TABLE OF CONTENTS

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

TABLE OF CONTENTS - Continued

1.0 INTRODUCTION

The procedures contained in this manual include all specifications, instructions and graphics needed to diagnose engine control module (ECM) and sentry key remote entry module (SKREEM) problems; they are no start, diagnostic trouble code (DTC) and no trouble code problems for the ECM. The diagnostics in this manual are based on the trouble condition or symptom being present at the time of diagnosis.

When repairs are required, refer to the appropriate service information for the proper removal and repair procedure.

Diagnostic procedures change every year. New diagnostic systems may be added; carryover systems may be enhanced. IT IS RECOMMENDED THAT YOU REVIEW THE ENTIRE MANUAL TO BECOME FAMILIAR WITH ALL NEW AND CHANGED DIAGNOSTIC PROCEDURES.

This manual will cover all the necessary requirements to begin a logical diagnostic path for each problem. If there is a diagnostic trouble code (DTC) detected, go to the trouble code test. If there are no DTCs present, go to a no trouble code (*), symptom based test.

This book reflects many suggested changes from readers of past issues. After using this book, if you have any comments or recommendations, please fill out the form at the back of the book and mail it back to us.

1.1 SYSTEM COVERAGE

This diagnostic procedures manual covers all Sprinter vehicles equipped with the 2.7L common rail diesel engine.

1.2 SIX-STEP TROUBLESHOOTING PROCEDURE

Diagnosis of the engine control module (ECM) and sentry key immobilizer system (SKREEM) is done in six basic steps:

- verification of complaint
- verification of any related symptom
- symptom analysis
- problem isolation
- repair of isolated problem
- verification of proper operation

NOTE: All tests in this manual should be performed with the engine at operating temperature, unless otherwise specified within a particular test.

2.0 IDENTIFICATION OF SYSTEM

The ECM is located to the left of the steering column behind the steering column opening cover. The sentry remote entry module (SKREEM) is attached to the rear of the instrument cluster.

3.0 SYSTEM DESCRIPTION AND FUNCTIONAL OPERATION

3.1 GENERAL DESCRIPTION

The 2.7L direct injection diesel engine system is equipped with the latest technical advances. The on-board diagnostics incorporated in the engine control module and SKREEM are intended to assist the field technician in repairing vehicle problems by the quickest means.

The engine system incorporates a common rail fuel delivery design. This design utilizes electronically controlled solenoid valve type fuel injectors. Each injector is controlled individually by the ECM. Injector timing and fuel quantity are controlled by the ECM based on inputs from various sensors. The precision control of the injectors by the ECM helps to reduce the engine noise, odor and smoke.

3.2 FUNCTIONAL OPERATION

3.2.1 ECM ON-BOARD DIAGNOSTICS

The ECM is programmed to monitor different circuits of the diesel fuel injection system. This monitoring is called on-board diagnostics.

Certain criteria must be met for a diagnostic trouble code to be entered into the ECM memory. The criteria may be a range of: engine rpm, engine temperature, time or other input signals to the ECM. If all of the criteria for monitoring a system or circuit are met, and a problem is sensed, then a DTC will be stored in the ECM memory.

It is possible that a DTC for a monitored circuit may not be entered into the ECM memory, even though a malfunction has occurred. This may happen when the monitoring criteria have not been met.

The ECM compares input signal voltages from each input device with specifications (the established high and low limits of the input range) that are programmed into it for that device. If the input voltage is not within the specifications and other trouble code criteria are met, a DTC will be stored in the ECM memory.

3.2.2 ECM OPERATING MODES

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

Ignition Switch On (Engine Off)

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

Engine Start-Up Mode

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

Normal Driving Modes

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

Limp-In Mode

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

Overspeed Detection Mode

If the ECM detects engine RPM that exceeds 5200 RPM, the ECM will set a DTC in memory, limit engine RPM to no more than 2500 RPM, and illuminate the MIL until the DTC is cleared.

After-Run Mode

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

3.2.3 MONITORED CIRCUITS

The ECM is able to monitor and identify most driveability related trouble conditions. Some circuits are directly monitored through ECM feedback circuitry. In addition, the ECM monitors the voltage state of some circuits and compares those states with expected values. Other systems are monitored indirectly when the ECM conducts a rationality test to identify problems.

Although most subsystems of the engine control module are either directly or indirectly monitored, there may be occasions when diagnostic trouble codes are not immediately identified. For a trouble code to set, a specific set of conditions must occur and unless these conditions occur, a DTC will not set.

3.2.4 SKREEM OVERVIEW

The sentry key remote entry module system (SKREEM) is designed to prevent unauthorized vehicle operation. The system consists of a sentry key remote entry module (SKREEM), ignition key(s) equipped with a transponder chip and the ECM. When the ignition switch is turned on, the SKREEM interrogates the ignition key. If the ignition key is Valid or Invalid, the SKREEM sends a message to the ECM indicating ignition key status. Upon receiving this message the ECM will terminate engine operation or allow the engine to continue to operate.

3.2.5 SKREEM ON-BOARD DIAGNOSTICS

The SKREEM has been programmed to transmit and monitor many different coded messages as well as CAN Bus messages. This monitoring is called On-Board Diagnostics. Certain criteria must be met for a DTC to be entered into SKREEM memory. The criteria may be a range of; input voltage, CAN Bus message or coded messages to the SKREEM. If all the criteria for monitoring a circuit or function are met and a fault is detected, a DTC will be stored in the SKREEM memory and the START ERROR indicator will be turned on in the instrument cluster.

3.2.6 SKREEM OPERATION

When ignition power is supplied to the SKREEM, the SKREEM performs an internal self-test. After the self-test is complete, the SKREEM energizes the antenna (this activates the transponder chip) and sends a challenge to the transponder chip. The transponder chip responds to the challenge by generating an encrypted response message.

After responding to the coded message, the transponder sends a transponder ID message to the SKREEM. The SKREEM compares the transponder ID message to the available valid key codes in SKREEM memory (8 key maximum at any one time). After validating the ignition key the SKREEM sends a CAN Bus message request to the ECM, then waits for the ECM response. If the ECM does not respond, the SKREEM will send the request again. If the ECM does not respond again, the SKREEM will stop sending the request and store a trouble code in memory. If the ECM sends a correct response to the SKREEM, the SKREEM sends a valid/invalid key message to the ECM. The ECM will allow or disallow engine operation based on this message.

Secret Key - an electronically stored value (identification number) that is unique to each SKREEM. The secret key is stored in the SKREEM, ECM and all ignition key transponders.
Challenge - a random number that is generated by the SKREEM at each ignition key cycle.

The secret key and challenge are the two variables used in the algorithm that produces the encrypted response message. The transponder uses the crypto algorithm to receive, decode and respond to the message sent by the SKREEM. After responding to the coded message, the transponder sends a transponder ID message to the SKREEM.

3.3 DIAGNOSTIC TROUBLE CODES

Each diagnostic trouble code (DTC) is diagnosed by following a specific procedure. The diagnostic test procedure contains step-by-step instruction for determining the cause of the DTC as well as no trouble code problems. It is not necessary to perform all of the tests in this book to diagnose an individual code.

Always begin diagnosis by reading the DTCs using the DRBIII®. This will direct you to the specific test(s) that must be performed.

3.3.1 HARD CODE

A DTC that comes back within one cycle of the ignition key is a hard code. This means that the problem is current every time the ECM/SKREEM checks that circuit or function. Procedures in this manual verify if the DTC is a hard code at the beginning of each test. When the fault is not a hard code, an intermittent test must be performed.

NOTE: If the DRBIII® displays faults for multiple components (i.e. ECT, MAF, IAT sensors) identify and check the shared circuits for possible problems before continuing (i.e. sensor grounds or 5-volt supply circuits). Refer to the appropriate schematic to identify shared circuits.

3.3.2 INTERMITTENT CODE

A DTC that is not current every time the ECM/SKREEM checks the circuit or function is an intermittent code. Most intermittent DTCs are caused by wiring or connector problems. Problems that come and go like this are the most difficult to diagnose; they must be looked for under specific conditions that cause them. The following checks may assist you in identifying a possible intermittent problem.

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

NOTE: Electromagnetic (radio) interference can cause an intermittent system malfunction. This interference can interrupt communication between the ignition key transponder and the SKREEM.

3.3.3 ECM DIAGNOSTIC TROUBLE CODES

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

If the DRBIII® displays faults for multiple components (i.e. MAF, ECT, ENG OIL, etc.), identify and check the shared circuits for possible problems before continuing (i.e. sensor grounds or 5-volt supply circuits). Refer to the appropriate wiring diagrams to identify shared circuits.

mass air flow sensor – signal voltage too low
mass air flow sensor – signal voltage too high
mass air flow sensor – supply voltage too high or low
mass air flow sensor – plausibility #1
mass air flow sensor – plausibility #2
mass air flow sensor – plausibility #3
mass air flow sensor – plausibility #4
boost pressure sensor – signal voltage too low
boost pressure sensor – signal voltage too high
boost pressure sensor – supply voltage too high or low
boost pressure sensor – plausibility
intake air temperature sensor circuit – signal voltage too low
intake air temperature sensor circuit – signal voltage too high
engine coolant temperature sensor circuit – signal voltage too low
engine coolant temperature sensor circuit – signal voltage too high

engine coolant temperature sensor circuit – engine is cold too long
fuel temperature sensor circuit – signal voltage too low
fuel temperature sensor circuit – signal voltage too high
fuel pressure sensor circuit malfunction – signal voltage too low
fuel pressure sensor circuit malfunction – signal voltage too high
fuel pressure sensor circuit malfunction – supply voltage too high or low
fuel pressure sensor circuit malfunction – plausibility
cylinder 1 injector circuit – current decrease
cylinder 1 injector circuit – load drop
cylinder 1 injector circuit – overcurrent high side
cylinder 1 injector circuit – overcurrent low side
cylinder 2 injector circuit – current decrease
cylinder 2 injector circuit – load drop
cylinder 2 injector circuit – overcurrent high side
cylinder 2 injector circuit – overcurrent low side
cylinder 3 injector circuit – current decrease
cylinder 3 injector circuit – load drop
cylinder 3 injector circuit – overcurrent high side
cylinder 3 injector circuit – overcurrent low side
cylinder 4 injector circuit – current decrease
cylinder 4 injector circuit – load drop
cylinder 4 injector circuit – overcurrent high side
cylinder 4 injector circuit – overcurrent low side
cylinder 5 injector circuit – current decrease
cylinder 5 injector circuit – load drop
cylinder 5 injector circuit – overcurrent high side
cylinder 5 injector circuit – overcurrent low side
vehicle speed sensor – plausibility #1
vehicle speed sensor – signal voltage too high
vehicle speed sensor – plausibility #2
vehicle speed sensor – frequency too high
can data bus – bus failure
can data bus – transmission error #1
can data bus – transmission error #2
can data bus – hardware failure
brake switch signal circuits – incorrect can message
brake switch signal circuits – plausibility with redundant contact
brake switch signal circuits – plausibility after initialization
atmospheric pressure sensor circuit – signal voltage too low
atmospheric pressure sensor circuit – signal voltage too high
fuel pressure malfunction – pressure too high
fuel pressure malfunction – pressure too low
fuel pressure malfunction – solenoid open
fuel pressure malfunction – actuator sticking
fuel pressure malfunction – leakage detected
fuel pressure malfunction – leakage detected
fuel pressure malfunction – positive deviation at engine speed too high
fuel shutdown solenoid – short circuit
fuel shutdown solenoid – open circuit
fuel pressure solenoid – short circuit
fuel pressure solenoid – open circuit
fuel pressure solenoid – plausibility
engine oil sensor – synchronization error #1
engine oil sensor – synchronization error #1
engine oil sensor – open or shorted to ground
engine oil sensor – supply voltage too high or too low
engine oil sensor – timing error
engine oil sensor – oil level plausibility
engine oil sensor – oil quality plausibility
engine oil sensor – water contamination
can message – abs message error
can message – tcm message error
accel pedal position sensor 1 circuit – signal voltage too low
accel pedal position sensor 1 circuit – signal voltage too high
accel pedal position sensor 1 circuit – supply voltage too high or low
accel pedal position sensor 1 circuit – plausibility #1
accel pedal position sensor 1 circuit – plausibility #2
accel pedal position sensor 1 circuit – plausibility #3
accel pedal position sensor 2 circuit – signal voltage too low
accel pedal position sensor 2 circuit – signal voltage too high
accel pedal position sensor 2 circuit – supply voltage too high or low
accel pedal position sensor 2 circuit – implausibility potentiometer 1 and 2
starter relay circuit – short circuit
starter relay circuit – open circuit
starter relay circuit – incorrect start
crankshaft position sensor circuit – plausibility #1
crankshaft position sensor circuit – overspeed recognition
crankshaft position sensor circuit – plausibility #2
cmp/ckp position sensor circuit – fuel shut-off activated
cmp/ckp position sensor circuit – signal frequency too high
cmp/ckp position sensor circuit – ckp dynamic plausibility
cmp/ckp position sensor circuit – cmp/ckp sync failure
cmp/ckp position sensor circuit – cmp dynamic plausibility
cmp/ckp position sensor circuit – correction for main injection delayed
egr solenoid circuit – short circuit
egr solenoid circuit – open circuit
egr solenoid circuit – positive deviation
egr solenoid circuit – negative deviation

egr solenoid circuit – improper flow
boost pressure solenoid – short to voltage
boost pressure solenoid – open or shorted to ground
boost pressure solenoid – positive deviation
boost pressure solenoid – negative deviation
boost pressure wastegate solenoid – plausibility
glow plug failure – cylinder 1
glow plug failure – cylinder 2
glow plug failure – cylinder 3
glow plug failure – cylinder 4
glow plug failure – cylinder 5
glow plug module – communication fault
glow plug module – internal fault
glow plug module – excess current
glow plug module – short circuit
glow plug module – incorrect diagnostic sequence
glow plug module – incorrect reception message
maximum vehicle speed limit – negative deviation
speed control – negative acceleration deviation
speed control – negative acceleration deviation
speed control – positive acceleration deviation
speed control – switch signal plausibility
speed control – can message plausibility
speed control – switch signal out of range
engine control relay control circuit – shuts off too early
engine control relay control circuit – shuts off too late
sensor reference voltage A circuit – voltage too low
sensor reference voltage A circuit – voltage too high
ignition voltage – voltage error
ECM – lower stabilization limit
ECM – upper stabilization limit
ECM – recovery error
ECM – shut-off monitoring
ECM – quantity stop
ECM – communication #1
ECM – communication #1
ECM – voltage supply is too low
ECM – voltage supply is too high
ECM – eeprom adaption value
ECM – sprintshift is coded as manual transmission
ECM – manual transmission is coded as sprintshift
ECM – eeprom communication
ECM – can bus open during version coding
ECM – version number missing
ECM – codeword is missing or incorrect
immobilizer – message missing
immobilizer – incorrect message
immobilizer – no error in ecm eeprom test
capacitor voltage 1 – readout too small
capacitor voltage 1 – readout too large
capacitor voltage 1 – voltage too high
capacitor voltage 1 – voltage too low
capacitor voltage 1 – calculated voltage is incorrect
fuel pressure solenoid – open circuit
fuel pressure solenoid – short circuit
after run shut off error – zero quantity
after run shut off error – injection powerstage
acm circuit fault
a/c compressor shut-off circuit – short circuit
a/c compressor shut-off circuit – open circuit
a/c compressor shut-off circuit – can data error
low side fuel pressure sensor circuit – signal voltage is too low
low side fuel pressure sensor circuit – signal voltage is too high
low side fuel pressure sensor circuit – plausibility
fuel delivery – pressure too low
fuel delivery – plausibility
fuel delivery – minimum pressure not reached
fuel delivery – fuel filter restriction
fuel pressure – measurement is too low
fuel pressure – measurement is too high
water level sensor – water in fuel
instrument cluster – can error
instrument cluster – glow lamp fault
torque reduction message from abs – no communication
torque reduction message from abs – can plausibility
torque reduction message from abs – message error
torque reduction message from abs – message missing
torque reduction message from abs – plausibility #1
torque reduction message from abs – plausibility #2
torque reduction message from tcm – tcm dtc #1
torque reduction message from tcm – tcm dtc #2
torque reduction message from tcm – can plausibility
torque reduction message from tcm – message error
torque reduction message from tcm – messages missing
torque reduction message from tcm – plausibility
torque reduction message from tcm – engine stop
referenc voltage B – voltage is too low
referenc voltage B – voltage is too high
a/d converter error internal failure
a/d converter error app sensor ground failure
a/d converter error voltage failure
capacitor #1 – voltage error
capacitor #2 – voltage error

3.3.4 HANDLING NO TROUBLE CODE PROBLEMS

After reading Section 3.0 (System Description and Functional Operation), you should have a better understanding of the theory and operation of the on-board diagnostics and how this relates to the diagnosis of a vehicle that may have a driveability-related symptom or complaint. When there are no trouble codes present, refer to the no trouble code (*) tests.

3.4 USING THE DRBIII®

Refer to the DRBIII® user's guide for instructions and assistance with reading the DTCs, erasing the DTCs, lab scope usage and other DRBIII® functions.

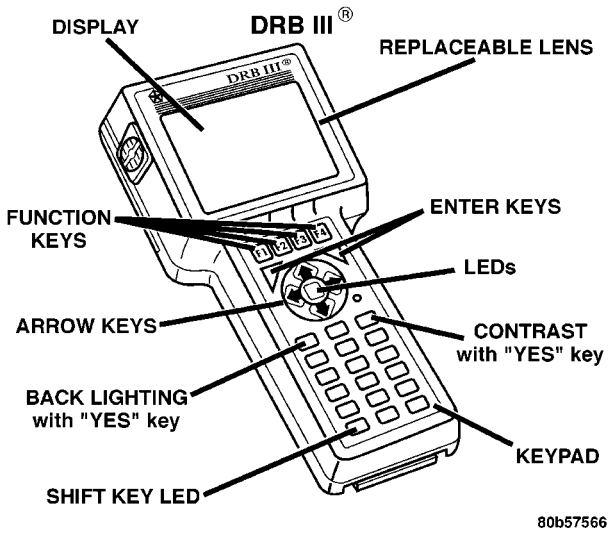
3.4.1 DRBIII® DOES NOT POWER UP

If the LEDs do not light or no sound is emitted at start up, check for loose cable connections or a bad cable. Check the vehicle battery voltage at data link connector cavity 16. A minimum of 11.0 volts is required to adequately power the DRBIII®. Check for proper ground connection at data link connector cavities 4 and 5.

If all connections are proper between the DRBIII® and the vehicle or other devices, and the vehicle battery is fully charged, an inoperative DRBIII® may be the result of a faulty cable or vehicle wiring. For a blank screen, refer to the appropriate diagnostic manual.

3.4.2 DISPLAY IS NOT VISIBLE

Low temperatures will affect the visibility of the display. Adjust the contrast to compensate for this condition.



4.0 DISCLAIMERS, SAFETY, WARNINGS

4.1 DISCLAIMERS

All information, illustrations and specifications contained in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

4.2 SAFETY

4.2.1 TECHNICIAN SAFETY INFORMATION

WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS. FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.

WARNING: ENGINES PRODUCE CARBON MONOXIDE THAT IS ODORLESS, CAUSES SLOWER REACTION TIME AND CAN LEAD TO SERIOUS INJURY. WHEN THE ENGINE IS OPERATING, KEEP SERVICE AREA WELL VENTILATED OR ATTACH THE VEHICLE EXHAUST SYSTEM TO THE SHOP EXHAUST REMOVAL SYSTEM.

Set the parking brake and block the wheels before testing or repairing the vehicle. It is especially important to block the wheels on front wheel drive vehicles; the parking brake does not hold the drive wheels.

When servicing a vehicle, always wear eye protection and remove any metal jewelry such as watchbands or bracelets that might make electrical contact.

When diagnosing powertrain system problems, it is important to follow approved procedures where applicable. These procedures can be found in the service manual. Following these procedures is very important to the safety of the individuals performing the diagnostic tests.

4.2.2 VEHICLE PREPARATION FOR TESTING

Make sure the vehicle being tested has a fully charged battery. If it does not, false diagnostic codes or error messages may occur.

4.2.3 SERVICING SUB-ASSEMBLIES

Some components of the powertrain system are intended to be serviced as an assembly only. At-

tempting to remove or repair certain system subcomponents may result in personal injury and/or improper system operation. Only those components with approved repair and installation procedures in the service manual should be serviced.

4.2.4 DRBIII® SAFETY INFORMATION

WARNING: EXCEEDING THE LIMITS OF THE DRBIII® MULTIMETER IS DANGEROUS. IT CAN EXPOSE YOU TO SERIOUS OR POSSIBLE FATAL INJURY. CAREFULLY READ AND UNDERSTAND THE CAUTIONS AND SPECIFICATION LIMITS.

Follow the vehicle manufacturer's service specifications at all times.

- Do not use the DRBIII® if it has been damaged.
- Do not use the test leads if the insulation is damaged or if metal is exposed.
- To avoid electrical shock, do not touch the test leads, tip or the circuit being tested.
- Choose the proper range and function for the measurement. Do not try voltage or current measurements that may exceed the rated capacity.
- Do not exceed the limits shown in the table below:

FUNCTION	INPUT LIMIT
Volts	0–500 peak volts AC 0–500 volts DC
Ohms (Resistance)*	0–1.12 megaohms
Frequency Measure Frequency Generated	0–10 kHz
Temperature	–58 – +1100°F –50 – +600°C

* Ohms cannot be measured if voltage is present. Ohms can be measured only on a non-powered circuit.

- Voltage between any terminal and ground must not exceed 500v DC or 500v peak AC.
- Use caution when measuring voltage above 25v DC or 25v AC.
- The circuit being tested must be protected by a 10 amp fuse or circuit breaker.
- Use the low current shunt to measure circuits up to 10 amps. Use the high current shunt to measure circuits exceeding 10 amps.
- When testing for the presence of voltage or current, make sure the meter is functioning correctly. Take a reading of a known voltage or current before accepting a zero reading.
- When measuring current, connect the meter in series with the load.
- Disconnect the live test lead before disconnecting the common test lead.

4.3 WARNINGS AND CAUTIONS

4.3.1 ROAD TEST WARNINGS

Some complaints will require a test drive as part of the repair verification procedure. The purpose of the test drive is to try to duplicate the diagnostic code or symptom condition.

CAUTION: Before road testing a vehicle, be sure that all components are reassembled. During the test drive, do not hang the DRBIII® from the rear view mirror. Do not attempt to read the DRBIII® while driving. Have an assistant available to operate the DRBIII®.

4.3.2 VEHICLE DAMAGE CAUTIONS

Before disconnecting any control module, make sure the ignition is off. Failure to do so could damage the module. When testing voltage or circuit integrity at any control module, use the terminal side (not the wire end) of the harness connector. Do not probe through the insulation; this will damage it and eventually cause it to fail because of corrosion.

Be careful when performing electrical test so as to prevent accidental shorting of terminals. Such a mistake can damage fuses or components. Also, a second code could be set, making diagnosis of the original problem more difficult.

5.0 REQUIRED TOOLS AND EQUIPMENT

DRBIII® (diagnostic read-out box) scan tool
vacuum gauge
ammeter
ohmmeter
voltmeter
jumper wires and probes
oscilloscope

6.0 GLOSSARY OF TERMS

A/C	air conditioning
APP	accelerator pedal position (sensor)
BCM	body control module
BP	boost pressure (sensor)
CKP	crankshaft position (sensor)

CMP	camshaft position (sensor)
CTM	central timer module
DLC	data link connector
ECM	engine control module
ECT	engine coolant temperature (sensor)
EGR	exhaust gas recirculation (solenoid/ valve)
IAT	intake air temperature (sensor)
MAF	mass air flow (sensor)
MIL	malfunction indicator lamp
ms	millisecond(s)
S/C	speed control
SKREEM	sentry key remote entry module
WIF	water in fuel (sensor)

7.0

DIAGNOSTIC INFORMATION AND PROCEDURES

Symptom List:

P-1105 ATMOSPHERIC PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH
P-1105 ATMOSPHERIC PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW
P1613-ECM INTERNAL ERROR - LOWER STABILIZATION LIMIT
P1613-ECM INTERNAL ERROR - UPPER STABILIZATION LIMIT
P1614-ECM COMMUNICATION #1
P1614-ECM COMMUNICATION #2
P1614-ECM QUANTITY STOP
P1614-ECM RECOVERY ERROR
P1614-ECM SHUT OFF MONITORING
P1617-ECM EEPROM ADAPTION VALUE
P1617-ECM EEPROM COMMUNICATION
P1630-IMMOBILIZER - NO ERROR IN ECM EEPROM TEST
P1666-AFTER RUN SHUT OFF ERROR-INJECTION POWERSTAGE
P1666-AFTER RUN SHUT OFF ERROR-ZERO QUANTITY
P2319-A/D CONVERTER ERROR APP SENSOR GROUND FAILURE
P2319-A/D CONVERTER ERROR INTERNAL FAILURE
P2319-A/D CONVERTER ERROR VOLTAGE FAILURE
P2320-CAPACITOR #1 - VOLTAGE ERROR
P2320-CAPACITOR #2 - VOLTAGE ERROR

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P-1105 ATMOSPHERIC PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
INTERMITTENT CONDITION

P-1105 ATMOSPHERIC PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates an internal ECM problem.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1
P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #2
P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #3
P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #4
P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH
P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO LOW
P0100-MASS AIR FLOW SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1.

When Monitored and Set Condition:

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1

When Monitored: With the ignition on.

Set Condition: The ECM detects a rationality problem with the MAF Sensor.

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #2

When Monitored: With the ignition on.

Set Condition: The ECM detects a rationality problem with the MAF Sensor.

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #3

When Monitored: With the ignition on.

Set Condition: The ECM detects a rationality problem with the MAF Sensor.

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #4

When Monitored: With the ignition on.

Set Condition: The ECM detects a rationality problem with the MAF Sensor.

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The MAF Sensor Signal voltage is above 4.8 volts for at least 3 seconds.

P0100-MASS AIR FLOW SENSOR SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Mass Air Flow Sensor Signal voltage is below 1.6 volts for at least 3 seconds.

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1 — Continued

P0100-MASS AIR FLOW SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The MAF Sensor 5 Volt Supply circuit voltage is below 4.9 volts or above 5.1 volts for at least 3 seconds.

