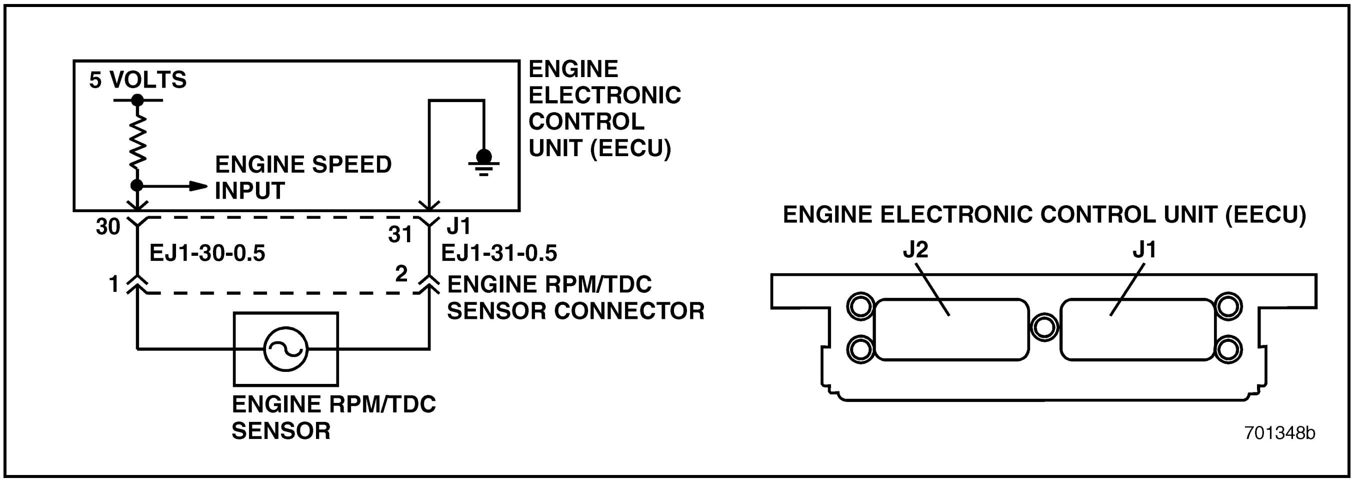


Figure 846 — Engine Speed Sensor Circuit (ASET™ IEGR Engine)

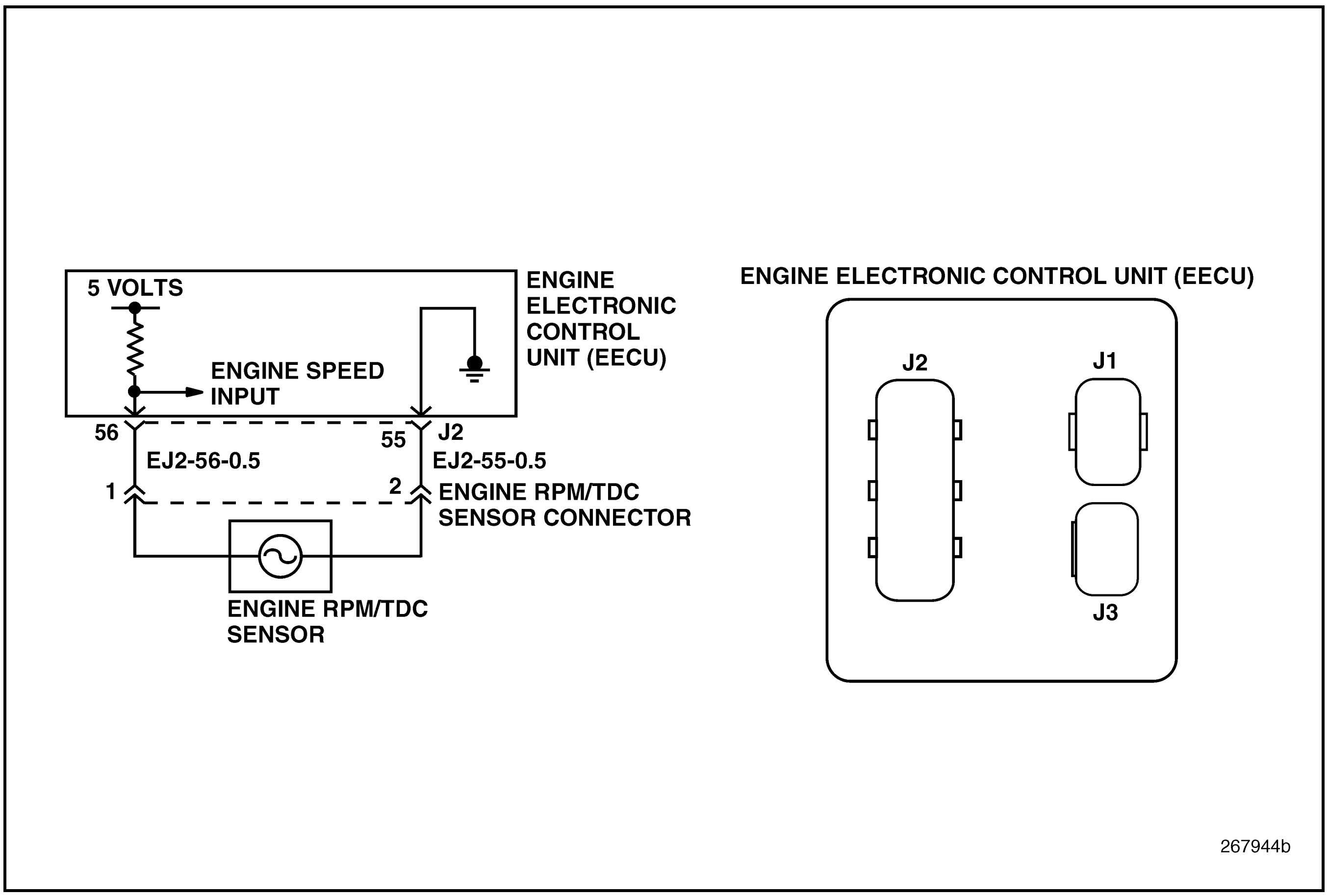


Figure 847 — Engine Speed Sensor Circuit (ASET™ CEGR Engine)

Failure Mode Identifier (FMI): 0 (Valid High)

Parameter Identification (PID): 190

Message Identification (MID): 142

Circuit Description: The Engine Speed Sensor is an inductive sensor that will generate a voltage signal when the sensor's magnetic field is excited. The Engine Speed Sensor is installed near the flywheel, when the engine is running the flywheel's teeth rotate past the sensor's tip and a signal is generated. The Engine Control Unit (EECU) monitors the frequency of the Engine Speed Sensor signal to calculate the engine RPM. The air gap between the sensor tip and the flywheel teeth can influence the sensor's output signal.

Location: The RPM/TDC Sensor is located on the left side of the engine, on the flywheel housing.

Code Setting Conditions: This is a telltale fault that is found in the inactive fault table. If this fault does appear in the active fault table, it will only last a few seconds and then disappear without turning the Electronic Malfunction Lamp (EML), ON.

This fault reports that the engine RPM has exceeded the customer's preset engine overspeed RPM fault threshold set in Customer Data. The purpose of this fault is to log severe engine overspeeds. A low overspeed RPM fault threshold could cause excessive fault occurrences.

Test 1 — Checking the Customer Engine Overspeed Setting

1. Using a diagnostic tool, check the Customer Data section for the overspeed RPM setting.
2. Check the inactive fault table and verify that the fault in question does not have a blink code.
3. Record the number of overspeed occurrences from the inactive fault table. Notify the vehicle owner or shop foreman that the engine has exceeded the company's overspeed limit and the number of occurrences. Do not notify the driver. Receive permission to clear the fault table.
4. Record the permission to clear the fault table and the number of overspeed occurrences on the repair order. Recheck the inactive fault table after you have finished servicing the vehicle to ensure that the service procedures have not created more overspeed faults. If overspeed faults have been set during servicing, clear them before the truck leaves the shop.

LOW OIL PRESSURE WITH DRIVER ALARM NO DIAGNOSTIC BLINK CODE (ASET™ IEGR ENGINE)

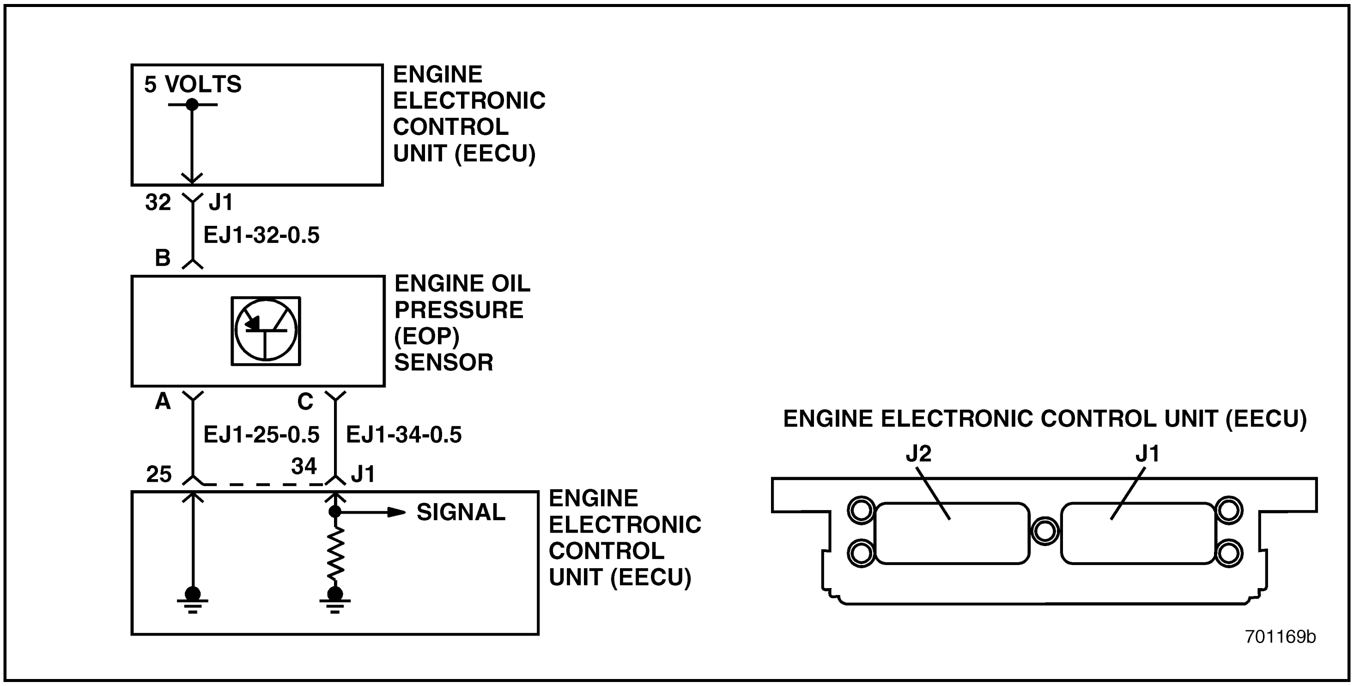


Figure 848 — Engine Oil Pressure Sensor Circuit (ASET™ IEGR Engine)

NOTE

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 1 (Valid Low)

Parameter Identification (PID): 100

Message Identification (MID): 142

Circuit Description: The Engine Oil Pressure (EOP) Sensor is used to detect engine lubrication system failures. The sensor consists of a pressure sensitive diaphragm and amplifier. Mechanical pressure causes the sensor's diaphragm to deflect and produce an electrical signal proportional to the pressure. The diaphragm deflection signal is amplified in the sensor. The sensor's signal is monitored by the Engine Electronic Control Unit (EECU). The EECU will set fault code 1-1 if the EECU senses that the signal being sent by the Engine Oil Pressure (EOP) Sensor is electrically faulty. The Vehicle Electronic Control Unit (VECU) will log a fault (no diagnostic blink code) and turn on the shutdown lamp and driver alarm if the signal being sent by the EOP is valid, but drops to less than a predetermined value.

Location: The Engine Oil Pressure (EOP) Sensor is located at the left side of the engine on top of the oil filter assembly. The Engine Electronic Control Unit (EECU) is mounted on the air intake manifold on the left side of the engine.

Additional Symptoms: Driver alarm sounds, optional engine shutdown.

Test 1 — Checking the Engine Oil Level

1. Check the oil level on the dipstick.

   If the oil is between the add and full lines, go to test “Test 2 — Looking for Missing Oil Fittings” on page 687.

   If the oil is below the add line, inspect the engine for the cause of the oil loss. Also check the vehicle maintenance records for oil add and change dates.

Test 2 — Looking for Missing Oil Fittings

1. Carefully inspect the engine for missing oil fittings. Look particularly around the turbo oil supply and the oil filter pedestal oil supply.

   If there are NO missing fittings, and no other obvious cause of a pressure loss, go to test “Test 4 — Checking for Oil Pressure While Cranking the Engine” on page 687.

Test 4 — Checking for Oil Pressure While Cranking the Engine

CAUTION

Do NOT crank the engine for more than 30 seconds without interruption since this can tax the batteries and starter motor. Allow at least 2 minutes between attempts to allow the starter to cool and the batteries to re-energize.

1. Turn the ignition key OFF.
2. Connect a gauge that is known to be accurate to the oil pressure gallery or oil pedestal with a hose.
3. Disconnect fuse 40 from the electrical equipment panel.
4. Turn the ignition key ON and crank the engine.

   If the gauge registers oil pressure within 30 seconds of cranking, go to test “Test 8 — Checking the Engine Oil Pressure (EOP) Sensor” on page 687.

   If the gauge does NOT register oil pressure within 30 seconds of cranking, there is a problem with the oil pump, drive, or other internal engine component. Locate and repair the problem.

Test 8 — Checking the Engine Oil Pressure (EOP) Sensor

1. Turn the ignition key OFF.
2. Reinstall fuse 40.
3. Turn the ignition key ON, start and idle the engine.

   If the pressure on the gauge does not reach or exceed 5 psi after 15 seconds of idling, STOP THE ENGINE! The Engine Oil Pressure Sensor works properly. There is still a mechanical problem resulting in low oil pressure, such as a blocked passage, filter, etc. Locate and correct the source of the problem.

   If the pressure exceeds 5 psi at idle, compare the pressure on the gauge with the pressure recorded by V-MAC III using a diagnostic tool. If the pressures agree within 3 psi, run the engine to high idle and compare the two pressures again. If the pressures still agree within 3 psi, there is no longer a problem. V-MAC III correctly detected a problem with the oil pressure that has since disappeared.

   If the pressures do not agree at any time within 3 psi, go to test “Test 16 — Electrical Checks” on page 688.

Test 16 — Electrical Checks

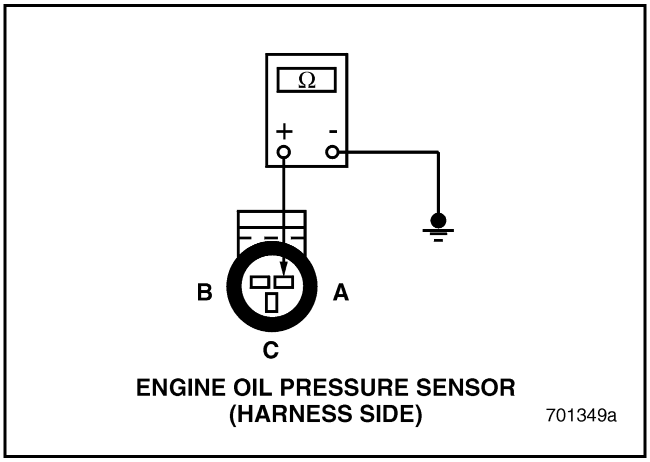


Figure 849

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Engine Oil Pressure Sensor.
3. Measure the resistance between pin A on the harness side of the Engine Oil Pressure Sensor connector and a known good ground.

   If the resistance between pin A and ground is greater than 20 ohms, make sure that there are no electrical devices such as lights, heater motors, etc. running in the cab. Locate a new good ground and try again. If the resistance is still greater than 20 ohms, there is a break or bad connection between the Engine Oil Pressure Sensor connector pin A and Engine Control Unit (EECU) connector J1 pin 25. Check for corroded terminals on the Engine Oil Pressure Sensor connector and EECU connector J1. Also check for evidence of damaged wiring.

   If the resistance is less than 20 ohms, go to Engine Oil Pressure Diagnostic, Blink Code 1-1 (ASET™ IEGR Engine).

LOW OIL PRESSURE WITH DRIVER ALARM NO DIAGNOSTIC BLINK CODE (ASET™ CEGR ENGINE)

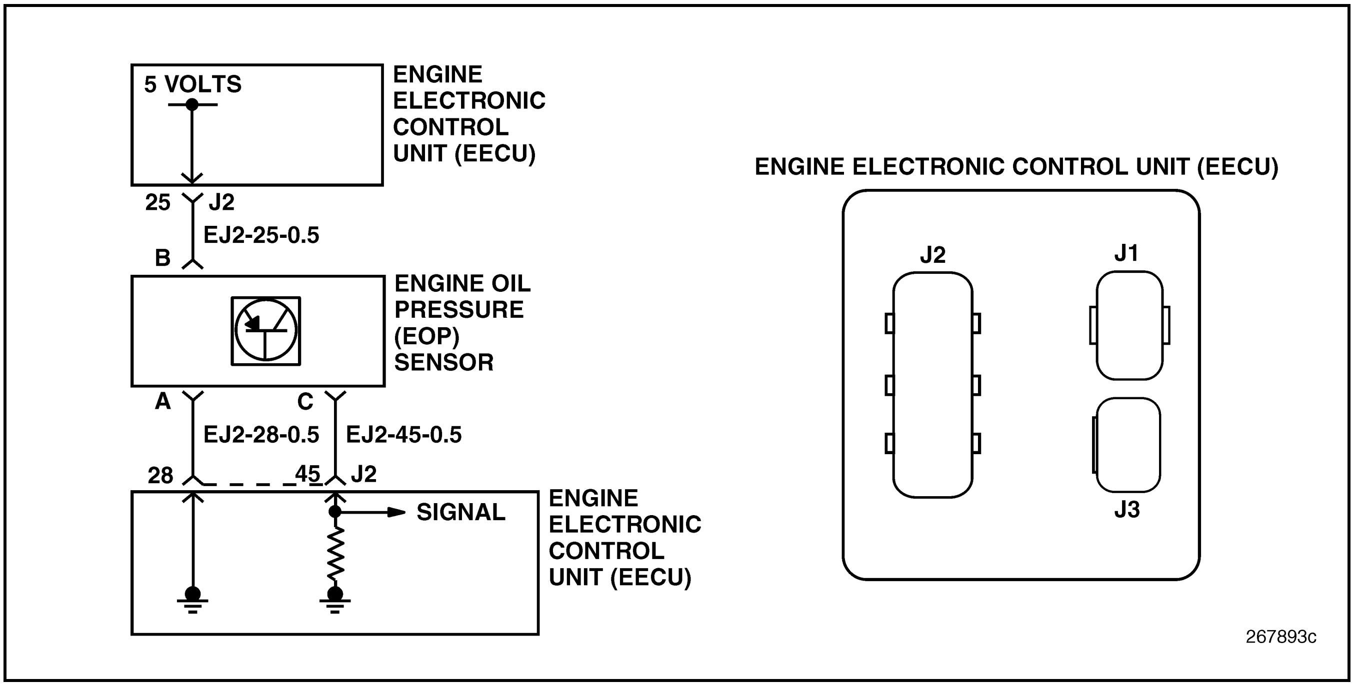


Figure 850 — Engine Oil Pressure Sensor Circuit (ASET™ CEGR Engine)

N O T E

When performing electrical tests, wiggle wires and connectors to find intermittent problems.

