SECTION 1F

ENGINE CONTROLS

CAUTION: Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

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SPECIFICATIONS

SCAN TOOL DATA TABLE

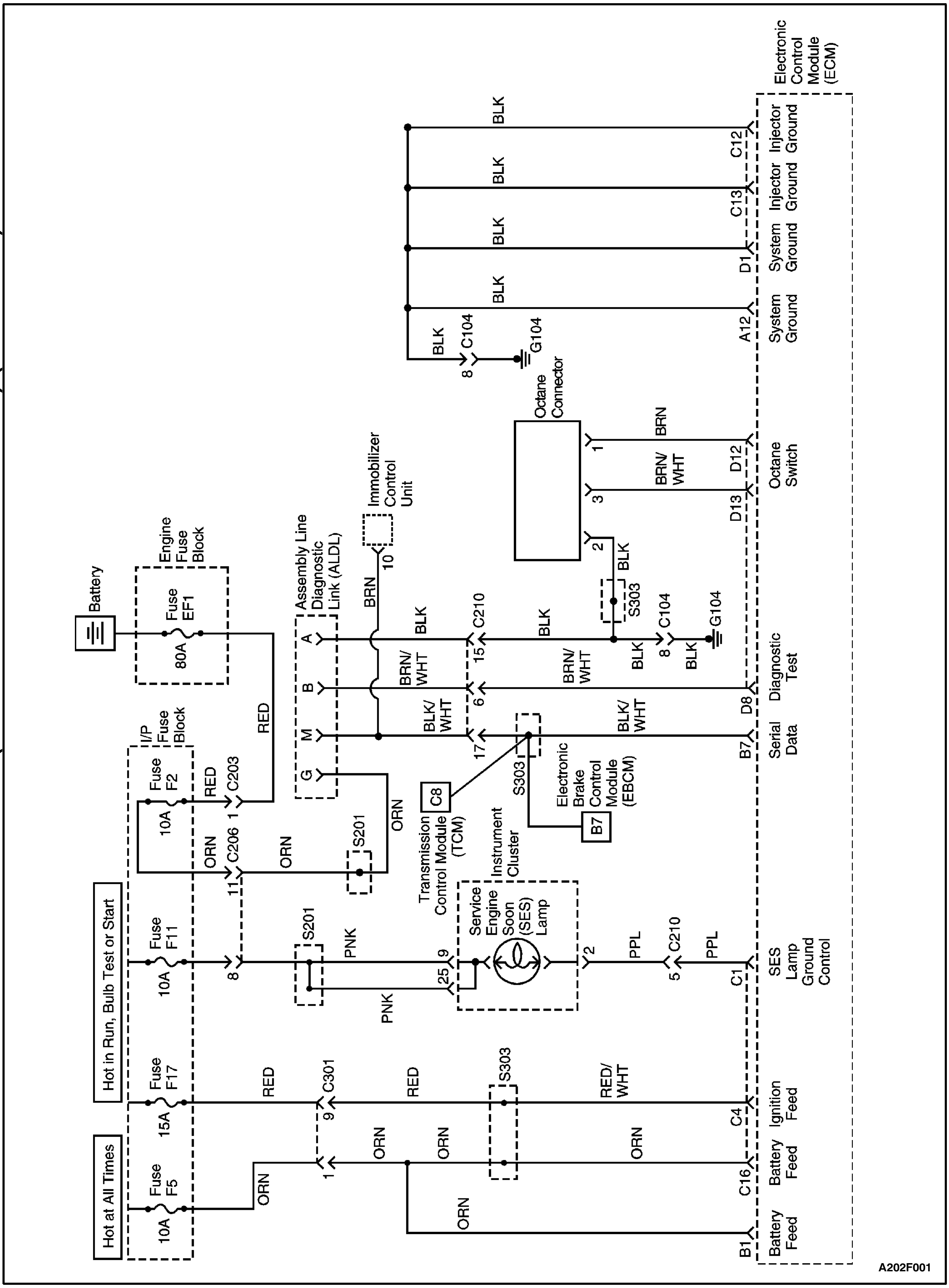
Parameter	Units Displayed	Typical Data Value
Engine Speed	rpm	$ 50 rpm from desired rpm in drive (A/T) $ 50 rpm from desired rpm in neutral (M/T)
Desired Idle	rpm	ECM idle command (varies with temperature)
Engine Coolant Temperature	degrees Celsius	85-105°C
MAT/Internal Air Temperature	degrees Celsius	10-90°C
MAP	kPa/volts	29-48 kPa/1-2 volts (varies with manifold and barometric pressure)
Barometric Pressure	kPa/volts	varies with altitude
Fueling Mode	open/closed	“Closed Loop” (may enter “Open Loop” at extended idle)
Throttle Position	volts	0.3-1.0 v
Air/Fuel Ratio	-	-
Oxygen Sensor Signal	millivolts	1-1000 mv (varies continuously)
Injector-Pulse Width	milliseconds	0.8-2.5 ms
Spark Advance	degrees	varies
Fuel Integrator	counts	110 X 145
Block Lever	counts	115 X 138
Idle Air Control	counts	1-50
P/N Switch (A/T Only)	P-N and R-D-L	Park/Neutral (P/N)
Vehicle Speed	kph, mph	0
A/C Pressure	kPa	varies
Ignition/Battery Voltage	volts	13.5-14.8 v
Cooling Fan Relay	on/off	on/off
A/C Request	yes/no	no
A/C Clutch	on/off	off
Low Fan Request	on/off	on/off
Prom ID	0-9999	PROM ID number varies
Canister Purge Solenoid	on/off	off
CO Adjust (Leaded Fuel)	count	128
High-Speed Fan	on/off	off

FASTENER TIGHTENING SPECIFICATIONS

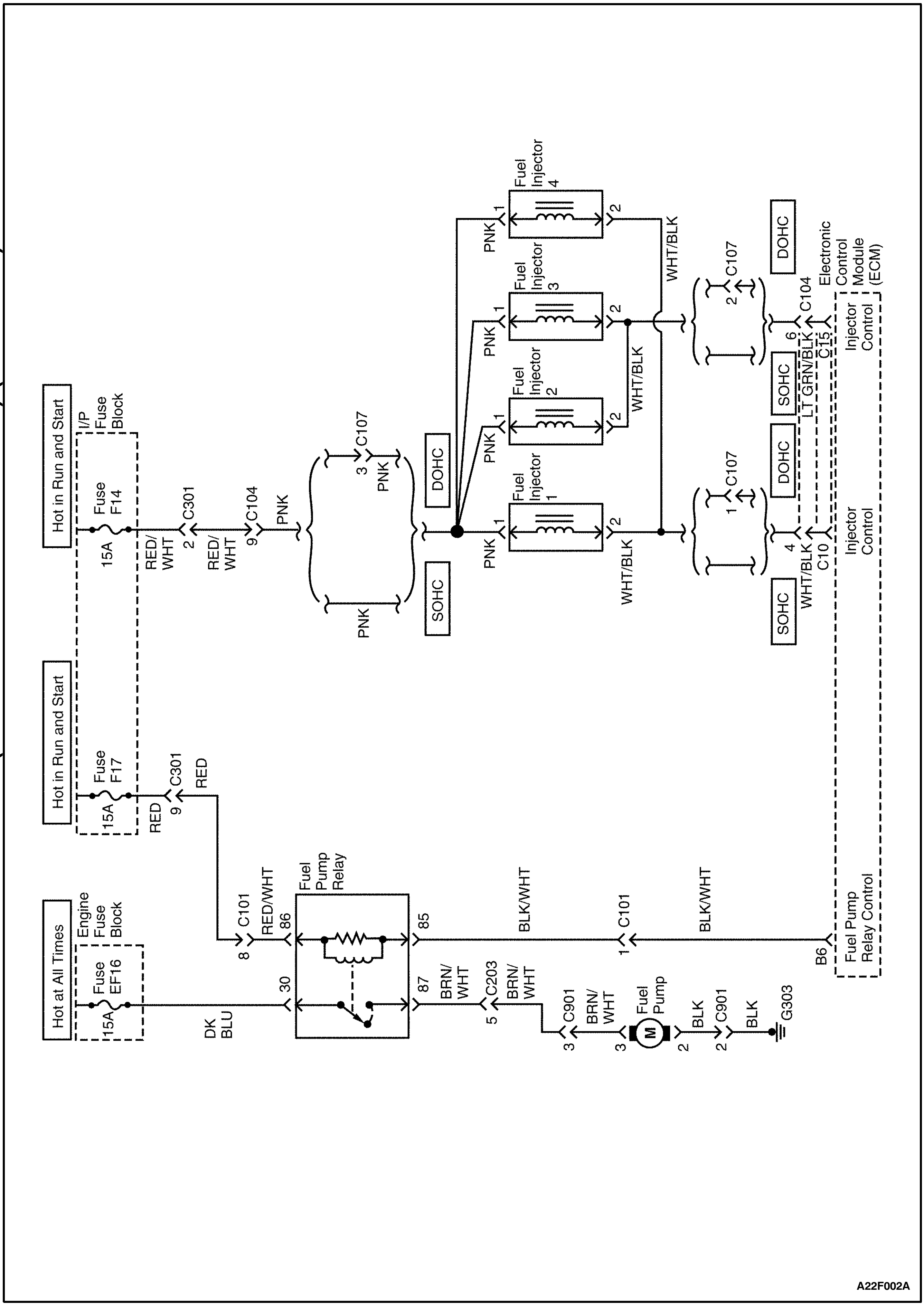
Application	N•m	Lb-Ft	Lb-In
Coolant Temperature Sensor	20	15	-
Crankshaft Position Sensor Retaining Bolt	10	-	89
Direct Ignition System Ignition Coil Retaining Bolts	10	-	89
Evaporative Emission Canister Flange Bolt	20	15	-
Exhaust Gas Recirculation Valve Retaining Bolts	20	15	-
Fuel Pressure Regulator Retaining Bolt - SOHC	12	-	106
Fuel Pressure Regulator Retaining Screw	12	-	106
Fuel Tank Retaining Bolts	20	15	-
Idle Air Control Valve Retaining Bolts	3	-	27
Knock Sensor Bolt	20	15	-
Manifold Absolute Pressure Sensor Mounting Bracket Bolt	10	-	89
Manifold Absolute Pressure Sensor Retaining Bolts and Nuts	8	-	71
Oxygen Sensor	41	30	-
Parking Brake Cable Retainer Clamps	10	-	89
Throttle Body Retaining Bolts	15	11	-
Throttle Position Sensor Retaining Bolts	2	-	18
Variable Geometry Induction System Vacuum Actuator Assembly Mounting Bracket Bolt	16	12	-

SCHEMATIC AND ROUTING DIAGRAMS

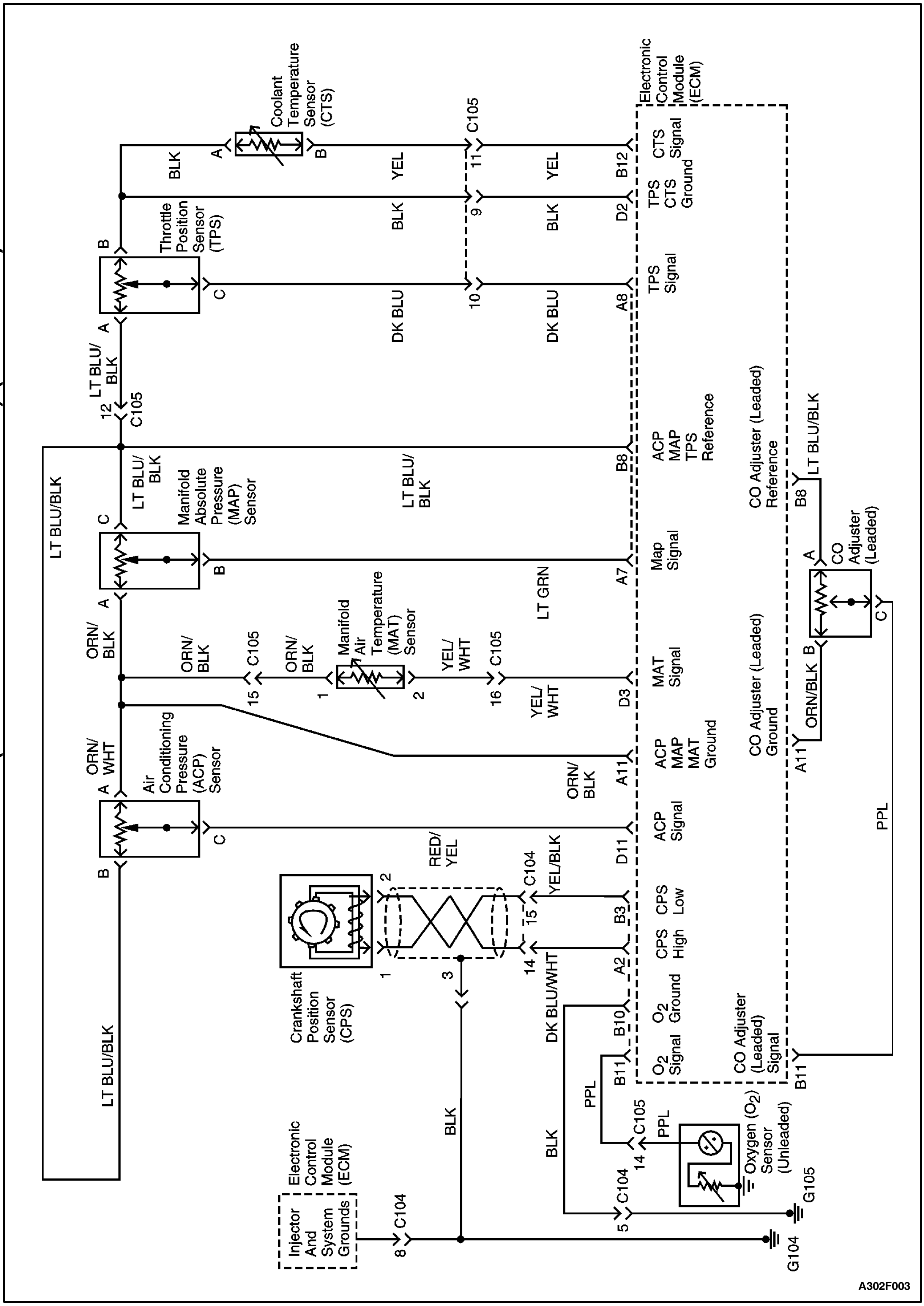
ECM WIRING DIAGRAM (1.3L AND 1.5L SOHC - 1 OF 5) (IEFI-6 ECM)



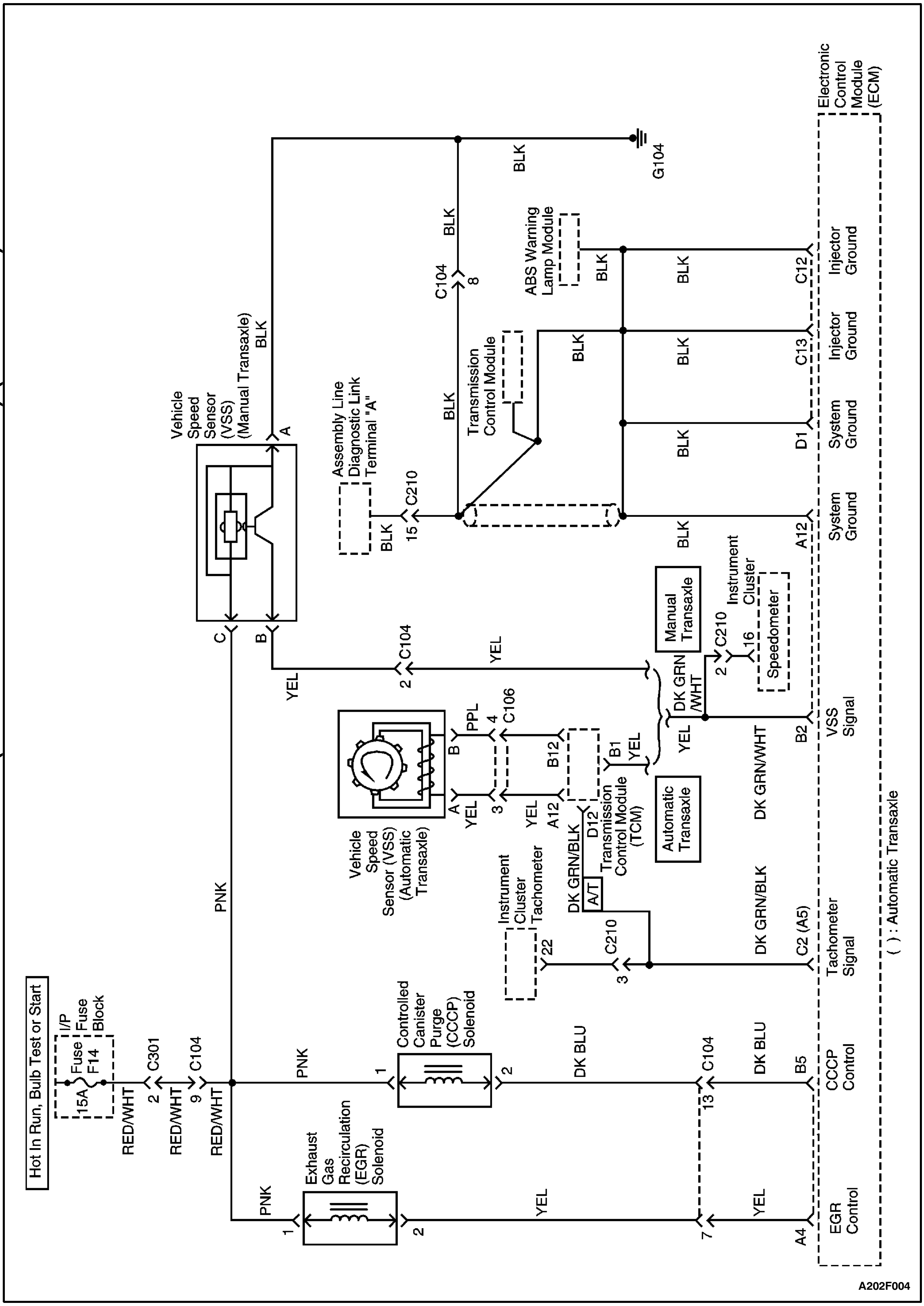
ECM WIRING DIAGRAM (1.3L AND 1.5L SOHC - 2 OF 5) (IEFI-6 ECM)



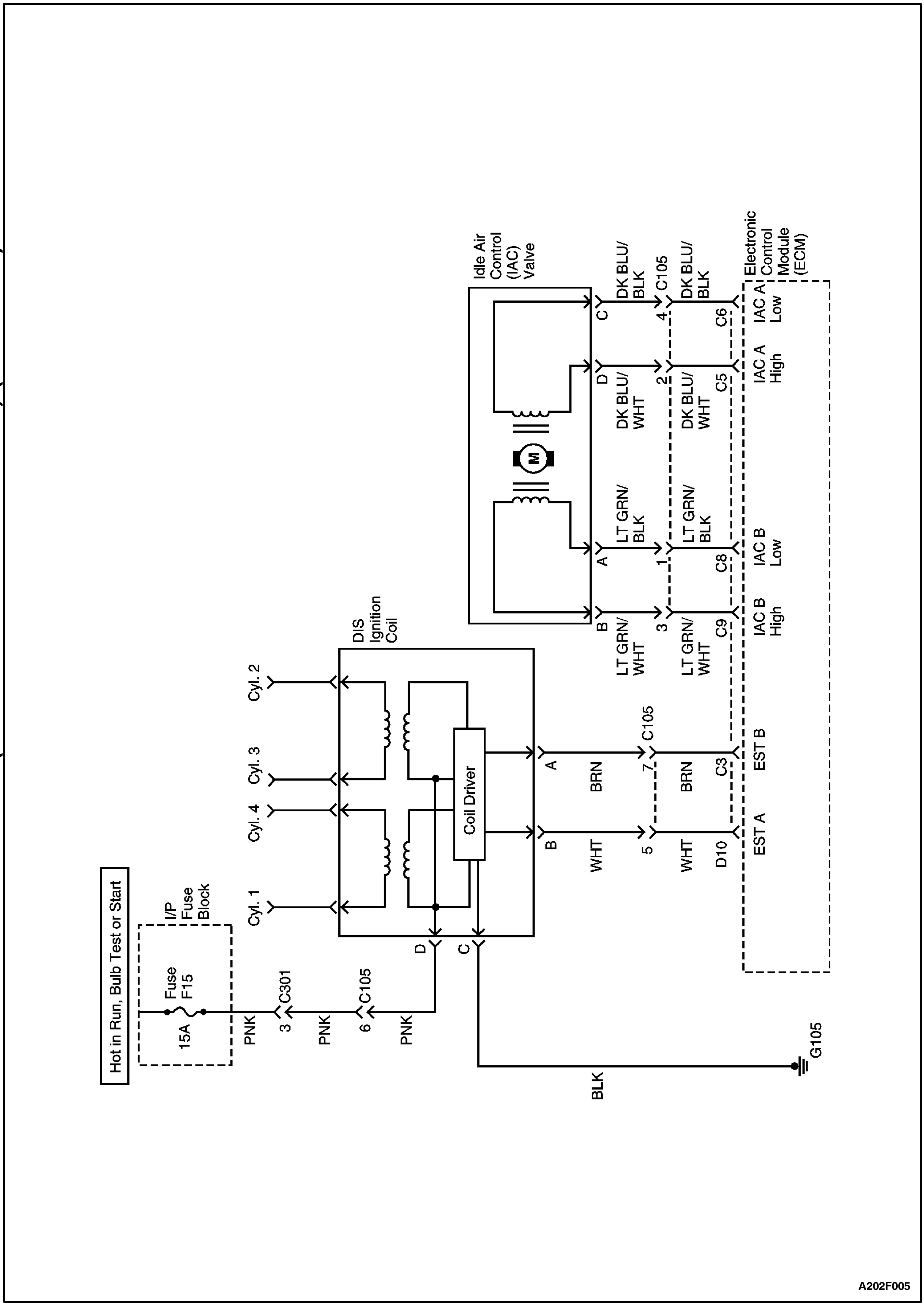
ECM WIRING DIAGRAM (1.3L AND 1.5L SOHC - 3 OF 5) (IEFI-6 ECM)



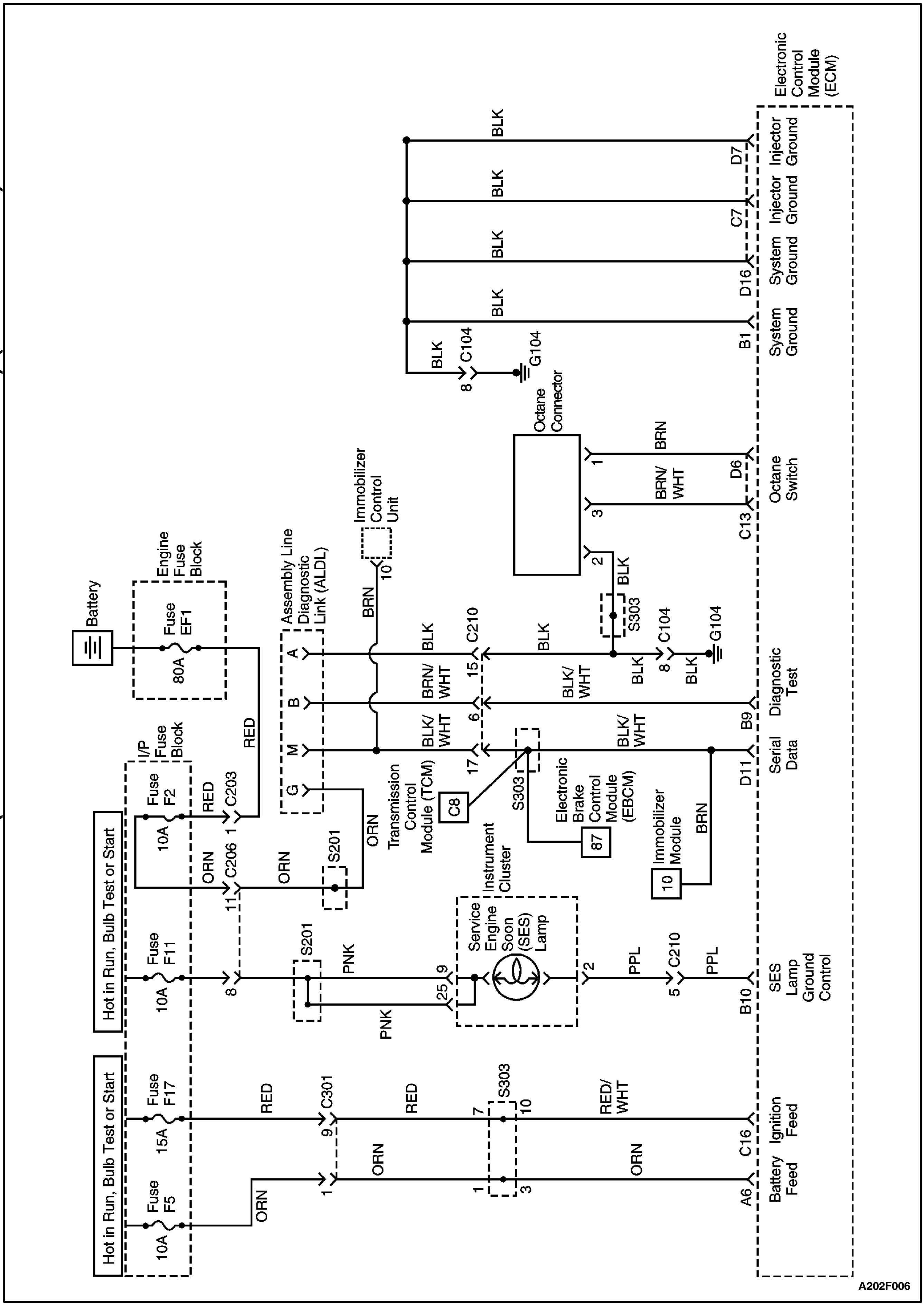
ECM WIRING DIAGRAM (1.3L AND 1.5L SOHC - 4 OF 5) (IEFI-6 ECM)

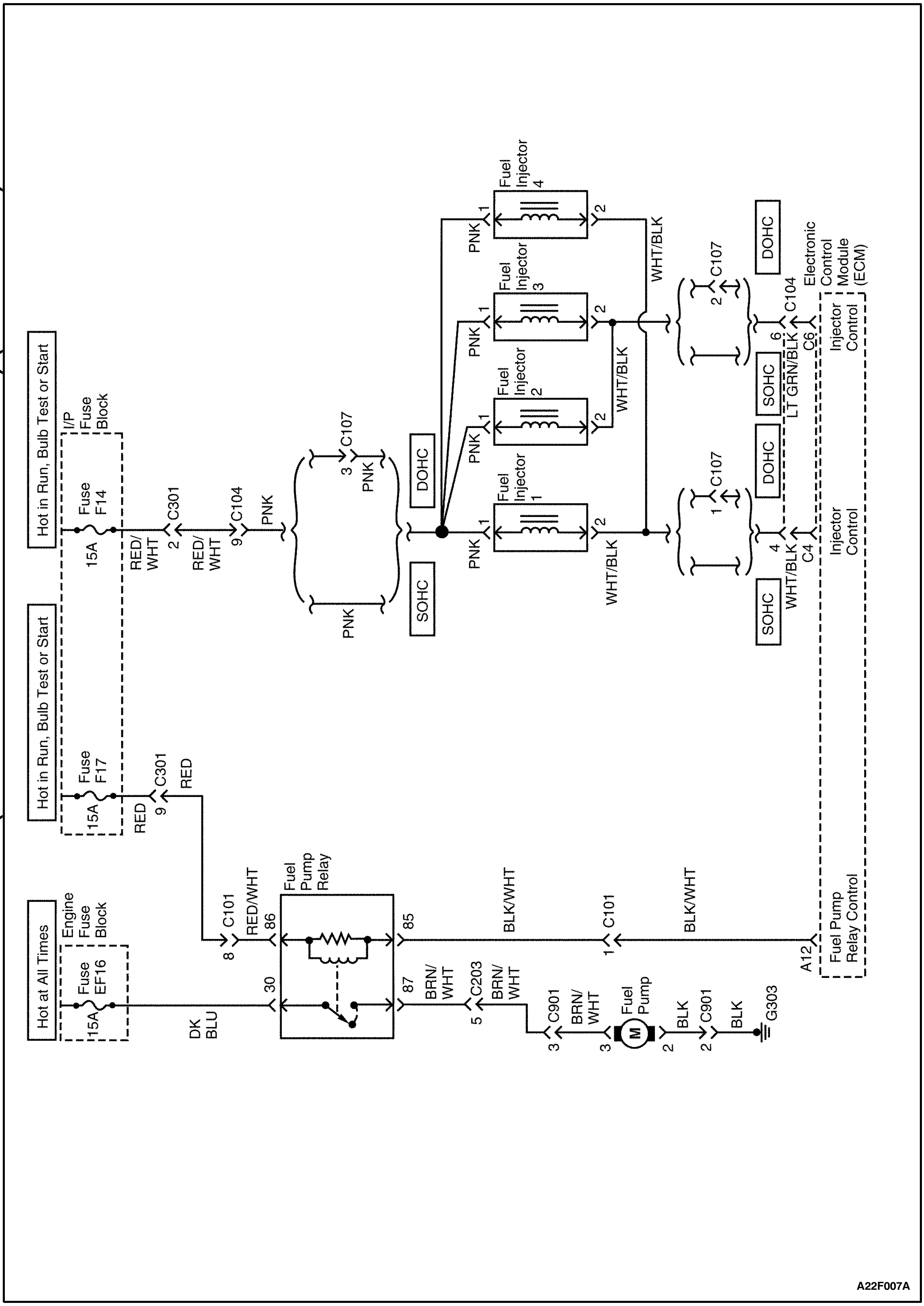


ECM WIRING DIAGRAM (1.3L AND 1.5L SOHC - 5 OF 5) (IEFI-6 ECM)

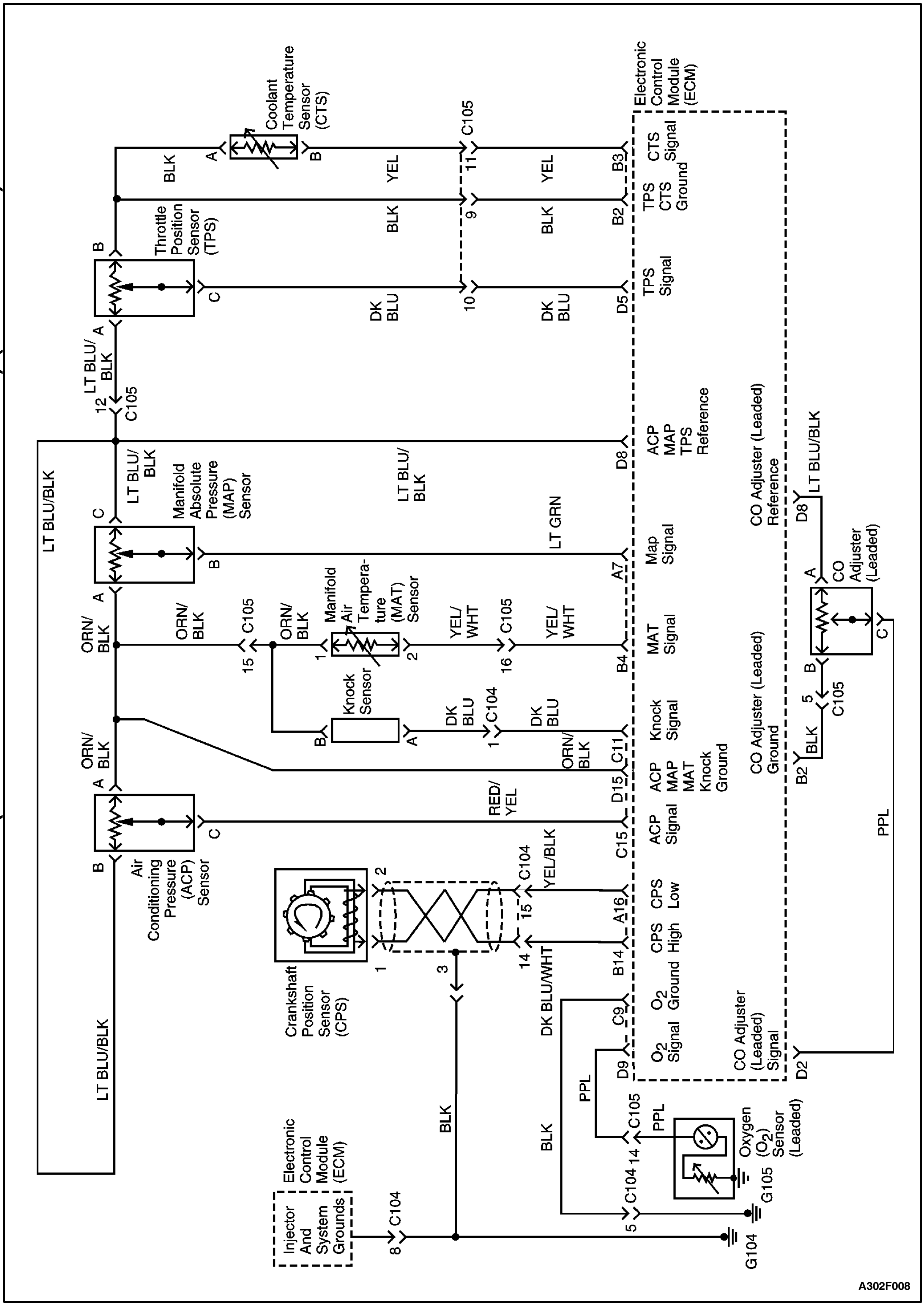


ECM WIRING DIAGRAM (1.3L SOHC AND 1.6L DOHC - 1 OF 5) (ITMS-6F ECM)

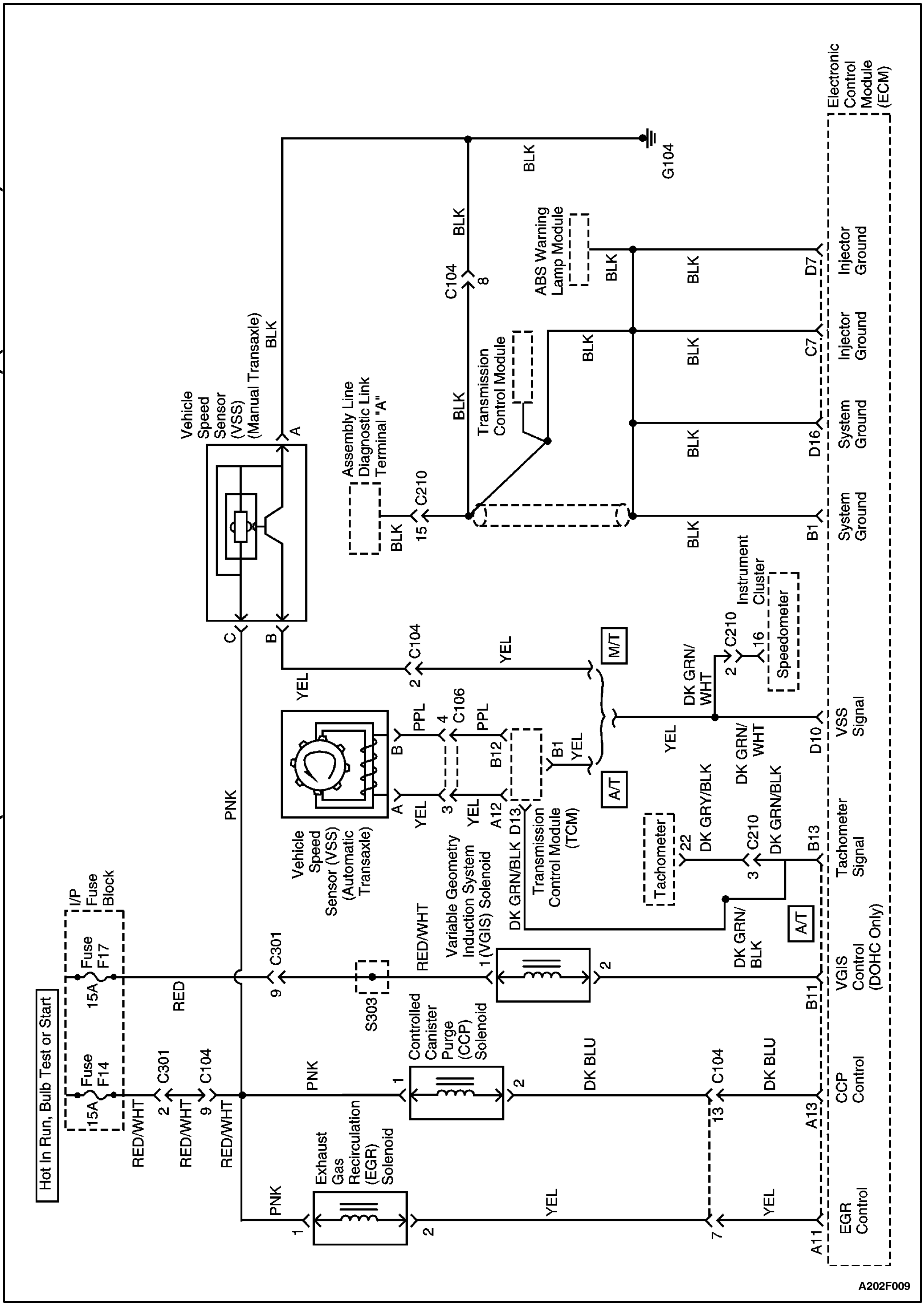



ECM WIRING DIAGRAM (1.3L SOHC AND 1.6L DOHC - 2 OF 5) (ITMS-6F ECM)
Hot at All Times
Engine Fuse Block
Fuse EF16
15A
Hot in Run, Bulb Test or Start
Fuse F17
Fuse F14
I/P Fuse Block
RED
C301
RED/WHT
C104
PNK
C107
DOHC
SOHC
Fuel Injector 1
Fuel Injector 2
Fuel Injector 3
Fuel Injector 4
WHT/BLK
LT GRN/BLK
Electronic Control Module (ECM)
Injector Control
Fuel Pump Relay Control
Fuel Pump Relay
C101
BLK/WHT
DK BLU
BRN/WHT
C203
C901
Fuel Pump
BLK
G303
A12
C4
C6
A22F007A

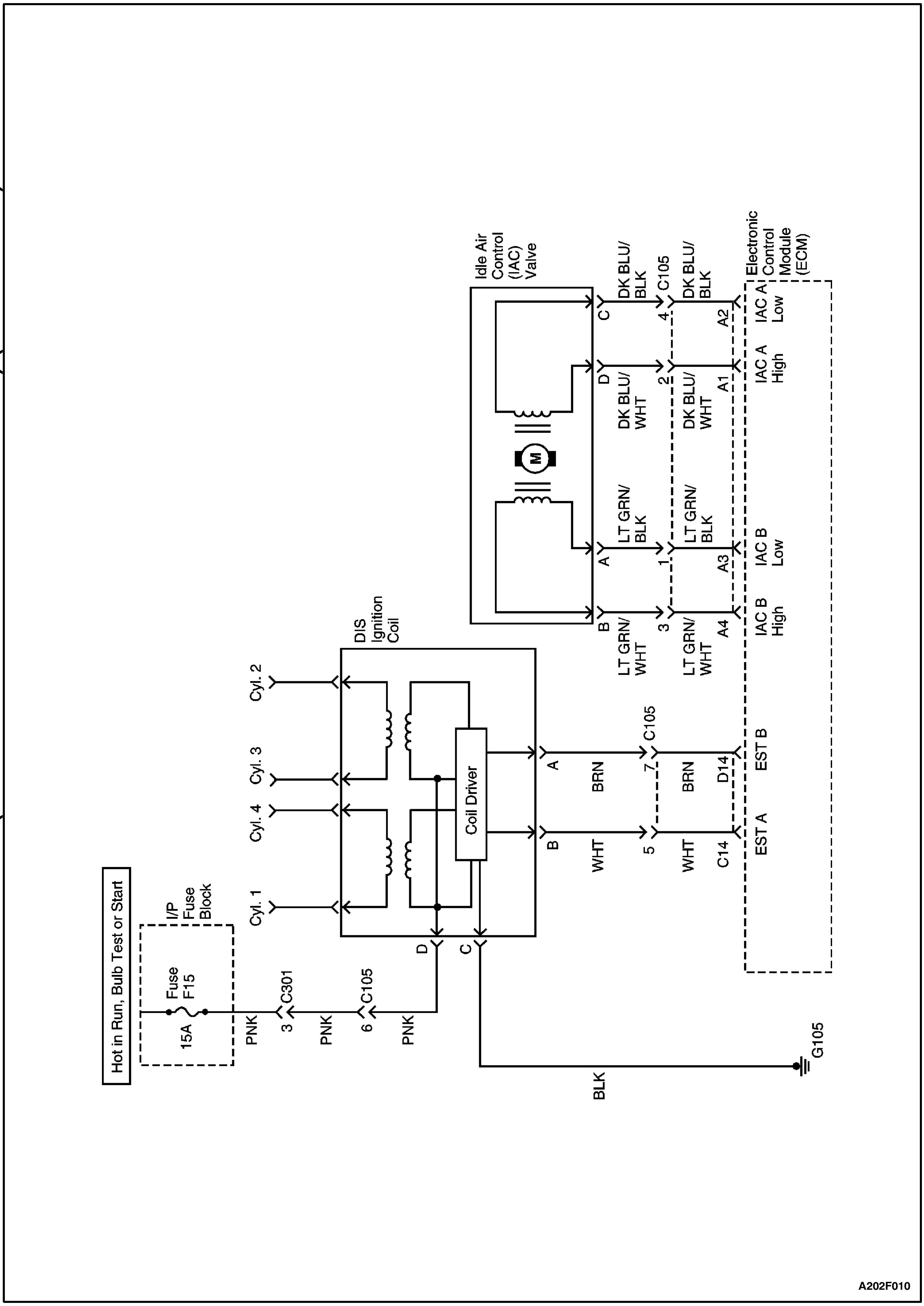
ECM WIRING DIAGRAM (1.3L SOHC AND 1.6L DOHC – 3 OF 5) (ITMS-6F ECM)



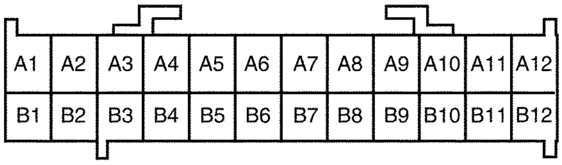
ECM WIRING DIAGRAM (1.3L SOHC AND 1.6L DOHC – 4 OF 5) (ITMS-6F ECM)



ECM WIRING DIAGRAM (1.3L SOHC AND 1.6L DOHC – 5 OF 5) (ITMS-6F ECM)

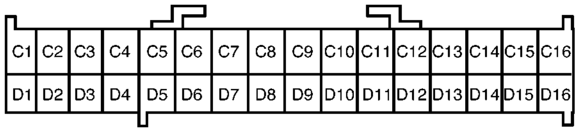


CONNECTOR END VIEW



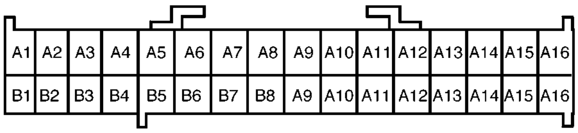
Electronic Control
Module (ECM) 24-Pin
Connector
(1.3L and 1.5L SOHC)

A302F065



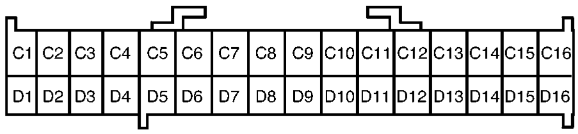
Electronic Control
Module (ECM) 32-Pin
Connector
(1.3L and 1.5L SOHC)

A302F066



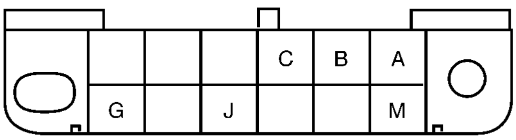
Electronic Control
Module (ECM) J2 (Red)
Connector
(1.3L SOHC and 1.6L DOHC)

A202F067



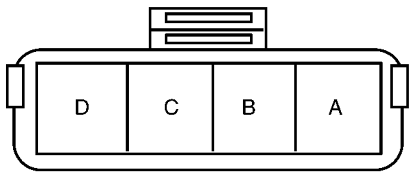
Electronic Control
Module (ECM) J1 (White)
Connector
(1.3L SOHC and 1.6L DOHC)

A202F068



Assembly Line
Diagnostic Link
(ALDL)

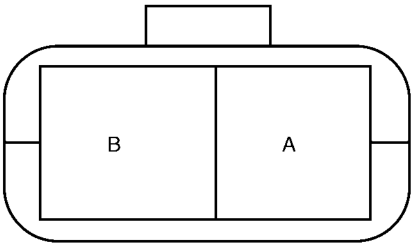
A302F091



Direct Ignition System (DIS)
Ignition Coil
Connector

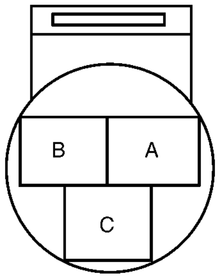
A102F080

CONNECTOR END VIEW (Cont'd)



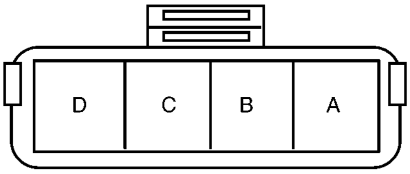
Coolant Temperature
Sensor (CTS) Connector

A102F085



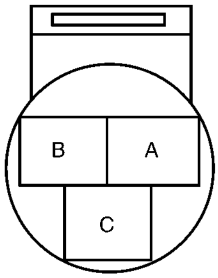
Air Conditioning
Pressure (ACP) Sensor
Connector

A102F088



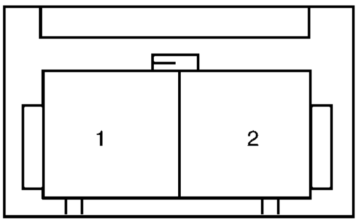
Idle Air Control (IAC) Valve
Connector

A102F076



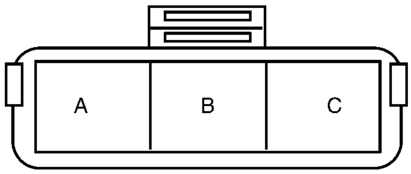
Throttle Position
Sensor (TPS) Connector

A102F074



Manifold Air
Temperature (MAT) Sensor
Connector

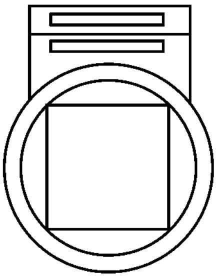
A102F077



Vehicle Speed
Sensor (VSS) (M/T)
Connector

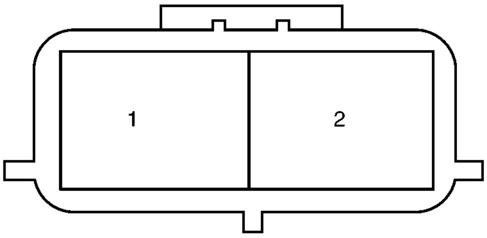
A102F086

CONNECTOR END VIEW (Cont'd)



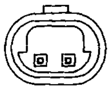
Oxygen (O_2) Sensor Connector

A102F081



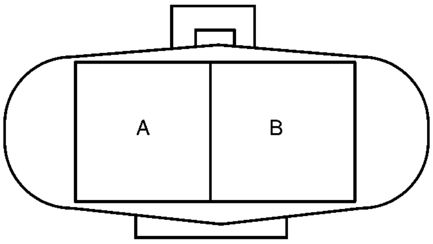
Controlled Canister Purge (CCP) Solenoid Connector

A102F078



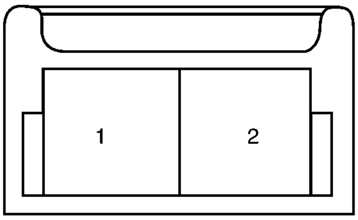
Knock Sensor Connector

A202F069



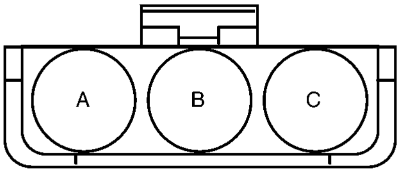
Cooling Fan Connector

A102F089



Fuel Injector Connector

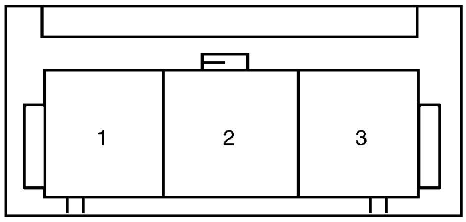
A102F082



Manifold Absolute Pressure (MAP) Sensor Connector

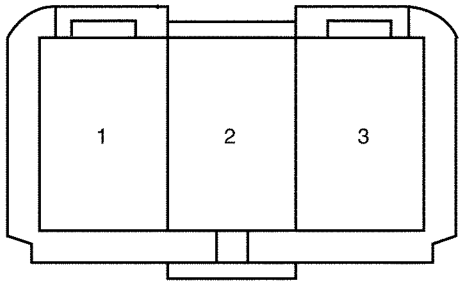
A102F075

CONNECTOR END VIEW (Cont'd)