POSSIBLE CAUSES
12 VOLT SUPPLY CIRCUIT OPEN
CHECKING THE ENGINE CONTROL RELAY SYSTEM
ECM - 5-VOLT SUPPLY CIRCUIT
MASS AIRFLOW SENSOR
SENSOR GROUND OPEN
INTERMITTENT CONDITION
MAF SENSOR 5 VOLT SUPPLY CIRCUIT OPEN
MAF SENSOR SIGNAL CIRCUIT OPEN
MAF 5 VOLT SUPPLY CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
MAF SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
ECM SENSOR GROUND CIRCUIT OPEN
MAF SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
MAF SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
MAF SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
MAF SENSOR CIRCUIT SHORTED TO VOLTAGE
ECM - MAF SENSOR SIGNAL CIRCUIT

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: Inspect the turbocharger inlet tube between the MAF Sensor and the turbocharger for damage, restriction or poor connection. Any of these conditions can cause a MAF Plausibility DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRB III display a Mass Air Flow Sensor DTC? Yes → Go To 2 No → Go To 17	All

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: Check the ECM for other ECM DTC's related to circuits that are open, shorted to ground or low voltage problems.** Does the DRB also display these type of DTC's? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1,7 and 8. Does the test light illuminate brightly for each circuit? Yes → Go To 4 No → Refer to symptom list and perform Checking the ECM Power and Grounds. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**NOTE: A malfunctioning EGR system can cause this DTC to set. Refer to symptom Checking the EGR System in the Driveability category to check EGR system operation.** Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Measure the voltage of the MAF Sensor 5 Volt Supply circuit in MAF Sensor harness connector. Is the voltage between 4.8 and 5.2 volts? Yes → Go To 5 No → Go To 13	All
5	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the MAF Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the MAF Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the MAF Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the MAF Sensor Signal circuit for an open Perform ROAD TEST VERIFICATION - VER-2.	All

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the MAF Sensor Signal circuit. Is the resistance below 1000 ohms? Yes → Repair the MAF Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All
8	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the MAF Sensor Signal circuit and the Sensor Ground circuit at of the MAF Sensor harness connector. Is the resistance below 1000 ohms? Yes → Repair the MAF Sensor Signal for a short to Sensor Ground . Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All
9	Turn the ignition off. Disconnect the MAF Sensor harness connector. Connect a jumper wire between MAF Sensor Signal circuit and the 5-volt supply circuit at the MAF Sensor harness connector . Turn the ignition on. With the DRBIII, read the MAF VOLTS. Does the DRBIII display between 4.0 and 5.5 volts? Yes → Go To 10 No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the MAF Sensor and the ECM. Is the resistance below 10.0 ohms? Yes → Go To 11 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Measure the voltage between the 5-volt Supply circuit and the Sensor Ground circuit at the MAF Sensor harness connector. Is the voltage above 4.5 volts? Yes → Go To 12 No → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, probe the 12 Volt Supply circuit in the MAF Sensor harness connector Does the test light illuminate brightly? Yes → Replace the MAF Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the 12 Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
13	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the 5 Volt Supply circuit. Is the resistance below 10.0 ohms? Yes → Go To 14 No → Repair the MAF Sensor 5 Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
14	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the MAF Sensor 5 Volt Supply circuit and the Sensor Ground circuit at the MAF Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 15 No → Repair the MAF 5 Volt Supply circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
15	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the MAF Sensor 5 Volt Supply circuit at the MAF harness connector. Is the resistance below 1000 ohms? Yes → Repair the MAF Sensor 5 Volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 16	All

P0100-MASS AIR FLOW SENSOR PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
16	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the MAF Sensor 5 Volt Supply circuit in the ECM harness connector. Is the voltage above 1.0 volt? Yes → Repair the MAF Sensor 5 Volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
17	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0105-BOOST PRESSURE SENSOR PLAUSIBILITY

When Monitored and Set Condition:

P0105-BOOST PRESSURE SENSOR PLAUSIBILITY

When Monitored: With the engine speed below 800 rpm.

Set Condition: When the engine is idling, the boost pressure sensor input differs from the barometric pressure sensor input by 2.17 psi for at least 6 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
HIGH RESISTANCE IN THE BOOST PRESSURE SENSOR SIGNAL CIRCUIT
HIGH RESISTANCE IN THE BOOST PRESSURE SENSOR GROUND CIRCUIT
HIGH RESISTANCE IN THE SENSOR REFERENCE VOLTAGE B CIRCUIT
BOOST PRESSURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off, wait 30 seconds, then start and idle the engine for at least 30 seconds. **NOTE: Engine idle speed must be below 870 RPM.** With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Boost Pressure Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Go To 3 No → Repair the Boost Pressure Sensor Signal circuit for high resistance. Perform ROAD TEST VERIFICATION - VER-2.	All

P0105-BOOST PRESSURE SENSOR PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 4 No → Repair the Boost Pressure Sensor Ground circuit for high resistance. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Reference Voltage B circuit. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the Sensor Reference Voltage B circuit for high resistance. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Replace the Boost Pressure Sensor. Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle, pausing several times to cycle the ignition. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → The repair is complete. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Boost Pressure Sensor Signal voltage exceeds 4.85 volts for at least 2 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BOOST PRESSURE SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
BOOST PRESSURE SENSOR GROUND CIRCUIT OPEN
BOOST PRESSURE SENSOR
POOR CONNECTOR TERMINAL CONTACT
ENGINE CONTROL MODULE (INTERNAL)
ENGINE CONTROL MODULE (SENSOR SIGNAL SHORTED TO VOLTAGE)

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: Ensure all turbocharger inlet and outlet tubes are connected properly, without damage and restriction before continuing with this test. Also ensure the wastegate actuator and actuator rod are attached and functioning properly.** **NOTE: If a P1470 DTC is present with this DTC, diagnose P1470 DTC before continuing.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition key on and off several times, leaving the key on for at least 10 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the Boost Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor Ground circuit. Is the voltage above 1.0 volt? Yes → Repair the Boost Pressure Sensor Ground circuit for a short to voltage. Note: The ECM will need to be checked for proper operation before the repair is completed. A short to voltage on a ground circuit can damage the ECM. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5 **NOTE: If the Sensor Ground circuit had a short to voltage on it, the ECM could be damaged. Retest the Fuel Pressure Sensor circuit.**	All
5	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the Boost Pressure Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. **NOTE: Ensure all harness connectors are connected.** Turn the ignition on. Measure the voltage of the Boost Pressure Sensor Signal circuit by back probing ECM harness connector C1, cavity 11. Is the voltage above 4.85 volts? Yes → Replace the Boost Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Ensure good terminal contact between the Boost Pressure Sensor harness connector and the sensor. The repair is complete. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Boost Pressure Sensor Signal voltage is below 0.30 volt for at least 2 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE B CIRCUIT OPEN
BOOST PRESSURE SENSOR
BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
BOOST PRESSURE SENSOR SIGNAL AND GROUND CIRCUITS SHORTED TOGETHER
BOOST PRESSURE SENSOR SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, read the Turbocharger Boost Pressure Sensor voltage. Is the voltage below 0.3 volt? Yes → Go To 2 No → Go To 8	All
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Turn the ignition on. Measure the voltage between ground and the Sensor Reference Voltage B circuit. Is the voltage above 4.9 volts? Yes → Go To 3 No → Repair the Sensor Reference Voltage B circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Turn the ignition on. Connect a jumper wire between the Boost Pressure Sensor Signal and Sensor Reference Voltage B circuits. With the DRB, read the Boost Pressure Sensor voltage. Is the Boost Pressure Sensor voltage above 4.5 volts? Yes → Replace the Boost Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Boost Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Boost Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Boost Pressure Sensor Signal circuit and Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Boost Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Boost Pressure Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Go To 7 No → Repair the Boost Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0105-BOOST PRESSURE SENSOR SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0105-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored and Set Condition:

P0105-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Boost Pressure Sensor 5 Volt Supply circuit voltage is below 4.8 volts or above 5.2 volts for at least 100 ms.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO GROUND
BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO SENSOR GROUND
BOOST PRESSURE SENSOR 5 VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off, wait 30 seconds, then turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All

P0105-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage between ground and the Boost Pressure Sensor 5 Volt Supply circuit at the Boost Pressure Sensor harness connector. Is the voltage above 1.0 volt? Yes → Repair the Boost Pressure Sensor 5 Volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Boost Pressure Sensor 5 Volt Supply circuit at the Boost Pressure Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Boost Pressur Sensor 5 Volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Boost Pressure Sensor 5 Volt Supply circuit at the Boost Pressure Sensor harness connector. Is the resistance above 1000 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Boost Pressure Sensor 5 Volt Supply circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All

P0105-BOOST PRESSURE SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW — Continued

TEST	ACTION	APPLICABILITY
5	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Intake Air Temperature Sensor Signal voltage is above 4.83 volts.

POSSIBLE CAUSES
CHECK FOR ACTIVE DTC
CHECKING FOR OTHER DTC'S
INTERMITTENT CONDITION
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
INTAKE AIR TEMP SENSOR GROUND CIRCUIT OPEN
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: The IAT Sensor Signal circuit and the Fuel Temp Signal circuit are connected internally in the ECM.** **NOTE: If either circuit is shorted to voltage internally or externally, the ECM will display P0110 IAT CKT Signal Voltage Too High and P0180 Fuel Temp Sensor Signal Voltage Too High.** Turn the ignition on and wait 90 seconds. With the DRBIII®, read the active ECM DTCs. Does the DRB display P0110 and P0180 DTC's? Yes → Repair the IAT Signal circuit or the Fuel Temperature Sensor circuit for a short to voltage. If o.k. replace the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage on the IAT Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Go To 4 No → Repair the Intake Air Temperature Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: Remove the jumper wire.**	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the IAT Sensor harness connector. Measure the resistance of the Intake Air Temperature Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the Intake Air Temperature Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the IAT Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the ECM harness connector and the IAT Sensor harness connector. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Intake Air Temperature Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Intake Air Temperature Sensor Signal voltage is below 0.073 volt for more than 60 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
IAT SENSOR
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
INTAKE AIR TEMP SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs for at least 2 minutes. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the IAT Sensor harness connector. Turn the ignition on. Monitor the DRB for ECM DTCs for at least 2 minutes. Does the DRB display P0110 INTAKE AIR TEMP SIGNAL VOLTAGE TOO HIGH? Yes → Replace the Intake Air Temperature Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0110-INTAKE AIR TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the IAT Sensor harness connector. Measure the resistance between ground and the Intake Air Temperature Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Intake Air Temperature Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the IAT Sensor harness connector. Measure the resistance between the Intake Air Temperature Sensor Signal circuit and the Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Intake Air Temperature Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT ENGINE IS COLD TOO LONG

When Monitored and Set Condition:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT ENGINE IS COLD TOO LONG

When Monitored: With the engine running.

Set Condition: The engine temperature fails to reach 80°C (176°F) within 20 minutes of startup.

POSSIBLE CAUSES
ENGINE COLD TOO LONG

TEST	ACTION	APPLICABILITY
1	**Note: The best way to diagnose this DTC is to allow the vehicle to remain outside overnight in order to have a completely cold soaked engine.** **Note: Extremely cold outside ambient temperatures may cause this DTC to set.** Verify that the coolant level is correct. Start the engine. With the DRBIII®, set the engine RPM to 1500 and allow the engine to warm up for 10-15 minutes. With the DRBIII®, monitor the Engine Coolant Temperature value during the warm up cycle. Make sure the transition of temperature change is smooth. Did the engine temperature reach a minimum of 80° C (176° F)? Yes → Test Complete. No → Refer to the Service Information for cooling system performance diagnosis. The most probable cause is a Thermostat problem. Also, refer to any related TSBs. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Engine Coolant Temperature Sensor Signal voltage is above 4.98 volts for more than 3 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECM ECT SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECT SENSOR GROUND CIRCUIT OPEN
ECT SENSOR
ECT SENSOR SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If multiple DTCs are present, the most likely cause is a 5-Volt Supply or Sensor Ground circuit shorted to voltage or ground. Refer to the Service Information Wiring section for circuits that would affect multiple DTCs.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Engine Coolant Temperature (ECT) Sensor voltage. Is the ECT Sensor voltage above 4.90 volts? Yes → Go To 2 No → Go To 7	All
2	Turn the ignition off. Disconnect the ECT Sensor harness connector. Turn the ignition on. Measure the voltage on the ECT Sensor Signal circuit. Is the voltage above 5.5 volts? Yes → Repair the ECT Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECT Sensor harness connector. Connect a jumper wire between the ECT Sensor harness connector cavities. Turn the ignition on. With the DRB, read the ECT Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the ECT Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the ECT Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the ECT Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the ECT Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ECT Sensor harness connector. Measure the resistance of the ECT Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the ECT Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
7	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Engine Coolant Temperature Sensor Signal voltage is below 0.073 volt for more than 3 seconds.

POSSIBLE CAUSES
INTERMITTENT CONDITION
ECT SENSOR
ECT SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
ECT SENSOR SIGNAL AND GROUND CIRCUITS SHORTED TOGETHER
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Engine Coolant Temperature (ECT) Sensor voltage. Is the ECT Sensor voltage below 0.073 volt? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the ECT Sensor harness connector. Turn the ignition on. With the DRB, read the ECT Sensor voltage. Is the voltage above 4.0 volts? Yes → Replace the ECT Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0115-ENGINE COOLANT TEMP SENSOR CIRCUIT SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ECT Sensor harness connector. Measure the resistance between ground and the ECT Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the ECT Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the ECT Sensor harness connector. Measure the resistance between the ECT Sensor Signal circuit and Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the ECT Sensor Signal and Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0180-FUEL TEMPERATURE SENSOR CIRCUIT - SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0180-FUEL TEMPERATURE SENSOR CIRCUIT - SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The fuel temperature sensor signal voltage is above 4.7 volts.

POSSIBLE CAUSES
CHECKING FOR OTHER DTC'S
INTERMITTENT CONDITION
FUEL TEMPERATURE SENSOR GROUND CIRCUIT OPEN
FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
FUEL TEMPERATURE SENSOR
FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT OPEN
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If multiple DTCs are present, the most likely cause is a 5-Volt Supply or Sensor Ground circuit shorted to voltage or ground. Refer to the Service Information Wiring section for circuits that would affect multiple DTCs.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Fuel Temperature Sensor voltage. Is the Fuel Temperature Sensor voltage above 4.80 volts? Yes → Go To 2 No → Go To 7	All

P0180-FUEL TEMPERATURE SENSOR CIRCUIT - SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: The IAT Sensor Signal circuit and the Fuel Temp Signal circuit are connected internally in the ECM.** **NOTE: If either circuit is shorted to voltage internally or externally, the ECM will display P0110 IAT CKT Signal Voltage Too High and P0180 Fuel Temp Sensor Signal Voltage Too High.** Turn the ignition on and wait 90 seconds. With the DRBIII®, read the active ECM DTCs. Does the DRB display P0110 and P0180 DTC's? Yes → Repair the IAT Signal circuit or the Fuel Temperature Sensor circuit for a short to voltage. If o.k. replace the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the Fuel Temperature Sensor harness connector. Turn the ignition on. Measure the voltage on the Fuel Temperature Sensor Signal circuit. Is the voltage above 5.5 volts? Yes → Repair the Fuel Temperature Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Fuel Temperature Sensor harness connector. Connect a jumper wire between the Fuel Temperature Sensor harness connector cavities. Turn the ignition on. With the DRB, read the Fuel Temperature Sensor voltage. Is the voltage below 1.0 volt? Yes → Replace the Fuel Temperature Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the Fuel Temperature Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Temperature Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the Fuel Temperature Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0180-FUEL TEMPERATURE SENSOR CIRCUIT - SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Temperature Sensor harness connector. Measure the resistance of the Fuel Temperature Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fuel Temperature Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0180-FUEL TEMPERATURE SENSOR CIRCUIT - SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0180-FUEL TEMPERATURE SENSOR CIRCUIT - SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The fuel temperature sensor signal voltage is below 0.8 volt.

POSSIBLE CAUSES
INTERMITTENT CONDITION
FUEL TEMPERATURE SENSOR
FUEL TEMPERATURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL TEMPERATURE SENSOR SIGNAL AND GROUND CIRCUITS SHORTED TOGETHER
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, monitor the Fuel Temperature Sensor voltage. Is the Fuel Temperature Sensor voltage below 0.10 volt? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the Fuel Temperature Sensor harness connector. Turn the ignition on. With the DRB, read the Fuel Temperature Sensor voltage. Is the voltage above 4.0 volts? Yes → Replace the Fuel Temperature Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0180-FUEL TEMPERATURE SENSOR CIRCUIT - SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Temperature Sensor harness connector. Measure the resistance between ground and the Fuel temperature Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Fuel Temperature Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Temperature Sensor harness connector. Measure the resistance between the Fuel Temperature Sensor Signal circuit and Sensor Ground circuit. Is the resistance above 1000 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fuel Temperature Sensor Signal and Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH

When Monitored and Set Condition:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The Fuel Rail Pressure Sensor Signal voltage is above 4.8 volts.

POSSIBLE CAUSES
ECM - FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECM - FUEL PRESSURE SENSOR SIGNAL OPEN
FUEL PRESSURE SENSOR SIGNAL CIRCUIT OPEN
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT OPEN
SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
FUEL PRESSURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**WARNING: THE FUEL INJECTION PUMP SUPPLIES HIGH-PRESSURE FUEL TO EACH INDIVIDUAL INJECTOR THROUGH HIGH-PRESSURE FUEL LINES. FUEL UNDER HIGH PRESSURE CAN PENETRATE SKIN AND CAUSE PERSONAL INJURY. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition key on and off several times, leaving the key on for at least 10 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 10	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor Signal circuit. Select the appropriate voltage reading. Voltage is above 5.5 volts. Go To 3 Voltage is between 4.7 and 5.4 volts. Go To 4 Voltage is below 4.7 volts. Go To 9	All
3	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fuel Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 5.0 ohms? Yes → Go To 5 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the 5-Volt Supply circuit. Is the resistance below 5.0 ohms? Yes → Go To 6 No → Repair the 5-volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Sensor Ground circuit at the Fuel Pressure Sensor and ECM harness connectors. Is the voltage above 1.0 volt at either connector? Yes → Repair the Sensor Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7 **NOTE: If the Sensor Ground circuit had a short to voltage on it, the ECM could be damaged. Retest the Fuel Pressure Sensor circuit.**	All
7	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Connect a jumper wire between the Fuel Pressure Sensor Signal circuit and the Sensor Ground circuit in the Fuel Pressure Sensor harness connector. Turn the ignition on and monitor the DRB for DTCs. Is DTC P0190 FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW present? Yes → Replace the Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Pressure Sensor Signal circuit. Is the resistance below 5.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Fuel Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
10	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW

When Monitored and Set Condition:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The Fuel Rail Pressure Sensor Signal voltage is below 0.2 volt.

POSSIBLE CAUSES
FUEL PRESSURE SENSOR
INTERMITTENT CONDITION
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
ECM - FUEL PRESSURE SENSOR SIGNAL SHORTED TO GROUND

TEST	ACTION	APPLICABILITY
1	**WARNING: THE FUEL INJECTION PUMP SUPPLIES HIGH-PRESSURE FUEL TO EACH INDIVIDUAL INJECTOR THROUGH HIGH-PRESSURE FUEL LINES. FUEL UNDER HIGH PRESSURE CAN PENETRATE SKIN AND CAUSE PERSONAL INJURY. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING.** **NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition key on and off several times, leaving the key on for at least 10 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor Signal circuit. Is the voltage between 4.7 and 5.3 volts? Yes → Replace the Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Fuel Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Fuel Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Fuel Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Fuel Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P0190-FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored and Set Condition:

P0190-FUEL PRESS SENSOR CIRCUIT MALF SUPPLY VOLTAGE TOO HIGH OR LOW

When Monitored: With the ignition on.

Set Condition: The Fuel Pressure Sensor 5-Volt Supply voltage is below 4.9 volts or above 5.1 volts for 100 ms.

POSSIBLE CAUSES
CHECK FOR SENSOR REFERENCE VOLTAGE A CIRCUIT DTCS
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**WARNING: THE FUEL INJECTION PUMP SUPPLIES HIGH-PRESSURE FUEL TO EACH INDIVIDUAL INJECTOR THROUGH HIGH-PRESSURE FUEL LINES. FUEL UNDER HIGH PRESSURE CAN PENETRATE SKIN AND CAUSE PERSONAL INJURY. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, read ECM DTCs. Is the High or Low DTC for P1611 SENSOR REFERENCE VOLTAGE A CIRCUIT set with this DTC? Yes → Refer to the symptom list for the related symptom(s). Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

P0190-FUEL PRESS SENSOR CIRCUIT PLAUSIBILITY

When Monitored and Set Condition:

P0190-FUEL PRESS SENSOR CIRCUIT PLAUSIBILITY

When Monitored: With the engine running.

Set Condition: The Fuel Pressure Sensor signal voltage does not correspond with the desired output of the Fuel Pressure Solenoid.

POSSIBLE CAUSES
CHECKING WIRING AND CONNECTORS
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRB III display this DTC? Yes → Go To 2 No → Go To 3	All
2	Inspect the wiring and connectors between the Fuel Pressure Sensor and the ECM harness connectors. Ensure that all connectors are secured properly. Check terminals and wiring for signs of damage, corrosion or other problems that could cause high resistance. Were any problems found? Yes → Repair or Replace as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0190-FUEL PRESS SENSOR CIRCUIT PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE
P0201-CYLINDER 1-INJECTOR CIRCUIT LOAD DROP
P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
P0202-CYLINDER 2-INJECTOR CIRCUIT CURRENT DECREASE
P0202-CYLINDER 2-INJECTOR CIRCUIT LOAD DROP
P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
P0203-CYLINDER 3-INJECTOR CIRCUIT CURRENT DECREASE
P0203-CYLINDER 3-INJECTOR CIRCUIT LOAD DROP
P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
P0204-CYLINDER 4-INJECTOR CIRCUIT CURRENT DECREASE
P0204-CYLINDER 4-INJECTOR CIRCUIT LOAD DROP
P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT LOW SIDE
P0205-CYLINDER 5-INJECTOR CIRCUIT CURRENT DECREASE
P0205-CYLINDER 5-INJECTOR CIRCUIT LOAD DROP
P0205-CYLINDER 5-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE
P0205-CYLINDER 5-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE.

When Monitored and Set Condition:

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

P0201-CYLINDER 1-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0201-CYLINDER 1-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0202-CYLINDER 2-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0202-CYLINDER 2-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0202-CYLINDER 2-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0203-CYLINDER 3-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0203-CYLINDER 3-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

P0203-CYLINDER 3-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0204-CYLINDER 4-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0204-CYLINDER 4-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0204-CYLINDER 4-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0205-CYLINDER 5-INJECTOR CIRCUIT CURRENT DECREASE

When Monitored: With the engine running.

Set Condition: The ECM detects an incorrect rate of current decrease after injection occurs.

P0205-CYLINDER 5-INJECTOR CIRCUIT LOAD DROP

When Monitored: With the engine running.

Set Condition: The ECM detects insufficient current through the injector driver when on.

P0205-CYLINDER 5-INJECTOR CIRCUIT OVERCURRENT HIGH SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the common driver circuit.

P0205-CYLINDER 5-INJECTOR CIRCUIT OVERCURRENT LOW SIDE

When Monitored: With the engine running.

Set Condition: The ECM detects excessive current on the injector driver circuit.

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

POSSIBLE CAUSES
CHECKING THE ENGINE CONTROL RELAY SYSTEM
ENGINE CONTROL MODULE
INTERMITTENT CONDITION
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO VOLTAGE
COMMON DRIVER CIRCUIT SHORTED TO VOLTAGE
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO GROUND
COMMON DRIVER CIRCUIT SHORTED TO GROUND
FUEL INJECTOR CIRCUITS SHORTED TOGETHER
FUEL INJECTOR CONTROL CIRCUIT OPEN
COMMON DRIVER CIRCUIT OPEN
FUEL INJECTOR

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start the engine and test drive the vehicle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 11	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1,7 and 8. Does the test light illuminate brightly for each circuit? Yes → Go To 3 No → Refer to symptom list and perform Checking the ECM Power and Grounds. Perform ROAD TEST VERIFICATION - VER-2.	All

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect all of the Cylinder Fuel Injector harness connectors. Disconnect the ECM harness connectors. Remove the Engine Control Relay from Fuse Block No.1 Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector in Fuse Block No.1. Turn the ignition on. Measure the voltage of each Fuel Injector Control circuit. Is the voltage above 1.0 volt for any of the measurements? Yes → Repair the appropriate Fuel Injector Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect all of the Cylinder Fuel Injector harness connectors. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of both Common Driver circuits. Is the voltage above 1.0 volt for either measurement? Yes → Repair the Common Driver circuit(s) for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Fuel Injector harness connectors. Measure the resistance between ground and each Fuel Injector Control circuit. Is the resistance below 1000 ohms for any of the measurements? Yes → Repair the Fuel Injector Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance between ground and both Common Driver circuits. Is the resistance below 1000 ohms for either measurement? Yes → Repair the Common Driver circuit(s) for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance between each of the Fuel Injector Control circuits and the Common Driver circuit. Is the resistance below 1000 ohms for any of the measurements? Yes → Repair the Fuel Injector Control circuit and Common Driver circuit for a short together. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance of each Fuel Injector Control circuit between its respective injector harness connector and the ECM harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 9 No → Repair the appropriate Fuel Injector Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Cylinder Fuel Injector harness connectors. Measure the resistance of each Common Driver circuit between the ECM harness connector and each Fuel Injector harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 10 No → Repair the Common Driver circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Replace the Cylinder Fuel Injector in accordance with the Service Information. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → The repair is complete. Perform ROAD TEST VERIFICATION - VER-2.	All

P0201-CYLINDER 1-INJECTOR CIRCUIT CURRENT DECREASE — Continued

TEST	ACTION	APPLICABILITY
11	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0500-VEHICLE SPEED SENSOR - PLAUSIBILITY #1
P0500-VEHICLE SPEED SENSOR - PLAUSIBILITY #2
P0500-VEHICLE SPEED SENSOR FREQUENCY TOO HIGH
P0500-VEHICLE SPEED SENSOR SIGNAL VOLTAGE TOO HIGH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0500-VEHICLE SPEED SENSOR - PLAUSIBILITY #1.