Failure Mode Identifier (FMI): 1 (Valid Low)

Parameter Identification (PID): 100

Message Identification (MID): 142

Circuit Description: The Engine Oil Pressure (EOP) Sensor is used to detect engine lubrication system failures. The sensor consists of a pressure sensitive diaphragm and amplifier. Mechanical pressure causes the sensor's diaphragm to deflect and produce an electrical signal proportional to the pressure. The diaphragm deflection signal is amplified in the sensor. The sensor's signal is monitored by the Engine Electronic Control Unit (EECU). The EECU will set fault code 1-1 if the EECU senses that the signal being sent by the Engine Oil Pressure (EOP) Sensor is electrically faulty. The Vehicle Electronic Control Unit (VECU) will log a fault (no diagnostic blink code) and turn on the shutdown lamp and driver alarm if the signal being sent by the EOP is valid, but drops to less than a predetermined value.

Location: The Engine Oil Pressure (EOP) Sensor is located at the left side of the engine on top of the oil filter assembly. The Engine Electronic Control Unit (EECU) is mounted on the air intake manifold on the left side of the engine.

Additional Symptoms: Driver alarm sounds, optional engine shutdown.

Test 1 — Checking the Engine Oil Level

1. Check the oil level on the dipstick.

   If the oil is between the add and full lines, go to test "Test 2 — Looking for Missing Oil Fittings" on page 690.

   If the oil is below the add line, inspect the engine for the cause of the oil loss. Also check the vehicle maintenance records for oil add and change dates.

Test 2 — Looking for Missing Oil Fittings

1. Carefully inspect the engine for missing oil fittings. Look particularly around the turbo oil supply and the oil filter pedestal oil supply.

   If there are NO missing fittings, and no other obvious cause of a pressure loss, go to test “Test 4 — Checking for Oil Pressure While Cranking the Engine” on page 690.

Test 4 — Checking for Oil Pressure While Cranking the Engine

CAUTION

Do NOT crank the engine for more than 30 seconds without interruption since this can tax the batteries and starter motor. Allow at least 2 minutes between attempts to allow the starter to cool and the batteries to re-energize.

1. Turn the ignition key OFF.
2. Connect a gauge that is known to be accurate to the oil pressure gallery or oil pedestal with a hose.
3. Disconnect fuse 38 from the electrical equipment panel.
4. Turn the ignition key ON and crank the engine.

   If the gauge registers oil pressure within 30 seconds of cranking, go to test “Test 8 — Checking the Engine Oil Pressure (EOP) Sensor” on page 690.

   If the gauge does NOT register oil pressure within 30 seconds of cranking, there is a problem with the oil pump, drive, or other internal engine component. Locate and repair the problem.

Test 8 — Checking the Engine Oil Pressure (EOP) Sensor

1. Turn the ignition key OFF.
2. Reinstall fuse 38.
3. Turn the ignition key ON, start and idle the engine.

   If the pressure on the gauge does not reach or exceed 5 psi after 15 seconds of idling, STOP THE ENGINE! The Engine Oil Pressure Sensor works properly. There is still a mechanical problem resulting in low oil pressure, such as a blocked passage, filter, etc. Locate and correct the source of the problem.

   If the pressure exceeds 5 psi at idle, compare the pressure on the gauge with the pressure recorded by V-MAC III using a diagnostic tool. If the pressures agree within 3 psi, run the engine to high idle and compare the two pressures again. If the pressures still agree within 3 psi, there is no longer a problem. V-MAC III correctly detected a problem with the oil pressure that has since disappeared.

   If the pressures do not agree at any time within 3 psi, go to test “Test 16 — Electrical Checks” on page 691.

Test 16 — Electrical Checks

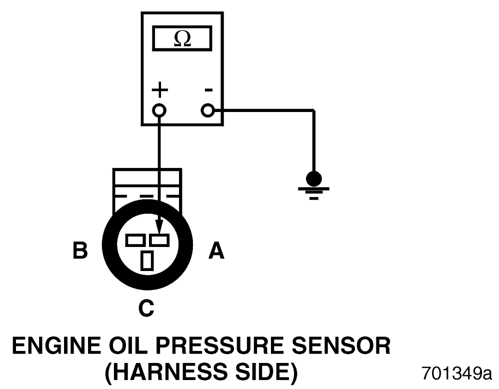


Figure 851

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Engine Oil Pressure Sensor.
3. Measure the resistance between pin A on the harness side of the Engine Oil Pressure Sensor connector and a known good ground.

   If the resistance between pin A and ground is greater than 20 ohms, make sure that there are no electrical devices such as lights, heater motors, etc. running in the cab. Locate a new good ground and try again. If the resistance is still greater than 20 ohms, there is a break or bad connection between the Engine Oil Pressure Sensor connector pin A and Engine Control Unit (EECU) connector J1 pin 25. Check for corroded terminals on the Engine Oil Pressure Sensor connector and EECU connector J1. Also check for evidence of damaged wiring.

   If the resistance is less than 20 ohms, go to Engine Oil Pressure Diagnostic, Blink Code 1-1 (ASET™ CEGR Engine).

INACCURATE OIL PRESSURE NO DIAGNOSTIC BLINK CODE (ASET™ IEGR ENGINE)

NOTE

This diagnostic routine is used to diagnose inconsistency between oil pressure recorded by the V-MAC III control units and oil pressure displayed on the gauge in the cab.

Test 1 — Checking the Engine Oil Pressure Gauge

1. Connect a gauge that is known to be accurate, to the oil pressure gallery or oil pedestal.
2. Start the engine and allow it to idle.

   Compare the pressure on the known good gauge with the pressure recorded by V-MAC III using a diagnostic computer. If the pressures are within 3 psi of one another, then the problem is in the gauge panel circuit.

   If the pressures are NOT within 3 psi, proceed to test 2.

Test 2 — Electrical Checks

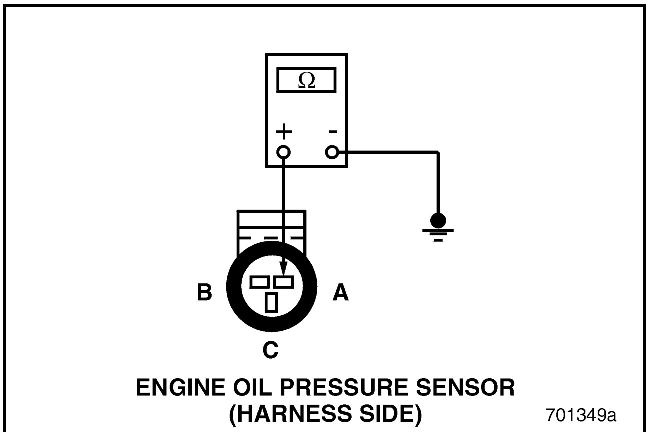


Figure 852

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Engine Oil Pressure (EOP) Sensor.
3. Measure the resistance between pin A on the harness side of the Engine Oil Pressure (EOP) Sensor connector and a known good ground.

   If the resistance between pin A and ground is greater than 20 ohms, make sure that there are no electrical devices such as lights, heater motors, etc. running in the cab. Locate a new good ground and try again. If the resistance is still greater than 20 ohms, there is a break or faulty connection between Engine Oil Pressure (EOP) Sensor connector pin A and Engine Electronic Control Unit (EECU) connector J1 pin 25. Check for corroded terminals on the Engine Oil Pressure (EOP) Sensor connector and EECU connector J1. Also check for evidence of damaged wiring.

   If the resistance is less than 20 ohms, go to Engine Oil Pressure Diagnostic, Blink Code 1-1 (ASET™ IEGR Engine).

INACCURATE OIL PRESSURE NO DIAGNOSTIC BLINK CODE (ASET™ CEGR ENGINE)

NOTE

This diagnostic routine is used to diagnose inconsistency between oil pressure recorded by the V-MAC III control units and oil pressure displayed on the gauge in the cab.

Test 1 — Checking the Engine Oil Pressure Gauge

1. Connect a gauge that is known to be accurate, to the oil pressure gallery or oil pedestal.
2. Start the engine and allow it to idle.

   Compare the pressure on the known good gauge with the pressure recorded by V-MAC III using a diagnostic computer. If the pressures are within 3 psi of one another, then the problem is in the gauge panel circuit.

   If the pressures are NOT within 3 psi, proceed to test 2.

Test 2 — Electrical Checks

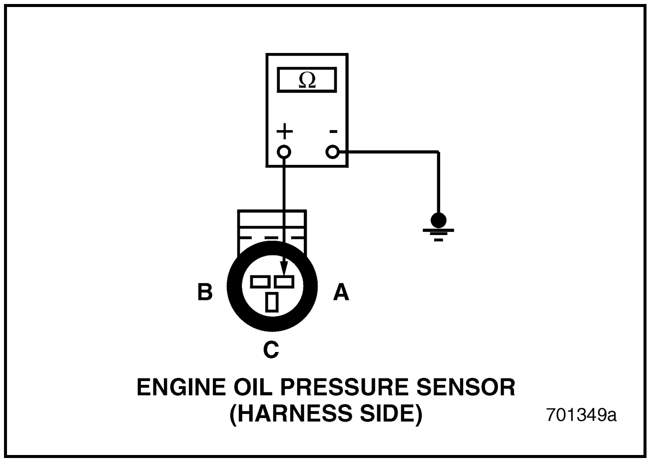


Figure 853

1. Turn the ignition key OFF.
2. Disconnect the harness connector from the Engine Oil Pressure (EOP) Sensor.
3. Measure the resistance between pin A on the harness side of the Engine Oil Pressure (EOP) Sensor connector and a known good ground.

   If the resistance between pin A and ground is greater than 20 ohms, make sure that there are no electrical devices such as lights, heater motors, etc. running in the cab. Locate a new good ground and try again. If the resistance is still greater than 20 ohms, there is a break or faulty connection between Engine Oil Pressure (EOP) Sensor connector pin A and Engine Electronic Control Unit (EECU) connector J2 pin 28. Check for corroded terminals on the Engine Oil Pressure (EOP) Sensor connector and EECU connector J2. Also check for evidence of damaged wiring.

   If the resistance is less than 20 ohms, go to Engine Oil Pressure Diagnostic, Blink Code 1-1 (ASET™ CEGR Engine).

ROAD SPEED HIGH NO DIAGNOSTIC BLINK CODE

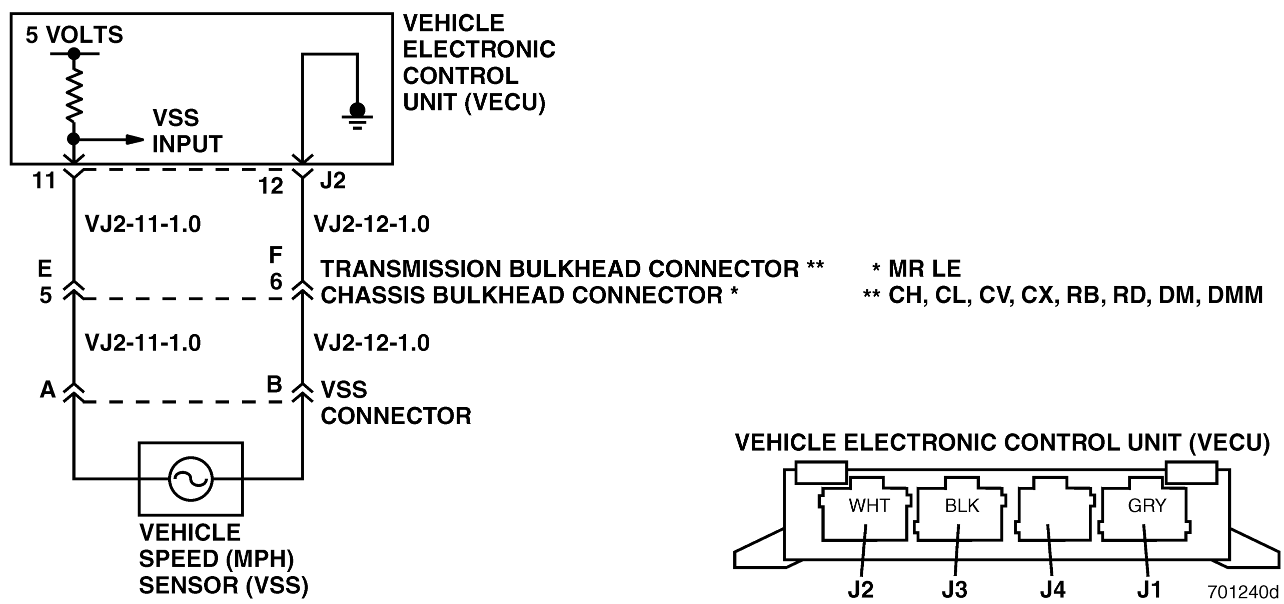


Figure 854 — Vehicle Speed Sensor (VSS) Circuit

Failure Mode Identifier (FMI): 0 (Road Speed High)

Parameter Identification (PID): P84

Message Identification (MID): 142

Circuit Description: The Vehicle Speed (MPH) Sensor (VSS) is an inductive sensor that generates a pulsed voltage signal when the sensor's magnetic field is excited. When the vehicle is moving the transmission output shaft speedometer gear teeth rotate past the VSS tip and a pulsed voltage signal is generated. The Vehicle Electronic Control Unit monitors the frequency of the signal and calculates the vehicle speed. The air gap between the sensor and the gear should be checked if erratic or inaccurate speedometer readings are reported.

Location: The VSS is located at the rear of the transmission, near the output shaft.

Additional Symptoms: The reduced power option may be enabled.

NOTE

If this fault is logged after changing the carrier ratio, tire size, or transmission, update the Vehicle Data area of the VECU to reflect the new carrier ratio, tire size, or top gear ratio and number of teeth on the road speed tone wheel.

Code Setting Conditions: This fault will be logged in VECU memory if the VSS input to the VECU indicates a road speed greater than 128 mph (206 kph).

Normal VSS Parameters:

Transmission	Resistance at 75°F (23.9°C)
Mack T200/T300-Series with Sensor #64MT413M	252 to 308 ohms
Mack T200/T300-Series with Sensor #64MT435M	238 to 292 ohms
Mack T200/T300-Series with Sensor #64MT424M	146 to 180 ohms
Mack T200/T300-Series with Sensor #64MT439M	146 to 180 ohms
Allison HD	270 to 330 ohms
Allison HT	2900 to 3400 ohms

Test 1 — Checking Harness Connections and Sensor

1. Check connectors at the Vehicle Electronic Control Unit (VECU) and Vehicle Speed (MPH) Sensor (VSS) for proper connections.

   If the connections are OK, check the type of transmission. If the transmission is a Mack T200/300, go to test “Test 2 — Check VSS Adjustment” on page 695.

   If the transmission is an Allison HD, replace the VSS Sensor and re-check the system. If input speed is still in excess of 128 mph (206 kph), reinstall the previous VSS and replace the Vehicle Electronic Control Unit (VECU).

Test 2 — Check VSS Adjustment

1. Remove the existing VSS and reinstall the VSS by hand until it bottoms. Then back the sensor out exactly 1 turn. Torque the jam nut to 15 lb-ft (20 N•m). Recheck VSS input speed.

   If input speed is still in excess of 128 mph (206 kph), replace the VSS and recheck the system.

   If input speed is still in excess of 128 mph (206 kph), reinstall the original VSS and replace the Vehicle Electronic Control Unit (VECU).

ENGINE COOLANT TEMPERATURE HIGH NO DIAGNOSTIC BLINK CODE

NOTE

This diagnostic routine is used to isolate the root cause of high engine coolant temperature with no diagnostic blink code set.

Failure Mode Identifier (FMI): 0 (Valid High)

Parameter Identification (PID): 110

Message Identification (MID): 142

Check the following items if the vehicle is experiencing high coolant temperature with no diagnostic blink code set.

1. Check the engine coolant level.

   If the coolant level is low and code 1-7 is not set, inspect and clean the coolant level probe.

2. Check for coolant leakage around hoses and hose connections. Check for leakage around radiator seams, core, draincock and radiator cap.
3. Check the coolant overflow surge tank, heater hoses and heater core for possible leakage.
4. Inspect the cooling system for collapsed or plugged hoses.
5. Inspect drive belts on the engine cooling fan and the water pump for proper adjustment.
6. Ensure that the cooling system is filled with the proper mixture of antifreeze.
7. Ensure that the correct thermostat is installed.
8. Ensure the radiator core is not plugged or damaged.
9. Ensure that the engine cooling fan and fan clutch are working properly.

FAN ALWAYS ON NO DIAGNOSTIC BLINK CODE (ASET™ CEGR ENGINE)

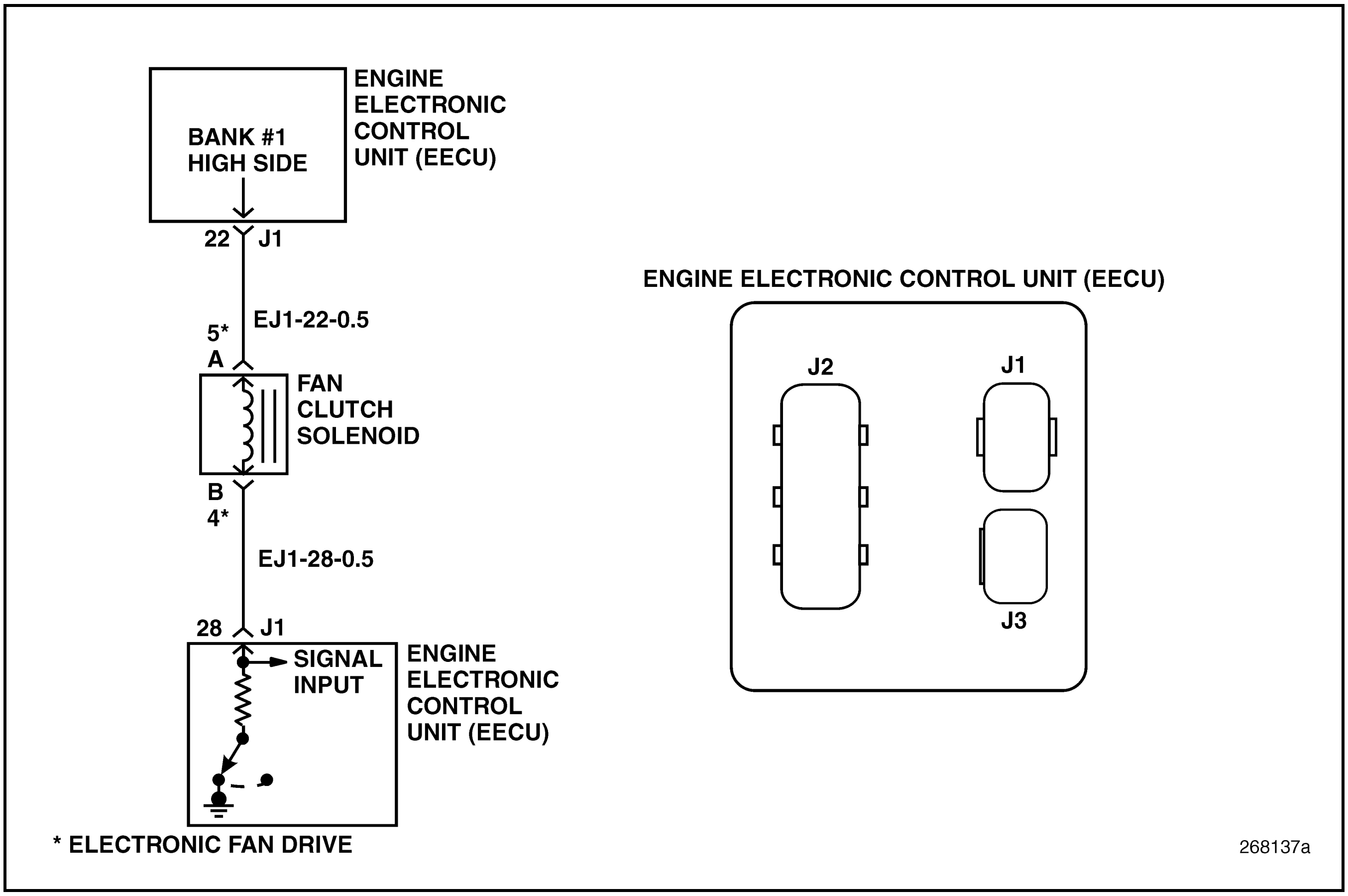


Figure 855 — Fan Clutch Output Circuit (ASET™ CEGR Engine)

NOTE

This diagnostic routine is used to isolate the root cause of continuous engine fan engagement with no diagnostic blink code set.