Crankshaft Position
Sensor (CPS) Connector

A102F084

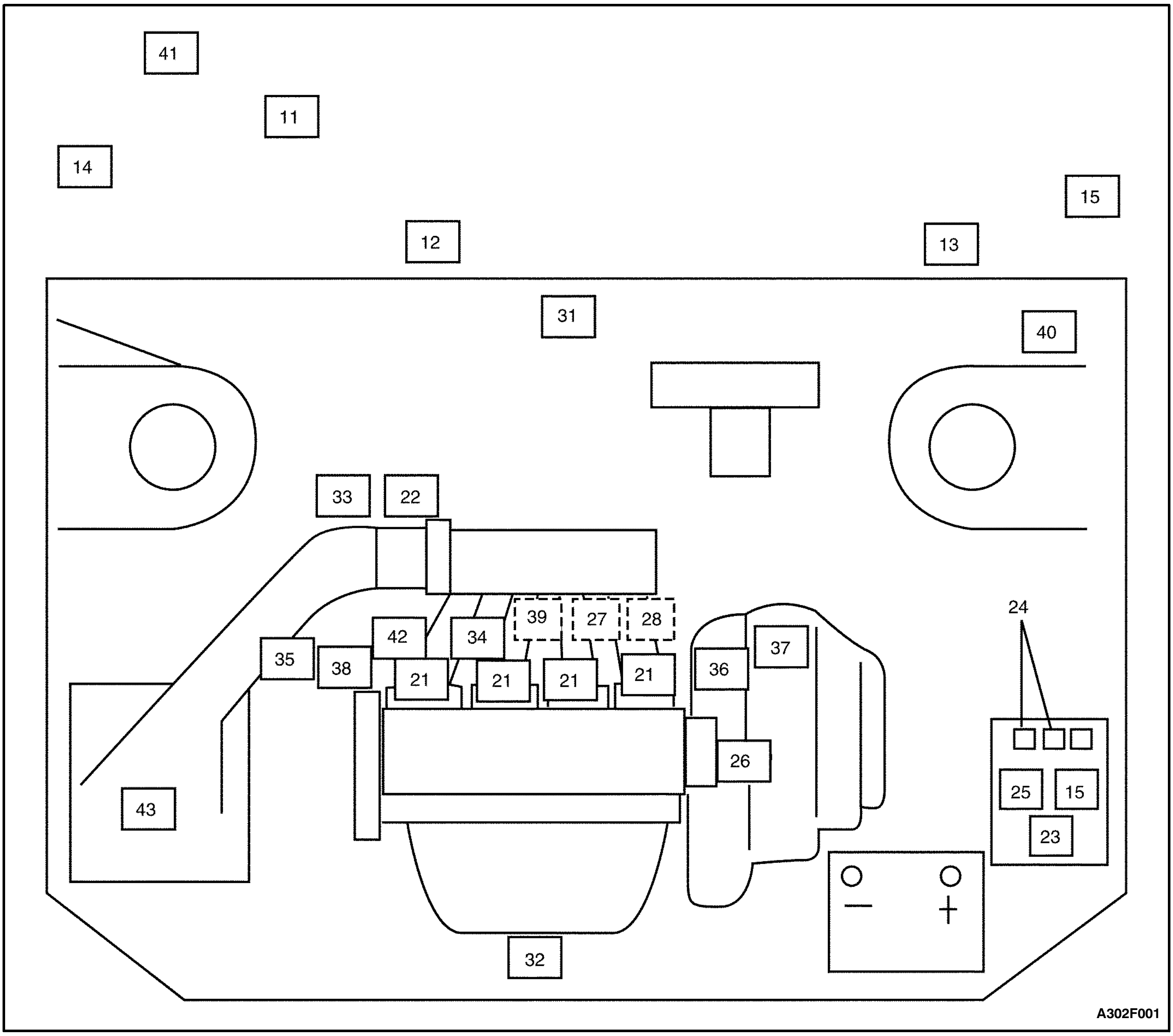


CO Potentiometer Connector

B302F150

COMPONENT LOCATOR

COMPONENT LOCATOR - SOHC



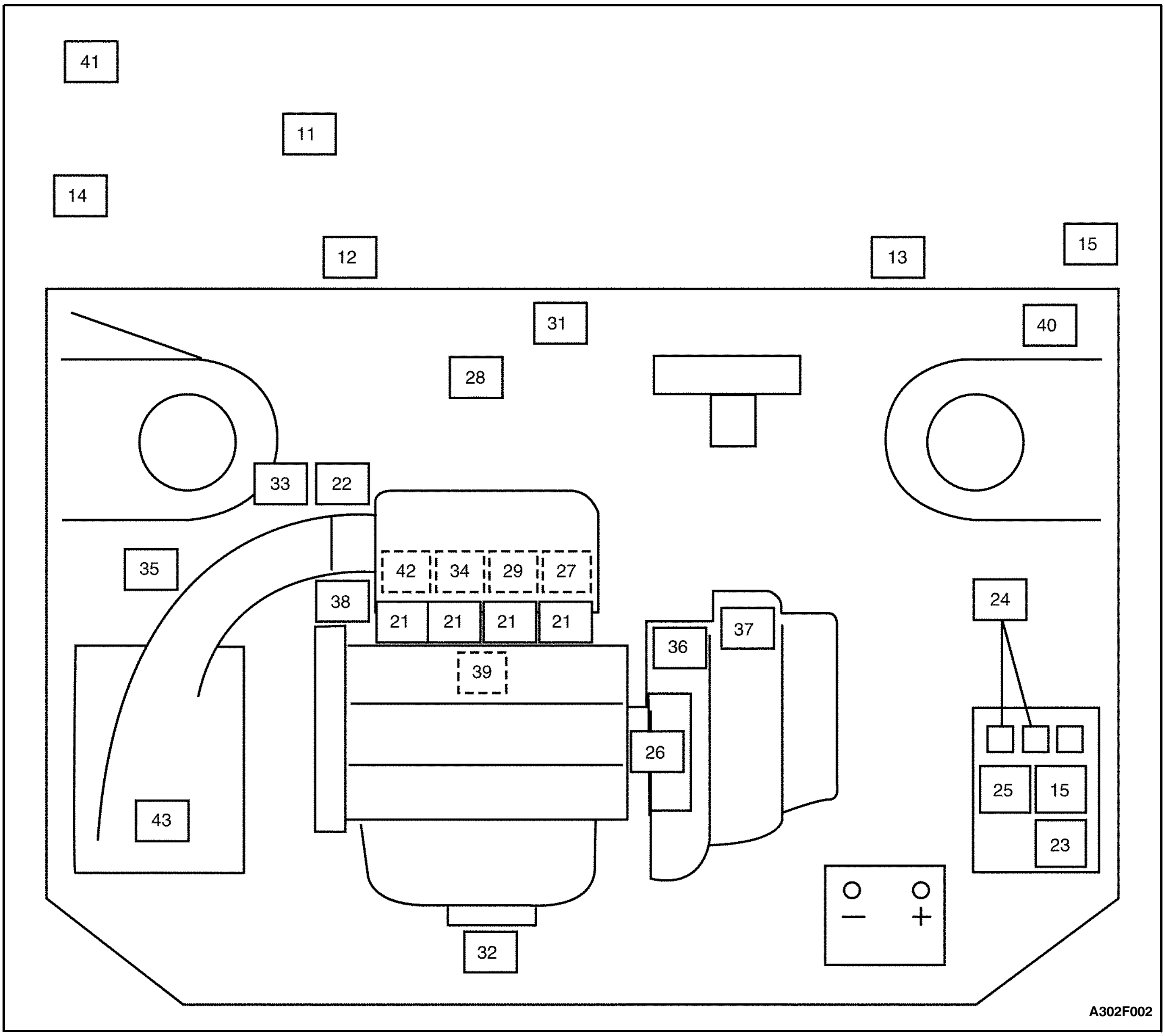
Components on ECM Harness
- 11 Electronic Control Module (ECM)
- 12 Assembly Line Diagnostic Link (ALDL) Diagnostic Connector
- 13 Malfunction Indicator Lamp
- 14 ECM/ABS Harness Ground
- 15 Fuse Panel (2)

ECM-Controlled Devices
- 21 Fuel Injector (4)
- 22 Idle Air Control (IAC) Valve
- 23 Fuel Pump Relay
- 24 Engine Fan Relays
- 25 A/C Compressor Relay
- 26 Direct Ignition System (DIS) Ignition Coil
- 27 Controlled Canister Purge (CCP) Solenoid
- 28 Exhaust Gas Recirculation (EGR) Solenoid

Information Sensors
- 31 Manifold Absolute Pressure (MAP) Sensor
- 32 Oxygen (O_2) Sensor
- 33 Throttle Position Sensor (TPS)
- 34 Coolant Temperature Sensor (CTS)
- 35 Manifold Air Temperature (MAT) Sensor
- 36 Vehicle Speed Sensor (VSS) (Manual Transaxle Only)
- 37 P/N Switch (Automatic Transaxle only)
- 38 Crankshaft Position Sensor (CPS)
- 39 Knock Sensor
- 40 CO Potentiometer

Not ECM-Connected
- 41 Evaporative Emission Canister (under vehicle, behind right rear wheel)
- 42 Oil Pressure Switch
- 43 Air Cleaner

COMPONENT LOCATOR – DOHC



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- 11 Electronic Control Module (ECM)
- 12 Assembly Line Diagnostic Link (ALDL) Diagnostic Connector
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- 38 Crankshaft Position Sensor (CPS)
- 39 Knock Sensor
- 40 CO Potentiometer

Not ECM-Connected
- 41 Evaporative Emission Canister (under vehicle, behind right rear wheel)
- 42 Oil Pressure Switch
- 43 Air Cleaner

DIAGNOSIS

TROUBLE CODE DIAGNOSIS

CLEARING TROUBLE CODES

Notice: To prevent electronic control module (ECM) damage, the key must be OFF when disconnecting or reconnecting the power to the ECM (for example battery cable, electronic control module pigtail connector, electronic control module fuse, jumper cables, etc.).

When the ECM sets a diagnostic trouble code (DTC), the service engine soon (SES) lamp will be turned on and a DTC will be stored in the ECM's memory. If the problem is intermittent, the light will go out after 10 seconds if the fault is no longer present. The DTC will stay in the ECM's memory until the battery voltage to the ECM is removed. Removing battery voltage for 10 seconds will clear all stored DTCs.

DTCs should be cleared after repairs have been completed. Some diagnostic tables will tell you to clear the codes before using the chart. This allows the ECM to set the DTC while going through the chart, which will help to find the cause of the problem more quickly.

IDLE LEARN PROCEDURE

Whenever the battery cables, the electronic control module (ECM), or the ECM fuse is disconnected or replaced, the following idle learn procedure must be performed:

1. Turn the ignition ON for 5 seconds.
2. Turn the ignition OFF for 5 seconds.
3. Turn the ignition ON for 5 seconds.
4. Start the engine in P/N (park/neutral).
5. Allow the engine run until the engine coolant is above 85°C (185°F).
6. Turn the air conditioning (A/C) ON for 10 seconds, if equipped.
7. Turn the A/C OFF for 10 seconds, if equipped.
8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D).
9. Turn the A/C ON for 10 seconds, if equipped.
10. Turn the A/C OFF for 10 seconds, if equipped.
11. Turn the ignition OFF. The idle learn procedure is complete.

DIAGNOSTIC SYSTEM CHECK (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The diagnostic system check is an organized approach to identifying a problem created by an electronic engine control system malfunction. It must be the starting point for any driveability complaint diagnosis because it directs the technician to the next logical step in diagnosing the complaint. Understanding the table and using it correctly will reduce diagnostic time and prevent the unnecessary replacement of parts.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. Check for proper operation of the service engine soon (SES) lamp. When the ignition is ON and the engine is OFF, the SES lamp should come on and remain on steadily.
2. No SES at this point indicates that there is a problem with the SES circuit or the electronic control module (ECM) control of that circuit.
3. This step checks the ability of the ECM to control the SES lamp. With the assembly line diagnostic link (ALDL) terminal grounded, the SES lamp should flash a Code 12 three times, followed by any diagnostic trouble code (DTC) stored in memory. Depending upon the type of ECM, an ECM error may result in the inability to flash Code 12.
4. Most procedures use a scan tool to aid diagnosis; therefore, serial data must be available. If an ECM error is present, the ECM may be able to illuminate the SES lamp, but not enable serial data.
5. Although the ECM is powered up, an "Engine Cranks But Will Not Start" symptom could exist because of an ECM or system problem.
6. This step will isolate if the customer complaint is an SES or a driveability problem with no SES. Refer to the DTC in this section for a list of valid DTCs. An invalid DTC may be the result of a faulty scan tool or a faulty ECM.
7. Comparison of actual control system data with the typical values is a quick check to determine if any parameter is not within limits. Keep in mind that a basic engine problem (such as incorrect valve timing or a vacuum leak) may substantially alter sensor values.
8. Installation of a scan tool will provide a good ground path for the ECM and may hide a driveability complaint due to poor ECM grounds.
9. If the actual data is not within the typical values established, refer to the tables in "Symptom Diagnosis" to provide a functional check of the suspect component or system.

Diagnostic System Check (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Verify the customer complaint(s). Are the customer's complaint(s) verified?	-	Go to Step 2	-
2	Turn the ignition ON. Is the service engine soon (SES) lamp on steadily?	-	Go to Step 4	Go to Step 3
3	Jumper the assembly line diagnostic link (ALDL) terminals A and B. Does the SES flash Code 12?	-	Go to Step 4	Go to "Will Not Flash SES"
4	1. Connect the scan tool to the ALDL. 2. Turn the ignition ON. Does the scan tool display serial data?	-	Go to Step 5	Go to Step 12
5	Start the engine. Does the engine start?	-	Go to Step 6	Go to "Engine Cranks But Will Not Start"
6	1. Turn the ignition OFF. 2. Connect the scan tool to the ALDL. 3. Turn the ignition ON. Are any diagnostic trouble codes (DTCs) displayed?	-	Go to Step 8	Go to Step 7
7	1. Start the engine. 2. Compare the scan tool data with typical values. Are the values normal or within the normal range?	-	Go to Step 9	Go to Step 10
8	Refer to the applicable DTC table. Start with the DTC with the lowest numerical value and move up. Are the DTC(s) identified as valid trouble code(s)?	-	Go to the applicable DTC table	Go to Step 6
9	Are there any symptoms that have been identified?	-	Go to the applicable symptom table	Go to Step 11
10	Identify the component that has a serial data value outside the normal range. Has the component been identified?	-	Go to "Diagnostic Aids"	-
11	1. Clear any DTC(s) from the electronic control module (ECM) memory. 2. Verify that the DTC(s) have been cleared. 3. Road test the vehicle. 4. Recheck for the presence of any DTC(s). Is the repair complete?	-	System OK	Go to Step 1
12	1. Attach the scan tool to another vehicle. 2. Turn the ignition ON. Does the scan tool read serial data?	-	Go to Step 13	Go to Step 16
13	Check for an open or short in the wire between ECM terminal B7 and ALDL connector M. Is the problem found?	-	Go to Step 14	Go to Step 15
14	1. Repair the open or short as necessary. 2. Connect the scan tool to the ALDL. 3. Start the engine. Does the scan tool display serial data?	-	System OK	Go to Step 15

Diagnostic System Check (1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
15	1. Replace the ECM. 2. Connect the scan tool to the ALDL. 3. Start the engine. Does the scan tool display serial data?	-	Go to Step 6	-
16	1. Replace the scan tool. 2. Connect the scan tool to the ALDL. 3. Ignition ON. Does the scan tool read serial data?	-	Go to Step 5	-

DIAGNOSTIC SYSTEM CHECK (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The diagnostic system check is an organized approach to identifying a problem created by an electronic engine control system malfunction. It must be the starting point for any driveability complaint diagnosis because it directs the technician to the next logical step in diagnosing the complaint. Understanding the table and using it correctly will reduce diagnostic time and prevent the unnecessary replacement of parts.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. Check for proper operation of the service engine soon (SES) lamp. When the ignition is ON and the engine is OFF, the SES lamp should come on and remain on steadily.
2. No SES at this point indicates that there is a problem with the SES circuit or the electronic control module (ECM) control of that circuit.
3. This step checks the ability of the ECM to control the SES lamp. With the assembly line diagnostic link (ALDL) terminal grounded, the SES lamp should flash a Code 12 three times, followed by any diagnostic trouble code (DTC) stored in memory. Depending upon the type of ECM, an ECM error may result in the inability to flash Code 12.
4. Most procedures use a scan tool to aid diagnosis; therefore, serial data must be available. If an ECM error is present, the ECM may be able to illuminate the SES lamp, but not enable serial data.
5. Although the ECM is powered up, an "Engine Cranks But Will Not Start" symptom could exist because of an ECM or system problem.
6. This step will isolate if the customer complaint is an SES or a driveability problem with no SES. Refer to the DTC in this section for a list of valid DTCs. An invalid DTC may be the result of a faulty scan tool or a faulty ECM.
7. Comparison of actual control system data with the typical values is a quick check to determine if any parameter is not within limits. Keep in mind that a basic engine problem (such as incorrect valve timing or a vacuum leak) may substantially alter sensor values.
8. Installation of a scan tool will provide a good ground path for the ECM and may hide a driveability complaint due to poor ECM grounds.
9. If the actual data is not within the typical values established, refer to the tables in "Symptom Diagnosis" to provide a functional check of the suspect component or system.

Diagnostic System Check (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Verify the customer complaint(s). Are the customer's complaint(s) verified?	-	Go to Step 2	-
2	Turn the ignition ON. Is the service engine soon (SES) lamp on steadily?	-	Go to Step 4	Go to Step 3
3	Jumper the assembly line diagnostic link (ALDL) terminals A and B. Does the SES flash Code 12?	-	Go to Step 4	Go to "Will Not Flash SES"
4	1. Connect the scan tool to the ALDL. 2. Turn the ignition ON. Does the scan tool display serial data?	-	Go to Step 5	Go to Step 12
5	Start the engine. Does the engine start?	-	Go to Step 6	Go to "Engine Cranks But Will Not Start"
6	1. Turn the ignition OFF. 2. Connect the scan tool to the ALDL. 3. Turn the ignition ON. Are any diagnostic trouble codes (DTCs) displayed?	-	Go to Step 8	Go to Step 7
7	1. Start the engine. 2. Compare the scan tool data with typical values. Are the values normal or within the normal range?	-	Go to Step 9	Go to Step 10
8	Refer to the applicable DTC table. Start with the DTC with the lowest numerical value and move up. Are the DTC(s) identified as valid trouble code(s)?	-	Go to the applicable DTC table	Go to Step 6
9	Are there any symptoms that have been identified?	-	Go to the applicable symptom table	Go to Step 11
10	Identify the component that has a serial data value outside the normal range. Has the component been identified?	-	Go to "Diagnostic Aids"	-
11	1. Clear any DTC(s) from the electronic control module (ECM) memory. 2. Verify that the DTC(s) have been cleared. 3. Road test the vehicle. 4. Recheck for the presence of any DTC(s). Is the repair complete?	-	System OK	Go to Step 1
12	1. Attach the scan tool to another vehicle. 2. Turn the ignition ON. Does the scan tool read serial data?	-	Go to Step 13	Go to Step 16
13	Check for an open or short in the wire between ECM terminal D11 and ALDL connector M. Is the problem found?	-	Go to Step 14	Go to Step 15
14	1. Repair the open or short as necessary. 2. Connect the scan tool to the ALDL. 3. Start the engine. Does the scan tool display serial data?	-	System OK	Go to Step 15

Diagnostic System Check (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
15	1. Replace the ECM. 2. Connect the scan tool to the ALDL. 3. Start the engine. Does the scan tool display serial data?	-	Go to Step 6	-
16	1. Replace the scan tool. 2. Connect the scan tool to the ALDL. 3. Ignition ON. Does the scan tool read serial data?	-	Go to Step 5	-

DIAGNOSTIC AIDS

If an intermittent problem is evident, follow the guidelines below.

Preliminary Checks

Before using this section you should have already performed the "Diagnostic System Check."

Perform a thorough visual inspection. This inspection can often lead to correcting a problem without further checks and can save valuable time. Inspect for the following conditions:

- Electronic control module (ECM) grounds for being clean, tight, and in their proper location.
- Vacuum hoses for splits, kinks, or collapsing and improper connections as shown on the Vehicle Emission Control Information label. Inspect thoroughly for any type of leak or restriction.
- Air leaks at the throttle body mounting area and the intake manifold sealing surfaces.
- Ignition wires for cracks, hardness, improper routing, and carbon tracking.
- Wiring for improper connections.
- Wiring for pinches or cuts.

Diagnostic Trouble Code Tables

Do not use the diagnostic trouble code (DTC) tables to try to correct an intermittent fault. The fault must be present to locate the problem.

Incorrect use of the DTC tables may result in the unnecessary replacement of parts.

Faulty Electrical Connections or Wiring

Most intermittent problems are caused by faulty electrical connections or wiring. Perform a careful inspection of suspect circuits for the following:

- Poor mating of the connector halves.
- Terminals not fully seated in the connector body.
- Improperly formed or damaged terminals. All connector terminals in a problem circuit should be carefully inspected, reformed, or replaced to insure contact tension.
- Poor terminal-to-wire connection. This requires removing the terminal from the connector body.

Road Test

If a visual inspection does not find the cause of the problem, the vehicle can be driven with a voltmeter or a scan tool connected to a suspected circuit. An abnormal voltage or scan tool reading will indicate that the problem is in that circuit.

If there are no wiring or connector problems found and a DTC was stored for a circuit having a sensor, except for DTC 44 and DTC 45, replace the sensor.

Intermittent Service Engine Soon (SES) Lamp

An intermittent service engine soon (SES) lamp with no DTC present may be caused by the following:

- Electrical system interference caused by a defective relay, ECM-driven solenoid, or switch.
- Improper installation of electrical options such as lights, two-way radios, sound systems, or security systems.
- Ignition control wires not routed away from ignition wires, ignition system components, and the generator.
- Ignition secondary wires shorted to ground.
- SES lamp driver wire or diagnostic test terminal intermittently shorted to ground.
- Intermittent loss of ECM ground connections.

Fuel System

Some intermittent driveability problems can be attributed to poor fuel quality. If a vehicle is occasionally running rough, stalling, or otherwise performing badly, ask the customer about the following fuel buying habits:

- Do they always buy from the same source? If so, fuel quality problems can usually be discounted.
- Do they buy their fuel from whichever fuel station is advertising the lowest price? If so, check the fuel tank for signs of debris, water, or other contamination.

ENGINE CRANKS BUT WILL NOT START (1.3L AND 1.5L SOHC IEFI-6)

Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. By performing a compression test, it can be determined if the engine has the mechanical ability to run.
9. It is important to check for the presence of spark from all of the ignition wires. If spark is present from one to three of the ignition coil terminals, the crankshaft position sensor (CPS) is OK.
19. In checking the electronic control module (ECM) outputs for the electronic spark timing signal, it recommended to use an oscilloscope to view the varying voltage signals. In measuring these outputs with a voltmeter, intermittent errors may occur that cannot be seen by a voltmeter.
35. This step checks for proper operation of the ECM's control of the fuel pump circuit.
59. This step checks for a ground signal being supplied by the ECM to operate the fuel injectors. If there is no ground present during the cranking of the engine, and the fuel injector wiring is OK, the ECM is at fault.

Engine Cranks But Will Not Start (1.3L and 1.5L SOHC IEFI-6)

Caution: Use only electrically insulated pliers when handling ignition wires with the engine running to preĆvent an electrical shock.

Caution: Do not pinch or restrict nylon fuel lines. Damage to the lines could cause a fuel leak, resulting in possible fire or personal injury.

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Crank the engine. Does the engine start and continue to run?	-	System OK	Go to Step 3
3	Perform a cylinder compression test. Is the cylinder compression for all of the cylinders at or above the value specified?	689 kPa (100 psi)	Go to Step 7	Go to Step 4
4	Inspect the timing belt alignment. Is the timing belt in alignment?	-	Go to Step 6	Go to Step 5
5	Align or replace the timing belt as needed. Is the repair complete?	-	Go to Step 2	-
6	Repair the internal engine damage as needed. Is the repair complete?	-	Go to Step 2	-
7	Inspect the fuel pump fuse. Is the problem found?	-	Go to Step 8	Go to Step 9
8	Replace the fuse. Is the repair complete?	-	Go to Step 2	-
9	Check for the presence of spark from all of the ignition wires while cranking the engine. Is spark present from all of the ignition wires?	-	Go to Step 34	Go to Step 10
10	1. Measure the resistance of the ignition wires. 2. Replace any of the ignition wire(s) with a resistance above the value specified. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	30,000 W	Go to Step 2	Go to Step 11

Engine Cranks But Will Not Start (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Turn the ignition OFF. 2. Disconnect the crankshaft position sensor (CPS) connector. 3. Turn the ignition ON. 4. Measure the voltage between the CPS connector terminals 1 and 3. Does the voltage measure near the value specified?	1.08 v	Go to Step 12	Go to Step 13
12	Measure the voltage between the CPS connector terminals 2 and 3. Does the voltage measure near the value specified?	1.08 v	Go to Step 19	Go to Step 14
13	Measure the voltage between the CPS connector terminals 1 and ground. Does the voltage measure near the value specified?	1.08 v	Go to Step 15	Go to Step 16
14	Measure the voltage between the CPS connector terminals 2 and ground. Does the voltage measure near the value specified?	1.08 v	Go to Step 15	Go to Step 17
15	Check for an open or short in the wire between the CPS connector terminal 3 and ground. Is the problem found?	-	Go to Step 18	Go to Step 33
16	Check for an open or short in the wire between the CPS connector terminal 1 and the electronic control module (ECM) connector terminal A2. Is the problem found?	-	Go to Step 18	Go to Step 33
17	Check for an open or short in the wire between the CPS connector terminal 2 and the ECM connector terminal B3. Is the problem found?	-	Go to Step 18	Go to Step 33
18	Repair the wiring as needed. Is the repair complete?	-	Go to Step 2	-
19	1. Disconnect the direct ignition system (DIS) ignition coil connector to prevent the vehicle from starting. 2. Measure the voltage at the ECM connector terminal A2 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with ignition ON, 1.20 v during cranking	Go to Step 20	Go to Step 21
20	Measure the voltage at the ECM connector terminal B3 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with ignition ON, 1.20 v during cranking	Go to Step 22	Go to Step 21
21	Replace the CPS. Is the repair complete?	-	Go to Step 2	-
22	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the DIS ignition coil. 3. Connect a test light between terminal D of the DIS ignition coil connector and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 23	Go to Step 24
23	Connect a test light between terminal C of the DIS ignition coil connector and battery positive. Is the test light on?	-	Go to Step 27	Go to Step 25

Engine Cranks But Will Not Start (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
24	Check for an open in the wiring between the ignition switch and the DIS ignition coil connector terminal D. Is the problem found?	-	Go to Step 26	-
25	Check for an open in the wire from the DIS ignition coil to ground. Is the problem found?	-	Go to Step 26	-
26	1. Repair the wiring as needed. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	Go to Step 2	Go to Step 27
27	1. Turn the ignition OFF. 2. Disconnect the DIS ignition coil connector. 3. While cranking the engine, measure the voltage at the DIS ignition coil connector terminal B. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 28	Go to Step 29
28	While cranking the engine, measure the voltage at the DIS ignition coil connector terminal A. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 32	Go to Step 30
29	Check for an open in the wire from the DIS ignition coil connector terminal B to the ECM connector terminal D10. Is the problem found?	-	Go to Step 31	Go to Step 33
30	Check for an open in the wire from the DIS ignition coil connector terminal A to the ECM connector terminal C3. Is the problem found?	-	Go to Step 31	Go to Step 33
31	1. Repair the wiring as needed. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	Go to Step 2	Go to Step 32
32	Replace the DIS ignition coil. Is the repair complete?	-	Go to Step 2	-
33	Replace the ECM. Is the repair complete?	-	Go to Step 2	-
34	1. Turn the ignition OFF. 2. Connect a fuel pressure gauge. 3. Crank the engine. Is any fuel pressure present?	-	Go to Step 37	Go to Step 35
35	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the fuel pump. 3. Connect a test light between the fuel pump connector terminals 3 and 2. 4. Turn the ignition ON. 5. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 36	Go to Step 46

Engine Cranks But Will Not Start (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
36	Replace the fuel pump. Is the repair complete?	-	Go to Step 2	-
37	Is the fuel pressure within the value specified?	283-324 kPa (41-47 psi)	Go to Step 41	Go to Step 38
38	1. Check the fuel filter for a restriction. 2. Inspect the fuel lines for kinks and restrictions. Is the problem found?	-	Go to Step 39	Go to Step 40
39	1. Replace the fuel filter and/or the fuel lines as needed. 2. Connect a fuel pressure gauge. 3. Crank the engine. Is the fuel pressure within the value specified?	283-324 kPa (41-47 psi)	Go to Step 2	Go to Step 40
40	1. Disconnect the vacuum line from the fuel pressure regulator. 2. Inspect the vacuum line for the presence of fuel. 3. Inspect the fuel pressure regulator vacuum port for the presence of fuel. Is any fuel present?	-	Go to Step 43	Go to Step 44
41	Check the fuel for contamination. Is the fuel contaminated?	-	Go to Step 42	Go to Step 58
42	1. Remove the contaminated fuel from the fuel tank. 2. Clean the fuel tank as needed. Is the repair complete?	-	Go to Step 2	-
43	Replace the fuel pressure regulator. Is the repair complete?	-	Go to Step 2	-
44	1. Remove the fuel pump assembly from the fuel tank. 2. Inspect the fuel pump sender and the fuel coupling hoses for a restriction. 3. Inspect the in-tank fuel filter for a restriction. Is the problem found?	-	Go to Step 45	Go to Step 36
45	Replace the fuel pump sender, the in-tank fuel filter, and/or the fuel coupling hoses as needed. Is the repair complete?	-	Go to Step 2	-
46	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the fuel pump. 3. Connect a test light between the fuel pump connector terminal 3 and a known good ground. 4. Turn the ignition ON. 5. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 47	Go to Step 48
47	Repair the open wire between the fuel pump connector terminal 2 and ground. Is the repair complete?	-	Go to Step 2	-
48	1. Turn the ignition OFF. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 49	Go to Step 54

Engine Cranks But Will Not Start (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
49	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 85 and battery positive. 3. Turn the ignition ON. 4. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 50	Go to Step 55
50	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 51	Go to Step 57
51	1. Turn the ignition OFF. 2. Check the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3 for an open or short to ground. Is the problem found?	-	Go to Step 52	Go to Step 53
52	Repair the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3. Is the repair complete?	-	Go to Step 2	-
53	Replace the fuel pump relay. Is the repair complete?	-	Go to Step 2	-
54	1. Inspect the I/P fuse block fuse F17. 2. Check for an open in the wiring between the ignition switch and the fuel pump relay connector terminal 86. Is the problem found?	-	Go to Step 65	-
55	Check the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal B6 for an open. Is the problem found?	-	Go to Step 56	Go to Step 33
56	Repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal B6. Is the repair complete?	-	Go to Step 2	-
57	Repair the wire between the fuel pump relay connector terminal 30 and the fuse EF16. Is the repair complete?	-	Go to Step 2	-
58	1. Turn the ignition OFF. 2. Disconnect the fuel injector harness connectors from all of the fuel injectors. 3. Turn the ignition ON. 4. Connect a test light between the fuel injector harness connector 1 and ground. 5. Repeat step 4 for each of the remaining fuel injectors. Is the test light on at all of the fuel injectors?	-	Go to Step 59	Go to Step 62

Engine Cranks But Will Not Start (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
59	1. Turn the ignition OFF. 2. Connect a test light between the fuel injector harness connector terminal 2 and battery positive. 3. Crank the engine. 4. Repeat Steps 3 and 4 for each of the remaining fuel injectors. Does the test light flash for all of the fuel injectors?	-	Go to Step 60	Go to Step 63
60	Measure the resistance of each fuel injector. Is the resistance within the value specified?	11.6-12.4 W	System OK	Go to Step 61
61	Replace any of the fuel injectors with a resistance out of specification. Is the repair complete?	-	Go to Step 2	-
62	Repair the open wire(s) between the fuel injector harness connector(s) terminal 1 and the engine harness C104 terminal 9. Is the repair complete?	-	Go to Step 2	-
63	1. Check for an open between the fuel injector harness connector terminal 2 and the ECM connector terminal C10 for the fuel injectors 1 and 4. 2. Check for an open between the fuel injector harness connector terminal 2 and the ECM connector terminal C15 for the fuel injectors 2 and 3. Is the problem found?	-	Go to Step 64	Go to Step 66
64	Repair the open fuel injector harness wire(s). Is the repair complete?	-	Go to Step 2	-
65	Replace the fuse or repair the wiring as needed. Is the repair complete?	-	Go to Step 2	-
66	1. Inspect the I/P fuse F14. 2. Check for an open between the circuits from terminal 1 for each of the four fuel injectors and the ignition switch. Is the problem found?	-	Go to Step 65	-

ENGINE CRANKS BUT WILL NOT START (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. By performing a compression test, it can be determined if the engine has the mechanical ability to run.
9. It is important to check for the presence of spark from all of the ignition wires. If spark is present from one to three of the ignition coil terminals, the crankshaft position sensor (CPS) is OK.
19. In checking the electronic control module (ECM) outputs for the electronic spark timing signal, it recommended to use an oscilloscope to view the varying voltage signals. In measuring these outputs with a voltmeter, intermittent errors may occur that cannot be seen by a voltmeter.
35. This step checks for proper operation of the ECM's control of the fuel pump circuit.
59. This step checks for a ground signal being supplied by the ECM to operate the fuel injectors. If there is no ground present during the cranking of the engine, and the fuel injector wiring is OK, the ECM is at fault.

Engine Cranks But Will Not Start (1.3L SOHC and 1.6L DOHC ITMS-6F)

Caution: Use only electrically insulated pliers when handling ignition wires with the engine running to preĆ vent an electrical shock.

Caution: Do not pinch or restrict nylon fuel lines. Damage to the lines could cause a fuel leak, resulting in possible fire or personal injury.

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Crank the engine. Does the engine start and continue to run?	-	System OK	Go to Step 3
3	Perform a cylinder compression test. Is the cylinder compression for all of the cylinders at or above the value specified?	689 kPa (100 psi)	Go to Step 7	Go to Step 4
4	Inspect the timing belt alignment. Is the timing belt in alignment?	-	Go to Step 6	Go to Step 5
5	Align or replace the timing belt as needed. Is the repair complete?	-	Go to Step 2	-
6	Repair the internal engine damage as needed. Is the repair complete?	-	Go to Step 2	-
7	Inspect the fuel pump fuse. Is the problem found?	-	Go to Step 8	Go to Step 9
8	Replace the fuse. Is the repair complete?	-	Go to Step 2	-
9	Check for the presence of spark from all of the ignition wires while cranking the engine. Is spark present from all of the ignition wires?	-	Go to Step 34	Go to Step 10
10	1. Measure the resistance of the ignition wires. 2. Replace any of the ignition wire(s) with a resistance above the value specified. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	30,000 W	Go to Step 2	Go to Step 11

Engine Cranks But Will Not Start (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Turn the ignition OFF. 2. Disconnect the crankshaft position sensor (CPS) connector. 3. Turn the ignition ON. 4. Measure the voltage between the CPS connector terminals 1 and 3. Does the voltage measure near the value specified?	1.08 v	Go to Step 12	Go to Step 13
12	Measure the voltage between the CPS connector terminals 2 and 3. Does the voltage measure near the value specified?	1.08 v	Go to Step 19	Go to Step 14
13	Measure the voltage between the CPS connector terminal 1 and ground. Does the voltage measure near the value specified?	1.08 v	Go to Step 15	Go to Step 16
14	Measure the voltage between the CPS connector terminals 2 and ground. Does the voltage measure near the value specified?	1.08 v	Go to Step 15	Go to Step 17
15	Check for an open or short in the wire between the CPS connector terminal 3 and ground. Is the problem found?	-	Go to Step 18	Go to Step 33
16	Check for an open or short in the wire between the CPS connector terminal 1 and the electronic control module (ECM) connector terminal B14. Is the problem found?	-	Go to Step 18	Go to Step 33
17	Check for an open or short in the wire between the CPS connector terminal 2 and the ECM connector terminal A16. Is the problem found?	-	Go to Step 18	Go to Step 33
18	Repair the wiring as needed. Is the repair complete?	-	Go to Step 2	-
19	1. Disconnect the direct ignition system (DIS) ignition coil connector to prevent the vehicle from starting. 2. Measure the voltage at the ECM connector terminal B14 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with ignition ON, 1.20 v during cranking	Go to Step 20	Go to Step 21
20	Measure the voltage at the ECM connector terminal A16 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with ignition ON, 1.20 v during cranking	Go to Step 22	Go to Step 21
21	Replace the CPS. Is the repair complete?	-	Go to Step 2	-
22	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the DIS ignition coil. 3. Connect a test light between terminal D of the DIS ignition coil connector and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 23	Go to Step 24
23	Connect a test light between terminal C of the DIS ignition coil connector and battery positive. Is the test light on?	-	Go to Step 27	Go to Step 25

Engine Cranks But Will Not Start (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
24	Check for an open in the wiring between the ignition switch and the DIS ignition coil connector terminal D. Is the problem found?	-	Go to Step 26	-
25	Check for an open in the wire from the DIS ignition coil to ground. Is the problem found?	-	Go to Step 26	-
26	1. Repair the wiring as needed. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	Go to Step 2	Go to Step 27
27	1. Turn the ignition OFF. 2. Disconnect the DIS ignition coil connector. 3. While cranking the engine, measure the voltage at the DIS ignition coil connector terminal B. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 28	Go to Step 29
28	While cranking the engine, measure the voltage at the DIS ignition coil connector terminal A. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 32	Go to Step 30
29	Check for an open in the wire from the DIS ignition coil connector terminal B to the ECM connector terminal C14. Is the problem found?	-	Go to Step 31	Go to Step 33
30	Check for an open in the wire from the DIS ignition coil connector terminal A to the ECM connector terminal D14. Is the problem found?	-	Go to Step 31	Go to Step 33
31	1. Repair the wiring as needed. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	Go to Step 2	Go to Step 32
32	Replace the DIS ignition coil. Is the repair complete?	-	Go to Step 2	-
33	Replace the ECM. Is the repair complete?	-	Go to Step 2	-
34	1. Turn the ignition OFF. 2. Connect a fuel pressure gauge. 3. Crank the engine. Is any fuel pressure present?	-	Go to Step 37	Go to Step 35
35	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the fuel pump. 3. Connect a test light between the fuel pump connector terminals 3 and 2. 4. Turn the ignition ON. 5. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 36	Go to Step 46

Engine Cranks But Will Not Start (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
36	Replace the fuel pump. Is the repair complete?	-	Go to Step 2	-
37	Is the fuel pressure within the value specified?	283-324 kPa (41-47 psi)	Go to Step 41	Go to Step 38
38	1. Check the fuel filter for a restriction. 2. Inspect the fuel lines for kinks and restrictions. Is the problem found?	-	Go to Step 39	Go to Step 40
39	1. Replace the fuel filter and/or the fuel lines as needed. 2. Connect a fuel pressure gauge. 3. Crank the engine. Is the fuel pressure within the value specified?	283-324 kPa (41-47 psi)	Go to Step 2	Go to Step 40
40	1. Disconnect the vacuum line from the fuel pressure regulator. 2. Inspect the vacuum line for the presence of fuel. 3. Inspect the fuel pressure regulator vacuum port for the presence of fuel. Is any fuel present?	-	Go to Step 43	Go to Step 44
41	Check the fuel for contamination. Is the fuel contaminated?	-	Go to Step 42	Go to Step 58
42	1. Remove the contaminated fuel from the fuel tank. 2. Clean the fuel tank as needed. Is the repair complete?	-	Go to Step 2	-
43	Replace the fuel pressure regulator. Is the repair complete?	-	Go to Step 2	-
44	1. Remove the fuel pump assembly from the fuel tank. 2. Inspect the fuel pump sender and the fuel coupling hoses for a restriction. 3. Inspect the in-tank fuel filter for a restriction. Is the problem found?	-	Go to Step 45	Go to Step 36
45	Replace the fuel pump sender, the in-tank fuel filter, and/or the fuel coupling hoses as needed. Is the repair complete?	-	Go to Step 2	-
46	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the fuel pump. 3. Connect a test light between the fuel pump connector terminal 3 and a known good ground. 4. Turn the ignition ON. 5. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 47	Go to Step 48
47	Repair the open wire between the fuel pump connector terminal 2 and ground. Is the repair complete?	-	Go to Step 2	-

Engine Cranks But Will Not Start (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
48	1. Turn the ignition OFF. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 49	Go to Step 54
49	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 85 and battery positive. 3. Turn the ignition ON. 4. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 50	Go to Step 55
50	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 51	Go to Step 57
51	1. Turn the ignition OFF. 2. Check the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3 for an open or short to ground. Is the problem found?	-	Go to Step 52	Go to Step 53
52	Repair the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3. Is the repair complete?	-	Go to Step 2	-
53	Replace the fuel pump relay. Is the repair complete?	-	Go to Step 2	-
54	1. Inspect the I/P fuse block fuse F17. 2. Check for an open in the wiring between the ignition switch and the fuel pump relay connector terminal 86. Is the problem found?	-	Go to Step 65	-
55	Check the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal A12 for an open. Is the problem found?	-	Go to Step 56	Go to Step 33
56	Repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal A12. Is the repair complete?	-	Go to Step 2	-
57	Repair the wire between the fuel pump relay connector terminal 30 and the fuse EF16. Is the repair complete?	-	Go to Step 2	-

Engine Cranks But Will Not Start (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
58	1. Turn the ignition OFF. 2. Disconnect the fuel injector harness connectors from all of the fuel injectors. 3. Turn the ignition ON. 4. Connect a test light between the fuel injector harness connector 1 and ground. 5. Repeat Step 4 for each of the remaining fuel injectors. Is the test light on at all of the fuel injectors?	-	Go to Step 59	Go to Step 62
59	1. Turn the ignition OFF. 2. Connect a test light between the fuel injector harness connector terminal 2 and battery positive. 3. Crank the engine. 4. Repeat Steps 3 and 4 for each of the remaining fuel injectors. Does the test light flash for all of the fuel injectors?	-	Go to Step 60	Go to Step 63
60	Measure the resistance of each fuel injector. Is the resistance within the value specified?	11.6-12.4 W	System OK	Go to Step 61
61	Replace any of the fuel injectors with a resistance out of specification. Is the repair complete?	-	Go to Step 2	-
62	Repair the open wire(s) between the fuel injector harness connector(s) terminal 1 and the engine harness connector C104 terminal 9. Is the repair complete?	-	Go to Step 2	-
63	1. Check for an open between the fuel injector harness connector terminal 2 and the ECM connector terminal C4 for the fuel injectors 1 and 4. 2. Check for an open between the fuel injector harness connector terminal 2 and the ECM connector terminal C6 for the fuel injectors 2 and 3. Is the problem found?	-	Go to Step 64	Go to Step 66
64	Repair the open fuel injector harness wire(s). Is the repair complete?	-	Go to Step 2	-
65	Replace the fuse or repair the wiring as needed. Is the repair complete?	-	Go to Step 2	-
66	1. Inspect the I/P fuse F14. 2. Check for an open between the circuit from terminal 1 for each of the four fuel injectors and the ignition switch. Is the problem found?	-	Go to Step 65	-

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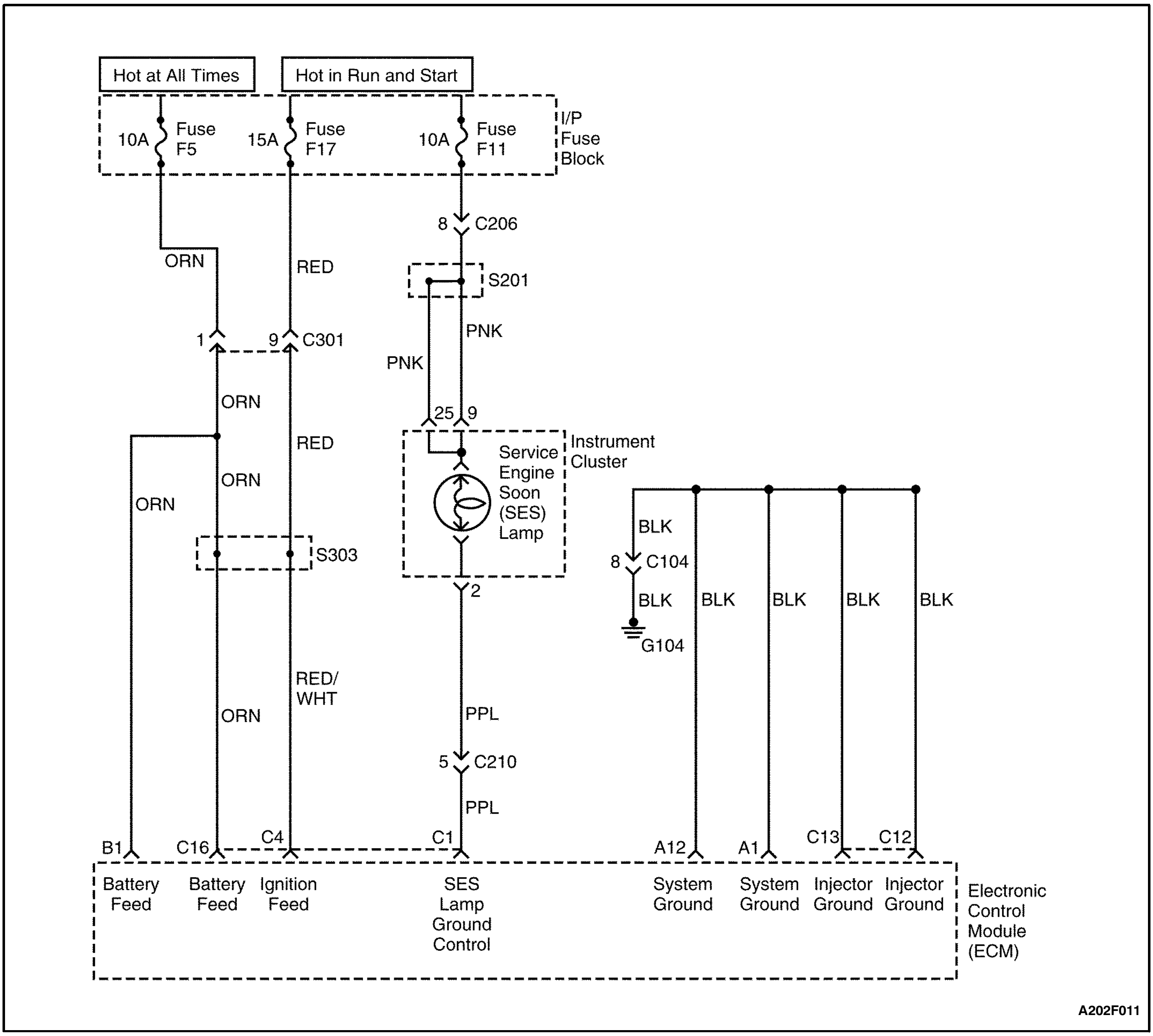

NO SERVICE ENGINE SOON LAMP (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

There should always be a steady service engine soon (SES) lamp when the ignition is ON and the engine is stopped. Battery voltage is supplied directly to the SES bulb. The electronic control module (ECM) will control the SES lamp and turn it on by providing a ground path through the ECM connector terminal C1 wire to the SES lamp.

Diagnostic Aids

- If the engine runs OK, inspect for a faulty malfunction indicator lamp bulb.
- If the engine cranks but will not start, check for open fuses and poor ECM connections. Particularly check for ECM ignition and battery feeds, including clean and tight ECM ground connections.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step checks for battery voltage in the instrument panel SES lamp bulb socket.
8. This step, along with step 9, checks for battery feed to the ECM.
10. This step checks for ignition feed to the ECM.
24. At this point the SES lamp wiring is OK. The problem is a faulty ECM.