POSSIBLE CAUSES
INTERMITTENT CONDITION
CHECK FOR RELATED CONTROLLER ANTILOCK BRAKES DTCS
CHECK FOR RELATED TRANSMISSION CONTROL MODULE DTCS
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM displays any CAN Bus related DTC's, repair the CAN Bus related DTC's before continuing with this test.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle. With the DRB, read the ECM DTC's. Does the DRB display this DTC? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRB, check for Controller Antilock Brakes DTCs. **NOTE: The ECM Receives vehicle speed messages via CAB Bus from the ABS module. An interruption on the CAN Bus can cause this fault to set.** Are any related CAB DTCs present? Yes → Refer to symptom list for problems related to CAB DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0500-VEHICLE SPEED SENSOR - PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
3	**NOTE: The TCM Receives vehicle speed messages via CAB Bus from the ABS module. An interruption on the CAN Bus can cause this fault to set.** Turn the ignition on. With the DRB, check the TCM for DTCs. Are any related Vehicle Speed related TCM DTCs present? Yes → Replace the CAB in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P0600-CAN DATA BUS - BUS FAILURE
P0600-CAN DATA BUS - HARDWARE FAULT
P0600-CAN DATA BUS - TRANSMISSION ERROR #1
P0600-CAN DATA BUS - TRANSMISSION ERROR #2

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0600-CAN DATA BUS - BUS FAILURE.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
TERMINATION MODULE
INSTRUMENT CLUSTER
CAN CIRCUITS SHORTED TO VOLTAGE
MODULE SHORT TO VOLTAGE
CAN BUS CIRCUITS OPEN TO TCM
CAN CIRCUITS SHORTED TO GROUND
CAN CIRCUITS SHORTED TOGETHER
INTERMITTENT MODULE
MODULE INTERNAL SHORT
MODULE SHORT TO GROUND
SENTRY KEY REMOTE ENTRY MODULE

TEST	ACTION	APPLICABILITY
1	With the DRBIII®, read the active and stored DTCs for all modules that use CAN Bus communication. **NOTE: Due to capabilities of certain controllers that use the CAN Bus, not all modules report CAN Bus DTCs.** **NOTE: If a total CAN Bus failure transpires, there will be multiple CAN Bus DTCs present in many modules. If the other modules are reporting Engine CAN Bus message faults or DTC's related to ECM CAN messages ONLY, answer No for the following question.** Are other modules reporting active or stored CAN Bus communication DTCs? Yes → Go To 2 No → Go To 11	All

P0600-CAN DATA BUS - BUS FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Instrument Cluster harness connectors. Turn the ignition on. With the DRBIII®, read the active DTCs for all modules that use CAN Bus communication. **NOTE: Due to capabilities of certain controllers that use the CAN Bus, not all modules report CAN Bus DTCs.** **NOTE: If a total CAN Bus failure transpires, there will be multiple CAN Bus DTCs present in many modules. If the other modules are reporting Instrument Cluster CAN Bus message faults or DTC's related to I/C CAN messages ONLY, answer No.** Are other modules reporting active CAN Bus communication DTCs? Yes → Go To 3 No → Replace The Instrument Cluster. Perform BODY VERIFICATION TEST - VER 1.	All
3	Turn the ignition off. Disconnect the Instrument Cluster harness connectors. Turn the ignition on. Measure the voltage between CAN C Bus (+) circuit and ground. Measure the voltage between CAN C Bus (-) circuit and ground. Is the voltage above 3.0 volts on either circuit? Yes → Go To 4 No → Go To 5	All
4	Turn the ignition off. Using a voltmeter, connect one end to the CAN circuit that previously measured above 3.0 volts, and the other end to ground. **NOTE: Refer to the wiring diagrams in the service information to help determine which modules are connected to the CAN Bus.** **NOTE: Wait one minute after turning the ignition off before disconnecting the module.** Disconnect a module that is connected to the CAN bus. Turn the ignition on. Monitor and note the voltmeter reading. Repeat this procedure until either the voltage reading drops below 3.0 volts or all modules connected to the CAN Bus are disconnected and the voltage reading remains above 3.0 volts. What is the outcome? > 3.0 volts w/all modules disconnected Repair the CAN C Bus (+) circuit or the CAN C Bus (-) circuit for a short to voltage. Perform BODY VERIFICATION TEST - VER 1. < 3.0 volts after disconnecting a module Replace the module that caused the voltage reading to drop after disconnecting it. Perform BODY VERIFICATION TEST - VER 1.	All

P0600-CAN DATA BUS - BUS FAILURE — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the Instrument Cluster harness connectors. Disconnect the negative battery cable. Measure the resistance between ground and the CAN C Bus (+) circuit. Measure the resistance between ground and the CAN C Bus (-) circuit. Is the resistance below 50.0 ohms on either circuit? Yes → Go To 6 No → Go To 7	All
6	Turn the ignition off. Disconnect the negative battery cable. Using an ohmmeter, connect one end to the CAN Bus circuit that previously measured below 50.0 ohms and the other end to ground. **NOTE: Refer to the wiring diagrams in the service information to help determine which modules are connected to the CAN Bus.** Disconnect a module that is connected to the CAN Bus. Monitor and note the ohmmeter reading. Repeat this procedure until either the resistance reading goes above 50.0 ohms or all modules connected to the CAN Bus are disconnected and the resistance reading remains below 50.0 ohms. What is the outcome? < 50.0 ohms w/all modules disconnected Repair the CAN C Bus (+) circuit or the CAN C Bus (-) circuit for a short to ground. Perform BODY VERIFICATION TEST - VER 1. >50.0 ohms after disconnecting a module Replace the module that caused the resistance reading to increase after disconnecting it. Perform BODY VERIFICATION TEST - VER 1.	All
7	Turn the ignition off. Disconnect the Instrument Cluster harness connectors. Measure the resistance between the CAN C Bus (+) and CAN C Bus (-) circuits in the Instrument Cluster harness connector. Select the following measurement outcome. 120.0 ± 5.0 ohms Go To 8 60.0 ± 5.0 ohms Go To 9 Below 55.0 ohms Go To 10	All

P0600-CAN DATA BUS - BUS FAILURE — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the Instrument Cluster harness connectors. Disconnect the ECM harness connectors. Measure the resistance between the CAN Bus (+) and CAN Bus (-) circuits at the Instrument Cluster harness connector. Is the resistance 120.0 ± 5.0 ohms? Yes → Replace the Engine Control Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1. No → Replace the Sentry Key Remote Entry Module in accordance with the Service Information. Perform BODY VERIFICATION TEST - VER 1.	All
9	Turn the ignition off. **NOTE: Refer to the wiring diagrams in the service information to help determine which modules are connected to the CAN Bus.** Disconnect a module that is connected to the CAN Bus. Turn the ignition on. With the DRBIII®, erase all module DTCs. Turn the ignition off, wait 10 seconds then turn the ignition on and wait one minute. With the DRBIII®, read all DTCs from modules using CAN Bus. Repeat this procedure until the CAN Bus faults related to all modules is eliminated. View repair Replace appropriate module. Replace the Module that caused the general CAN Bus faults. Perform BODY VERIFICATION TEST - VER 1.	All
10	Turn the ignition off. Disconnect the Instrument Cluster harness connectors. **NOTE: Refer to the wiring diagrams in the service information to help determine which modules are connected to the CAN Bus.** Connect an ohmmeter to the CAN Bus (+) and CAN Bus (-) circuits at the Instrument Cluster harness connector. Disconnect a module that is connected to the CAN Bus. Monitor and note the ohmmeter reading. Repeat this procedure until either the resistance reading goes above 55.0 ohms or all modules connected to the CAN Bus are disconnected and the resistance reading remains below 55.0 ohms. What is the outcome? < 55.0 ohms w/all modules disconnected Repair the CAN C Bus (+) circuit or the CAN C Bus (-) circuit for a short together. Perform BODY VERIFICATION TEST - VER 1. >55.0 ohms after disconnecting a module Replace the module that caused the resistance reading to increase after disconnecting it. Perform BODY VERIFICATION TEST - VER 1.	All

P0600-CAN DATA BUS - BUS FAILURE — Continued

TEST	ACTION	APPLICABILITY
11	Turn the ignition off to the lock position. Disconnect the TCM C2 harness connector. Disconnect the ECM harness connector. **NOTE: Check connectors - Clean/repair as necessary.** Measure the resistance of both the CAN C Bus (+) circuit and the CAN C Bus (-) circuit between the TCM C2 harness connector and ECM harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Test Complete. No → Repair the CAN C Bus (+) and/or CAN C Bus (-) circuit for an open. Perform BODY VERIFICATION TEST - VER 1.	All

Symptom List:

P0703-BRAKE SWITCH SIGNAL CIRCUITS INCORRECT CAN MESSAGE
P0703-BRAKE SWITCH SIGNAL CIRCUITS PLAUSIBILITY #1
P0703-BRAKE SWITCH SIGNAL PLAUSIBILITY #2

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P0703-BRAKE SWITCH SIGNAL CIRCUITS INCORRECT CAN MESSAGE.

POSSIBLE CAUSES
INTERMITTENT CONDITION
CHECK FOR RELATED CONTROLLER ANTILOCK BRAKES DTCS
CHECK FOR RELATED TRANSMISSION CONTROL MODULE DTCS
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM displays any CAN Bus related DTC's, repair the CAN Bus related DTC's before continuing with this test.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle. With the DRB, read the ECM DTC's. Does the DRB display this DTC? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRB, check for Controller Antilock Brakes DTCs. **NOTE: The ECM Receives brake switch messages via CAB Bus from the ABS module. An interruption on the CAN Bus can cause this fault to set.** Are any related CAB DTCs present? Yes → Refer to symptom list for problems related to CAB DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P0703-BRAKE SWITCH SIGNAL CIRCUITS INCORRECT CAN MESSAGE

— Continued

TEST	ACTION	APPLICABILITY
3	**NOTE: The TCM Receives CAN Bus messages from the ABS module. An interruption on the CAN Bus can cause this fault to set.** Turn the ignition on. With the DRB, check the TCM for DTCs. Are there any CAN Bus TCM DTC's related to the ABS Module? Yes → Replace the CAB in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1187-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING
P1187-FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED
P1187-FUEL RAIL PRESSURE MALFUNCTION LEAKAGE DETECTED
P1187-FUEL RAIL PRESSURE MALFUNCTION POSITIVE DEVIATION AT ENGINE SPEED TO HIGH
P1187-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO HIGH-SHUT OFF
P1187-FUEL RAIL PRESSURE MALFUNCTION PRESSURE TOO LOW
P1187-FUEL RAIL PRESSURE MALFUNCTION SOLENOID OPEN

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1187-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING.

POSSIBLE CAUSES
AIR IN FUEL SYSTEM
CHECKING FOR OTHER DTC'S
CHECKING THE FUEL DELIVERY SYSTEM
CHECKING THE FUEL DELIVERY SYSTEM
FUEL INJECTOR CONTROL CIRCUIT SHORTED TO GROUND
FUEL INJECTOR(S)
FUEL PRESSURE SOLENOID
FUEL PRESSURE SOLENOID
FUEL PRESSURE SOLENOID
FUEL PUMP
FUEL PUMP
FUEL SYSTEM CONTAMINATION
FUEL SYSTEM LEAK
INJECTOR COMMON DRIVER CIRCUIT OPEN
INTERMITTENT CONDITION

P1187-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
1	**WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Turn the ignition on. With the DRBIII®, read the ECM DTCs. Are there any other DTCs present? Yes → Refer to symptom list for problems related to the DTC other than P1187. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB III® at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: Refer to the Service Information and perform the Air Bleed Procedure before continuing diagnosis.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. **NOTE: Driving the vehicle up and down steep hills or rapid cornering with a low fuel level can cause this DTC to set. Verify with customer if Low Fuel Light was illuminated when fault occurred.** Test drive the vehicle under various load and speed conditions to attempt to duplicate the fault. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 3 No → Go To 15	All
3	Turn the ignition off. **WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Inspect the entire fuel system for leakage. Is there any evidence of leakage? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All

P1187-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Mixing any other fuels such as gasoline or kerosine can cause this DTC to set.** Turn the ignition off. **WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Inspect the fuel system for contamination. Is the fuel contaminated? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start the engine. Does the engine start and idle? Yes → Go To 6 No → Go To 11	All
6	Start the engine. With the DRBIII® in Sensors, compare the Fuel Pressure Setpoint with the Actual Fuel Pressure readings. **NOTE: If there is air in the fuel system, the Actual Fuel Pressure will oscillate above and below the Fuel Pressure Setpoint.** Does Actual Fuel Pressure oscillate above and below the Fuel Pressure Setpoint? Yes → Refer to the Service Information to purge air from the fuel system. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 7	All
7	Start the engine. With the DRBIII® in Sensors, compare the Fuel Pressure Setpoint with the Actual Fuel Pressure readings. **NOTE: A sticking Fuel Pressure Solenoid is indicated by Actual Fuel Pressure gradually dropping below the Fuel Pressure Setpoint then suddenly increasing (spiking) above the Fuel Pressure Setpoint.** Does Actual Fuel Pressure gradually decrease then suddenly increase (spike) above the Fuel Pressure Yes → Replace the Fuel Pressure Solenoid in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All

P1187-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
8	Refer to the appropriate Service Information and refer to Diagnosis and Testing Fuel Delivery System table. **NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, failed fuel pressure solenoid, air in fuel system, failed fuel sending unit, contaminated fuel, faulty injector.** Were there any problems with the Fuel Delivery System? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All
9	**NOTE: An injector that sticks open can cause this DTC. A sticking injector will cause the engine to missfire and emit excessive black smoke from the exhaust system.** Start and idle the engine. Does the engine exhibit the symptoms described in the above note? Yes → Using the Service Information, remove and inspect the Fuel Injectors for signs of damage or debris that may cause the injector to stick. Sticking injectors may cause the combustion chamber to become black and oil soaked. Replace Injector(s) as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 10	All
10	Turn the ignition off. Replace the Fuel Pressure Solenoid in accordance with the Service Information. Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start and test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the ECM display a P1187 DTC? Yes → Replace the Fuel Pump in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
11	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Fuel Injector harness connectors. Measure the resistance between ground and each of the Fuel Injector Control circuits. Is the resistance below 1000 ohms for any of the measurements? Yes → Repair the appropriate Fuel Injector Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 12	All

P1187-FUEL RAIL PRESSURE MALFUNCTION ACTUATOR STICKING — Continued

TEST	ACTION	APPLICABILITY
12	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect all of the Fuel Injector harness connectors. Measure the resistance of the Common Injector Driver circuit between the ECM harness connector and each Fuel Injector harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 13 No → Repair the Injector Common Driver circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
13	Refer to the appropriate Service Information and refer to Diagnosis and Testing Fuel Delivery System table. **NOTE: The following is a list of problems that can cause fuel pressure to deviate from specification: restricted fuel filter or fuel lines, failed fuel pressure solenoid, air in fuel system, failed fuel sending unit, contaminated fuel, faulty injector.** Were there any problems with the Fuel Delivery System? Yes → Repair as necessary in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 14	All
14	Turn the ignition off. Replace the Fuel Pressure Solenoid in accordance with the Service Information. Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start and test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the ECM display a P1187 DTC? Yes → Replace the Fuel Injection Pump in accordance with the Service Information. No → Test Complete.	All
15	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB III® parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1188-FUEL SHUTDOWN SOLENOID CIRCUIT OPEN
P1188-FUEL SHUTDOWN SOLENOID CIRCUIT SHORTED TO GROUND OR B+

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1188-FUEL SHUTDOWN SOLENOID CIRCUIT OPEN.

When Monitored and Set Condition:

P1188-FUEL SHUTDOWN SOLENOID CIRCUIT OPEN

When Monitored: With the ignition on.

Set Condition: The ECM detects an open in the Fuel Pressure Solenoid circuitry.

P1188-FUEL SHUTDOWN SOLENOID CIRCUIT SHORTED TO GROUND OR B+

When Monitored: With the ignition on.

Set Condition: The ECM detects excessive current on the Fuel Shutdown Solenoid circuitry.

POSSIBLE CAUSES
CHECKING THE ENGINE CONTROL RELAY SYSTEM
FUEL SHUTDOWN SOLENOID
FUEL SHUTDOWN SOLENOID CIRCUIT(S) SHORTED TO GROUND
FUEL SHUTDOWN SOLENOID CIRCUIT(S) SHORTED TO VOLTAGE
FUEL SHUTDOWN SOLENOID CIRCUIT(S) SHORTED TOGETHER
FUEL SHUTDOWN SOLENOID OPEN CIRCUIT(S)
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All

P1188-FUEL SHUTDOWN SOLENOID CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
2	**NOTE: Check the ECM for other ECM DTC's related to circuits that are open, shorted to ground or low voltage problems.** Does the DRB also display these type of DTC's? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1,7 and 8. Does the test light illuminate brightly for each circuit? Yes → Go To 4 No → Refer to symptom list and perform Checking the ECM Power and Grounds. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Shutdown Solenoid harness connector. Measure the resistance of each of the Fuel Shutdown Solenoid circuits between the ECM harness connector and the Fuel Shutdown Solenoid harness connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 5 No → Repair the circuit(s) that measured above 10.0 ohms for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Shutdown Solenoid harness connector. Measure the resistance between ground and each of the Fuel Shutdown Solenoid circuits. Is the resistance above 1000 ohms for each measurement? Yes → Go To 6 No → Repair the circuit(s) that measured below 1000 ohms for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Shutdown Solenoid harness connector. Measure the resistance between the Fuel Shutdown Solenoid circuits. Is the resistance above 1000 ohms? Yes → Go To 7 No → Repair the Fuel Shutdown Solenoid circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All

P1188-FUEL SHUTDOWN SOLENOID CIRCUIT OPEN — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Fuel Shutdown Solenoid harness connector. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage each of the Fuel Shutdown Solenoid circuits. Is the voltage below 1.0 volt for each measurement? Yes → Replace the Fuel Shutdown Solenoid in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the circuit(s) that measured above 1.0 volts for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1190-FUEL PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT
P1190-FUEL PRESSURE SOLENOID CIRCUIT PLAUSIBILITY
P1190-FUEL PRESSURE SOLENOID CIRCUIT SHORTED TO GROUND OR B+
P1663-FUEL PRESSURE SOLENOID SIGNAL VOLTAGE TOO HIGH
P1663-FUEL PRESSURE SOLENOID SIGNAL VOLTAGE TOO LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1190-FUEL PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT.

When Monitored and Set Condition:

P1190-FUEL PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the Fuel Pressure Solenoid Control circuit.

P1190-FUEL PRESSURE SOLENOID CIRCUIT PLAUSIBILITY

When Monitored: When the ignition is turned off.

Set Condition: The ECM detects engine speed does not fall below 650 RPM within 1.5 second after ignition off.

P1190-FUEL PRESSURE SOLENOID CIRCUIT SHORTED TO GROUND OR B+

When Monitored: With the ignition on and the ECM attempting to actuate the Fuel Pressure Solenoid.

Set Condition: The ECM detects excessive current on the Fuel Pressure Solenoid Control circuit when attempting to actuate the Fuel Pressure Solenoid.

POSSIBLE CAUSES
CHECKING THE ENGINE CONTROL RELAY SYSTEM
INTERMITTENT CONDITION
FUEL PRESSURE SOLENOID CONTROL SHORTED TO VOLTAGE
FUEL PRESSURE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SOLENOID CONTROL CIRCUIT OPEN
FUEL PRESSURE SOLENOID
ENGINE CONTROL MODULE

P1190-FUEL PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **WARNING: HIGH-PRESSURE FUEL LINES DELIVER DIESEL FUEL UNDER EXTREME PRESSURE FROM THE INJECTION PUMP TO THE FUEL INJECTORS. THIS MAY BE AS HIGH AS 23,200 PSI (1600 BAR). USE EXTREME CAUTION WHEN INSPECTING FOR HIGH-PRESSURE FUEL LEAKS.** **WARNING: FUEL UNDER THIS AMOUNT OF PRESSURE CAN PENETRATE SKIN CAUSING PERSONAL INJURY OR DEATH. INSPECT FOR HIGH-PRESSURE FUEL LEAKS WITH A SHEET OF CARDBOARD. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING WHEN SERVICING FUEL SYSTEM.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times, turning the ignition off for at least 30 seconds between each run cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All
2	**NOTE: Check the ECM for other ECM DTC's related to circuits that are open, shorted to ground or low voltage problems.** Does the DRB also display these type of DTC's? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1,7 and 8. Does the test light illuminate brightly for each circuit? Yes → Go To 4 No → Refer to symptom list and perform Checking the ECM Power and Grounds. Perform ROAD TEST VERIFICATION - VER-2.	All

P1190-FUEL PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Solenoid Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Fuel Pressure Solenoid Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Fuel Pressure Solenoid Control circuit. Measure the resistance between ground and the Fuel Pressure Solenoid 12-volt Supply Is the resistance above 1000 ohms for both measurements? Yes → Go To 6 No → Repair the Fuel Pressure Solenoid circuit(s) for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Fuel Pressure Solenoid Control circuit. Measure the resistance of the Fuel Pressure Solenoid 12-volt Supply circuit. Is the resistance below 10.0 ohms for both measurements? Yes → Go To 7 No → Repair the Fuel Pressure Solenoid circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1190-FUEL PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the Fuel Pressure Solenoid harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. **NOTE: The DRB should display P1188-FUEL PRESSURE SOLENOID OPEN CIRCUIT.** Turn the ignition off. Connect a jumper wire between cavity 1 and cavity 2 of the Fuel Pressure Solenoid harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. **NOTE: The DRB should display P1188-FUEL PRESSURE SOLENOID SHORT CIRCUIT.** Does the DRB display the appropriate DTC for each condition? Yes → Replace the Fuel Pressure Solenoid in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time.The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1192-ENGINE OIL SENSOR WATER CONTAMINATION
P1192-ENGINE OIL SENSOR OIL LEVEL PLAUSIBILITY
P1192-ENGINE OIL SENSOR OIL QUALITY PLAUSIBILITY

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1192-ENGINE OIL SENSOR WATER CONTAMINATION.

POSSIBLE CAUSES
ENGINE OIL SENSOR
VERIFY THE CURRENT DTC
ENGINE OIL CONTAMINATION

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. Change the engine oil in accordance with the Service Information. With the DRBIII®, erase ECM DTCs. Start the engine and allow it to reach operating temperature. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Test complete. Perform ROAD TEST VERIFICATION - VER-2.	All
2	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** Refer to any Technical Service Bulletins (TSB) that may apply. Turn the ignition off. **NOTE: This DTC implies that the engine oil is being contaminated by water, engine coolant or other material due to a mechanical or service failures such as failed gaskets, seals, cracks or incorrectly installed components.** Inspect the engine for conditions referred to in the above note. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Engine Oil Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P1192-ENGINE OIL SENSOR CIRCUIT OPEN OR SHORTED TO GROUND
P1192-ENGINE OIL SENSOR SUPPLY VOLTAGE TOO HIGH OR LOW
P1192-ENGINE OIL SENSOR SYNCHRONIZATION ERROR #1
P1192-ENGINE OIL SENSOR SYNCHRONIZATION ERROR #2
P1192-ENGINE OIL SENSOR TIMING ERROR

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1192-ENGINE OIL SENSOR CIRCUIT OPEN OR SHORTED TO GROUND.

POSSIBLE CAUSES
5-VOLT SUPPLY CIRCUIT OPEN
ECM - ENGINE OIL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECM - ENGINE OIL SENSOR SIGNAL SHORT TO GROUND
ENGINE OIL SENSOR FAILURE
ENGINE OIL SENSOR SIGNAL CIRCUIT OPEN
ENGINE OIL SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
ENGINE OIL SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
ENGINE OIL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION

P1192-ENGINE OIL SENSOR CIRCUIT OPEN OR SHORTED TO GROUND — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: The engine oil level must be at the proper level for this test to be valid. Refer to the Service information and ensure the engine oil level is at the specified level.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times, letting the engine run for at least 30 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 9	All
2	Turn the ignition off. Disconnect the Engine Oil Sensor harness connector. Turn the ignition on. Measure the voltage of the Engine Oil Sensor Signal circuit. Select the appropriate voltage reading. Voltage is above 5.5 volts. Go To 3 Voltage is between 4.7 and 5.4 volts. Go To 4 Voltage is below 4.7 volts. Go To 6	All
3	Turn the ignition off. Disconnect the Engine Oil Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Engine Oil Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Engine Oil Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P1192-ENGINE OIL SENSOR CIRCUIT OPEN OR SHORTED TO GROUND — Continued

TEST	ACTION	APPLICABILITY
4	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Engine Oil Sensor harness connector. Measure the resistance of the 5-Volt Supply circuit between the ECM harness connector and the Engine Oil Sensor harness connector. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the 5-Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Engine Oil Sensor harness connector. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Replace the Engine Oil Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Engine Oil Sensor harness connector. Measure the resistance of the Engine Oil Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Engine Oil Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Engine Oil Sensor harness connector. Measure the resistance between ground and the Engine Oil Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 8 No → Repair the Engine Oil Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Engine Oil Sensor harness connector. Measure the resistance between Sensor Ground and the Engine Oil Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Engine Oil Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All

P1192-ENGINE OIL SENSOR CIRCUIT OPEN OR SHORTED TO GROUND — Continued

TEST	ACTION	APPLICABILITY
9	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1221-CAN MESSAGE - ABS MESSAGE ERROR

POSSIBLE CAUSES
ABS MODULE
CAN BUS CIRCUITS OPEN
INTERMITTENT CONDITION
ABS DTCS

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates a communication problem between the TCM and the ECM.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, attempt to read ABS DTCs. **NOTE: If the DRB is unable to communicate with the ABS module, refer to the symptom list for problem related to ABS Module Communication.** Are there any ABS DTCs? Yes → Refer to symptom list for problems related to ABS DTC's. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the ABS Module harness connectors. Turn the ignition on. Measure and note the voltage of both CAN Bus circuit at the ABS Module harness connector. Is the voltage between 2.2 volts and 2.8 volts for each measurement? Yes → Replace the ABS Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the CAN Bus circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1221-CAN MESSAGE - ABS MESSAGE ERROR — Continued

TEST	ACTION	APPLICABILITY
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1221-CAN MESSAGE - TCM MESSAGE ERROR

POSSIBLE CAUSES
CAN BUS CIRCUITS OPEN
TRANSMISSION CONTROL MODULE
INTERMITTENT CONDITION
TCM DTCS

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates a communication problem between the TCM and the ECM.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition on. With the DRBIII®, attempt to read TCM DTCs. **NOTE: If the DRB is unable to communicate with the TCM, refer to the symptom list for problem related to TCM Communication.** Are there any TCM DTCs? Yes → Refer to symptom list for problems related to TCM DTC's. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the TCM harness connectors. Turn the ignition on. Measure and note the voltage of both CAN Bus circuit at the TCM harness connector. Is the voltage between 2.2 volts and 2.8 volts for each measurement? Yes → Replace the TCM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the CAN Bus circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1221-CAN MESSAGE - TCM MESSAGE ERROR — Continued

TEST	ACTION	APPLICABILITY
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #1
P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #2
P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #3
P1222-ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO HIGH
P1222-ACC PEDAL POSITION SENSOR 1 CKT SIGNAL VOLTAGE TOO LOW
P1222-ACC PEDAL POSITION SENSOR 1 CKT SUPPLY VOLTAGE TOO HIGH OR LOW
P1234-ACC PEDAL POSITION SENSOR 2 CIRCUIT PLAUSIBILITY 1 AND 2
P1234-ACC PEDAL POSITION SENSOR 2 CKT SIGNAL VOLTAGE TOO HIGH
P1234-ACC PEDAL POSITION SENSOR 2 CKT SIGNAL VOLTAGE TOO LOW
P1234-ACC PEDAL POSITION SENSOR 2 CKT SUPPLY VOLTAGE TOO HIGH OR LOW

Test Note: **All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #1.**

POSSIBLE CAUSES
ACCELERATOR PEDAL POSITION SENSOR
ECM - APP SENSOR 1 5-VOLT SUPPLY CIRCUIT
SENSOR GROUND OPEN (APP SENSOR)
INTERMITTENT CONDITION
APP SENSOR 5-VOLT SUPPLY CIRCUIT OPEN
APP SENSOR SIGNAL CIRCUIT OPEN
APP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO SENSOR GROUND
APP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
APP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO GROUND
VERIFY APP SENSOR OPERATION
APP SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
APP SENSOR 5-VOLT SUPPLY CIRCUIT SHORTED TO VOLTAGE
ECM - SENSOR GROUND OPEN
APP SENSOR CIRCUIT SHORTED TO VOLTAGE
APP SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
ECM - APP SENSOR SIGNAL CIRCUIT

P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: The APP Sensor is a device that contains 2 separate potentiometer type sensors. Each sensor has its own 5-volt supply circuit, sensor ground circuit and signal circuit. The APP Sensor no longer incorporates a low-idle switch.** **NOTE: The APP Sensor 2 signal should always be approximately 1/2 the voltage of the APP Sensor 1 signal.** Turn the ignition on. Using a voltmeter, backprobe the APP Sensor 1 and APP Sensor 2 Volts at the APP Sensor harness connector with the accelerator pedal in the at rest position. Is the voltage between 0.18 and 0.26 volt for sensor 1 and 0.07 and 0.15 volt for sensor 2? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition on. Fully depress the accelerator pedal. Using a voltmeter backprobe the APP Sensor harness connector and read the voltage for APP Sensor 1 and APP Sensor 2. Is the voltage between 4.30 and 4.70 volts for #1 and 1.95 and 2.35 volts for #2? Yes → Go To 3 No → Go To 5	All
3	Turn the ignition on. With the DRB, read the APP Sensor 1 and APP Sensor 2 percentages (%). With the accelerator pedal in the idle position, slowly depress the accelerator pedal until the pedal is fully depressed. **NOTE: The percentage readings for APP Sensors 1 and 2 should increase smoothly as the pedal is depressed.** **NOTE: This test can also performed using a voltmeter by back probing each APP Sensor Signal circuit at the APP Sensor harness connector and observing the voltmeter for a smooth voltage change through the entire pedal travel.** Does the percentage (voltage) increase smoothly for both readings with the accelerator pedal travel? Yes → Go To 4 No → Replace the Accelerator Pedal Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set by slowly pressing and releasing the accelerator pedal several times. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
5	**NOTE: Perform the rest of this diagnostic procedure on the individual APP Sensor Potentiometer (1 or 2) that did not display the correct voltages in the previous test.** Turn the ignition off. Disconnect the APP Sensor harness connector. Turn the ignition on. Measure the voltage of the 5-Volt Supply circuit in the APP Sensor harness connector. Is the voltage between 4.7 and 5.3 volts? Yes → Go To 6 No → Go To 14	All
6	Turn the ignition off. Disconnect the APP Sensor harness connector. Connect a jumper wire between APP Sensor Signal circuit and the 5-volt supply circuit at the APP Sensor harness connector . With the DRB, read the PEDAL OUTPUT VOLTS. Does the DRB display between 4.0 and 5.5 volts? Yes → Go To 7 No → Go To 10	All
7	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the APP Sensor Ground circuit. Is the voltage above 1.0 volt? Yes → Repair the App Sensor Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All

P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
8	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the APP Sensor and the ECM. Is the resistance below 10.0 ohms? Yes → Go To 9 No → Repair the APP Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the APP Sensor harness connector. Using a 12-volt test light connected to 12-volts, check the Sensor Ground circuit of the appropriate potentiometer. Does the test light illuminate brightly? Yes → Replace the Accelerator Pedal Position Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the APP Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 11 No → Repair the APP Sensor Signal circuit for an open Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the APP Sensor Signal circuit. Is the resistance below 1000 ohms? Yes → Repair the APP Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 12	All
12	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the APP Sensor Signal circuit and the Sensor Ground circuit at the APP Sensor harness connector. Is the resistance below 1000 ohms? Yes → Repair the APP Sensor Signal and Sensor Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 13	All

P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the APP Sensor Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the APP Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
14	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Accelerator Pedal Position Sensor 5-volt Supply circuit. Is the resistance below 10.0 ohms? Yes → Go To 15 No → Repair the Accelerator Pedal Position Sensor 5-Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
15	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Accelerator Pedal Position Sensor 5-Volt Supply circuit and both Sensor Ground circuits in the APP Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 16 No → Repair the 5-Volt Supply circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
16	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Accelerator Pedal Position Sensor 5-volt Supply circuit. Is the resistance below 1000 ohms? Yes → Repair the Accelerator Pedal Position Sensor 5-Volt Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 17	All

P1222-ACC PEDAL POSITION SENSOR 1 CKT PLAUSIBILITY #1 — Continued

TEST	ACTION	APPLICABILITY
17	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Accelerator Pedal Position Sensor 5-Volt Supply circuit in the ECM harness connector. Is the voltage above 1.0 volt? Yes → Repair the Accelerator Pedal Position Sensor 5-Volt Supply circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P1330-STARTER RELAY CIRCUIT OPEN CIRCUIT
P1330-STARTER RELAY CIRCUIT SHORT CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1330-STARTER RELAY CIRCUIT OPEN CIRCUIT.