Circuit Description: The Electronic Viscous Fan Drive contains a solenoid that controls the flow of fluid between reservoirs in the fan drive housing and cover. The EECU provides power to the solenoid and controls solenoid operation to optimize fan speed based on coolant temperature, aftercooler outlet temperature and A/C load.

Location: The Electronic Viscous Fan Drive is bolted to the drive pulley on the front of the engine.

Additional Symptoms: Poor engine performance, poor fuel economy.

DANGER

The fan can engage without warning. Hands, arms and personal items can easily be entangled in the belts or fan blades. Keep arms, hair, clothing, jewelry, etc. clear from the fan and belts when the engine is running.

FAN ALWAYS ON (CEGR ENGINE)

Check the following items if the vehicle is experiencing continuous engine fan engagement with no diagnostic blink code set:

1. Ensure the engine fan does not not turn off after 10 minutes of engine operation at moderate speeds (1100-1500 rpm).
2. Verify aftercooler outlet temperature is less than 150°F using the Advanced Diagnostics Screen of V-MAC III Service Diagnostics software.
3. Verify coolant temperature is less than 200°F using the Advanced Diagnostics Screen of V-MAC III Service Diagnostics software.
4. Ensure Correct Fan Type is Selected in the Engine ECU Customer Data.
5. Verify the A/C system is functioning properly, and not commanding the engine fan to be ON.

   Using a diagnostic tool, enter the V-MAC III Engine ECU Customer Data screen and temporarily deselect the option Air Conditioning Installed to cause the engine ECU to ignore all air conditioning commands. The fan should turn off after approximately 5 minutes of engine operation.
6. Verify vehicle options in the Cab Fan Controls section of Vehicle ECU Customer Data are not commanding the engine fan to be ON.
7. Inspect the Electronic Viscous Fan Drive for mechanical failure.

TRANSMISSION OIL TEMPERATURE HIGH NO DIAGNOSTIC BLINK CODE

NOTE

This diagnostic routine is used to isolate the root cause of high transmission oil temperature with no diagnostic blink code set.

Failure Mode Identifier (FMI): 0 (Valid High)

Parameter Identification (PID): 177

Message Identification (MID): 142

Manual Transmission

Fault Logging Conditions: The Vehicle Electronic Control Unit (VECU) continuously monitors the signal from the Transmission Oil Temperature (TOT) Sensor. This fault will be logged in VECU memory and the driver will receive a warning, if the VECU detects a manual transmission oil temperature greater than 310°F (154.4°C). If the VECU detects a manual transmission oil temperature greater than 325°F (162.8°C), the VECU will initiate engine shutdown procedures.

Check the following items if the vehicle is experiencing high transmission oil temperature with no diagnostic blink code set.

1. Check the manual transmission oil level and quality. Drain and replace the transmission oil if any sign of contamination is evident.
2. Check for transmission oil leaks and repair as necessary.
3. Ensure that the transmission breather is free of debris and road dirt.
4. Remove the Transmission Oil Temperature (TOT) Sensor and inspect the sensor tip for varnish and metal chips.

   If the sensor tip is coated with varnish, clean the sensor and recheck the TOT signal.

   If the sensor tip is contaminated with metal chips, drain and refill the transmission, clean and reinstall the sensor, and recheck the TOT signal.

Allison HD Automatic Transmission

Fault Logging Conditions: The Vehicle Electronic Control Unit (VECU) continuously monitors the Allison HD automatic transmission oil temperature on the J1587 serial data lines. This fault will be logged in VECU memory and the driver will receive a warning, if the VECU detects an automatic transmission oil temperature greater than 247°F (119.4°C). If the VECU detects an automatic transmission oil temperature greater than 255°F (123.9°C), the VECU will initiate engine shutdown procedures.

Check the following items if the vehicle is experiencing high transmission oil temperature with no diagnostic blink code set.

1. Check the automatic transmission oil level and quality. Drain and replace the transmission oil if any sign of contamination is evident.
2. Check the base idle speed.
3. Using a diagnostic computer, check the transmission oil temperature in the MONITOR PARAMETERS section of the service diagnostics software.
4. Check the temperature of the transmission oil going to the oil cooler, using the transmission oil temperature gauge on the dash. The temperature indicated on the gauge will be greater than the temperature indicated on the service tool.
5. Check for transmission oil leaks and repair as necessary.
6. Check the transmission oil cooler lines for kinks, restrictions, and other damage.

EXHAUST TEMPERATURE HIGH NO DIAGNOSTIC BLINK CODE

NOTE

This diagnostic routine is used to isolate the root cause of high engine exhaust temperature with no diagnostic blink code set.

Failure Mode Identifier (FMI): 0 (Valid High)

Parameter Identification (PID): 173

Message Identification (MID): 142

Code Setting Conditions: This fault will be logged in Vehicle Electronic Control Unit (VECU) memory if the VECU detects an engine exhaust temperature greater than 1100°F (593.3°C).

Check the following items if the vehicle is experiencing high engine exhaust temperature with no diagnostic blink code set.

1. Check the charge air cooler for bent fins or blockage. Clean and repair the cooler as necessary.
2. Check for mechanical turbocharger failures.
3. Ensure that the Exhaust Temperature (ET) Sensor is enabled in the OEM area of the Vehicle Electronic Control Unit (VECU).
4. Remove the ET Sensor and check the sensor tip for corrosion and contamination. Replace the sensor if necessary and recheck the ET signal.

ENGINE CRANKS BUT WILL NOT START NO DIAGNOSTIC FAULT CODE (ASET™ IEGR ENGINE)

Diagnostic Description: This diagnostic procedure should be used only after establishing that no diagnostic codes are logged in the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU), there is adequate cranking fuel pressure, the Vehicle Electronic Control Unit (VECU) is not in sleep mode, and there is no significant mechanical engine damage.

NOTE

Before continuing with this procedure, check the following connectors for corrosion, loose connections, grease contamination, and improper assembly.

- Engine Electronic Control Unit (EECU) connectors J1 and J2
- Vehicle Electronic Control Unit (VECU) connector J3
- J1939 Serial Communication connector(s) (3 way Deutsch type)
- Cab/Transmission Bulkhead connector
- Engine/Transmission transition connector
- Electrical Equipment Panel power relays and fuses
- Battery Ground ring terminals at the 135 amp circuit breaker
- Battery Power ring terminals at the starter relay and starter solenoid
- 135 amp ground circuit breaker posts
- Engine Power Distribution Module (EPDM)/Transmission connector (conventional models)
- EPDM Fuse 40 terminals and wiring (conventional models)

Test 1 — Checking the Power Relay Cycle Down

1. Turn the key switch OFF.
2. Measure the voltage between fuse 16 and a good ground.

   Measure the voltage between fuse 40 and a good ground.

   If battery voltage is NOT present at either fuse, go to test “Test 2 — Checking the Switched Power Supply” on page 701.

   If battery voltage is present at one fuse, go to test “Test 3 — Checking the Power Relays” on page 702.

   If battery voltage is present at BOTH fuses, circuit VJ3-13 is shorted to voltage. Locate and repair the short circuit.

Test 2 — Checking the Switched Power Supply

1. Turn the key switch ON.
2. Measure the voltage between fuse 16 and a good ground with the engine cranking.

   Measure the voltage between fuse 40 and a good ground with the engine cranking.

   If battery voltage is present at both fuses, go to test “Test 4 — Checking EECU Fault Logging” on page 702.

   If the measured voltage is less than 7 volts, locate and repair the short to ground in the suspect power relay output circuit.

Test 3 — Checking the Power Relays

1. If battery voltage was present at fuse 16, remove 70 amp power relay 2.

   If battery voltage was present at fuse 40, remove 70 amp power relay 3.
2. Check for continuity between relay terminals 30 and 87.

   If continuity exists, the relay is stuck closed. Replace the suspect relay.

   If continuity does NOT exist, the output circuit of the suspect relay (circuit VJ3-17 for power relay 2 or circuit 40-A for power relay 3) is shorted to voltage. Locate and repair the short circuit.

Test 4 — Checking EECU Fault Logging

1. Remove the ABS fuses.
2. Remove fuse 16.
3. Crank the engine and then check for diagnostic fault codes.

   If fault codes 6-3, 6-4, and 6-5 are logged in the EECU, in any combination, go to test “Test 8 — Checking VECU Fault Logging” on page 702.

   If fault codes 6-3, 6-4, and 6-5 are NOT logged in any combination, go to test “Test 9 — Checking EECU Power and Ground Circuits” on page 702.

Test 8 — Checking VECU Fault Logging

1. Turn the key switch OFF.
2. Install fuse 16 and remove fuse 40.
3. Crank the engine and then check for diagnostic fault codes.

   If fault code 6-4 is logged in the VECU, go to test “Test 16 — Checking the Cranking Engine Speed Signal” on page 702.

   If fault code 6-4 is NOT logged in the VECU, go to test “Test 17 — Checking VECU Power and Ground Circuits” on page 703.

Test 9 — Checking EECU Power and Ground Circuits

1. Turn the key switch OFF.
2. Disconnect connector J2 from the EECU.
3. Measure the voltage between EECU connector J2 pins 10 and 12 while cranking the engine.

   Measure the voltage between EECU connector J2 pins 22 and 24 while cranking the engine.

   Measure the voltage between EECU connector J2 pins 41 and 43 while cranking the engine.

   If the measured voltage is less than 7 volts at any of the measurement points, locate and repair the open or short circuit to ground in the suspect circuit.

   If the measured voltage is greater than 7 volts at all of the measurement points, replace the EECU.

Test 16 — Checking the Cranking Engine Speed Signal

1. Turn the key switch OFF.
2. Connect all connectors that were previously disconnected from the EECU and the VECU.
3. Install fuse 40.
4. Use a diagnostic computer to monitor the engine speed while cranking the engine.

   If the diagnostic tool shows an engine speed of 150 to 200 RPM while cranking the engine, go to test “Test 32 — Checking the Engine Speed Input” on page 703.

   If the diagnostic tool shows an engine speed less than 150 RPM while cranking the engine, check the batteries, cables and the starting system for proper operation.

   If the diagnostic tool shows no engine speed or NA while cranking the engine, adjust the Engine Speed and Engine Position (EP) Sensors and retest the system.

Test 17 — Checking VECU Power and Ground Circuits

1. Turn the key switch OFF.
2. Remove fuse 40.
3. Connect VECU connector J3 (if the connector had been disconnected for a previous test).
4. Measure the voltage between VECU connector J3 pins 17 and 18 while cranking the engine.

   If the measured voltage is less than 7 volts, locate and repair the open or short circuit to ground in the suspect circuit.

   If the measured voltage is greater than 7 volts, replace the VECU.

Test 32 — Checking the Engine Speed Input

1. Turn the key switch OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Crank the engine and then check for fault codes.

   If fault code 3-4 is logged in the EECU, go to test “Test 64 — Checking the Engine Position Input” on page 703.

   If fault code 3-4 is NOT logged in the EECU, check the engine speed and engine position circuits for damage and replace the EECU.

Test 64 — Checking the Engine Position Input

1. Turn the key switch OFF.
2. Connect the Engine Position (EP) Sensor connector.
3. Disconnect the Engine Speed Sensor connector.
4. Crank the engine and then check for fault codes.

   If fault code 3-2 is logged in the EECU, go to test “Test 128 — Checking Voltage Drop Across an EUP” on page 703.

   If fault code 3-2 is NOT logged in the EECU, check the engine speed and engine position circuits for damage and replace the EECU.

Test 128 — Checking Voltage Drop Across an EUP

1. Connect the Engine Speed Sensor connector.
2. Measure the voltage drop across an EUP while the engine is cranking.

   If the voltage drop across the EUP is 0.12 volts AC or 0.016 volts DC, contact Mack Trucks Service Engineering for further assistance.

   If there is NO voltage drop across the EUP, replace the EECU and VECU with known good units.

ENGINE CRANKS BUT WILL NOT START NO DIAGNOSTIC FAULT CODE (ASET™ CEGR ENGINE)

Diagnostic Description: This diagnostic procedure should be used only after establishing that no diagnostic codes are logged in the Vehicle Electronic Control Unit (VECU) or the Engine Electronic Control Unit (EECU), there is adequate cranking fuel pressure, the Vehicle Electronic Control Unit (VECU) is not in sleep mode, and there is no significant mechanical engine damage.

NOTE

Before continuing with this procedure, check the following connectors for corrosion, loose connections, grease contamination, and improper assembly.

- Engine Electronic Control Unit (EECU) connectors J1, J2 and J3
- Vehicle Electronic Control Unit (VECU) connector J3
- J1939 Serial Communication connector(s) (3 way Deutsch type)
- Cab/Transmission Bulkhead connector
- Engine/Transmission transition connector
- Electrical Equipment Panel power relays and fuses
- Battery Ground ring terminals at the 135 amp circuit breaker
- Battery Power ring terminals at the starter relay and starter solenoid
- 135 amp ground circuit breaker posts
- Engine Power Distribution Module (EPDM)/Transmission connector (conventional models)
- EPDM Fuse 38 terminals and wiring (conventional models)

Test 1 — Checking the Power Relay Cycle Down

1. Turn the key switch off, wait for power relays to cycle down.
2. Measure the voltage between fuse 16 and a good ground.
3. Measure voltage at the Engine Electronic Control Unit (EECU) pin 34 of the J2 connector using the test lead adapter J-47021 and a good ground.

   If battery voltage is not present at either fuse 16 or at EECU pin 34 of the J2 connector, go to test “Test 2 — Checking the Switched Power Supply” on page 704.

   If battery voltage is present at fuse 16 or at EECU pin 34 of the J2 connector, go to test “Test 3 — Checking the Power Relays” on page 705.

   If battery voltage is present at both fuse 16 and at EECU pin 34 of the J2 connector, Circuit VJ3-13 is shorted to voltage. Locate and repair the short circuit.

Test 2 — Checking the Switched Power Supply

1. Turn the key switch ON.
2. Measure the voltage between fuse 16 and a good ground with the engine cranking.
3. Measure voltage at the Engine Electronic Control Unit (EECU) pin 34 of the J2 connector using the test lead adapter J-47021 and a good ground with the engine cranking.

   If battery voltage is present at both fuse 16 and at EECU pin 34 of the J2 connector, go to test “Test 4 — Checking EECU Fault Logging” on page 705.

   If the measured voltage is less than 7 volts, locate and repair the short to ground in the relay circuit.

Test 3 — Checking the Power Relays

1. Check for voltage at fuse 16 with the ignition switch in the off position and system powered down. If battery voltage is present at fuse 16, remove the 70 amp power relay 2.
2. Remove the EECU J2 connector and check for voltage at pin 34. If battery voltage is present at EECU pin 34 of the J2 connector, disconnect the VECU VJ3 connector.
3. Check for continuity between power relay terminals 30 and 87. If continuity exists, the relay is stuck closed. Replace the relay.
4. If continuity does NOT exist, the output circuit of the suspect relay (circuit VJ3-17 for power relay 2) is shorted to voltage. Locate and repair the short circuit.

Test 4 — Checking EECU Fault Logging

1. Remove the ABS fuses.
2. Remove fuse 16.
3. Crank the engine and then check for diagnostic fault codes.

   If fault codes 6-3, 6-4, and 6-5 are logged in the EECU, in any combination, go to test "Test 8 — Checking VECU Fault Logging" on page 705.

   If fault codes 6-3, 6-4, and 6-5 are NOT logged in any combination, go to test "Test 9 — Checking EECU Power and Ground Circuits" on page 705.

Test 8 — Checking VECU Fault Logging

1. Turn the key switch OFF.
2. Install fuse 16 and remove fuse 38.
3. Crank the engine and then check for diagnostic fault codes.

   If fault code 6-4 is logged in the VECU, go to test "Test 16 — Checking the Cranking Engine Speed Signal" on page 705.

   If fault code 6-4 is NOT logged in the VECU, go to test "Test 17 — Checking VECU Power and Ground Circuits" on page 706.

Test 9 — Checking EECU Power and Ground Circuits

1. Turn the key switch OFF.
2. Disconnect connector J2 from the EECU.
3. Measure the voltage between EECU connector J2 pins 2 and 4 while cranking the engine.

   Measure the voltage between EECU connector J2 pins 3 and 7 while cranking the engine.

   Measure the voltage between EECU connector J2 pins 5 and 8 while cranking the engine.

   If the measured voltage is less than 7 volts at any of the measurement points, locate and repair the open or short circuit to ground in the suspect circuit.

   If the measured voltage is greater than 7 volts at all of the measurement points, replace the EECU.

Test 16 — Checking the Cranking Engine Speed Signal

1. Turn the key switch OFF.
2. Connect all connectors that were previously disconnected from the EECU and the VECU.
3. Install fuse 38.
4. Use a Diagnostic Computer to monitor the engine speed while cranking the engine.

   If the diagnostic tool shows an engine speed of 150 to 200 RPM while cranking the engine, go to test "Test 32 — Checking the Engine Speed Input" on page 706.

   If the diagnostic tool shows an engine speed less than 150 RPM while cranking the engine, check the batteries, cables and the starting system for proper operation.

   If the diagnostic tool shows no engine speed or NA while cranking the engine, adjust the Engine Speed and Engine Position (EP) Sensors and retest the system.

Test 17 — Checking VECU Power and Ground Circuits

1. Turn the key switch OFF.
2. Remove fuse 38.
3. Connect VECU connector J3 (if the connector had been disconnected for a previous test).
4. Measure the voltage between VECU connector J3 pins 17 and 18 while cranking the engine.

   If the measured voltage is less than 7 volts, locate and repair the open or short circuit to ground in the suspect circuit.

   If the measured voltage is greater than 7 volts, replace the VECU.

Test 32 — Checking the Engine Speed Input

1. Turn the key switch OFF.
2. Disconnect the Engine Position (EP) Sensor connector.
3. Crank the engine and then check for fault codes.

   If fault code 3-4 is logged in the EECU, go to test “Test 64 — Checking the Engine Position Input” on page 706.

   If fault code 3-4 is NOT logged in the EECU, check the engine speed and engine position circuits for damage and replace the EECU.

Test 64 — Checking the Engine Position Input

1. Turn the key switch OFF.
2. Connect the Engine Position (EP) Sensor connector.
3. Disconnect the Engine Speed Sensor connector.
4. Crank the engine and then check for fault codes.

   If fault code 3-2 is logged in the EECU, go to test “Test 128 — Checking Voltage Drop Across an EUP” on page 706.

   If fault code 3-2 is NOT logged in the EECU, check the engine speed and engine position circuits for damage and replace the EECU.

Test 128 — Checking Voltage Drop Across an EUP

1. Connect the Engine Speed Sensor connector.
2. Measure the voltage drop across an EUP while the engine is cranking.

   If the voltage drop across the EUP is 0.12 volts AC or 0.016 volts DC, contact Mack Trucks Service Engineering for further assistance.

   If there is NO voltage drop across the EUP, replace the EECU and VECU with known good units.