No Service Engine Soon Lamp (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Start the engine. Does the engine start?	-	Go to Step 2	Go to Step 7
2	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) connectors. 3. Turn the ignition ON. 4. Connect a test light between the ECM connector terminal C1 and ground. Is the service engine soon (SES) lamp on?	-	Go to Step 14	Go to Step 3
3	Inspect the kick panel fuse F11. Is the fuse OK?	-	Go to Step 4	Go to Step 15
4	Check the ignition feed to the SES bulb using a voltmeter. Is the voltage within the value specified?	11-14 v	Go to Step 5	Go to Step 16
5	Inspect the SES bulb. Is the SES bulb OK?	-	Go to Step 6	Go to Step 17
6	Check for an open or short to voltage in the wire between the ECM connector terminal C1 and the SES bulb. Is the problem found?	-	Go to Step 18	Go to Step 13
7	Inspect the ECM fuse F5/F17. Is the problem found?	-	Go to Step 19	Go to Step 8
8	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Connect a test light to ECM connector terminal B1 and ground. Is the test light on?	-	Go to Step 9	Go to Step 20
9	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Connect a test light between the ECM connector terminal C16 and ground. Is the test light on?	-	Go to Step 10	Go to Step 21
10	1. Turn the ignition OFF. 2. Connect a test light between the ECM connector terminal C4 and ground. 3. Turn the ignition ON. Is the test light on?	-	Go to Step 11	Go to Step 22
11	Inspect the ECM connector terminals B1, C16, and C4 for damage or poor mating. Is the problem found?	-	Go to Step 12	Go to Step 14
12	Repair the ECM connector terminal(s) as needed. Is the repair complete?	-	Go to "Diagnostic System Check"	-
13	Inspect for damage or poor mating at the ECM connector terminal C1. Is the problem found?	-	Go to Step 12	Go to Step 14
14	Check the ECM connector terminals A12 and D1 for ground. Are the grounds OK?	-	Go to Step 24	Go to Step 23

No Service Engine Soon Lamp (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
15	1. Turn the ignition OFF. 2. Replace the fuse. 3. Turn the ignition ON. Is the SES lamp on?	-	Go to "Diagnostic System Check"	Go to Step 4
16	Repair the open in the ignition feed wire to the SES bulb. Is the repair complete?	-	Go to "Diagnostic System Check"	-
17	Replace the SES bulb. Is the repair complete?	-	Go to "Diagnostic System Check"	-
18	Repair the wire between the ECM connector terminal C1 and the SES bulb. Is the repair complete?	-	Go to "Diagnostic System Check"	-
19	1. Turn the ignition OFF. 2. Replace the ECM fuse. 3. Turn the ignition ON. Is the SES lamp on?	-	Go to "Diagnostic System Check"	Go to Step 1
20	Repair the wire between the ECM connector terminal B1 and the F5. Is the repair complete?	-	Go to "Diagnostic System Check"	-
21	Repair the wire between the ECM connector terminal C16 and the F5. Is the repair complete?	-	Go to "Diagnostic System Check"	-
22	Repair the wire between the ECM connector terminal C4 and fuse F17. Is the repair complete?	-	Go to "Diagnostic System Check"	-
23	Repair the open wire between the ECM connector terminals A12 and/or D1 and ground. Is the repair complete?	-	Go to "Diagnostic System Check"	-
24	Replace the ECM. Is the repair complete?	-	Go to "Diagnostic System Check"	-

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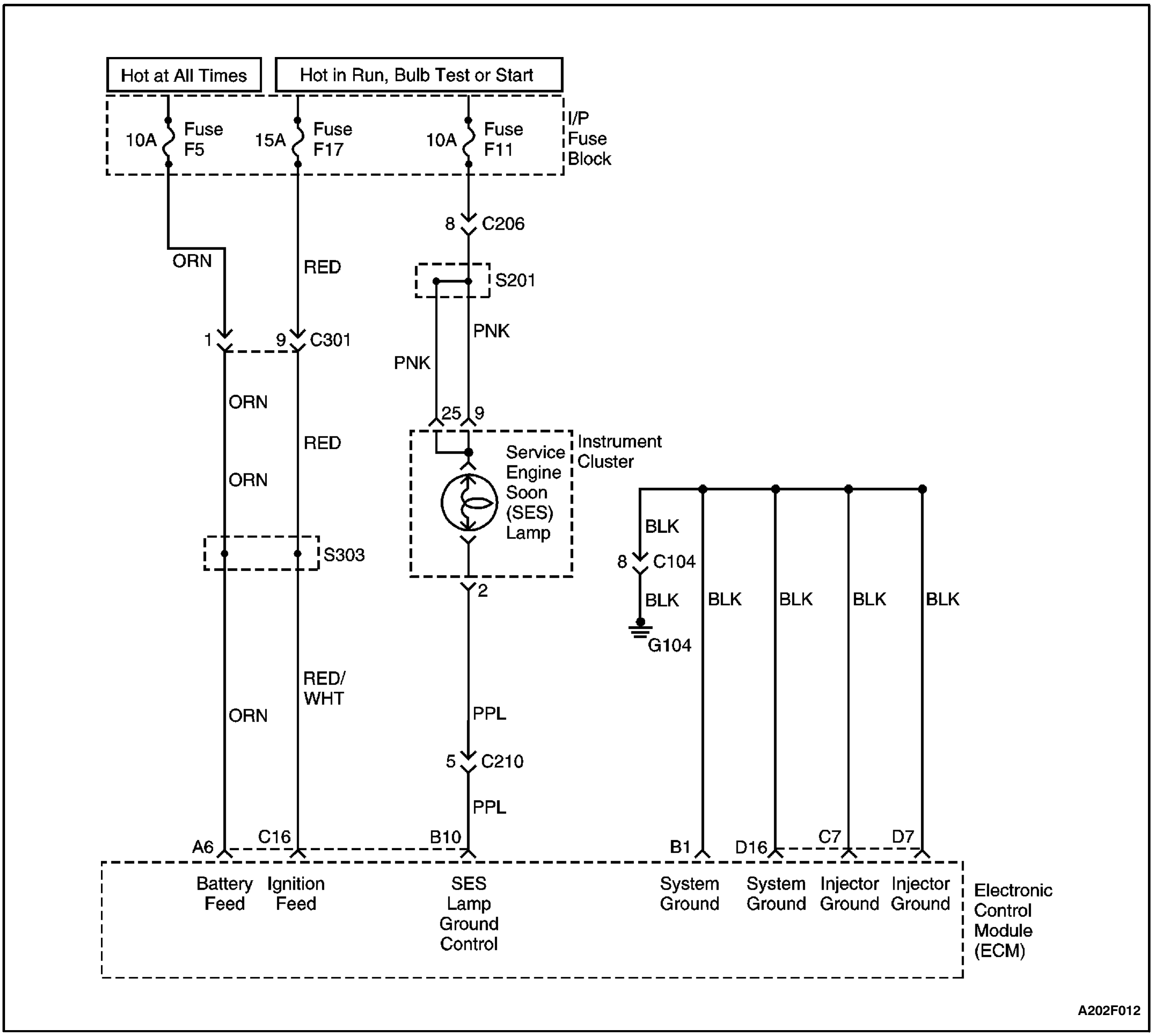

NO SERVICE ENGINE SOON LAMP (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

There should always be a steady service engine soon (SES) lamp when the ignition is ON and the engine is stopped. Battery voltage is supplied directly to the SES bulb. The electronic control module (ECM) will control the SES lamp and turn it on by providing a ground path through the ECM connector terminal B10 wire to the SES lamp.

Diagnostic Aids

- If the engine runs OK, inspect for a faulty malfunction indicator lamp bulb.
- If the engine cranks but will not start, check for open fuses and poor ECM connections. Particularly check for ECM ignition and battery feeds, including clean and tight ECM ground connections.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step checks for battery voltage in the instrument panel SES lamp bulb socket.
8. This step checks for battery feed to the ECM.
9. This step checks for ignition feed to the ECM.
22. At this point the SES lamp wiring is OK. The problem is a faulty ECM.

No Service Engine Soon Lamp (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Start the engine. Does the engine start?	-	Go to Step 2	Go to Step 7
2	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) connectors. 3. Turn the ignition ON. 4. Connect a test light between the ECM connector terminal B10 and ground. Is the service engine soon (SES) lamp on?	-	Go to Step 13	Go to Step 3
3	Inspect the kick panel fuse F11. Is the fuse OK?	-	Go to Step 4	Go to Step 14
4	Check the ignition feed to the SES bulb using a voltmeter. Is the voltage within the value specified?	11-14 v	Go to Step 5	Go to Step 15
5	Inspect the SES bulb. Is the SES bulb OK?	-	Go to Step 6	Go to Step 16
6	Check for an open or short to voltage in the wire between the ECM connector terminal B10 and the SES bulb. Is the problem found?	-	Go to Step 17	Go to Step 12
7	Inspect the ECM fuse F5/F17. Is the problem found?	-	Go to Step 18	Go to Step 8
8	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Connect a test light to ECM connector terminal A6 and ground. Is the test light on?	-	Go to Step 9	Go to Step 19
9	1. Turn the ignition OFF. 2. Disconnect the ECM white connector. 3. Connect a test light between the ECM connector terminal C16 and ground. Is the test light on?	-	Go to Step 10	Go to Step 20
10	Inspect the ECM connector terminals A6 and C16 for damage or poor mating. Is the problem found?	-	Go to Step 11	Go to Step 13
11	Repair the ECM connector terminal(s) as needed. Is the repair complete?	-	Go to "Diagnostic System Check"	-
12	Inspect for damage or poor mating at the ECM connector terminal B10. Is the problem found?	-	Go to Step 11	Go to Step 13
13	Check the ECM connector terminals B1 and D16 for ground. Are the grounds OK?	-	Go to Step 22	Go to Step 21
14	1. Turn the ignition OFF. 2. Replace the fuse. 3. Turn the ignition ON. Is the SES lamp on?	-	Go to "Diagnostic System Check"	Go to Step 4

No Service Engine Soon Lamp (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
15	Repair the open in the ignition feed wire to the SES bulb. Is the repair complete?	-	Go to "Diagnostic System Check"	-
16	Replace the SES bulb. Is the repair complete?	-	Go to "Diagnostic System Check"	-
17	Repair the wire between the ECM connector terminal B10 and the SES bulb. Is the repair complete?	-	Go to "Diagnostic System Check"	-
18	1. Turn the ignition OFF. 2. Replace the ECM fuse. 3. Turn the ignition ON. Is the SES lamp on?	-	Go to "Diagnostic System Check"	Go to Step 1
19	Repair the wire between the ECM connector terminal A6 and the fuse F5. Is the repair complete?	-	Go to "Diagnostic System Check"	-
20	Repair the wire between the ECM connector terminal C16 and the fuse F17. Is the repair complete?	-	Go to "Diagnostic System Check"	-
21	Repair the open wire between the ECM connector terminals B1 and/or D16 and ground. Is the repair complete?	-	Go to "Diagnostic System Check"	-
22	Replace the ECM. Is the repair complete?	-	Go to "Diagnostic System Check"	-

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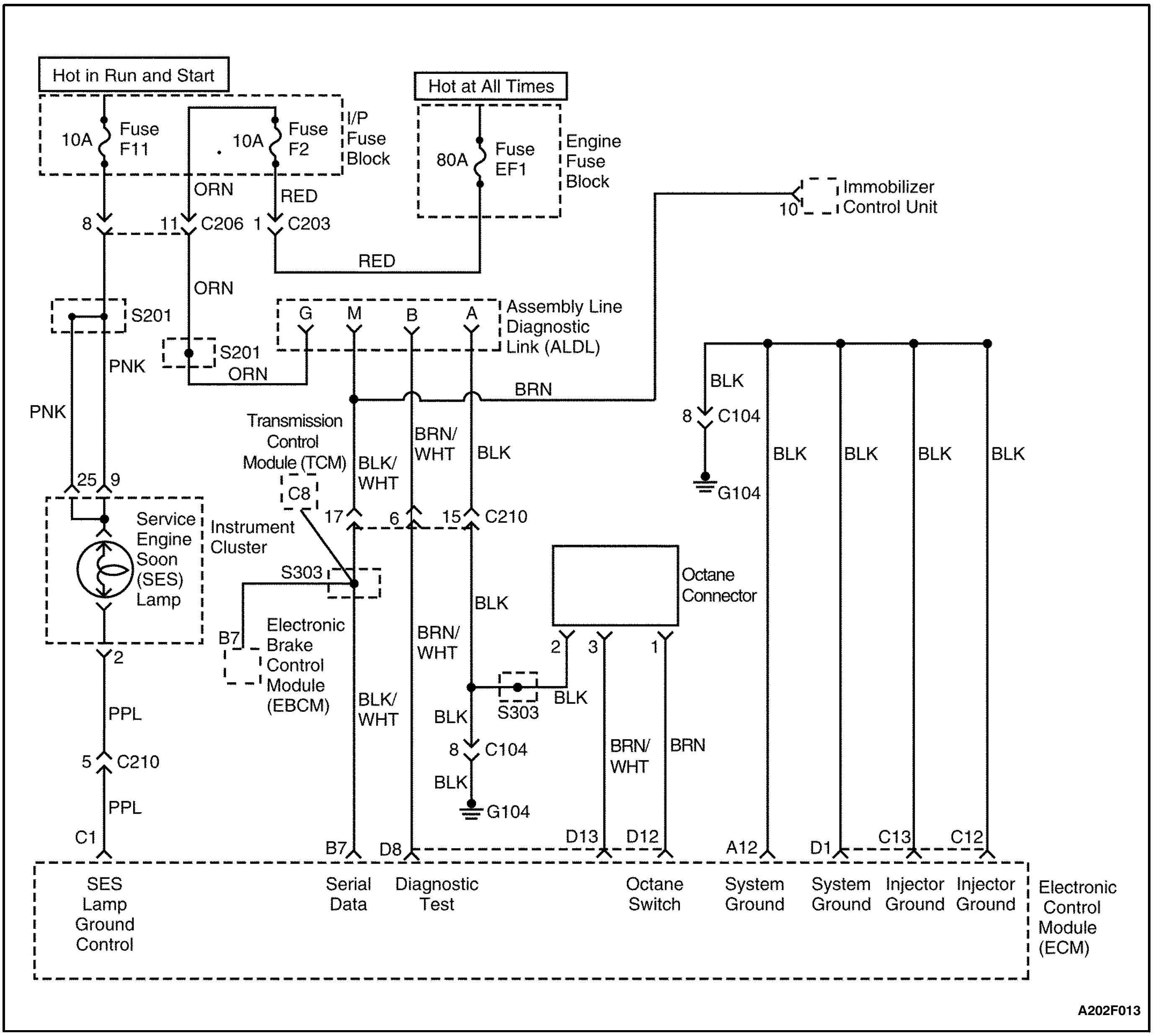


WILL NOT FLASH SERVICE ENGINE SOON LAMP (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

There should always be a steady service engine soon (SES) lamp when the ignition is ON and the engine stopped. Battery ignition voltage is supplied directly to the SES bulb. The electronic control module (ECM) will turn the SES on by grounding the ECM connector terminal C1 wire. With the assembly line diagnostic link (ALDL) A and B terminals grounded, the SES lamp should flash a Code 12 followed by any diagnostic trouble codes (DTCs) stored in the ECM memory. A steady SES lamp suggests a short to ground in the ECM connector terminal C1 wire, or an open in the diagnostic test wire. A steady but dim light indicates a failed quad-driver. The table will confirm and suggest the cause.

Diagnostic Aids

- If the engine runs OK, inspect for a faulty SES bulb.
- If the engine cranks but will not start, check for open fuses and poor ECM connections. Particularly check for ECM ignition and battery feeds, including clean and tight ECM ground connections.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

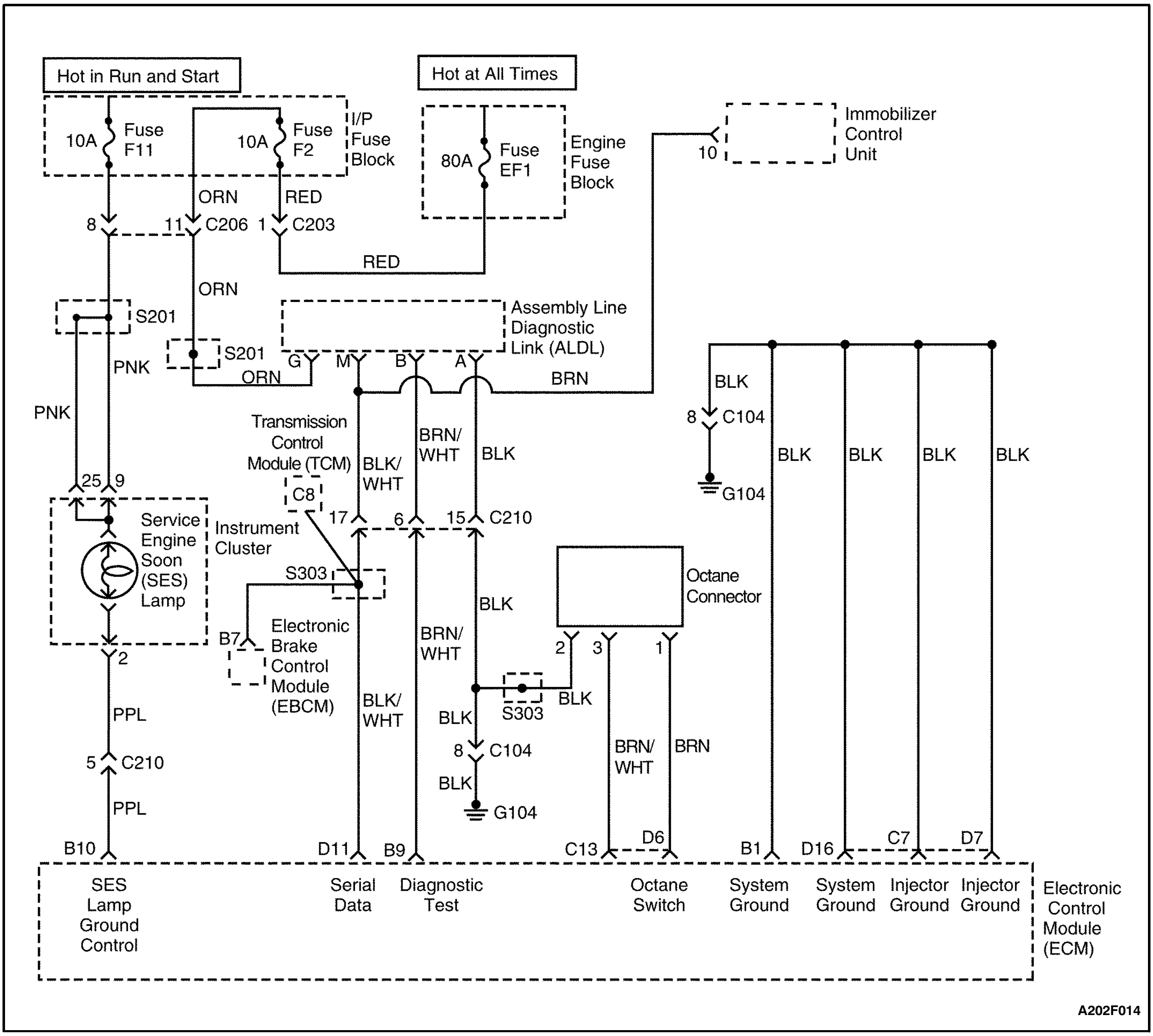
3. If the SES lamp is on when the ECM white connector is disconnected, the wire to the ECM connector terminal C1 is shorted to ground.

5. This step will check for an open diagnostic test wire.

11. At this point the SES wiring is OK. The problem is a faulty ECM.

Will Not Flash Service Engine Soon Lamp (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Turn the ignition ON. Is the service engine soon (SES) lamp on?	-	Go to Step 2	Go to ”No Service Engine Soon Lamp”
2	1. Turn the ignition OFF. 2. Jumper the assembly line diagnostic link (ALDL) terminals A and B. 3. Turn the ignition ON. Does the SES lamp flash the diagnostic trouble code (DTC) 12?	-	Go to “Diagnostic System Check”	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the ECM white connector. 3. Turn the ignition ON. Is the SES on?	-	Go to Step 4	Go to Step 5
4	Repair the short to ground in the wire between the electronic control module (ECM) connector terminal C1 and the SES bulb. Is the repair complete?	-	Go to “Diagnostic System Check”	-
5	1. Turn the ignition OFF. 2. Reconnect the ECM white connector. 3. Turn the ignition ON. 4. Backprobe the ECM connector terminal D8 with a test light connected to ground. Does the SES flash DTC 12?	-	Go to Step 6	Go to Step 8
6	Check for an open wire between the ECM connector terminal D8 and the ALDL terminal B. Is the problem found?	-	Go to Step 10	Go to Step 7
7	Repair the open wire between the ALDL terminal A and ground. Is the repair complete?	-	Go to “Diagnostic System Check”	-
8	Check for damage or poor mating at the ECM connector terminal D8. Is the problem found?	-	Go to Step 9	Go to Step 11
9	Repair the ECM connector terminal D8. Is the repair complete?	-	Go to “Diagnostic System Check”	-
10	Repair the wire between the ECM connector terminal D8 and the ALDL terminal B. Is the repair complete?	-	Go to “Diagnostic System Check”	-
11	Replace the ECM. Is the repair complete?	-	Go to “Diagnostic System Check”	-



WILL NOT FLASH SERVICE ENGINE SOON LAMP (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

There should always be a steady service engine soon (SES) lamp when the ignition is ON and the engine stopped. Battery ignition voltage is supplied directly to the SES bulb. The electronic control module (ECM) will turn the SES on by grounding the ECM connector terminal B10 wire. With the assembly line diagnostic link (ALDL) A and B terminals grounded, the SES lamp should flash a Code 12 followed by any diagnostic trouble codes (DTCs) stored in the ECM memory. A steady SES lamp suggests a short to ground in the ECM connector terminal B10 wire, or an open in the diagnostic test wire. A steady but dim light indicates a failed quad-driver. The table will confirm and suggest the cause.

Diagnostic Aids

- If the engine runs OK, inspect for a faulty SES bulb.
- If the engine cranks but will not start, check for open fuses and poor ECM connections. Particularly check for ECM ignition and battery feeds, including clean and tight ECM ground connections.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. If the SES lamp is on when the ECM red connector is disconnected, the wire to the ECM connector terminal B10 is shorted to ground.

5. This step will check for an open diagnostic test wire.

11. At this point the SES wiring is OK. The problem is a faulty ECM.

Will Not Flash Service Engine Soon Lamp (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Turn the ignition ON. Is the service engine soon (SES) lamp on?	-	Go to Step 2	Go to "No Service Engine Soon Lamp"
2	1. Turn the ignition OFF. 2. Jumper the assembly line diagnostic link (ALDL) terminals A and B. 3. Turn the ignition ON. Does the SES lamp flash the diagnostic trouble code (DTC) 12?	-	Go to "Diagnostic System Check"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Turn the ignition ON. Is the SES on?	-	Go to Step 4	Go to Step 5
4	Repair the short to ground in the wire between the ECM connector terminal B10 and the SES bulb. Is the repair complete?	-	Go to "Diagnostic System Check"	-
5	1. Turn the ignition OFF. 2. Reconnect the ECM red connector. 3. Turn the ignition ON. 4. Backprobe the ECM connector terminal B9 with a test light connected to ground. Does the SES flash DTC 12?	-	Go to Step 6	Go to Step 8
6	Check for an open wire between the ECM connector terminal B9 and the ALDL terminal B. Is the problem found?	-	Go to Step 10	Go to Step 7
7	Repair the open wire between the ALDL terminal A and ground. Is the repair complete?	-	Go to "Diagnostic System Check"	-
8	Check for damage or poor mating at the ECM connector terminal B9. Is the problem found?	-	Go to Step 9	Go to Step 11
9	Repair the ECM connector terminal B9. Is the repair complete?	-	Go to "Diagnostic System Check"	-
10	Repair the wire between the ECM connector terminal B9 and the ALDL terminal B. Is the repair complete?	-	Go to "Diagnostic System Check"	-
11	Replace the ECM. Is the repair complete?	-	Go to "Diagnostic System Check"	-

FUEL SYSTEM PRESSURE TEST

Circuit Description

The fuel pump is an in-tank fuel pump mounted to a fuel sender assembly. The fuel pump will remain on as long as the engine is cranking or running and the electronic control module (ECM) is receiving reference pulses from the crankshaft position sensor (CPS). If there are no reference pulses, the ECM will turn off the fuel pump 2 seconds after the ignition switch is turned ON or 2 seconds after the engine stops running. The fuel pump delivers fuel to the fuel rail and the fuel injectors, where the fuel system pressure is controlled from 284 to 325 kPa (41 to 47 psi) by the fuel pressure regulator. The excess fuel is returned to the fuel tank.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. When the engine is idling, the intake manifold vacuum is high. This vacuum is applied to the fuel pressure regulator diaphragm, offsetting the spring pressure inside the fuel pressure regulator and lowering the fuel pressure.

10. If there is fuel bleeding back through the fuel return outlet, this is due to a faulty fuel pressure regulator.

14. Another symptom often present when the fuel injectors are leaking is hard starting. Leaking fuel injectors can cause a flooding condition.

23. Fuel leaking from the fuel pump inlet is due to a faulty one-way check valve in the fuel pump.

Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

Caution: Do not pinch or restrict nylon fuel lines. Damage to the lines could cause a fuel leak, resultĆ ing in possible fire or personal injury.

Fuel Pressure Relief Procedure

1. Remove the fuel cap.
2. Remove the fuel pump fuse EF18 from the engine fuse block.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

Fuel System Pressure Test

Step	Action	Value(s)	Yes	No
1	1. Relieve the fuel system pressure. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel pressure within the values specified and holding steady?	284-325 kPa (41-47 psi)	Go to Step 2	Go to Step 5
2	1. Disconnect the fuel pressure regulator vacuum hose. 2. Start the engine. 3. Allow the engine to idle. 4. Connect the fuel pressure regulator vacuum hose. Does the fuel pressure decrease?	-	System OK	Go to Step 3
3	1. Allow the engine to idle. 2. Disconnect the vacuum hose from the fuel pressure regulator. 3. Connect a vacuum pump with a gauge to the fuel pressure regulator vacuum port. 4. Apply 41-47 kPa (12-14 in. Hg) of vacuum to the fuel pressure regulator. Does the fuel pressure decrease?	-	Go to Step 4	Go to Step 16
4	1. Locate and correct the cause of the vacuum restriction to the fuel pressure regulator. 2. Confirm the operation of the fuel pressure regulator. Is the repair complete?	-	System OK	-

Fuel System Pressure Test (Cont'd)

Step	Action	Value(s)	Yes	No
5	1. Relieve the fuel system pressure. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel pressure within the values specified but not holding steady?	284-325 kPa (41-47 psi)	Go to Step 6	Go to Step 17
6	Inspect the fuel lines for a leak. Is the problem found?	-	Go to Step 7	Go to Step 8
7	1. Replace the fuel line(s) as needed. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel pressure within the values specified and holding steady?	284-325 kPa (41-47 psi)	System OK	-
8	1. Remove the fuel pump assembly. 2. With the fuel pump under pressure, inspect the fuel pump coupling hoses for leaking. Is the problem found?	-	Go to Step 9	Go to Step 10
9	1. Tighten or replace the fuel pump coupling hoses as needed. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel pressure within the values specified and holding steady?	284-325 kPa (41-47 psi)	System OK	-
10	With the fuel system under pressure, inspect the fuel return outlet for leaking. Is the problem found?	-	Go to Step 11	Go to Step 12
11	1. Replace the fuel pressure regulator. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel pressure within the values specified and holding steady?	284-325 kPa (41-47 psi)	System OK	-
12	With the fuel system under pressure, inspect the fuel inlet for leaking. Is the problem found?	-	Go to Step 13	Go to Step 14
13	1. Replace the fuel pump assembly. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel pressure within the values specified and holding steady?	284-325 kPa (41-47 psi)	System OK	-
14	1. Remove the fuel rail and the fuel injectors as an assembly. 2. With the fuel system under pressure, inspect all of the fuel injectors for leaking. Is the problem found?	-	Go to Step 15	-
15	1. Replace the leaking fuel injector(s). 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel pressure within the values specified and holding steady?	284-325 kPa (41-47 psi)	System OK	-

Fuel System Pressure Test (Cont'd)

Step	Action	Value(s)	Yes	No
16	1. Replace the fuel pressure regulator. 2. Disconnect the fuel pressure regulator vacuum hose. 3. Start the engine. 4. Allow the engine to idle. 5. Connect the fuel pressure regulator vacuum hose. Does the fuel pressure decrease?	-	System OK	-
17	1. Relieve the fuel system pressure. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel system pressure below the values specified and holding steady?	284-325 kPa (41-47 psi)	Go to Step 13	Go to Step 18
18	1. Relieve the fuel system pressure. 2. Install a fuel pressure gauge. 3. Turn the ignition ON. Is the fuel system pressure below the values specified and not holding steady?	284-325 kPa (41-47 psi)	Go to Step 19	-
19	Inspect the fuel lines for leaks. Is the problem found?	-	Go to Step 7	Go to Step 20
20	1. Remove the fuel pump assembly. 2. With the fuel pump under pressure, inspect the fuel pump coupling hoses for leaking. Is the problem found?	-	Go to Step 9	Go to Step 21
21	1. Remove the fuel pump assembly. 2. With the fuel system under pressure, inspect the fuel return outlet for leaking. Is the problem found?	-	Go to Step 11	Go to Step 22
22	1. Remove the fuel pump assembly. 2. With the fuel system under pressure, inspect the fuel inlet for leaking. Is the problem found?	-	Go to Step 13	Go to Step 23
23	1. Remove the fuel rail and the fuel injectors as an assembly. 2. With the fuel system under pressure, inspect all of the fuel injectors for leaking. Is the problem found?	-	Go to Step 15	Go to Step 13

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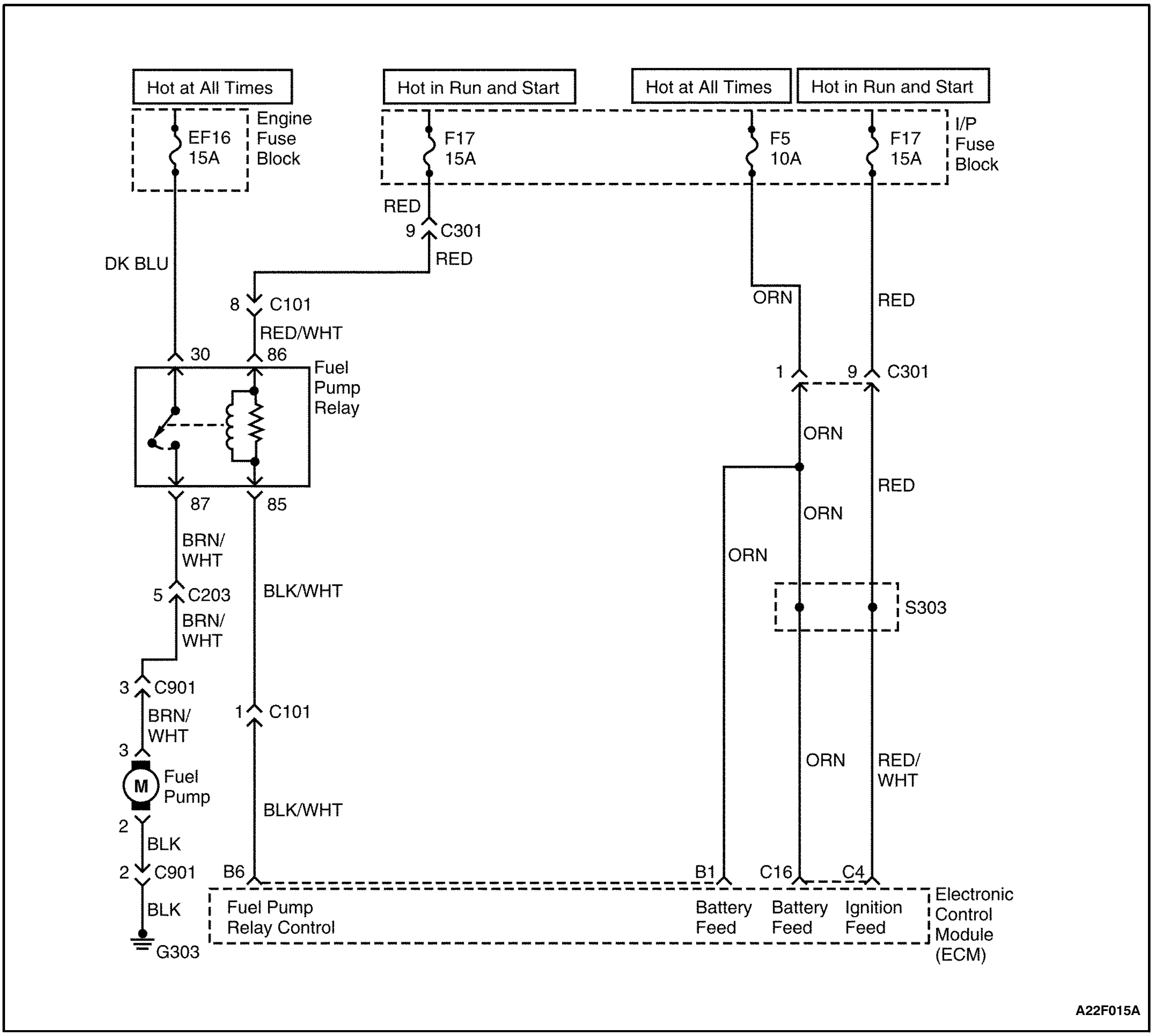

FUEL PUMP RELAY CIRCUIT CHECK (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

When the ignition switch is turned ON, the electronic control module (ECM) will activate the fuel pump relay and run the in-tank fuel pump. The fuel pump will operate as long as the engine is cranking or running and the ECM is receiving ignition reference pulses.

If there are no reference pulses, the ECM will shut off the fuel pump within 2 seconds after the ignition switch is turned ON.

Diagnostic Aids

An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks for the ECM providing a ground for the operation of the fuel pump relay.
7. By confirming that the wiring is OK using Steps 2 through 6, it can be determined that the fuel pump relay is at fault.
8. If there is no voltage present at the fuel pump relay connector terminal 86, the problem is an open I/P fuse block fuse F17, or an open in the wiring between the fuel pump relay and the ignition switch.

9. After determining that there is no ground being provided by the ECM to the fuel pump relay, the fault is either the ECM or the wiring between the ECM and the fuel pump relay.

Fuel Pump Relay Circuit Check (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF for 10 seconds. 2. Turn the ignition ON. 3. Listen for in-tank fuel pump operation. Does the fuel pump operate for the time specified?	2 sec	System OK	Go to Step 2
2	1. Turn the ignition OFF. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 3	Go to Step 8
3	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 85 and battery positive. 3. Turn the ignition ON. 4. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 4	Go to Step 9
4	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 5	Go to Step 11
5	Check for an open or short to ground in the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3. Is the problem found?	-	Go to Step 6	Go to Step 7
6	1. Repair the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
7	1. Replace the fuel pump relay. 2. Turn the ignition OFF for 10 seconds. 3. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
8	Check for an open wire between the fuel pump relay connector terminal 86 and the ignition switch. Is the problem found?	-	Go to Step 13	-
9	Check for an open wire between the fuel pump relay connector terminal 85 and the electronic control module (ECM) connector terminal B6. Is the problem found?	-	Go to Step 10	Go to Step 12

Fuel Pump Relay Circuit Check (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
10	1. Replace the fuse EF16 or repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal B6. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
11	1. Replace the fuse EF16 or repair the wire between the fuel pump relay connector terminal 30 and the fuse EF16. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
12	1. Replace the ECM. 2. Turn the ignition OFF for 10 seconds. 3. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
13	1. Replace the fuse EF17 or repair the wire between the fuel pump relay connector terminal 86 and the ignition system. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-

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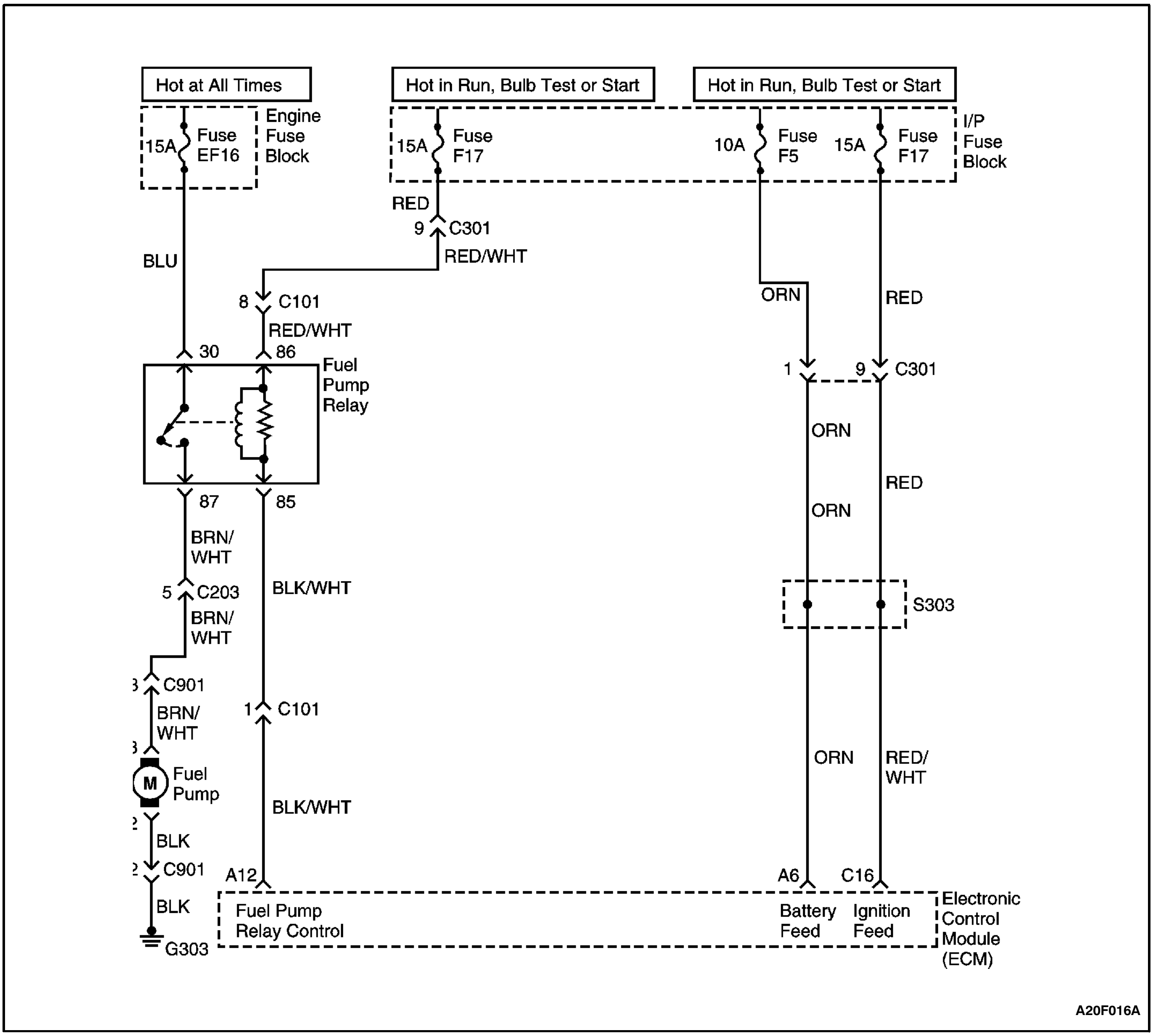

FUEL PUMP RELAY CIRCUIT CHECK (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

When the ignition switch is turned ON, the electronic control module (ECM) will activate the fuel pump relay and run the in-tank fuel pump. The fuel pump will operate as long as the engine is cranking or running and the ECM is receiving ignition reference pulses.

If there are no reference pulses, the ECM will shut off the fuel pump within 2 seconds after the ignition switch is turned ON.

Diagnostic Aids

An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks for the ECM providing a ground for the operation of the fuel pump relay.
7. By confirming that the wiring is OK using Steps 2 through 6, it can be determined that the fuel pump relay is at fault.
8. If there is no voltage present at the fuel pump relay connector terminal 86, the problem is an open I/P fuse block fuse F17, or an open in the wiring between the fuel pump relay and the ignition switch.

9. After determining that there is no ground being provided by the ECM to the fuel pump relay, the fault is either the ECM or the wiring between the ECM and the fuel pump relay.

Fuel Pump Relay Circuit Check (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF for 10 seconds. 2. Turn the ignition ON. 3. Listen for in-tank fuel pump operation. Does the fuel pump operate for the time specified?	2 sec	System OK	Go to Step 2
2	1. Turn the ignition OFF. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 3	Go to Step 8
3	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 85 and battery positive. 3. Turn the ignition ON. 4. With the ignition ON, the test light should light for the time specified. Is the test light on?	2 sec	Go to Step 4	Go to Step 9
4	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 5	Go to Step 11
5	Check for an open or short to ground in the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3. Is the problem found?	-	Go to Step 6	Go to Step 7
6	1. Repair the wire between the fuel pump relay connector terminal 87 and the fuel pump connector terminal 3. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
7	1. Replace the fuel pump relay. 2. Turn the ignition OFF for 10 seconds. 3. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
8	Check for an open wire between the fuel pump relay connector terminal 86 and the ignition switch. Is the problem found?	-	Go to Step 13	-
9	Check for an open wire between the fuel pump relay connector terminal 85 and the electronic control module (ECM) connector terminal A12. Is the problem found?	-	Go to Step 10	Go to Step 12

Fuel Pump Relay Circuit Check (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
10	1. Repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal A12. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
11	1. Replace the fuse EF16 or repair the wire between the fuel pump relay connector terminal 30 and the EF16. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
12	1. Replace the ECM. 2. Turn the ignition OFF for 10 seconds. 3. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-
13	1. Replace the fuse EF17 or repair the wire between the fuel pump connector terminal 86 and the ignition switch. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	-

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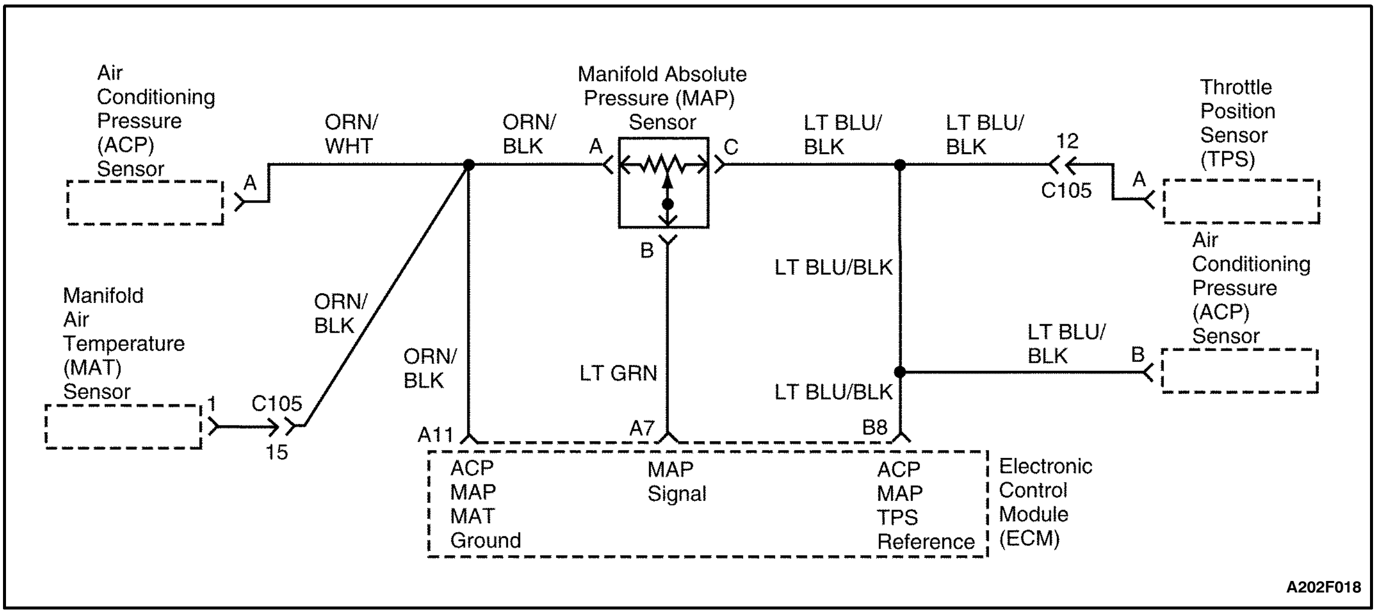


MANIFOLD ABSOLUTE PRESSURE CHECK (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The manifold absolute pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load (intake manifold vacuum) and rpm changes. The MAP sensor converts these changes into a voltage output. The electronic control module (ECM) sends a 5-volt reference voltage to the MAP sensor. As the intake manifold pressure changes, the output voltage of the MAP sensor also changes. A low voltage (high vacuum) output of 1 to 2 volts is present at idle. A high voltage (low vacuum) output of 4.0 to 4.8 volts is present at wide open throttle. The MAP sensor is also used under certain conditions to measure barometric pressure. This allows the ECM to make adjustments for altitude changes. The ECM uses the MAP sensor for fuel delivery and ignition timing changes.

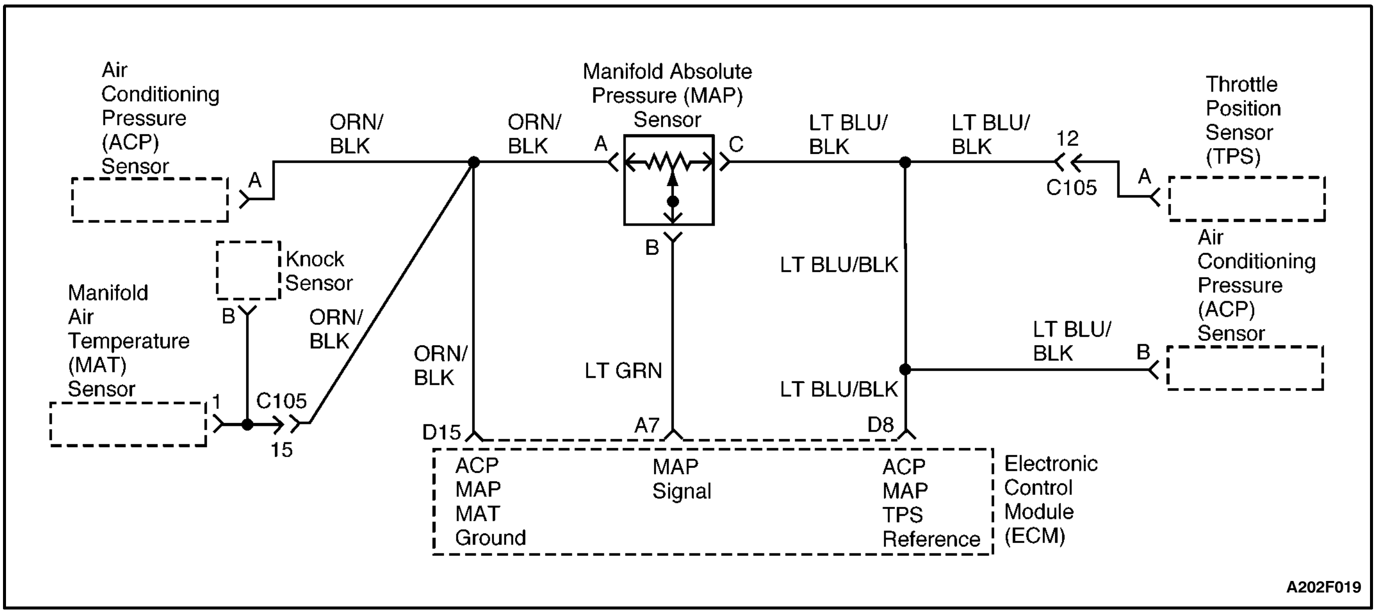
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. Applying 34 kPa (10 inches Hg) of vacuum to the MAP sensor should cause the voltage to change. Subtract the second voltage reading from the first. That voltage value should be more than 1.5 volts. When applying vacuum to the MAP sensor, the change in the voltage should happen instantly. A slow voltage change indicates a faulty MAP sensor.
3. Disconnect the MAP sensor from the bracket and twist the MAP sensor. Output changes more than 0.1 volt indicate a faulty connector or connection.

Manifold Absolute Pressure Check (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Connect a scan tool to the assembly line diagnostic link (ALDL). 3. Turn the ignition ON. 4. Compare the manifold absolute pressure (MAP) sensor voltage reading from the scanner with that from a known good vehicle. Is the difference in the two voltage readings less than the value specified?	0.4 v	Go to Step 2	Go to Step 5
2	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. Disconnect the MAP sensor vacuum line. 4. Connect a hand vacuum pump to the MAP sensor. 5. Turn the ignition ON. 6. Note the MAP sensor voltage. 7. Apply 34 kPa (10 in. Hg) of vacuum to the MAP sensor and note the voltage change. Is the difference in voltage readings more than the value specified?	1.5 v	System OK	Go to Step 3
3	Inspect the MAP sensor connector terminals. Is the problem found?	-	Go to Step 4	Go to Step 5
4	Repair the MAP sensor connector terminals as needed. Is the repair complete?	-	System OK	-
5	Replace the MAP sensor. Is the repair complete?	-	System OK	-



MANIFOLD ABSOLUTE PRESSURE CHECK (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The manifold absolute pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load (intake manifold vacuum) and rpm changes. The MAP sensor converts these changes into a voltage output. The electronic control module (ECM) sends a 5-volt reference voltage to the MAP sensor. As the intake manifold pressure changes, the output voltage of the MAP sensor also changes. A low voltage (high vacuum) output of 1 to 2 volts is present at idle. A high voltage (low vacuum) output of 4.0 to 4.8 volts is present at wide open throttle. The MAP sensor is also used under certain conditions to measure barometric pressure. This allows the ECM to make adjustments for altitude changes. The ECM uses the MAP sensor for fuel delivery and ignition timing changes.

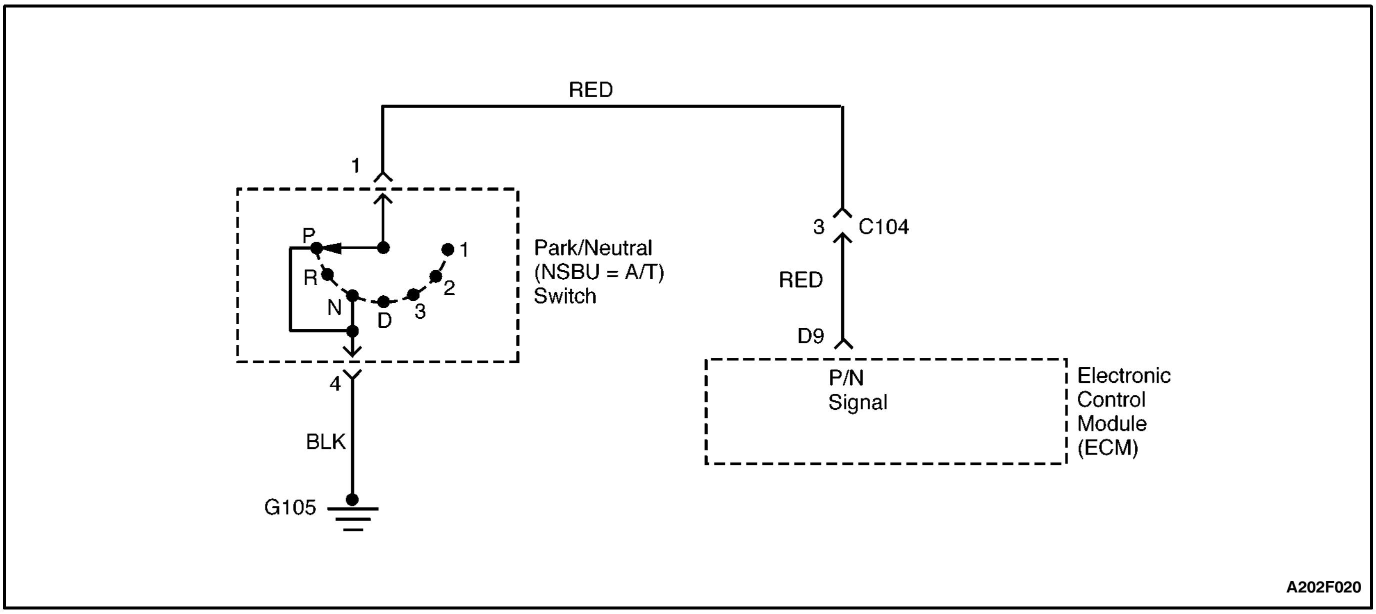
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. Applying 34 kPa (10 inches Hg) of vacuum to the MAP sensor should cause the voltage to change. Subtract the second voltage reading from the first. That voltage value should be more than 1.5 volts. When applying vacuum to the MAP sensor, the change in the voltage should happen instantly. A slow voltage change indicates a faulty MAP sensor.
3. Disconnect the MAP sensor from the bracket and twist the MAP sensor. Output changes more than 0.1 volt indicate a faulty connector or connection.