When Monitored and Set Condition:

P1330-STARTER RELAY CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open on the Starter Relay Control circuit.

P1330-STARTER RELAY CIRCUIT SHORT CIRCUIT

When Monitored: During engine crank attempt.

Set Condition: The ECM detects too much current on the Starter Motor Relay Control circuit.

POSSIBLE CAUSES
CHECKING THE ENGINE CONTROL RELAY SYSTEM
INTERMITTENT CONDITION
SUBSTITUTE STARTER RELAY
STARTER RELAY CONTROL CIRCUIT SHORTED TO GROUND
STARTER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE
STARTER RELAY CONTROL CIRCUIT OPEN

P1330-STARTER RELAY CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Attempt to start the engine several times, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All
2	**NOTE: Check the ECM for other ECM DTC's related to circuits that are open, shorted to ground or low voltage problems.** Does the DRB also display these type of DTC's? Yes → Go To 3 No → Go To 4	All
3	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1,7 and 8. Does the test light illuminate brightly for each circuit? Yes → Go To 4 No → Refer to symptom list and perform Checking the ECM Power and Grounds. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Install a substitute relay in place of the Starter Relay. Attempt to start the engine several times, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 5 No → Replace the Starter Relay. Perform ROAD TEST VERIFICATION - VER-2.	All

P1330-STARTER RELAY CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Remove the Starter Relay harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Starter Relay Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the Starter Relay Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Starter Relay harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Starter Relay Control circuit. Is the resistance above 1000 ohms? Yes → Go To 7 No → Repair the Starter Relay Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Remove the Starter Relay from the PDC. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Starter Relay Control circuit. Is the voltage below 1.0 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Starter Relay Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY
P1335-CKP SENSOR CIRCUIT PLAUSIBILITY #1
P1335-CKP SENSOR CIRCUIT PLAUSIBILITY #2

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY.

When Monitored and Set Condition:

P1335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY

When Monitored: With the engine cranking or running.

Set Condition: The ECM detects a change in engine speed that has occurred more rapidly than is physically possible by the engine.

P1335-CKP SENSOR CIRCUIT PLAUSIBILITY #1

When Monitored: With the engine cranking or running.

Set Condition: The ECM detects a change in engine speed that has occurred more rapidly than is physically possible by the engine.

P1335-CKP SENSOR CIRCUIT PLAUSIBILITY #2

When Monitored: With the engine cranking or running.

Set Condition: The ECM detects a change in engine speed that has occurred more rapidly than is physically possible by the engine.

POSSIBLE CAUSES
CRANKSHAFT POSITION SENSOR
ENGINE CONTROL MODULE
OPEN SHIELD CIRCUIT
INTERMITTENT CONDITION

P1335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates the Engine Speed Sensor has seen an engine speed above 5200 RPM. This can occur if errant noise is picked up on the CKP Sensor Signal circuit.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Test drive the vehicle and monitor the DRBIII® for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the CKP Sensor harness connector. Measure the resistance of the Shield circuit. Is the resistance below 10.0 ohms? Yes → Go To 3 No → Repair the Shield circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Replace the Crankshaft Position Sensor in accordance with the Service Information. With the DRB, erase ECM DTCs. Perform several drive cycles, turning the ignition off for at least 10 seconds between each drive cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → The repair is complete. Refer to the Service Information to check for engine mechanical problems that may have occurred due to excessive engine speed. Perform ROAD TEST VERIFICATION - VER-2.	All

P1335-CKP SENSOR CIRCUIT DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
4	**CAUTION: Refer to the Service Information to check for engine mechanical problems that may have occurred due to excessive engine RPM.** **WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Check the CKP Sensor wiring harness for incorrect routing which may cause EMI interference. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY

When Monitored and Set Condition:

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY

When Monitored: The engine speed is above 790 RPM.

Set Condition: The ECM compares the current crankshaft RPM to the last calculated crankshaft RPM and the acceleration or deceleration is greater than is physically possible.

POSSIBLE CAUSES
CRANKSHAFT POSITION SENSOR
ENGINE CONTROL MODULE
OPEN SHIELD CIRCUIT
INTERMITTENT CONDITION
CRANKSHAFT POSITION SENSOR SIGNAL CIRCUIT(S) SHORTED TO GROUND
CKP SENSOR CIRCUITS SHORTED TOGETHER
CKP SENSOR SIGNAL CIRCUITS OPEN
CKP SENSOR SIGNAL CIRCUIT(S) SHORTED TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Attempt to start the engine. Did the engine start? Yes → Go To 2 No → Go To 3	All

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
3	Refer to the Service Information to ensure the Engine Drive Gears/Sprocket are installed correctly and the camshaft and crankshaft gears are timed correctly. Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and both of the CKP Sensor Signal circuits. Is the resistance above 1000 ohms for both measurements? Yes → Go To 4 No → Repair the CKP Sensor Signal circuit(s) for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the CKP Sensor Signal circuits. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the CKP Sensor Signal circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of CKP Sensor Signal circuits. Is the resistance below 10.0 ohms for both measurements? Yes → Go To 6 No → Repair the CKP Sensor Signal circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CKP DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition off. Disconnect the CKP Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of both CKP Sensor Signal circuits. Is the voltage below 1.0 volt for both measurements? Yes → Go To 7 No → Repair the CKP Sensor Signal circuit(s) for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition off. Using the DRB lab scope, backprobe both of the CKP Sensor Signal circuits at the ECM harness connector. **NOTE: Refer to Charts and Graphs to view a correct CKP Sensor signal.** Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRB. Does the DRB display a steady clean CKP Signal pattern for each circuit? Yes → Go To 8 No → Replace the Crankshaft Position Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the CKP Sensor harness connector. Measure the resistance of the Shield circuit. Is the resistance below 10.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Shield circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom List:

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE
P1354-CMP/CKP POSITION SENSOR CIRCUIT - CORRECTION FOR MAIN INJECTION DELAYED
P1354-CMP/CKP POSITION SENSOR CIRCUIT - FUEL SHUT-OFF ACTIVATED

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1354-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE.

When Monitored and Set Condition:

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE

When Monitored: With the engine running.

Set Condition: The ECM determines that the camshaft position sensor signal frequency is not plausible with the crankshaft position sensor signal frequency.

POSSIBLE CAUSES
CAMSHAFT POSITION SENSOR SIGNAL PROBLEM
CRANKSHAFT POSITION SENSOR SIGNAL PROBLEM
DAMAGED CKP SENSOR
DAMAGED CMP SENSOR OR CAMSHAFT
ENGINE CONTROL MODULE
GEAR ALIGNMENT PROBLEM
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start the engine. With the DRBIII®, read the ECM DTCs. Does the DRB III display this DTC? Yes → Go To 3 No → Go To 2	All

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRB III display this DTC? Yes → Go To 3 No → Go To 8	All
3	Refer to the Service Information to ensure the Engine Drive Gears/Sprocket are installed correctly and the camshaft and crankshaft gears are timed correctly. Turn the ignition off. Remove the CMP Sensor. Inspect the CMP Sensor for conditions such as loose mounting screws, damage or debris, also check the camshaft for cracked teeth. Is there any evidence of these conditions? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Remove the CKP Sensor. Inspect the CKP Sensor for conditions such as loose mounting screws, damage or debris. Is there any evidence of these conditions? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Using the DRB lab scope, backprobe the CMP Sensor Signal circuit at the CMP Sensor harness connector. Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRB. **NOTE: Refer to Charts and Graphs to view a correct CMP Sensor signal.** Does the DRB display a steady clean CMP Signal pattern? Yes → Go To 6 No → Perform Test for DTC P1354-Camshaft Position Sensor Circuit Static Plausibility. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Using the DRB lab scope, backprobe both of the CKP Sensor Signal circuits at the CKP Sensor harness connector. **NOTE: Refer to Charts and Graphs to view a correct CKP Sensor signal.** Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRB. Does the DRB display a steady clean CKP Signal pattern for each circuit? Yes → Go To 7 No → Perform Test for DTC P1354-Crankshaft Position Sensor Circuit Dynamic Plausibility. Perform ROAD TEST VERIFICATION - VER-2.	All

P1354-CMP/CKP POSITION SENSOR CIRCUIT - CMP/CKP SYNC FAILURE — Continued

TEST	ACTION	APPLICABILITY
7	Refer to the Service Information and check alignment of the camshaft sprocket, crankshaft sprocket and injection pump sprocket. Are all of the sprockets aligned correctly? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair or adjust as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1354-CMP/CKP POSITION SENSOR CIRCUIT - DYNAMIC PLAUSIBILITY

P1354-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1354-CMP/CKP POSITION SENSOR CIRCUIT - DYNAMIC PLAUSIBILITY.

When Monitored and Set Condition:

P1354-CMP/CKP POSITION SENSOR CIRCUIT - DYNAMIC PLAUSIBILITY

When Monitored: With the engine cranking or running.

Set Condition: The ECM detects the Camshaft Sensor Signal is missing.

P1354-CMP/CKP POSITION SENSOR CIRCUIT - SIGNAL FREQUENCY TOO HIGH

When Monitored: With the engine running.

Set Condition: The ECM detects that engine speed is greater than 10,000 RPM.

POSSIBLE CAUSES
DAMAGED CMP SENSOR OR CAMSHAFT
ECM
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
12 VOLT SUPPLY CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
CMASHAFT POSITION SENSOR
ECM SENSOR GROUND CIRCUIT OPEN
CMP SENSOR SIGNAL CIRCUIT SHORTED TO THE SENSOR GROUND CIRCUIT
CMP SENSOR CIRCUIT SHORTED TO VOLTAGE

P1354-CMP/CKP POSITION SENSOR CIRCUIT - DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: The Timing Belt must be correctly installed and operational before diagnosis can be made. Refer to the Service Information to ensure the timing belt is properly installed.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Attempt to start the engine cranking the engine for at least 7 seconds. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 3 No → Go To 2	All
2	Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Test drive the vehicle. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display this DTC? Yes → Go To 3 No → Go To 13	All
3	Refer to the Service Information to ensure the Engine Drive Gears/Sprocket are installed correctly and the camshaft and crankshaft gears are timed correctly. Turn the ignition off. Disconnect the CMP Sensor harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the 12 Volt Supply circuit in CMP Sensor harness connector. Does the test light illuminate brightly? Yes → Go To 4 No → Repair the 12 Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the CMP Sensor harness connector. Turn the ignition on. Measure the voltage of the CMP Sensor Signal circuit. Is the voltage above 10.0 volts? Yes → Go To 5 No → Go To 10	All

P1354-CMP/CKP POSITION SENSOR CIRCUIT - DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
5	Turn the ignition off. Disconnect the CMP Sensor harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the CMP Sensor Signal circuit at the CMP Sensor harness connector. Is the test light on? Yes → Repair the CMP Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit between the CMP Sensor harness connector and the ECM harness connector. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
7	Turn the ignition on. Disconnect the IAT Sensor harness connector. Disconnect the Camshaft Position Sensor harness connector. Connect one end of a jumper wire to the IAT Sensor signal circuit in the IAT Sensor harness connector. Connect the other end of the jumper wire to the Sensor Ground circuit in the Camshaft Position Sensor harness connector. With the DRBIII® in Engine, Sensors, read the Intake Air Temp volts. Is the voltage below 1.0 volt? Yes → Go To 8 No → Replace and program the ECM in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Remove the CMP Sensor. Inspect the CMP Sensor for conditions such as loose mounting screws, damage, or cracks. Inspect the camshaft for conditions such as damage, debris or cracked teeth. Is there any evidence of these conditions? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All

P1354-CMP/CKP POSITION SENSOR CIRCUIT - DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
9	Turn the ignition off. With the DRBIII® lab scope lead, backprobe the CMP Signal circuit. Set the DRBIII® lab scope settings as follows: Time = 0.2s/Div, 20 volts scale, Offset = 0.00 volts, Probe = X10, Coupling = DC. While observing the DRBIII® display, crank the engine. **NOTE: The DRBIII® should display a digital signal (square wave) similar to that shown in Charts and Graphs.** Does the DRBIII® display an uninterrupted digital signal (square wave)? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Camshaft Position Sensor in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the CMP Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 11 No → Repair the CMP Sensor Signal circuit for an open Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the CMP Sensor Signal circuit. Is the resistance below 1000 ohms? Yes → Repair the CMP Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 12	All
12	Turn the ignition off. Disconnect the CMP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the CMP Sensor Signal circuit and the Sensor Ground circuit at the CMP Sensor harness connector. Is the resistance below 1000 ohms? Yes → Repair the CMP Sensor Signal and Sensor Ground circuits for a short together. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P1354-CMP/CKP POSITION SENSOR CIRCUIT - DYNAMIC PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
13	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Remove the CMP Sensor and the CKP Sensor, checking for loose mounting screws and debris on the sensor magnets that can corrupt the sensor signal. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1403-EGR SOLENOID CIRCUIT IMPROPER FLOW
P1403-EGR SOLENOID CIRCUIT NEGATIVE DEVIATION
P1403-EGR SOLENOID CIRCUIT POSITIVE DEVIATION

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1403-EGR SOLENOID CIRCUIT IMPROPER FLOW.

POSSIBLE CAUSES
EGR VALVE
INTERMITTENT CONDITION
ENGINE CONTROL MODULE - INTERNAL

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 3	All
2	**NOTE: Inspect the complete exhaust system for restriction. Restrictions in the exhaust system can cause improper EGR flow. Repair as necessary** Turn the ignition off. Replace the EGR Valve. With the DRBIII®, erase DTCs. Test drive the vehicle. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the EGR Valve. Perform ROAD TEST VERIFICATION - VER-2.	All

P1403-EGR SOLENOID CIRCUIT IMPROPER FLOW — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1403-EGR SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P1403-EGR SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the EGR Solenoid Control circuit.

POSSIBLE CAUSES
CHECKING THE ENGINE CONTROL RELAY SYSTEM
INTERMITTENT CONDITION
ENGINE CONTROL RELAY OUTPUT CIRCUIT OPEN
EGR VALVE CONTROL CIRCUIT SHORTED TO GROUND
EGR VALVE CONTROL CIRCUIT OPEN
EGR SOLENOID
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition cycles, turning the ignition off for at least 10 seconds between each ignition cycle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All
2	**NOTE: Check the ECM for other ECM DTC's related to circuits that are open, shorted to ground or low voltage problems.** Does the DRB also display these type of DTC's? Yes → Go To 3 No → Go To 4	All

P1403-EGR SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1, 7 and 8. Does the test light illuminate brightly for each circuit? Yes → Go To 4 No → Refer to symptom list and perform Checking the ECM Power and Grounds. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the EGR Valve harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the Engine Control Relay Output circuit in the EGR Valve harness connector. Does the test light illuminate brightly? Yes → Go To 5 No → Repair the Engine Control Relay Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the EGR Valve harness connector. Disconnect the ECM harness connectors. Measure the resistance between the EGR Valve Control circuit in the EGR Valve harness connector and ground. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the EGR Valve Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the EGR Valve harness connector. Disconnect the ECM harness connectors. Measure the resistance of the EGR Valve Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the EGR Valve Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1403-EGR SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Install a substitute EGR Solenoid in place of the vehicle's EGR Solenoid. **NOTE: Ensure the ECM and EGR Valve harness connectors are connected.** Turn the ignition on. With the DRB, check for this DTC to set again. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the EGR Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time.The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1403-EGR SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P1403-EGR SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on and the ECM attempting to actuate the EGR Solenoid.

Set Condition: The ECM detects excessive current draw on the EGR Solenoid Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
EGR SOLENOID
EGR VALVE CONTROL SHORTED TO VOLTAGE
ENGINE CONTROL MODULE - INTERNAL
ENGINE CONTROL MODULE - INTERNAL SHORT TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the EGR Valve harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. Does the DRB display P1403 EGR OPEN CIRCUIT? Yes → Replace the EGR Solenoid. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P1403-EGR SOLENOID CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the EGR Valve harness connector. Turn the ignition on. Measure the voltage of the EGR Valve Control circuit at the EGR Valve harness connector. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** Turn the ignition off. Disconnect the EGR Valve harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the EGR Valve Control circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the EGR Valve Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1470-BOOST PRESSURE SOLENOID CIRCUIT - PLAUSIBILITY
P1470-BOOST PRESSURE SOLENOID CIRCUIT NEGATIVE DEVIATION
P1470-BOOST PRESSURE SOLENOID CIRCUIT POSITIVE DEVIATION

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1470-BOOST PRESSURE SOLENOID CIRCUIT - PLAUSIBILITY.

When Monitored and Set Condition:

P1470-BOOST PRESSURE SOLENOID CIRCUIT - PLAUSIBILITY

When Monitored: With the ignition on.

Set Condition: The Boost Pressure Sensor indicates less boost pressure than the ECM is commanding.

P1470-BOOST PRESSURE SOLENOID CIRCUIT NEGATIVE DEVIATION

When Monitored: With the ignition on.

Set Condition: The Boost Pressure Sensor indicates more boost pressure than the ECM is commanding.

P1470-BOOST PRESSURE SOLENOID CIRCUIT POSITIVE DEVIATION

When Monitored: With the ignition on.

Set Condition: The Boost Pressure Sensor indicates less boost pressure than the ECM is commanding.

POSSIBLE CAUSES
INTERMITTENT CONDITION
CHECKING VACUUM SUPPLY
BOOST PRESSURE SOLENOID
ENGINE CONTROL MODULE

P1470-BOOST PRESSURE SOLENOID CIRCUIT - PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: Ensure all turbocharger inlet and outlet tubes are connected properly, without damage and restriction before continuing with this test. Also ensure the vacuum chamber actuator and actuator rod are attached and functioning properly.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Test drive the vehicle. Monitor the DRBIII® for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Disconnect both vacuum lines at the Boost Pressure Solenoid. Using a vacuum line connection tee, connect the vacuum supply line to the Boost Pressure Solenoid Output line at the Boost Pressure Solenoid. Disconnect the vacuum line at the Boost Pressure Vacuum Unit. Connect a vacuum gauge to the Boost Pressure Solenoid Output line at the Boost Pressure Vacuum Unit Start the engine. With the engine at idle, note the vacuum gauge reading. Is the vacuum above 20 inches? Yes → Go To 3 No → Inspect the vacuum hoses/tubes for damage, restriction and leaks. If OK, refer to the Service Information to check the Vacuum Pump operation. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Install a substitute Boost Pressure Solenoid in place of the vehicle's Boost Pressure Solenoid. **NOTE: Ensure the ECM and Boost Pressure Solenoid harness connectors are connected.** Turn the ignition on. With the DRB, check for this DTC to set again. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Boost Pressure Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All

P1470-BOOST PRESSURE SOLENOID CIRCUIT - PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time.The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1470-BOOST PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored and Set Condition:

P1470-BOOST PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects an open or short to ground on the Boost Pressure Solenoid Control circuit.

POSSIBLE CAUSES
CHECKING THE ENGINE CONTROL RELAY SYSTEM
INTERMITTENT CONDITION
12 VOLT SUPPLY CIRCUIT OPEN
BOOST PRESSURE SOLENOID CONTROL CIRCUIT SHORTED TO GROUND
BOOST PRESSURE SOLENOID CONTROL CKT OPEN
BOOST PRESSURE SOLENOID
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 8	All
2	**NOTE: Check the ECM for other ECM DTC's related to circuits that are open, shorted to ground or low voltage problems.** Does the DRB also display these type of DTC's? Yes → Go To 3 No → Go To 4	All

P1470-BOOST PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1, 7 and 8. Does the test light illuminate brightly for each circuit? Yes → Go To 4 No → Refer to symptom list and perform Checking the ECM Power and Grounds. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Boost Pressure Solenoid harness connector. Turn the ignition on. Using a 12-volt test light connected to ground, check the 12 Volt Supply circuit in the Boost Pressure Solenoid harness connector. Does the test light illuminate brightly? Yes → Go To 5 No → Repair the 12 Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Boost Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Boost Pressure Solenoid Control circuit in the Boost Pressure Solenoid harness connector and ground. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Boost Pressure Solenoid Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Boost Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Boost Pressure Solenoid Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 7 No → Repair the Boost Pressure Solenoid Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1470-BOOST PRESSURE SOLENOID CIRCUIT OPEN CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Install a substitute Boost Pressure Solenoid in place of the vehicle's Boost Pressure Solenoid. **NOTE: Ensure the ECM and Boost Pressure Solenoid harness connectors are connected.** Turn the ignition on. With the DRB, check for this DTC to set again. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Replace the Boost Pressure Solenoid. Perform ROAD TEST VERIFICATION - VER-2.	All
8	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time.The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1470-BOOST PRESSURE SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored and Set Condition:

P1470-BOOST PRESSURE SOLENOID CIRCUIT SHORT CIRCUIT

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to battery on the Boost Pressure Solenoid Control circuit.

POSSIBLE CAUSES
INTERMITTENT CONDITION
BOOST PRESSURE SOLENOID
BOOST PRESSURE SOLENOID CONTROL SHORT TO VOLTAGE
ENGINE CONTROL MODULE - INTERNAL
ENGINE CONTROL MODULE - INTERNAL SHORT TO VOLTAGE

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 5	All
2	Turn the ignition off. Disconnect the Boost Pressure Solenoid harness connector. Turn the ignition on. With the DRB, erase ECM DTCs. Monitor the DRB for ECM DTCs. Does the DRB display BOOST PRESSURE SOLENOID OPEN CIRCUIT? Yes → Replace the Boost Pressure Solenoid. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P1470-BOOST PRESSURE SOLENOID CIRCUIT SHORT CIRCUIT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Boost Pressure Solenoid harness connector. Turn the ignition on. Measure the voltage of the Boost Pressure Solenoid Control circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Boost Pressure Solenoid harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Boost Pressure Solenoid Control circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Boost Pressure Solenoid Control circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1481-GLOW PLUG FAILURE - CYLINDER #1
P1481-GLOW PLUG FAILURE - CYLINDER #2
P1481-GLOW PLUG FAILURE - CYLINDER #3
P1481-GLOW PLUG FAILURE - CYLINDER #4
P1481-GLOW PLUG FAILURE - CYLINDER #5

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1481-GLOW PLUG FAILURE - CYLINDER #1.

POSSIBLE CAUSES
GLOW PLUG
GLOW PLUG CONTROL CIRCUIT OPEN
GLOW PLUG CONTROL CIRCUIT SHORTED TO GROUND
GLOW PLUG CONTROL CIRCUIT SHORTED TO VOLTAGE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the appropriate Glow Plug harness connectors. Disconnect the Glow Plug Module harness connector. Measure the resistance of the appropriate Glow Plug Control circuit. Is the resistance below 10.0 ohms? Yes → Go To 3 No → Repair the appropriate Glow Plug Control circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1481-GLOW PLUG FAILURE - CYLINDER #1 — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the appropriate Glow Plug harness connectors. Disconnect the Glow Plug Module harness connector. Measure the resistance between ground and the appropriate Glow Plug Control circuit. Is the resistance below 1000.0 ohms? Yes → Repair the appropriate Glow Plug Control circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the appropriate Glow Plug harness connectors. Disconnect the Glow Plug Module harness connector. Turn the ignition on. Measure the voltage of the appropriate Glow Plug Control circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the appropriate Glow Plug Control circuit for a short to voltage Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. With the DRBIII®, erase ECM DTCs. Refer to the Service Information and replace the appropriate Glow Plug. Perform several ignition cycles leaving the ignition on for at least 10 seconds then off for 10 seconds. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1482-GLOW PLUG MODULE - COMMUNICATION FAULT
P1482-GLOW PLUG MODULE - INCORRECT RECEPTION MESSAGE
P1482-GLOW PLUG MODULE - SHORT CIRCUIT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1482-GLOW PLUG MODULE - COMMUNICATION FAULT.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
GLOW PLUG CONTROL SIGNAL CIRCUIT OPEN
GLOW PLUG CONTROL SIGNAL CIRCUIT SHORTED TO GROUND
GLOW PLUG CONTROL SIGNAL CIRCUIT SHORTED TO VOLTAGE
GLOW PLUG MODULE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Glow Plug Module harness connectors. Disconnect the ECM harness connectors. Measure the resistance of the Glow Plug Control Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 3 No → Repair the Glow Plug Control Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1482-GLOW PLUG MODULE - COMMUNICATION FAULT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Glow Plug Module harness connectors. Disconnect the ECM harness connectors. Measure the resistance between ground and the Glow Plug Control Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Glow Plug Control Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Glow Plug Module harness connectors. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Measure the resistance of the Glow Plug Control Signal circuit. Is the voltage below 1.0 volt? Yes → Go To 5 No → Repair the Glow Plug Control Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Replace the Glow Plug Module in accordance with the Service Information. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1482-GLOW PLUG MODULE - EXCESS CURRENT
P1482-GLOW PLUG MODULE - INCORRECT DIAGNOSTIC SEQUENCE
P1482-GLOW PLUG MODULE - INTERNAL FAULT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1482-GLOW PLUG MODULE - EXCESS CURRENT.

POSSIBLE CAUSES
GLOW PLUG MODULE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates an internal Glow Plug Control Module problem or an incorrect Glow Plug Module has been installed.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Replace and program the Glow Plug Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All

P1482-GLOW PLUG MODULE - EXCESS CURRENT — Continued

TEST	ACTION	APPLICABILITY
2	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1520-S/C - CAN MESSAGE PLAUSIBILITY
P1520-S/C - NEGATIVE ACCELERATION DEVIATION
P1520-S/C - NEGATIVE ACCELERATION DEVIATION
P1520-S/C - POSITIVE ACCELERATION DEVIATION
P1520-S/C - SWITCH SIGNAL OUT OF RANGE
P1520-S/C - SWITCH SIGNAL PLAUSIBILITY

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1520-S/C - CAN MESSAGE PLAUSIBILITY.