VIP DIGITAL DASH DISPLAY NO DIAGNOSTIC FAULT CODE

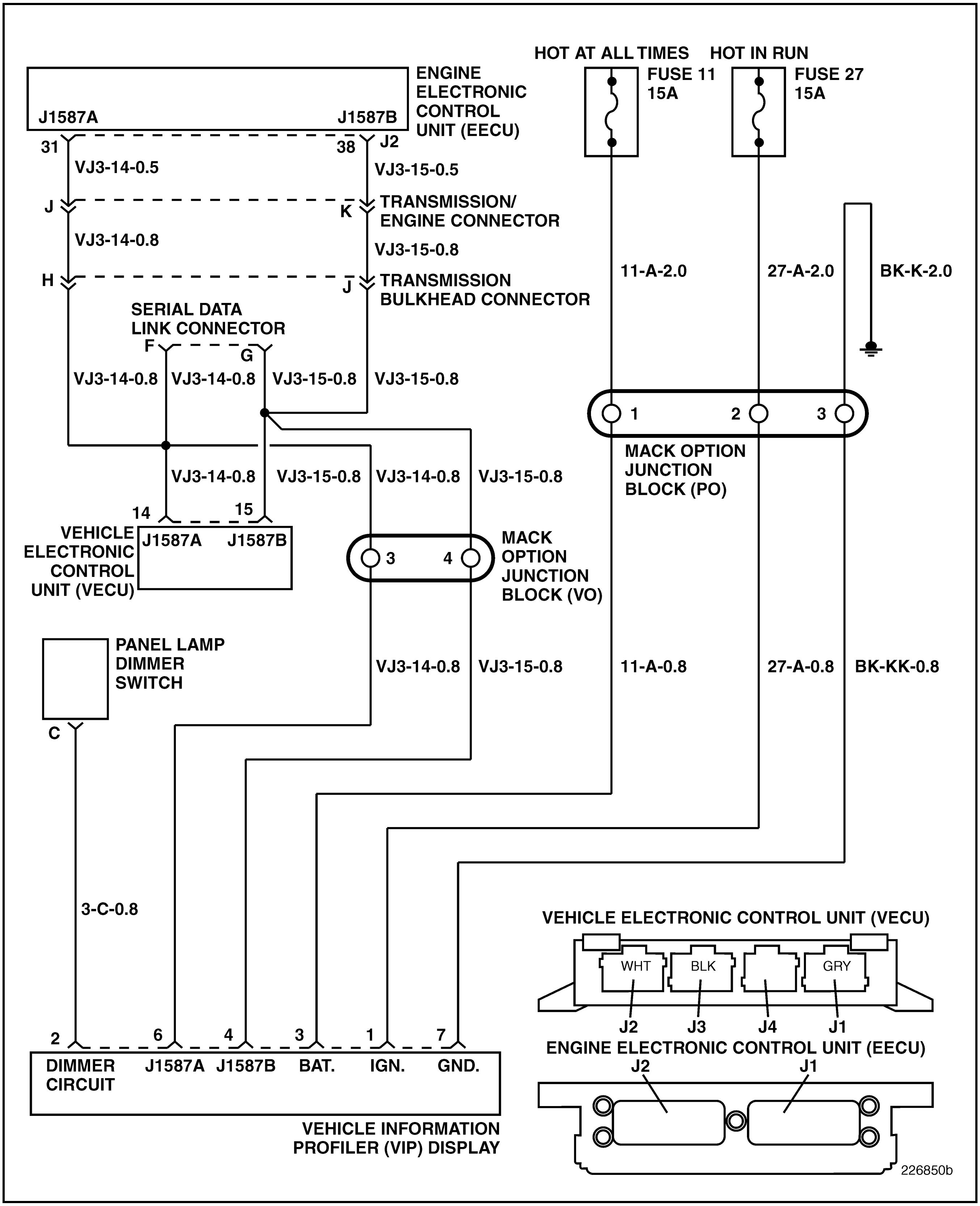


Figure 856 — VIP Digital Dash Display Circuit (ASET™ IEGR Engine)

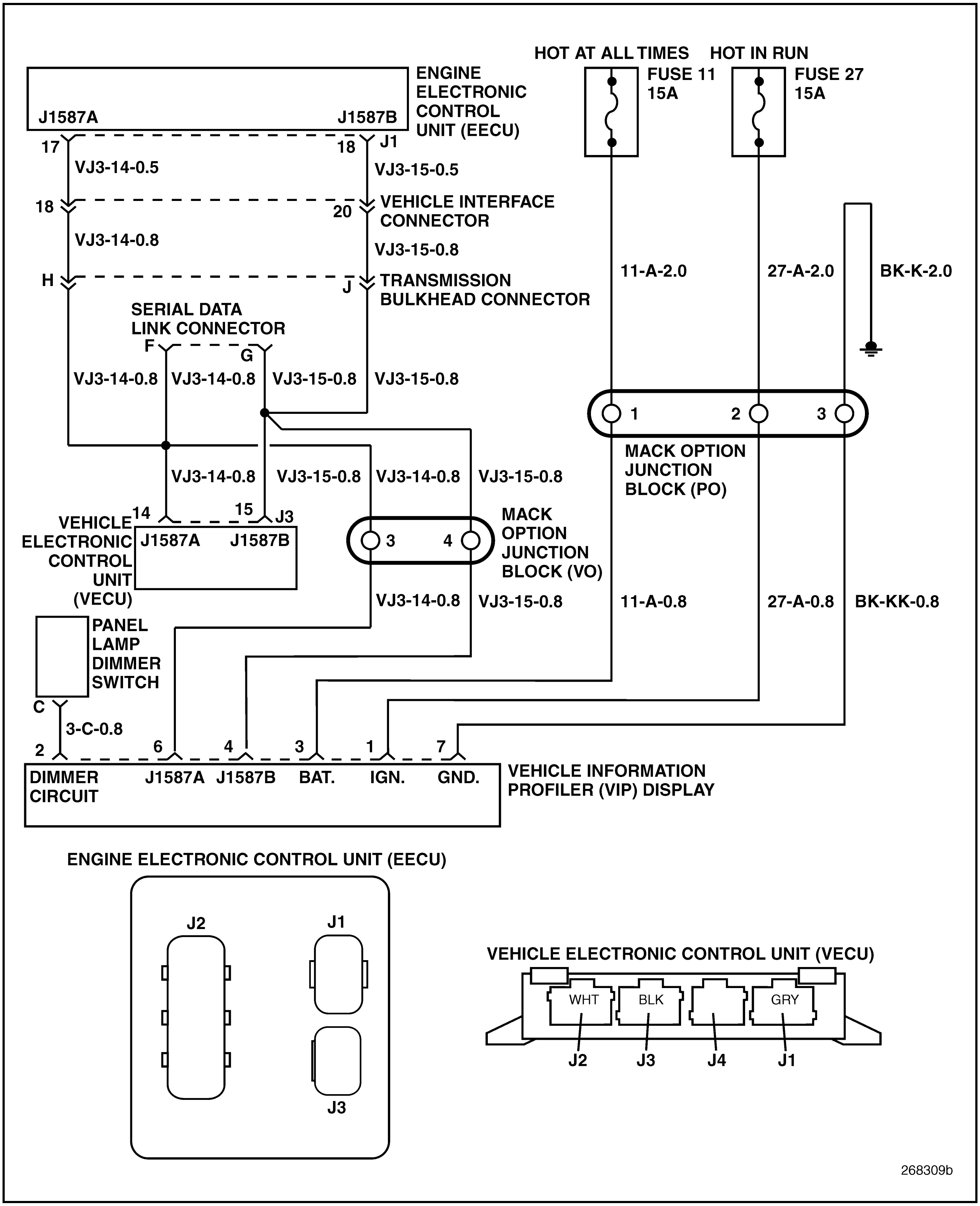


Figure 857 — VIP Digital Dash Display Circuit (ASET™ CEGR Engine)

System Description: The Vehicle Information Profile (VIP) digital dash display allows the driver to monitor a wide variety of vehicle parameters. The VIP display receives information from the Vehicle Electronic Control Unit (VECU) and the Engine Electronic Control Unit (EECU) on the J1587 serial data lines. The intensity of the VIP display is controlled by the instrument panel dimmer circuit.

NOTE

Do not attempt to service the VIP unit. If the VIP display is inoperative, check for key ON battery power at VIP connector pins 1 and 3. Check for a good ground at VIP connector pin 7. Verify the continuity of the J1587 data lines. If power, ground, and serial data are being successfully supplied to the VIP unit, replace it with a new VIP display.

NOTES

SPECIFICATIONS

V-MAC III SENSOR SPECIFICATIONS

The tables in this section show the normal specifications for V-MAC III system sensors.

Aftercooler Outlet Temperature Sensor (AOT) Sensor (CEGR — #64MT450A)

Aftercooler Outlet Temperature	Sensor Resistance
50°F (10°C)	59.5 k ohms
180°F (82°C)	3.5 k ohms

Intake Air Temperature Sensor (CEGR — #64MT450A)

Intake Manifold Temperature	Sensor Resistance
50°F (10°C)	59.5 k ohms
180°F (82°C)	3.5 k ohms

Intake Air Temperature Sensor (IEGR — #64MT2102)

Intake Manifold Temperature	Sensor Resistance
77°F (25°C)	1835–2076 ohms
100°F (37.8°C)	1146–1291 ohms
220°F (104.4°C)	158–170 ohms
250°F (121.11°C)	105–112 ohms

Ambient Air Temperature (AAT) Sensor

Ambient Air Temperature	Sensor Resistance
32°F (0°C)	3422 ohms
104°F (40°C)	1485 ohms

Boost Air Pressure (BAP) Sensor (IEGR — #64MT2101)

Boost Air Pressure	Sensor Output (5 volt input)
0 psi	0.7 volts
5 psi	1.1 volts
10 psi	1.7 volts
15 psi	2.1 volts
20 psi	2.6 volts
25 psi	3.1 volts
30 psi	3.6 volts
35 psi	4.1 volts
40 psi	4.6 volts

Boost Air Pressure (BAP) Sensor (CEGR — #64MT446)

Boost Air Pressure	Sensor Output (5 volt input)
0 psi	0.5 volts
10 psi	1.1 volts
20 psi	1.7 volts
30 psi	2.3 volts
40 psi	3.0 volts
50 psi	3.6 volts
60 psi	4.2 volts

Compressor Discharge Temperature (CDT) Sensor (CEGR — #64MT450A)

Compressor Discharge Temperature	Sensor Resistance
50°F (10°C)	59.5 k ohms
180°F (82°C)	3.5 k ohms

Engine Coolant Temperature (ECT) Sensor (#64MT2103M)

Engine Coolant Temperature	Sensor Resistance
77°F (25°C)	2590–2960 ohms
100°F (37.8°C)	1500–1690 ohms
220°F (104.4°C)	151–160 ohms
230°F (110°C)	128–136 ohms

Engine Oil Pressure (EOP) Sensor

Engine Oil Pressure	Sensor Output (5 volt input)
0 psi	0.6 volts
10 psi	1.05 volts
20 psi	1.6 volts
30 psi	2.1 volts
40 psi	2.6 volts
50 psi	3.1 volts
60 psi	3.6 volts
70 psi	4.1 volts
80 psi	4.6 volts

Engine Oil Temperature (EOT) Sensor (Oil Filter Pedestal Mounted Sensor #64MT2107)

Engine Oil Temperature	Sensor Resistance
77°F (25°C)	2590–2960 ohms
100°F (37.8°C)	1500–1690 ohms
220°F (104.4°C)	151–160 ohms
230°F (110°C)	128–136 ohms

Engine Oil Temperature (EOT) Sensor (Oil Pan Mounted Sensor #64MT2113)

Engine Oil Temperature	Sensor Resistance
75°F (24°C)	2100 ohms
100°F (37.8°C)	1250 ohms
125°F (51.7°C)	800 ohms
150°F (65.5°C)	525 ohms
175°F (79.4°C)	350 ohms
200°F (93.3°C)	240 ohms
225°F (107.2°C)	160 ohms
250°F (121.1°C)	140 ohms
275°F (135°C)	90 ohms
300°F (148.9°C)	65 ohms

Engine Position (EP) Sensor

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Engine Speed/Timing (RPM/TDC) Sensor

Ambient Temperature	Sensor Resistance
Less than 68°F (20°C)	650–946 ohms
68°F (20°C)	774–946 ohms
Greater than 68°F (20°C)	774–1300 ohms

Front Drive Axle Oil Temperature (FAOT) Sensor

Front Drive Axle Oil Temperature	Sensor Resistance
75°F (24°C)	2100 ohms
100°F (37.8°C)	1250 ohms
125°F (51.7°C)	800 ohms
150°F (65.5°C)	525 ohms
175°F (79.4°C)	350 ohms
200°F (93.3°C)	240 ohms
225°F (107.2°C)	160 ohms
250°F (121.1°C)	140 ohms
275°F (135°C)	90 ohms
300°F (148.9°C)	65 ohms

Fuel Temperature (FT) Sensor

Fuel Temperature	Sensor Resistance
77°F (25°C)	2590–2960 ohms
100°F (37.8°C)	1500–1690 ohms
220°F (104.4°C)	151–160 ohms
230°F (110°C)	128–136 ohms

Fuel Level (FL) Sensor

Fuel Level	Sensor Resistance
Full Tank	28–34 ohms
Half Tank	132–144 ohms
Empty Tank	238–255 ohms

Intake Air Temperature and Humidity (IATH) Sensor (CEGR — #64MT463M)

Intake Air Temperature	Sensor Resistance
32°F (0°C)	30,025 ohms
68°F (20°C)	12,280 ohms
86°F (30°C)	8,178 ohms
104°F (40°C)	5,575 ohms

Intake Air Temperature and Humidity (IATH) Sensor (CEGR — #64MT463M)

Intake Air Humidity	Sensor Output (5 volt input)
10% Relative Humidity	1.180 volts
95% Relative Humidity	3.704 volts

Intake Manifold Temperature (IMT) Sensor (IEGR)

Intake Air Temperature	Sensor Resistance
14°F (–10°C)	8500–9500 ohms
32°F (0°C)	5500–6500 ohms
50°F (10°C)	3500–3900 ohms
68°F (20°C)	2200–2600 ohms
86°F (30°C)	1500–1800 ohms
104°F (40°C)	1000–1300 ohms
122°F (50°C)	750–850 ohms
140°F (60°C)	600–650 ohms
158°F (70°C)	450–500 ohms

Intake Manifold Temperature (IMT) Sensor (CEGR — #64MT450)

Intake Manifold Temperature	Sensor Resistance
50°F (10°C)	59.5 k ohms
180°F (82°C)	3.5 k ohms

Rear Drive Axle Oil Temperature (RAOT) Sensor

Rear Drive Axle Oil Temperature	Sensor Resistance
75°F (24°C)	2100 ohms
100°F (37.8°C)	1250 ohms
125°F (51.7°C)	800 ohms
150°F (65.5°C)	525 ohms
175°F (79.4°C)	350 ohms
200°F (93.3°C)	240 ohms
225°F (107.2°C)	160 ohms
250°F (121.1°C)	140 ohms
275°F (135°C)	90 ohms
300°F (148.9°C)	65 ohms

Transmission Oil Temperature (TOT) Sensor

Transmission Oil Temperature	Sensor Resistance
75°F (24°C)	2100 ohms
100°F (37.8°C)	1250 ohms
125°F (51.7°C)	800 ohms
150°F (65.5°C)	525 ohms
175°F (79.4°C)	350 ohms
200°F (93.3°C)	240 ohms
225°F (107.2°C)	160 ohms
250°F (121.1°C)	140 ohms
275°F (135°C)	90 ohms
300°F (148.9°C)	65 ohms

Throttle Position (TP) Sensor

Resistance pin C to pin A	2000–3000 Ω
Resistance pin C to pin B	200–800 Ω (accelerator pedal not depressed)
Resistance pin C to sensor case	Over 100 kΩ

Vehicle Speed (MPH) Sensor (VSS)

Transmission	Resistance at 75°F (23.9°C)
Mack T200/T300-Series with Sensor #64MT413M	252 to 308 ohms
Mack T200/T300-Series with Sensor #64MT435M	238 to 292 ohms
Mack T200/T300-Series with Sensor #64MT424M	146 to 180 ohms
Mack T200/T300-Series with Sensor #64MT439M	146 to 180 ohms
Allison HD	270 to 330 ohms
Allison HT	2900 to 3400 ohms

V-MAC III E-TECH™ ENGINE FUEL RATE SPECIFICATIONS (1997 THROUGH 1999)

The following table shows the normal fuel consumption rates for V-MAC III E-Tech™ engines.

Fuel Rate (Gallons Per Hour)	EM7 275	EM7 300	E7 310/330	E7 330/350	E7 355/380	E7 300	E7 350	E7 400	E7 427	E7 460
Idle (650 RPM)	0.5–1.0	0.5–1.0	0.5–1.0	0.5–1.0	0.5–1.0	0.5–1.0	0.5–1.0	0.5–1.0	0.5–1.0	0.5–1.0
High Idle (2100 RPM)	2.0–3.0	2.0–3.0	2.0–3.0	2.0–3.0	2.0–3.0	2.0–3.0	2.0–3.0	2.0–3.0	2.0–3.0	2.0–3.0
Full Load (Rated RPM)	12.3	13.3	13.9	14.7	15.8	13.3	15.5	18.0	19.2	20.9
Full Load (Peak Torque RPM)	11.2	12.2	12.5	13.5	14.4	11.5	13.4	14.5	16.1	16.7

SCHEMATICS AND DIAGRAMS

SYSTEM CONNECTORS

The V-MAC® III system utilizes many different connector styles and sizes. The Vehicle Electronic Control Unit (VECU), Engine Electronic Control Unit (EECU), and the Serial Communications Port connectors are the largest connectors in the system, and are where the majority of the V-MAC® III system testing is performed. This section illustrates the VECU, EECU, and Serial Communications Port connectors and includes charts with connector terminal identification and functions. The charts should not be used as a replacement for the detailed tests that appear in this manual. The charts are intended as an identification reference for use when repairing a connector or terminal.

6-Pin Serial Communication Port

The Serial Communications Port is a six (6) pin connector used for system diagnostics and reprogramming. It is located under the dashboard to the left of the steering column. This port is used for connecting a diagnostic computer to the vehicle. See the illustration for the pin locations. A listing of the signal on each pin follows the illustration.

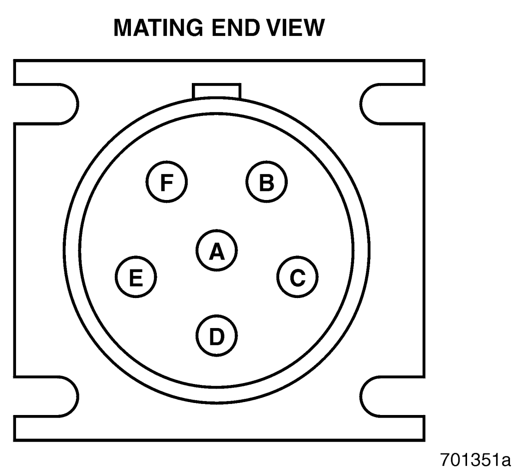


Figure 858 — 6-Pin Serial Communication Port

PIN Letter	Designation
A	Serial data link PLUS (+) line
B	Serial data link MINUS (–) line
C	PLUS (+) 12 volts
D	Accessory relay
E	Chassis ground
F	Not used

9-Pin Serial Communication Port

The Serial Communications Port is a nine (9) pin connector used for system diagnostics and reprogramming. It is located under the dashboard to the left of the steering column. This port is used for connecting a diagnostic computer to the vehicle. See the illustration for the pin locations. A listing of the signal on each pin follows the illustration.