Manifold Absolute Pressure Check (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Connect a scan tool to the assembly line diagnostic link (ALDL). 3. Turn the ignition ON. 4. Compare the manifold absolute pressure (MAP) sensor voltage reading from the scanner with that from a known good vehicle. Is the difference in the two voltage readings less than the value specified?	0.4 v	Go to Step 2	Go to Step 5
2	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. Disconnect the MAP sensor vacuum line. 4. Connect a hand vacuum pump to the MAP sensor. 5. Turn the ignition ON. 6. Note the MAP sensor voltage. 7. Apply 34 kPa (10 in. Hg) of vacuum to the MAP sensor and note the voltage change. Is the difference in voltage readings more than the value specified?	1.5 v	System OK	Go to Step 3
3	Inspect the MAP sensor connector terminals. Is the problem found?	-	Go to Step 4	Go to Step 5
4	Repair the MAP sensor connector terminals as needed. Is the repair complete?	-	System OK	-
5	Replace the MAP sensor. Is the repair complete?	-	System OK	-



PARK/NEUTRAL SWITCH (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The park/neutral (P/N) switch contacts are a part of the selector position switch. The contacts are closed to ground in park and neutral and open in the drive ranges.

The electronic control module (ECM) supplies ignition voltage through a current limiting resistor to the signal wire and senses a closed switch when the voltage on the signal wire drops to less than 1 volt. The ECM uses the P/N signal as one of the inputs to control idle air and spark timing.

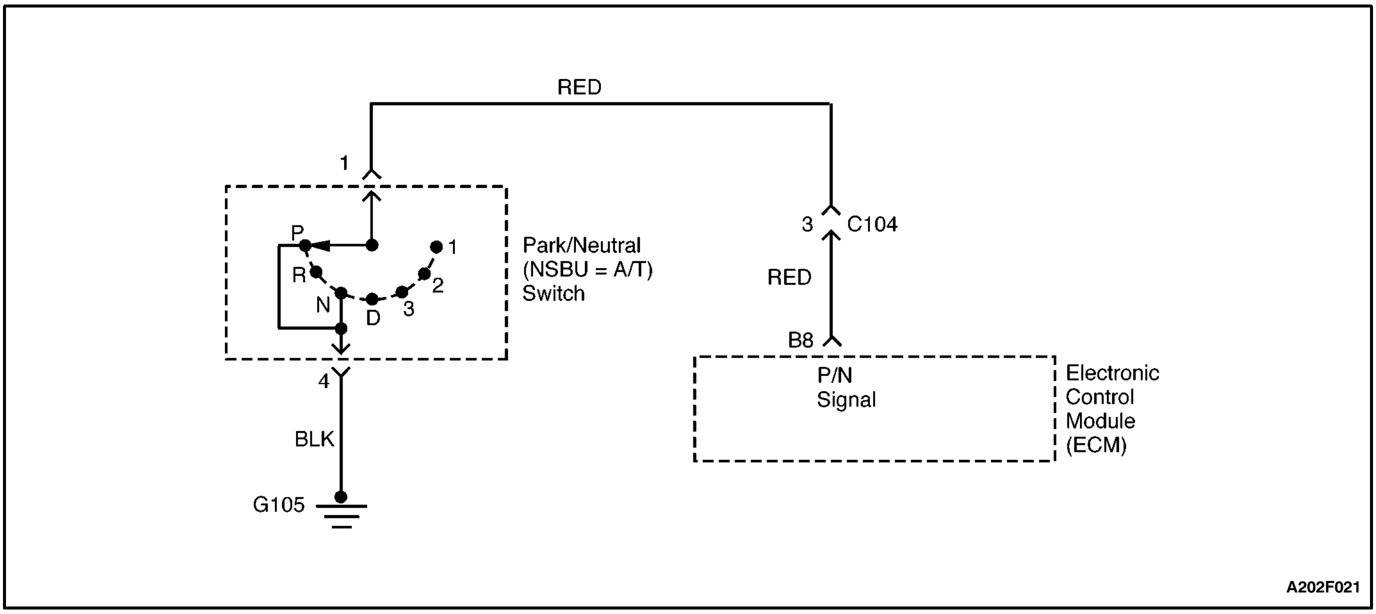
Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. This step checks for the P/N switch closed to ground in the park position. Different makes of scan tools will read P/N differently. Refer to the tool operations manual for the type of display used.
2. This step checks for an open P/N switch in the drive range.

Park/Neutral Switch (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	1. Connect a scan tool to the assembly line diagnostic link (ALDL). 2. Place the transaxle in park (P). 3. Turn the ignition ON. Does the scan tool indicate park or neutral?	-	Go to Step 2	Go to Step 10
2	Place the transaxle in drive (D). Does the scan tool indicate drive?	-	System OK	Go to Step 3
3	Disconnect the park/neutral (P/N) switch. Does the scan tool indicate drive?	-	Go to Step 4	Go to Step 7
4	Check the P/N switch adjustment. Is the problem found?	-	Go to Step 5	Go to Step 6
5	Adjust the P/N switch. Is the repair complete?	-	System OK	-
6	Replace the P/N switch. Is the repair complete?	-	System OK	-
7	Check for an open or short to ground in the wire between the P/N switch connector terminal 1 and the electronic control module (ECM) connector terminal D9. Is the problem found?	-	Go to Step 8	Go to Step 9
8	Repair the open or short to ground in the wire between the P/N switch connector terminal 1 and the ECM connector terminal D9. Is the repair complete?	-	System OK	-
9	Replace the ECM. Is the repair complete?	-	System OK	-
10	1. Disconnect the P/N switch. 2. Jumper the P/N switch connector terminals 1 and 4. 3. Turn the ignition ON. Does the scan tool indicate park?	-	Go to Step 4	Go to Step 11
11	Jumper the P/N switch connector terminal 1 to ground. Does the scan tool indicate park?	-	Go to Step 12	Go to Step 7
12	Repair the open wire between the P/N switch connector terminal 4 and ground. Is the repair complete?	-	System OK	-



PARK/NEUTRAL SWITCH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The park/neutral (P/N) switch contacts are a part of the selector position switch. The contacts are closed to ground in park and neutral and open in the drive ranges.

The electronic control module (ECM) supplies ignition voltage through a current limiting resistor to the signal wire and senses a closed switch when the voltage on the signal wire drops to less than 1 volt. The ECM uses the P/N signal as one of the inputs to control idle air and spark timing.

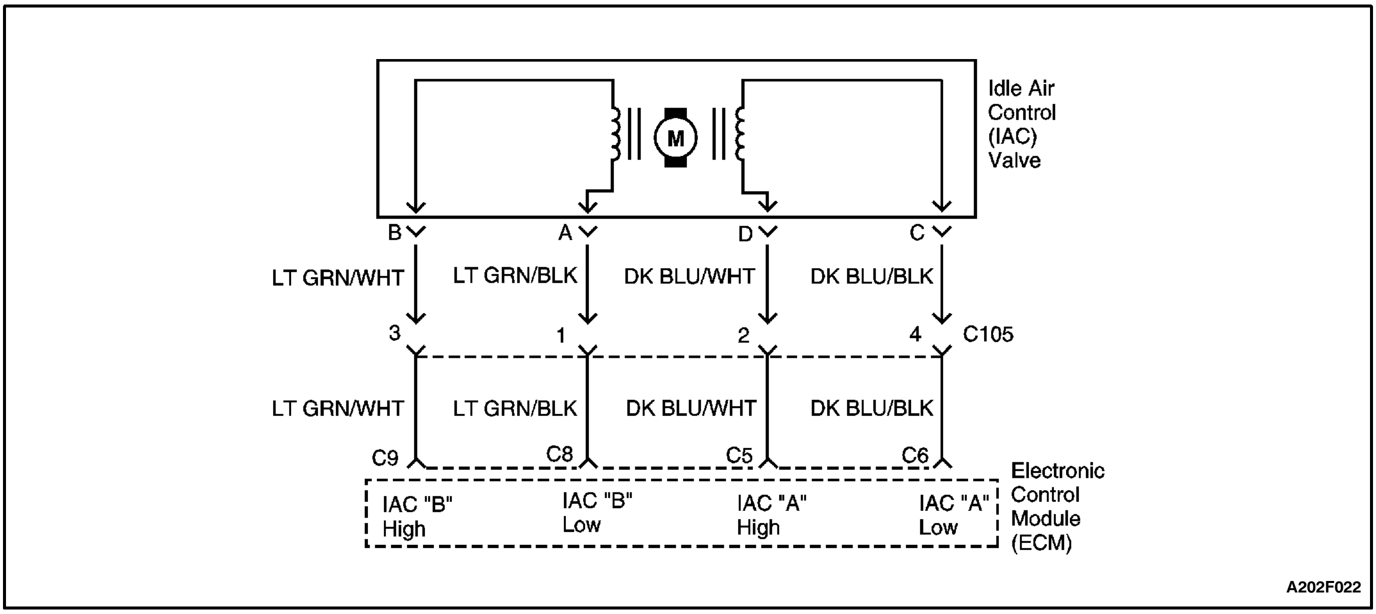
Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. This step checks for the P/N switch closed to ground in the park position. Different makes of scan tools will read P/N differently. Refer to the tool operations manual for the type of display used.
2. This step checks for an open P/N switch in the drive range.

Park/Neutral Switch (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	1. Connect a scan tool to the assembly line diagnostic link (ALDL). 2. Place the transaxle in park (P). 3. Turn the ignition ON. Does the scan tool indicate park or neutral?	-	Go to Step 2	Go to Step 10
2	Place the transaxle in drive (D). Does the scan tool indicate drive?	-	System OK	Go to Step 3
3	Disconnect the park/neutral (P/N) switch. Does the scan tool indicate drive?	-	Go to Step 4	Go to Step 7
4	Check the P/N switch adjustment. Is the problem found?	-	Go to Step 5	Go to Step 6
5	Adjust the P/N switch. Is the repair complete?	-	System OK	-
6	Replace the P/N switch. Is the repair complete?	-	System OK	-
7	Check for an open or short to ground in the wire between the P/N switch connector terminal 1 and the electronic control module (ECM) connector terminal B8. Is the problem found?	-	Go to Step 8	Go to Step 9
8	Repair the open or short to ground in the wire between the P/N switch connector terminal 1 and the ECM connector terminal B8. Is the repair complete?	-	System OK	-
9	Replace the ECM. Is the repair complete?	-	System OK	-
10	1. Disconnect the P/N switch. 2. Jumper the P/N switch connector terminals 1 and 4. 3. Turn the ignition ON. Does the scan tool indicate park?	-	Go to Step 4	Go to Step 11
11	Jumper the P/N switch connector terminal 1 to ground. Does the scan tool indicate park?	-	Go to Step 12	Go to Step 7
12	Repair the open wire between the P/N switch connector terminal 4 and ground. Is the repair complete?	-	System OK	-



IDLE AIR CONTROL SYSTEM CHECK (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The electronic control module (ECM) controls the engine idle speed with the idle air control (IAC) valve. To increase the idle speed, the ECM pulls the IAC pintle away from its seat, allowing more air to pass by the throttle bore. To decrease the idle speed, it extends the IAC valve pintle toward its seat, reducing bypass air flow. A scan tool will read the ECM commands to the IAC valve in counts. The higher counts indicate more air bypass (higher idle). The lower counts indicate less air is allowed to bypass (lower idle).

Diagnostic Aids

If the idle is too high, stop the engine. Fully extend the IAC valve with an IAC tester. Start the engine. If the idle speed is above 800 rpm, locate and repair the vacuum leak. Also, check for a binding throttle plate or throttle linkage, or an incorrect base idle setting.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. The IAC valve is extended and retracted by the IAC driver. IAC valve movement is verified by an engine speed change. If no change in engine speed occurs, the valve can be removed from the throttle body and tested. Connect the IAC driver to the removed IAC valve and turn the ignition ON. Do not start the engine.
5. This step checks the quality of the IAC valve movement in Step 2. Fully extending the IAC valve may cause an engine stall. This may be normal.
6. Steps 2 and 5 verify proper IAC valve operation. This step checks the IAC circuit for a wiring or ECM fault.

Idle Air Control Valve Reset Procedure

Whenever the battery cable or the ECM connector or the ECM fuse EF31 is disconnected or replaced (more than 10 seconds), the following idle learn procedure must be performed:

1. Turn the ignition ON for 5 seconds.
2. Turn the ignition OFF for 10 seconds.
3. Turn the ignition ON for 5 seconds.
4. Start the engine in park/neutral (P/N).
5. Allow the engine to run until the engine coolant is above 85°C (185°F).
6. Turn the air conditioning (A/C) ON over 10 seconds, if equipped.
7. Turn the A/C OFF over 10 seconds, if equipped.
8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D).
9. Turn the A/C ON over 10 seconds, if equipped.
10. Turn the A/C OFF over 10 seconds, if equipped.
11. Turn the ignition OFF. The idle learn procedure is complete.

Idle Air Control System Check (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Connect the idle air control (IAC) driver to the IAC valve. 3. Connect a scan tool to the assembly line diagnostic link (ALDL). 4. Start the engine. 5. With the IAC driver, extend and retract the IAC valve. Engine rpm should increase and decrease as the IAC valve is cycled. Does the engine rpm change?	-	Go to Step 5	Go to Step 3
3	1. Remove the IAC valve. 2. Inspect the IAC passages for restrictions. Is the problem found?	-	Go to Step 4	Go to Step 19
4	Clean the IAC passages. Is the repair complete?	-	System OK	-
5	1. Turn the ignition OFF. 2. Start the engine. 3. Using the IAC driver, extend and retract the IAC valve. Engine rpm should increase and decrease as the IAC valve is cycled. Does the rpm change smoothly within the value specified with each flash of the IAC driver?	700-1500 rpm	Go to Step 6	Go to Step 3
6	1. Turn the ignition OFF. 2. Connect the IAC driver to the IAC valve. 3. Install an IAC node light to the IAC valve connector. 4. Start the engine. 5. Cycle the IAC driver. 6. Watch the node lights of the IAC driver. Do both lights cycle red and green but never off as the rpm is changed?	-	Go to Step 7	Go to Step 9
7	1. Measure the resistance of the IAC valve between terminals A and B. 2. Measure the resistance of the IAC valve between terminals C and D. Does the resistance measure within the value specified?	40-80 W	Go to Step 8	Go to Step 19
8	1. Measure the resistance of the IAC valve between terminals B and C. 2. Measure the resistance of the IAC valve between terminals A and D. Does the ohmmeter show the specified value?	R	Go to "Diagnostic Aids"	Go to Step 19
9	Inspect the IAC connector terminals. Is the problem found?	-	Go to Step 10	Go to Step 11
10	Repair or replace the IAC connector terminals as needed. Is the repair complete?	-	System OK	-

Idle Air Control System Check (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
11	Check for an open or short in the wire between the IAC connector terminal B and the electronic control module (ECM) connector terminal C9. Is the problem found?	-	Go to Step 15	Go to Step 12
12	Check for an open or short in the wire between the IAC connector terminal A and the ECM connector terminal C8. Is the problem found?	-	Go to Step 15	Go to Step 13
13	Check for an open or short in the wire between the IAC connector terminal D and the ECM connector terminal C5. Is the problem found?	-	Go to Step 15	Go to Step 14
14	Check for an open or short in the wire between the IAC connector terminal C and the ECM connector terminal C6. Is the problem found?	-	Go to Step 15	Go to Step 16
15	Repair the wire as needed. Is the repair complete?	-	System OK	-
16	Inspect the ECM connector terminals. Is the problem found?	-	Go to Step 17	Go to Step 18
17	Repair the ECM connector terminals as needed. Is the repair complete?	-	System OK	-
18	Replace the ECM. Is the repair complete?	-	System OK	-
19	Replace the IAC valve. Is the repair complete?	-	System OK	-

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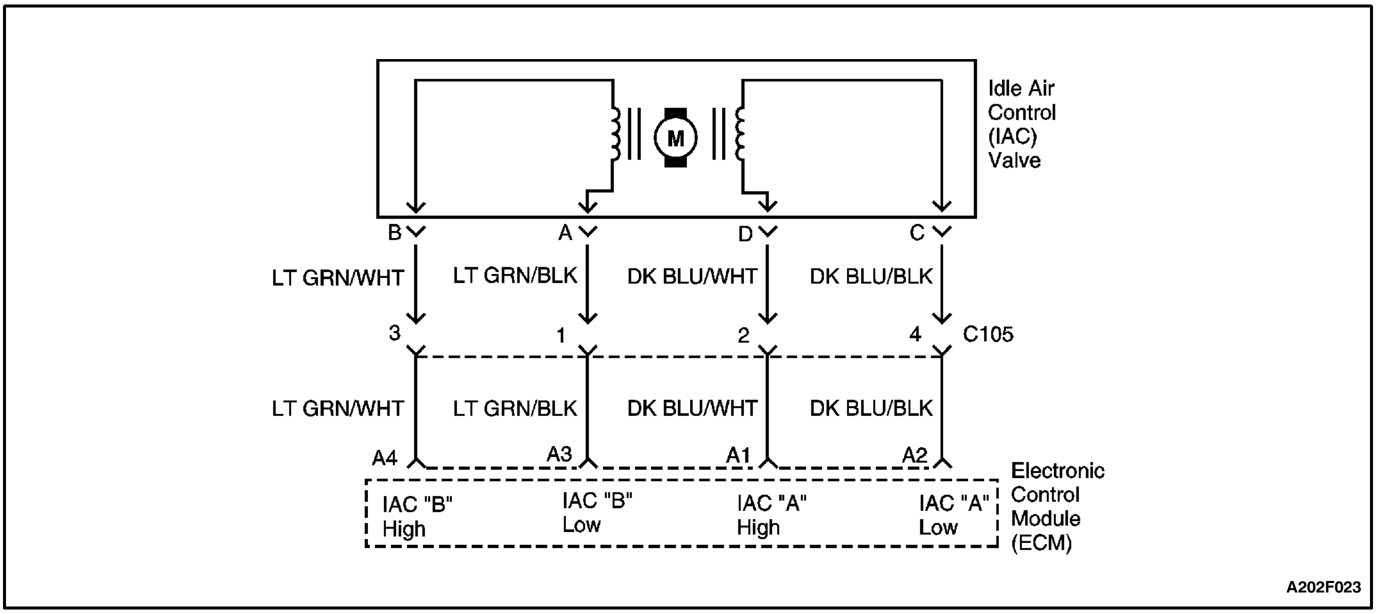

IDLE AIR CONTROL SYSTEM CHECK (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) controls the engine idle speed with the idle air control (IAC) valve. To increase the idle speed, the ECM pulls the IAC pintle away from its seat, allowing more air to pass by the throttle bore. To decrease the idle speed, it extends the IAC valve pintle toward its seat, reducing bypass air flow. A scan tool will read the ECM commands to the IAC valve in counts. The higher counts indicate more air bypass (higher idle). The lower counts indicate less air is allowed to bypass (lower idle).

Diagnostic Aids

If the idle is too high, stop the engine. Fully extend the IAC valve with an IAC tester. Start the engine. If the idle speed is above 800 rpm, locate and repair the vacuum leak. Also, check for a binding throttle plate or throttle linkage, or an incorrect base idle setting.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. The IAC valve is extended and retracted by the IAC driver. IAC valve movement is verified by an engine speed change. If no change in engine speed occurs, the valve can be removed from the throttle body and tested. Connect the IAC driver to the removed IAC valve and turn the ignition ON. Do not start the engine.
5. This step checks the quality of the IAC valve movement in Step 2. Fully extending the IAC valve may cause an engine stall. This may be normal.
6. Steps 2 and 5 verify proper IAC valve operation. This step checks the IAC circuit for a wiring or ECM fault.

Idle Air Control Valve Reset Procedure

Whenever the battery cable or the ECM connector or the ECM fuse EF31 is disconnected or replaced (more than 10 seconds), the following idle learn procedure must be performed:

1. Turn the ignition ON for 5 seconds.
2. Turn the ignition OFF for 10 seconds.
3. Turn the ignition ON for 5 seconds.
4. Start the engine in park/neutral (P/N).
5. Allow the engine to run until the engine coolant is above 85°C (185°F).
6. Turn the air conditioning (A/C) ON over 10 seconds, if equipped.
7. Turn the A/C OFF over 10 seconds, if equipped.
8. If the vehicle is equipped with an automatic transaxle, apply the parking brake. While pressing the brake pedal, place the transaxle in drive (D).
9. Turn the A/C ON over 10 seconds, if equipped.
10. Turn the A/C OFF over 10 seconds, if equipped.
11. Turn the ignition OFF. The idle learn procedure is complete.

Idle Air Control System Check (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Connect the idle air control (IAC) driver to the IAC valve. 3. Connect a scan tool to the assembly line diagnostic link (ALDL). 4. Start the engine. 5. With the IAC driver, extend and retract the IAC valve. Engine rpm should increase and decrease as the IAC valve is cycled. Does the engine rpm change?	-	Go to Step 5	Go to Step 3
3	1. Remove the IAC valve. 2. Inspect the IAC passages for restrictions. Is the problem found?	-	Go to Step 4	Go to Step 19
4	Clean the IAC passages. Is the repair complete?	-	System OK	-
5	1. Turn the ignition OFF. 2. Start the engine. 3. Using the IAC driver, extend and retract the IAC valve. Engine rpm should increase and decrease as the IAC valve is cycled. Does the rpm change smoothly within the value specified with each flash of the IAC driver?	700-1500 rpm	Go to Step 6	Go to Step 3
6	1. Turn the ignition OFF. 2. Connect the IAC driver to the IAC valve. 3. Install an IAC node light to the IAC valve connector. 4. Start the engine. 5. Cycle the IAC driver. 6. Watch the node lights of the IAC driver. Do both lights cycle red and green but never off as the rpm is changed?	-	Go to Step 7	Go to Step 9
7	1. Measure the resistance of the IAC valve between terminals A and B. 2. Measure the resistance of the IAC valve between terminals C and D. Does the resistance measure within the value specified?	40-80 W	Go to Step 8	Go to Step 19
8	1. Measure the resistance of the IAC valve between terminals B and C. 2. Measure the resistance of the IAC valve between terminals A and D. Does the ohmmeter show the specified value?	R	Go to "Diagnostic Aids"	Go to Step 19
9	Inspect the IAC connector terminals. Is the problem found?	-	Go to Step 10	Go to Step 11
10	Repair or replace the IAC connector terminals as needed. Is the repair complete?	-	System OK	-

Idle Air Control System Check (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
11	Check for an open or short in the wire between the IAC connector terminal B and the electronic control module (ECM) connector terminal A4. Is the problem found?	-	Go to Step 15	Go to Step 12
12	Check for an open or short in the wire between the IAC connector terminal A and the ECM connector terminal A3. Is the problem found?	-	Go to Step 15	Go to Step 13
13	Check for an open or short in the wire between the IAC connector terminal D and the ECM connector terminal A1. Is the problem found?	-	Go to Step 15	Go to Step 14
14	Check for an open or short in the wire between the IAC connector terminal C and the ECM connector terminal A2. Is the problem found?	-	Go to Step 15	Go to Step 16
15	Repair the wire as needed. Is the repair complete?	-	System OK	-
16	Inspect the ECM connector terminals. Is the problem found?	-	Go to Step 17	Go to Step 18
17	Repair the ECM connector terminals as needed. Is the repair complete?	-	System OK	-
18	Replace the ECM. Is the repair complete?	-	System OK	-
19	Replace the IAC valve. Is the repair complete?	-	System OK	-

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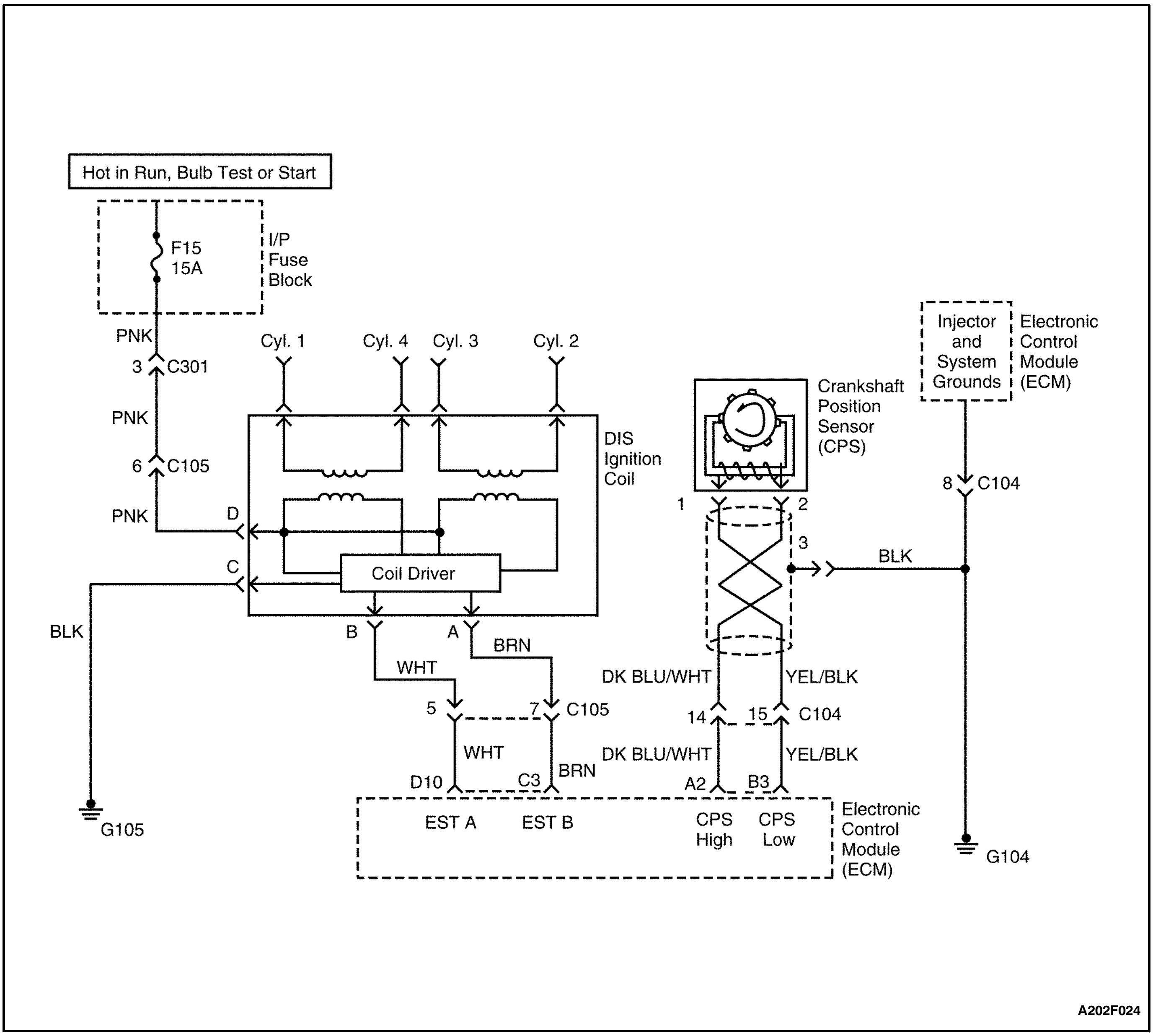


IGNITION SYSTEM CHECK (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The direct ignition system (DIS) uses a waste spark method of spark distribution. In this type of DIS system, the crankshaft position sensor (CPS) is mounted to the oil pump near a slotted wheel that is a part of the crankshaft pulley. The CPS sends reference pulses to the electronic control module (ECM). The ECM then triggers the DIS ignition coil. Once the ECM triggers the DIS ignition coil, both of the connected spark plugs fire at the same time. One cylinder is on its compression stroke at the same time that the other is on the exhaust stroke, resulting in lower energy needed to fire the spark plug in the cylinder on its exhaust stroke. This leaves the remainder of the high voltage to be used to fire the spark plug in the cylinder on its compression stroke. Since the CPS is in a fixed position, timing adjustments are not possible or needed.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. It is important to check for the presence of spark to all of the cylinders to isolate the problem to either DIS ignition coil inputs or outputs.
5. In checking the ECM outputs for the electronic spark timing signal, it recommended to use an oscilloscope to view the varying voltage signals. In measuring these outputs with a voltmeter, intermittent errors may occur that cannot be seen by a voltmeter.
6. After confirming ECM inputs for the electronic spark timing to the DIS ignition coil are OK, it can be determined that a faulty DIS ignition coil is the problem.

11. After confirming proper CPS inputs to the ECM and the lack of wiring problems, it can be determined that the ECM is at fault.

24. This step, along with Step 25, checks for battery voltage and a ground to the DIS ignition coil.

Ignition System Check (1.3L and 1.5L SOHC IEFI-6)

Caution: Use only electrically insulated pliers when handling ignition wires with the engine running to preĆ vent an electrical shock.

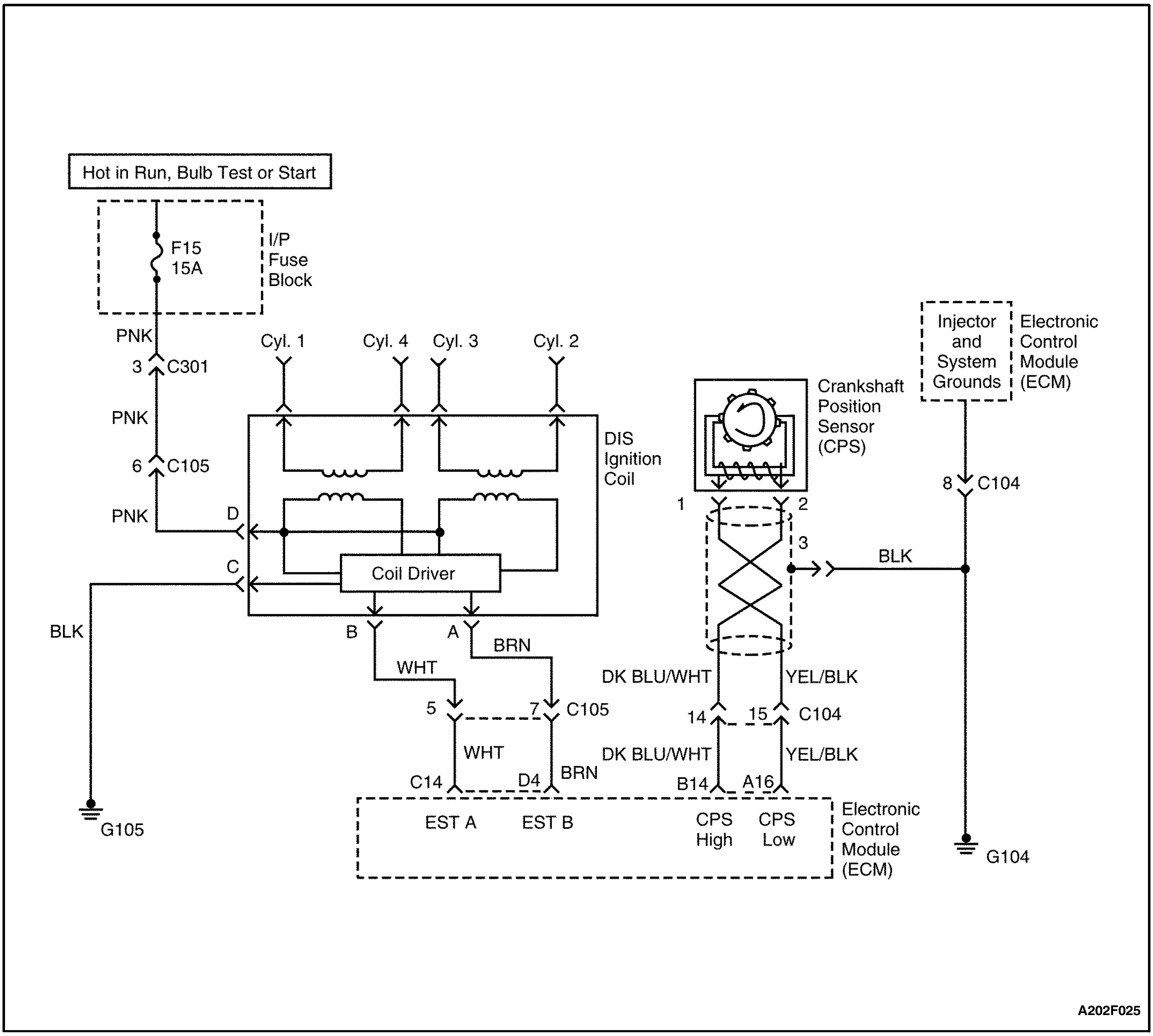
Step	Action	Value(s)	Yes	No
1	1. Remove the spark plugs. 2. Inspect for wet spark plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. 3. Replace the spark plugs as needed. Is the repair complete?	-	System OK	Go to Step 2
2	Check for the presence of spark from all of the ignition wires while cranking the engine. Is spark present from all of the ignition wires?	-	System OK	Go to Step 3
3	1. Measure the resistance of the ignition wires. 2. Replace any ignition wire(s) with a resistance above the value specified. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	30,000 W	System OK	Go to Step 4
4	Is spark present from at least one of the ignition wires, but not all of the ignition wires?	-	Go to Step 5	Go to Step 12
5	1. Turn the ignition OFF. 2. Disconnect the direct ignition system (DIS) ignition coil connector. 3. While cranking the engine, measure the voltage at the DIS ignition coil connector terminal B. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 6	Go to Step 7
6	While cranking the engine, measure the voltage at the DIS ignition coil connector terminal A. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 10	Go to Step 8
7	Check for an open in the wire from the DIS ignition coil connector terminal B to the electronic control module (ECM) connector terminal D10. Is the problem found?	-	Go to Step 9	Go to Step 11
8	Check for an open in the wire from the DIS ignition coil connector terminal A to the ECM connector terminal C3. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair the wiring as needed. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	System OK	-

Ignition System Check (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
10	1. Replace the DIS ignition coil. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	System OK	-
11	1. Replace the ECM. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	System OK	-
12	1. Turn the ignition OFF. 2. Disconnect the crankshaft position sensor (CPS) connector. 3. Measure the resistance between the CPS terminals 1 and 2. Is the resistance within the value specified?	400-600 W	Go to Step 13	Go to Step 28
13	1. Measure the resistance between the CPS terminals 1 and 3. 2. Measure the resistance between the CPS terminals 2 and 3. Is the resistance infinite (open circuit)?	R	Go to Step 14	Go to Step 28
14	1. Turn the ignition ON. 2. Measure the voltage between the CPS connector terminals 1 and 3. Is the voltage within the value specified?	0.95-1.10 v	Go to Step 20	Go to Step 15
15	Measure the voltage between the CPS connector terminal 1 and ground. Is the voltage within the value specified?	0.95-1.10 v	Go to Step 17	Go to Step 16
16	Check the wire between the CPS connector terminal 1 and the ECM connector terminal A2 for an open or short. Is the problem found?	-	Go to Step 18	Go to Step 11
17	Check the wire between the CPS connector terminal 3 and ground for an open or short. Is the problem found?	-	Go to Step 19	Go to Step 11
18	Repair the wire between the CPS connector terminal 1 and the ECM connector terminal A2. Is the repair complete?	-	System OK	-
19	Repair the wire between the CPS connector terminal 3 and ground. Is the repair complete?	-	System OK	-
20	1. Turn the ignition ON. 2. Measure the voltage between the CPS connector terminals 2 and 3. Is the voltage within the value specified?	0.95-1.10 v	Go to Step 24	Go to Step 21
21	Measure the voltage between the CPS connector terminal 2 and ground. Is the voltage within the value specified?	0.95-1.10 v	Go to Step 17	Go to Step 22

Ignition System Check (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
22	Check the wire between the CPS connector terminal 2 and the ECM connector terminal B3 for an open or short. Is the problem found?	-	Go to Step 23	Go to Step 11
23	Repair the wire between the CPS connector terminal 2 and the ECM connector terminal B3. Is the repair complete?	-	System OK	-
24	1. Turn the ignition OFF. 2. Connect a test light between the DIS ignition coil connector terminal D and ground. 3. Turn the ignition ON. Is the test light on?	-	Go to Step 25	Go to Step 26
25	Connect a test light between the DIS ignition coil connector terminal C and battery positive. Is the test light on?	-	Go to Step 5	Go to Step 27
26	Check for an open or short to ground in the wiring between the DIS ignition coil connector terminal D and the ignition switch. Is the problem found?	-	Go to Step 29	-
27	Repair the wire between the DIS ignition coil connector terminal C and ground. Is the repair complete?	-	System OK	-
28	Replace the CPS. Is the repair complete?	-	System OK	-
29	Replace the fuse F15 or repair the open in the wiring between the DIS ignition coil connector terminal D and the ignition switch. Is the repair complete?	-	System OK	-



IGNITION SYSTEM CHECK (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The direct ignition system (DIS) uses a waste spark method of spark distribution. In this type of DIS system, the crankshaft position sensor (CPS) is mounted to the oil pump near a slotted wheel that is a part of the crankshaft pulley. The CPS sends reference pulses to the electronic control module (ECM). The ECM then triggers the DIS ignition coil. Once the ECM triggers the DIS ignition coil, both of the connected spark plugs fire at the same time. One cylinder is on its compression stroke at the same time that the other is on the exhaust stroke, resulting in lower energy needed to fire the spark plug in the cylinder on its exhaust stroke. This leaves the remainder of the high voltage to be used to fire the spark plug in the cylinder on its compression stroke. Since the CPS is in a fixed position, timing adjustments are not possible or needed.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. It is important to check for the presence of spark to all of the cylinders to isolate the problem to either DIS ignition coil inputs or outputs.
5. In checking the ECM outputs for the electronic spark timing signal, it recommended to use an oscilloscope to view the varying voltage signals. In measuring these outputs with a voltmeter, intermittent errors may occur that cannot be seen by a voltmeter.
6. After confirming ECM inputs for the electronic spark timing to the DIS ignition coil are OK, it can be determined that a faulty DIS ignition coil is the problem.

11. After confirming proper CPS inputs to the ECM and the lack of wiring problems, it can be determined that the ECM is at fault.

24. This step, along with Step 25, checks for battery voltage and a ground to the DIS ignition coil.

Ignition System Check (1.3L SOHC and 1.6L DOHC ITMS-6F)

Caution: Use only electrically insulated pliers when handling ignition wires with the engine running to preĆ vent an electrical shock.

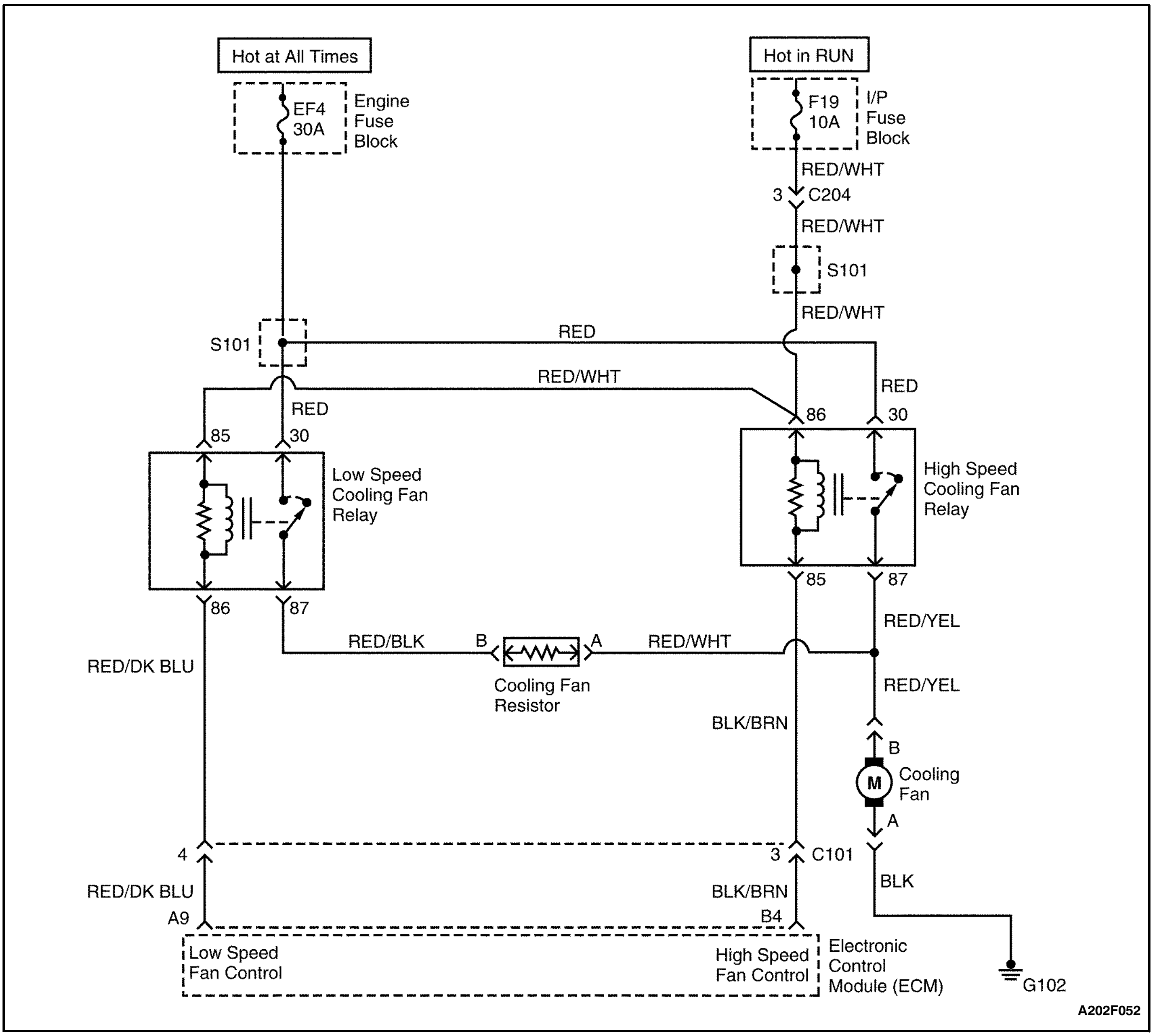
Step	Action	Value(s)	Yes	No
1	1. Remove the spark plugs. 2. Inspect for wet spark plugs, cracks, wear, improper gap, burned electrodes, or heavy deposits. 3. Replace the spark plugs as needed. Is the repair complete?	-	System OK	Go to Step 2
2	Check for the presence of spark from all of the ignition wires while cranking the engine. Is spark present from all of the ignition wires?	-	System OK	Go to Step 3
3	1. Measure the resistance of the ignition wires. 2. Replace any ignition wire(s) with a resistance above the value specified. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	30,000 W	System OK	Go to Step 4
4	Is spark present from at least one of the ignition wires, but not all of the ignition wires?	-	Go to Step 5	Go to Step 12
5	1. Turn the ignition OFF. 2. Disconnect the direct ignition system (DIS) ignition coil connector. 3. While cranking the engine, measure the voltage at the DIS ignition coil connector terminal B. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 6	Go to Step 7
6	While cranking the engine, measure the voltage at the DIS ignition coil connector terminal A. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 10	Go to Step 8
7	Check for an open in the wire from the DIS ignition coil connector terminal B to the electronic control module (ECM) connector terminal C14. Is the problem found?	-	Go to Step 9	Go to Step 11
8	Check for an open in the wire from the DIS ignition coil connector terminal A to the ECM connector terminal D14. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair the wiring as needed. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	System OK	-

Ignition System Check (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
10	1. Replace the DIS ignition coil. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	System OK	-
11	1. Replace the ECM. 2. Connect the DIS ignition coil connector. 3. Check for the presence of spark from all of the ignition wires. Is spark present from all of the ignition wires?	-	System OK	-
12	1. Turn the ignition OFF. 2. Disconnect the crankshaft position sensor (CPS) connector. 3. Measure the resistance between the CPS terminals 1 and 2. Is the resistance within the value specified?	400-600 W	Go to Step 13	Go to Step 28
13	1. Measure the resistance between the CPS terminals 1 and 3. 2. Measure the resistance between the CPS terminals 2 and 3. Is the resistance infinite (open circuit)?	R	Go to Step 14	Go to Step 28
14	1. Turn the ignition ON. 2. Measure the voltage between the CPS connector terminals 1 and 3 Is the voltage within the value specified?	0.95-1.10 v	Go to Step 20	Go to Step 15
15	Measure the voltage between the CPS connector terminal 1 and ground. Is the voltage within the value specified?	0.95-1.10 v	Go to Step 17	Go to Step 16
16	Check the wire between the CPS connector terminal 1 and the ECM connector terminal B14 for an open or short. Is the problem found?	-	Go to Step 18	Go to Step 11
17	Check the wire between the CPS connector terminal 3 and ground for an open or short. Is the problem found?	-	Go to Step 19	Go to Step 11
18	Repair the wire between the CPS connector terminal 1 and the ECM connector terminal B14. Is the repair complete?	-	System OK	-
19	Repair the wire between the CPS connector terminal 3 and ground. Is the repair complete?	-	System OK	-
20	1. Turn the ignition ON. 2. Measure the voltage between the CPS connector terminals 2 and 3. Is the voltage within the value specified?	0.95-1.10 v	Go to Step 24	Go to Step 21
21	Measure the voltage between the CPS connector terminal 2 and ground. Is the voltage within the value specified?	0.95-1.10 v	Go to Step 17	Go to Step 22

Ignition System Check (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
22	Check the wire between the CPS connector terminal 2 and the ECM connector terminal A16 for an open or short. Is the problem found?	-	Go to Step 23	Go to Step 11
23	Repair the wire between the CPS connector terminal 2 and the ECM connector terminal A16. Is the repair complete?	-	System OK	-
24	1. Turn the ignition OFF. 2. Connect a test light between the DIS ignition coil connector terminal D and ground. 3. Turn the ignition ON. Is the test light on?	-	Go to Step 25	Go to Step 26
25	Connect a test light between the DIS ignition coil connector terminal C and battery positive. Is the test light on?	-	Go to Step 5	Go to Step 27
26	Check for an open or short to ground in the wiring between the DIS ignition coil connector terminal D and the ignition switch. Is the problem found?	-	Go to Step 29	-
27	Repair the wire between the DIS ignition coil connector terminal C and ground. Is the repair complete?	-	System OK	-
28	Replace the CPS. Is the repair complete?	-	System OK	-
29	Replace the fuse F15 or repair the open in the wiring between the DIS ignition coil connector terminal D and the ignition switch. Is the repair complete?	-	System OK	-



ENGINE COOLING FAN CIRCUIT CHECK – WITHOUT A/C (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The engine cooling fan circuit operates the cooling fan. The cooling fan is controlled by the electronic control module (ECM) based on input from the coolant temperature sensor (CTS). The ECM controls the low-speed cooling fan operation by internally grounding the ECM connector terminal A9. This energizes the low-speed cooling fan relay and operates the cooling fan at low speed. The low-speed cooling fan operation is achieved by the cooling fan resistor causing a drop in the voltage supplied to the cooling fan. The ECM controls the high-speed cooling fan operation by internally grounding the ECM connector terminal B4. This energizes the high-speed cooling fan relay, bypassing the radiator fan resistor. This results in high-speed cooling fan operation.

Diagnostic Aids

- **If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the engine coolant temperature gauge indicated overheating. If the engine is overheating and the cooling fans are on, the cooling system should be checked.**
- **If the I/P fuse block fuse F19 or the engine fuse block fuse EF4 become open (blown) immediately after installation, inspect for a short to ground in the wiring of the appropriate circuit. If the fuses become open (blown) when the cooling fan is to be turned on by the ECM, suspect a faulty cooling fan motor.**

- The ECM will turn the cooling fans on at low speed when the coolant temperature is 93°C (199°F). The ECM will turn the cooling fans off when the coolant temperature is 90°C (194°F).
- The ECM will turn the cooling fans on at high speed when the coolant temperature is 97°C (207°F). The ECM will change the cooling fans from high speed to low speed when the coolant temperature is 94°C (201°F).
- The cooling fan circuit can be checked quickly by disconnecting the ECM 24-pin connector and grounding the connector terminal A9. This should create low-speed cooling fan operation with the ignition ON. By grounding the ECM connector terminals A9 and B4 and turning the ignition ON, high-speed cooling fan operation should be achieved.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step, along with Step 5, checks for the ability of the ECM to operate the cooling fans.