POSSIBLE CAUSES
S/C SWITCH SUPPLY CIRCUIT SHORTED TO GROUND
SIGNAL CIRCUIT OPEN
SIGNAL CIRCUIT SHORTED TO GROUND
SIGNAL CIRCUIT SHORTED TO VOLTAGE
SWITCH SUPPLY CIRCUIT OPEN
INTERMITTENT CONDITION
S/C SWITCH
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle and activate the Speed Control. At some point during the test drive, move the S/C lever to all four positions for at least 5.0 seconds. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 13	All

P1520-S/C - CAN MESSAGE PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the S/C Switch harness connector. Turn the ignition on. Measure the voltage of the S/C Switch Supply circuit at the S/C Switch harness connector. Is the voltage above 10.0 volts? Yes → Go To 3 No → Go To 11	All
3	Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the state of the following switch. ″Cruise CTRL ACC″ **NOTE: Except for the Safety Contact switch, each switch state should change from OFF to ON ONLY when the S/C control lever is moved to the corresponding switch position.** **NOTE: The Safety Contact input should read OFF with the S/C switch at rest. If the S/C Switch Lever is moved to any of the other positions, the Safety Contact input should display ON.** While monitoring the DRB Inputs, move the S/C Switch Lever to the ″Accel″ position for 10 seconds. Did the Cruise CTRL ACC switch state change correctly as described? Yes → Go To 4 No → Go To 8	All
4	Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the state of the following switch. ″Cruise CTRL DEC″ **NOTE: Except for the Safety Contact switch, each switch state should change from OFF to ON ONLY when the S/C control lever is moved to the corresponding switch position.** **NOTE: The Safety Contact input should read OFF with the S/C switch at rest. If the S/C Switch Lever is moved to any of the other positions, the Safety Contact input should display ON.** While monitoring the DRB Inputs, move the S/C Switch Lever to the ″Decel″ position for 10 seconds. Did the Cruise CTRL DEC switch state change correctly as described? Yes → Go To 5 No → Go To 8	All
5	Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the state of the following switch. ″Cruise CTRL RES″ **NOTE: Except for the Safety Contact switch, each switch state should change from OFF to ON ONLY when the S/C control lever is moved to the corresponding switch position.** **NOTE: The Safety Contact input should read OFF with the S/C switch at rest. If the S/C Switch Lever is moved to any of the other positions, the Safety Contact input should display ON.** While monitoring the DRB Inputs, move the S/C Switch Lever to the ″Resume″ position for 10 seconds. Did the Cruise CTRL RES switch state change correctly as described? Yes → Go To 6 No → Go To 8	All

P1520-S/C - CAN MESSAGE PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
6	Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the state of the following switch. ″Safety Contact″ **NOTE: The Safety Contact input should read OFF with the S/C switch at rest. If the S/C Switch Lever is moved to any of the other positions, the Safety Contact input should display ON.** While monitoring the DRB Inputs, move the S/C Switch Lever to the each of the 4 positions for 10 seconds. Did the Safety Contact switch state change correctly as described? Yes → Go To 7 No → Go To 8	All
7	Turn the ignition on. With the DRBIII® in Inputs/Outputs, read the state of the following switch. ″Cruise CTRL OFF″ **NOTE: Except for the Safety Contact switch, each switch state should change from OFF to ON ONLY when the S/C control lever is moved to the corresponding switch position.** **NOTE: The Safety Contact input should read OFF with the S/C switch at rest. If the S/C Switch Lever is moved to any of the other positions, the Safety Contact input should display ON.** While monitoring the DRB Inputs, move the S/C Switch Lever to the ″OFF″ position for 10 seconds. Did the Cruise CTRL OFF switch state change correctly as described? Yes → Go To 13 No → Go To 8	All
8	**NOTE: The previous test identified a specific problem with one of the S/C Switch Signals. Perform the following tests on the circuit that indicated a problem.** Turn the ignition off. Disconnect the S/C Switch harness connector. Disconnect the ECM harness connectors. Turn the ignition on. Measure the voltage of the appropriate S/C Switch Signal circuit. Is the voltage above 1.0 volt? Yes → Repair the Appropriate Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All
9	Turn the ignition off. Disconnect the S/C Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance of the appropriate S/C Switch Signal circuit between the S/C Switch harness connector and the ECM harness connector. Is the resistance below 10.0 ohms? Yes → Go To 10 No → Repair the Appropriate Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P1520-S/C - CAN MESSAGE PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
10	Turn the ignition off. Disconnect the S/C Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the appropriate S/C Switch Signal circuit. Is the resistance above 1000 ohms? Yes → Replace the S/C Switch. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Appropriate Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
11	Turn the ignition off. Disconnect the S/C Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance of the S/C Switch Supply circuit between the ECM harness connector and the S/C Switch harness connector. Is the resistance below 10.0 ohms? Yes → Go To 12 No → Repair the S/C Switch Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
12	Turn the ignition off. Disconnect the S/C Switch harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the S/C Switch Supply circuit. Is the resistance above 1000.0 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the S/C Switch Supply circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
13	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1610-ENGINE CONTROL RELAY SHUTS OFF TOO EARLY

When Monitored and Set Condition:

P1610-ENGINE CONTROL RELAY SHUTS OFF TOO EARLY

When Monitored: During after-run.

Set Condition: The internal ECM timer determines that the Engine Control Relay has shut off before the AFTER-RUN mode of operation has been completed.

POSSIBLE CAUSES
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE ENGINE CONTROL RELAY
ENGINE CONTROL RELAY SIGNAL CIRCUIT OPEN INTERMITTENTLY
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, check for additional DTCs. Are other DTCs present? Yes → Refer to the Symptom List for diagnosis of the other DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 3 No → Go To 5	All

P1610-ENGINE CONTROL RELAY SHUTS OFF TOO EARLY — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute relay in place of the Engine Control Relay. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 4 No → Replace the Engine Control Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Remove the Engine Control Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance of the Engine Control Relay Signal circuit while wiggling the wiring harness and connectors between the ECM and the Fuse Block #1. Was the resistance above 10.0 ohms at any time while wiggling the wiring harness and connectors? Yes → Repair the Engine Control Relay Signal circuit for an intermittent open. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
5	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1610-ENGINE CONTROL RELAY SHUTS OFF TOO LATE

When Monitored and Set Condition:

P1610-ENGINE CONTROL RELAY SHUTS OFF TOO LATE

When Monitored: During after-run.

Set Condition: The internal ECM timer determines that the Engine Control Relay remains on for more than 2.0 seconds after the ECM has turned off the Engine Control Relay.

POSSIBLE CAUSES
CHECK FOR OTHER DTCS
INTERMITTENT CONDITION
SUBSTITUTE ENGINE CONTROL RELAY
ENGINE CONTROL RELAY SIGNAL CIRCUIT SHORTED TO GROUND INTERMITTENTLY
ENGINE CONTROL RELAY OUTPUT CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRB, check for additional DTCs. Are other DTCs present? Yes → Refer to the Symptom List for diagnosis of the other DTCs before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 3 No → Go To 6	All

P1610-ENGINE CONTROL RELAY SHUTS OFF TOO LATE — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Install a substitute relay in place of the Engine Control Relay. Perform several ignition key cycles, pausing for at least 10 seconds between each cycle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 4 No → Replace the Engine Control Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Remove the Engine Control Relay from the PDC. Disconnect the ECM harness connectors. Measure the resistance between ground and the Engine Control Relay Signal circuit while wiggling the wiring harness and connectors. Was the resistance below 10.0 ohms at any time while wiggling the wiring harness and connectors? Yes → Repair the Engine Control Relay Signal circuit for an intermittent short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	Turn the ignition off. Remove the Engine Control Relay from the PDC. Turn the ignition on. Measure the voltage of the Engine Control Relay Output circuit. Is the voltage below 0.5 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Engine Control Relay Output circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All

P1610-ENGINE CONTROL RELAY SHUTS OFF TOO LATE — Continued

TEST	ACTION	APPLICABILITY
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH

When Monitored and Set Condition:

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to voltage on the Sensor Reference Voltage A circuit or the APP Sensor, MAF Sensor or Engine Oil Sensor 5-volt Supply circuit.

POSSIBLE CAUSES
MAF SENSOR
VISUAL WIRING AND CONNECTOR INSPECTION
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE A SHORTED TO VOLTAGE
ENGINE CONTROL MODULE
MAF SENSOR SIGNAL CIRCUIT SHORTED TO MAF 12-VOLT SUPPLY CIRCUIT

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Start the engine. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 7	All

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the MAF, APP and Engine Oil Sensor harness connectors. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector in Fuse Block No.1. Turn the ignition on. Measure the voltage at ECM harness connector cavities 3-5, 3-19, 4-15 and 4-18. Is the voltage above 1.0 volt for any of the measurements? Yes → Repair the circuit(s) that measured above 1.0 volt for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the 12-volt Supply circuit and the MAF Signal circuit at the MAF Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the MAF Sensor Signal circuit for a short to the MAF 12-volt Supply circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 5 No → Replace the MAF Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. visually inspect the wiring and connectors associated with the MAF, APP and Engine oil Sensors for problems that may result in a short circuit. Were any problems found? Yes → Repair or replace wiring/connectors as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
7	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW

When Monitored and Set Condition:

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to ground on the Sensor Reference Voltage A circuit or a short to ground on the APP Sensor, MAF Sensor or Engine Oil Sensor 5-volt Supply circuit.

POSSIBLE CAUSES
APP SENSOR
ENGINE OIL SENSOR
MAF SENSOR
VISUAL WIRING AND CONNECTOR INSPECTION
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE A SHORTED TO GROUND
ACCEL PEDAL POSITION SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT
ENGINE CONTROL MODULE
ENGINE OIL SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT
MAF SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 11	All

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. visually inspect the wiring and connectors associated with the MAF, APP and Engine Oil Sensors for problems that may result in a short circuit. Were any problems found? Yes → Repair or replace wiring/connectors as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the MAF, APP and Engine Oil Sensor harness connectors. Disconnect the ECM harness connectors. Measure the resistance between ground and ECM harness connector cavities 3-5, 3-19, 4-15 and 4-18. Is the voltage below 1000 ohms for any of the measurements? Yes → Repair the circuit(s) that measured below 1000 ohms for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Engine Oil Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Engine Oil Sensor Signal circuit at the Engine Oil Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Engine Oil Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the MAF Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the MAF Sensor Signal circuit at the MAF Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the MAF Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the APP Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the 5-volt Supply circuit and each of the Sensor Ground circuits (APP Sensor cav 2 and 4) at the APP Sensor harness connector. Is the resistance above 1000 ohms for both measurements? Yes → Go To 7 No → Repair the APP Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the APP Sensor harness connector. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 8 No → Replace the APP Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the MAF Sensor harness connector. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 9 No → Replace the MAF Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the Engine Oil Sensor harness connector. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 10 No → Replace the Engine Oil Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
10	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P1611-SENSOR REFERENCE VOLTAGE A CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
11	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1612-IGNITION VOLTAGE - VOLTAGE ERROR

POSSIBLE CAUSES
CHECK THE ECM POWER AND GROUNDS
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 3	All
2	Refer to symptom Checking the ECM Power and Grounds. View repair. Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
3	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1615-ECM INTERNAL ERROR - SUPPLY VOLTAGE IS TOO HIGH
P1615-ECM VOLTAGE SUPPLY IS TOO LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1615-ECM INTERNAL ERROR - SUPPLY VOLTAGE IS TOO HIGH.

When Monitored and Set Condition:

P1615-ECM VOLTAGE SUPPLY IS TOO LOW

When Monitored: With the ignition on.

Set Condition: The ECM detects voltage below 8.0 volts on the ECM Battery Supply circuit(s).

POSSIBLE CAUSES
CHECKING ECM POWER AND GROUNDS
ECM
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. **NOTE: This DTC may be caused by a charging system problem. Refer to the Service Information and verify proper charging system operation before continuing.** Test drive the vehicle. Turn the ignition on. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 3	All

P1615-ECM INTERNAL ERROR - SUPPLY VOLTAGE IS TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Refer to the symptom list and perform the Checking the ECM Power and Ground test. Were any problem found with the ECM powers and grounds? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
3	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1617- ECM CODEWORD IS INCORRECT OR MISSING
P1617- ECM VERSION NUMBER MISSING

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1617- ECM CODEWORD IS INCORRECT OR MISSING.

POSSIBLE CAUSES
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: This DTC indicates that an error occurred during ECM programming.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Refer to the Service Information and attempt to reprogram the ECM. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1630-IMMOBILIZER MESSAGE MISSING

POSSIBLE CAUSES
SKREEM MODULE
VERIFY CAN SYSTEM RESISTANCE
VERIFY CAN SYSTEM VOLTAGE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Disconnect the SKREEM Module harness connectors. Measure the resistance between the CAN Bus (+) and the CAN Bus (-) circuits in the SKREEM Module harness connector. Is the resistance between 50 and 70 ohms? Yes → Go To 3 No → Repair the open, short to ground or faulty module in the CAN Bus system. Perform ROAD TEST VERIFICATION - VER-2.	All
3	Turn the ignition off. Disconnect the SKREEM Module harness connector. Turn the ignition on. Measure the voltage of both CAN Bus circuits in the SKREEM Module harness connector. Is the voltage between 2.2 volts and 2.8 volts for both measurements? Yes → Replace and program the SKREEM Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the open, short to ground, short to voltage or faulty module in the CAN Bus system. Perform ROAD TEST VERIFICATION - VER-2.	All

P1630-IMMOBILIZER MESSAGE MISSING — Continued

TEST	ACTION	APPLICABILITY
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P1661-CAPACITOR #1 CALCULATED VOLTAGE IS INCORRECT
P1661-CAPACITOR #1 READOUT TOO LARGE
P1661-CAPACITOR #1 READOUT TOO SMALL
P1661-CAPACITOR 1 VOLTAGE TOO HIGH
P1661-CAPACITOR 1 VOLTAGE TOO LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P1661-CAPACITOR #1 CALCULATED VOLTAGE IS INCORRECT.

POSSIBLE CAUSES
CHECKING FOR INJECTOR CODES
ENGINE CONTROL MODULE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII®, read the ECM DTCs. Does the DRB display any Injector Cylinder DTC? Yes → Repair Fuel Injector related DTC's before continuing. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 2	All
2	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates an internal ECM problem.** Turn the ignition on. With the DRBIII®, erase ECM DTCs. Perform several engine run cycles, turning the ignition off for at least 20 seconds between each engine run cycle. With the DRBIII®, read the ECM DTCs. Did this DTC set again? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P1661-CAPACITOR #1 CALCULATED VOLTAGE IS INCORRECT — Continued

TEST	ACTION	APPLICABILITY
3	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P1681-ACM CIRCUIT FAULT

POSSIBLE CAUSES
AIRBAG CONTROL MODULE
INTERMITTENT CONDITION
ACM SIGNAL CIRCUIT SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** With the DRB, check the Airbag Module for proper communication and DTCs. If there are any ACM DTCs, repair them prior to continuing this test. Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 4	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the ACM Signal circuit. Is the voltage below 1.0 volt? Yes → Replace the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P1681-ACM CIRCUIT FAULT — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Refer to the Service Information and disconnect the ACM harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay from the Fuse Block No.1 Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector in Fuse Block No.1.. Turn the ignition on. Measure the voltage of the ACM Signal circuit. Is the voltage below 1.0 volt? Yes → Replace and program the Airbag Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the ACM Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P2006-LOW FUEL PRESSURE SENSOR SIGNAL VOLTAGE TOO HI

POSSIBLE CAUSES
FUEL PRESSURE SENSOR
ECM - FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
ECM - LOW SIDE FUEL PRESSURE SENSOR SIGNAL OPEN
LOW SIDE FUEL PRESSURE SENSOR SIGNAL CIRCUIT OPEN
LOW SIDE FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
INTERMITTENT CONDITION
5-VOLT SUPPLY CIRCUIT OPEN
SENSOR GROUND CIRCUIT SHORTED TO VOLTAGE
LOW SIDE FUEL PRESSURE SENSOR
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Test drive the vehicle. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 11	All
2	Turn the ignition off. Disconnect the Low Fuel Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Low Fuel Pressure Sensor Signal circuit. Select the appropriate voltage reading. Voltage is above 5.5 volts. Go To 3 Voltage is between 4.7 and 5.4 volts. Go To 4 Voltage is below 4.7 volts. Go To 10	All

P2006-LOW FUEL PRESSURE SENSOR SIGNAL VOLTAGE TOO HI — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Low Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Low Fuel Pressure Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Low Side Fuel Pressure Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Low Side Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Go To 5 No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Low Side Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the 5-Volt Supply circuit. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the 5-volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Low Side Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Sensor Ground circuit at the Low Side Fuel Pressure Sensor and ECM harness connectors. Is the voltage below 1.0 volt at both connectors? Yes → Go To 7 No → Repair the Sensor Ground circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. **NOTE: If the Sensor Ground circuit had a short to voltage on it, the ECM could be damaged. Retest the Fuel Pressure Sensor circuit.**	All

P2006-LOW FUEL PRESSURE SENSOR SIGNAL VOLTAGE TOO HI — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Connect a jumper wire between the Fuel Pressure Sensor Signal circuit and the Sensor Ground circuit in the Fuel Pressure Sensor harness connector. Turn the ignition on and monitor the DRB for DTCs. Is DTC P0190 FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW present? Yes → Replace the Low Side Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All
8	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Connect a jumper wire between the Fuel Pressure Sensor Signal circuit and the Sensor Ground circuit in the Fuel Pressure Sensor harness connector. Turn the ignition on and monitor the DRB for DTCs. Is DTC P0190 FUEL PRESS SENSOR CIRCUIT MALF SIGNAL VOLTAGE TOO LOW present? Yes → Replace the Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 9	All
9	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Disconnect the Low Side Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance of the Low Side Fuel Pressure Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Replace the Engine Control Module in accordance with the Service Information. No → Repair the Low Side Fuel Pressure Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P2006-LOW FUEL PRESSURE SENSOR SIGNAL VOLTAGE TOO HI — Continued

TEST	ACTION	APPLICABILITY
11	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P2006-LOW SIDE FUEL PRESSURE SENSOR - SIGNAL VOLTAGE IS TOO LOW

POSSIBLE CAUSES
FUEL PRESSURE SENSOR
INTERMITTENT CONDITION
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
ECM - FUEL PRESSURE SENSOR SIGNAL SHORTED TO GROUND

TEST	ACTION	APPLICABILITY
1	**WARNING: THE FUEL INJECTION PUMP SUPPLIES HIGH-PRESSURE FUEL TO EACH INDIVIDUAL INJECTOR THROUGH HIGH-PRESSURE FUEL LINES. FUEL UNDER HIGH PRESSURE CAN PENETRATE SKIN AND CAUSE PERSONAL INJURY. WEAR SAFETY GOGGLES AND ADEQUATE PROTECTIVE CLOTHING.** **NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Cycle the ignition key on and off several times, leaving the key on for at least 10 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 6	All
2	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Turn the ignition on. Measure the voltage of the Fuel Pressure Sensor Signal circuit. Is the voltage between 4.7 and 5.3 volts? Yes → Replace the Fuel Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P2006-LOW SIDE FUEL PRESSURE SENSOR - SIGNAL VOLTAGE IS TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between ground and the Fuel Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 4 No → Repair the Fuel Pressure Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Fuel Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Fuel Pressure Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Fuel Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
6	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P2007-FUEL DELIVERY - MINIMUM PRESSURE NOT REACHED
P2007-FUEL DELIVERY PLAUSIBILITY
P2007-FUEL DELIVERY- FUEL FILTER RESTRICTION
P2007-FUEL DELIVERY- PRESSURE TOO LOW
P2008-FUEL PRESSURE - MEASUREMENT IS TOO HIGH
P2008-FUEL PRESSURE - MEASUREMENT IS TOO LOW

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P2007-FUEL DELIVERY - MINIMUM PRESSURE NOT REACHED.

POSSIBLE CAUSES
MECHANICAL FAILURE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** **NOTE: This DTC indicates that there is a mechanical fuel system problem.** Turn the ignition off. The following is a checklist to help determine the cause of this DTC. Check or replace the fuel filter. Inspect all fuel lines for damage or restriction that may prohibit proper fuel delivery. Inspect the fuel tank for damage. Were any problems found? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:
P2009-WATER LEVEL SENSOR - WATER IN FUEL

POSSIBLE CAUSES
12-VOLT SUPPLY CIRCUIT OPEN
ECM - ENGINE OIL SENSOR SIGNAL SHORT TO GROUND
ECM - WATER LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
SENSOR GROUND CIRCUIT OPEN
WATER LEVEL SENSOR FAILURE
WATER LEVEL SENSOR SIGNAL CIRCUIT OPEN
WATER LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO 12-VOLT SUPPLY
WATER LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO GROUND
WATER LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND
WATER LEVEL SENSOR SIGNAL CIRCUIT SHORTED TO VOLTAGE
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	**NOTE: If DTC P1611 or P2306 is present with this DTC, diagnose DTCs P1611 and P2306 before diagnosing this DTC.** **NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Start the engine several times, letting the engine run for at least 30 seconds at a time. With the DRB, read ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 10	All
2	Turn the ignition off. Disconnect the Water Level Sensor harness connector. Turn the ignition on. Measure the voltage of the Water Level Sensor Signal circuit. Select the appropriate voltage reading. Voltage is above 5.5 volts. Go To 3 Voltage is between 4.7 and 5.4 volts. Go To 5 Voltage is below 4.7 volts. Go To 7	All

P2009-WATER LEVEL SENSOR - WATER IN FUEL — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Water Level Sensor harness connector. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage of the Water Level Sensor Signal circuit. Is the voltage below 1.0 volt? Yes → Go To 4 No → Repair the Water Level Sensor Signal circuit for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the Water Level Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the 12-volt supply circuit and the Water Level Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Water Level Sensor Signal circuit for a short to the 12-volt Supply circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Water Level Sensor harness connector. Measure the resistance of the 12-Volt Supply circuit between the ECM harness connector and the Engine Oil Sensor harness connector. Is the resistance below 10.0 ohms? Yes → Go To 6 No → Repair the 12-Volt Supply circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Water Level Sensor harness connector. Measure the resistance of the Sensor Ground circuit. Is the resistance below 10.0 ohms? Yes → Replace the Water Level Sensor. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Sensor Ground circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

P2009-WATER LEVEL SENSOR - WATER IN FUEL — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Water Level Sensor harness connector. Measure the resistance of the Water Level Sensor Signal circuit. Is the resistance below 10.0 ohms? Yes → Go To 8 No → Repair the Water Level Sensor Signal circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
8	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Water Level Sensor harness connector. Measure the resistance between ground and the Water Level Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Go To 9 No → Repair the Water Level Sensor Signal circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2.	All
9	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the Water Level Sensor harness connector. Measure the resistance between Sensor Ground and the Water Level Sensor Signal circuit. Is the resistance above 1000 ohms? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Water Level Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
10	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running and at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P2200-INSTRUMENT CLUSTER - CAN ERROR
P2200-INSTRUMENT CLUSTER - GLOW LAMP FAULT

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P2200-INSTRUMENT CLUSTER - CAN ERROR.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
INSTRUMENT CLUSTER DTCS
VERIFY GLOW LAMP OPERATION
VERIFY INSTRUMENT CLUSTER COMMUNICATION
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII® attempt to communicate with the Instrument Cluster. **NOTE: If there are other DTCs set with this DTC, refer to the Symptom List and repair other stored ECM DTCs before diagnosing this DTC.** Is the Instrument Cluster communicating with the DRB? Yes → Go To 2 No → Refer to the appropriate symptom in the Body Diagnostic Information. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition on. With the DRBIII®, read the Instrument Cluster DTCs. Are there any Instrument Cluster DTCs? Yes → Refer to symptom list for problems related to Instrument Cluster. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	While turning the ignition on and off several times, observe the Glow Plug Indicator in the Instrument Cluster. Is the Glow Plug Indicator operating properly? Yes → Go To 4 No → Refer to symptom list for problems related to Glow Plug Lamp operation. Perform ROAD TEST VERIFICATION - VER-2.	All

P2200-INSTRUMENT CLUSTER - CAN ERROR — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Turn the ignition off then turn the ignition on and wait 60 seconds. With the DRBIII®, read the ECM DTCs. Does the DRB display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 5	All
5	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom List:

P2203-TORQUE REDUCTION MESSAGE FROM ABS - CAN PLAUSIBILITY
P2203-TORQUE REDUCTION MESSAGE FROM ABS - MESSAGE ERROR
P2203-TORQUE REDUCTION MESSAGE FROM ABS - MESSAGES MISSING
P2203-TORQUE REDUCTION MESSAGE FROM ABS - NO COMMUNIOCATION
P2203-TORQUE REDUCTION MESSAGE FROM ABS - PLAUSIBILITY #1
P2203-TORQUE REDUCTION MESSAGE FROM ABS PLAUSIBILITY #2

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P2203-TORQUE REDUCTION MESSAGE FROM ABS - CAN PLAUSIBILITY.

POSSIBLE CAUSES
CAB DTCS
ENGINE CONTROL MODULE
VERIFY CAB COMMUNICATION
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII® attempt to communicate with the CAB. **NOTE: If there are other DTCs set with this DTC, refer to the Symptom List and repair other stored ECM DTCs before diagnosing this DTC.** Is the CAB communicating with the DRB? Yes → Go To 2 No → Refer to the appropriate symptom in the Body Diagnostic Information.	All
2	Turn the ignition on. With the DRBIII®, read the CAB DTCs. Are there any CAB DTCs? Yes → Refer to symptom list for problems related to CAB. No → Go To 3	All

P2203-TORQUE REDUCTION MESSAGE FROM ABS - CAN PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Turn the ignition off then turn the ignition on and wait 60 seconds. With the DRBIII®, read the ECM DTCs. Does the DRB display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. No → Go To 4	All
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. No → Test Complete.	All

Symptom List:

P2204-TORQUE REDUCTION MESSAGE FROM TCM - CAN PLAUSIBILITY
P2204-TORQUE REDUCTION MESSAGE FROM TCM - ENGINE STOP
P2204-TORQUE REDUCTION MESSAGE FROM TCM - MESSAGE ERROR
P2204-TORQUE REDUCTION MESSAGE FROM TCM - MESSAGES MISSING
P2204-TORQUE REDUCTION MESSAGE FROM TCM - PLAUSIBILITY
P2204-TORQUE REDUCTION MESSAGE FROM TCM - TCM DTC #1
P2204-TORQUE REDUCTION MESSAGE FROM TCM - TCM DTC #2

Test Note: All symptoms listed above are diagnosed using the same tests. The title for the tests will be P2204-TORQUE REDUCTION MESSAGE FROM TCM - CAN PLAUSIBILITY.

POSSIBLE CAUSES
ENGINE CONTROL MODULE
TCM DTCS
VERIFY TCM COMMUNICATION
INTERMITTENT CONDITION

TEST	ACTION	APPLICABILITY
1	Turn the ignition on. With the DRBIII® attempt to communicate with the TCM. **NOTE: If there are other DTCs set with this DTC, refer to the Symptom List and repair other stored ECM DTCs before diagnosing this DTC.** Is the TCM communicating with the DRB? Yes → Go To 2 No → Refer to the appropriate symptom in the Body Diagnostic Information.	All
2	Turn the ignition on. With the DRBIII®, read the TCM DTCs. Are there any TCM DTCs? Yes → Refer to symptom list for problems related to TCM. No → Go To 3	All

P2204-TORQUE REDUCTION MESSAGE FROM TCM - CAN PLAUSIBILITY — Continued

TEST	ACTION	APPLICABILITY
3	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRBIII®, erase the ECM DTCs. Turn the ignition off then turn the ignition on and wait 60 seconds. With the DRBIII®, read the ECM DTCs. Does the DRB display this DTC? Yes → Replace and program the Engine Control Module in accordance with the Service Information. No → Go To 4	All
4	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. No → Test Complete.	All

Symptom:

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH

When Monitored and Set Condition:

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to voltage on the Sensor Reference Voltage B circuit or the Boost Pressure Sensor or the Fuel Pressure Sensor (high-side) 5-Volt Supply circuit.