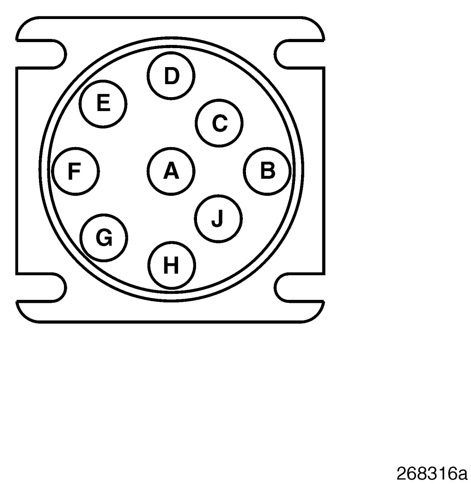


Figure 859 — 9-Pin Serial Communication Port

PIN Letter	Designation
A	Chassis ground
B	PLUS (+) 12 volts
C	J1939 Serial data link PLUS (+) line
D	J1939 Serial data link MINUS (–) line
E	J1939 Serial data link shield line
F	J1587 Serial data link PLUS (+) line
G	J1587 Serial data link MINUS (–) line
H	Not used
J	Not used

Vehicle Electronic Control Unit (VECU) Connectors

The Vehicle Electronic Control Unit (VECU) has three 18 pin connectors. Each pin is marked on the inside of the connector. To disconnect a connector from the VECU, press down on the tang of the harness connector and gently pull the connector from the VECU. Be sure that the connector is aligned as shown below to avoid confusion when checking pin numbers. The connector number and color are shown as a reference for reconnecting the VECU to the cab harness.

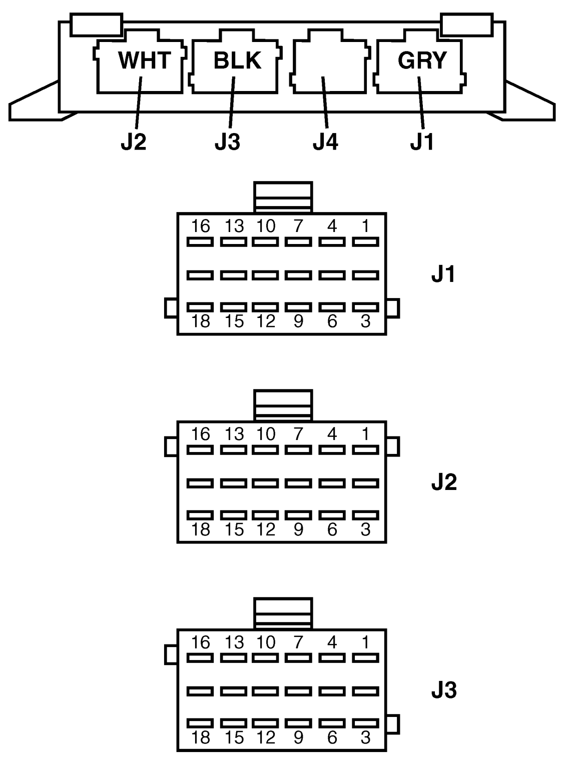


Figure 860 — VECU Connectors

VEHICLE ELECTRONIC CONTROL UNIT (VECU) CONNECTOR PIN DESIGNATIONS

VECU Connector J1	
PIN Number	**Description**
1	Ignition key switch
2	Starter signal
3	Buffered vehicle speed output (Speedometer Signal)
4	Buffered RPM output (Tachometer Signal)
5	Shutdown override signal
6	Speed control ON/OFF switch signal
7	Speed control SET/DECEL signal
8	Speed control RESUME/ACCEL signal
9	Clutch engaged signal
10	Parking brake signal (#1)
11	Service brake signal
12	Engine brake switch — low
13	Engine brake switch — high
14	Not used
15	Fan clutch override
16	Not used
17	Not used
18	Fuel level sensor signal

VECU Connector J2	
PIN Number	Description
1	VECU Reference ground
2	Transmission oil temperature signal
3	Front drive axle temperature signal
4	Rear drive axle temperature signal
5	Not used (spare relay)
6	Not used
7	Exhaust temperature sensor signal
8	Exhaust temperature sensor return
9	PTO 1 selected
10	PTO 2 (when selected)
11	Vehicle speed sensor PLUS (+)
12	Vehicle speed sensor MINUS (–)
13	Parking brake signal (#2)
14	Not used
15	Not used
16	Not used
17	CAN-T1
18	CAN-T2

VECU Connector J3	
PIN Number	Description
1	J1939 data link high
2	J1939 data link low
3	Not used
4	Throttle position sensor voltage reference
5	Throttle position sensor signal
6	Throttle position sensor return
7	Spare relay #3
8	Shutdown lamp (mechanical gauge panel)
9	Electronic Malfunction Lamp (EML) signal (mechanical gauge panel)
10	Spare relay #2
11	Not used (spare driver alarm)
12	Spare relay #1
13	Accessory relay control
14	J1587 serial data link A PLUS (+)
15	J1587 serial data link B MINUS (–)
16	PLUS (+) 12 volts from battery
17	PLUS (+) 12 volts from accessory relay
18	Chassis ground

Engine Electronic Control Unit (EECU) Connectors (ASET™ IEGR Engine)

The Engine Electronic Control Unit (EECU) has two 43 pin connectors. To disconnect a connector from the EECU, pull back on the connector lock and gently pull the connector back on its heel and away from the EECU. For easy reference, the following illustration shows each pin number as it appears on the connector. Be sure that the connector is aligned as shown below to avoid confusion when checking pin numbers. The connector number and EECU orientation are shown as a reference for reconnecting the EECU to the engine harness.

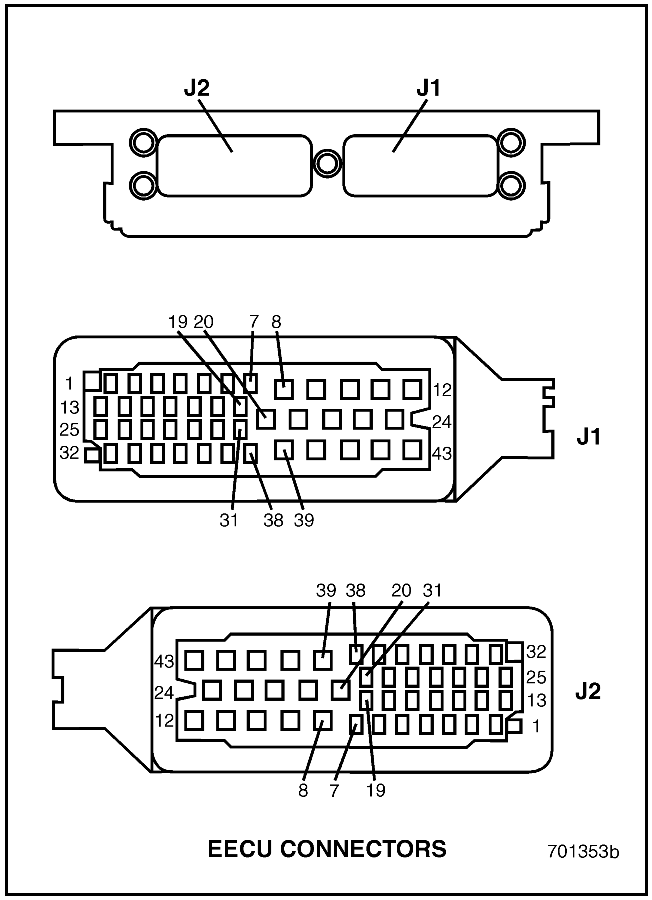


Figure 861 — EECU Connectors (ASET™ IEGR Engine)

ENGINE ELECTRONIC CONTROL UNIT (EECU) CONNECTOR PIN DESIGNATIONS (ASET™ IEGR ENGINE)

EECU Connector J1	
PIN Number	Description
1	Not used (Engine oil level sensor)
2	Not used
3	Not used
4	Not used
5	Engine oil temperature sensor signal
6	Not used
7	Air conditioning pressure switch
8	Wastegate solenoid control/Parallel fan circuit
9	Fan clutch solenoid control
10	Electronic unit pump injector #1
11	Electronic unit pump injector #5
12	Electronic unit pump injector #6
13	Not used (Engine oil level sensor)
14	Not used
15	Boost air pressure sensor signal
16	Not used
17	Coolant temperature sensor signal
18	Engine position sensor return
19	Engine position sensor signal
20	Engine brake #2 control
21	Engine brake #1 control
22	Electronic unit pump injector #2
23	Electronic unit pump injector #3
24	Electronic unit pump injector #4
25	Oil pressure sensor return
26	Temperature sensor common return
27	Intake air temperature sensor signal
28	Fuel temperature sensor signal
29	Not used
30	RPM/TDC sensor signal
31	RPM/TDC sensor return
32	Oil pressure sensor voltage reference
33	Not used
34	Engine oil pressure sensor signal
35	Boost air pressure sensor return
36	Boost air pressure sensor voltage reference
37	Not used
38	Not used
39	Not used
40	Not used
41	Rear bank electronic unit pump injector solenoid voltage supply
42	Front bank electronic unit pump injector solenoid voltage supply
43	Not used

EECU Connector J2	
PIN Number	Description
1	Not used
2	Not used
3	Engine coolant level sensor signal
4	Not used
5	Not used
6	Not used
7	Not used
8	J1939 data link high
9	Not used
10	12 volts from power relay
11	Not used
12	Chassis ground
13	Not used
14	Not used
15	Not used
16	Not used
17	Not used
18	Not used
19	Not used
20	Not used
21	Not used
22	12 volts from power relay

EECU Connector J2	
PIN Number	Description
23	Not used
24	Chassis ground
25	Not used
26	Engine coolant level sensor return
27	Ambient air temperature sensor return
28	Not used
29	Ambient air temperature sensor signal
30	Not used
31	J1587 serial data link (+)
32	Not used
33	Not used
34	Not used
35	Not used
36	Not used
37	Not used
38	J1587 serial data link (–)
39	J1939 data link low
40	Not used
41	12 volts from power relay
42	Not used
43	Chassis ground

Engine Electronic Control Unit (EECU) Connectors (ASET™ CEGR Engine)

The Engine Electronic Control Unit (EECU) has three connectors, J1 is a 36 pin connector, J2 is an 89 pin connector, and J3 is a 16 pin connector. To disconnect a connector from the EECU, pull back on the connector lock and gently pull the connector back on its heel and away from the EECU. For easy reference, the following illustration shows each pin number as it appears on the connector. Be sure that the connector is aligned as shown below to avoid confusion when checking pin numbers. The connector number and EECU orientation are shown as a reference for reconnecting the EECU to the engine harness.

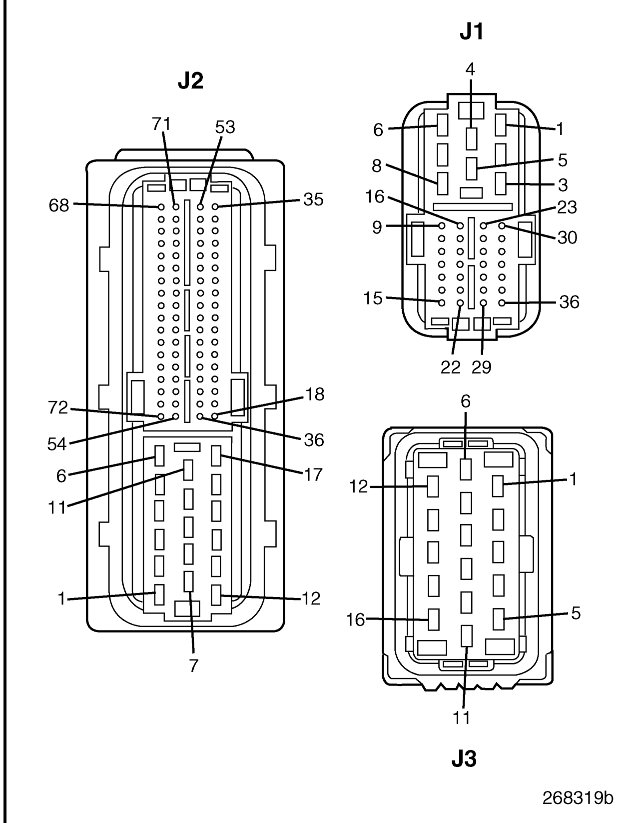


Figure 862 — EECU Connectors (ASET™ CEGR Engine)

ENGINE ELECTRONIC CONTROL UNIT (EECU) CONNECTOR PIN DESIGNATIONS (ASET™ CEGR ENGINE)

EECU Connector J1	
PIN Number	**Description**
1	Not used
2	12 volts (Battery power)
3	12 volts (Battery power)
4	Chassis ground
5	12 volts (Battery power)
6	Not used
7	Chassis ground
8	Chassis ground
9	Not used
10	ISO K-line
11	Coolant level sensor return
12	Coolant level sensor signal
13	Not used (coolant level warning signal)
14	Fan speed sensor signal return
15	Fan speed sensor supply voltage
16	Not used
17	J1587 serial data link (+)
18	J1587 serial data link (–)
19	Not used
20	Fan speed sensor signal
21	Not used
22	High side bank 1
23	CAN2 J1939 data link high
24	CAN2 J1939 data link low
25	Not used
26	Not used
27	Not used
28	Fan clutch output
29	Not used
30	CAN1 J1939 data link low
31	CAN1 J1939 data link high
32	Not used
33	Not used
34	Not used
35	Air conditioning high pressure switch
36	Not used

EECU Connector J2	
PIN Number	Description
1	Not used
2	Not used
3	Not used
4	Not used
5	Not used (spare control output)
6	Variable geometry turbo output
7	High side bank 1
8	Not used
9	Not used (spare control)
10	Aux. cooling low
11	Not used
12	High side bank 2 (aux cooler low)
13	Not used
14	Not used
15	Not used
16	Variable EGR control signal (hi)
17	Variable EGR control signal (low)
18	Not used (ground pass thorough)
19	Not used
20	Not used
21	Not used (oil level sensor signal)
22	Not used (oil level sensor ground)
23	Not used
24	Not used
25	Oil pressure sensor supply voltage
26	Variable geometry turbo position sensor supply voltage
27	Not used
28	Oil pressure sensor ground
29	EGR pressure sensor ground
30	Air humidity sensor +5 volt reference voltage
31	Not used
32	Not used
33	Not used
34	Wake-up input

EECU Connector J2	
PIN Number	Description
35	Boost air pressure sensor supply voltage
36	Not used
37	Not used
38	Not used
39	Not used
40	Not used
41	Not used
42	Not used
43	Not used
44	Not used
45	Oil pressure sensor signal
46	Not used
47	Humidity sensor signal
48	Not used
49	Boost air pressure sensor ground
50	Boost air pressure sensor signal
51	Variable geometry turbo position sensor signal
52	Not used
53	Not used
54	Turbo wheel speed sensor signal (+)
55	Engine speed sensor (–)
56	Engine speed sensor (+)
57	Not used
58	Not used
59	Not used
60	Not used
61	Inlet manifold air temperature sensor ground
62	Not used
63	Not used
64	Oil temperature sensor signal
65	Combustion air temperature sensor signal
66	
67	Compressor temperature sensor and Aftercooler outlet temperature sensor grounds

EECU Connector J2	
PIN Number	Description
68	Ambient air temperature sensor signal
69	Variable geometry turbo position sensor ground
70	Not used
71	Not used
72	Turbo wheel speed sensor signal (–)
73	Turbo wheel speed sensor shield
74	Not used
75	Engine position sensor signal (+)
76	Engine position sensor signal (–)
77	Not used
78	Not used
79	Not used
80	Inlet manifold temperature sensor signal
81	Fuel temperature sensor signal
82	Oil and fuel temperature sensor grounds
83	Humidity sensor ground
84	Aftercooler outlet temperature sensor ground
85	Compressor discharge temperature sensor signal
86	Coolant temperature sensor signal
87	Coolant temperature sensor and ambient air temperature sensor grounds
88	Not used
89	Not used

EECU Connector J3	
PIN Number	Description
1	Not used
2	Not used
3	Electronic unit pump injector #6 solenoid voltage supply
4	Electronic unit pump injector #5 solenoid voltage supply
5	Electronic unit pump injector #3 solenoid voltage supply
6	Electronic unit pump injector #3 solenoid control
7	Engine brake #1 control
8	Engine brake #2 control
9	Electronic unit pump injector #1 solenoid voltage supply
10	Electronic unit pump injector #2 solenoid voltage supply
11	Electronic unit pump injector #4 solenoid voltage supply
12	Electronic unit pump injector #5 solenoid control
13	Electronic unit pump injector #1 solenoid control
14	Electronic unit pump injector #4 solenoid control
15	Electronic unit pump injector #2 solenoid control
16	Electronic unit pump injector #6 solenoid control

CAB AND CHASSIS CONNECTORS

This section provides connector terminal and circuit identification for some of the larger cab and chassis electrical connectors. In some diagnostic routines, these connectors can be used as intermediate check points to isolate the location of electrical problems to a specific wiring harness.

Cab-Chassis Bulkhead Connector

The cab-chassis bulkhead connector, used on conventional models, is a 21 pin in-line, Deutsch-type connector. The cab-chassis bulkhead connector is located on the left side of the bulkhead. See the illustration for the pin locations. The table that follows the illustration shows connector pin designations for a typically configured vehicle.

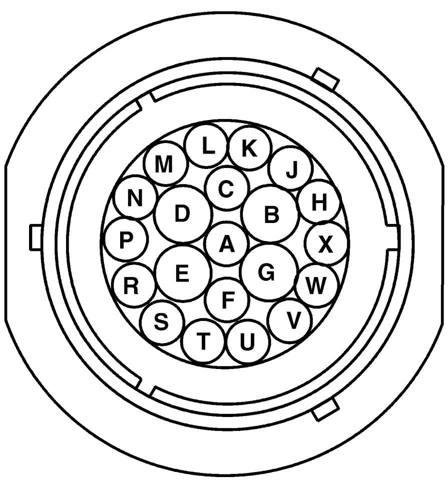


Figure 863 — Cab-Chassis Bulkhead Connector

PIN Letter	Circuit Designation
A	VJ2-3-0.8
B	2-D-2.0
C	VJ2-4-0.8
D	2-C-2.0
E	8-B-2.0
F	VJ2-1-0.8
G	Not used
H	4-E-1.0
J	4-C-1.0
K	4-F-1.0
L	4-D-1.0
M	3-B-1.0
N	VJ1-11-1.0/0.8
P	35-C-0.8
R	35-B-1.0
S	3-D-0.8
T	Not used
U	Not used
V	Not used
W	Not used
X	Not used

Cab-Transmission Harness Bulkhead Connector

The cab-transmission harness bulkhead connector, used on conventional models, is a 23 pin in-line, Deutsch-type connector. The cab-transmission harness bulkhead connector is located on the left side of the bulkhead. See the illustration for the pin locations. The table that follows the illustration shows connector pin designations for a typically configured vehicle.

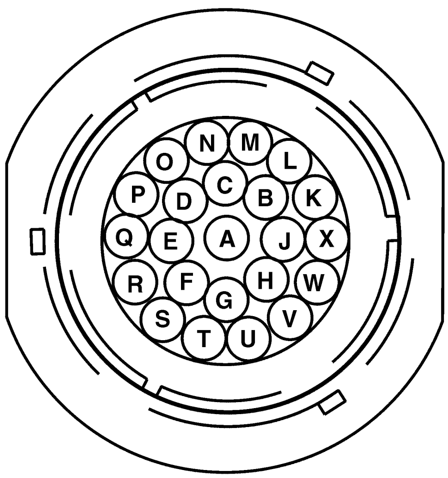


Figure 864 — Cab-Transmission Harness Bulkhead Connector

PIN Letter	Circuit Designation
A	42-B-0.8
B	VJ2-2-0.8
C	VJ2-1-0.8
D	VJ2-9-0.8
E	VJ2-11-1.0
F	VJ2-12-1.0
G	VJ1-18-0.8
H	VJ3-14-0.8 *
J	VJ3-15-0.8 *
K	Not used
L	Not used
M	25-B-1.0
N	Not used
O	19-C-0.8
P	VJ3-13-0.8
Q	EJ1-5-0.8
R	18-B-2.0
S	Not used
T	Not used
U	Not used
V	Not used
W	Not used
X	Not used

* Indicates Twisted Pair VJ3-14-0.8/VJ3-15-0.8

Transmission-Engine Transition Connector

The transmission-engine transition connector is a 15 pin in-line, Deutsch-type connector. The transmission-engine transition connector is located on top of the transmission bell housing. See the illustration for the pin locations. The table that follows the illustration shows connector pin designations for a typically configured vehicle.