22. By directly grounding the ECM connector terminals A9 and B4, the cooling fan should run at high speed.

Engine Cooling Fan Circuit Check – Without A/C (1.3L and 1.5L SOHC IEFI-6)

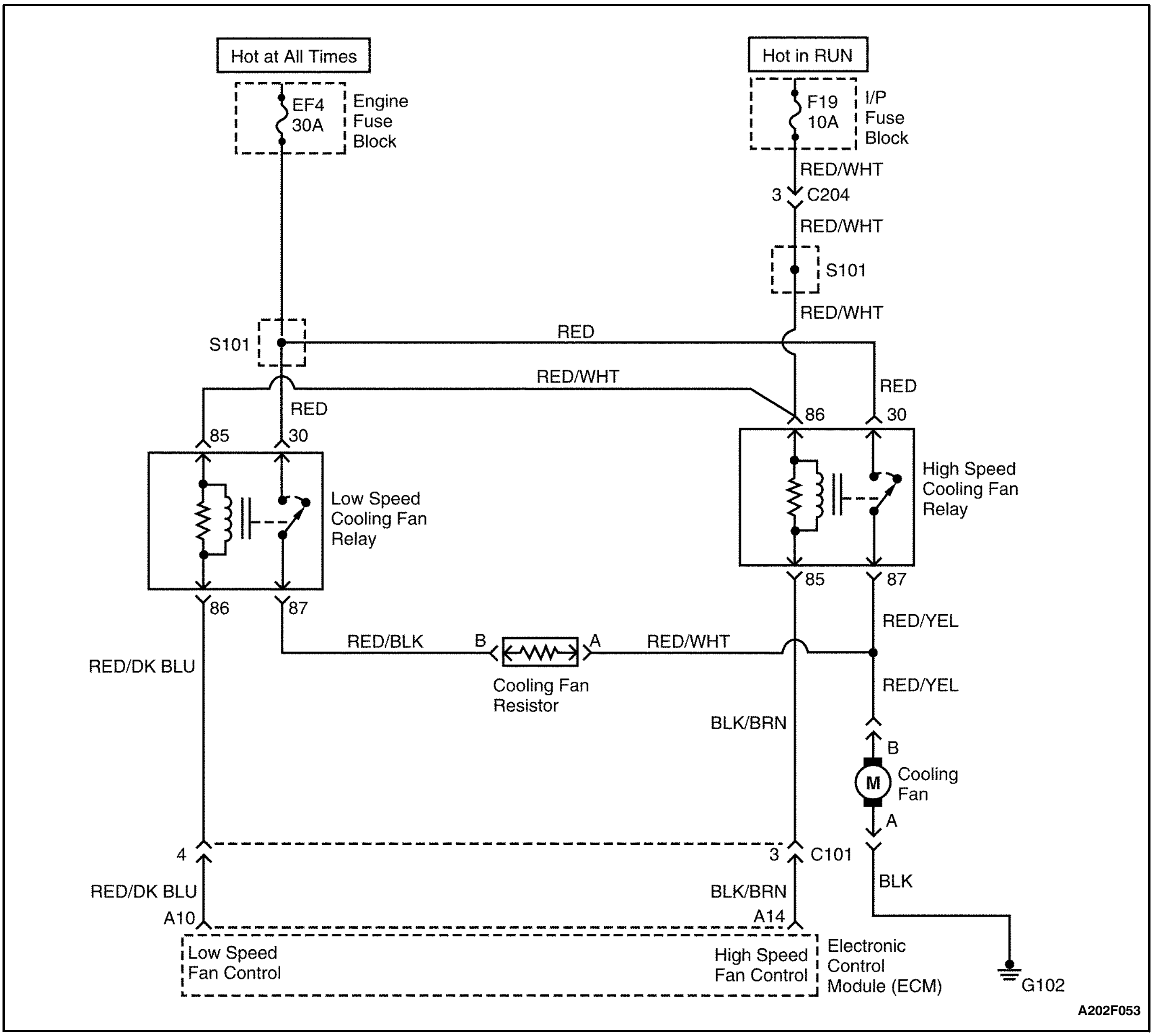
Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Check the I/P fuse block fuse 19. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Check the engine fuse block fuse EF4. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 4	Go to "Diagnostic Aids"
4	1. Turn the ignition OFF. 2. Connect the scan tool to the assembly line diagnostic link (ALDL). 3. Start the engine. 4. The cooling fan should run at low speed when the coolant temperature reaches 93°C (199°F). Does the cooling fan run at low speed?	-	Go to Step 5	Go to Step 6
5	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. Start the engine. 4. The cooling fan should run at high speed when the coolant temperature reaches 97°C (207°F). Does the cooling fan run at high speed?	-	System OK	Go to Step 22
6	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) 24-pin connector. 3. Connect a fused jumper between the ECM connector terminal A9 and ground. 4. Turn the ignition ON. Does the cooling fan run at low speed?	-	Go to Step 21	Go to Step 7
7	1. Turn the ignition OFF. 2. Connect a fused jumper between the ECM connector terminal A9 and ground. 3. Disconnect the cooling fan connector. 4. Connect a test light between the cooling fan connector terminal B and ground. 5. Turn the ignition ON. Is the test light on?	-	Go to Step 8	Go to Step 9

Engine Cooling Fan Circuit Check – Without A/C (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
8	1. Turn the ignition OFF. 2. Connect a test light between the cooling fan connector terminal A and battery positive. Is the test light on?	-	Go to Step 18	Go to Step 17
9	1. Turn the ignition OFF. 2. Disconnect the low-speed cooling fan relay. 3. Connect a test light between the low-speed cooling fan relay connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 10	Go to Step 13
10	1. Turn the ignition OFF. 2. Connect a test light between the low-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 11	Go to Step 14
11	Connect a test light between the low-speed cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 12	Go to Step 16
12	1. Connect a fused jumper between the ECM connector terminal A9 and ground. 2. Connect a test light between the low-speed cooling fan relay connector terminal 85 and battery positive. Is the test light on?	-	Go to Step 19	Go to Step 15
13	Repair the open wire between the low-speed cooling fan relay connector terminal 85 and the ignition switch. Is the repair complete?	-	System OK	-
14	Repair the open wire between the low-speed cooling fan relay connector terminal 30 and the fuse EF4. Is the repair complete?	-	System OK	-
15	Repair the open wire between the low-speed cooling fan relay connector terminal 86 and the ECM connector terminal A9. Is the repair complete?	-	System OK	-
16	Check for an open wire between the low-speed cooling fan connector terminal 87 and the cooling fan connector terminal B. Is the problem found?	-	Go to Step 20	Go to Step 17
17	Check for an open wire between the cooling fan connector terminal A and ground. Is the problem found?	-	Go to Step 20	Go to Step 18
18	Replace the cooling fan. Is the repair complete?	-	System OK	-
19	Replace the low-speed cooling fan relay. Is the repair complete?	-	System OK	-
20	Repair the wire as needed. Is the repair complete?	-	System OK	-

Engine Cooling Fan Circuit Check – Without A/C (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
21	Replace the ECM. Is the repair complete?	-	System OK	-
22	1. Turn the ignition OFF. 2. Disconnect the ECM 24-pin connector. 3. Connect a fused jumper between the ECM connector terminal A9 and ground. 4. Connect a fused jumper between the ECM connector terminal B4 and ground. 5. Turn the ignition ON. Does the cooling fan run at high speed?	-	Go to Step 21	Go to Step 23
23	1. Turn the ignition OFF. 2. Disconnect the high-speed cooling fan relay. 3. Connect a test light between the high-speed cooling fan relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 24	Go to Step 28
24	1. Turn the ignition OFF. 2. Connect a test light between the high-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 25	Go to Step 29
25	Connect a test light between the high-speed cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 26	Go to Step 30
26	1. Connect a fused jumper between the ECM connector terminal B4 and ground. 2. Connect a test light between the high-speed relay connector terminal 85 and battery positive. Is the test light on?	-	Go to Step 27	Go to Step 31
27	Replace the high-speed cooling fan relay. Is the repair complete?	-	System OK	-
28	Repair the open wire between the high-speed cooling fan connector terminal 86 and the ignition switch. Is the repair complete?	-	System OK	-
29	Repair the open wire between the high-speed cooling fan relay connector terminal 30 and the fuse EF4. Is the repair complete?	-	System OK	-
30	Repair the open wire between the high-speed cooling fan relay connector terminal 87 and the cooling fan connector terminal B. Is the repair complete?	-	System OK	-
31	Repair the open wire between the high-speed cooling fan relay connector terminal 85 and the ECM connector terminal B4. Is the repair complete?	-	System OK	-



ENGINE COOLING FAN CIRCUIT CHECK - WITHOUT A/C (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The engine cooling fan circuit operates the cooling fan. The cooling fan is controlled by the electronic control module (ECM) based on input from the coolant temperature sensor (CTS). The ECM controls the low-speed cooling fan operation by internally grounding the ECM connector terminal A10. This energizes the low-speed cooling fan relay and operates the cooling fan at low speed. The low-speed cooling fan operation is achieved by the cooling fan resistor causing a drop in the voltage supplied to the cooling fan. The ECM controls the high-speed cooling fan operation by internally grounding the ECM connector terminal A14. This energizes the high-speed cooling fan relay, bypassing the radiator fan resistor. This results in high-speed cooling fan operation.

Diagnostic Aids

- **If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the engine coolant temperature gauge indicated overheating. If the engine is overheating and the cooling fans are on, the cooling system should be checked.**
- **If the I/P fuse block fuse F19 or the engine fuse block fuse EF4 become open (blown) immediately after installation, inspect for a short to ground in the wiring of the appropriate circuit. If the fuses become open (blown) when the cooling fan is to be turned on by the ECM, suspect a faulty cooling fan motor.**

- The ECM will turn the cooling fans on at low speed when the coolant temperature is 93°C (199°F). The ECM will turn the cooling fans off when the coolant temperature is 90°C (194°F).
- The ECM will turn the cooling fans on at high speed when the coolant temperature is 97°C (207°F). The ECM will change the cooling fans from high speed to low speed when the coolant temperature is 94°C (201°F).
- The cooling fan circuit can be checked quickly by disconnecting the ECM connector and grounding the connector terminal A10. This should create low-speed cooling fan operation with the ignition ON. By grounding the ECM connector terminals A10 and A14 and turning the ignition ON, high-speed cooling fan operation should be achieved.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step, along with step 5, checks for the ability of the ECM to operate the cooling fans.
22. By directly grounding the ECM connector terminals A10 and A14, the cooling fan should run at high speed.

Engine Cooling Fan Circuit Check – Without A/C (1.3L SOHC and 1.6L DOHC ITMS-6F)

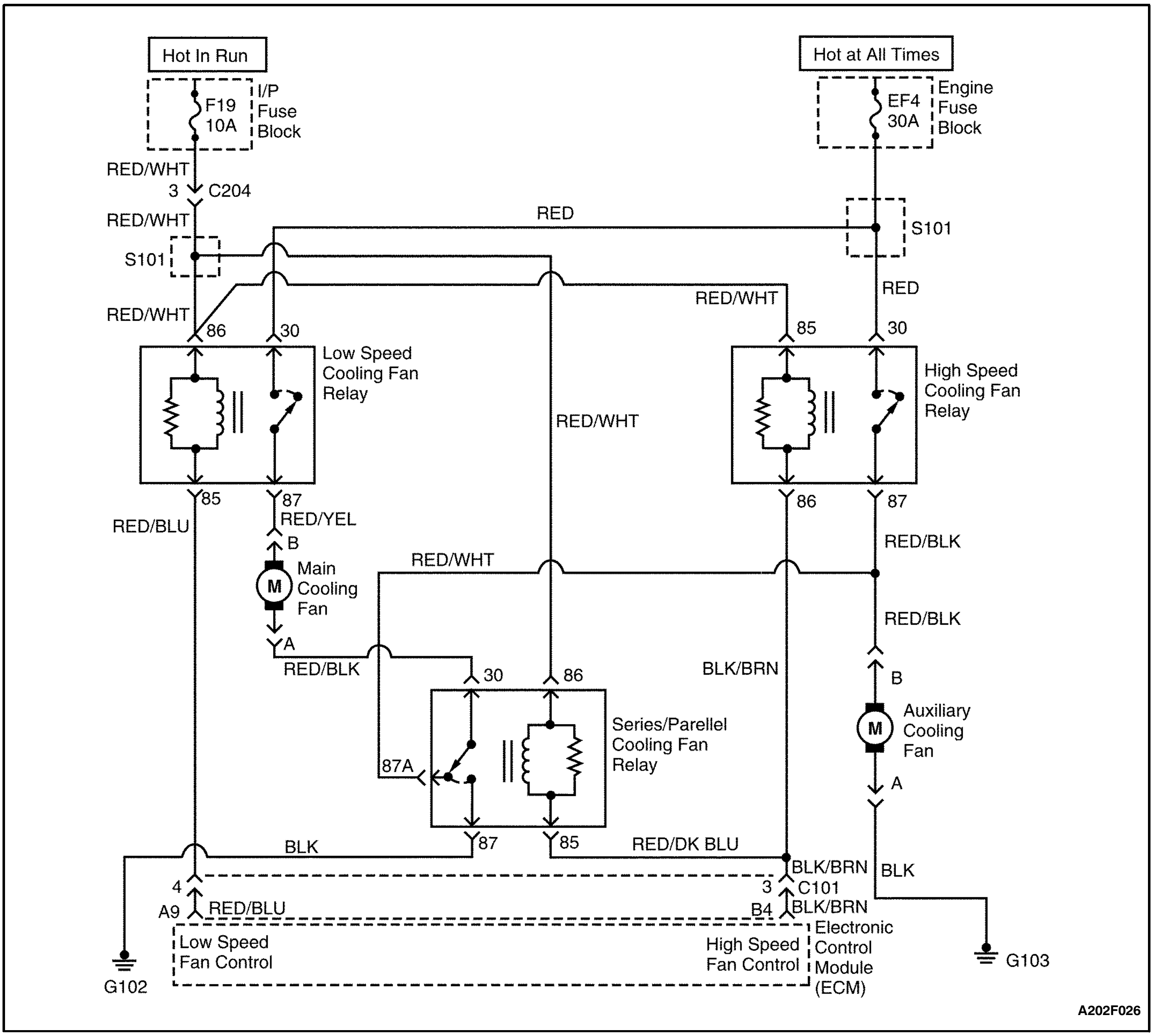
Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Check the I/P fuse block fuse 19. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Check the engine fuse block fuse EF4. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 4	Go to "Diagnostic Aids"
4	1. Turn the ignition OFF. 2. Connect the scan tool to the assembly line diagnostic link (ALDL). 3. Start the engine. 4. The cooling fan should run at low speed when the coolant temperature reaches 93°C (199°F). Does the cooling fan run at low speed?	-	Go to Step 5	Go to Step 6
5	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. Start the engine. 4. The cooling fan should run at high speed when the coolant temperature reaches 97°C (207°F). Does the cooling fan run at high speed?	-	System OK	Go to Step 22
6	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) connector. 3. Connect a fused jumper between the ECM connector terminal A10 and ground. 4. Turn the ignition ON. Does the cooling fan run at low speed?	-	Go to Step 21	Go to Step 7
7	1. Turn the ignition OFF. 2. Connect a fused jumper between the ECM connector terminal A10 and ground. 3. Disconnect the cooling fan connector. 4. Connect a test light between the cooling fan connector terminal B and ground. 5. Turn the ignition ON. Is the test light on?	-	Go to Step 8	Go to Step 9

Engine Cooling Fan Circuit Check – Without A/C (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
8	1. Turn the ignition OFF. 2. Connect a test light between the cooling fan connector terminal A and battery positive. Is the test light on?	-	Go to Step 18	Go to Step 17
9	1. Turn the ignition OFF. 2. Disconnect the low-speed cooling fan relay. 3. Connect a test light between the low-speed cooling fan relay connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 10	Go to Step 13
10	1. Turn the ignition OFF. 2. Connect a test light between the low-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 11	Go to Step 14
11	Connect a test light between the low-speed cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 12	Go to Step 16
12	1. Connect a fused jumper between the ECM connector terminal A10 and ground. 2. Connect a test light between the low-speed cooling fan relay connector terminal 86 and battery positive. Is the test light on?	-	Go to Step 19	Go to Step 15
13	Repair the open wire between the low-speed cooling fan relay connector terminal 85 and the ignition switch. Is the repair complete?	-	System OK	-
14	Repair the open wire between the low-speed cooling fan relay connector terminal 30 and the fuse EF4. Is the repair complete?	-	System OK	-
15	Repair the open wire between the low-speed cooling fan relay connector terminal 86 and the ECM connector terminal A10. Is the repair complete?	-	System OK	-
16	Check for an open wire between the low-speed cooling fan connector terminal 87 and the cooling fan connector terminal B. Is the problem found?	-	Go to Step 20	Go to Step 17
17	Check for an open wire between the cooling fan connector terminal A and ground. Is the problem found?	-	Go to Step 20	Go to Step 18
18	Replace the cooling fan. Is the repair complete?	-	System OK	-
19	Replace the low-speed cooling fan relay. Is the repair complete?	-	System OK	-
20	Repair the wire as needed. Is the repair complete?	-	System OK	-

Engine Cooling Fan Circuit Check – Without A/C (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
21	Replace the ECM. Is the repair complete?	-	System OK	-
22	1. Turn the ignition OFF. 2. Disconnect the ECM connector. 3. Connect a fused jumper between the ECM connector terminal A10 and ground. 4. Connect a fused jumper between the ECM connector terminal A14 and ground. 5. Turn the ignition ON. Does the cooling fan run at high speed?	-	Go to Step 21	Go to Step 23
23	1. Turn the ignition OFF. 2. Disconnect the high-speed cooling fan relay. 3. Connect a test light between the high-speed cooling fan relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 24	Go to Step 28
24	1. Turn the ignition OFF. 2. Connect a test light between the high-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 25	Go to Step 29
25	Connect a test light between the high-speed cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 26	Go to Step 30
26	1. Connect a fused jumper between the ECM connector terminal A14 and ground. 2. Connect a test light between the high-speed relay connector terminal 85 and battery positive. Is the test light on?	-	Go to Step 27	Go to Step 31
27	Replace the high-speed cooling fan relay. Is the repair complete?	-	System OK	-
28	Repair the open wire between the high-speed cooling fan connector terminal 86 and the ignition switch. Is the repair complete?	-	System OK	-
29	Repair the open wire between the high-speed cooling fan relay connector terminal 30 and the fuse EF4. Is the repair complete?	-	System OK	-
30	Repair the open wire between the high-speed cooling fan relay connector terminal 87 and the cooling fan connector terminal B. Is the repair complete?	-	System OK	-
31	Repair the open wire between the high-speed cooling fan relay connector terminal 85 and the ECM connector terminal A14. Is the repair complete?	-	System OK	-



ENGINE COOLING FAN CIRCUIT CHECK – WITH A/C (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The engine cooling fan circuit operates the main cooling fan and the auxiliary cooling fan. The cooling fans are controlled by the electronic control module (ECM) based on inputs from the coolant temperature sensor (CTS) and the air conditioning pressure (ACP) sensor. The ECM controls the low-speed cooling fan operation by internally grounding the ECM connector terminal A9. This energizes the low-speed cooling fan relay and operates the main cooling fan and the auxiliary cooling fan at low speed as the cooling fans are connected in a series circuit. The ECM controls the high-speed cooling fan operation by internally grounding the ECM connector terminal A9 and the ECM connector terminal B4 at the same time. This energizes the low-speed cooling fan relay, the high-speed cooling fan relay, and the series/parallel cooling fan relay resulting in high-speed fan operation as the cooling fans are now connected in a parallel circuit.

Diagnostic Aids

- If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the engine coolant temperature gauge indicated overheating. If the engine is overheating and the cooling fans are on, the cooling system should be checked.

- If the engine fuse block fuses EF4 become open (blown) immediately after installation, inspect for a short to ground in the wiring of the appropriate circuit. If the fuses become open (blown) when the cooling fans are to be turned on by the ECM, suspect a faulty cooling fan motor.
- The ECM will turn the cooling fans on at low speed when the coolant temperature is 97°C (207°F). The ECM will turn the cooling fans off when the coolant temperature is 94°C (201°F).
- The ECM will turn the cooling fans on at high speed when the coolant temperature is 101°C (214°F). The ECM will change the cooling fans from high speed to low speed when the coolant temperature is 98°C (208°F).
- The ECM will turn the cooling fans on at low speed when the air conditioning (A/C) system is on. The ECM will change the cooling fans from low speed to high speed when the high-side A/C pressure is 1 882 kPa (273 psi), then return to low speed when the high-side A/C pressure is 1 448 kPa (210 psi). When the A/C system is on, the ECM will change the cooling fans from low to high speed when the coolant temperature reaches 117°C (243°F) then return to low speed when the coolant temperature reaches 114°C (237°F).
- The cooling fan circuit can be checked quickly by disconnecting the ECM red connector and grounding the connector terminal A9. This should create low-speed cooling fan operation with the ignition ON. By grounding the ECM connector terminals A9 and B4 and turning the ignition ON, high-speed cooling fan operation should be achieved.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step, along with Step 5, checks for the ability of the ECM to operate the cooling fans.
8. This step, along with Step 9, checks for the ability of the ECM to operate the cooling fans in response to A/C pressure readings.
16. After confirming battery voltage and the ECM supplying a ground to the coil side of the low-speed cooling fan relay, jumper connector terminals 30 and 87 to determine if the relay is at fault or a wiring problem is present.
31. This step checks for the presence of battery voltage to the main cooling fan when the A/C is on. If battery voltage is present and the cooling fans are not operating, the problem is in the ground side of the cooling fan circuit.
37. By directly grounding the ECM connector terminals A9 and B4, the main and auxiliary cooling fans should run at high speed.

Engine Cooling Fan Circuit Check – With A/C (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	1. Check the engine fuse block fuse EF4. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 3	Go to “Diagnostic Aids”
3	1. Check the I/P fuse block fuse F19. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 4	Go to “Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Turn the air conditioning (A/C) switch OFF. 3. Connect a scan tool to the assembly line diagnostic link (ALDL). 4. Start the engine. 5. The cooling fans should run at low speed when the coolant temperature reaches 97°C (207°F). Do the cooling fans run at low speed?	-	Go to Step 5	Go to Step 10

Engine Cooling Fan Circuit Check – With A/C (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the ALDL. 4. Start the engine. 5. The cooling fans should run at high speed when the coolant temperature reaches 101°C (214°F). Do the cooling fans run at high speed?	-	Go to Step 6	Go to Step 33
6	1. Turn the ignition OFF. 2. Start the engine. 3. Turn the A/C switch ON. Does the A/C compressor clutch engage?	-	Go to Step 8	Go to Step 7
7	1. Diagnose the A/C compressor clutch circuit. 2. Repair the A/C compressor clutch circuit as needed. 3. Start the engine. 4. Turn the A/C switch ON. Does the A/C compressor clutch engage?	-	Go to Step 8	-
8	Do the cooling fans run at low speed?	-	Go to Step 9	Go to Step 31
9	1. Turn the ignition OFF. 2. Connect the A/C pressure gauges. 3. Start the engine. 4. Turn the A/C switch ON. 5. The cooling fans should run at high speed when the high-side A/C pressure reaches 1 882 kPa (273 psi). Do the cooling fans run at high speed?	-	System OK	-
10	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. The coolant temperature should be above 97°C (207°C). 4. Disconnect the main cooling fan connector. 5. Turn the ignition ON. 6. Connect a test light between the main cooling fan connector terminal B and ground. Is the test light on?	-	Go to Step 11	Go to Step 12
11	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. The coolant temperature should be above 97°C (207°C). 4. Disconnect the main cooling fan connector. 5. Connect a test light between the main cooling fan connector terminal A and battery positive. Is the test light on?	-	Go to Step 28	Go to Step 17
12	1. Turn the ignition OFF. 2. Disconnect the low-speed cooling fan relay. 3. Connect a test light between the low-speed cooling fan relay connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 13	Go to Step 24

Engine Cooling Fan Circuit Check – With A/C (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
13	1. Turn the ignition OFF. 2. Connect the low-speed cooling fan relay. 3. Disconnect the electronic control module (ECM) red connector. 4. Connect a fused jumper between the ECM connector terminal A9 and ground. 5. Turn the ignition ON. Do the cooling fans run at low speed?	-	Go to Step 30	Go to Step 14
14	Check for an open wire between the low-speed cooling fan relay connector terminal 85 and the ECM connector terminal A9. Is the problem found?	-	Go to Step 25	Go to Step 15
15	1. Turn the ignition OFF. 2. Disconnect the low-speed cooling fan relay. 3. Connect a test light between the low-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 16	Go to Step 23
16	Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. Do the cooling fans run at low speed?	-	Go to Step 26	Go to Step 17
17	1. Disconnect the series/parallel cooling fan relay. 2. Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. 3. Connect a fused jumper between the series/parallel cooling fan relay connector terminals 30 and 87. Do the cooling fans run at low speed?	-	Go to Step 27	Go to Step 18
18	Check the wire between the low-speed cooling fan relay connector terminal 87 to the main cooling fan connector terminal B for an open. Is the problem found?	-	Go to Step 22	Go to Step 19
19	Check the wire between the main cooling fan connector terminal A and the series/parallel cooling fan relay connector terminal 30 for an open. Is the problem found?	-	Go to Step 22	Go to Step 20
20	Check the wire between the series/parallel cooling fan relay connector terminal 87 and the auxiliary cooling fan connector terminal B for an open. Is the problem found?	-	Go to Step 22	Go to Step 21
21	Check for an open wire between the auxiliary cooling fan connector terminal A and ground. Is the problem found?	-	Go to Step 22	Go to Step 29
22	Repair the open wire as needed. Is the repair complete?	-	System OK	-
23	Repair the open between the low-speed cooling fan relay connector terminal 30 and the fuse EF4. Is the repair complete?	-	System OK	-
24	Repair the open between the low-speed cooling fan relay connector terminal 86 and the ignition switch. Is the repair complete?	-	System OK	-

Engine Cooling Fan Circuit Check - With A/C (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
25	Repair the open wire between the low-speed cooling fan relay connector terminal 85 and the ECM connector terminal A9. Is the repair complete?	-	System OK	-
26	Replace the low-speed cooling fan relay. Is the repair complete?	-	System OK	-
27	Replace the series/parallel cooling fan relay. Is the repair complete?	-	System OK	-
28	Replace the main cooling fan. Is the repair complete?	-	System OK	-
29	Replace the auxiliary cooling fan. Is the repair complete?	-	System OK	-
30	Replace the ECM. Is the repair complete?	-	System OK	-
31	1. Turn the ignition OFF. 2. Disconnect the main cooling fan connector. 3. Connect a test light between the main cooling fan connector terminal B and ground. 4. Turn the A/C switch ON. 5. Start the engine. Is the test light on?	-	Go to Step 32	Go to Step 12
32	1. Turn the ignition OFF. 2. Connect a test light between the main cooling fan connector terminal A and battery positive. 3. Turn the A/C switch ON. 4. Start the engine. Is the test light on?	-	Go to Step 28	Go to Step 17
33	1. Turn the ignition OFF. 2. Disconnect the high-speed cooling fan relay. 3. Connect a test light between the high-speed cooling fan relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 34	Go to Step 44
34	1. Turn the ignition OFF. 2. Connect a test light between the high-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 35	Go to Step 45
35	1. Disconnect the series/parallel cooling fan relay. 2. Connect a test light between the series/parallel cooling fan relay connector terminal 86 and ground. 3. Turn the ignition ON. Is the test light on?	-	Go to Step 36	Go to Step 46
36	1. Turn the ignition OFF. 2. Connect a test light between the series/parallel cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 37	Go to Step 47

Engine Cooling Fan Circuit Check – With A/C (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
37	1. Connect the main cooling fan connector. 2. Connect the high-speed cooling fan relay. 3. Connect the series/parallel cooling fan relay. 4. Disconnect the ECM connector. 5. Connect a fused jumper between the ECM connector terminal A9 and ground. 6. Connect a fused jumper between the ECM connector terminal B4 and ground. 7. Turn the ignition ON. Do the cooling fans run at high speed?	-	Go to Step 30	Go to Step 38
38	1. Turn the ignition OFF. 2. Check for an open wire between the high-speed cooling fan relay connector terminal 86 and the ECM connector terminal B4. Is the problem found?	-	Go to Step 22	Go to Step 39
39	1. Disconnect the high-speed cooling fan relay. 2. Connect a test light between the high-speed cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 40	Go to Step 48
40	1. Disconnect the ECM connector. 2. Connect a fused jumper between the ECM connector terminal B4 and ground. 3. Disconnect the series/parallel cooling fan relay. 4. Connect a test light between the series/parallel cooling fan relay connector terminal 85 and battery positive. Is the test light on?	-	Go to Step 41	Go to Step 49
41	1. Connect the series/parallel cooling fan relay. 2. Connect a fused jumper between the ECM connector terminal B4 and ground. 3. Disconnect the high-speed cooling fan relay. 4. Connect a fused jumper between the high-speed cooling fan relay connector terminals 30 and 87. 5. Disconnect the low-speed cooling fan relay. 6. Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. 7. Turn the ignition ON. Do the cooling fans run at high speed?	-	Go to Step 43	Go to Step 42
42	1. Turn the ignition OFF. 2. Connect a fused jumper between the ECM connector terminal B4 and ground. 3. Disconnect the series/parallel cooling fan relay. 4. Connect a fused jumper between the series/parallel cooling fan relay connector terminals 30 and 87. 5. Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. 6. Turn the ignition ON. Do the cooling fans run at high speed?	-	Go to Step 27	-

Engine Cooling Fan Circuit Check – With A/C (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
43	Replace the high-speed cooling fan relay. Is the repair complete?	-	System OK	-
44	Repair the open wire between the high-speed cooling fan relay connector terminal 85 and the ignition switch. Is the repair complete?	-	System OK	-
45	Repair the open wire between the high-speed cooling fan relay connector terminal 30 and the battery. Is the repair complete?	-	System OK	-
46	Repair the open wire between the series/parallel cooling fan relay connector terminal 86 and the ignition switch. Is the repair complete?	-	System OK	-
47	Repair the open wire between the series/parallel cooling fan relay connector terminal 87 and ground. Is the repair complete?	-	System OK	-
48	Repair the open wire between the high-speed cooling fan relay connector terminal 87 and the auxiliary cooling fan connector terminal B. Is the repair complete?	-	System OK	-
49	Repair the open wire between the series/parallel cooling fan relay connector terminal 85 and the ECM connector terminal B4. Is the repair complete?	-	System OK	-

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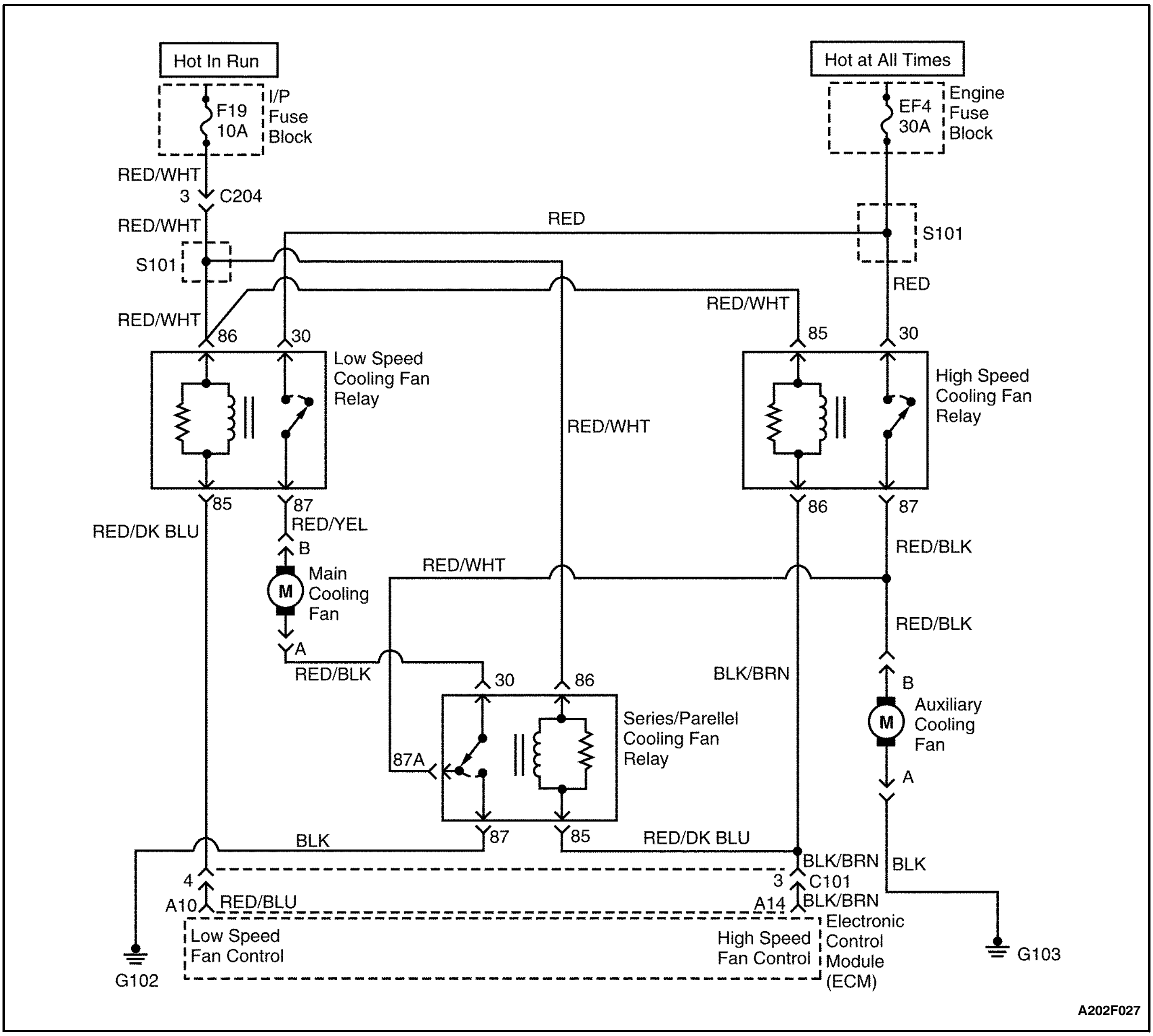


ENGINE COOLING FAN CIRCUIT CHECK - WITH A/C (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The engine cooling fan circuit operates the main cooling fan and the auxiliary cooling fan. The cooling fans are controlled by the electronic control module (ECM) based on inputs from the coolant temperature sensor (CTS) and the air conditioning pressure (ACP) sensor. The ECM controls the low-speed cooling fan operation by internally grounding the ECM connector terminal A10. This energizes the low-speed cooling fan relay and operates the main cooling fan and the auxiliary cooling fan at low speed as the cooling fans are connected in a series circuit. The ECM controls the high-speed cooling fan operation by internally grounding the ECM connector terminal A10 and the ECM connector terminal A14 at the same time. This energizes the low-speed cooling fan relay, the high-speed cooling fan relay, and the series/parallel cooling fan relay resulting in high-speed fan operation as the cooling fans are now connected in a parallel circuit.

Diagnostic Aids

- If the owner complained of an overheating problem, it must be determined if the complaint was due to an actual boil over, or the engine coolant temperature gauge indicated overheating. If the engine is overheating and the cooling fans are on, the cooling system should be checked.

- If the engine fuse block fuses EF3 or EF8 become open (blown) immediately after installation, inspect for a short to ground in the wiring of the appropriate circuit. If the fuses become open (blown) when the cooling fans are to be turned on by the ECM, suspect a faulty cooling fan motor.
- The ECM will turn the cooling fans on at low speed when the coolant temperature is 93°C (199°F). The ECM will turn the cooling fans off when the coolant temperature is 90°C (194°F).
- The ECM will turn the cooling fans on at high speed when the coolant temperature is 97°C (207°F). The ECM will change the cooling fans from high speed to low speed when the coolant temperature is 94°C (201°F).
- The ECM will turn the cooling fans on at low speed when the air conditioning (A/C) system is on. The ECM will change the cooling fans from low speed to high speed when the high-side A/C pressure is 1 882 kPa (273 psi), then return to low speed when the high-side A/C pressure is 1 448 kPa (210 psi). When the A/C system is on, the ECM will change the cooling fans from low to high speed when the coolant temperature reaches 115°C (239°F) then return to low speed when the coolant temperature reaches 112°C (234°F).
- The cooling fan circuit can be checked quickly by disconnecting the ECM red connector and grounding the connector terminal A10. This should create low-speed cooling fan operation with the ignition ON. By grounding the ECM connector terminals A10 and A14 and turning the ignition ON, high-speed cooling fan operation should be achieved.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step, along with step 5, checks for the ability of the ECM to operate the cooling fans.
8. This step, along with step 9, checks for the ability of the ECM to operate the cooling fans in response to A/C pressure readings.
16. After confirming battery voltage and the ECM supplying a ground to the coil side of the low-speed cooling fan relay, jumper connector terminals 30 and 87 to determine if the relay is at fault or a wiring problem is present.
31. This step checks for the presence of battery voltage to the main cooling fan when the A/C is on. If battery voltage is present and the cooling fans are not operating, the problem is in the ground side of the cooling fan circuit.
37. By directly grounding the ECM connector terminals A10 and A14, the main and auxiliary cooling fans should run at high speed.

Engine Cooling Fan Circuit Check – With A/C (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Check the engine fuse block fuse EF4. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 3	Go to "Diagnostic Aids"
3	1. Check the I/P fuse block fuse F19. 2. Replace the fuse as needed. Is the fuse OK?	-	Go to Step 4	Go to "Diagnostic Aids"
4	1. Turn the ignition OFF. 2. Turn the air conditioning (A/C) switch OFF. 3. Connect a scan tool to the assembly line diagnostic link (ALDL). 4. Start the engine. 5. The cooling fans should run at low speed when the coolant temperature reaches 93°C (199°F). Do the cooling fans run at low speed?	-	Go to Step 5	Go to Step 10

Engine Cooling Fan Circuit Check – With A/C (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the ALDL. 4. Start the engine. 5. The cooling fans should run at high speed when the coolant temperature reaches 97°C (207°F). Do the cooling fans run at high speed?	-	Go to Step 6	Go to Step 33
6	1. Turn the ignition OFF. 2. Start the engine. 3. Turn the A/C switch ON. Does the A/C compressor clutch engage?	-	Go to Step 8	Go to Step 7
7	1. Diagnose the A/C compressor clutch circuit. 2. Repair the A/C compressor clutch circuit as needed. 3. Start the engine. 4. Turn the A/C switch ON. Does the A/C compressor clutch engage?	-	Go to Step 8	-
8	Do the cooling fans run at low speed?	-	Go to Step 9	Go to Step 31
9	1. Turn the ignition OFF. 2. Connect the A/C pressure gauges. 3. Start the engine. 4. Turn the A/C switch ON. 5. The cooling fans should run at high speed when the high-side A/C pressure reaches 1 882 kPa (273 psi). Do the cooling fans run at high speed?	-	System OK	-
10	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. The coolant temperature should be above 93°C (199°C). 4. Disconnect the main cooling fan connector. 5. Turn the ignition ON. 6. Connect a test light between the main cooling fan connector terminal B and ground. Is the test light on?	-	Go to Step 11	Go to Step 12
11	1. Turn the ignition OFF. 2. Connect a scan tool to the ALDL. 3. The coolant temperature should be above 93°C (199°C). 4. Disconnect the main cooling fan connector. 5. Connect a test light between the main cooling fan connector terminal A and battery positive. Is the test light on?	-	Go to Step 28	Go to Step 17
12	1. Turn the ignition OFF. 2. Disconnect the low-speed cooling fan relay. 3. Connect a test light between the low-speed cooling fan relay connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 13	Go to Step 24

Engine Cooling Fan Circuit Check – With A/C (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
13	1. Turn the ignition OFF. 2. Connect the low-speed cooling fan relay. 3. Disconnect the electronic control module (ECM) red connector. 4. Connect a fused jumper between the ECM connector terminal A10 and ground. 5. Turn the ignition ON. Do the cooling fans run at low speed?	-	Go to Step 30	Go to Step 14
14	Check for an open wire between the low-speed cooling fan relay connector terminal 85 and the ECM connector terminal A10. Is the problem found?	-	Go to Step 25	Go to Step 15
15	1. Turn the ignition OFF. 2. Disconnect the low-speed cooling fan relay. 3. Connect a test light between the low-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 16	Go to Step 23
16	Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. Do the cooling fans run at low speed?	-	Go to Step 26	Go to Step 17
17	1. Disconnect the series/parallel cooling fan relay. 2. Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. 3. Connect a fused jumper between the series/parallel cooling fan relay connector terminals 30 and 87. Do the cooling fans run at low speed?	-	Go to Step 27	Go to Step 18
18	Check the wire between the low-speed cooling fan relay connector terminal 87 to the main cooling fan connector terminal B for an open. Is the problem found?	-	Go to Step 22	Go to Step 19
19	Check the wire between the main cooling fan connector terminal A and the series/parallel cooling fan relay connector terminal 30 for an open. Is the problem found?	-	Go to Step 22	Go to Step 20
20	Check the wire between the series/parallel cooling fan relay connector terminal 87 and the auxiliary cooling fan connector terminal B for an open. Is the problem found?	-	Go to Step 22	Go to Step 21
21	Check for an open wire between the auxiliary cooling fan connector terminal A and ground. Is the problem found?	-	Go to Step 22	Go to Step 29
22	Repair the open wire as needed. Is the repair complete?	-	System OK	-
23	Repair the open between the low-speed cooling fan relay connector terminal 30 and the fuse EF4. Is the repair complete?	-	System OK	-
24	Repair the open between the low-speed cooling fan relay connector terminal 86 and the ignition switch. Is the repair complete?	-	System OK	-

Engine Cooling Fan Circuit Check – With A/C (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
25	Repair the open wire between the low-speed cooling fan relay connector terminal 85 and the ECM connector terminal A10. Is the repair complete?	-	System OK	-
26	Replace the low-speed cooling fan relay. Is the repair complete?	-	System OK	-
27	Replace the series/parallel cooling fan relay. Is the repair complete?	-	System OK	-
28	Replace the main cooling fan. Is the repair complete?	-	System OK	-
29	Replace the auxiliary cooling fan. Is the repair complete?	-	System OK	-
30	Replace the ECM. Is the repair complete?	-	System OK	-
31	1. Turn the ignition OFF. 2. Disconnect the main cooling fan connector. 3. Connect a test light between the main cooling fan connector terminal B and ground. 4. Turn the A/C switch ON. 5. Start the engine. Is the test light on?	-	Go to Step 32	Go to Step 12
32	1. Turn the ignition OFF. 2. Connect a test light between the main cooling fan connector terminal A and battery positive. 3. Turn the A/C switch ON. 4. Start the engine. Is the test light on?	-	Go to Step 28	Go to Step 17
33	1. Turn the ignition OFF. 2. Disconnect the high-speed cooling fan relay. 3. Connect a test light between the high-speed cooling fan relay connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	-	Go to Step 34	Go to Step 44
34	1. Turn the ignition OFF. 2. Connect a test light between the high-speed cooling fan relay connector terminal 30 and ground. Is the test light on?	-	Go to Step 35	Go to Step 45
35	1. Disconnect the series/parallel cooling fan relay. 2. Connect a test light between the series/parallel cooling fan relay connector terminal 86 and ground. 3. Turn the ignition ON. Is the test light on?	-	Go to Step 36	Go to Step 46
36	1. Turn the ignition OFF. 2. Connect a test light between the series/parallel cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 37	Go to Step 47

Engine Cooling Fan Circuit Check – With A/C (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
37	1. Connect the main cooling fan connector. 2. Connect the high-speed cooling fan relay. 3. Connect the series/parallel cooling fan relay. 4. Disconnect the ECM connector. 5. Connect a fused jumper between the ECM connector terminal A10 and ground. 6. Connect a fused jumper between the ECM connector terminal A14 and ground. 7. Turn the ignition ON. Do the cooling fans run at high speed?	-	Go to Step 30	Go to Step 38
38	1. Turn the ignition OFF. 2. Check for an open wire between the high-speed cooling fan relay connector terminal 86 and the ECM connector terminal A14. Is the problem found?	-	Go to Step 22	Go to Step 39
39	1. Disconnect the high-speed cooling fan relay. 2. Connect a test light between the high-speed cooling fan relay connector terminal 87 and battery positive. Is the test light on?	-	Go to Step 40	Go to Step 48
40	1. Disconnect the ECM connector. 2. Connect a fused jumper between the ECM connector terminal A14 and ground. 3. Disconnect the series/parallel cooling fan relay. 4. Connect a test light between the series/parallel cooling fan relay connector terminal 85 and battery positive. Is the test light on?	-	Go to Step 41	Go to Step 49
41	1. Connect the series/parallel cooling fan relay. 2. Connect a fused jumper between the ECM connector terminal A14 and ground. 3. Disconnect the high-speed cooling fan relay. 4. Connect a fused jumper between the high-speed cooling fan relay connector terminals 30 and 87. 5. Disconnect the low-speed cooling fan relay. 6. Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. 7. Turn the ignition ON. Do the cooling fans run at high speed?	-	Go to Step 43	Go to Step 42
42	1. Turn the ignition OFF. 2. Connect a fused jumper between the ECM connector terminal A14 and ground. 3. Disconnect the series/parallel cooling fan relay. 4. Connect a fused jumper between the series/parallel cooling fan relay connector terminals 30 and 87. 5. Connect a fused jumper between the low-speed cooling fan relay connector terminals 30 and 87. 6. Turn the ignition ON. Do the cooling fans run at high speed?	-	Go to Step 27	-

Engine Cooling Fan Circuit Check – With A/C (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
43	Replace the high-speed cooling fan relay. Is the repair complete?	-	System OK	-
44	Repair the open wire between the high-speed cooling fan relay connector terminal 85 and the ignition switch. Is the repair complete?	-	System OK	-
45	Repair the open wire between the high-speed cooling fan relay connector terminal 30 and the battery. Is the repair complete?	-	System OK	-
46	Repair the open wire between the series/parallel cooling fan relay connector terminal 86 and the ignition switch. Is the repair complete?	-	System OK	-
47	Repair the open wire between the series/parallel cooling fan relay connector terminal 87 and ground. Is the repair complete?	-	System OK	-
48	Repair the open wire between the high-speed cooling fan relay connector terminal 87 and the auxiliary cooling fan connector terminal B. Is the repair complete?	-	System OK	-
49	Repair the open wire between the series/parallel cooling fan relay connector terminal 85 and the ECM connector terminal A14. Is the repair complete?	-	System OK	-

FUEL INJECTOR BALANCE TEST

A fuel injector tester is used to energize the injector for a precise amount of time, thus spraying a measured amount of fuel into the intake manifold. This causes a drop in the fuel rail pressure that can be recorded and used to compare each of the fuel injectors. All of the fuel injectors should have the same pressure drop 10 kPa (1.5 psi).

Injector Balance Test Example

Cylinder	1	2	3	4
First Reading	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)	296 kPa (43 psi)
Second Reading	131 kPa (19 psi)	117 kPa (17 psi)	124 kPa (18 psi)	145 kPa (21 psi)
Amount Of Drop	165 kPa (24 psi)	179 kPa (26 psi)	172 kPa (25 psi)	151 kPa (22 psi)
Average Range: 156-176 kPa (22.5-25.5 psi)	Injector OK	Faulty Injector - Too Much Pressure Drop	Injector OK	Faulty Injector - Too Little Pressure Drop

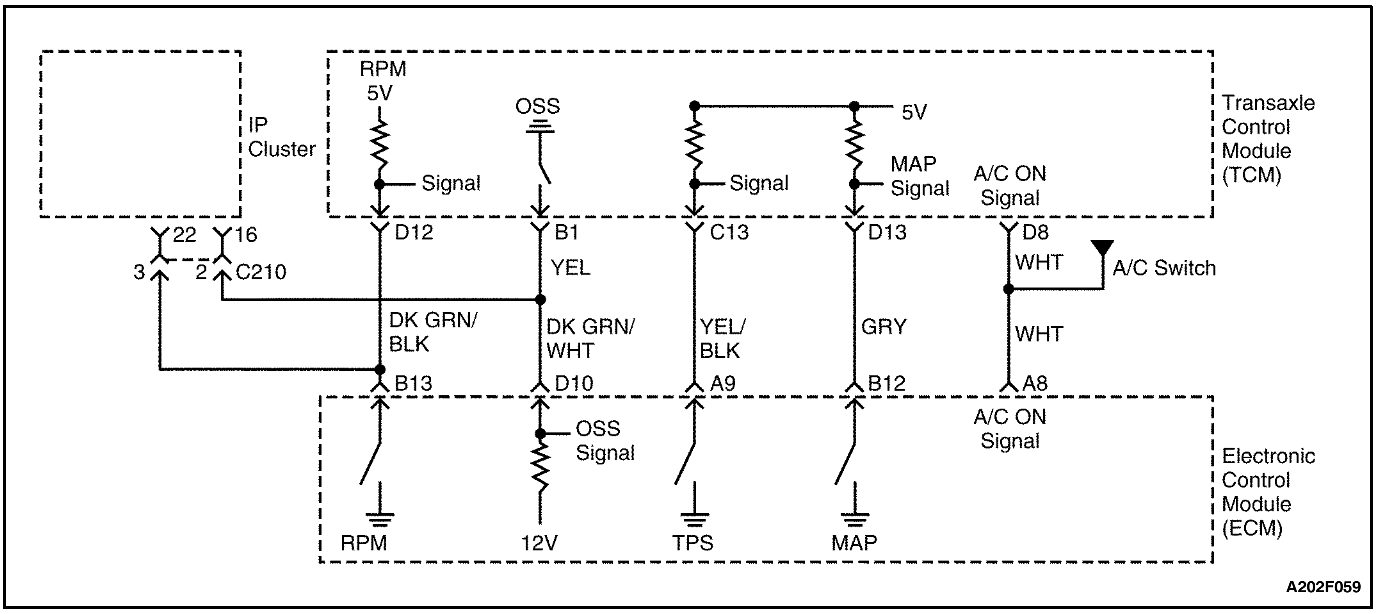
Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

Caution: Do not pinch or restrict nylon fuel lines. Damage to the lines could cause a fuel leak, resulting in possible fire or personal injury.

Notice: In order to prevent flooding of the engine, do not perform the Injector Balance Test more than once (including any retest on faulty fuel injectors) without running the engine.