POSSIBLE CAUSES
BOOST PRESSURE SENSOR
FUEL PRESSURE SENSOR (HIGH-SIDE)
VISUAL WIRING AND CONNECTOR INSPECTION
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE B SHORTED TO VOLTAGE
ENGINE CONTROL MODULE

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 7	All

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
2	Turn the ignition off. Disconnect the Boost Pressure and Fuel Pressure Sensor (high-side) harness connectors. Disconnect the ECM harness connectors. Remove the Engine Control Relay. Connect a jumper wire between cavity 30 and cavity 87 of the Engine Control Relay connector. Turn the ignition on. Measure the voltage at ECM harness connector cavities C3-17 and C4-13. Is the voltage above 1.0 volt for any of the measurements? Yes → Repair the circuit(s) that measured above 1.0 volt for a short to voltage. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All
3	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 4 No → Replace the Boost Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off. Disconnect the Fuel Pressure Sensor (high-side) harness connector. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 5 No → Replace the Fuel Pressure Sensor (high-side) Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Visually inspect the wiring and connectors associated with the Boost Pressure and Fuel Pressure (high-side) Sensors for problems that may result in a short circuit. Were any problems found? Yes → Repair or replace wiring/connectors as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 6	All
6	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO HIGH — Continued

TEST	ACTION	APPLICABILITY
7	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW

When Monitored and Set Condition:

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW

When Monitored: With the ignition on.

Set Condition: The ECM detects a short to ground on the Sensor Reference Voltage B circuit, or a short to ground on the Boost Pressure Sensor or the Fuel Pressure Sensor (high-side) 5-Volt Supply circuit.

POSSIBLE CAUSES
BOOST PRESSURE SENSOR
FUEL PRESSURE SENSOR (HIGH-SIDE)
VISUAL WIRING AND CONNECTOR INSPECTION
INTERMITTENT CONDITION
SENSOR REFERENCE VOLTAGE B SHORTED TO GROUND
BOOST PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT
ENGINE CONTROL MODULE
FUEL PRESSURE SENSOR SIGNAL CIRCUIT SHORTED TO SENSOR GROUND CIRCUIT

TEST	ACTION	APPLICABILITY
1	**NOTE: If the ECM detects and stores a DTC, the ECM also stores the engine/vehicle operating conditions under which the DTC was set. Some of these conditions are displayed on the DRB at the same time the DTC is displayed.** **NOTE: Before erasing stored DTCs, record these conditions. Attempting to duplicate these conditions may assist when checking for an active DTC.** Turn the ignition on. With the DRB, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. Monitor the DRB for ECM DTCs. Did this DTC set again? Yes → Go To 2 No → Go To 9	All
2	Turn the ignition off. Visually inspect the wiring and connectors associated with the Fuel Pressure (high-side) and Boost Pressure Sensors for problems that may result in a short circuit. Were any problems found? Yes → Repair or replace wiring/connectors as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 3	All

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the Fuel Pressure (high-side) Pressure and Boost Pressure Sensor harness connectors. Disconnect the ECM harness connectors. Measure the resistance between ground and ECM harness connector cavities C3-17 and C4-13. Is the voltage below 1000 ohms for any of the measurements? Yes → Repair the circuit(s) that measured below 1000 ohms for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 4	All
4	Turn the ignition off. Disconnect the Fuel Pressure Sensor (high-side) harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Fuel Pressure Sensor (high-side) Signal circuit at the Fuel Pressure Sensor (high-side) harness connector. Is the resistance above 1000 ohms? Yes → Go To 5 No → Repair the Fuel Pressure Sensor (high-side) Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Disconnect the ECM harness connectors. Measure the resistance between the Sensor Ground circuit and the Water Level Sensor Signal circuit at the Boost Pressure Sensor harness connector. Is the resistance above 1000 ohms? Yes → Go To 6 No → Repair the Boost Pressure Sensor Signal circuit for a short to the Sensor Ground circuit. Perform ROAD TEST VERIFICATION - VER-2.	All
6	Turn the ignition off. Disconnect the Boost Pressure Sensor harness connector. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 7 No → Replace the Boost Pressure Sensor. Perform ROAD TEST VERIFICATION - VER-2.	All

P2306-SENSOR REFERENCE VOLTAGE B CKT VOLTAGE TOO LOW — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the Fuel Pressure Sensor (high-side) harness connector. Turn the ignition on. With the DRBIII®, erase ECM DTCs. Turn the ignition off for 10 seconds. Turn the ignition on. With the DRBIII®, read ECM DTCs. Does the DRB display this DTC? Yes → Go To 8 No → Replace the Fuel Pressure Sensor (high-side). Perform ROAD TEST VERIFICATION - VER-2.	All
8	If there are no possible causes remaining, view repair. Repair Replace and program the Engine Control Module in accordance with the Service Information. Perform ROAD TEST VERIFICATION - VER-2.	All
9	**WARNING: WHEN THE ENGINE IS OPERATING, DO NOT STAND IN A DIRECT LINE WITH THE FAN. DO NOT PUT YOUR HANDS NEAR THE PULLEYS, BELTS OR FAN. DO NOT WEAR LOOSE CLOTHING.** **NOTE: The conditions that set the DTC are not present at this time. The following list may help in identifying the intermittent condition.** With the engine running at normal operating temperature, monitor the DRB parameters related to the DTC while wiggling the wiring harness. Look for parameter values to change and/or a DTC to set. Review the DTC When Monitored and Set Conditions. If possible, try to duplicate the conditions under which the DTC was set. Refer to any Technical Service Bulletins (TSB) that may apply. Visually inspect the related wiring harness. Look for any chafed, pierced, pinched, or partially broken wires. Visually inspect the related wiring harness connectors. Look for broken, bent, pushed out, or corroded terminals. Were any of the above conditions present? Yes → Repair as necessary. Perform ROAD TEST VERIFICATION - VER-2. No → Test Complete.	All

Symptom:

***CHECKING THE POWER AND GROUNDS**

POSSIBLE CAUSES
CHECKING THE ENGINE CONTROL RELAY SYSTEM
ECM GROUND CIRCUIT(S) OPEN
ECM OUTPUT SHORTED - FUSE 16
ECM OUTPUT SHORTED - FUSE 17
EGR VALVE/CRANKCASE HEATER
ENGINE CONTROL RELAY
ENGINE CONTROL RELAY B+ SUPPLY
ENGINE CONTROL RELAY OUTPUT CIRCUIT(S) OPEN
ENGINE CONTROL RELAY OUTPUT CKT SHORTED TO GROUND FUSE #16
ENGINE CONTROL RELAY OUTPUT CKT SHORTED TO GROUND FUSE #17
ENGINE CONTROL RELAY SIGNAL CIRCUIT OPEN
FUSE BLOCK NO.1
IGNITION SWITCH START OUTPUT CIRCUIT OPEN
IGNITION SWITCH START/RUN OUTPUT CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	**NOTE: Ensure Fuse 16 and Fuse 17 in Fuse Block No. 1 are O.K. before continuing. If Fuse 16 is open, go to Test #9. If Fuse 17 is open, go to Test #5.** Turn the ignition off. Disconnect the ECM harness connectors. Using a 12-volt test light connected to 12-volts, check each of the ECM ground circuits in ECM harness connector C1 cavities 4, 5 and 6. Did the test light illuminate brightly for each cavity? Yes → Go To 2 No → Repair the ECM Ground circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
2	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition switch to the Start position. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit in ECM C3 harness connector cavity 20. Does the test light illuminate brightly? Yes → Go To 3 No → Repair the Ignition Switch Start Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

*CHECKING THE POWER AND GROUNDS — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition switch to the Start position. Using a 12-volt test light connected to ground, check the Fused Ignition Switch Output circuit in ECM C2 harness connector cavity 13. Repeat the previous step with the ignition switch in the Run position. Does the test light illuminate brightly in the Start and Run positions? Yes → Go To 4 No → Repair the Ignition Switch Start/Run Output circuit for an open. Perform ROAD TEST VERIFICATION - VER-2.	All
4	Turn the ignition off. Disconnect the ECM harness connectors. Turn the ignition on. Measure the voltage of the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Is the voltage above 10.0 volts? Yes → Go To 5 No → Repair the Engine Control Relay Signal circuit for an open or short to ground between the ECM and Fuse Block No. 1. If the circuit is not open or shorted to ground, replace Fuse Block No.1. Perform ROAD TEST VERIFICATION - VER-2.	All
5	Turn the ignition off. Remove and inspect Fuse #17 from Fuse Block No.1. Is the fuse open? Yes → Go To 6 No → Go To 10	All
6	Install a good fuse in place of Fuse #17 in Fuse Block No. 1. The following is a list of components and circuits that can cause an open circuit in Fuse #17 in Fuse Block No.1. Use the Service Information Wiring Diagrams and check these circuits/components for shorts. Crankcase Heater and related circuits. EGR Valve Solenoid and related circuits. Boost Pressure Solenoid and related circuits. Fuel Shutdown Solenoid and related circuits. Speed Control Switch and related circuits. Mass Air Flow Sensor and related circuits. Test drive the vehicle. Turn the ignition off. Remove and inspect Fuse #17 from Fuse Block No.1 Is the fuse open? Yes → Go To 7 No → Go To 10	All

*CHECKING THE POWER AND GROUNDS — Continued

TEST	ACTION	APPLICABILITY
7	Turn the ignition off. Disconnect the ECM harness connectors. Disconnect the EGR Valve harness connector. Disconnect the Crankcase Heater harness connector. Install a good fuse in place of Fuse #17 in Fuse Block No.1 Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Turn the ignition on. Remove and inspect Fuse #17 in Fuse Block No. 1. Is the fuse open? Yes → Repair the Engine Control relay Output circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 8	All
8	**NOTE: Ensure that the ECM harness is not disconnected and Fuse #17 is not open.** Turn the ignition off. Disconnect the EGR Valve harness connector. Disconnect the Crankcase Heater harness connector. Test drive the vehicle. Turn the ignition off. Remove and inspect Fuse #17 in Fuse Block No.1 Is the fuse open? Yes → Go To 9 No → Replace the shorted EGR Valve or Crankcase Heater as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
9	**NOTE: Several ECM output circuits/ solenoids that can cause Fuse #17 to fail. These circuits/components must be checked in order to prevent incorrect ECM replacement.** The following is a list of components and circuits that can cause Fuse #17 in Fuse Block No.1 to fail. Use the Service Information Wiring Diagrams and check these circuits/components for shorts. Boost Pressure Solenoid and related circuits. Fuel Shutdown Solenoid and related circuits. Speed Control Switch and related circuits. Mass Air Flow Sensor and related circuits. View repair. Yes → Repair or replace shorted circuit/component as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
10	Turn the ignition off. Remove and inspect Fuse #16 from Fuse Block No.1 Is the fuse open? Yes → Go To 11 No → Go To 13	All

*CHECKING THE POWER AND GROUNDS — Continued

TEST	ACTION	APPLICABILITY
11	Turn the ignition off. Disconnect the ECM harness connectors. Install a good fuse in place of Fuse #16 in Fuse Block No.1 Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Remove and inspect Fuse #16 from Fuse Block No.1. Is the fuse open? Yes → Repair the Engine Control relay Output circuit for a short to ground. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 12	All
12	**NOTE: Several ECM output circuits/ solenoids that can cause Fuse #17 to fail. These circuits/components must be checked in order to prevent incorrect ECM replacement.** The following is a list of components and circuits that can cause Fuse #16 in Fuse Block No.1 to fail. Use the Service Information Wiring Diagrams and check these circuits/components for shorts. Fuel Pressure Solenoid and related circuits. Starter Relay and related circuits. Fuel Injectors and related circuits. View repair. Yes → Repair or replace shorted circuit/component as necessary. Perform ROAD TEST VERIFICATION - VER-2.	All
13	Turn the ignition off. Disconnect the ECM harness connectors. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1,7 and 8. Choose the appropriate result. Test light is on for all circuits. Test Complete. Test light is on for 1 or 2 circuits Repair the Engine Control Relay Output circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2. Light off for all circuits. Go To 14	All
14	Turn the ignition off. Substitute the Engine Control Relay with a known good relay. Disconnect the ECM harness connectors. Connect a jumper wire between ground and the Engine Control Relay Signal circuit in ECM C3 harness connector cavity 46. Turn the ignition on. Using a 12-volt test light connected to ground, check the Fused Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1,7 and 8. Does the test light illuminate brightly? Yes → Replace the initial Engine Control Relay. Perform ROAD TEST VERIFICATION - VER-2. No → Go To 15	All

*CHECKING THE POWER AND GROUNDS — Continued

TEST	ACTION	APPLICABILITY
15	Turn the ignition off. Remove the Engine Control Relay from Fuse Block No.1 Using a 12-volt test light connected to ground, check both Battery (+) circuits at the Engine Control Relay connector in Fuse Block No.1 Does the test light illuminate brightly for each circuit? Yes → Go To 16 No → Repair the Battery (+) Supply circuits to the Engine Control Relay. Perform ROAD TEST VERIFICATION - VER-2.	All
16	Turn the ignition off. Remove the Engine Control Relay from Fuse Block No.1 Disconnect the ECM harness connectors. Connect a jumper wire between Engine Control Relay connector cavities 30 and 87. Using a 12-volt test light connected to ground, check the Engine Control Relay Output circuits at the ECM C1 harness connector cavities 1, 7 and 8. Does the test light illuminate brightly for each circuit? Yes → Replace Fuse Block No. 1. Perform ROAD TEST VERIFICATION - VER-2. No → Repair the Engine Control Relay Output circuit(s) for an open. Perform ROAD TEST VERIFICATION - VER-2.	All

Symptom:

*ENGINE CRANKS BUT WILL NOT START

POSSIBLE CAUSES
CAMSHAFT POSITION SENSOR SIGNAL PROBLEM
CRANKSHAFT POSITION SENSOR SIGNAL PROBLEM
ECM CODES PRESENT
ECT SENSOR
ENGINE CONTROL MODULE
ENGINE DRIVE GEAR/SPROCKET
FUEL SUPPLY CONTAMINATION
FUEL SYSTEM PRESSURE MECHANICAL
FUEL SYSTEM RESTRICTION
GLOW PLUGS
SKIM CODES PRESENT

TEST	ACTION	APPLICABILITY
1	**NOTE: The ECM must have proper power and ground connections for the following tests to be valid. Refer to Checking the ECM Power and Grounds in the symptom list.** Turn the ignition on. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display any ECM DTCs? Yes → Refer to symptom list for problems related to ECM DTC. Perform NO START VERIFICATION - VER-1. No → Go To 2	All
2	Turn the ignition on. With the DRBIII®, read the SKREEM DTCs. Does the DRBIII® display any SKREEM DTCs? Yes → Refer to symptom list for problems related to SKIM DTC. Perform NO START VERIFICATION - VER-1. No → Go To 3	All
3	Using a temperature probe, check the vehicle temperature near the ECT Sensor. Turn the ignition on. With the DRBIII® in Sensors, read the ECT Sensor temperature. Compare the temperature probe reading with the DRBIII® reading. Are the two readings within 10°C of each other? Yes → Go To 4 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All

*ENGINE CRANKS BUT WILL NOT START — Continued

TEST	ACTION	APPLICABILITY
4	**NOTE: Prior to performing this test, be sure to check the Glow Plug Relay operation. Refer to CHECKING GLOW PLUG OPERATION for the related symptom(s).** Refer to the Service Information and check the Glow Plugs for proper operation. Are the Glow Plugs operating properly? Yes → Go To 5 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
5	Inspect the fuel system lines for restrictions, leaks or other problems. Is there any evidence of problems? Yes → Repair as necessary. Perform NO START VERIFICATION - VER-1. No → Go To 6	All
6	Refer to the Service Information and perform the fuel pressure test. Is the fuel pressure within specification? Yes → Go To 7 No → Repair as necessary. Perform NO START VERIFICATION - VER-1.	All
7	Inspect the fuel supply for contamination. Is the fuel contaminated? Yes → Check the fuel supply for contamination. Perform NO START VERIFICATION - VER-1. No → Go To 8	All
8	Turn the ignition off. Using the DRBIII® lab scope, backprobe the CMP Sensor Signal circuit at the ECM harness connector. Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRBIII®. **NOTE: Refer to Charts and Graphs to view a correct CMP Sensor signal.** Does the DRBIII® display a steady clean CMP Signal pattern? Yes → Go To 9 No → Perform Test for DTC P1354-Camshaft Position Sensor Circuit Static Plausibility. Perform NO START VERIFICATION - VER-1.	All
9	Turn the ignition off. Using the DRBIII® lab scope, backprobe both of the CKP Sensor Signal circuits at the ECM harness connector. **NOTE: Refer to Charts and Graphs to view a correct CKP Sensor signal.** Start the engine, if the engine will not start, crank the engine for several seconds while monitoring the DRBIII®. Does the DRBIII® display a steady clean CKP Signal pattern for each circuit? Yes → Go To 10 No → Perform Test for DTC P1354-Crankshaft Position Sensor Circuit Dynamic Plausibility. Perform NO START VERIFICATION - VER-1.	All

*ENGINE CRANKS BUT WILL NOT START — Continued

TEST	ACTION	APPLICABILITY
10	Refer to the Service Information to ensure the Engine Drive Gears/Sprocket are installed correctly and the camshaft and crankshaft gears are timed correctly. Were any problems found? Yes → Repair as necessary. Perform NO START VERIFICATION - VER-1. No → Replace and program the Engine Control Module in accordance with the Service Information. Perform NO START VERIFICATION - VER-1.	All

Symptom:

*ENGINE WILL NOT CRANK

POSSIBLE CAUSES
BATTERY CABLE HIGH RESISTANCE
BATTERY CABLES
CHECKING ECM POWER AND GROUNDS
CHECKING FOR TCM CODES
ECM
ECM CODES PRESENT
IGNITION SWITCH OUTPUT (START) CIRCUIT OPEN
MECHANICAL PROBLEM
SKIM CODES PRESENT
STARTER MOTOR
STARTER MOTOR RELAY
STARTER MOTOR RELAY CIRCUIT(S) OPEN
STARTER MOTOR RELAY CIRCUIT(S) SHORTED TO GROUND
STARTER RELAY CONTROL CIRCUIT SHORTED TO VOLTAGE
STARTER RELAY OUTPUT CIRCUIT OPEN

TEST	ACTION	APPLICABILITY
1	Turn the ignition off. **NOTE: The battery must be fully charged before diagnosing a no crank condition.** Inspect the battery cables for corrosion, looseness or other problems. Is there evidence of problems? Yes → Repair as necessary. Perform NO START VERIFICATION - VER-1. No → Go To 2	All
2	Turn the ignition off. Remove the Starter Motor Relay from the Fuse/Relay Block. Connect a test light between cavities 85 and 86 of the Starter Motor Relay connector in the Fuse/Relay Block connector. While observing the test light, attempt to start the engine. Did the test light illuminate when turning the ignition switch to the Crank position? Yes → Go To 3 No → Go To 8	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
3	Turn the ignition off. Remove the Starter Motor Relay from the Fuse/Relay Block. Using a 12-volt test light connected to ground, check the Ignition Switch Output (Start) circuit in the Starter Motor Relay connector in the Fuse/Relay Block while turning the ignition to the Crank/Start position. Did the test light illuminate while turning the ignition to the Crank/Start position? Yes → Go To 4 No → Repair the Ignition Switch Output (Start) circuit for an open. Perform NO START VERIFICATION - VER-1.	All
4	Turn the ignition off. Remove the Starter Motor Relay from the Fuse/Relay Block. Install a substitute relay in place of the Starter Motor Relay. Attempt to start the engine. Does the engine crank? Yes → Replace the Starter Motor Relay. Perform NO START VERIFICATION - VER-1. No → Go To 5	All
5	Turn the ignition off. Remove the Starter Motor Relay from the Fuse/Relay Block. Disconnect the Starter Motor Relay Output wire from the Starter Solenoid. Connect the Starter Motor Relay Output wire (at the Starter) to ground. Using a 12-volt test light connected to 12-volts, check the Starter Motor Relay Output circuit at the Starter Motor Relay connector in the Fuse/Relay Block. Does the test light illuminate brightly? Yes → Go To 6 No → Repair the Starter Relay Output circuit for an open. Perform NO START VERIFICATION - VER-1.	All
6	Using the Service Information, check the battery cables for high resistance. Did either battery cable have a voltage drop greater than 0.2 volts? Yes → Replace the battery cable(s). Perform NO START VERIFICATION - VER-1. No → Go To 7	All
7	Turn the ignition off. Attempt to manually rotate the crankshaft 360°. Is the crankshaft able to rotate 360°? Yes → Replace the Starter Motor. Perform NO START VERIFICATION - VER-1. No → Repair the engine mechanical problem. Perform NO START VERIFICATION - VER-1.	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
8	**NOTE: The ECM must have proper power and ground connections for the following tests to be valid. Refer to Checking the ECM Power and Grounds in the symptom list.** Turn the ignition on. With the DRBIII®, read the ECM DTCs. Does the DRBIII® display any ECM DTCs? Yes → Refer to symptom list for problems related to ECM DTC. Perform NO START VERIFICATION - VER-1. No → Go To 9	All
9	Turn the ignition on. With the DRBIII®, read the SKIM DTCs. Does the DRBIII® display any SKIM DTCs? Yes → Refer to symptom list for problems related to SKIM. Perform NO START VERIFICATION - VER-1. No → Go To 10	All
10	Turn the ignition on. With the DRBIII®, read the TCM DTCs. Does the DRBIII® display any TCM DTCs? Yes → Refer to symptom list for problems related to TCM. Perform NO START VERIFICATION - VER-1. No → Go To 11	All
11	Perform the Checking the ECM Power and Grounds test. Were any problems found? Yes → Repair as necessary. Perform NO START VERIFICATION - VER-1. No → Go To 12	All
12	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Starter Motor Relay from the Fuse/Relay Block Remove the Engine Control Relay from the Fuse Block No.1. Using a jumper wire, connect Engine Control Relay connector cavities 30 and 87 in the Fuse Block No.1. Turn the ignition on. Measure the voltage of the Starter Motor Relay Control circuit. Is the voltage above 1.0 volt? Yes → Repair the Starter Relay Control circuit for a short to voltage. Perform NO START VERIFICATION - VER-1. No → Go To 13	All

*ENGINE WILL NOT CRANK — Continued

TEST	ACTION	APPLICABILITY
13	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Starter Motor Relay from the Fuse/Relay Block. Measure the resistance of the Starter Motor Relay Control circuit between the ECM harness connector and the Fuse/Relay Block connector. Measure the resistance of the Starter Motor Relay 12-volt Supply circuit between the ECM harness connector and the Fuse/Relay Block connector. Is the resistance below 10.0 ohms for each measurement? Yes → Go To 14 No → Repair the Starter Motor Relay circuit(s) for an open. Perform NO START VERIFICATION - VER-1.	All
14	Turn the ignition off. Disconnect the ECM harness connectors. Remove the Starter Motor Relay from the Fuse/Relay Block. Measure the resistance between ground and the Starter Motor Relay Control circuit at the Fuse/Relay Block connector. Measure the resistance between ground and the Starter Motor Relay 12-volt Supply circuit at the Fuse/Relay Block connector. Is the resistance below 10.0 ohms for each measurement? Yes → Replace and program the Engine Control Module in accordance with the Service Information. Perform NO START VERIFICATION - VER-1. No → Repair the Starter Motor Relay circuit(s) for a short to ground. Perform NO START VERIFICATION - VER-1.	All

Verification Tests

BODY VERIFICATION TEST - VER 1	APPLICABILITY
1. Disconnect all jumper wires and reconnect all previously disconnected components and connectors. 2. Ensure that all accessories are turned off and the battery is fully charged. **3. NOTE: Refer to the service information for proper programming procedures if the ABM; ACM; ATC; CTM; ECM; IC; SKREEM; SLA; or SSM was replaced.** 4. If the SKREEM was replaced, program all RKE transmitters used with this vehicle. **5. NOTE: Perform the next 8 steps of this procedure if either diagnosing the Automatic Temperature Control (ATC) system or if repairs were made to the ATC system. All of the following criteria must be met in order to successfully run the ATC Function Test.** 6. With DRBIII®, record and erase ATC DTCs. 7. Place the shift lever in Park. 8. Start the engine. Allow the engine to reach normal operating temperature. 9. Set the blower to high speed. 10. Press the Air Conditioning switch On. 11. With the DRBIII®, verify that the ambient temperature is above 59°F (15°C), the refrigerant pressure is between 29 and 348 PSI (2 and 24 bar), the evaporator temperature is above 36.5°F (2.5°C), and the coolant temperature is above 158°F (70°C). 12. With the DRBIII® in ATC, select System Tests and select ATC Function Test. When the ATC Function Test is complete, proceed to the next step of this procedure. 13. With the DRBIII®, read active ATC DTCs. If any DTC is active or if the original condition is still present, proceed to the conclusion question and answer Yes. 14. With the DRBIII®, record and erase all DTCs from ALL modules. Start and run the engine for 2 minutes. Operate all functions of the system that caused the original concern. 15. Turn the ignition off and wait 5 seconds. Turn the ignition on and using the DRBIII®, read DTCs from ALL modules. Are any DTC's present or is the original condition still present? Yes → Repair is not complete, refer to the appropriate symptom. No → Repair is complete.	All

NO START VERIFICATION - VER-1	APPLICABILITY
1. NOTE: IMPORTANT! If the Engine Control Module or Sentry Key Immobilizer Module has been replaced, ensure the programming procedure for the module has been performed in accordance with the Service Information. 2. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 3. Inspect the engine oil for contamination. If it is contaminated, change the oil and filter. 4. With the DRB, erase all diagnostic trouble codes (DTCs). 5. Turn the ignition off for at least 10 seconds. 6. Attempt to start the engine. 7. If the engine is unable to start, look for any Technical Service Bulletins (TSBs) that may relate to this condition. Return to the Symptom List if necessary. 8. If the engine starts and continues to run, the repair is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

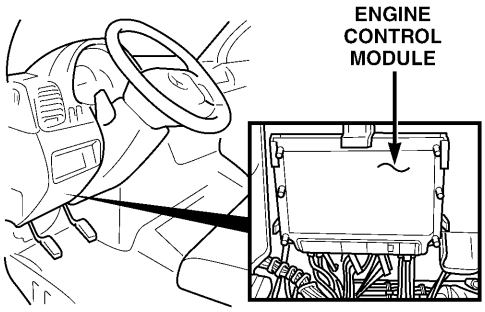
Verification Tests — Continued

ROAD TEST VERIFICATION - VER-2	APPLICABILITY
1. Inspect the vehicle to ensure that all engine components are properly installed and connected. Reassemble and reconnect components as necessary. 2. If this verification procedure is being performed after a non-DTC test, perform steps 3 and 4. 3. Check to see if the initial symptom still exists. If there are no trouble codes and the symptom no longer exists, the repair was successful and testing is now complete. 4. If the initial or another symptom exists, the repair is not complete. Check all pertinent Technical Service Bulletins (TSBs) and return to the Symptom List if necessary. 5. For previously read DTCs that have not been dealt with, return to the Symptom List and follow the diagnostic path for that DTC; otherwise, continue. 6. If the Engine Control Module (ECM) has not been changed, perform steps 7 and 8, otherwise, continue with step 9. 7. With the DRB III®, erase all diagnostic trouble codes (DTCs), then disconnect the DRB III®. 8. Turn the ignition off for at least 10 seconds. 9. If equipped with a Transfer Case Position Switch, perform step 10, otherwise, continue with step 11. 10. With the ignition switch on, place the Transfer Case Shift Lever in each gear position, stopping for 15 seconds in each position. 11. Ensure no DTCs remain by performing steps 12 through 15. 12. Road test the vehicle. For some of the road test, go at least 64 km/h (40 MPH). If this test is for an A/C Relay Control Circuit, drive the vehicle for at least 5 minutes with the A/C on. 13. At some point, stop the vehicle and turn the engine off for at least 10 seconds, then restart the engine and continue. 14. Upon completion of the road test, turn the engine off and check for DTCs with the DRB III®. 15. If the repaired DTC has set again, the repair is not complete. Check for any pertinent Technical Service Bulletins (TSBs) and return to the Symptom List. If there are no DTCs, the repair was successful and is now complete. Are any DTCs or symptoms remaining? Yes → Repair is not complete, refer to appropriate symptom. No → Repair is complete.	All