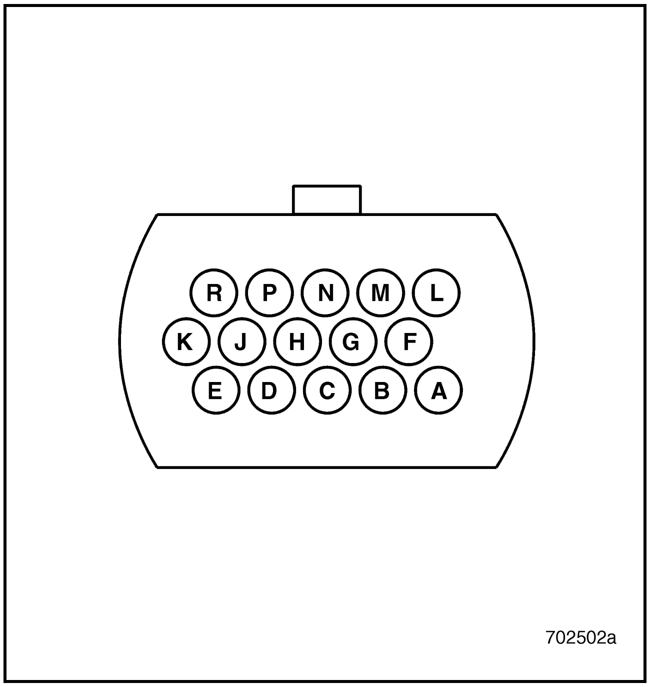


Figure 865 — Transmission-Engine Transition Connector

PIN Letter	Circuit Designation
A	BK-A-2.0 **
B	EJ2-10-2.0
C	41-A-2.0
D	EJ2-35-0.8/0.5
E	Not used
F	Not used
G	EJ1-5-0.8
H	25-B-1.0
J	VJ3-14-0.8/0.5 *
K	VJ3-15-0.8/0.5 *
L	Not used
M	EJ2-22-2.0
N	EJ2-41-2.0
P	Not used
R	19-C-0.8

* Indicates Twisted Pair VJ3-14-0.8/VJ3-15-0.8

** Engine Green Cell Test Ground Point — DO NOT USE FOR ANY OTHER PURPOSE

Cab-Chassis-Transmission Harness Hinge Point Connector

The cab-chassis-transmission harness hinge point connector, used on the MR model, is a 31 pin in-line, Deutsch-type connector. The cab-chassis-transmission harness hinge point connector is located on the front of the left radiator support. See the illustration for the pin locations. The table that follows the illustration shows connector pin designations for a typically configured vehicle.

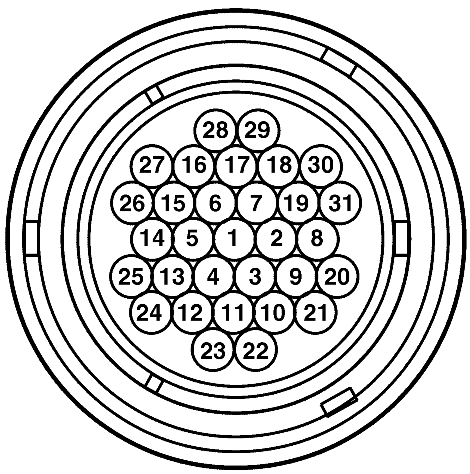


Figure 866 — Cab-Chassis-Transmission Harness Hinge Point Connector

PIN Number	Circuit Designation
1	42-B-1.0
2	VJ2-2-0.8
3	VJ2-1-0.8
4	VJ2-9-0.8
5	VJ2-11-1.0
6	VJ2-12-1.0
7	VJ1-18-0.8
8	VJ3-14-0.8 *
9	VJ3-15-0.8 *
10	Not used
11	25-B-1.0
12	17-A-0.8
13	VJ1-9A-0.8
14	19-C-0.8
15	Not used
16	Not used
17	EJ2-10-2.0
18	41-A-2.0
19	42-A-1.0
20	Not used
21	Not used
22	3-B-1.0
23	4-E-1.0
24	34-B-1.0
25	4-C-1.0
26	44-A-2.0
27	Not used
28	EJ2-22-2.0
29	EJ2-41-2.0
30	VJ1-2-0.8
31	18-B-2.0

* Indicates Twisted Pair VJ3-14-0.8/VJ3-15-0.8

Cab-Chassis-Transmission Bulkhead Connector

The cab-chassis-transmission bulkhead connector, used on the LE model, is a 31 pin in-line, Deutsch-type connector. The cab-chassis-transmission bulkhead connector is located under the left driver's floor panel. See the illustration for the pin locations. The table that follows the illustration shows connector pin designations for a typically configured vehicle.

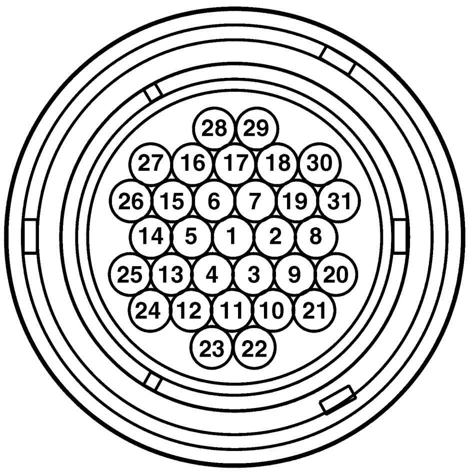


Figure 867 — Cab-Chassis-Transmission Bulkhead Connector

PIN Number	Circuit Designation
1	Not used
2	VJ2-2-0.8
3	VJ2-1-0.8
4	30-B-0.8
5	VJ2-11-1.0
6	VJ2-12-1.0
7	VJ1-18-0.8
8	VJ3-14-0.8 *
9	VJ3-15-0.8 *
10	Not used
11	Not used
12	Not used
13	Not used
14	19-C-0.8
15	EJ1-5-0.8
16	9-C-0.8
17	EJ2-10-2.0
18	Not used
19	Not used
20	Not used
21	Not used
22	5-A-1.0
23	VJ1-11-1.0
24	Not used
25	Not used
26	44-A-2.0
27	Not used
28	EJ2-22-2.0
29	EJ2-41-2.0
30	VJ1-2-0.8
31	Not used

* Indicates Twisted Pair VJ3-14-0.8/VJ3-15-0.8

Cab-Chassis Body Power Bulkhead Connector

The cab-chassis body power bulkhead connector, used on the LE model, is a 16 pin in-line, Deutsch-type connector. The cab-chassis body power bulkhead connector is located under the left driver's floor panel. See the illustration for the pin locations. The table that follows the illustration shows connector pin designations for a typically configured vehicle.

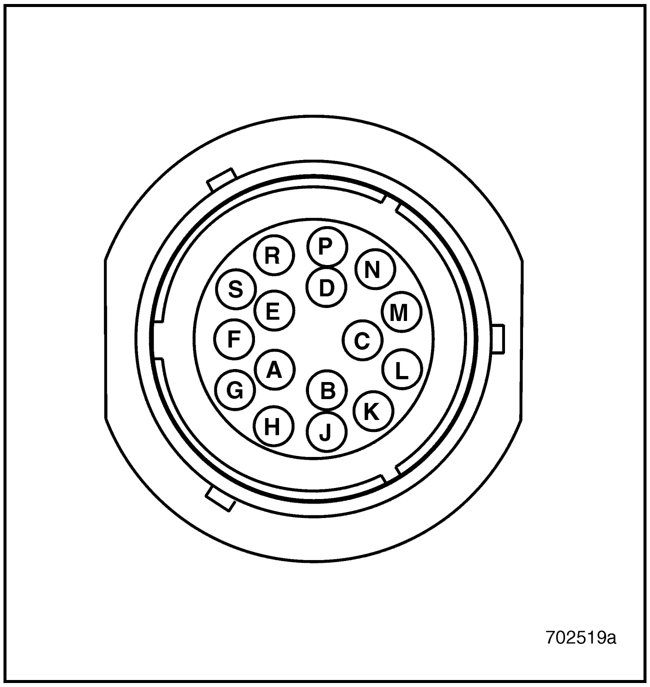


Figure 868 — Cab-Chassis Body Power Bulkhead Connector

PIN Letter	Circuit Designation
A	35-B-3.0
B	4-C-3.0
C	33-B-3.0
D	33-B-3.0
E	4-E-3.0
F	37-B-3.0
G	38-A-3.0
H	34-B-3.0
J	34-B-3.0
K	34-C-3.0
L	39-B-3.0
M	Not used
N	Not used
P	Not used
R	Not used
S	Not used

Digital Gauge Cluster Connector

The digital gauge cluster is available on CV, CX and CH models. The digital gauge cluster connector is a 36 pin connector. See the illustration for the pin locations. The table that follows the illustration shows a functional description of the circuit on each connector pin for a typically configured vehicle.

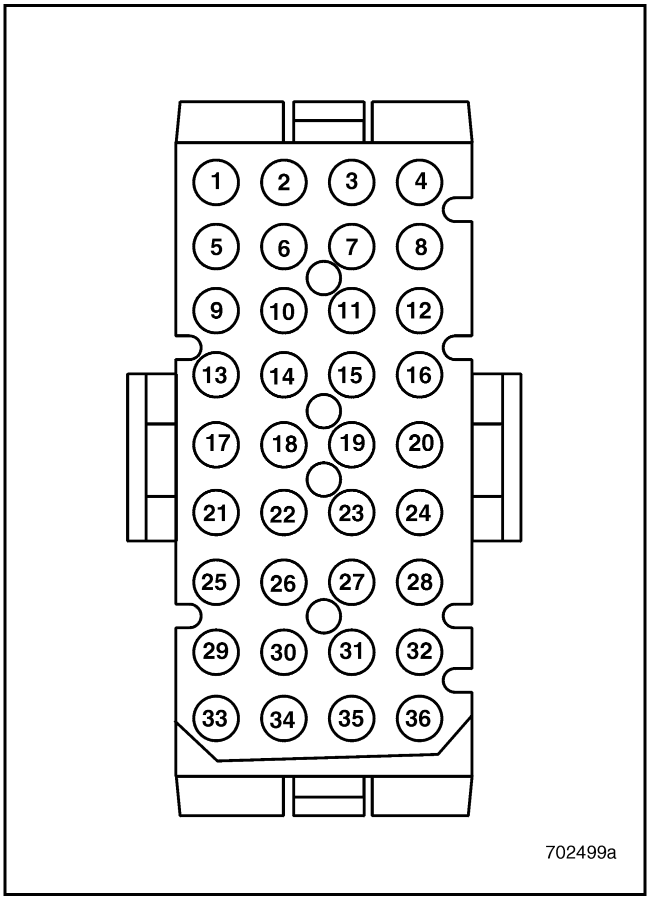


Figure 869 — Digital Gauge Cluster Connector

PIN Number	Circuit Description
1	Indicator lamp illumination ground
2	Not used
3	Not used
4	Ignition power
5	Hook-up lamps indicator (+)
6	Not used
7	Not used
8	Not used
9	Right turn indicator (+)
10	Not used
11	Not used
12	Neutral indicator (+)
13	Reverse indicator (+)
14	J1587 serial data link (+)
15	Not used
16	Not used
17	Left turn indicator (+)
18	Not used
19	Not used
20	Not used
21	Low brake air indicator (+)
22	Not used
23	Not used
24	Not used
25	High beam indicator (+)
26	Not used
27	Not used
28	Not used
29	Battery power
30	J1587 serial data link (–)
31	PDLO indicator (–)
32	Not used
33	Heated mirror indicator (+)
34	Illumination (+)
35	Battery ground
36	Gauge illumination ground

VIP Digital Dash Display Connector

The VIP digital dash display is available on CV, CX and CH models. The VIP digital dash display connector is a 9 pin connector. See the illustration for the pin locations. The table that follows the illustration shows a functional description of the circuit on each connector pin.

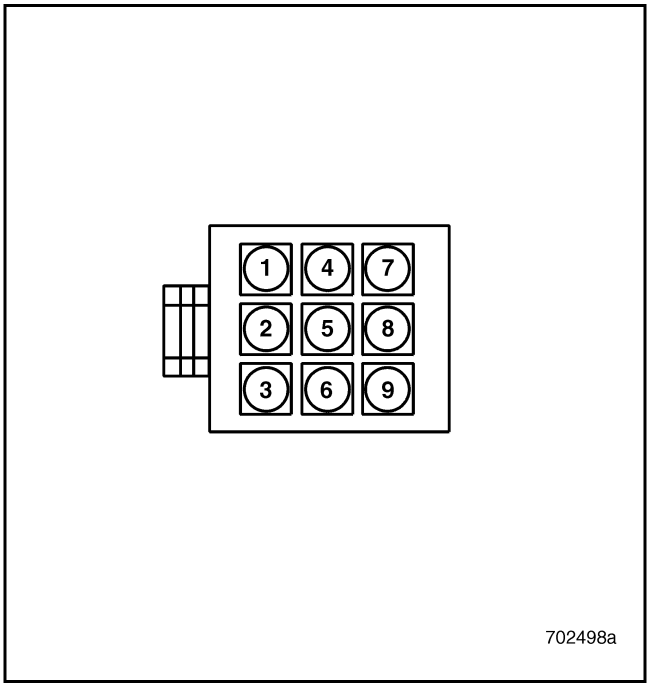


Figure 870 — VIP Digital Dash Display Connector

As viewed from the harness end of the connector.

PIN Number	Circuit Description
1	Ignition power
2	Illumination (+)
3	Battery power
4	J1587 serial data link B (–)
5	Not used
6	J1587 serial data link A (+)
7	Ground
8	Not used
9	Not used

J1939 Serial Port Connector Repair

The J1939 serial port connector is a 3 pin in-line, Deutsch-type connector. This connector is used to connect the J1939 serial port cable to various electronic control module harnesses within the vehicle. Use the procedures outlined in this section when it is necessary to repair a J1939 serial port connector.

TERMINAL REMOVAL

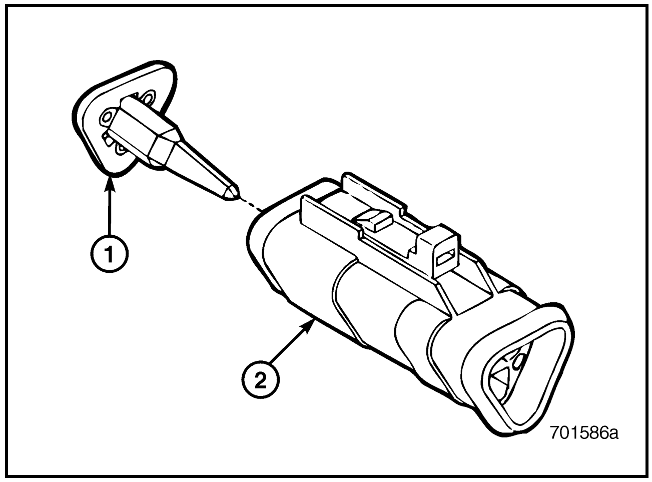


Figure 871 — Removing the Wedgelock

1. Wedgelock	2. Connector Body

1. Use a small-bladed screwdriver to remove the wedgelock that holds the terminals in place.
2. Use a sharp knife to carefully remove the shrink tubing from the rear of the connector plug.
3. Use a small screwdriver to release the locking tab on each of the terminals. Pull the wires and terminals from the rear of the connector body.
4. Slide a new piece of shrink tubing over the removed terminals and onto the cable.
5. If a terminal is being replaced, cut the wire through the middle of the crimp to minimize wire loss.

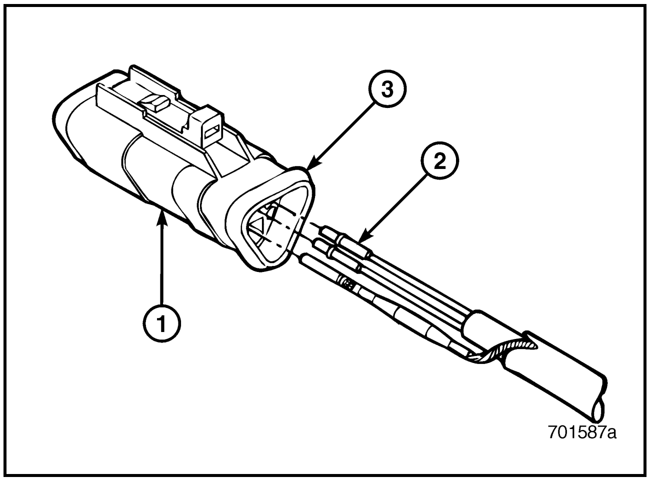


Figure 872 — Removing the Wires and Terminals

1. Connector Body 2. Standard Socket Terminal	3. Shrink Tubing Installation Area

TERMINAL CRIMPING

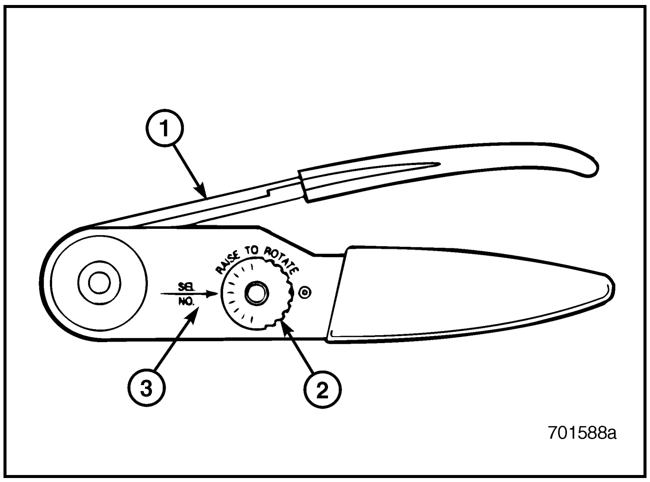


Figure 873 — Setting the Wire Size Adjustment

1. Crimper J 34182 2. Wire Size Indicator	3. SEL NO. Arrow

1. Strip 0.236–0.315 inches (6–8 mm) of insulation from the end of the wire.
2. Set the wire size adjustment on crimping tool J 34182 to number 18.
3. Insert the contact end of the replacement terminal into the crimping tool. Adjust the crimping tool depth by loosening the locking ring until the depth adjusting screw is free. Turn the adjusting screw until the wire end of the replacement terminal is just above flush with the crimping hole. Tighten the locking ring.
4. Fully insert the wire into the terminal, so that the stripped portion of the wire is in the crimp area.
5. Squeeze the handle of the crimping tool until it releases. The terminal is now properly installed onto the wire.
6. Remove the terminal and wire from the crimping tool.
7. Tug on the wire to ensure that the crimp is tight.