Test

1. An engine cool down period of 10 minutes is necessary in order to avoid irregular readings due to hot soak fuel boiling.
2. Connect the fuel pressure gauge carefully to avoid any fuel spillage.
3. The fuel pump should run about 2 seconds after the ignition is turned to the ON position.
4. Insert a clear tube attached to the vent valve of the fuel pressure gauge into a suitable container.
5. Bleed the air from the fuel pressure gauge and the hose until all of the air is bled from the fuel pressure gauge.
6. The ignition switch must be in the OFF position at least 10 seconds in order to complete the electronic control module (ECM) shutdown cycle.
7. Turn the ignition ON in order to get the fuel pressure to its maximum level.
8. Allow the fuel pressure to stabilize and then record this initial pressure reading. Wait until there is no movement of the needle on the fuel pressure gauge.
9. Follow the manufacturer's instructions for the use of the adapter harness. Energize the fuel injector tester once and note the fuel pressure drop at its lowest point. Record this second reading. Subtract it from the first reading to determine the amount of the fuel pressure drop.
10. Disconnect the fuel injector tester from the fuel injector.
11. After turning the ignition ON, in order to obtain maximum pressure once again, make a connection at the next fuel injector. Energize the fuel injector tester and record the fuel pressure reading. Repeat this procedure for all the injectors.
12. Retest any of the fuel injectors for which the pressure drop exceeds the 10 kPa (1.5 psi) specification.
13. Replace any of the fuel injectors that fail the retest.
14. If the pressure drop of all of the fuel injectors is within 10 kPa (1.5 psi), then the fuel injectors are flowing normally and no replacement should be necessary.
15. Reconnect the fuel injector harness and review the symptom diagnostic tables.



DIAGNOSTIC TROUBLE CODE (DTC) 1 TCMPWM LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The throttle position angle is computed by the transaxle control module (TCM) and the electronic control module (ECM) from the throttle position sensor (TPS) voltage input.

DTC 1 Will Set When

- TCMPWM output short to ground (TPS: 0 - 5%) is present for more than 2 seconds.

Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

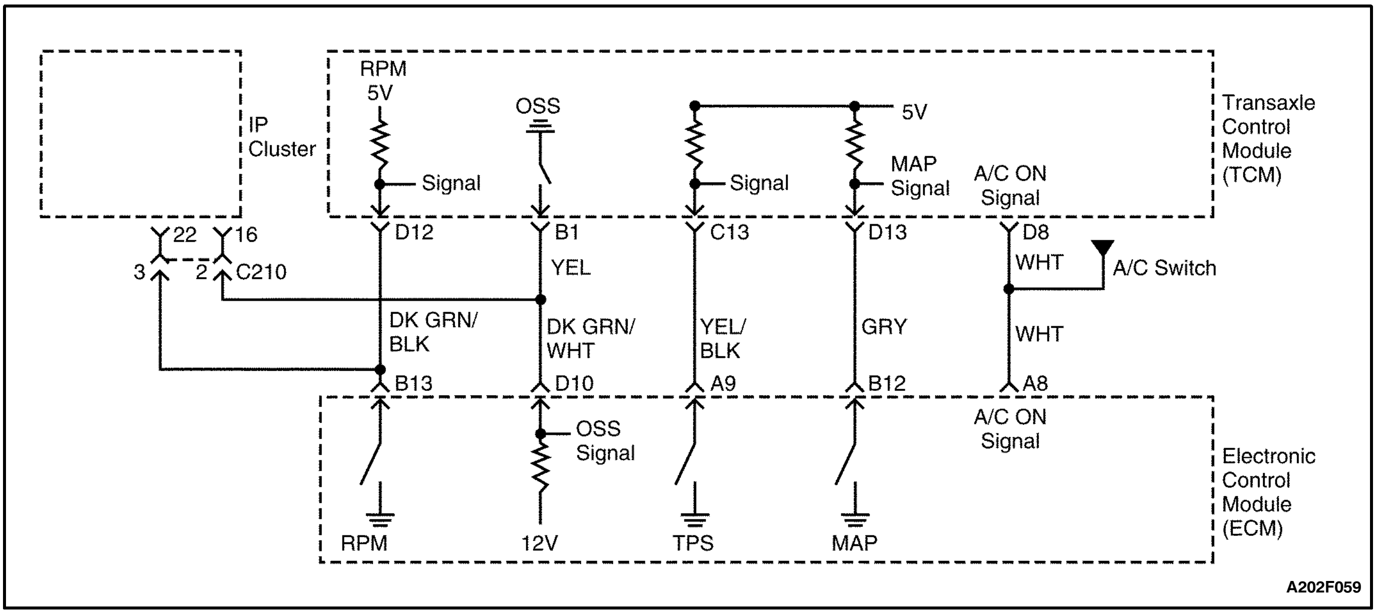
4. This step checks to see if the TCM is receiving TPS signal voltage.

DTC 1 – TCMPWM Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Connect a voltmeter to terminal C13 of the transaxle control module (TCM) and ground. 3. Turn the ignition ON. Does the voltmeter show the value specified?	6 v	Go to Step 3	Go to Step 4
3	1. Turn the ignition OFF. 2. Replace the TCM. Is the repair complete?	-	System OK	-

DTC 1 – TCMPWM Low (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value	Yes	No
4	1. To determine if the TCM is receiving throttle position sensor (TPS) signal voltage, begin by turning the ignition OFF. 2. Disconnect the electrical connectors at the TCM. 3. Disconnect the electrical connectors at the electronic control module (ECM). 4. Check the wire from terminal C13 of the TCM to terminal A9 of the ECM for a short to ground. Is the problem found?	-	Go to Step 5	Go to Step 6
5	Repair the short to ground between terminal C13 of the TCM and terminal A9 of the ECM. Is the repair complete?	-	System OK	-
6	Replace the ECM. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 2 TCMPWM HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The throttle position angle is computed by the transaxle control module (TCM) and the electronic control module (ECM) from the throttle position sensor (TPS) voltage input.

DTC 2 Will Set When

- TCMPWM output short to battery voltage (TPS: 95 - 100%) is present for more than 2 seconds.

Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

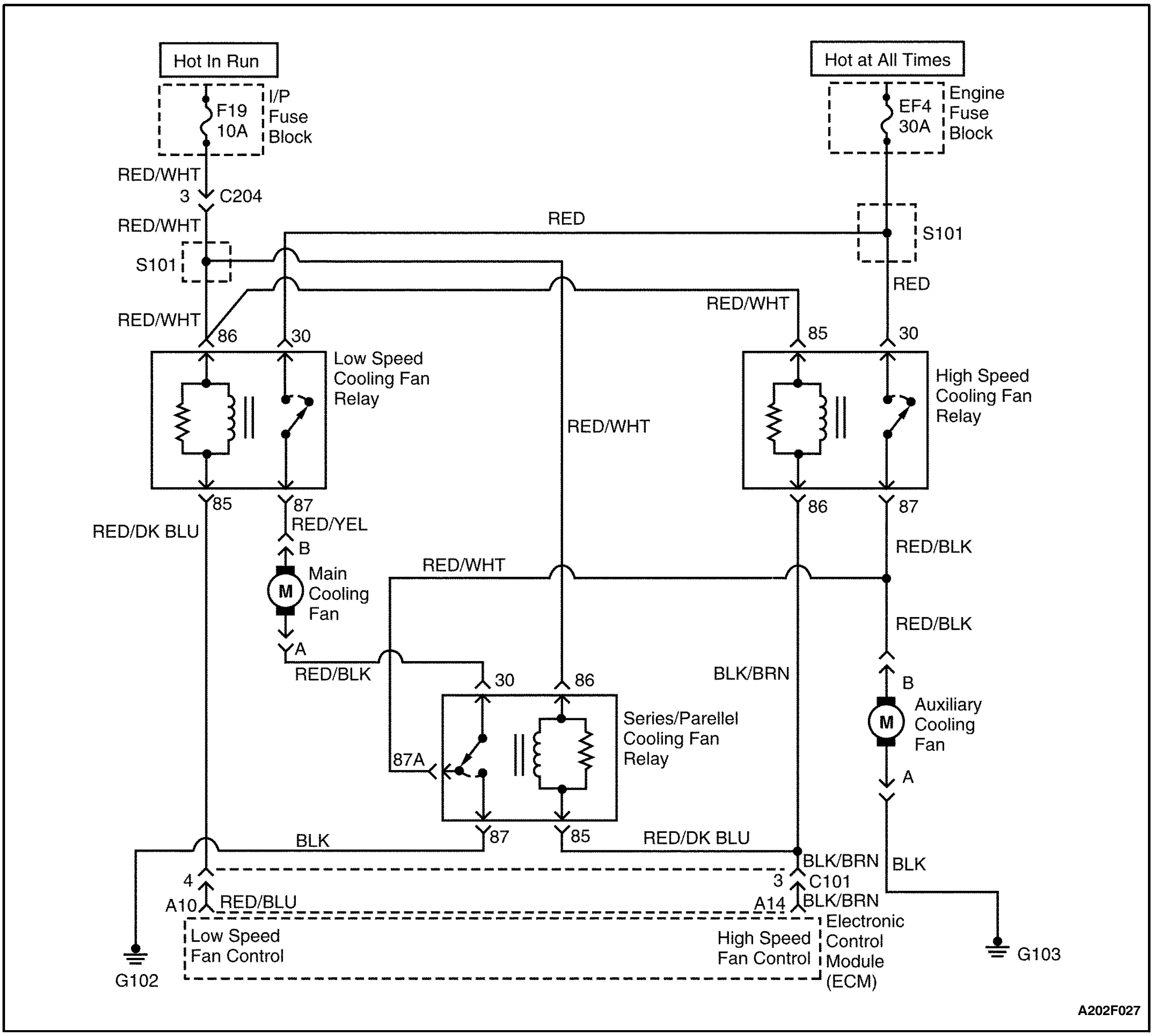
4. This step checks to see if the TCM is receiving TPS signal voltage.

DTC 2 – TCMPWM High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Connect a voltmeter to terminal C13 of the transaxle control module (TCM) and ground. 3. Turn the ignition ON. Does the voltmeter show the value specified?	6 v	Go to Step 3	Go to Step 4
3	1. Turn the ignition OFF. 2. Replace the TCM. Is the repair complete?	-	System OK	-

DTC 2 – TCMPWM High (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value	Yes	No
4	1. To determine if the TCM is receiving throttle position sensor (TPS) signal voltage, begin by turning the ignition OFF. 2. Disconnect the electrical connectors at the TCM. 3. Disconnect the electrical connectors at the electronic control module (ECM). 4. Check the wire from terminal C13 of the TCM to terminal A9 of the ECM for a short to battery voltage. Is the problem found?	-	Go to Step 5	Go to Step 6
5	Repair the short to battery voltage between terminal C13 of the TCM and terminal A9 of the ECM. Is the repair complete?	-	System OK	-
6	Replace the ECM. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 3
FAN NUMBER TWO LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The high-speed cooling fan relay is controlled by the electronic control module (ECM). The ECM applies a ground to the high-speed cooling fan relay, while also applying ground to the low-speed cooling fan relay, to achieve high-speed cooling fan operation. The ECM determines when to activate the high-speed cooling fan relay depending on the coolant temperature and the air conditioning (A/C) system high-side pressure.

DTC 3 Will Set When

- An open or short to ground condition exists and this condition is present for more than 2 seconds.

Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step checks for an open or shorted relay.
6. This step checks for an open or shorted relay.
11. This step checks for the ability of the ECM to ground the fan circuits.

DTC 3 – Fan Number Two Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Inspect the fuse F19. Is the fuse in good condition?	-	Go to Step 4	Go to Step 3
3	1. Replace the fuse. 2. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
4	1. Disconnect the high-speed cooling fan relay. 2. Measure the resistance between the high-speed cooling fan relay terminals 85 and 86. Is the circuit open or shorted to ground?	-	Go to Step 5	Go to Step 6
5	1. Replace the high-speed cooling fan relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Disconnect the series/parallel cooling fan relay. 2. Measure the resistance between the series/parallel cooling fan relay terminals 85 and 86. Is the circuit open or shorted to ground?	-	Go to Step 7	Go to Step 8
7	1. Replace the series/parallel cooling fan relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	Check for an open or short to ground in the wiring between the high-speed cooling fan relay connector terminal 85 and the ECM connector terminal A14. Is the problem found?	-	Go to Step 10	Go to Step 9
9	Check for an open or short to ground in the wiring between the series/parallel cooling fan relay connector terminal 85 and ECM connector terminal A14. Is the problem found?	-	Go to Step 10	Go to Step 11
10	1. Repair the open or short to ground in the wiring. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Turn the ignition OFF. 2. Connect the high-speed cooling fan relay. 3. Connect the series/parallel cooling fan relay. 4. Connect the ECM red connector. 5. Jumper terminals A and B of the assembly line diagnostic link (ALDL) connector. 6. Turn the ignition ON. 7. With a test light connected to battery voltage, backprobe the ECM connector terminal A14. Is the test light on?	-	Go to "Diagnostic Aids"	Go to Step 12

DTC 3 – Fan Number Two Low (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
12	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Inspect for a poor connection at the ECM connector terminal A14. Is the problem found?	-	Go to Step 13	Go to Step 14
13	1. Repair or replace the connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
14	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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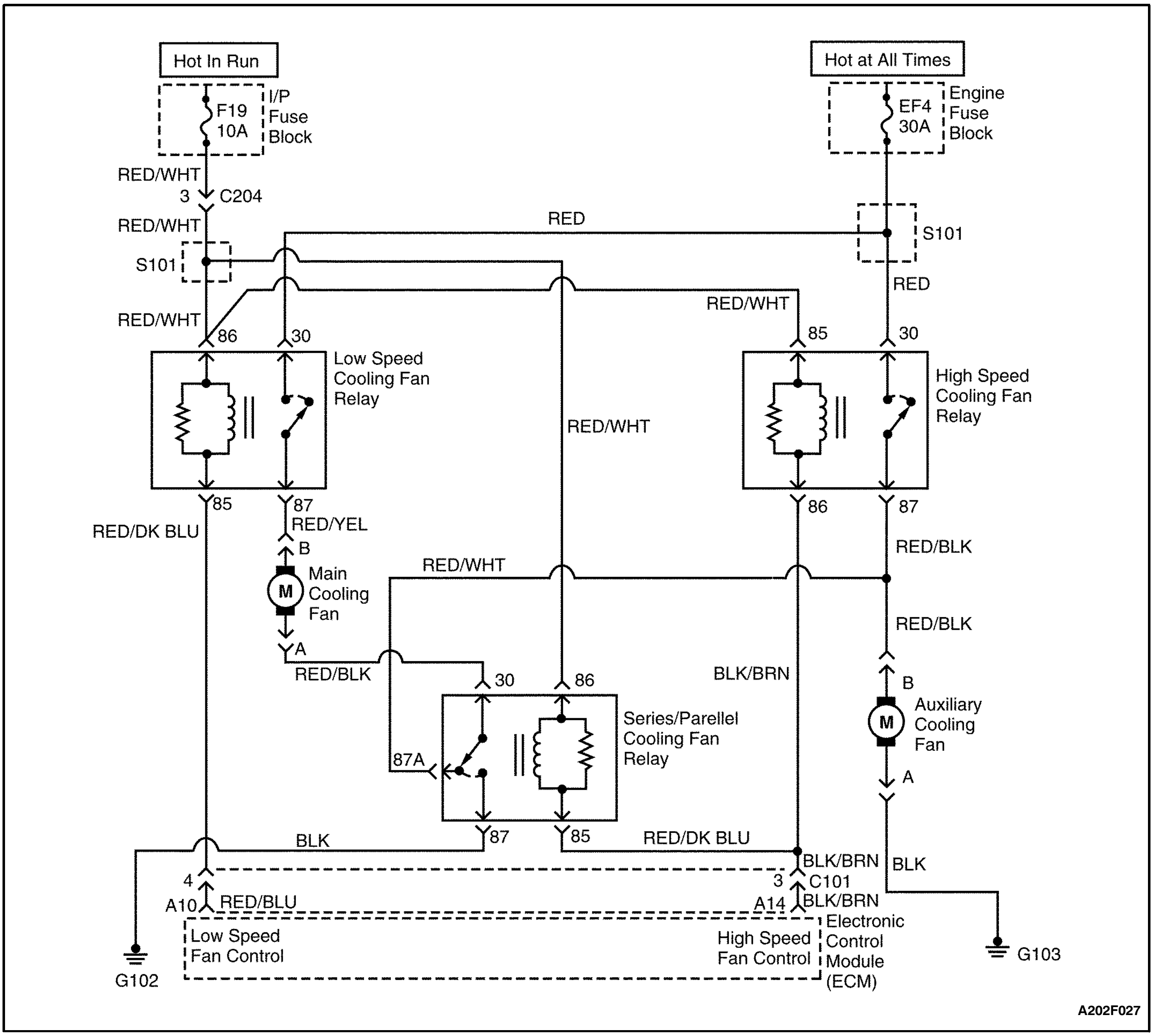


DIAGNOSTIC TROUBLE CODE (DTC) 4
FAN NUMBER TWO HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The high-speed cooling fan relay is controlled by the electronic control module (ECM). The ECM applies a ground to the high-speed cooling fan relay, while also applying ground to the low-speed cooling fan relay, to achieve high-speed cooling fan operation. The ECM determines when to activate the high-speed cooling fan relay depending on the coolant temperature and the air conditioning (A/C) system high-side pressure.

DTC 4 Will Set When

- A short to battery voltage condition exists and this condition is present for more than 2 seconds.

Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

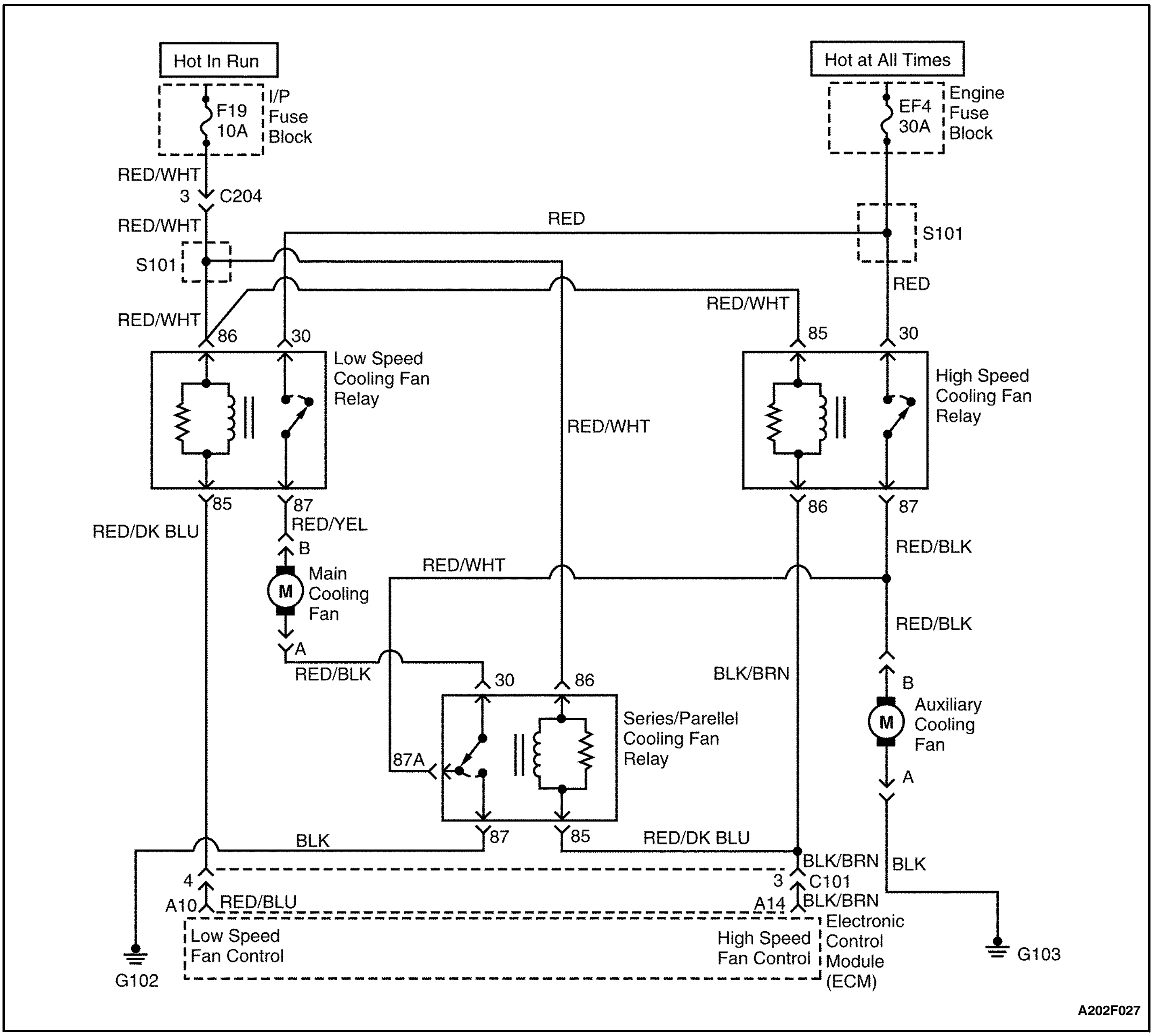
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. This step checks the wires for a short to battery voltage.
4. This step checks for a shorted relay.
6. This step checks for a shorted relay.

DTC 4 – Fan Number Two High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the electronic control module (ECM) red connector. 2. Disconnect the high-speed cooling fan relay and the series/parallel cooling fan relay. 3. Measure the voltage between the ECM connector terminal A14 and ground. Does the voltage measure within the value specified?	0 v	Go to Step 4	Go to Step 3
3	1. Repair the short to voltage between the high-speed cooling fan relay or the series/parallel cooling fan relay connector terminal 85 and the ECM connector terminal A14. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
4	Measure the resistance between the high-speed cooling fan relay terminals 85 and 86. Does the resistance measure near the value specified?	[0 W	Go to Step 5	Go to Step 6
5	1. Replace the high-speed cooling fan relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Measure the resistance between the series/parallel cooling fan relay terminals 85 and 86. Does the resistance measure near the value specified?	[0 W	Go to Step 7	Go to Step 8
7	1. Replace the series/parallel cooling fan relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	Inspect for a poor connection at the ECM connector terminal A14. Is the problem found?	-	Go to Step 9	Go to Step 10
9	1. Repair or replace the connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 5
FAN NUMBER ONE LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The low-speed cooling fan relay is controlled by the electronic control module (ECM). The ECM applies a ground to the low-speed cooling fan relay to achieve low-speed cooling fan operation. The ECM determines when to activate the low-speed cooling fan relay depending on the coolant temperature and the air conditioning (A/C) system high-side pressure.

DTC 5 Will Set When

- An open or short to ground condition exits and this condition is present for more than 2 seconds.

Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

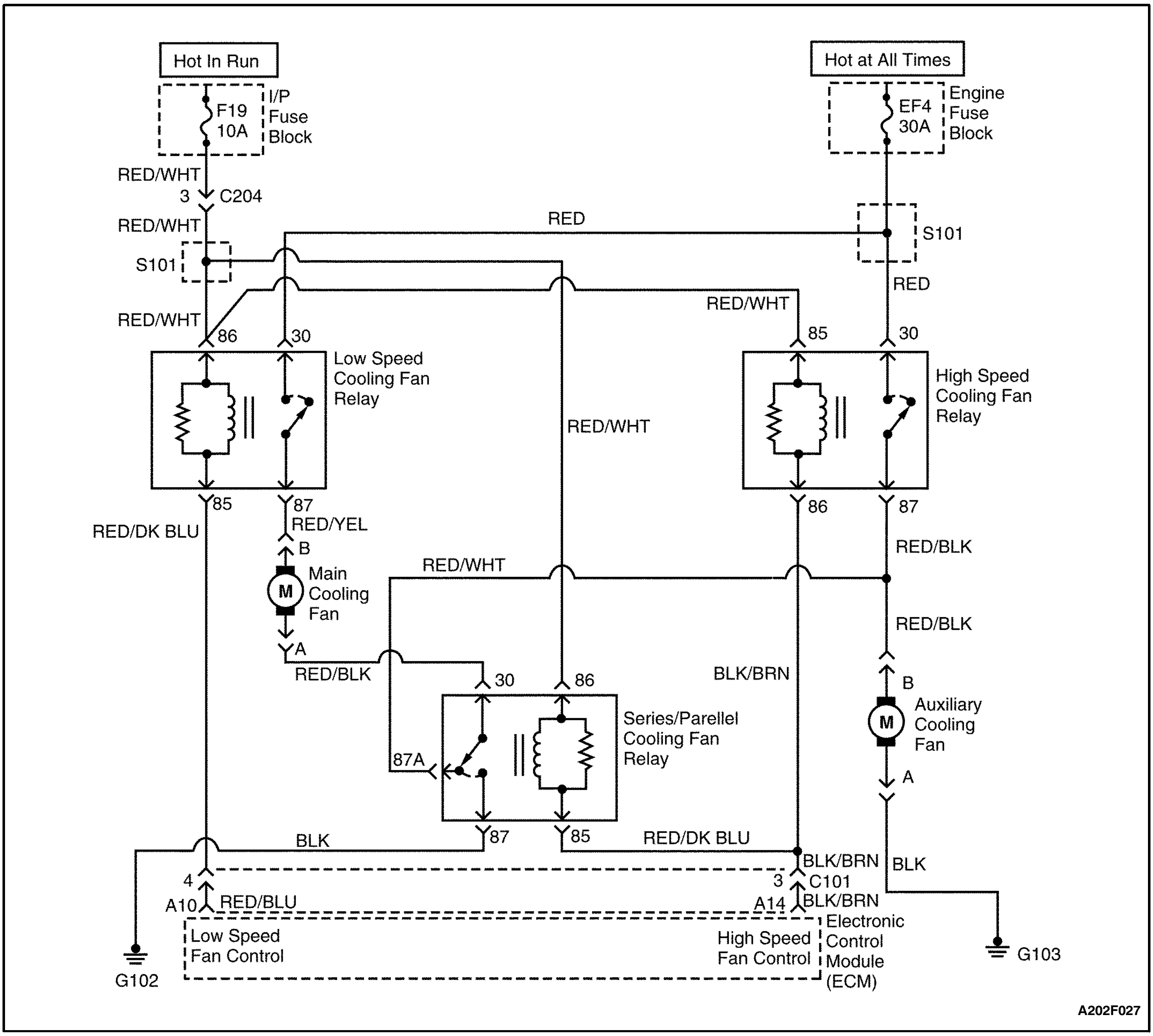
Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This step checks for an open or shorted relay.
8. This step checks for the ability of the ECM to ground the fan circuits.

DTC 5 – Fan Number One Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Inspect the fuse F19. Is the fuse in good condition?	-	Go to Step 4	Go to Step 3
3	1. Replace the fuse. 2. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
4	1. Disconnect the low-speed cooling fan relay. 2. Measure the resistance between the low-speed cooling fan relay terminals 85 and 86. Is the circuit open or shorted to ground?	-	Go to Step 5	Go to Step 6
5	1. Replace the low-speed cooling fan relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Check for an open or short to ground in the wiring between the low-speed cooling fan relay connector terminal 85 and the ECM connector terminal A10. Is the problem found?	-	Go to Step 7	Go to Step 8
7	1. Repair the open or short to ground in the wiring. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	1. Turn the ignition OFF. 2. Connect the low-speed cooling fan relay. 3. Connect the ECM red connector. 4. Jumper terminals A and B of the assembly line diagnostic link (ALDL) connector. 5. Turn the ignition ON. 6. With a test light connected to battery voltage, backprobe the ECM connector terminal A10. Is the test light on?	-	Go to "Diagnostic Aids"	Go to Step 9
9	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Inspect for a poor connection at the ECM connector terminal A10. Is the problem found?	-	Go to Step 10	Go to Step 11
10	1. Repair or replace the connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 6
FAN NUMBER ONE HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The low-speed cooling fan relay is controlled by the electronic control module (ECM). The ECM applies a ground to the low-speed cooling fan relay to achieve low-speed cooling fan operation. The ECM determines when to activate the low-speed cooling fan relay depending on the coolant temperature and the air conditioning (A/C) system high-side pressure.

DTC 6 Will Set When

- A short to battery voltage condition exists and this condition is present for more than 2 seconds.

Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.

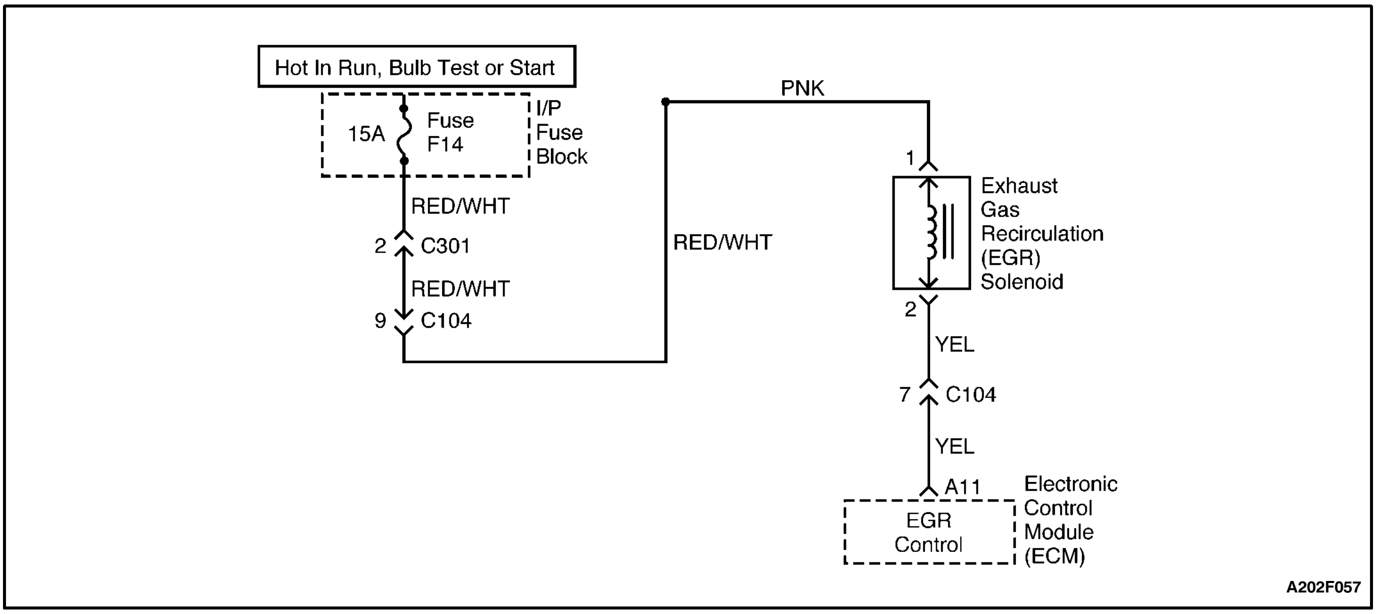
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. This step checks the wires for a short to battery voltage.
4. This step checks for a shorted relay.

DTC 6 – Fan Number Two High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the electronic control module (ECM) red connector. 2. Disconnect the low-speed cooling fan relay. 3. Measure the voltage between the ECM connector terminal A10 and ground. Does the voltage measure within the value specified?	0 v	Go to Step 4	Go to Step 3
3	1. Repair the short to voltage between the low-speed cooling fan relay connector terminal 86 and the ECM connector terminal A10. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
4	Measure the resistance between the low-speed cooling fan relay terminals 85 and 86. Does the resistance measure near the value specified?	[0 W	Go to Step 5	Go to Step 6
5	1. Replace the low-speed cooling fan relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Inspect for a poor connection at the ECM connector terminal A10. Is the problem found?	-	Go to Step 7	Go to Step 8
7	1. Repair or replace the connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 7
EGR ON/OFF SOLENOID LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) operates a solenoid to control the back pressure (BP) exhaust gas recirculation (EGR) valve.

The solenoid is normally closed. By providing a ground path, the ECM energizes the solenoid, which then allows vacuum to pass to the EGR valve.

The ECM monitors EGR effectiveness by de-energizing the EGR solenoid and shutting off vacuum to the EGR valve. With the EGR valve closed and the oxygen (O_2) sensor fluctuating normally, short-term fuel trim counts will be greater than they were during normal operation.

DTC 7 Will Set When

- A short to ground condition exits.
- This condition is present for more than 2 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the controlled canister purge (CCP) solenoid connector terminal 2 and battery positive while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

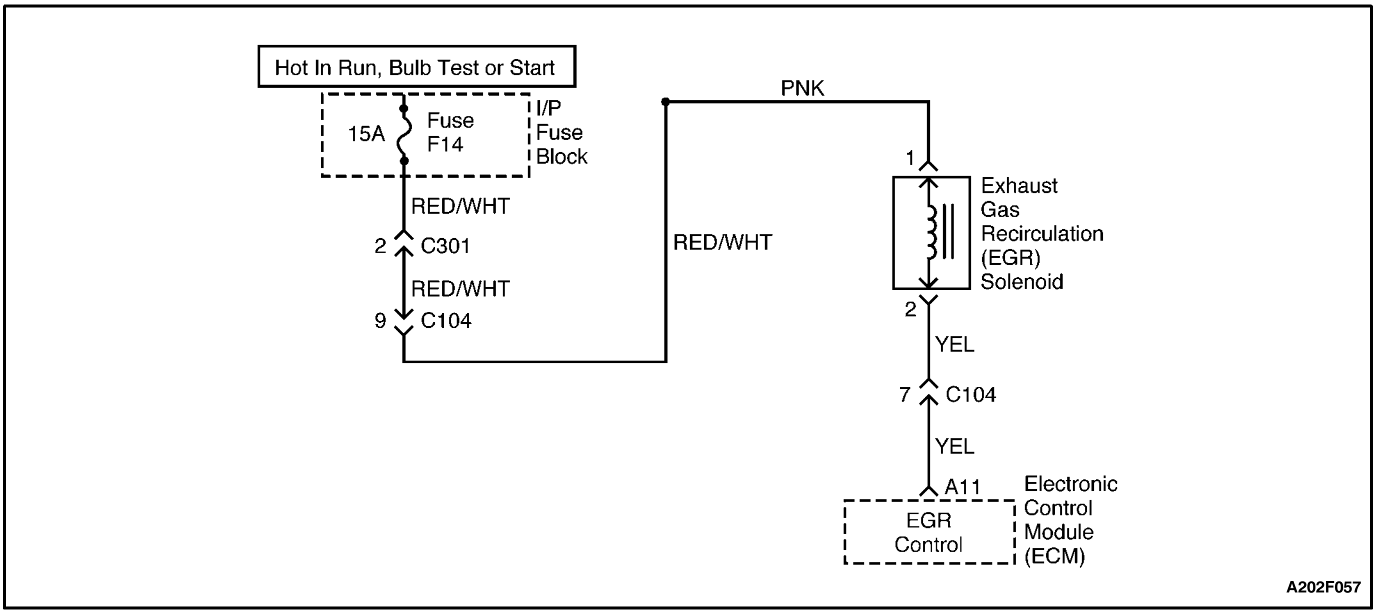
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. With the ignition OFF the ECM should not be applying ground to the EGR solenoid.
3. If the test light is still on after disconnecting the ECM red connector the wire between the EGR solenoid and the ECM is shorted to ground. If the test light goes off, the ECM is at fault.

DTC 7 – EGR On/Off Solenoid Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the exhaust gas recirculation (EGR) solenoid connector. 2. Connect a test light between the EGR solenoid connector terminal 2 and battery positive. Is the test light on?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Disconnect the ECM red connector. Is the test light on?	-	Go to Step 4	Go to Step 5
4	1. Repair the short to ground in the wire between the EGR solenoid connector terminal 2 and the ECM connector terminal A11. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
5	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 8
EGR ON/OFF SOLENOID HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) operates a solenoid to control the back pressure (BP) exhaust gas recirculation (EGR) valve.

The solenoid is normally closed. By providing a ground path, the ECM energizes the solenoid, which then allows vacuum to pass to the EGR valve.

The ECM monitors EGR effectiveness by de-energizing the EGR solenoid and shutting off vacuum to the EGR valve. With the EGR valve closed and the oxygen (O_2) sensor fluctuating normally, short-term fuel trim counts will be greater than they were during normal operation.

DTC 8 Will Set When

- A short to battery voltage condition exits.
- This condition is present for more than 2 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the controlled canister purge (CCP) solenoid connector terminal 2 and battery positive while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. If the test light is still on after disconnecting the ECM red connector, the wire between the CCP solenoid and thd ECM is shorted to voltage. If the test light goes off, the ECM is at fault.

DTC 8 – EGR On/Off Solenoid High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the exhaust gas recirculation (EGR) solenoid connector. 2. Measure the resistance of the EGR solenoid. Does the resistance measure near the value specified?	9 0 W	Go to Step 6	Go to Step 3
3	1. Disconnect the EGR solenoid connector. 2. Connect a test light between the EGR solenoid connector terminal 2 and ground. Is the test light on?	-	Go to Step 4	Go to "Diagnostic Aids"
4	Disconnect the electronic control module (ECM) red connector. Is the test light on?	-	Go to Step 5	Go to Step 7
5	1. Repair the short to voltage in the wire between the EGR solenoid connector terminal 2 and the ECM connector terminal A11. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Replace the EGR solenoid. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
7	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DIAGNOSTIC TROUBLE CODE (DTC) 12
NO PULSE REFERENCE

Circuit Description

This is a normal code that the electronic control module (ECM) stores when the engine is not running and the ignition key is ON.

DTC 12 Will Set When

- The engine is not running and the ignition key is ON.

Diagnostic Aids

- This code indicates a normal condition with no malfunction noted.
- This code indicates that the ECM has the ability to store codes.

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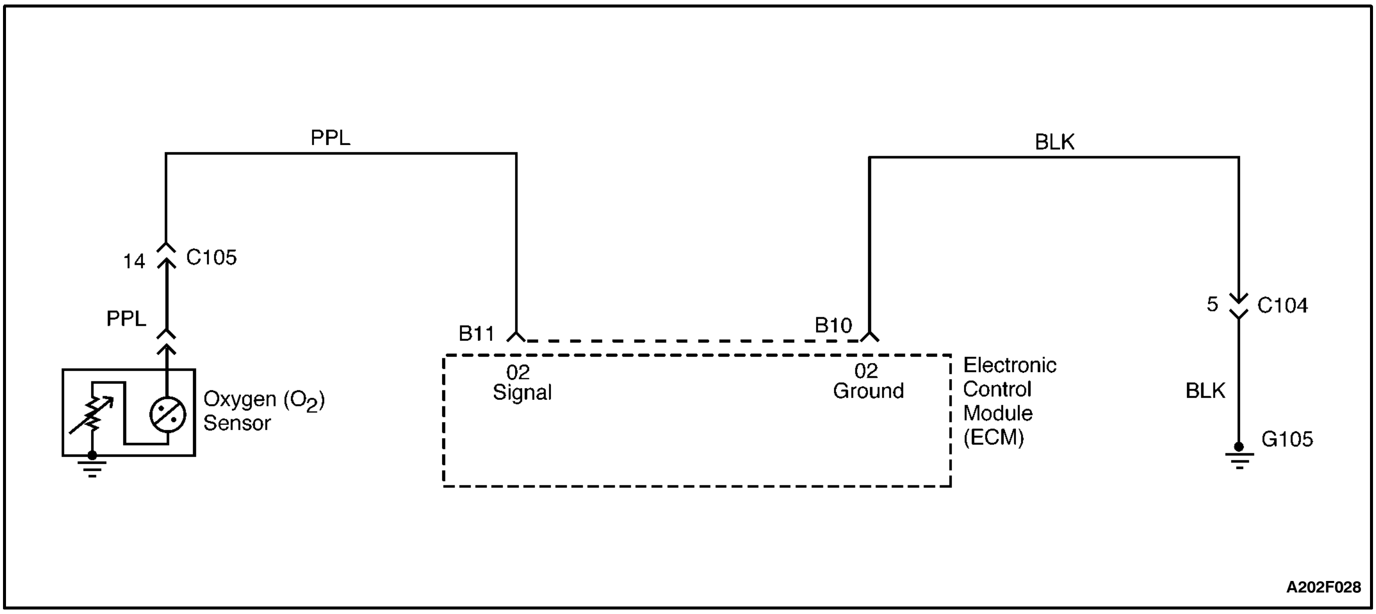

DIAGNOSTIC TROUBLE CODE (DTC) 13
OXYGEN SENSOR NOT TOGGLING (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The electronic control module (ECM) supplies a voltage of about 450 millivolts between the ECM terminals B11 and B10. The oxygen (O_2) sensor varies the voltage within a range of about 1 volt if the exhaust is rich, down to about 100 millivolts if the exhaust is lean. The O_2 sensor is like an open circuit and produces no voltage when it is below 360°C (680°F). An open O_2 sensor circuit or a cold O_2 sensor causes "open loop" operation.

DTC 13 Will Set When

- The engine has been running for at least 50 seconds.
- Diagnostic trouble codes (DTCs) 21, 22, 33, and 34 are not set.
- The throttle angle is above 5 percent.
- The coolant temperature is above 80°C (176°F).
- The O_2 sensor is steady between 350 millivolts and 550 millivolts.
- These conditions are present for 30 seconds.

Diagnostic Aids

Normal scan tool voltage varies between 100 millivolts and 999 millivolts while in closed loop.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. If the conditions for DTC 13 are present, the engine controls system will not operate in closed loop.
5. By making a vacuum leak, a lean running condition should now be present. If the O_2 sensor toggles below 450 millivolts, the O_2 sensor is sensing the lean running condition.
6. By making a slight vacuum leak at the manifold absolute pressure (MAP) sensor, a rich running condition should now be present. If the O_2 sensor toggles above 550 millivolts, the O_2 sensor is sensing the rich running condition.
10. An open or short to ground in the O_2 sensor circuit will not allow the ECM to operate in closed loop.

DTC 13 – Oxygen Sensor Not Toggling (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Start the engine. 3. Run the engine until it reaches operating temperature. 4. Check for closed loop operation. Does the electronic control module (ECM) go into closed loop?	-	Go to Step 3	Go to Step 8
3	1. Run the engine until it reaches operating temperature. 2. Check the oxygen (O_2) sensor reading at different throttle settings. Does the scan tool read the O_2 sensor input toggling between the values specified?	100-900 mv	Go to Step 7	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the O_2 sensor connector. 3. Check the O_2 sensor pigtail lead at the sensor. Is the lead properly attached to the sensor?	-	Go to Step 5	Go to Step 9
5	1. Reconnect the O_2 sensor connector. 2. Start the engine. 3. Run the engine until it reaches operating temperature. 4. Make a vacuum leak by disconnecting or partially disconnecting a vacuum hose. Do not disconnect the manifold absolute pressure (MAP) sensor. Does the O_2 sensor input stay fixed at or below the value specified?	300 mv	Go to Step 6	Go to Step 8
6	1. Run the engine until it reaches operating temperature. 2. Make a slight vacuum leak at the MAP sensor vacuum hose. Does the O_2 sensor input stay fixed at or above the value specified?	600 mv	Go to Step 7	Go to Step 8
7	1. Clear the intermittent diagnostic trouble code (DTC) 13 from the ECM. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Does DTC 13 reset in the ECM?	-	Go to Step 2	Go to "Diagnostic Aids
8	1. Turn the ignition OFF. 2. Disconnect the O_2 sensor connector. 3. Turn the ignition ON. 4. Measure the voltage at the O_2 sensor connector on the ECM side of the connector. Is the voltage within the value specified?	300-600 mv	Go to Step 9	Go to Step 10
9	1. Replace the O_2 sensor. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 13 – Oxygen Sensor Not Toggling (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
10	Check for an open or short to ground between the O_2 sensor connector and the ECM connector terminal B11. Is the problem found?	-	Go to Step 11	Go to Step 12
11	1. Repair the wire as needed. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
12	1. Replace the ECM. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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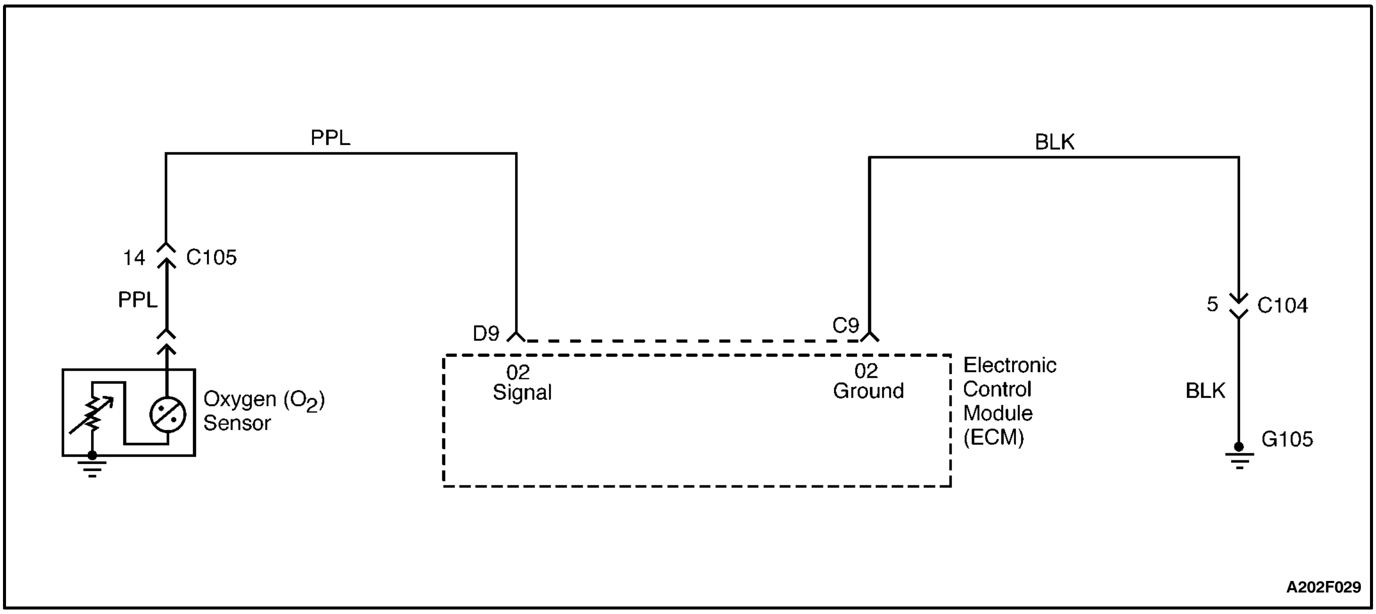

DIAGNOSTIC TROUBLE CODE (DTC) 13
OXYGEN SENSOR NOT TOGGLING (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) supplies a voltage of about 450 millivolts between the ECM terminals D9 and C9. The oxygen (O_2) sensor varies the voltage within a range of about 1 volt if the exhaust is rich, down to about 100 millivolts if the exhaust is lean. The O_2 sensor is like an open circuit and produces no voltage when it is below 360°C (680°F). An open O_2 sensor circuit or a cold O_2 sensor causes “open loop” operation.

DTC 13 Will Set When

- The engine has been running for at least 60 seconds.
- Diagnostic trouble codes (DTCs) 21, 22, 33, and 34 are not set.
- The throttle angle is above 5 percent.
- The coolant temperature is above 70°C (158°F).
- The O_2 sensor is steady between 340 millivolts and 540 millivolts.
- These conditions are present for 20 seconds.

Diagnostic Aids

Normal scan tool voltage varies between 100 millivolts and 999 millivolts while in closed loop.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

1. If the conditions for DTC 13 are present, the engine controls system will not operate in closed loop.
5. By making a vacuum leak, a lean running condition should now be present. If the O_2 sensor toggles below 450 millivolts, the O_2 sensor is sensing the lean running condition.
6. By making a slight vacuum leak at the manifold absolute pressure (MAP) sensor, a rich running condition should now be present. If the O_2 sensor toggles above 550 millivolts, the O_2 sensor is sensing the rich running condition.
10. An open or short to ground in the O_2 sensor circuit will not allow the ECM to operate in closed loop.