NOTES

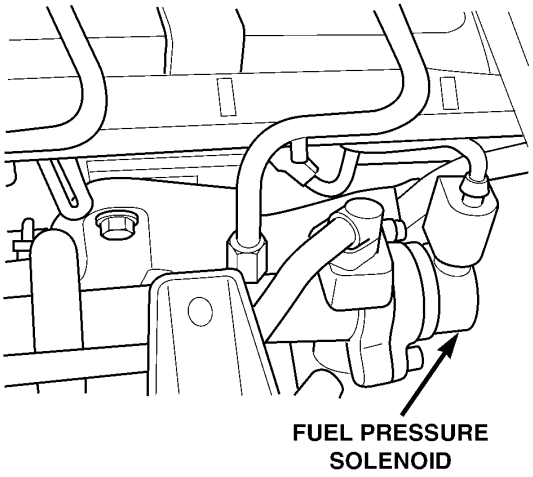
8.0 COMPONENT LOCATIONS

8.1 CONTROL MODULES

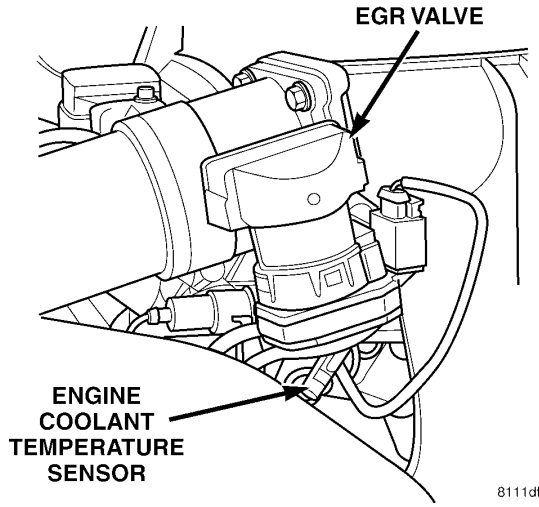


8111ddc8

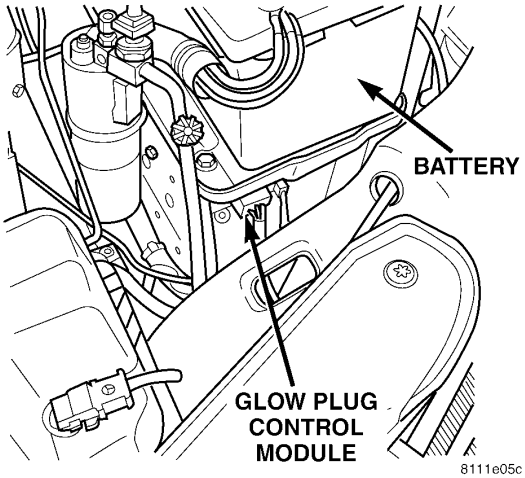
8.2 CONTROLS AND SOLENOIDS



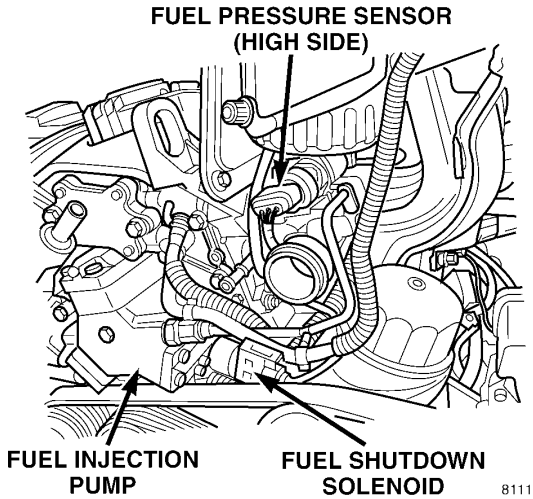
8111deac



8111df16

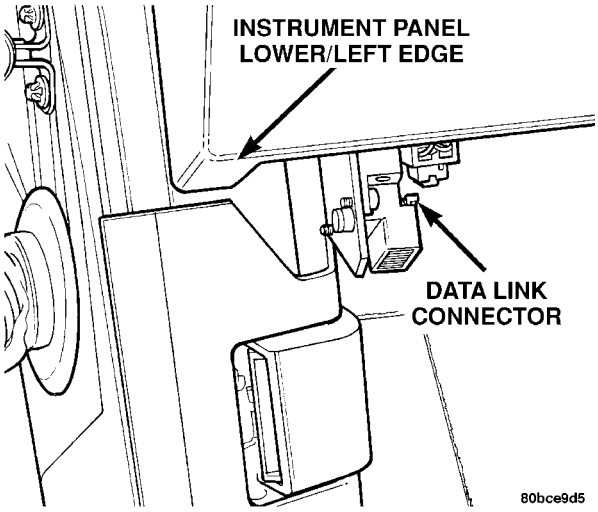


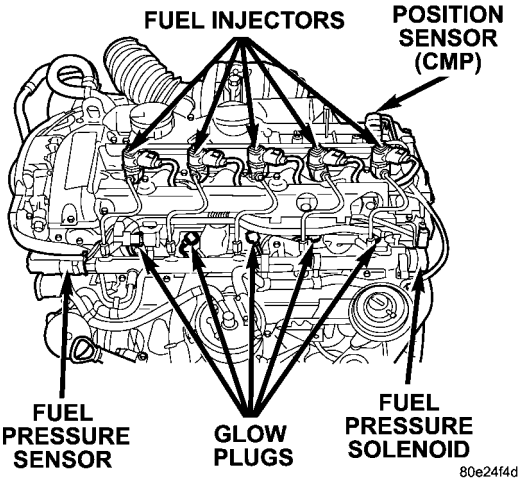
8111e05c



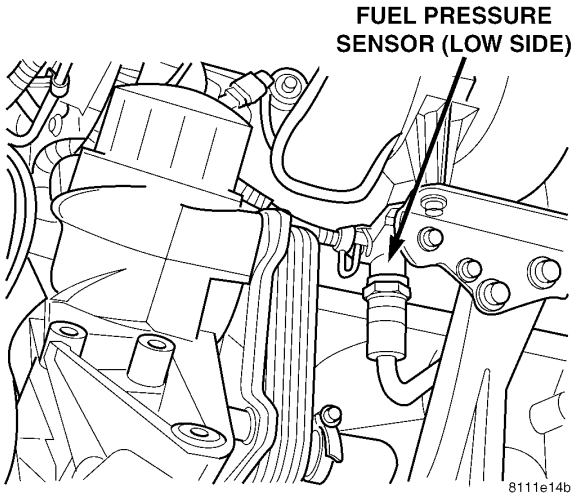
8111e0d1

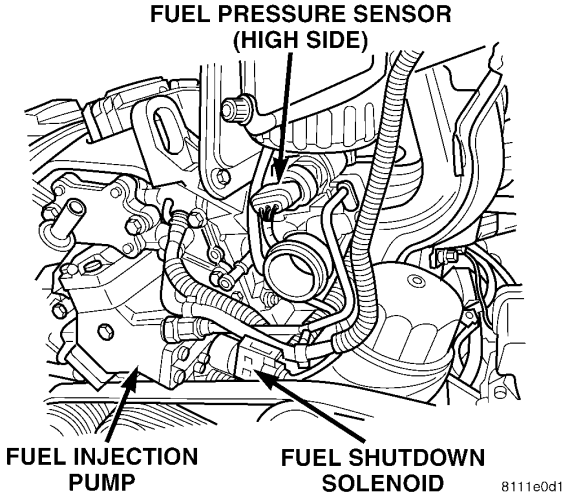
8.2 CONTROLS AND SOLENOIDS (Continued)

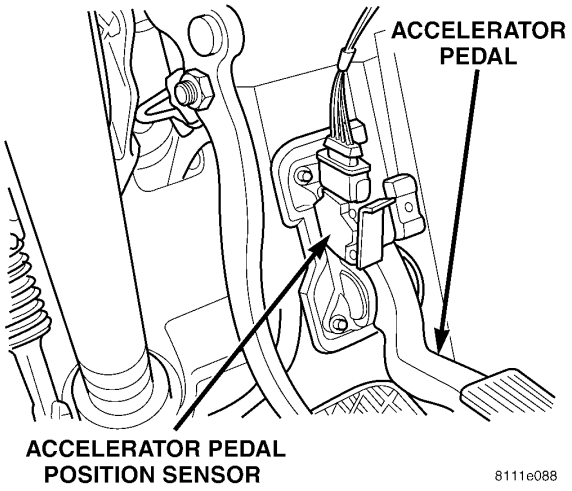


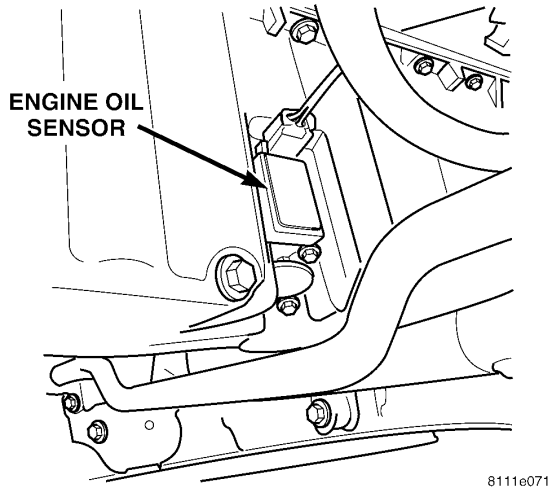


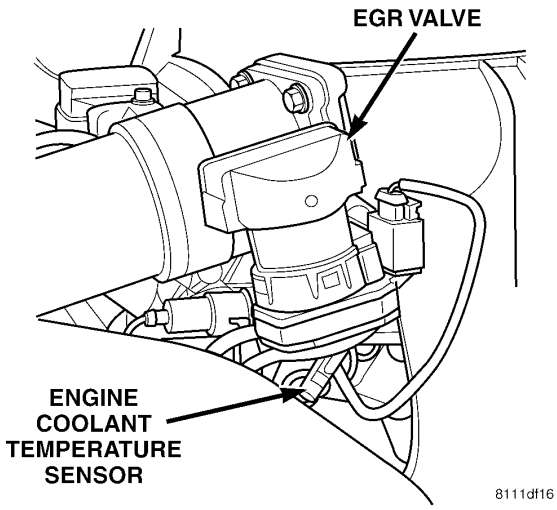
8.3 SENSORS

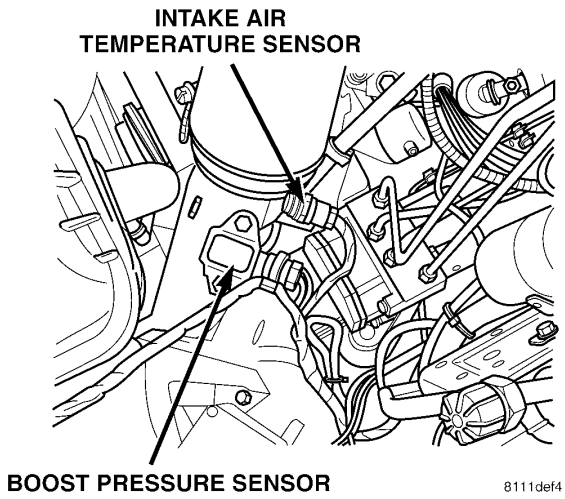


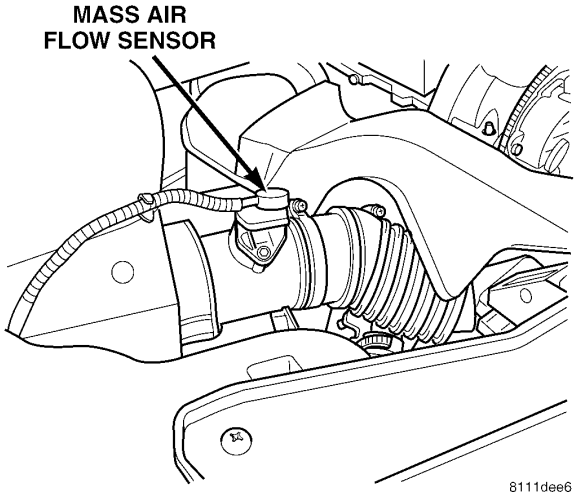




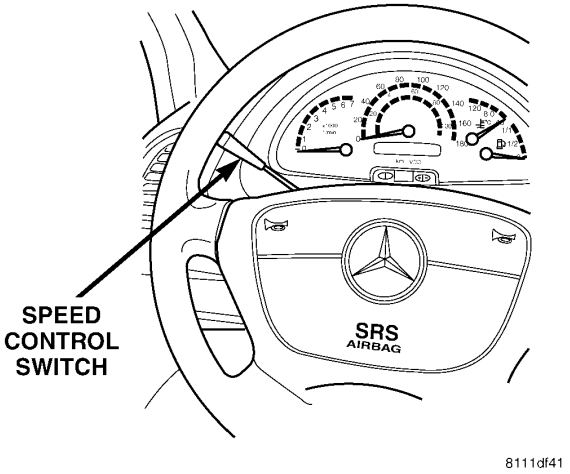


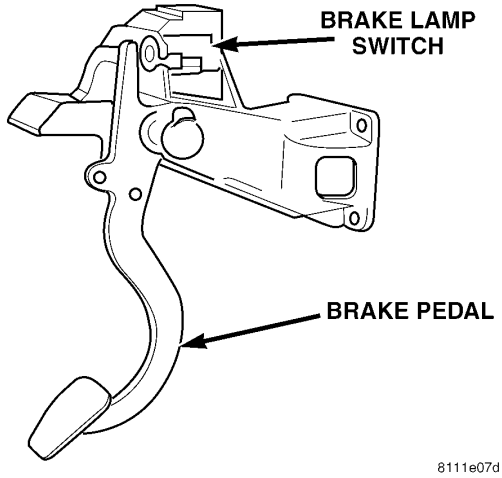

EGR VALVE
ENGINE COOLANT TEMPERATURE SENSOR
8111df16


INTAKE AIR TEMPERATURE SENSOR
BOOST PRESSURE SENSOR
8111def4


MASS AIR FLOW SENSOR
8111dee6

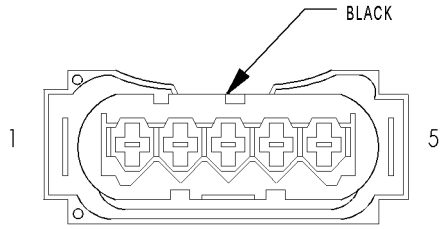
8.4 SWITCHES


SPEED CONTROL SWITCH
SRS AIRBAG
8111df41


BRAKE LAMP SWITCH
BRAKE PEDAL
8111e07d

NOTES

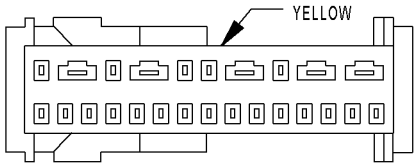
9.0 CONNECTOR PINOUTS



ACCELERATOR PEDAL SENSOR SENSOR

ACCELERATOR PEDAL POSITION SENSOR - BLACK

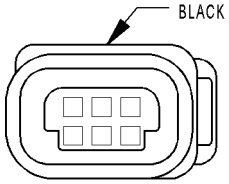
CAV	CIRCUIT	FUNCTION
1	18BL/RD	ACCEL PEDAL POSITION SENSOR 5 VOLT SUPPLY
2	18BR/BL	ACCEL PEDAL POSITION SENSOR GROUND NO. 1
3	18BL/DG	ACCEL PEDAL POSITION SENSOR SIGNAL NO. 1
4	18BR/GY	ACCEL PEDAL POSITION SENSOR GROUND NO. 2
5	18GY/DG	ACCEL PEDAL POSITION SENSOR SIGNAL NO. 2



AIRBAG CONTROL MODULE

AIRBAG CONTROL MODULE - YELLOW

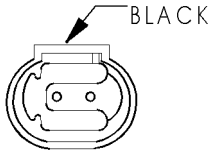
CAV	CIRCUIT	FUNCTION
1	20BL	DRIVER SEAT BELT TENSIONER LINE 2
2	20BR/YL	DRIVER SEAT BELT TENSIONER LINE 1
3	20BL	PASSENGER SEAT BELT TENSIONER LINE 2
4	20BR	PASSENGER SEAT BELT TENSIONER LINE 1
5	20BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
6	20BR	GROUND
7	20YL	AIRBAG WARNING INDICATOR DRIVER
9	20BK/RD	K-ACM
10	20DG	DRIVER AIRBAG SQUIB 1 LINE 2
11	20VT	DRIVER AIRBAG SQUIB 1 LINE 1
13	20BL/DG	PASSENGER AIRBAG SQUIB 1 LINE 2
14	20BR/DG	PASSENGER AIRBAG SQUIB 1 LINE 1
20	20DG	ENHANCED ACCIDENT REPORT DRIVER



BOOST PRESSURE SENSOR

BOOST PRESSURE SENSOR - BLACK

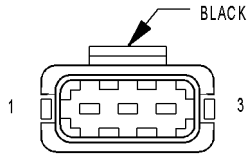
CAV	CIRCUIT	FUNCTION
1	18BR/WT	BOOST PRESSURE SENSOR GROUND
2	18WT/DG	BOOST PRESSURE SENSOR SIGNAL
3	18WT/RD	BOOST PRESSURE SENSOR 5 VOLT SUPPLY



BOOST PRESSURE SOLENOID

BOOST PRESSURE SOLENOID - BLACK

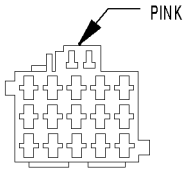
CAV	CIRCUIT	FUNCTION
1	20WT	BOOST PRESSURE SOLENOID CONTROL
2	20BR	BOOST PRESSURE SOLENOID 12 VOLT SUPPLY



CAMSHAFT POSITION SENSOR

CAMSHAFT POSITION SENSOR - BLACK

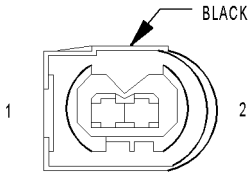
CAV	CIRCUIT	FUNCTION
1	20BR/DG	CAMSHAFT POSITION SENSOR GROUND
2	20YL/GY	CAMSHAFT POSITION SENSOR SIGNAL
3	18RD/BL	CAMSHAFT POSITION SENSOR 12 VOLT SUPPLY



CENTRAL TIMER MODULE C1

CENTRAL TIMER MODULE C1 - PINK

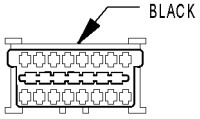
CAV	CIRCUIT	FUNCTION
1	16DG/BK	DRIVER DOOR UNLOCK SENSE
2	16BL/RD	DRIVER DOOR LOCK DRIVER
3	16BK/RD	DRIVER DOOR UNLOCK DRIVER
4	16YL/BK	DRIVER DOOR LOCK SENSE
5	16DG/BL/WT	PASSENGER FRONT DOOR UNLOCK SENSE
6	16YL/BL	PASSENGER FRONT DOOR LOCK SENSE
7	18BK/YL	MASTER DOOR LOCK SWITCH SENSE-ALL DOORS
8	16RD/BK	FUSED D(+) RELAY NO. 1 OUTPUT
9	16WT/BL (EXCEPT VTSS)	RKE INTERFACE
9	16WT/BL/RD (VTSS)	RKE INTERFACE
10	16BK/RD	FUSED IGNITION SWITCH OUTPUT
11	16DG	ENHANCED ACCIDENT REPORT DRIVER
12	20DG/WT	K-CTM/SSM
13	14RD/WT	FUSED B(+)
14	14BR	GROUND
15	16WT/BK	DRIVER DOOR AJAR INDICATOR DRIVER



CRANKSHAFT POSITION SENSOR

CRANKSHAFT POSITION SENSOR - BLACK

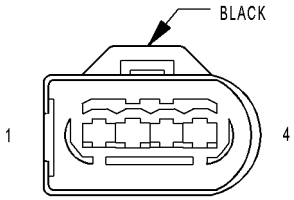
CAV	CIRCUIT	FUNCTION
1	20DG	CRANKSHAFT POSITION SENSOR SIGNAL NO. 2
2	20DG/WT	CRANKSHAFT POSITION SENSOR SIGNAL NO. 1



DATA LINK CONNECTOR

DATA LINK CONNECTOR - BLACK

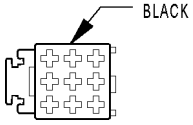
CAV	CIRCUIT	FUNCTION
1	20WT/DG	K-SKREEM
3	20DG/GY	ENGINE RPM
4	20BR	GROUND
5	20BR	GROUND
7	18BL/YL	K-ECM
8	20BK/BL/DG	FUSED IGNITION SWITCH OUTPUT (RUN-START)
9	20BL/BK	K-ABS/SHIFTER ASSEMBLY
11	20BL	K-TCM
12	20GY/DG/RD	K-CTM/SSM
13	20BK/RD	K-ACM
15	20WT/GY	K-IC/ATC/HBM/CHM
16	20RD/YL	FUSED B(+)



EGR
VALVE

EGR VALVE - BLACK

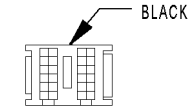
CAV	CIRCUIT	FUNCTION
1	20RD/YL	EGR VALVE CONTROL
2	16BK/GY	FUSED ENGINE CONTROL RELAY OUTPUT
3	18BR/BK	SENSOR GROUND



ENGINE
CONTROL
MODULE
C1

ENGINE CONTROL MODULE C1 - BLACK

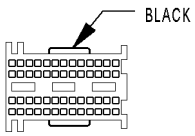
CAV	CIRCUIT	FUNCTION
1	16BK/RD	FUSED ENGINE CONTROL RELAY OUTPUT
4	14BR	GROUND
5	14BR	GROUND
6	14BR	GROUND
7	14BK/BL	FUSED ENGINE CONTROL RELAY OUTPUT
8	14BK/BL	FUSED ENGINE CONTROL RELAY OUTPUT



ENGINE
CONTROL
MODULE
C2

ENGINE CONTROL MODULE C2 - BLACK

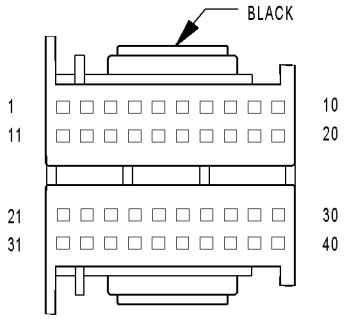
CAV	CIRCUIT	FUNCTION
7	18BR/DG	KICKDOWN SWITCH SIGNAL
9	18BR	SENSOR GROUND
11	20DG/WT	CAN C BUS (+)
12	20DG	CAN C BUS (-)
13	18BK	FUSED IGNITION SWITCH OUTPUT (RUN-START)
14	18DG	ACCEL/SET SIGNAL
16	18YL	DECEL/SET SIGNAL
17	20DG	ENHANCED ACCIDENT REPORT DRIVER
19	18RD	S/C SWITCH 12 VOLT SUPPLY
20	18BL	RESUME SIGNAL
21	18BK	VERIFICATION SIGNAL
22	18GY	OFF SIGNAL



ENGINE CONTROL MODULE C3

ENGINE CONTROL MODULE C3 - BLACK

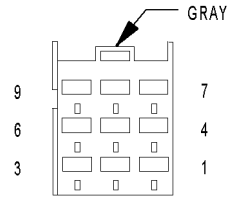
CAV	CIRCUIT	FUNCTION
1	18BR/DG	INTAKE AIR TEMPERATURE SENSOR GROUND
5	18BL/RD	ACCEL PEDAL POSITION SENSOR 5 VOLT SUPPLY
6	18WT/DG	BOOST PRESSURE SENSOR SIGNAL
7	20BR/YL	MASS AIR FLOW SENSOR GROUND
8	18BR/GY	ACCEL PEDAL POSITION SENSOR GROUND NO. 2
9	18GY/DG	ACCEL PEDAL POSITION SENSOR SIGNAL NO. 2
10	18BL/DG	ACCEL PEDAL POSITION SENSOR SIGNAL NO. 1
12	18DG/WT	INTAKE AIR TEMPERATURE SENSOR SIGNAL
17	18WT/RD	BOOST PRESSURE SENSOR 5 VOLT SUPPLY
18	20YL/DG	MASS AIR FLOW SENSOR SIGNAL
19	20BR/BK	MASS AIR FLOW SENSOR 5 VOLT SUPPLY
20	18VT	IGNITION SWITCH OUTPUT (START)
22	18BR/WT	BOOST PRESSURE SENSOR GROUND
23	18BR/BL	ACCEL PEDAL POSITION SENSOR GROUND NO. 1
25	18BK/RD	GLOW PLUG MODULE CONTROL
28	20BL/YL	K-ECM
30	18RD/BL	STARTER MOTOR RELAY 12 VOLT SUPPLY
33	20YL/RD	MASS AIR FLOW SENSOR 12 VOLT SUPPLY
35	20BR	BOOST PRESSURE SOLENOID 12 VOLT SUPPLY
40	20DG/YL	ENGINE RPM
43	18VT/DG	STARTER MOTOR RELAY CONTROL
46	18YL/BL	ENGINE CONTROL RELAY SIGNAL
48	20WT	BOOST PRESSURE SOLENOID CONTROL



ENGINE CONTROL MODULE C4

ENGINE CONTROL MODULE C4 - BLACK

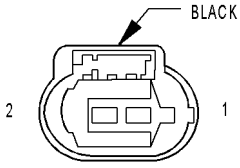
CAV	CIRCUIT	FUNCTION
2	20BR/DG	CAMSHAFT POSITION SENSOR GROUND
3	20YL/GY	CAMSHAFT POSITION SENSOR SIGNAL
4	20BR/GY	FUEL PRESSURE SENSOR GROUND
7	18GY/YL	LOW FUEL PRESSURE SENSOR GROUND
8	18GY/DG	LOW FUEL PRESSURE SENSOR 5 VOLT SUPPLY
10	18BR/RD	WATER IN FUEL SENSOR 12 VOLT SUPPLY
11	18BK/YL	WATER IN FUEL SENSOR SIGNAL
12	18RD/BL	CAMSHAFT POSITION SENSOR 12 VOLT SUPPLY
13	20RD/DG	FUEL PRESSURE SENSOR 5 VOLT SUPPLY
14	20DG/VT	FUEL PRESSURE SENSOR SIGNAL
15	20GY/BL	ENGINE OIL SENSOR SIGNAL
17	20BR/BK	SENSOR GROUND
18	20RD/YL	ENGINE OIL SENSOR 5 VOLT SUPPLY
21	20BK/WT	FUEL PRESSURE SOLENOID CONTROL
22	18RD/BK	FUEL SHUTDOWN SOLENOID 12 VOLT SUPPLY
26	20DG	CRANKSHAFT POSITION SENSOR SIGNAL NO. 2
27	20BR/WT	ENGINE COOLANT TEMPERATURE SENSOR GROUND
30	18DG/BK	FUEL TEMPERATURE SENSOR GROUND
31	20RD/WT	FUEL PRESSURE SOLENOID 12 VOLT SUPPLY
32	20BR/YL	FUEL SHUTDOWN SOLENOID CONTROL
34	18BR	WATER IN FUEL SENSOR GROUND
36	20DG/RD	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL
37	20DG/WT	CRANKSHAFT POSITION SENSOR SIGNAL NO. 1
38	18GY/RD	LOW FUEL PRESSURE SENSOR SIGNAL
39	18BL/GY	FUEL TEMPERATURE SENSOR SIGNAL
40	20RD/YL	EGR VALVE CONTROL