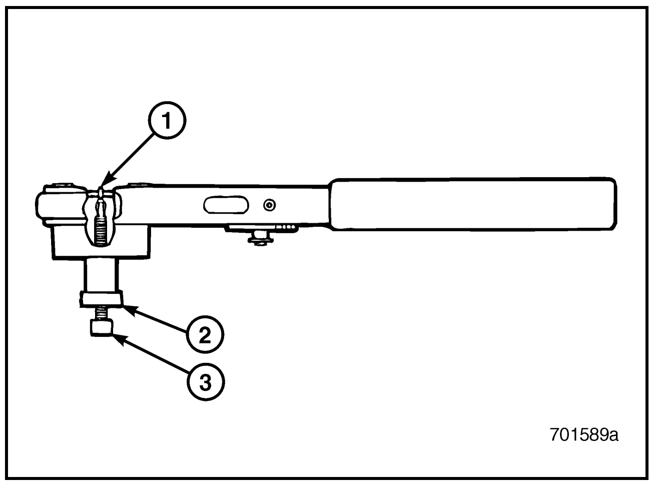


Figure 874 — Adjusting the Crimping Tool Depth

1. Terminal 2. Locking Ring	3. Depth Adjustment Screw

TERMINAL INSERTION

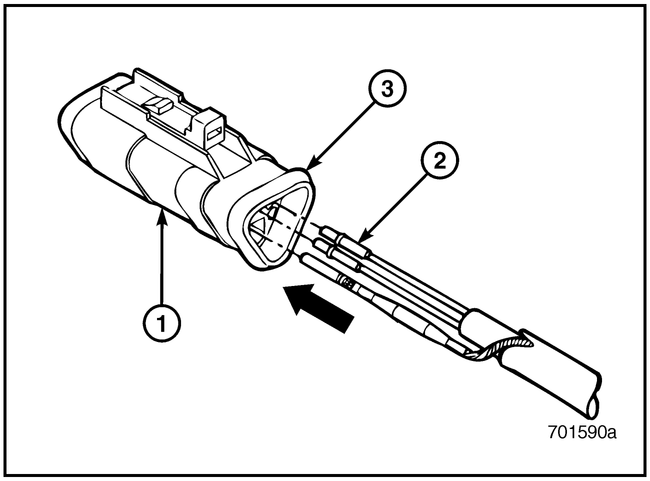


Figure 875 — Inserting the Wires and Terminals

1. Connector Body 2. Standard Socket Terminal	3. Shrink Tubing Installation Area

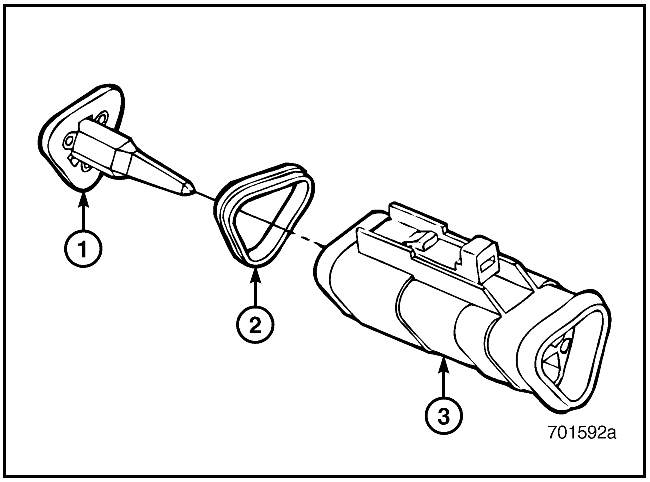


Figure 876 — Inserting the Wedgelock

1. Wedgelock 2. Connector Seal	3. Connector Body

1. Slide each wire and terminal assembly into the rear of the connector.
2. Insert the wedgelock to hold the terminals in place. Make sure the connector seal fits securely to the connector body.
3. Slide the shrink tubing over the raised area of the connector body. Use a heat gun to shrink the tubing into position over the harness and connector body.

NOTE

Current production vehicles use J1939 connectors fitted with a rear weather seal in place of shrink tubing.

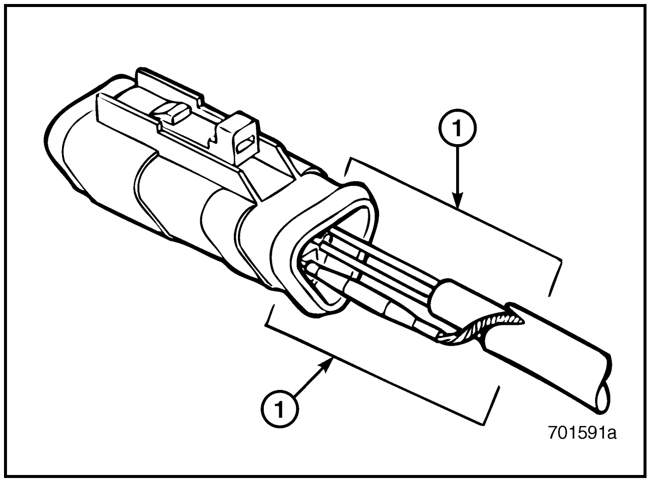


Figure 877 — Applying Shrink Tubing

1. Shrink Tubing Applied to this Area

Bulkhead Deutsch Connector and Serial Communication Port Repair

Use the procedures outlined in this section when it is necessary to repair a cab or chassis bulkhead connector or the serial communication port.

TERMINAL REMOVAL

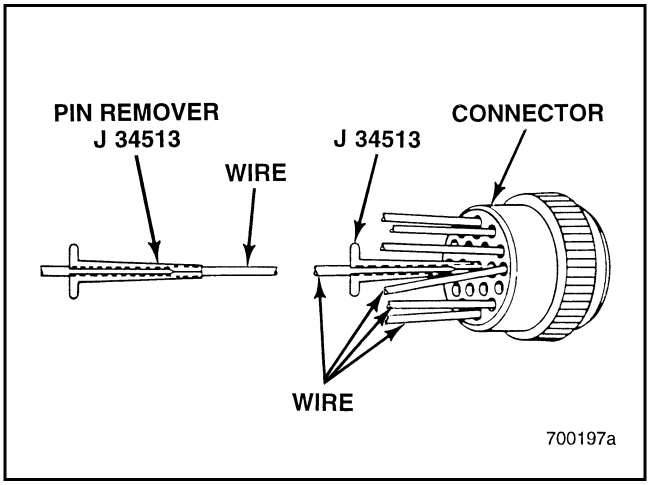


Figure 878 — Terminal Removal Tool

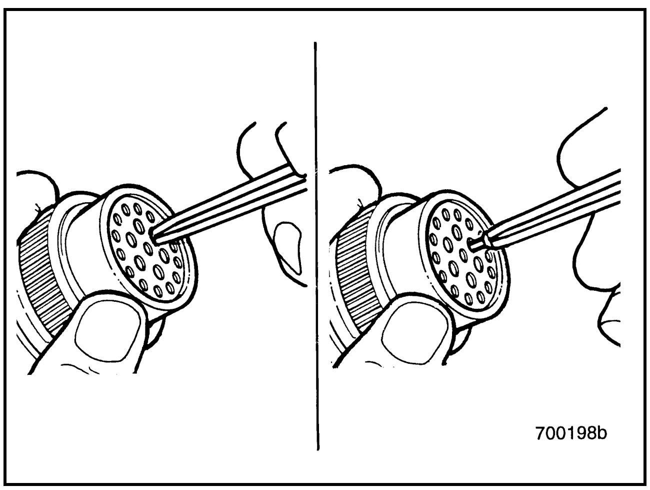


Figure 879 — Releasing the Terminal

1. Slide terminal removal tool J 34513, tapered end first, onto the damaged wire.
2. Push the terminal removal tool into the connector cavity until it completely engages the contact. Do not twist the tool while inserting it into the cavity.
3. Pull the terminal removal tool, terminal, and wire from the connector cavity as a unit.
4. Cut the wire as close to the crimp as possible to minimize wire loss.

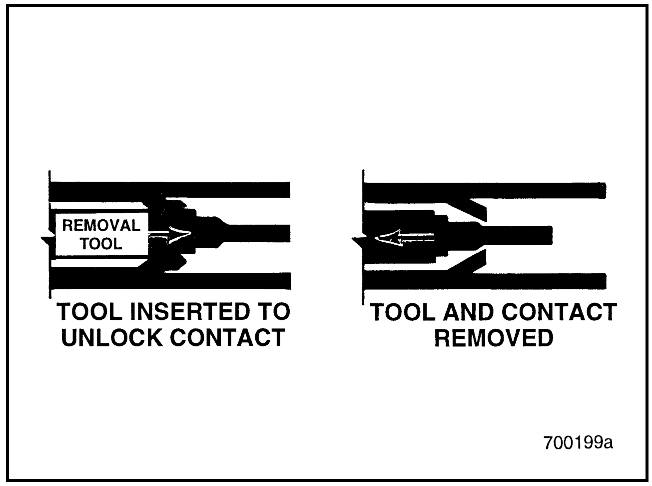


Figure 880 — Removing the Terminal from the Connector Cavity

CONTACT REPLACEMENT

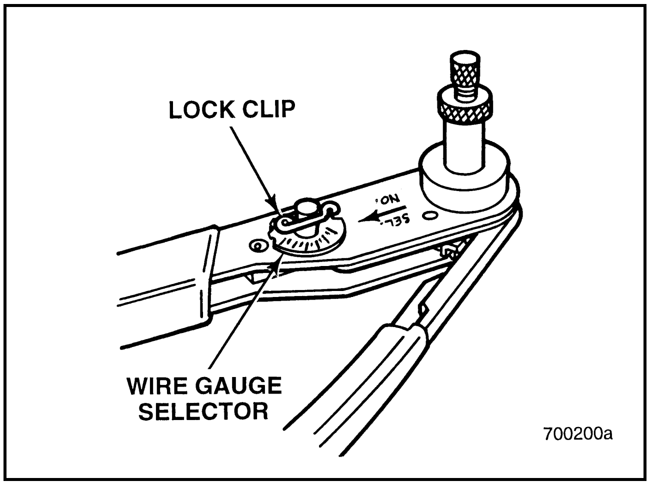


Figure 881 — Setting the Wire Size Adjustment

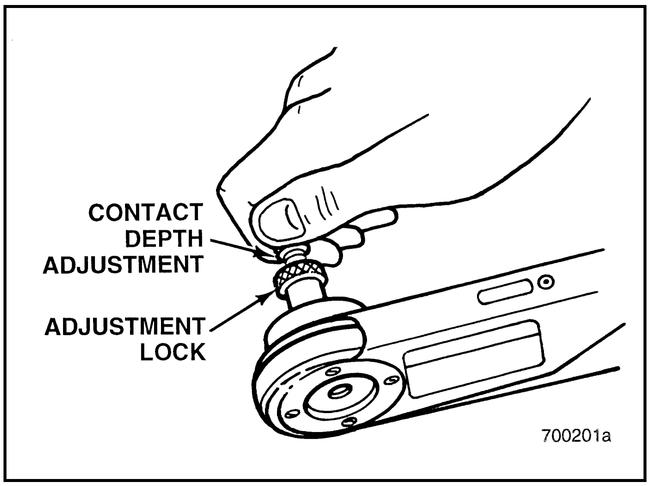


Figure 882 — Adjusting the Crimping Tool Depth

1. Strip 0.24–0.32 inches (6–8 mm) of insulation from the end of the wire.
2. Set the wire size adjustment on crimping tool J 34182 to match the gauge of the wire being repaired.
3. Insert the terminal into the crimping tool, contact end first. Close the crimping tool just enough to hold the terminal. Adjust the crimping tool depth by loosening the locking ring until the depth adjusting screw is free. Turn the adjusting screw until the wire end of the replacement terminal is just above flush with the crimping hole. Tighten the locking ring.
4. Insert the wire into the replacement terminal, so that the stripped portion of the wire is entirely in the crimp area.
5. Squeeze the handle of the crimping tool until it releases. The terminal is now properly installed onto the wire.
6. Remove the terminal and wire from the crimping tool.
7. Inspect the terminal for a good crimp and proper installation.

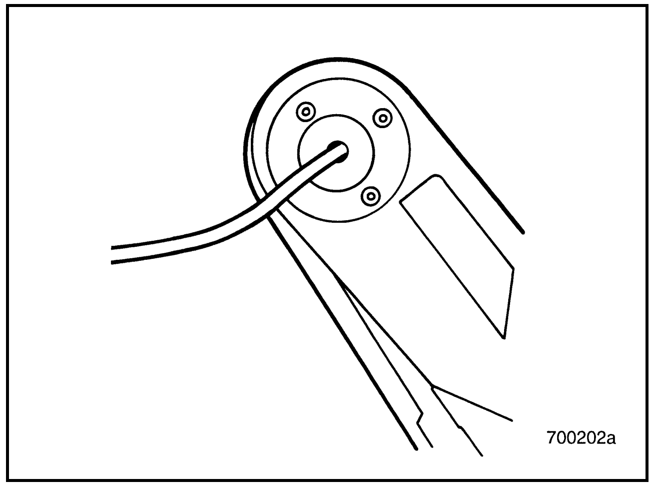


Figure 883 — Crimping the Terminal

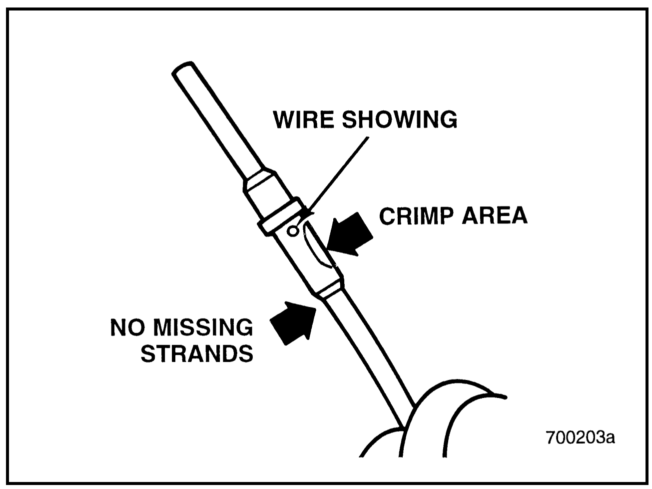


Figure 884 — Inspecting the Terminal Installation

TERMINAL INSERTION

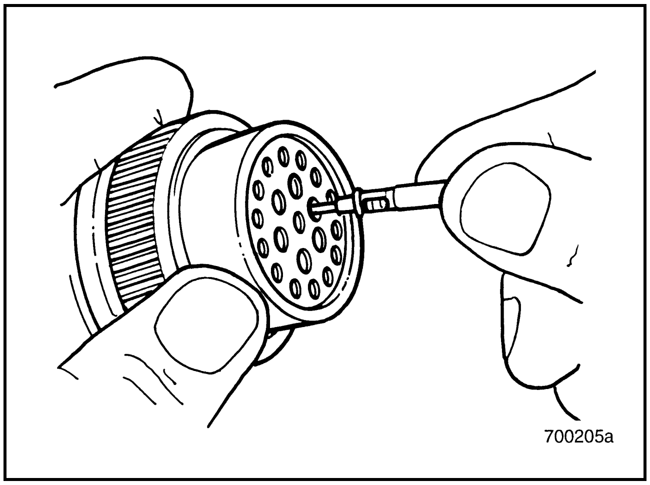


Figure 885 — Inserting the Terminal

1. Grasp the wire approximately 1 inch (25.4 mm) behind the terminal crimp.
2. Hold the connector body with the rear face toward the terminal and wire.
3. Push the terminal into the proper cavity of the connector body until a positive stop is felt. Gently tug on the wire to ensure that the terminal is locked into the connector body.

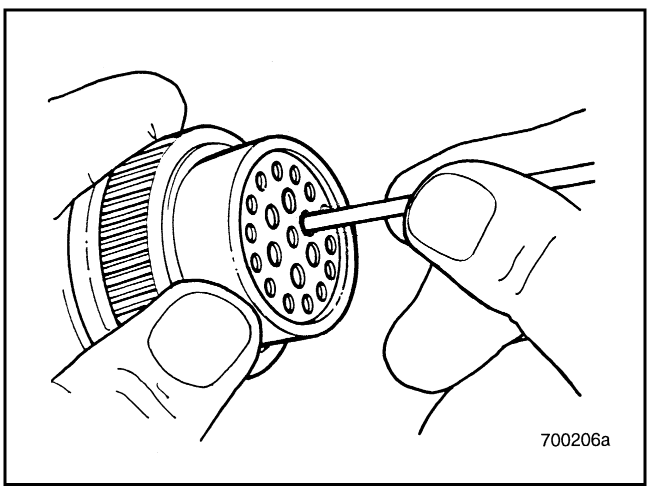


Figure 886 — Inserting the Terminal

Weather-Pack Connector Repair

Use the procedures outlined in this section when it is necessary to repair a Weather-Pack connector.

TERMINAL REMOVAL

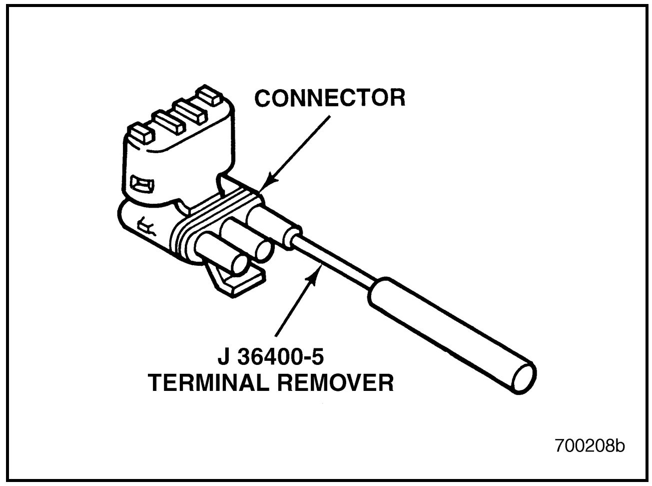


Figure 887 — Terminal Removal

1. Unlatch and open the hinged secondary lock on the rear of the connector body.
2. Push the damaged terminal into the connector body as far as possible. Insert terminal removal tool J 36400-5 into the cavity in the front face of the connector body. Push the tool onto the damaged terminal and pull the terminal and wire out of the rear of the connector body.
3. Cut the damaged terminal from the wire as close as possible to the crimp connection. Remove and discard the rubber wire seal.

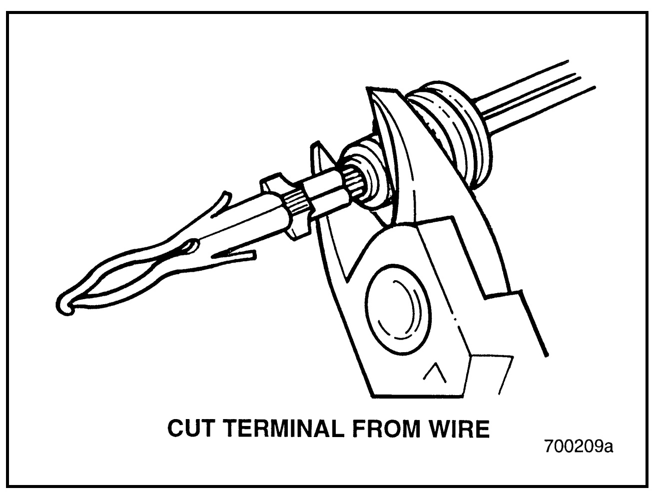


Figure 888 — Cutting the Terminal from the Wire

CONTACT REPLACEMENT

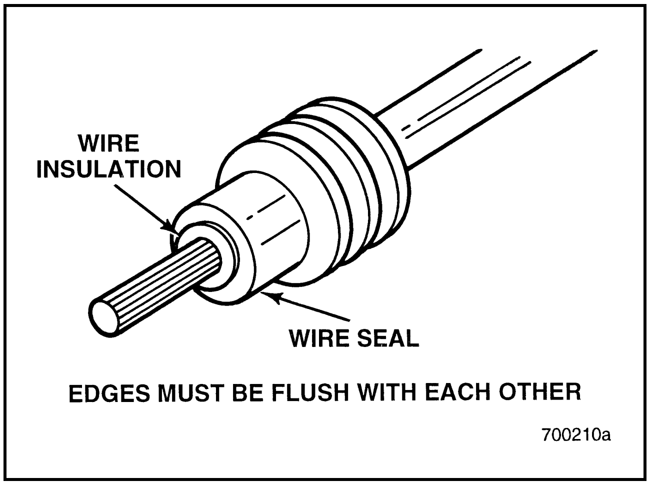


Figure 889 — Aligning the Rubber Wire Seal

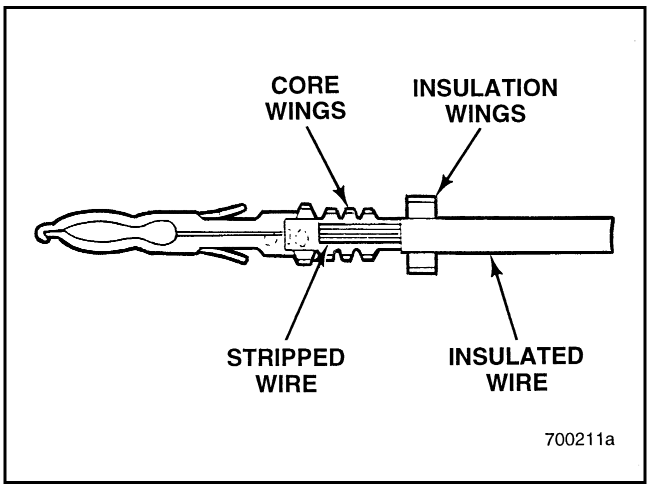


Figure 890 — Terminal Crimp Wings

1. Install a new rubber wire seal onto the wire.
2. Strip 0.23 to 0.25 inches (5.75–6.26 mm) of insulation from the end of the wire.
3. Align the end of the rubber wire seal with the end of the wire insulation.
4. Release the jaws of crimping tool J 35688. Insert the replacement terminal into the terminal holder until the insulation wings are flush with the crimping tool anvil.
5. Insert the wire and seal into the replacement terminal until the first rib of the seal is flush with the crimping tool anvil.
6. Squeeze the handle of the crimping tool until the ratchet releases. The terminal is now properly installed onto the wire.