DTC 13 – Oxygen Sensor Not Toggling (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Start the engine. 3. Run the engine until it reaches operating temperature. 4. Check for closed loop operation. Does the electronic control module (ECM) go into closed loop?	-	Go to Step 3	Go to Step 8
3	1. Run the engine until it reaches operating temperature. 2. Check the oxygen (O_2) sensor reading at different throttle settings. Does the scan tool read the O_2 sensor input toggling between the values specified?	100-900 mv	Go to Step 7	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the O_2 sensor connector. 3. Check the O_2 sensor pigtail lead at the sensor. Is the lead properly attached to the sensor?	-	Go to Step 5	Go to Step 9
5	1. Reconnect the O_2 sensor connector. 2. Start the engine. 3. Run the engine until it reaches operating temperature. 4. Make a vacuum leak by disconnecting or partially disconnecting a vacuum hose. Do not disconnect the manifold absolute pressure (MAP) sensor. Does the O_2 sensor input stay fixed at or below the value specified?	300 mv	Go to Step 6	Go to Step 8
6	1. Run the engine until it reaches operating temperature. 2. Make a slight vacuum leak at the MAP sensor vacuum hose. Does the O_2 sensor input stay fixed at or above the value specified?	600 mv	Go to Step 7	Go to Step 8
7	1. Clear the intermittent diagnostic trouble code (DTC) 13 from the ECM. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Does DTC 13 reset in the ECM?	-	Go to Step 2	Go to "Diagnostic Aids"
8	1. Turn the ignition OFF. 2. Disconnect the O_2 sensor connector. 3. Turn the ignition ON. 4. Measure the voltage at the O_2 sensor connector on the ECM side of the connector. Is the voltage within the value specified?	300-600 mv	Go to Step 9	Go to Step 10
9	1. Replace the O_2 sensor. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 13 – Oxygen Sensor Not Toggling (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
10	Check for an open or short to ground between the O_2 sensor connector and the ECM connector terminal D9. Is the problem found?	-	Go to Step 11	Go to Step 12
11	1. Repair the wire as needed. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
12	1. Replace the ECM. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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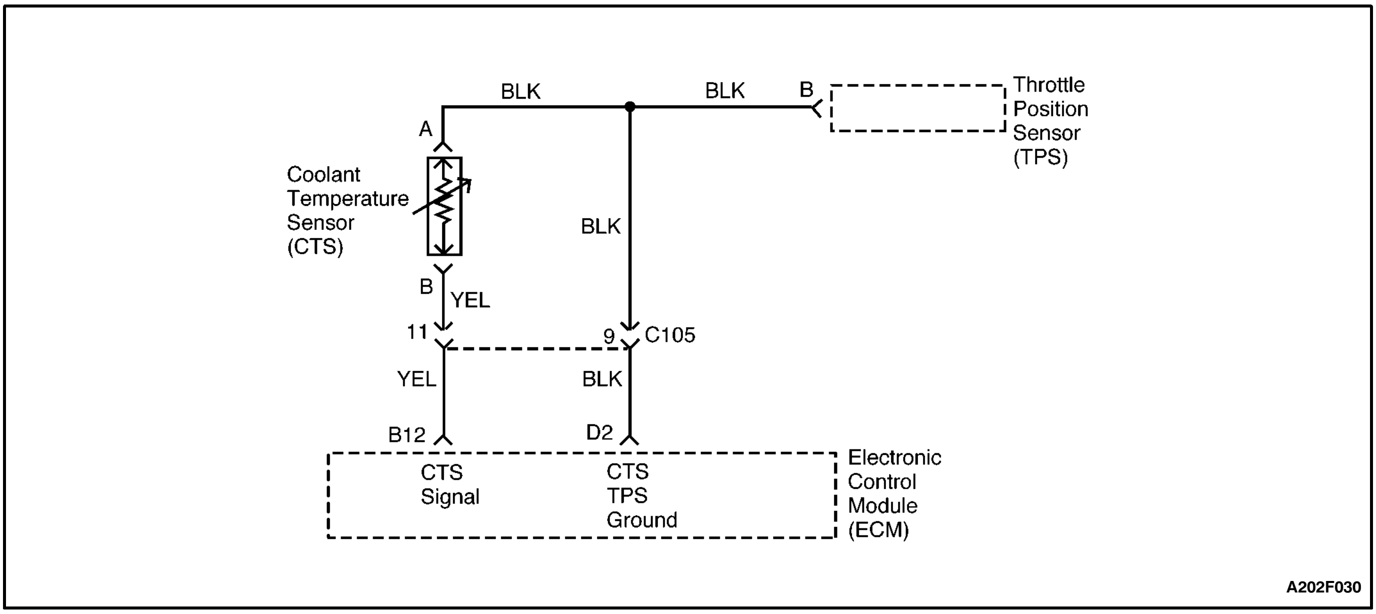

DIAGNOSTIC TROUBLE CODE (DTC) 14
COOLANT TEMPERATURE HIGH (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The coolant temperature sensor (CTS) uses a thermistor to control the signal voltage to the electronic control module (ECM). The ECM applies a voltage to the CTS. When the engine is cold, the CTS resistance is high. Therefore, the ECM will see a high signal voltage. As the engine warms, the CTS resistance becomes less, and the voltage drops. At normal engine operating temperature the CTS signal will measure about 1.5 to 2.0 volts.

DTC 14 Will Set When

- **The engine has been running for more than 2 seconds.**
- **The CTS signal voltage indicates a coolant temperature above 145°C (293°F).**

Diagnostic Aids

- **If the connections are OK, monitor the coolant temperature while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.**
- **The “Temperature Vs. Resistance Values” scale may be used to test the coolant sensor at various temperatures to evaluate the possibility of a “shifted” or “mis-scaled” CTS which may result in driveability complaints.**

COOLANT TEMPERATURE SENSOR TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This test simulates the conditions for setting Diagnostic Trouble Code (DTC) 14. If the ECM recognizes the low signal voltage (high temperature) and the scan tool displays 180°C (356°F), the ECM wiring is OK.
6. This step checks for voltage reference from the ECM.

DTC 14 – Coolant Temperature High (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool display the engine coolant temperature within the value specified?	80-110°C (176-230°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the coolant temperature sensor (CTS) connector. 3. Turn the ignition ON. Does the scan tool display the engine coolant temperature within the value specified?	Below * 30°C (* 22°F)	Go to Step 4	Go to Step 6
4	1. Jumper terminals A and B of the CTS connector. 2. Turn the ignition ON. Does the scan tool display the engine coolant temperature within the value specified?	Above 180°C (356°F)	Go to Step 5	Go to Step 6
5	1. Replace the CTS. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Measure the voltage at the CTS connector terminal B. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Disconnect the electronic controld module (ECM) white connector. 3. Inspect the ECM pins and the connector for bent or damaged terminals. Repair or replace as needed. 4. Check the wire between the CTS connector terminal A and the ECM connector terminal D2 for a short to ECM reference voltage. Is the problem found?	-	Go to Step 12	Go to Step 8
8	1. Replace the electronic control module. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 14 – Coolant Temperature High (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
9	Check the wire for a short to ground between the CTS connector terminal B and the ECM connector terminal B12. Is the problem found?	-	Go to Step 13	Go to Step 10
10	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Inspect the ECM pins and the connector for bent or damaged terminals or pins. Is the problem found?	-	Go to Step 11	Go to Step 8
11	1. Repair the connector terminals and straighten the ECM pins as needed. 2. If the ECM pins are broken, the ECM must be replaced. Are the terminals and pins repaired?	-	Go to Step 6	-
12	1. Repair the short to voltage in the wire between the CTS connector terminal A and the ECM connector terminal D2. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
13	1. Repair the short to ground in the wire between the CTS connector terminal B and the ECM connector terminal B12. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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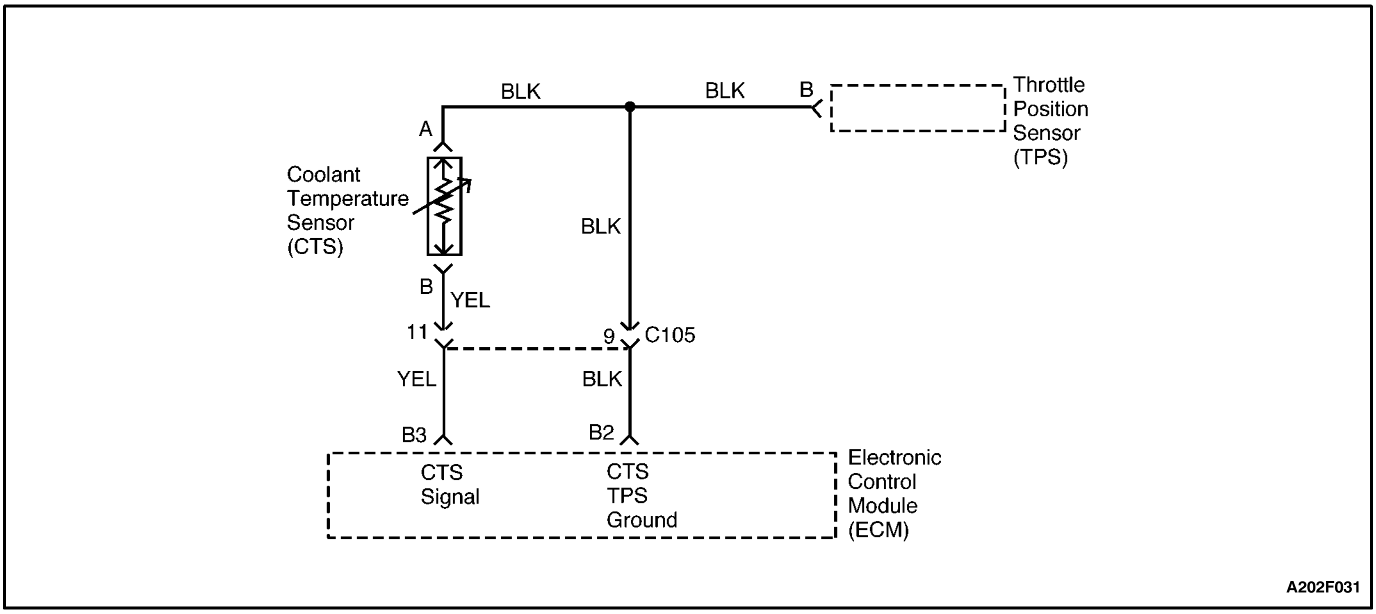

DIAGNOSTIC TROUBLE CODE (DTC) 14
COOLANT TEMPERATURE HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The coolant temperature sensor (CTS) uses a thermistor to control the signal voltage to the electronic control module (ECM). The ECM applies a voltage to the CTS. When the engine is cold, the CTS resistance is high. Therefore, the ECM will see a high signal voltage. As the engine warms, the CTS resistance becomes less, and the voltage drops. At normal engine operating temperature the CTS signal will measure about 1.5 to 2.0 volts.

DTC 14 Will Set When

- **The engine has been running for more than 2 seconds.**
- **The CTS signal voltage indicates a coolant temperature above 145°C (293°F).**

Diagnostic Aids

- **If the connections are OK, monitor the coolant temperature while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.**
- **The "Temperature Vs. Resistance Values" scale may be used to test the coolant sensor at various temperatures to evaluate the possibility of a "shifted" or "mis-scaled" CTS which may result in driveability complaints.**

COOLANT TEMPERATURE SENSOR TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This test simulates the conditions for setting Diagnostic Trouble Code (DTC) 14. If the ECM recognizes the low signal voltage (high temperature) and the scan tool displays 180°C (356°F), the ECM wiring is OK.
6. This step checks for voltage reference from the ECM.

DTC 14 – Coolant Temperature High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool display the engine coolant temperature within the value specified?	80-110°C (176-230°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the coolant temperature sensor (CTS) connector. 3. Turn the ignition ON. Does the scan tool display the engine coolant temperature within the value specified?	Below * 30°C (* 22°F)	Go to Step 4	Go to Step 6
4	1. Jumper terminals A and B of the CTS connector. 2. Turn the ignition ON. Does the scan tool display the engine coolant temperature within the value specified?	Above 180°C (356°F)	Go to Step 5	Go to Step 6
5	1. Replace the CTS. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Measure the voltage at the CTS connector terminal B. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) red connector. 3. Inspect the ECM pins and the connector for bent or damaged terminals. Repair or replace as needed. 4. Check the wire between the CTS connector terminal A and the ECM connector terminal B2 for a short to ECM reference voltage. Is the problem found?	-	Go to Step 12	Go to Step 8
8	1. Replace the ECM. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 14 – Coolant Temperature High (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
9	Check the wire for a short to ground between the CTS connector terminal B and the ECM connector terminal B3. Is the problem found?	-	Go to Step 13	Go to Step 10
10	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Inspect the ECM pins and the connector for bent or damaged terminals or pins. Is the problem found?	-	Go to Step 11	Go to Step 8
11	1. Repair the connector terminals and straighten the ECM pins as needed. 2. If the ECM pins are broken, the ECM must be replaced. Are the terminals and pins repaired?	-	Go to Step 6	-
12	1. Repair the short to voltage in the wire between the CTS connector terminal A and the ECM connector terminal B2. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
13	1. Repair the short to ground in the wire between the CTS connector terminal B and the ECM connector terminal B3. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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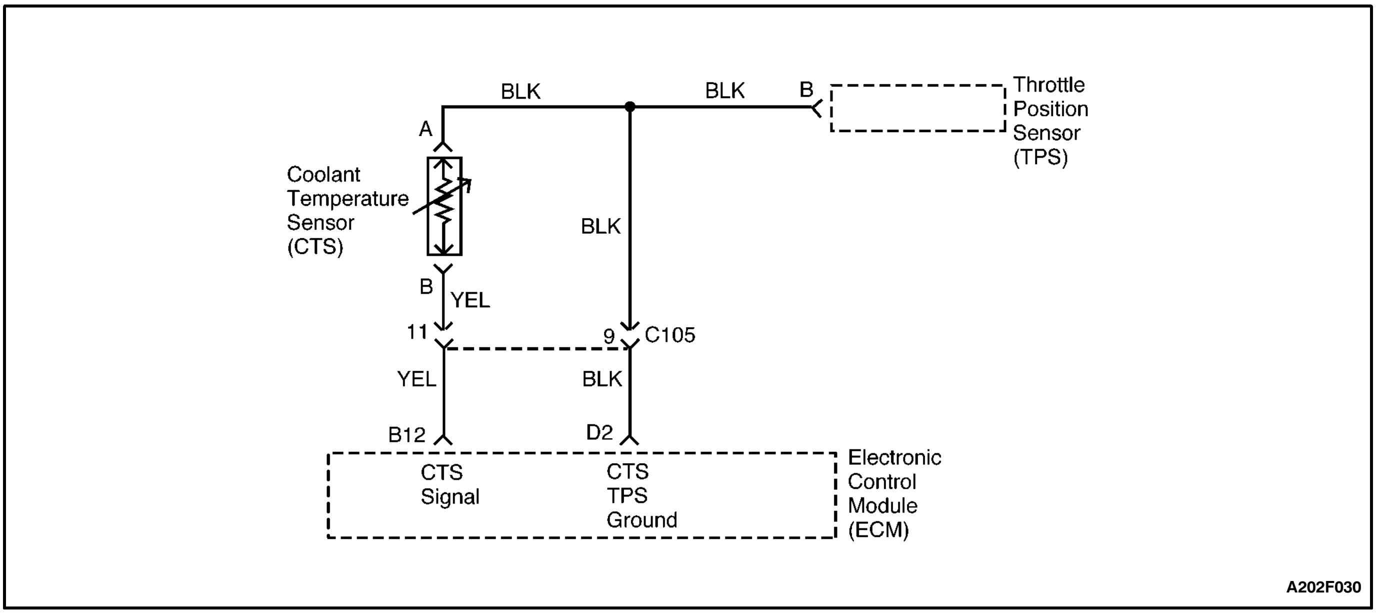

DIAGNOSTIC TROUBLE CODE (DTC) 15 COOLANT TEMPERATURE LOW (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The coolant temperature sensor (CTS) uses a thermistor to control the signal voltage to the electronic control module (ECM). The ECM applies a voltage to the CTS. When the engine is cold, the CTS resistance is high. Therefore, the ECM will see a high signal voltage. As the engine warms, the CTS resistance becomes less, and the voltage drops. At normal engine operating temperature the CTS signal will measure about 1.5 to 2.0 volts.

DTC 15 Will Set When

- The engine has been running for more than 2 seconds.
- The CTS signal voltage indicates a coolant temperature below * 35°C (* 31°F).

Diagnostic Aids

- If connections are OK, monitor the coolant temperature while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.
- The “Temperature Vs. Resistance Values” scale may be used to test the coolant sensor at various temperatures to evaluate the possibility of a “shifted” or “mis-scaled” CTS which may result in driveability complaints.

COOLANT TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This test simulates the conditions for setting Diagnostic Trouble Code (DTC) 15. If the ECM recognizes the low signal voltage (high temperature) and the scan tool displays 180°C (356°F), the ECM wiring is OK.
6. This step checks for voltage reference from the ECM.

DTC 15 – Coolant Temperature Low (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool display engine coolant temperature within the value specified?	80-110°C (176-230°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the coolant temperature sensor (CTS) connector. 3. Turn the ignition ON. Does the scan tool display engine coolant temperature below the value specified?	* 30°C (* 22°F)	Go to Step 4	Go to Step 6
4	Jumper terminals A and B of the CTS connector. Does the scan tool display engine coolant temperature above the value specified?	180°C (356°F)	Go to Step 5	Go to Step 6
5	1. Replace the CTS. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Measure the voltage at the CTS connector terminal B. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Inspect the ECM pins and the connector for bent or damaged terminals. Repair or replace damaged terminals as needed. 4. Check the wire between the CTS connector terminal A and the ECM connector terminal D2 for an open or short to battery voltage. Is the problem found?	-	Go to Step 12	Go to Step 8
8	1. Replace the ECM. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 15 – Coolant Temperature Low (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
9	Check the wire between the CTS connector terminal B and the ECM connector terminal B12 for an open or short battery voltage. Is the problem found?	-	Go to Step 13	Go to Step 10
10	1. Turn the ignition OFF. 2. Disconnect ECM red connector. 3. Check the ECM pins and the connector for bent or damaged terminals or pins. Is the problem found?	-	Go to Step 11	Go to Step 8
11	1. Repair the ECM connector terminals and straighten the ECM pins as needed. 2. If the ECM pins are broken, the ECM must be replaced. Are the terminals and pins repaired?	-	Go to Step 6	-
12	1. Repair the open or short to voltage in the wire between the CTS connector terminal A and the ECM connector terminal D2. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
13	1. Repair the open or short to voltage in the wire between the CTS connector terminal B and the ECM connector terminal B12. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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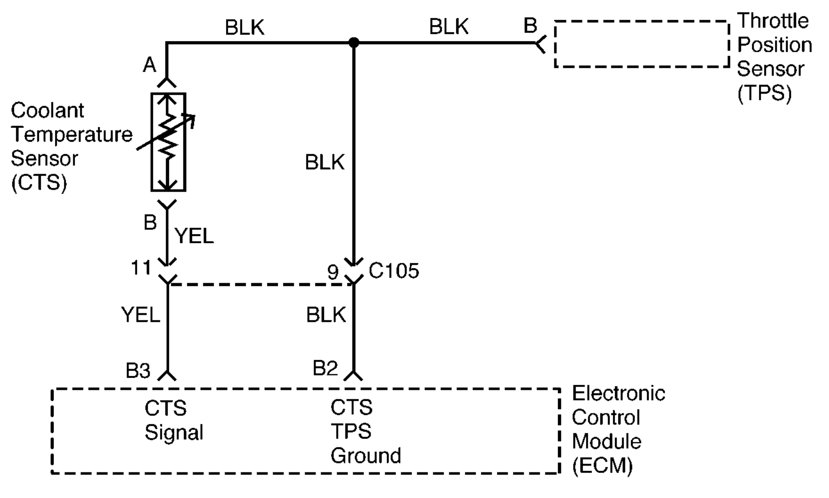

DIAGNOSTIC TROUBLE CODE (DTC) 15
COOLANT TEMPERATURE LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The coolant temperature sensor (CTS) uses a thermistor to control the signal voltage to the electronic control module (ECM). The ECM applies a voltage to the CTS. When the engine is cold, the CTS resistance is high. Therefore, the ECM will see a high signal voltage. As the engine warms, the CTS resistance becomes less, and the voltage drops. At normal engine operating temperature the CTS signal will measure about 1.5 to 2.0 volts.

DTC 15 Will Set When

- The engine has been running for more than 2 seconds.
- The CTS signal voltage indicates a coolant temperature below * 35°C (* 31°F).

Diagnostic Aids

- If connections are OK, monitor the coolant temperature while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.
- The "Temperature Vs. Resistance Values" scale may be used to test the coolant sensor at various temperatures to evaluate the possibility of a "shifted" or "mis-scaled" CTS which may result in driveability complaints.

COOLANT TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. This test simulates the conditions for setting Diagnostic Trouble Code (DTC) 15. If the ECM recognizes the low signal voltage (high temperature) and the scan tool displays 180°C (356°F), the ECM wiring is OK.
6. This step checks for voltage reference from the ECM.

DTC 15 – Coolant Temperature Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool display engine coolant temperature within the value specified?	80-110°C (176-230°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the coolant temperature sensor (CTS) connector. 3. Turn the ignition ON. Does the scan tool display engine coolant temperature below the value specified?	* 30°C (* 22°F)	Go to Step 4	Go to Step 6
4	Jumper terminals A and B of the CTS connector. Does the scan tool display engine coolant temperature above the value specified?	180°C (356°F)	Go to Step 5	Go to Step 6
5	1. Replace the CTS. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Measure the voltage at the CTS connector terminal B. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) red connector. 3. Inspect the ECM pins and the connector for bent or damaged terminals. Repair or replace damaged terminals as needed. 4. Check the wire between the CTS connector terminal A and the ECM connector terminal B2 for an open or short to battery voltage. Is the problem found?	-	Go to Step 12	Go to Step 8
8	1. Replace the ECM. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 15 – Coolant Temperature Low (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
9	Check the wire between the CTS connector terminal B and the ECM connector terminal B3 for an open or short battery voltage. Is the problem found?	-	Go to Step 13	Go to Step 10
10	1. Turn the ignition OFF. 2. Disconnect ECM red connector. 3. Check the ECM pins and the connector for bent or damaged terminals or pins. Is the problem found?	-	Go to Step 11	Go to Step 8
11	1. Repair the ECM connector terminals and straighten the ECM pins as needed. 2. If the ECM pins are broken, the ECM must be replaced. Are the terminals and pins repaired?	-	Go to Step 6	-
12	1. Repair the open or short to voltage in the wire between the CTS connector terminal A and the ECM connector terminal B2. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
13	1. Repair the open or short to voltage in the wire between the CTS connector terminal B and the ECM connector terminal B3. 2. Run the engine until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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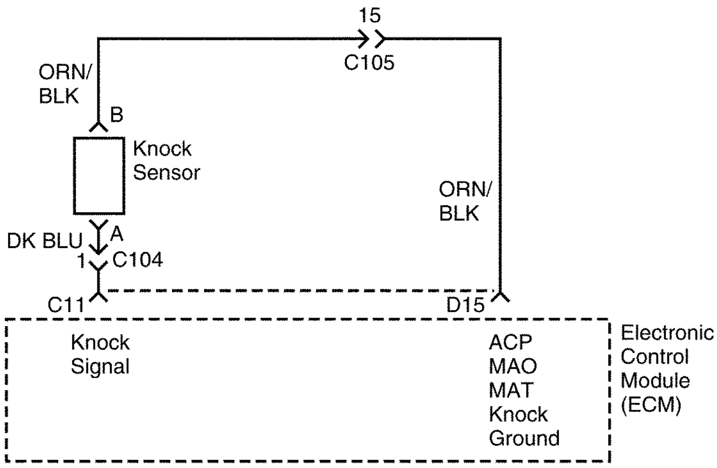


DIAGNOSTIC TROUBLE CODE (DTC) 16
KNOCK SENSOR FAILURE (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

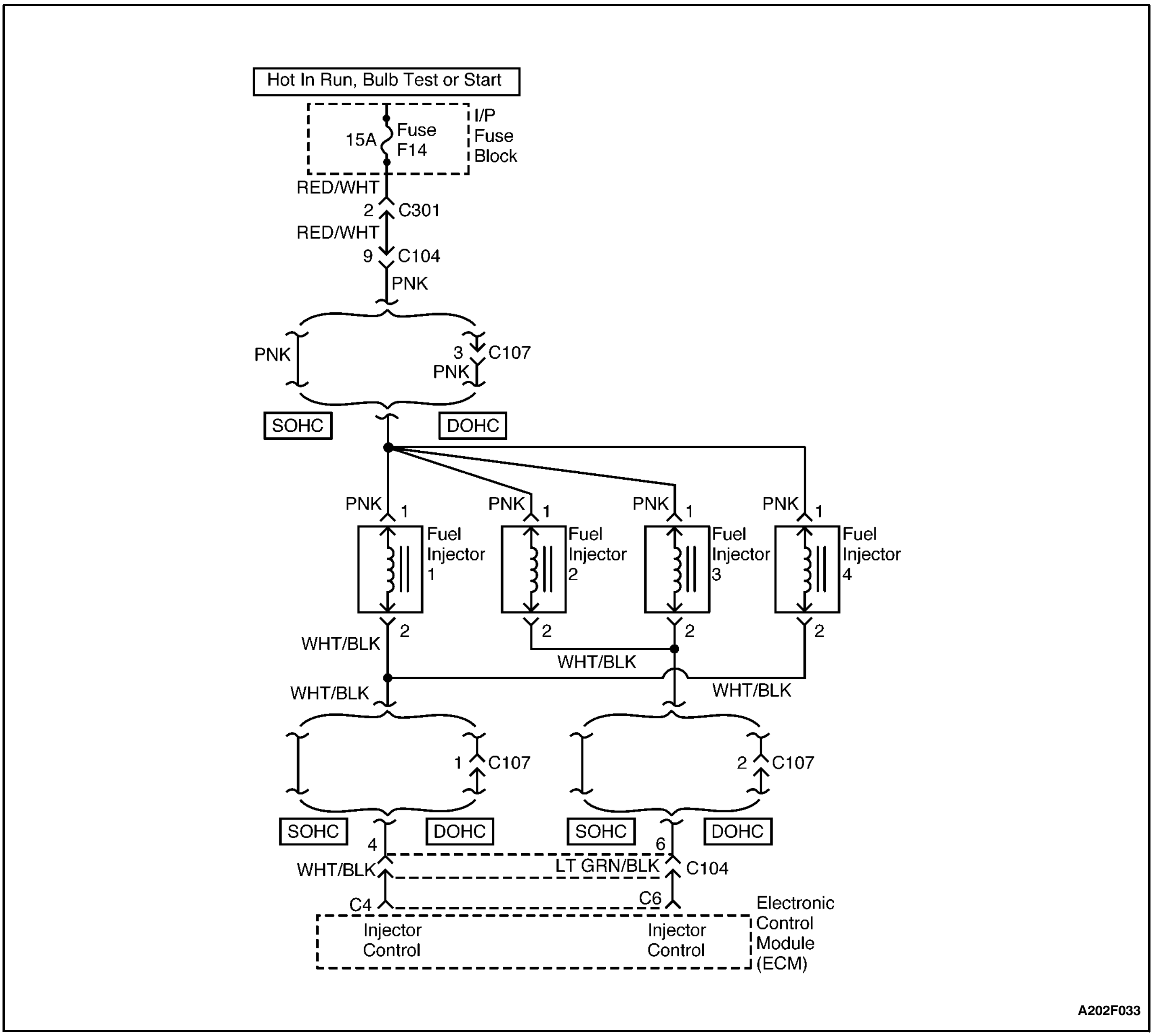
The knock sensor is used to detect engine detonation, allowing the electronic control module (ECM) to retard ignition control spark timing based on the knock sensor signal being received. The knock sensor produces an AC signal. The knock sensor signal's amplitude and frequency depend upon the amount of knock being experienced. The ECM contains a non-replaceable knock filter module called a signal-to-noise enhancement filter (SNEF) module. This filter module in the ECM determines whether knock is occurring by comparing the signal level on the knock sensor circuit with the voltage level on the noise channel. The noise channel allows the ECM to reject any false knock signal by knowing the amount of normal engine mechanical noise present. Normal engine noise varies depending on engine speed and load. When the ECM determines that an abnormally low noise channel voltage level is being experienced, Diagnostic Trouble Code (DTC) 16 will set.

DTC 16 Will Set When

- **The engine speed is above 2,800 rpm.**
- **Maximum integrated value is above 192.**
- **Minimum integrated value is below 20.**
- **The setup time is more than 8 seconds.**

DTC 16 – Knock Sensor (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check was performed?	-	Go to Step 2	-
2	Replace the electronic control module (ECM). Is the repair complete?	-	Go to "Diagnostic System Check"	-



DIAGNOSTIC TROUBLE CODE (DTC) 17 INJECTOR SHORTED TO GROUND/BATTERY (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

When the ignition switch is turned to ON or START, the electronic control module (ECM) will energize and de-energize the fuel injector solenoid coil. With the solenoid coil energized, a plunger is activated, which allows pressurized fuel to be sprayed through the fuel injector into the combustion chamber where it is mixed with air from the intake manifold. This creates the proper air/fuel mixture needed for combustion.

DTC 17 Will Set When

- The fuel pump is running.
- Battery voltage is equal to or greater than 9 volts.
- A fuel injector fault has been detected more than three times in successive 1-second intervals.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. This step checks for the presence of battery voltage to the fuel injectors.

3. If the fuel injector test light does not flash for one of the fuel injectors, there is an open fuel injector control wire to the ECM or the ECM is faulty.

13. An open coil in a fuel injector will prevent the fuel injector from operating.

DTC 17 – Injector Shorted to Ground/Battery (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the fuel injector harness from all of the fuel injectors. 2. Turn the ignition ON. 3. Measure the voltage at all of the fuel injector harness terminals. Is battery voltage present only on terminal 1 of each connector?	-	Go to Step 3	Go to Step 8
3	Connect a fuel injector test light to each of the fuel injector harness connectosr while cranking the engine. Does the test light blink on all connectors?	-	Go to Step 13	Go to Step 4
4	Does the fuel injector test light stay off for one or more of the fuel injector(s)?	-	Go to Step 6	Go to Step 5
5	Does the fuel injector test light stay on for one or more of the fuel injector(s)?	-	Go to Step 11	-
6	1. Check for a short to battery positive between the fuel injector harness connector terminal 2 and the electronic control module (ECM) connector terminal C4 for fuel injectors 1 and 4. 2. Check for a short to battery positive between the fuel injector harness connector terminal 2 and the ECM connector terminal C6 for fuel injectors 2 and 3. Is the problem found?	-	Go to Step 7	Go to Step 15
7	1. Repair the short to battery positive as needed. 2. Connect an injector test light to each injector harness connector while cranking the engine. Does the test light blink on all of the connectors?	-	Go to "Diagnostic System Check"	-
8	Is battery voltage not present at terminal 1 of any injector harness connector?	-	Go to Step 10	Go to Step 9
9	Is battery voltage present at terminal 2 of any injector harness connector?	-	Go to Step 6	-
10	1. Check for a short to ground in the fuel injector harness. 2. Check the fuel injector harness connectors for damaged terminals. 3. Perform repairs as needed. 4. Check for battery voltage at terminal 1 of all of the fuel injector harness connectors. Is battery voltage present only on terminal 1 of each connector?	-	Go to Step 3	-

DTC 17 – Injector Shorted to Ground/Battery (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Check for a short to ground between the fuel injector harness connector terminal 2 and ECM connector terminal C4 for injectors 1 and 4. 2. Check for a short to ground between the fuel injector harness connector terminal 2 and ECM connector terminal C6 for injectors 2 and 3. Is the problem found?	-	Go to Step 12	Go to Step 15
12	1. Repair the short to ground as needed. 2. Connect a fuel injector test light to each of the fuel injector harness connectors while cranking the engine. Does the test light blink on all connectors?	-	Go to Step 13	Go to Step 4
13	Measure the resistance of each fuel injector. The resistance will increase slightly at higher temperatures. Is the fuel injector resistance within the value specified?	11.6-12.4 W	System OK	Go to Step 14
14	1. Replace any of the fuel injectors with a resistance that is out of specification. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
15	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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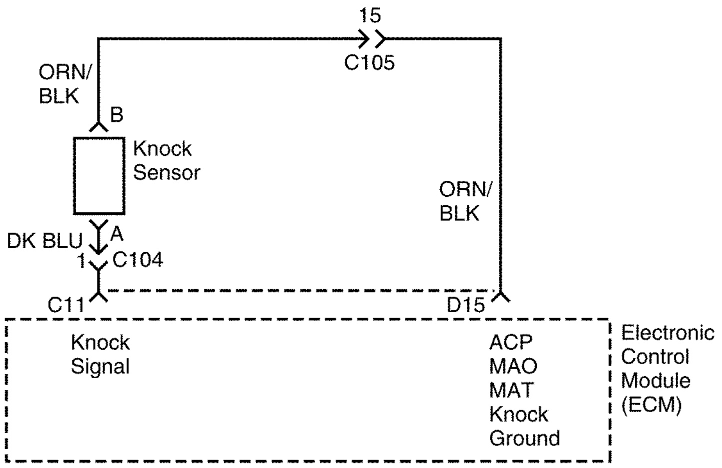


DIAGNOSTIC TROUBLE CODE (DTC) 18
DSNEF CONTROL ERROR FAILURE (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) uses the knock sensor to detect engine detonation, allowing the ECM to retard ignition control spark timing based on the knock sensor signal being received. The knock sensor produces an AC signal. The signal amplitude and frequency are dependent upon the amount of knock being experienced.

DTC 18 Will Set When

- Knock detection is enabled.
- Diagnostic Trouble Code (DTC) 16 is not set.
- The engine speed is above 2,000 rpm.
- Maximum integrated value is above 110 for at least 2 seconds.
- Minimum integrated value is below 1 for at least 2 seconds.
- Noise value is above 32 counts for at least 4 seconds.
- Noise value is below 0 counts for at least 4 seconds.

Diagnostic Aids

- Repair any engine mechanical problem before proceeding with diagnostics.
- Make sure the correct fuel octane rating is used.

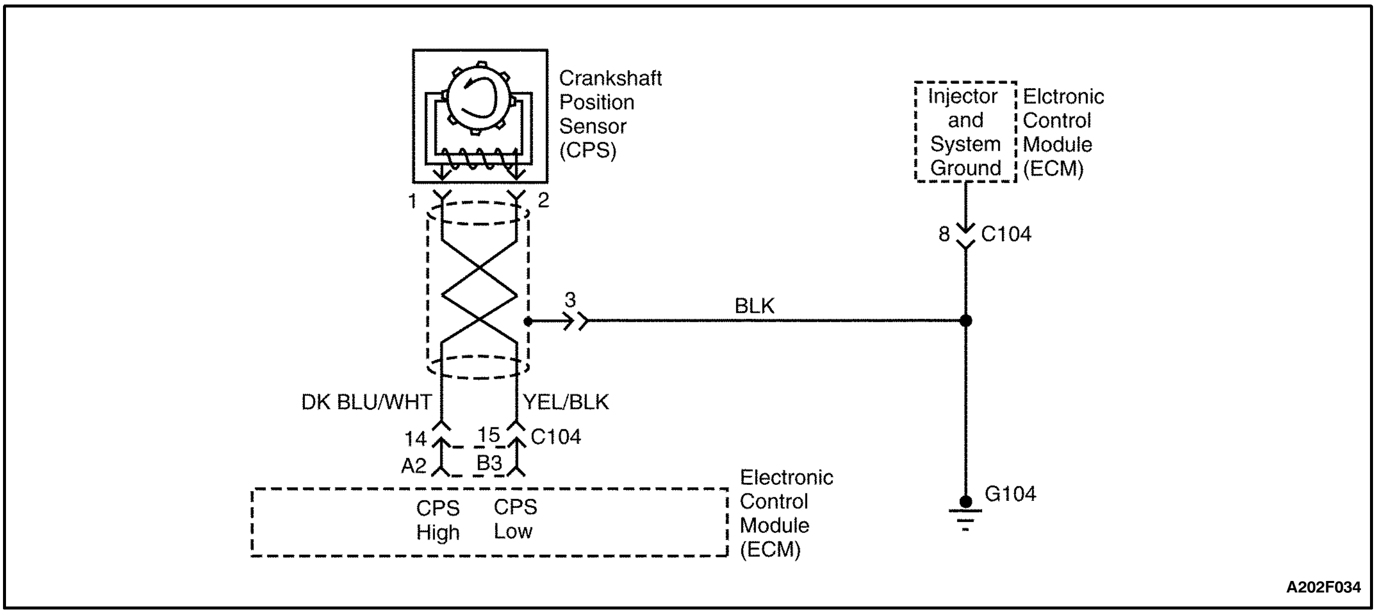
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. This step checks the signal circuit and not sensor voltage.
6. Check the ground side of the circuit for an open, a short to ground, or a short to battery.

DTC 18 – DSNEF Control Error Failure (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Perform the Diagnostic System Check. Is the Diagnostic System Check complete?	–	Go to Step 2	–
2	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the electronic control module (ECM). 3. Connect a digital voltmeter (DVM) to monitor AC voltage between terminal C11 of the ECM connector and ground. 4. Tap on the engine with an extension near the knock sensor while observing the signal on the DVM. Is any signal indicated on the DVM while tapping on the engine?	–	Go to Step 3	Go to Step 4
3	1. Connect the electrical connector at the ECM. 2. Disconnect the electrical connector at the knock sensor. 3. Using a test light to battery positive, probe terminal B on the ECM side of the knock sensor. Did the test light illuminate?	–	Go to Step 6	Go to Step 8
4	Check the wire from terminal C11 on the ECM to terminal A on the ECM side of the knock sensor for an open, a short to ground, or a short to battery. Does the wire indicate an open, a short to ground, or a short to battery?	–	Go to Step 5	Go to Step 7
5	Repair the wire from terminal C11 of the ECM to terminal A on the ECM side of the knock sensor. Is the repair complete?	–	Go to "Diagnostic System Check"	–
6	Replace the ECM. Is the repair complete?	–	Go to "Diagnostic System Check"	–
7	Replace the knock sensor. Is the repair complete?	–	Go to "Diagnostic System Check"	–
8	Repair the wire from terminal B of the knock sensor to terminal D15 of the ECM. Is the repair complete?	–	Go to "Diagnostic System Check"	–



DIAGNOSTIC TROUBLE CODE (DTC) 19
58X SIGNAL ERROR (A AND B) (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The crankshaft position sensor (CPS) is a Hall-effect sensor which senses a slotted wheel that is attached to the crankshaft pulley. The slotted wheel interrupts a magnetic field and produces a reference signal from the sensor.

DTC 19 Will Set When

- The revolutions of the 58X signal are fewer than 64.
- There are 10 or more consecutive missing pulses.
- The manifold absolute pressure (MAP) drops when the starter motor running is below 0.6 kPa for more than 3 seconds.
- Voltage drops when the starter motor is running below 0.5 v for more than 3 seconds.

Diagnostic Aids

Check for poor connections at the electronic control module (ECM) and at the CPS.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

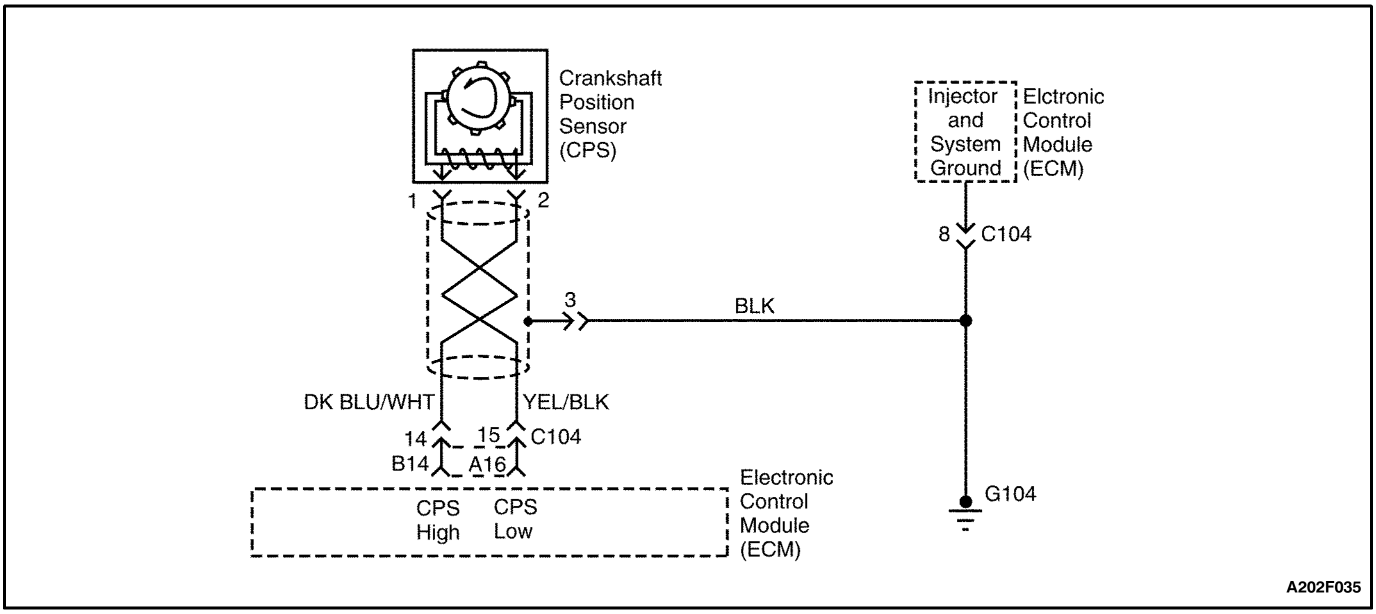
3. It is important to inspect all of the connector terminals to prevent inaccurate diagnosis.
6. The specified value during cranking is an average voltage produced as the sensor voltage oscillates.

DTC 19 – 58X Signal Error (A and B) (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	Start the engine and allow it to idle. Does the engine start?	-	Go to Step 3	Go to “Engine Cranks But Will Not Start”
3	1. Turn the ignition OFF. 2. Disconnect the crankshaft position sensor (CPS) connector. 3. Inspect the CPS terminals. Are any terminals damaged?	-	Go to Step 13	Go to Step 4

DTC 19 – 58X Signal Error (A and B) (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
4	Inspect the CPS connector terminals. Are any connector terminals damaged?	-	Go to Step 5	Go to Step 6
5	1. Repair or replace any damaged terminals. 2. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Connect the CPS connector. 2. Disconnect the direct ignition system (DIS) ignition coil connector to prevent the vehicle from starting. 3. Connect a voltmeter between ground and the ECM connector terminal A2 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with the ignition ON, 1.20 v during cranking	Go to Step 7	Go to Step 9
7	Connect a voltmeter between ground and the ECM connector terminal B3 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with the ignition ON, 1.20 v during cranking	Go to Step 8	Go to Step 10
8	1. Connect the DIS ignition coil connector 2. Replace the ECM. 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	Check for an open or short in the wire between the CPS connector terminal 1 and the ECM connector terminal A2. Is the problem found?	-	Go to Step 12	Go to Step 11
10	Check for an open or short in the wire between the CPS connector terminal 2 and the ECM connector terminal B3. Is the problem found?	-	Go to Step 12	Go to Step 11
11	Check for an open or short in the wire between the CPS connector terminal 3 and ground. Is the problem found?	-	Go to Step 12	Go to Step 13
12	1. Connect the DIS ignition coil connector. 2. Repair the wiring needed. 3. Clear any DTCs from the ECM. 4. Road test the vehicle. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
13	1. Connect the DIS ignition coil connector. 2. Replace the CPS. 3. Clear any DTCs from the ECM. 4. Road test the vehicle. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 19
58X SIGNAL ERROR (A AND B) (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The crankshaft position sensor (CPS) is a Hall-effect sensor which senses a slotted wheel that is attached to the crankshaft. The slotted wheel interrupts a magnetic field and produces a reference signal from the sensor.

DTC Will Set When

- Starting manifold absolute pressure (MAP) is less than 0.600 kPa (0.178 inches Hg).
- Starting battery voltage is less than 0.5 volt for at least 3 seconds.
- There are 10 or more consecutive missing pulses.
- The revolutions of the 58X signal are fewer than 64.

Diagnostic Aids

Check for poor connections at the electronic control module (ECM) and at the CPS.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

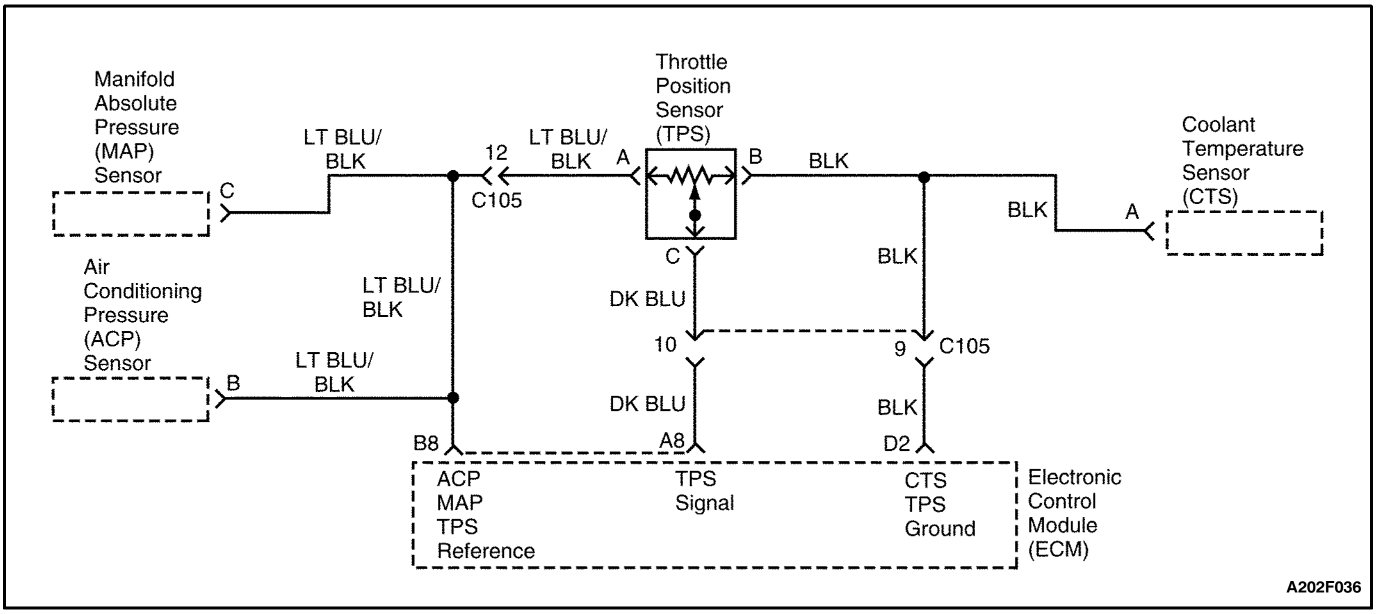
3. It is important to inspect all of the connector terminals to prevent inaccurate diagnosis.
6. The specified value during cranking is an average voltage produced as the sensor voltage oscillates.

DTC 19 – 58X Signal Error (A and B) (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Start the engine and allow it to idle. Does the engine start?	-	Go to Step 3	Go to "Engine Cranks But Will Not Start"
3	1. Turn the ignition OFF. 2. Disconnect the crankshaft position sensor (CPS) connector. 3. Inspect the CPS terminals. Are any terminals damaged?	-	Go to Step 13	Go to Step 4

DTC 19 – 58X Signal Error (A and B) (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
4	Inspect the CPS connector terminals. Are any connector terminals damaged?	-	Go to Step 5	Go to Step 6
5	1. Repair or replace any damaged terminals. 2. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Connect the CPS connector. 2. Disconnect the direct ignition system (DIS) ignition coil connector to prevent the vehicle from starting. 3. Connect a voltmeter between ground and the ECM connector terminal B14 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with the ignition ON, 1.20 v during cranking	Go to Step 7	Go to Step 9
7	Connect a voltmeter between ground and the ECM connector terminal A16 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.08 v with the ignition ON, 1.20 v during cranking	Go to Step 8	Go to Step 10
8	1. Connect the DIS ignition coil connector 2. Replace the ECM. 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	Check for an open or short in the wire between the CPS connector terminal 1 and the ECM connector terminal B14. Is the problem found?	-	Go to Step 12	Go to Step 11
10	Check for an open or short in the wire between the CPS connector terminal 2 and the ECM connector terminal A16. Is the problem found?	-	Go to Step 12	Go to Step 11
11	Check for an open or short in the wire between the CPS connector terminal 3 and ground. Is the problem found?	-	Go to Step 12	Go to Step 13
12	1. Connect the DIS ignition coil connector. 2. Repair the wiring needed. 3. Clear any DTCs from the ECM. 4. Road test the vehicle. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
13	1. Connect the DIS ignition coil connector. 2. Replace the CPS. 3. Clear any DTCs from the ECM. 4. Road test the vehicle. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 21
THROTTLE POSITION SENSOR HIGH (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The throttle position sensor (TPS) provides a voltage signal that changes in relation to the throttle plate angle. The signal voltage will vary from about 0.4 to 0.8 volt at idle to nearly 5.0 volts at wide-open throttle. The TPS is one of the most important inputs used by the electronic control module (ECM) for fuel control and other functions such as idle, wide-open throttle, deceleration enleanment, and acceleration enrichment.

DTC 21 Will Set When

- Diagnostic Trouble Codes (DTCs) 33 and 34 are not set.
- The engine speed is less than 1,750 rpm.
- The manifold absolute pressure (MAP) reading is below 65 kPa (19 inches Hg).
- The TPS reading is greater than 200 counts.
- All of the above conditions are present for 5 seconds.

Diagnostic Aids

- Inspect the ECM connector terminals and the TPS connector terminals for improper mating and poor terminal-to-wire connections.
- Observe the TPS voltage on a scan tool with the ignition ON and the engine stopped. Press the accelerator pedal while watching for smooth changes in the voltage readings of the TPS.

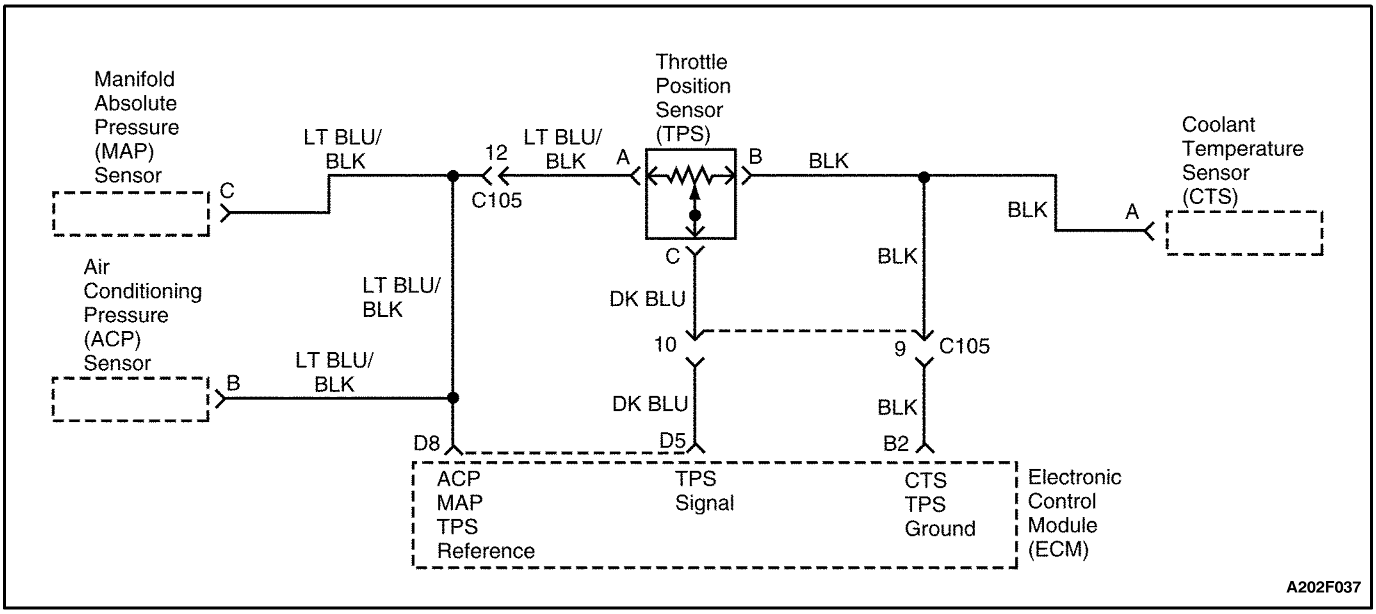
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks the voltage reference from the ECM and also the ground wire to the ECM.
4. This step checks the TPS signal wire. If the scan tool shows the TPS voltage above 4 volts, the signal wire is OK.
10. After checking the TPS wiring and confirming the ECM's ability to read a TPS signal, it can be determined that the TPS is at fault.