ENGINE CONTROL MODULE C5

ENGINE CONTROL MODULE C5 - GRAY

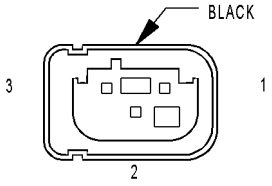
CAV	CIRCUIT	FUNCTION
2	14BK	COMMON INJECTOR DRIVER NO. 1
3	14BK/YL	FUEL INJECTOR NO. 4 CONTROL
4	14BL	COMMON INJECTOR DRIVER NO. 2
5	14BK/VT	FUEL INJECTOR NO. 2 CONTROL
7	14BK/DG	FUEL INJECTOR NO. 5 CONTROL
8	14BK/RD	FUEL INJECTOR NO. 3 CONTROL
9	14BK/BL	FUEL INJECTOR NO. 1 CONTROL



ENGINE COOLANT TEMPERATURE SENSOR

ENGINE COOLANT TEMPERATURE SENSOR - BLACK

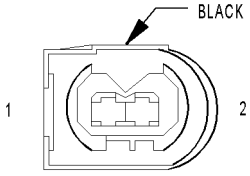
CAV	CIRCUIT	FUNCTION
1	20BR/WT	ENGINE COOLANT TEMPERATURE SENSOR GROUND
2	20DG/RD	ENGINE COOLANT TEMPERATURE SENSOR SIGNAL



ENGINE OIL SENSOR

ENGINE OIL SENSOR - BLACK

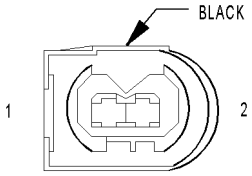
CAV	CIRCUIT	FUNCTION
1	20DG/BL	ENGINE OIL SENSOR SIGNAL
2	20BR/BK	SENSOR GROUND
3	20RD/YL	ENGINE OIL SENSOR 5 VOLT SUPPLY



FUEL INJECTOR NO. 1

FUEL INJECTOR NO. 1 - BLACK

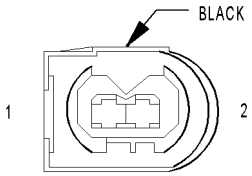
CAV	CIRCUIT	FUNCTION
1	14BK/BL	FUEL INJECTOR NO. 1 CONTROL
2	14BK	COMMON INJECTOR DRIVER NO. 1



FUEL
INJECTOR
NO. 2

FUEL INJECTOR NO. 2 - BLACK

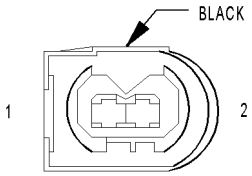
CAV	CIRCUIT	FUNCTION
1	14BK/VT	FUEL INJECTOR NO. 2 CONTROL
2	14BL	COMMON INJECTOR DRIVER NO. 2



FUEL
INJECTOR
NO. 3

FUEL INJECTOR NO. 3 - BLACK

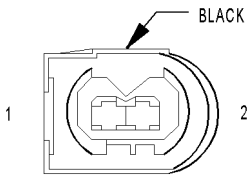
CAV	CIRCUIT	FUNCTION
1	14BK/RD	FUEL INJECTOR NO. 3 CONTROL
2	14BK	COMMON INJECTOR DRIVER NO. 1



FUEL
INJECTOR
NO. 4

FUEL INJECTOR NO. 4 - BLACK

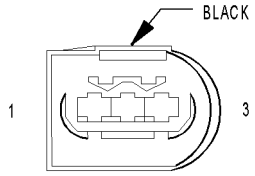
CAV	CIRCUIT	FUNCTION
1	14BK/YL	FUEL INJECTOR NO. 4 CONTROL
2	14BK	COMMON INJECTOR DRIVER NO. 1



FUEL
INJECTOR
NO. 5

FUEL INJECTOR NO. 5 - BLACK

CAV	CIRCUIT	FUNCTION
1	14BK/DG	FUEL INJECTOR NO. 5 CONTROL
2	14BL	COMMON INJECTOR DRIVER NO. 2



FUEL
PRESSURE
SENSOR

FUEL PRESSURE SENSOR - BLACK

CAV	CIRCUIT	FUNCTION
1	20BR/GY	FUEL PRESSURE SENSOR GROUND
2	20DG/VT	FUEL PRESSURE SENSOR SIGNAL
3	20RD/DG	FUEL PRESSURE SENSOR 5 VOLT SUPPLY

CONNECTOR
NOT
AVAILABLE

FUEL PRESSURE SOLENOID

CAV	CIRCUIT	FUNCTION
1	20BK/WT	FUEL PRESSURE SOLENOID CONTROL
2	20RD/WT	FUEL PRESSURE SOLENOID 12 VOLT SUPPLY

CONNECTOR
NOT
AVAILABLE

FUEL SHUTDOWN SOLENOID

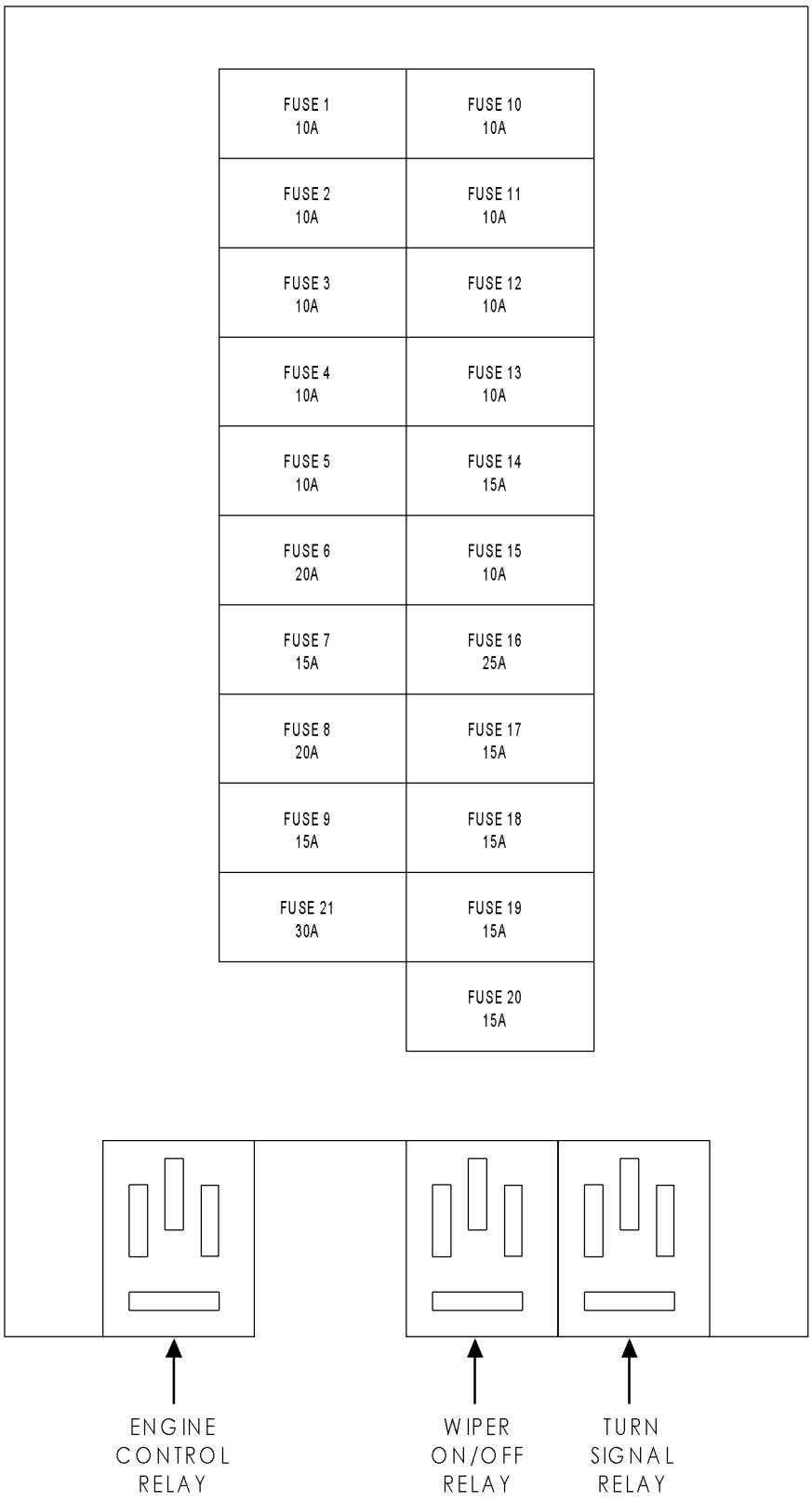
CAV	CIRCUIT	FUNCTION
1	20BR/YL	FUEL SHUTDOWN SOLENOID CONTROL
2	18RD/BK	FUEL SHUTDOWN SOLENOID 12 VOLT SUPPLY

CONNECTOR
NOT
AVAILABLE

FUEL TEMPERATURE SENSOR

CAV	CIRCUIT	FUNCTION
1	18DG/BK	FUEL TEMPERATURE SENSOR GROUND
2	18BL/GY	FUEL TEMPERATURE SENSOR SIGNAL

FUSE BLOCK NO. 1

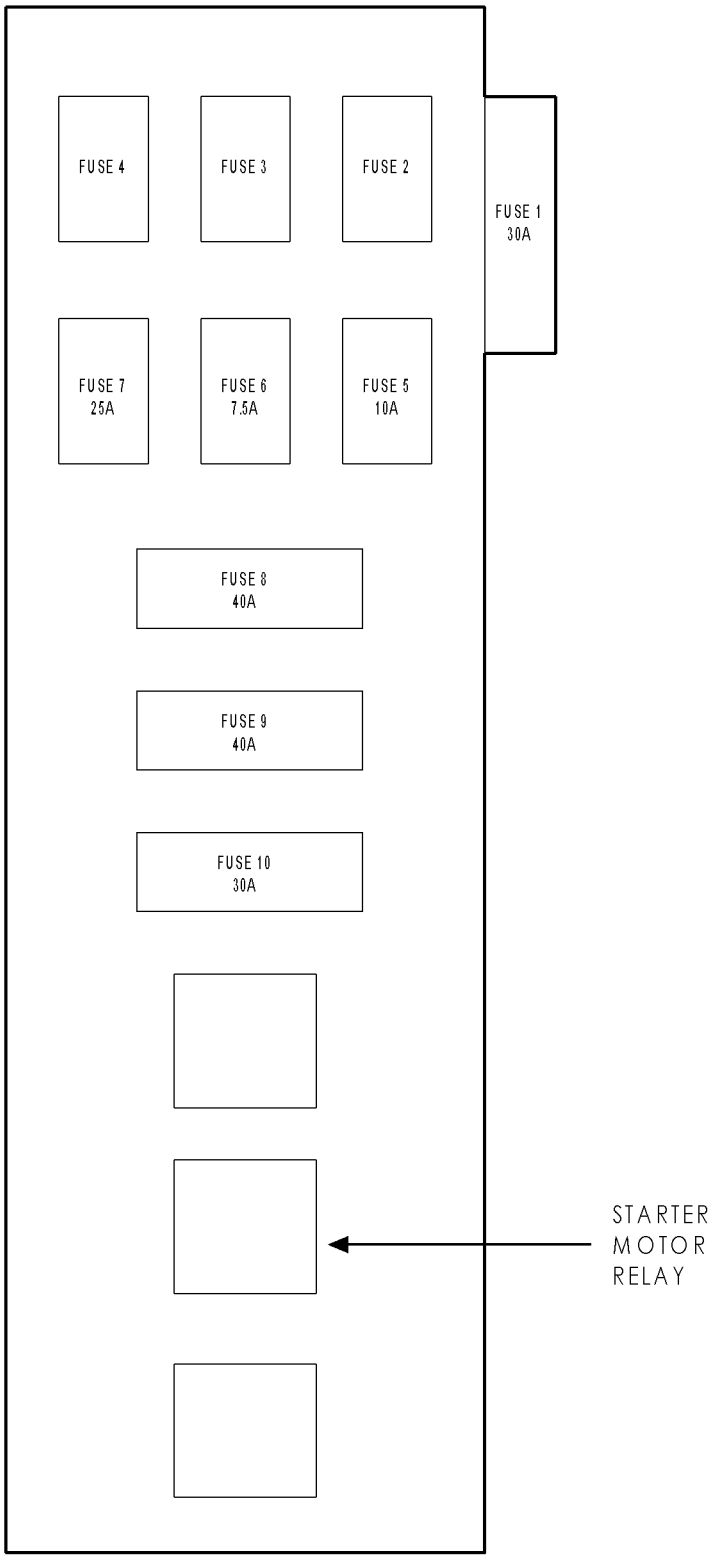


NOTE: THE FUSE AND RELAY LOCATIONS SHOWN HERE MAY VARY FROM VEHICLE TO VEHICLE.

ENGINE CONTROL RELAY (FUSE BLOCK NO. 1)

CAV	CIRCUIT	FUNCTION
30	INTERNAL	FUSED B(+)
85	INTERNAL	ENGINE CONTROL RELAY CONTROL
86	INTERNAL	FUSED B(+)
87	INTERNAL	ENGINE CONTROL RELAY OUTPUT

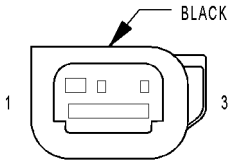
FUSE/ RELAY BLOCK



NOTE: THE FUSE AND RELAY LOCATIONS SHOWN HERE MAY VARY FROM VEHICLE TO VEHICLE.

STARTER MOTOR RELAY (FUSE/RELAY BLOCK)

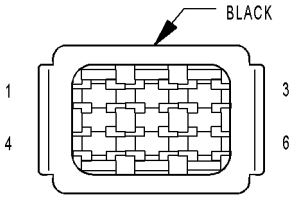
CAV	CIRCUIT	FUNCTION
30	12BK/YL	STARTER MOTOR RELAY OUTPUT
85	18RD/BL	STARTER MOTOR RELAY 12 VOLT SUPPLY
86	18VT/DG	STARTER MOTOR RELAY CONTROL
87	12VT	IGNITION SWITCH OUTPUT (START)
87A	-	-



GLOW PLUG CONTROL MODULE C1

GLOW PLUG CONTROL MODULE C1 - BLACK

CAV	CIRCUIT	FUNCTION
1	20BR	GROUND
2	18BK/RD	GLOW PLUG MODULE CONTROL



GLOW PLUG CONTROL MODULE C2

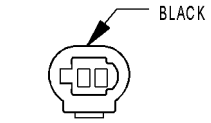
GLOW PLUG CONTROL MODULE C2 - BLACK

CAV	CIRCUIT	FUNCTION
1	14BK/DG	GLOW PLUG NO. 5 SUPPLY VOLTAGE
2	14BK/YL	GLOW PLUG NO. 4 SUPPLY VOLTAGE
3	14BK/RD	GLOW PLUG NO. 3 SUPPLY VOLTAGE
4	14BK/VT	GLOW PLUG NO. 2 SUPPLY VOLTAGE
5	14BK/BL	GLOW PLUG NO. 1 SUPPLY VOLTAGE

CONNECTOR NOT AVAILABLE

INSTRUMENT CLUSTER C1

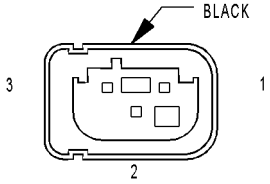
CAV	CIRCUIT	FUNCTION
1	20BR	FUEL LEVEL SENSOR SIGNAL RETURN
2	20BR/DG	AMBIENT TEMPERATURE SENSOR SIGNAL RETURN
4	20WT/GY	K-IC/ATC/HBM/CHM
5	20BR/BK	BRAKE INDICATOR SIGNAL
7	20BK/DG	RIGHT TURN SIGNAL
10	20BL/BK	FUEL LEVEL SENSOR SIGNAL (+)
11	20BL/DG	AMBIENT TEMPERATURE SENSOR SIGNAL (+)
14	20DG/WT/BL	ENGINE COOLANT LEVEL SWITCH SIGNAL
15	20BR/WT	FRONT COURTESY LAMPS CONTROL
16	20YL/RD	SEAT BELT SWITCH SIGNAL
17	20DG	CAN C BUS (-)
18	20DG/WT	CAN C BUS (+)



INTAKE AIR TEMPERATURE SENSOR

INTAKE AIR TEMPERATURE SENSOR - BLACK

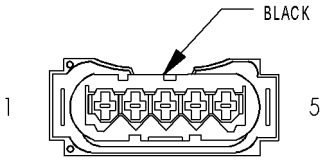
CAV	CIRCUIT	FUNCTION
1	18BR/DG	INTAKE AIR TEMPERATURE SENSOR GROUND
2	18DG/WT	INTAKE AIR TEMPERATURE SENSOR SIGNAL



LOW FUEL PRESSURE SENSOR

LOW FUEL PRESSURE SENSOR - BLACK

CAV	CIRCUIT	FUNCTION
1	18GY/DG	LOW FUEL PRESSURE SENSOR 5 VOLT SUPPLY
2	18GY/YL	LOW FUEL PRESSURE SENSOR GROUND
3	18GY/RD	LOW FUEL PRESSURE SENSOR SIGNAL



MASS AIR FLOW SENSOR

MASS AIR FLOW SENSOR - BLACK

CAV	CIRCUIT	FUNCTION
2	20YL/RD	MASS AIR FLOW SENSOR 12 VOLT SUPPLY
3	20BR/YL	MASS AIR FLOW SENSOR GROUND
4	20BR/BK	MASS AIR FLOW SENSOR 5 VOLT SUPPLY
5	20YL/DG	MASS AIR FLOW SENSOR SIGNAL

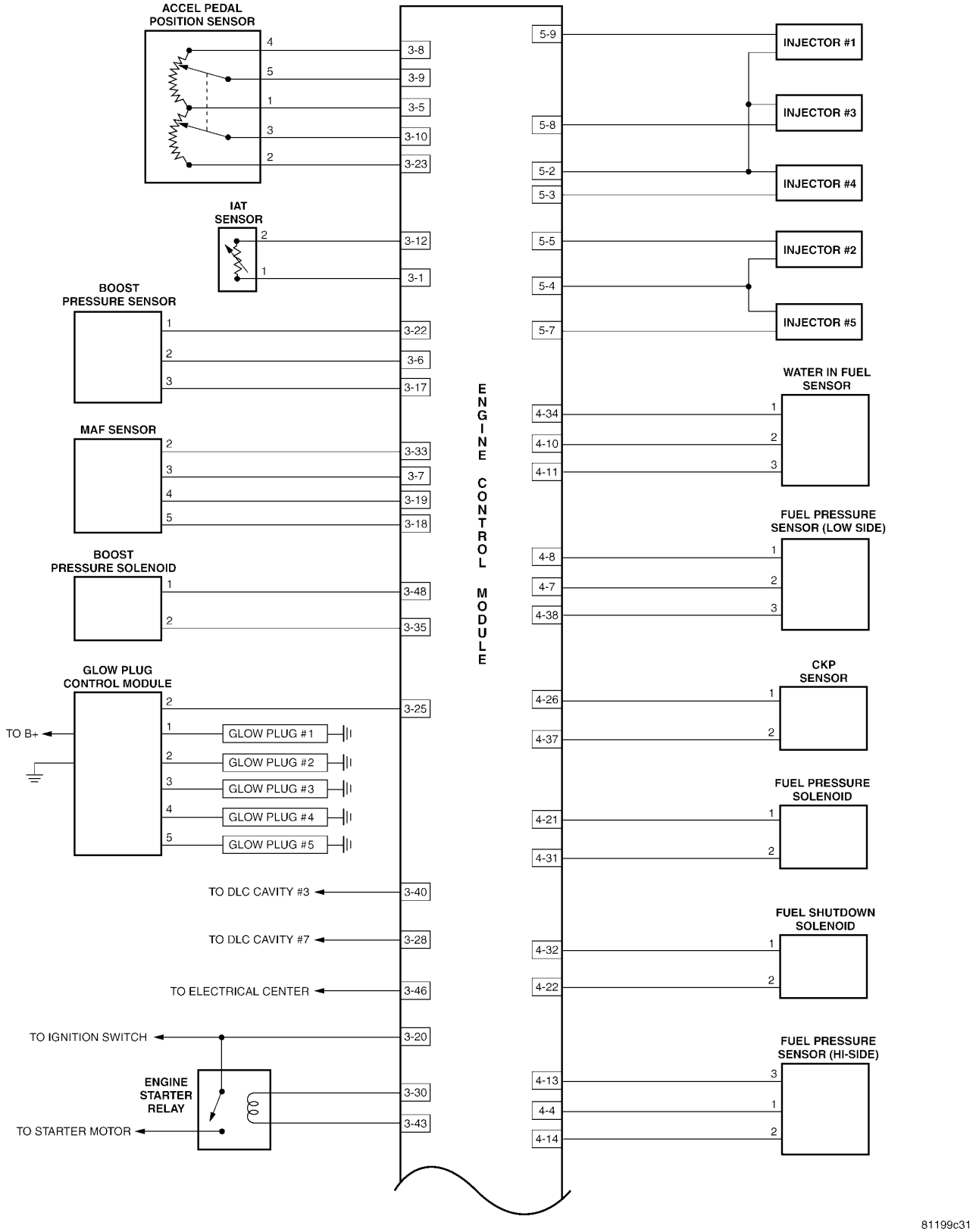
CONNECTOR NOT AVAILABLE

SPEED CONTROL SWITCH

CAV	CIRCUIT	FUNCTION
1	18GY	OFF SIGNAL
2	18BK	VERIFICATION SIGNAL
3	18BL	RESUME SIGNAL
4	18YL	DECEL/SET SIGNAL
5	18DG	ACCEL/SET SIGNAL
6	18RD	S/C SWITCH 12 VOLT SUPPLY

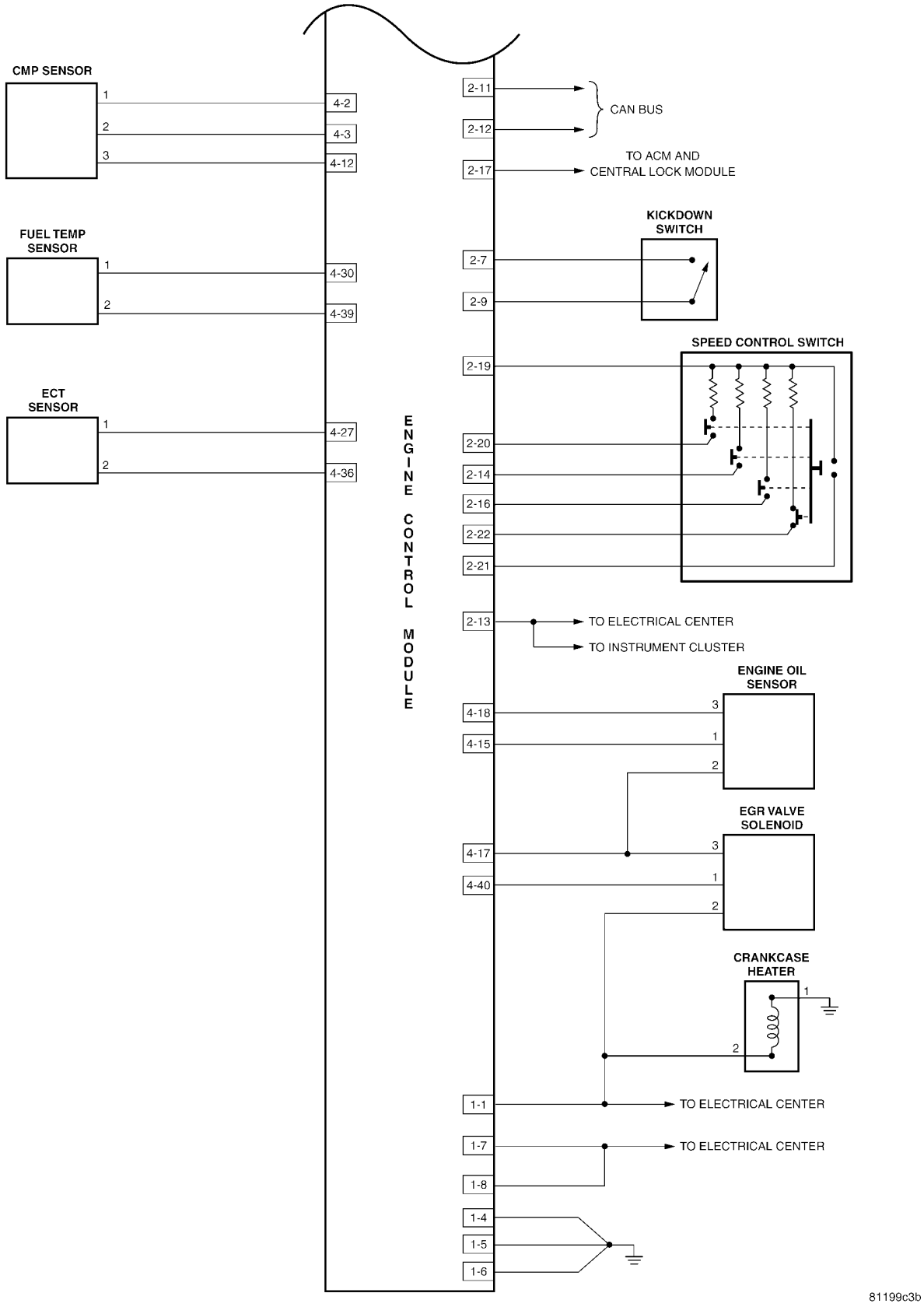
10.0 SCHEMATIC DIAGRAMS

10.1 ENGINE CONTROL MODULE

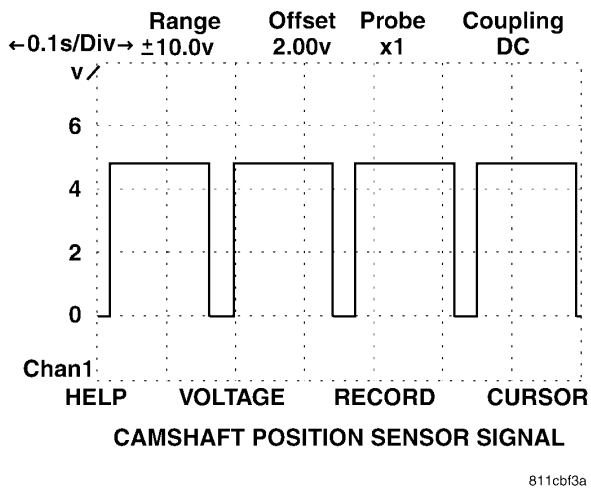


81199c31

10.2 ENGINE CONTROL MODULE

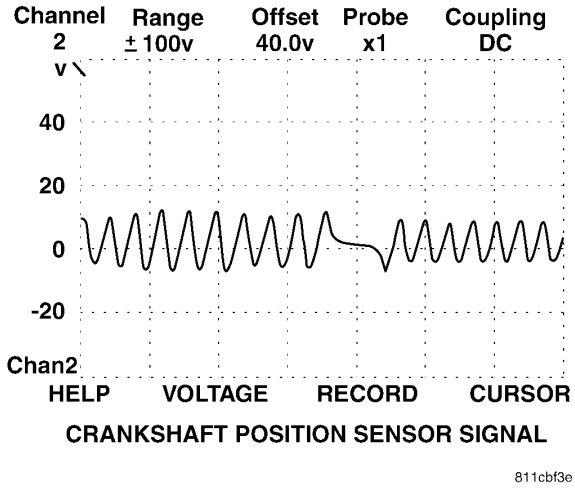


11.0 CHARTS AND GRAPHS



CAMSHAFT POSITION SENSOR SIGNAL

811cbf3a



CRANKSHAFT POSITION SENSOR SIGNAL

811cbf3e

NOTES