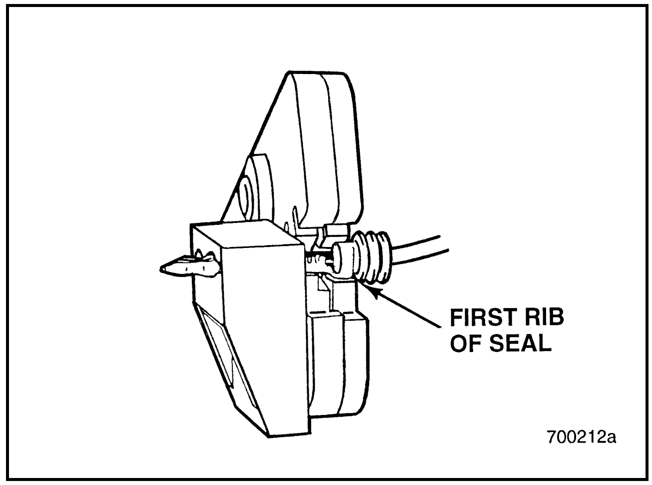


Figure 891 — Positioning the Wire in the Terminal

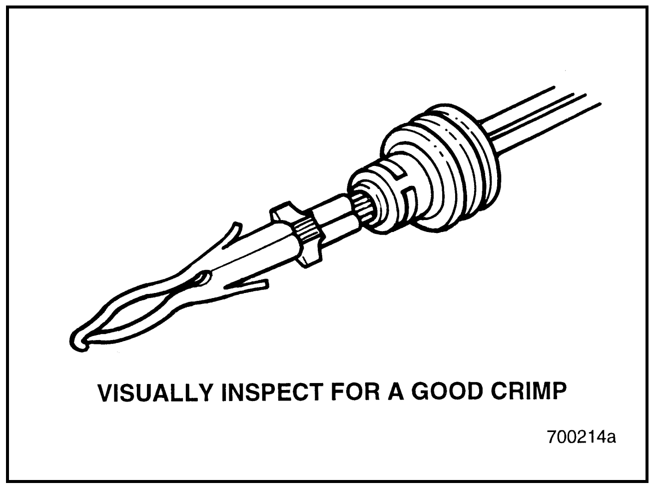


Figure 892 — Inspecting the Terminal

TERMINAL INSERTION

1. Grasp the wire approximately 1 inch (25.4 mm) behind the terminal crimp.
2. Hold the connector body with the rear face toward the terminal and wire.
3. Push the terminal into the proper cavity of the connector body until a positive stop is felt. Gently tug on the wire to ensure that the terminal is locked into the connector body.
4. Close and latch the secondary lock on the rear of the connector body.

Metri-Pack Connector Repair

Use the procedures outlined in this section when it is necessary to repair a Metri-Pack connector.

TERMINAL REMOVAL

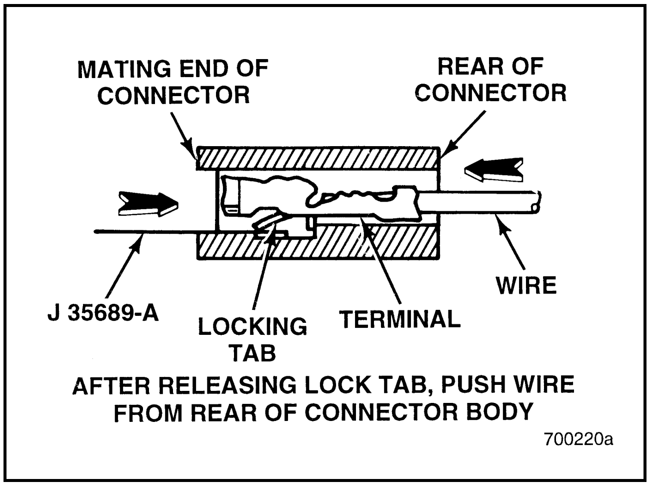


Figure 893 — Releasing the Terminal

1. Grasp the connector firmly and pull the damaged wire as far as possible toward the rear of the connector body.
2. Insert the needle end of the terminal removal tool J 35689-A into the notch in the appropriate cavity on the front face of the connector body. Carefully move the retaining tab toward the contact, and push the wire toward the front face of the connector body.
3. Push the wire and terminal from the rear of the connector out through the front of the connector body.
4. Cut the damaged terminal from the wire as close as possible to the terminal crimp.

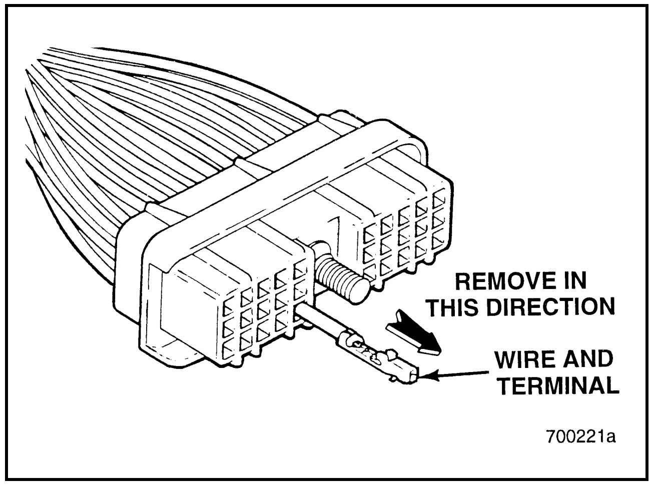


Figure 894 — Removing the Terminal

CONTACT REPLACEMENT

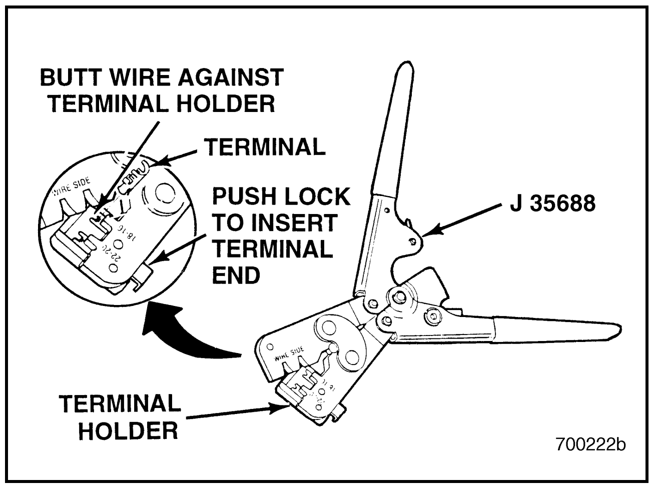


Figure 895 — Positioning the Terminal in the Crimping Tool

1. Before stripping the insulation from the wire, push the wire through the proper hole in the seal and out through the front face of the connector body.
2. Strip 0.15 to 0.17 inches (3.75–4.25 mm) of insulation from the end of the wire.
3. Release the jaws of crimping tool J 35688. Insert the replacement terminal into the terminal holder until the insulation wings are flush with the crimping tool anvil.
4. Apply just enough pressure to the handles of the crimping tool to hold the replacement terminal in place.
5. Insert the wire into the replacement terminal until it butts up against the terminal holder.

6. Squeeze the handle of the crimping tool until the ratchet releases. The terminal is now properly installed onto the wire.

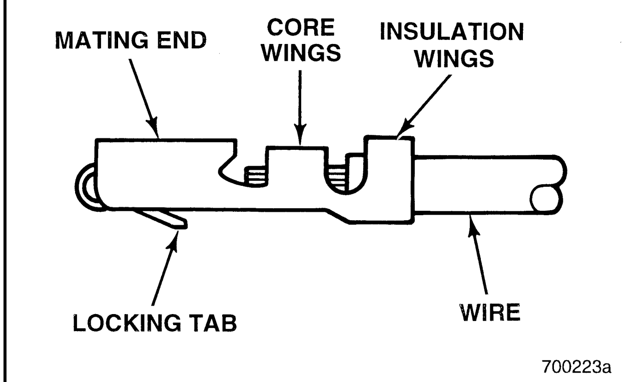


Figure 896 — Inspecting the Terminal

TERMINAL INSERTION

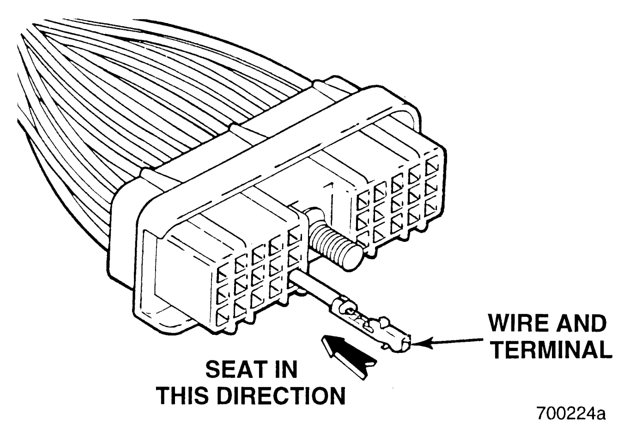


Figure 897 — Installing the Terminal

1. Align the terminal retaining tab with the notch in the connector body cavity.
2. Pull the wire and terminal back into the connector body until the retaining tab clicks into place.

Micro-Pack Connector Repair

Use the procedures outlined in this section when it is necessary to repair a Micro-Pack connector.

TERMINAL REMOVAL

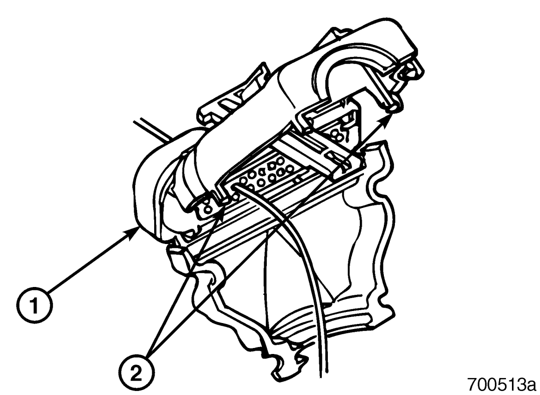


Figure 898 — Opening the Strain Relief Device

1. Strain Relief	2. Lock Tabs

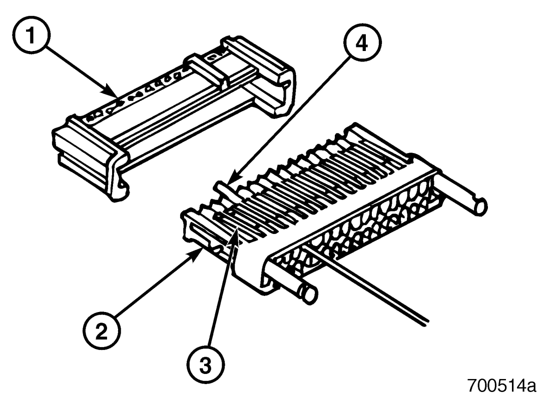


Figure 899 — Removing the Retainer

1. Retainer 2. Locking Tab	3. Terminal Locking Finger 4. Terminal

1. Unlatch and open the hinged strain relief devise covering the connector body.
2. Use a small screwdriver to depress the locking tabs on the sides of the connector body. Remove the retainer from the front of the connector.

3. Push the damaged terminal as far as possible toward the front face of the connector body. Carefully lift the terminal locking finger and pull the wire and terminal out of the rear of the connector body.
4. Cut the damaged terminal from the wire as close as possible to the crimp connection.

CONTACT REPLACEMENT

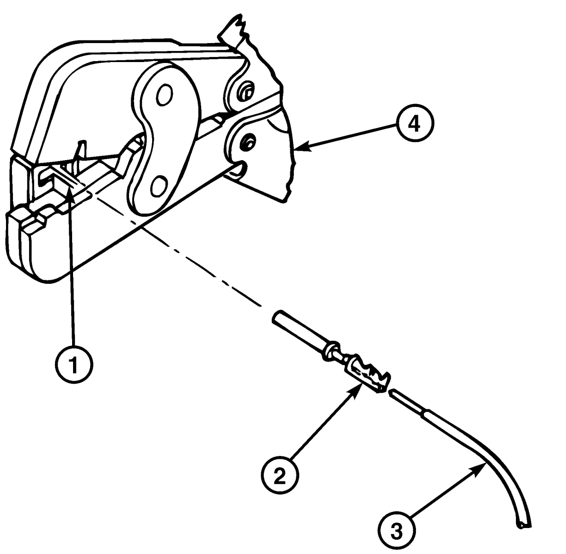


Figure 900 — Positioning the Terminal

1. Terminal Holder 2. Replacement Terminal	3. Stripped Wire 4. Crimping Tool

1. Strip 0.18 to 0.22 inches (4.5–5.5 mm) of insulation from the end of the wire.
2. Release the jaws of crimping tool J 35688. Insert the replacement terminal into the terminal holder until the insulation wings are flush with the crimping tool anvil.
3. Insert the bare wire fully into the replacement terminal.
4. Squeeze the handle of the crimping tool until the ratchet releases. The terminal is now properly installed onto the wire.

TERMINAL INSERTION

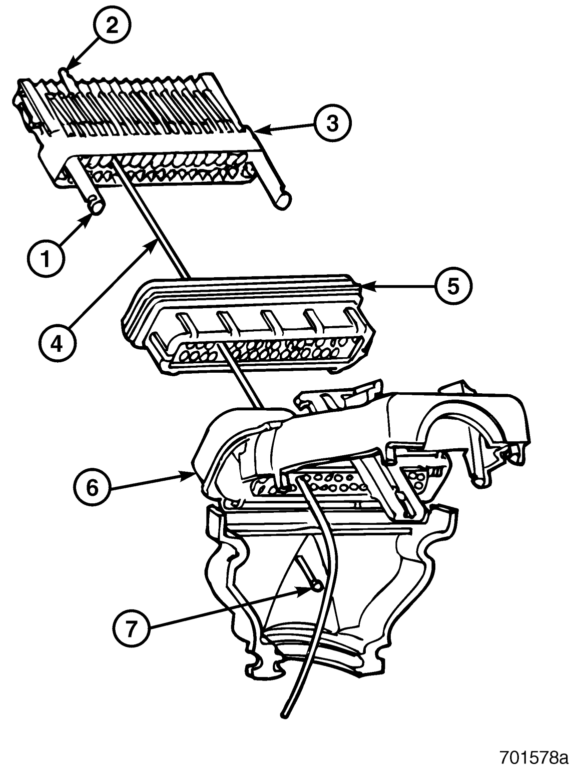


Figure 901 — Aligning the Connector

1. Locking Post 2. Terminal 3. Connector Body 4. Wire	5. Connector Seal 6. Strain Relief 7. Cavity Plug

1. Align the locking posts, on the connector body, with the connector seal and strain relief. Install the seal and the strain relief onto the connector body.
2. Push the terminal into the proper cavity of the connector body until it clicks into position.
3. Ensure that all terminals are properly positioned in the connector body. Install the retainer onto the front face of the connector. Install plugs into any empty connector cavities.
4. Position the harness conduit in the strain relief and latch the strain relief.

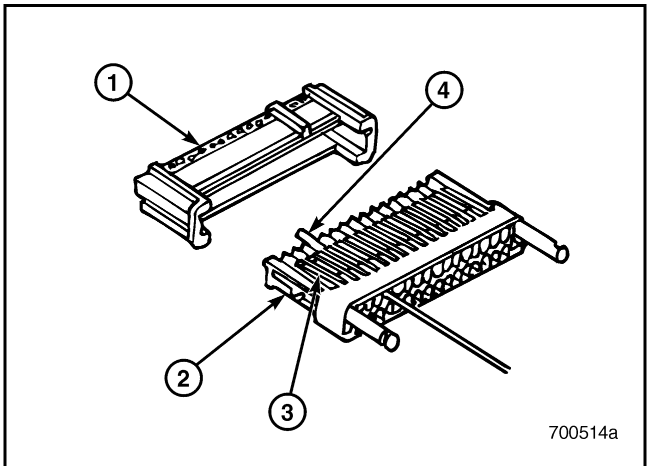


Figure 902 — Installing the Retainer

1. Retainer 2. Locking Tab	3. Terminal Locking Finger 4. Terminal

SPECIAL TOOLS AND EQUIPMENT

V-MAC® SERVICE TOOLS

This section lists the tools which are required to properly service the V-MAC® III system.

1. J45537-PLC (Kent-Moore)	RP 1210A compliant PLC/J1708 Serial link adapter (included in the J 45537-MACK serial link kit)
2. J 38581 A (Kent-Moore)	V-MAC® Electronic Connector Test Adapter Kit
4. J 38500-63 (Kent-Moore)	Serial Link Jumper (Deutsch-to-Deutsch)
5. Digital Multimeter	Any digital multimeter accurate to 2% with a minimum input impedance of 10 megaohm, and a 10 AMP range
6. Diagnostic Computer	Any 100% IBM compatible computer with 32Mb RAM and Windows 95/98 or newer operating system
7. Modem or network card	Any Hayes compatible modem
8. J 38582 (Kent-Moore)	V-MAC® Terminal Crimper/Removal Tool Kit
9. J 44786 (Kent-Moore)	ECU Connector Terminal Removal Tool
10. J 44787 (Kent-Moore)	ECU Connector Terminal Removal Tool
11. J 46505 (Kent-Moore)	CEGR™ EECU Terminal Crimper/Terminal Repair Kit
12. J 35123 (Kent-Moore)	Terminal Crimper
13. J 38500-96A (Kent-Moore)	6-to-9 Pin Communications Connector Adapter

The following tools are part of the J 38582 V-MAC® Terminal/Crimper/Removal Tool kit. These tools are available individually and are listed here for reference.

J 36400-5	Weather-Pack terminal removal tool
J 33095	Micro-Pack and Bosch (55 pin) terminal removal tool
J 34182	Deutsch terminal crimping tool
J 34513 and J 37451	Deutsch terminal removal tools
J 35688	Weather-Pack, Bosch, Micro-Pack, and Metri-Pack Crimping Tool
J 35689-A	Metri-Pack Terminal Removal Tool
J 38676	Bosch (7 pin) Terminal Removal Tool

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V-MAC® III

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