DTC 21 – Throttle Position Sensor High (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect a scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. 3. Operate the throttle lever from closed to open while watching the throttle position sensor (TPS) voltage on the scan tool. Does the scan tool show the TPS voltage change smoothly within the value specified?	0.10-0.90 v to 3.9-4.9 v	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the TPS connector. 3. Turn the ignition ON. 4. Measure the voltage between the TPS connector terminals A and B. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 4	Go to Step 5
4	Jumper the TPS connector terminals A and C. Does the scan tool show the TPS voltage above the value specified?	4.0 v	Go to Step 10	Go to Step 8
5	Measure the voltage between the TPS connector terminal A and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 6	Go to Step 7
6	Check for a short to battery voltage in the wire between the TPS connector terminal B and the electronic control module (ECM) connector terminal D2. Is the problem found?	-	Go to Step 9	Go to Step 11
7	Check for a short to battery voltage in the wire between the TPS connector terminal A and the ECM connector terminal B8. Is the problem found?	-	Go to Step 9	Go to Step 11
8	Check for a short to voltage in the wire between the TPS connector terminal C and the ECM connector terminal A8. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the TPS. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Turn the ignition OFF. 2. Replace the electronic control module. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 21
THROTTLE POSITION SENSOR HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The throttle position sensor (TPS) provides a voltage signal that changes in relation to the throttle plate angle. The signal voltage will vary from about 0.4 to 0.8 volt at idle to nearly 5.0 volts at wide-open throttle. The TPS is one of the most important inputs used by the electronic control module (ECM) for fuel control and other functions such as idle, wide-open throttle, deceleration enleanment, and acceleration enrichment.

DTC 21 Will Set When

- Diagnostic Trouble Codes (DTCs) 33 and 34 are not set.
- The engine speed is less than 3,000 rpm.
- The manifold absolute pressure (MAP) reading is below 85 kPa (25 inches Hg).
- The TPS reading is greater than 240 counts.
- These conditions are present for 2 seconds.

Diagnostic Aids

- Inspect the ECM connector terminals and the TPS connector terminals for improper mating and poor terminal-to-wire connections.
- Observe the TPS voltage on a scan tool with the ignition ON and the engine stopped. Press the accelerator pedal while watching for smooth changes in the voltage readings of the TPS.

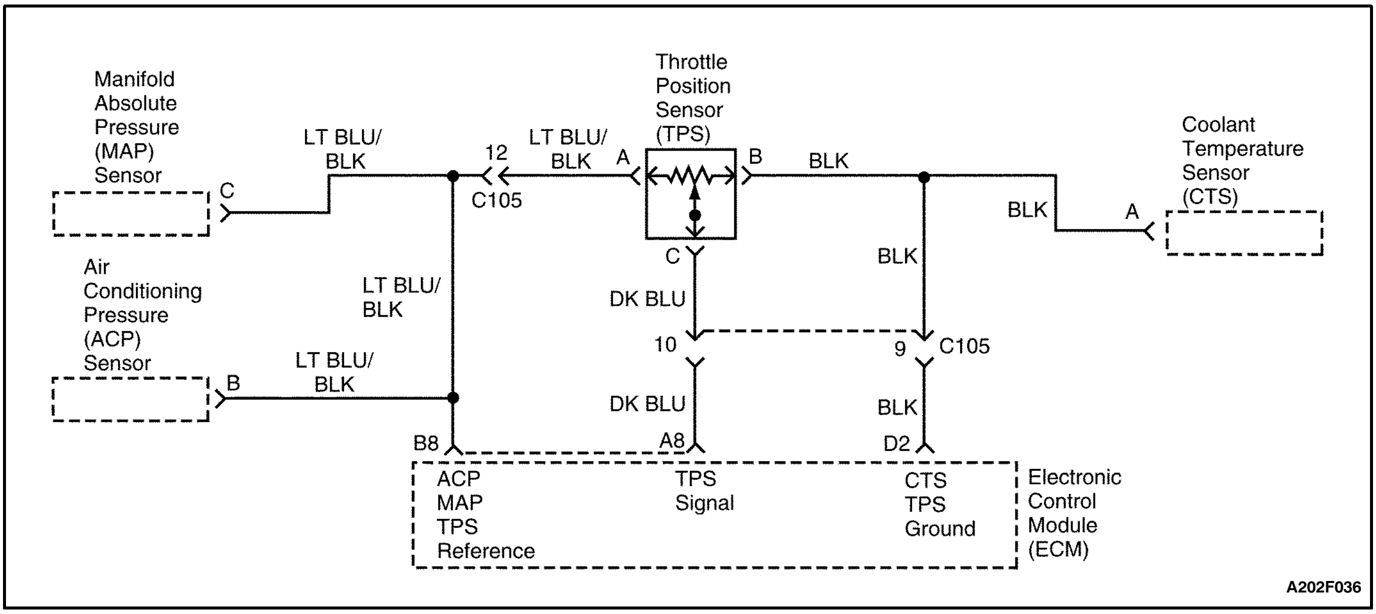
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks the voltage reference from the ECM and also the ground wire to the ECM.
4. This step checks the TPS signal wire. If the scan tool shows the TPS voltage above 4 volts, the signal wire is OK.
10. After checking the TPS wiring and confirming the ECM's ability to read a TPS signal, it can be determined that the TPS is at fault.

DTC 21 – Throttle Position Sensor High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect a scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. 3. Operate the throttle lever from closed to open while watching the throttle position sensor (TPS) voltage on the scan tool. Does the scan tool show the TPS voltage change smoothly within the value specified?	0.10-0.90 v to 3.9-4.9 v	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the TPS connector. 3. Turn the ignition ON. 4. Measure the voltage between the TPS connector terminals A and B. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 4	Go to Step 5
4	Jumper the TPS connector terminals A and C. Does the scan tool show the TPS voltage above the value specified?	4.0 v	Go to Step 10	Go to Step 8
5	Measure the voltage between the TPS connector terminal A and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 6	Go to Step 7
6	Check for a short to battery voltage in the wire between the TPS connector terminal B and the electronic control module (ECM) connector terminal B2. Is the problem found?	-	Go to Step 9	Go to Step 11
7	Check for a short to battery voltage in the wire between the TPS connector terminal A and the ECM connector terminal D8. Is the problem found?	-	Go to Step 9	Go to Step 11
8	Check for a short to voltage in the wire between the TPS connector terminal C and the ECM connector terminal D5. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the TPS. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 22
THROTTLE POSITION SENSOR LOW (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The throttle position sensor (TPS) provides a voltage signal that changes in relation to the throttle plate angle. The signal voltage will vary from about 0.4 to 0.8 volt at idle to nearly 5.0 volts at wide-open throttle. The TPS is one of the most important inputs used by the electronic control module (ECM) for fuel control and other functions such as idle, wide-open throttle, deceleration enleanment, and acceleration enrichment.

DTC 22 Will Set When

- Diagnostic Trouble Codes (DTCs) 33 and 34 are not set.
- The TPS reading is less than 10 counts.
- The condition is present for 5 seconds.

Diagnostic Aids

- Inspect the ECM connector terminals and the TPS connector terminals for improper mating and poor terminal-to-wire connections.
- Observe the TPS voltage on a scanner with the ignition ON and the engine stopped. Press the accelerator pedal while watching for smooth changes in the voltage readings of the TPS.

Test Description

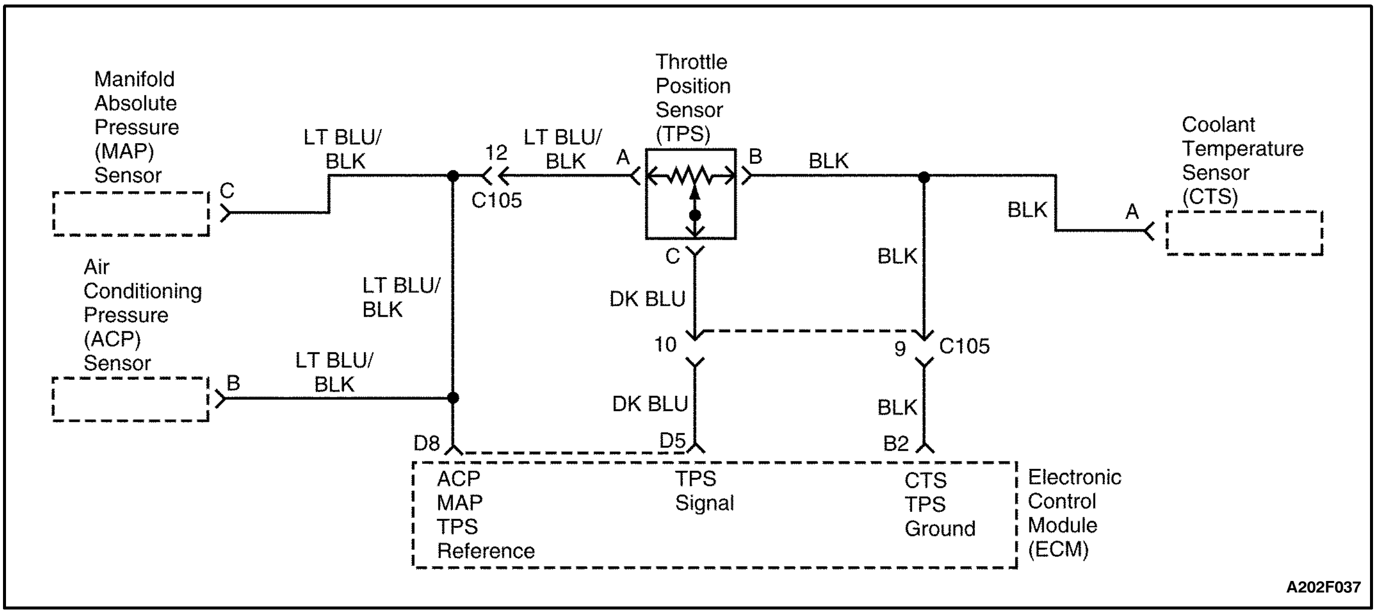
The number(s) below refer to step(s) on the diagnostic table.

1. When measuring the voltage between the TPS terminals A and B, 4.5 to 5.5 volts confirms the 5-volt reference and ground from the ECM are OK.

11. If there is a problem with the voltage reference or the ground from the ECM, confirm that the wiring is OK. If there is no problem present in the wiring, the ECM is at fault.

DTC 22 – Throttle Position Sensor Low (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. 3. Operate the throttle lever from closed to open while watching the throttle position sensor (TPS) voltage on the scan tool. Does the scan tool show the TPS voltage changing smoothly within the values specified?	0.10-0.90 v to 3.9-4.9 v	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the TPS connector. 3. Turn the ignition ON. 4. Measure the voltage between the TPS connector terminals A and B. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 4	Go to Step 5
4	Connect a fused jumper between the TPS connector terminals A and C. Does the scan tool show the TPS voltage above the value specified?	4 v	Go to Step 10	Go to Step 8
5	Measure the voltage between the TPS connector terminal A and the ground. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Check for an open in the wire between the TPS connector terminal B and the electronic control module (ECM) connector terminal D2. Is the problem found?	-	Go to Step 9	Go to Step 11
7	1. Turn the ignition OFF. 2. Check for an open or short to ground in the wire between the TPS connector terminal A and the ECM connector terminal B8. Is the problem found?	-	Go to Step 9	Go to Step 11
8	1. Turn the ignition OFF. 2. Check for an open or short to ground between the TPS connector terminal C and the ECM connector terminal A8. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Replace the TPS. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 22
THROTTLE POSITION SENSOR LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The throttle position sensor (TPS) provides a voltage signal that changes in relation to the throttle plate angle. The signal voltage will vary from about 0.4 to 0.8 volt at idle to nearly 5.0 volts at wide-open throttle. The TPS is one of the most important inputs used by the electronic control module (ECM) for fuel control and other functions such as idle, wide-open throttle, deceleration enleanment, and acceleration enrichment.

DTC 22 Will Set When

- **The TPS reading is less than 11 counts.**
- **Diagnostic Trouble Codes (DTCs) 33 and 34 are not set.**

Diagnostic Aids

- **Inspect the ECM connector terminals and the TPS connector terminals for improper mating and poor terminal-to-wire connections.**
- **Observe the TPS voltage on a scanner with the ignition ON and the engine stopped. Press the accelerator pedal while watching for smooth changes in the voltage readings of the TPS.**

Test Description

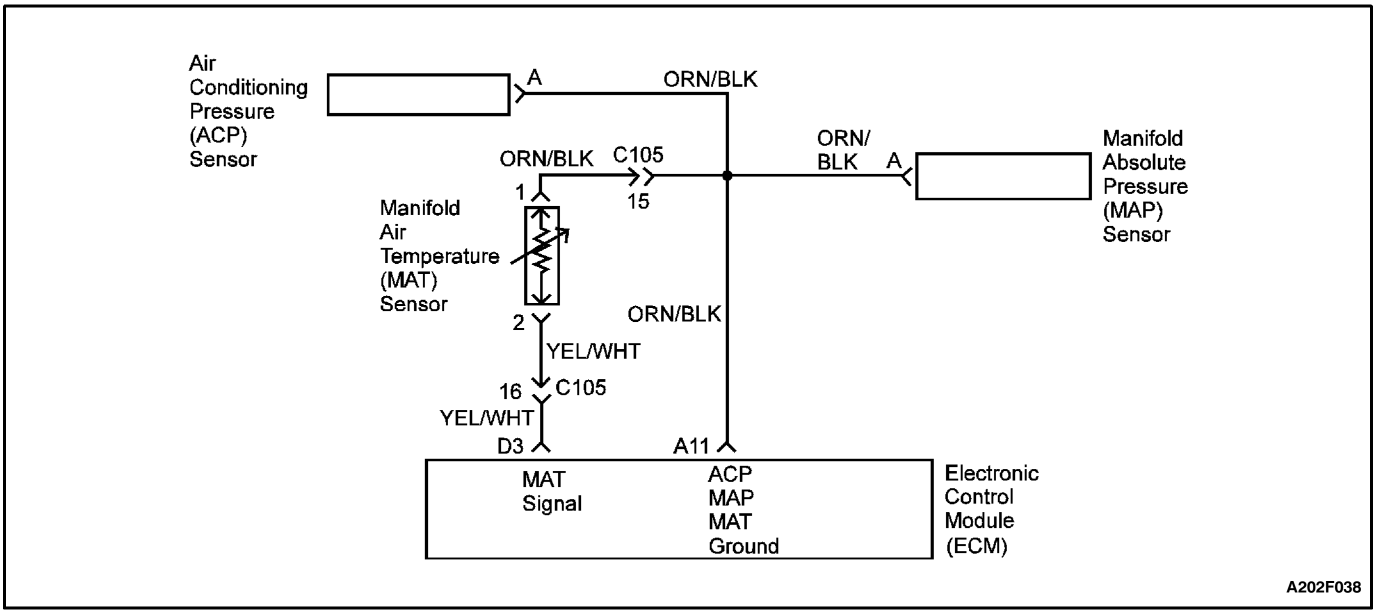
The number(s) below refer to step(s) on the diagnostic table.

1. **When measuring the voltage between the TPS terminals A and B, 4.5 to 5.5 volts confirms the 5-volt reference and ground from the ECM are OK.**

11. **If there is a problem with the voltage reference or the ground from the ECM, confirm that the wiring is OK. If there is no problem present in the wiring, the ECM is at fault.**

DTC 22 – Throttle Position Sensor Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. 3. Operate the throttle lever from closed to open while watching the throttle position sensor (TPS) voltage on the scan tool. Does the scan tool show the TPS voltage changing smoothly within the values specified?	0.10-0.90 v to 3.9-4.9 v	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the TPS connector. 3. Turn the ignition ON. 4. Measure the voltage between the TPS connector terminals A and B. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 4	Go to Step 5
4	Connect a fused jumper between the TPS connector terminals A and C. Does the scan tool show the TPS voltage above the value specified?	4 v	Go to Step 10	Go to Step 8
5	Measure the voltage between the TPS connector terminal A and the ground. Is the voltage within the value specified?	4.5-5.5 v	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Check for an open in the wire between the TPS connector terminal B and the electronic control module (ECM) connector terminal B2. Is the problem found?	-	Go to Step 9	Go to Step 11
7	1. Turn the ignition OFF. 2. Check for an open or short to ground in the wire between the TPS connector terminal A and the ECM connector terminal D8. Is the problem found?	-	Go to Step 9	Go to Step 11
8	1. Turn the ignition OFF. 2. Check for an open or short to ground between the TPS connector terminal C and the ECM connector terminal D5. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Replace the TPS. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 23
MANIFOLD AIR TEMPERATURE HIGH (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The manifold air temperature (MAT) sensor is a thermistor which measures the temperature of the air entering the engine. The electronic control module (ECM) applies 5 volts through a pull-up resistor to the MAT sensor. When the temperature is cold, the MAT sensor resistance is high and the ECM will monitor a high signal voltage on the MAT circuit. If the intake air is warm, the sensor resistance is lower, causing the ECM to monitor a lower voltage.

DTC 23 Will Set When

- The engine has been running longer than 50 seconds.
- The MAT sensor signal voltage indicates a temperature above 145°C (293°F).

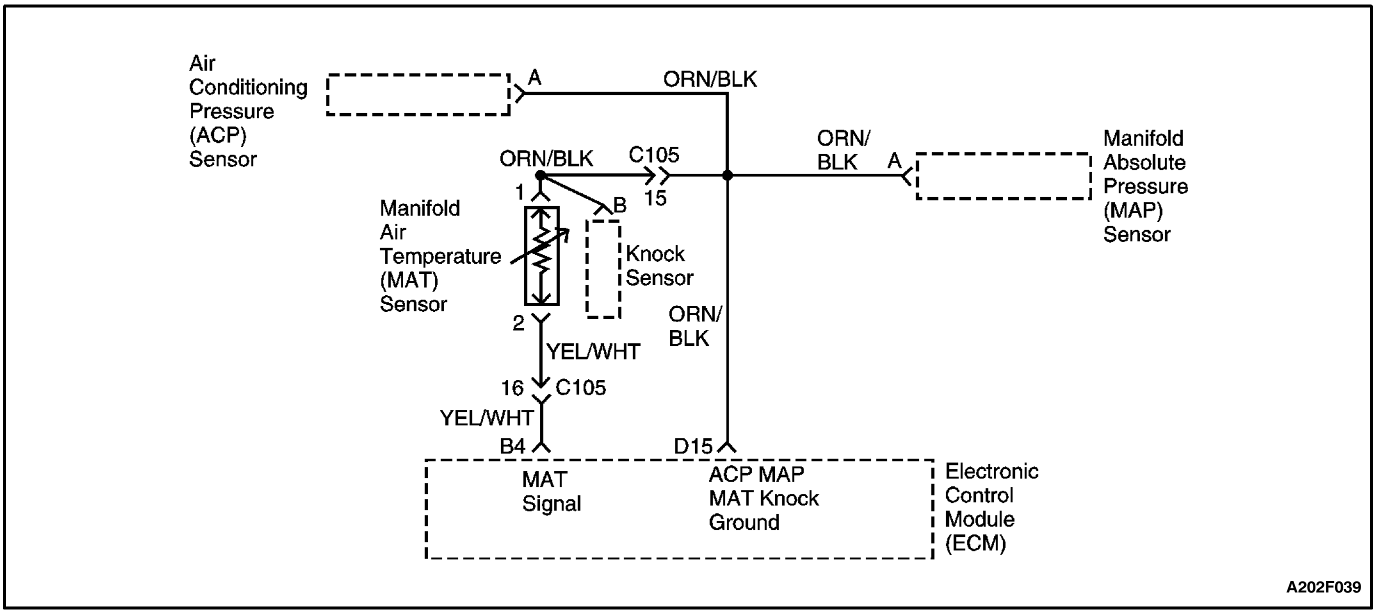
Diagnostic Aids

Inspect the wiring harness for damage. If the harness appears to be OK, observe the MAT sensor display on the scan tool while moving the connectors and the wiring harnesses related to the MAT sensor. A change in the display will indicate the location of the fault.

MANIFOLD AIR TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

DTC 23 – Manifold Air Temperature Sensor High (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool show the manifold air temperature (MAT) sensor reading within the value specified?	10-80°C (50-176°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the MAT sensor connector. 3. Turn the ignition ON. Does the scan tool show the MAT sensor reading below the value specified?	Lower Than * 35°C (* 31°F)	Go to Step 4	Go to Step 5
4	Check for a faulty connector or terminals at the MAT sensor connector. Is the problem found?	-	Go to Step 7	Go to Step 8
5	Check the wire for a short to ground between the MAT connector terminal 2 and the electronic control module (ECM) connector terminal D3. Is the problem found?	-	Go to Step 7	Go to Step 6
6	Check the wire for a short to ECM reference voltage between the MAT connector terminal 1 and the ECM connector terminal A11. Is the problem found?	-	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Run the engine until it reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	Go to Step 2
8	1. Turn the ignition OFF. 2. Replace the MAT sensor. 3. Clear any DTCs from the ECM. 4. Run the engine until it reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	1. Turn the ignition OFF. 2. Replace the ECM. 3. Run the engine until it reaches operating temperature. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 23
MANIFOLD AIR TEMPERATURE HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The manifold air temperature (MAT) sensor is a thermistor which measures the temperature of the air entering the engine. The electronic control module (ECM) applies 5 volts through a pull-up resistor to the MAT sensor. When the temperature is cold, the MAT sensor resistance is high and the ECM will monitor a high signal voltage on the MAT circuit. If the intake air is warm, the sensor resistance is lower, causing the ECM to monitor a lower voltage.

DTC 23 Will Set When

- The engine has been running longer than 120 seconds.
- The MAT sensor signal voltage indicates a temperature above 140°C (284°F).

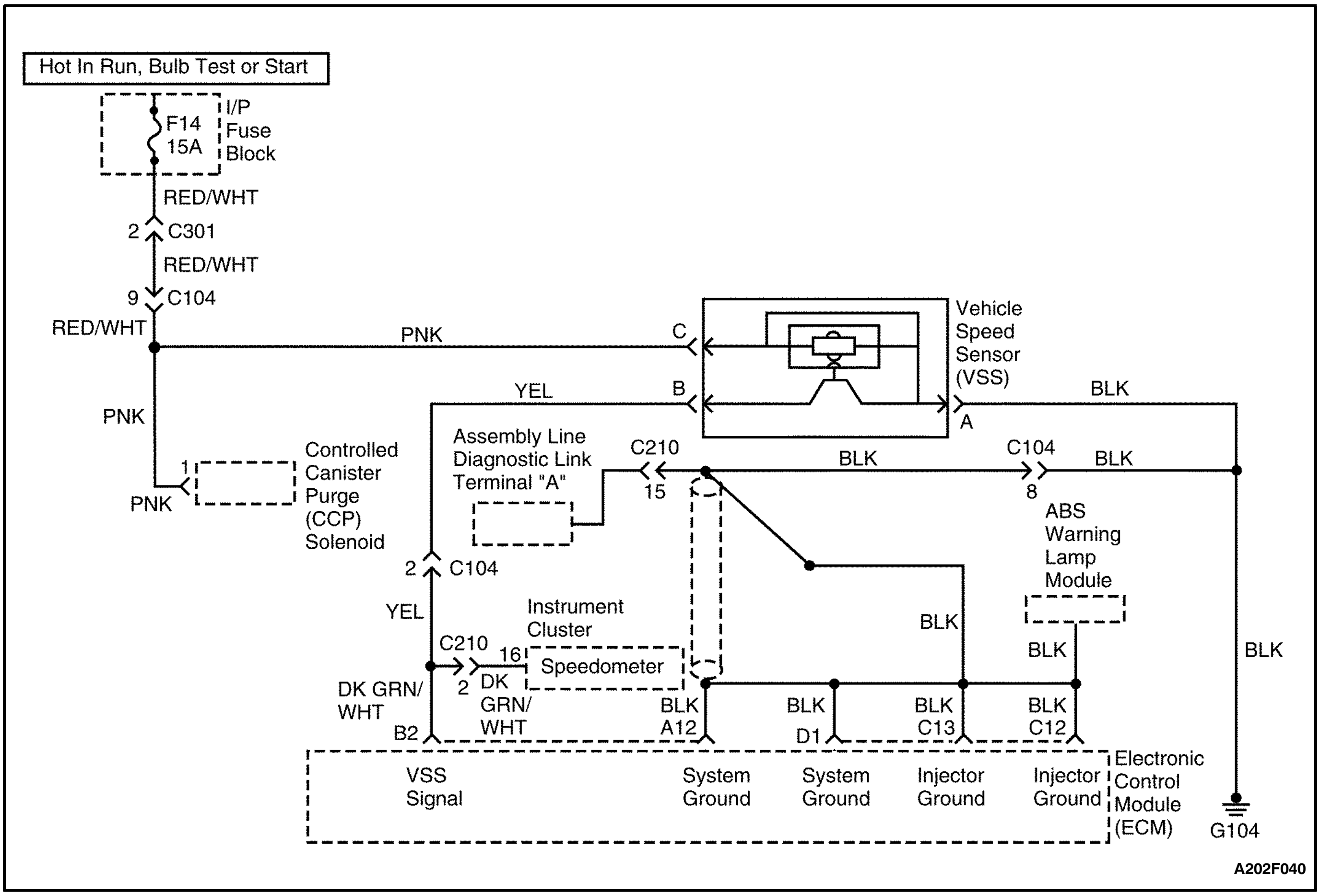
Diagnostic Aids

Inspect the wiring harness for damage. If the harness appears to be OK, observe the MAT sensor display on the scan tool while moving the connectors and the wiring harnesses related to the MAT sensor. A change in the display will indicate the location of the fault.

MANIFOLD AIR TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

DTC 23 – Manifold Air Temperature Sensor High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool show the manifold air temperature (MAT) sensor reading within the value specified?	10-80°C (50-176°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the MAT sensor connector. 3. Turn the ignition ON. Does the scan tool show the MAT sensor reading below the value specified?	Lower Than * 35°C (* 31°F)	Go to Step 4	Go to Step 5
4	Check for a faulty connector or terminals at the MAT sensor connector. Is the problem found?	-	Go to Step 7	Go to Step 8
5	Check the wire for a short to ground between the MAT connector terminal 2 and the electronic control module (ECM) connector terminal B4. Is the problem found?	-	Go to Step 7	Go to Step 6
6	Check the wire for a short to ECM reference voltage between the MAT connector terminal 1 and the ECM connector terminal D15. Is the problem found?	-	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Run the engine until it reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	Go to Step 2
8	1. Turn the ignition OFF. 2. Replace the MAT sensor. 3. Clear any DTCs from the ECM. 4. Run the engine until it reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	1. Turn the ignition OFF. 2. Replace the ECM. 3. Run the engine until it reaches operating temperature. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 24
VEHICLE SPEED SENSOR ERROR – MANUAL TRANSAXLE
(1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The electronic control module (ECM) applies and monitors 12 volts on the signal wire between the vehicle speed sensor (VSS) and the ECM. The signal wire connects to the VSS which alternately grounds the signal wire when the drive wheels are turning. This pulsing action takes place 2,289 times per kilometer (3,683 times per mile). The ECM will calculate vehicle speed based on the time between the pulses. This information is also displayed by the vehicle speedometer.

DTC 24 Will Set When

- Diagnostic Trouble Code (DTC) 34 is not set.
- The engine speed is between 1,600 rpm and 4,300 rpm.
- The VSS indicates a speed less than 8 km/h (5 mph).
- The manifold absolute pressure (MAP) sensor signal indicates less than 23 kPa (7 inches of Hg).
- These conditions are present for 10 seconds.

Diagnostic Aids

- Scan tool data should indicate a vehicle speed whenever the drive wheels are turning at more than 5 km/h (3 mph).

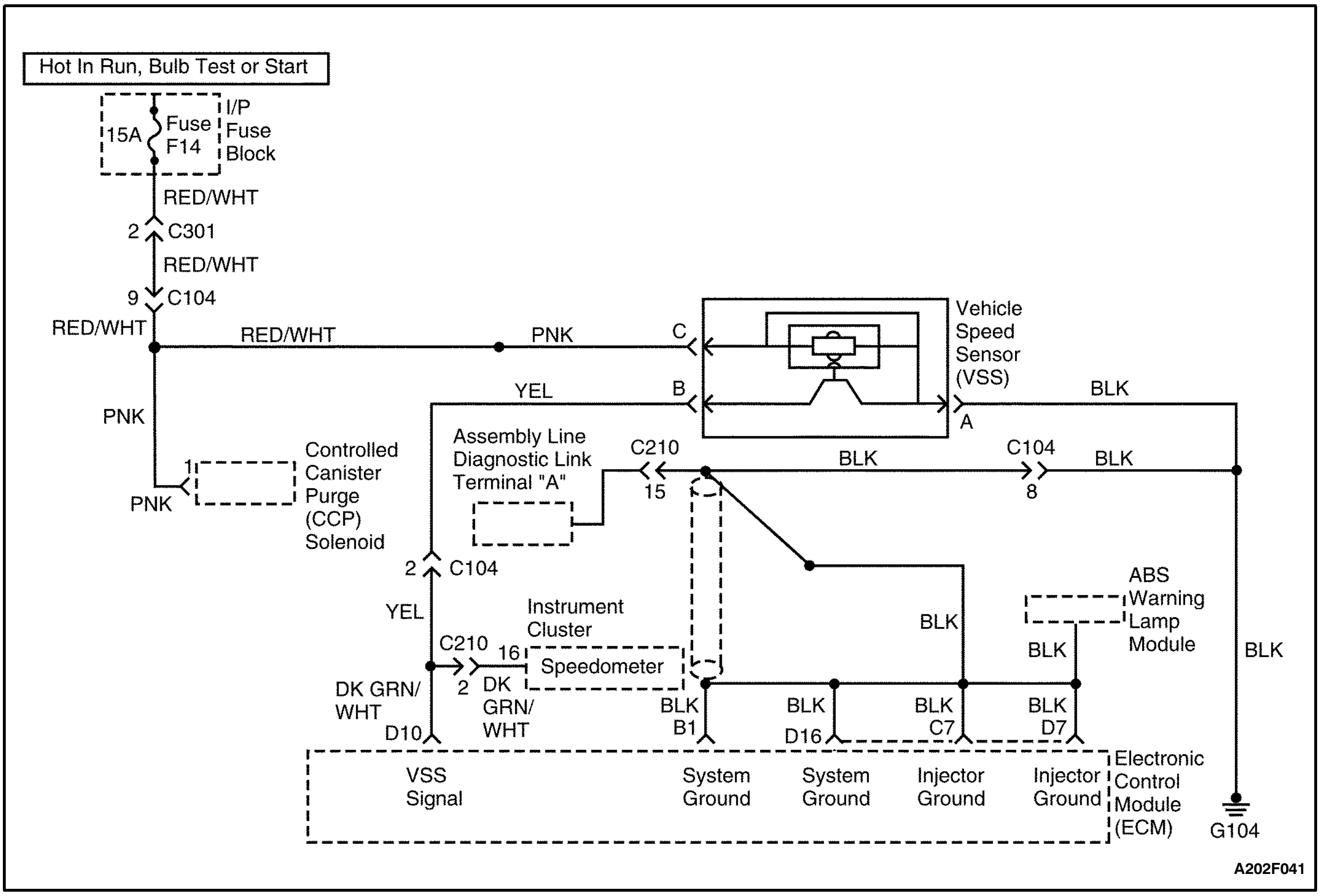
Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. By momentarily touching the VSS connector terminal 2 several times a second, a simulated VSS signal is created. If voltage and ground are present at the VSS, the VSS is faulty.

DTC 24 – Vehicle Speed Sensor Error (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Road test the vehicle. Does the scan tool read vehicle speed?	-	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the vehicle speed sensor (VSS) connector. 3. Turn the ignition ON. 4. Connect a test light between the VSS connector terminal B and ground. Is the test light on?	-	Go to Step 9	Go to Step 4
4	With a test light connected to ground, momentarily touch the VSS connector terminal B several times a second. Does the scan tool read vehicle speed?	-	Go to Step 5	Go to Step 11
5	Connect a test light between the VSS connector terminal C and ground. Is the test light on?	-	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Connect a test light between the VSS connector terminal A and battery positive. Is the test light on?	-	Go to Step 10	Go to Step 8
7	Repair the open wire between the VSS connector terminal C and the ignition switch. Is the repair complete?	-	System OK	-
8	Repair the open wire between the VSS connector terminal A and ground. Is the repair complete?	-	System OK	-
9	Repair the short to voltage in the wire between the VSS connector terminal B and the electronic control module (ECM) connector terminal B2. Is the repair complete?	-	System OK	-
10	Replace the VSS. Is the repair complete?	-	System OK	-
11	1. Turn the ignition OFF. 2. Check for an open wire between the VSS connector terminal B and the ECM connector terminal B2. Is the problem found?	-	Go to Step 12	Go to Step 13
12	Repair the open wire between the VSS connector terminal B and the ECM connector terminal B2. Is the repair complete?	-	System OK	-
13	Replace the ECM. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 24 VEHICLE SPEED SENSOR ERROR – MANUAL TRANSAXLE (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) applies and monitors 12 volts on the signal wire between the vehicle speed sensor (VSS) and the ECM. The signal wire connects to the VSS which alternately grounds the signal wire when the drive wheels are turning. This pulsing action takes place 2,289 times per kilometer (3,683 times per mile). The ECM will calculate vehicle speed based on the time between the pulses. This information is also displayed by the vehicle speedometer.

DTC 24 Will Set When

- Diagnostic Trouble Codes (DTCs) 21, 22, 33, and 34 are not set.
- The engine speed is between 2,000 rpm and 5,000 rpm.
- The VSS indicates a speed less than 6 km/h (4 mph).
- The manifold absolute pressure (MAP) sensor signal indicates less than 24 kPa (7 inches of Hg) for more than 4 seconds.
- These conditions are present for 4 seconds.

Diagnostic Aids

- Scan tool data should indicate a vehicle speed whenever the drive wheels are turning at more than 5 km/h (3 mph).

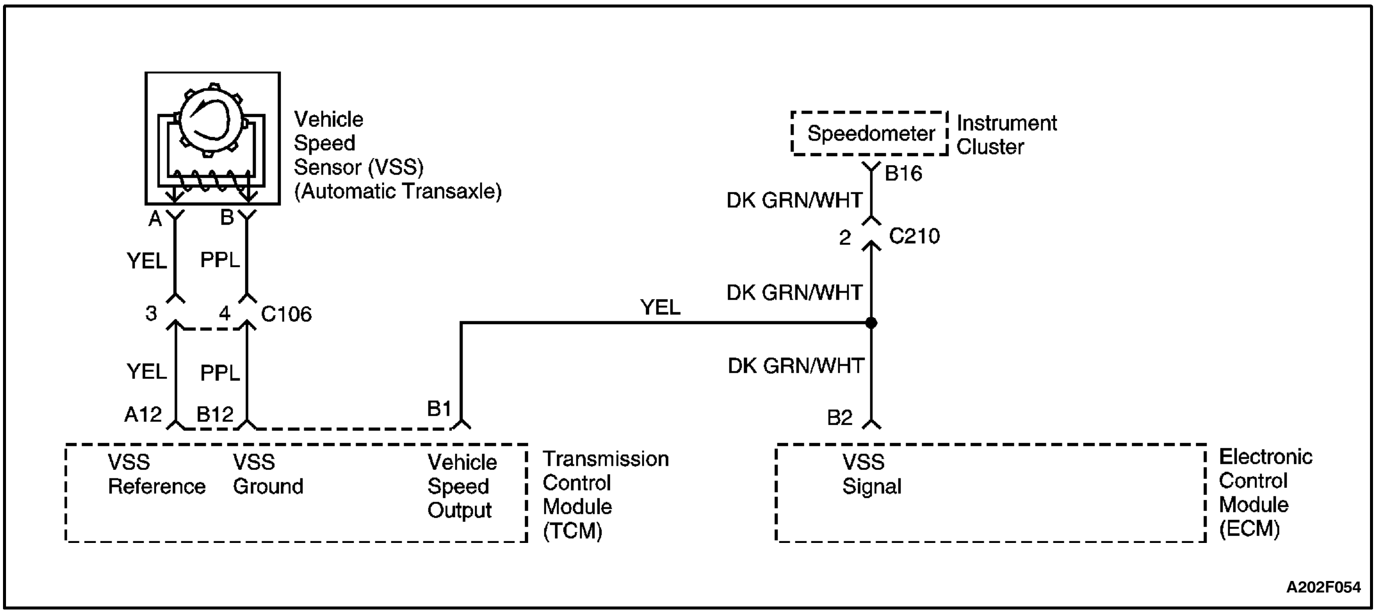
Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. By momentarily touching the VSS connector terminal 2 several times a second, a simulated VSS signal is created. If voltage and ground are present at the VSS, the VSS is faulty.

DTC 24 – Vehicle Speed Sensor Error (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Road test the vehicle. Does the scan tool read vehicle speed?	-	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the vehicle speed sensor (VSS) connector. 3. Turn the ignition ON. 4. Connect a test light between the VSS connector terminal B and ground. Is the test light on?	-	Go to Step 9	Go to Step 4
4	With a test light connected to ground, momentarily touch the VSS connector terminal B several times a second. Does the scan tool read vehicle speed?	-	Go to Step 5	Go to Step 11
5	Connect a test light between the VSS connector terminal C and ground. Is the test light on?	-	Go to Step 6	Go to Step 7
6	1. Turn the ignition OFF. 2. Connect a test light between the VSS connector terminal A and battery positive. Is the test light on?	-	Go to Step 10	Go to Step 8
7	Repair the open wire between the VSS connector terminal C and the ignition switch. Is the repair complete?	-	System OK	-
8	Repair the open wire between the VSS connector terminal A and ground. Is the repair complete?	-	System OK	-
9	Repair the short to voltage in the wire between the VSS connector terminal B and the electronic control module (ECM) connector terminal D10. Is the repair complete?	-	System OK	-
10	Replace the VSS. Is the repair complete?	-	System OK	-
11	1. Turn the ignition OFF. 2. Check for an open wire between the VSS connector terminal B and the ECM connector terminal D10. Is the problem found?	-	Go to Step 12	Go to Step 13
12	Repair the open wire between the VSS connector terminal B and the ECM connector terminal D10. Is the repair complete?	-	System OK	-
13	Replace the ECM. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 24 VEHICLE SPEED SENSOR ERROR – AUTOMATIC TRANSAXLE (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

Vehicle speed is provided to the transaxle control module (TCM) by the automatic transaxle output (shaft) vehicle speed sensor (VSS), which is a permanent magnet (PM) generator mounted to the transaxle case. The PM generator produces an AC voltage as the speed sensor rotor teeth pass in front of the sensor's magnetic field. The AC voltage level increases as the speed of the vehicle increases. The TCM then converts the AC voltage into a digital signal. The TCM uses the vehicle speed to determine shift timing, torque converter clutch (TCC) apply, TCC release, and gear ratio calculations. A digital output signal is then sent from the TCM to the electronic control module (ECM). This signal is also sent to the instrument panel for operation of the speedometer.

DTC 24 Will Set When

- Diagnostic Trouble Code (DTC) 34 is not set.
- The engine speed is between 1,600 rpm and 4,300 rpm.
- The VSS indicates a speed less than 8 km/h (5 mph).
- The manifold absolute pressur (MAP) sensor signal indicates less than 23 kPa (7 inches of Hg).
- These conditions are present for 10 seconds.

Diagnostic Aids

- The condition may be intermittent. Check for a loose VSS mounting or poor connections.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing the test equipment for a change.

Test Description

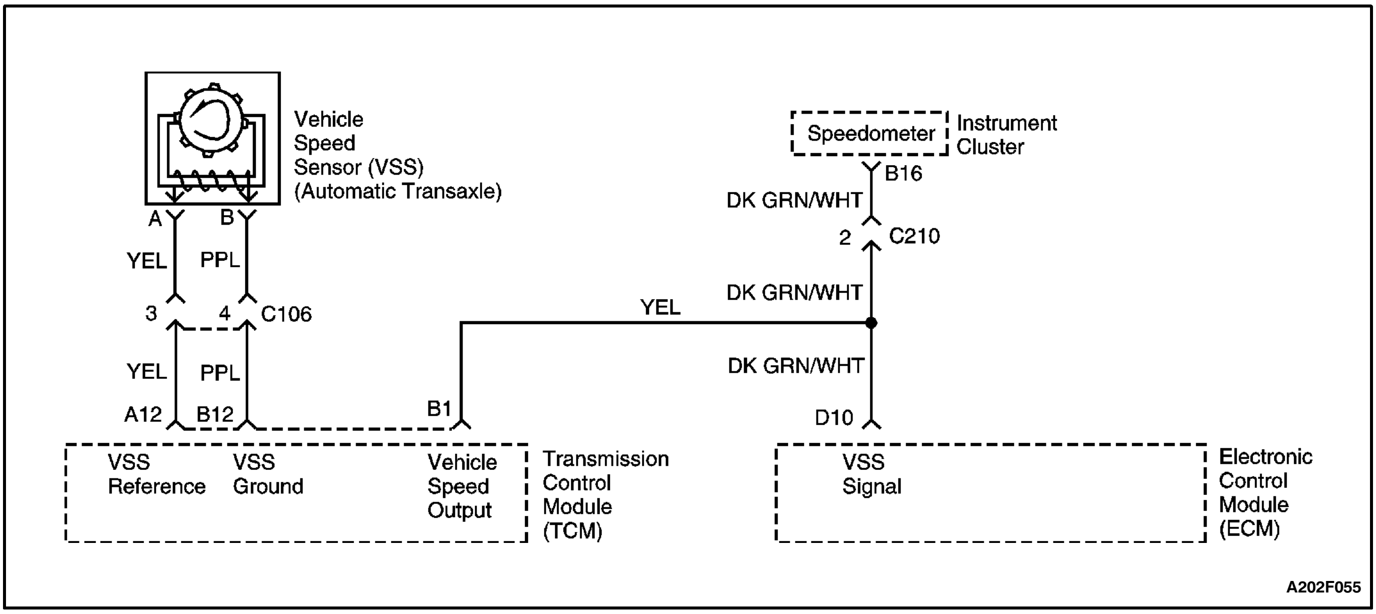
The number(s) below refer to step(s) on the diagnostic table.

2. This step checks for an output signal from the TCM to the electronic control module (ECM).
4. It is important to remember that the vehicle speed output is also sent to the instrument panel for speedometer operation.

DTC 24 – Vehicle Speed Sensor Error – Automatic Transaxle (1.3L and 1.5L SOHC IEFI-6)

Notice: In order to avoid damage to the drive axles when raising the drive wheels, support the lower control arms in the normal horizontal position. Do not run the vehicle in gear with the wheels hanging down at full travel.

Step	Action	Value(s)	Yes	No
1	Check for the presence of any transaxle control module (TCM) diagnostic trouble code(s) (DTCs) for the vehicle speed sensor (VSS). Is a TCM DTC present?	-	Go to the applicable DTC Table	Go to Step 2
2	1. Turn the ignition OFF. 2. Raise and suitably support the drive wheels. 3. Measure the voltage by backprobing the electronic control module (ECM) 24-pin connector terminal B2. 4. Start the engine and allow the engine to idle. 5. Place the transaxle in drive (D). Is a fluctuating voltage present?	-	Go to Step 6	Go to Step 3
3	1. Turn the ignition OFF. 2. Check for an open or short in the wire between the ECM connector terminal B2 and the TCM connector terminal B1. Is the problem found?	-	Go to Step 5	Go to Step 4
4	Check for an open or short in the wire between the ECM connector terminal B2 and the instrument panel connector terminal B16. Is the problem found?	-	Go to Step 5	Go to Step 7
5	Repair the wire as needed. Is the repair complete?	-	System OK	-
6	Replace the ECM. Is the repair complete?	-	System OK	-
7	Replace the TCM. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 24 VEHICLE SPEED SENSOR ERROR – AUTOMATIC TRANSAXLE (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

Vehicle speed is provided to the transaxle control module (TCM) by the automatic transaxle output (shaft) vehicle speed sensor (VSS), which is a permanent magnet (PM) generator mounted to the transaxle case. The PM generator produces an AC voltage as the speed sensor rotor teeth pass in front of the sensor's magnetic field. The AC voltage level increases as the speed of the vehicle increases. The TCM then converts the AC voltage into a digital signal. The TCM uses the vehicle speed to determine shift timing, torque converter clutch (TCC) apply, TCC release, and gear ratio calculations. A digital output signal is then sent from the TCM to the electronic control module (ECM). This signal is also sent to the instrument panel for operation of the speedometer.

DTC 24 Will Set When

- Diagnostic Trouble Codes (DTCs) 21, 22, 33, and 34 is not set.
- The engine speed is between 2,000 rpm and 5,000 rpm.
- The VSS indicates a speed less than 6 km/h (3.5 mph).
- The manifold absolute pressure (MAP) sensor signal indicates less than 24 kPa (7 inches of Hg).
- These conditions are present for 4 seconds.

Diagnostic Aids

- The condition may be intermittent. Check for a loose VSS mounting or poor connections.
- If diagnosing for a possible intermittent short or open condition, move or massage the wiring harness while observing the test equipment for a change.

Test Description

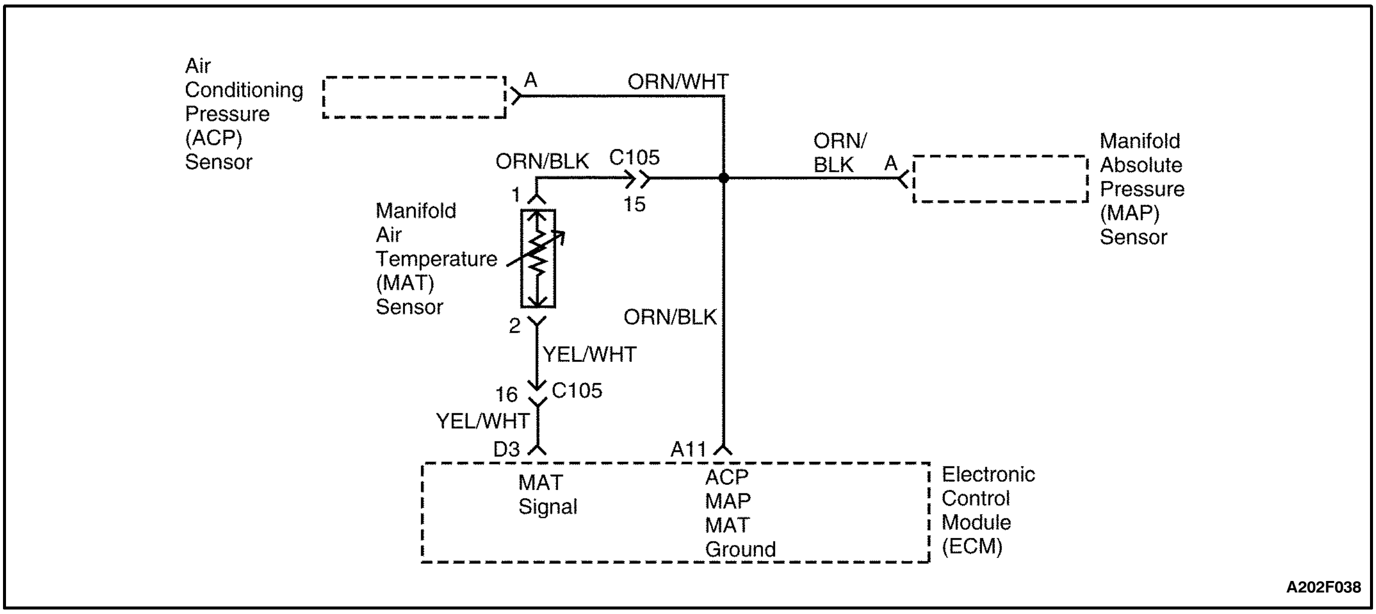
The number(s) below refer to step(s) on the diagnostic table.

2. This step checks for an output signal from the TCM to the ECM.
4. It is important to remember that the vehicle speed output is also sent to the instrument panel for speedometer operation.

DTC 24 – Vehicle Speed Sensor Error – Automatic Transaxle (1.3L SOHC and 1.6L DOHC ITMS-6F)

Notice: In order to avoid damage to the drive axles when raising the drive wheels, support the lower control arms in the normal horizontal position. Do not run the vehicle in gear with the wheels hanging down at full travel.

Step	Action	Value(s)	Yes	No
1	Check for the presence of any transaxle control module (TCM) diagnostic trouble code(s) (DTCs) for the vehicle speed sensor (VSS). Is a TCM DTC present?	-	Go to the Applicable DTC Table	Go to Step 2
2	1. Turn the ignition OFF. 2. Raise and suitably support the drive wheels. 3. Measure the voltage by backprobing the electronic control module (ECM) 24-pin connector terminal D10. 4. Start the engine and allow the engine to idle. 5. Place the transaxle in drive (D). Is a fluctuating voltage present?	-	Go to Step 6	Go to Step 3
3	1. Turn the ignition OFF. 2. Check for an open or short in the wire between the ECM connector terminal D10 and the TCM connector terminal B1. Is the problem found?	-	Go to Step 5	Go to Step 4
4	Check for an open or short in the wire between the ECM connector terminal B2 and the instrument panel connector terminal B16. Is the problem found?	-	Go to Step 5	Go to Step 7
5	Repair the wire as needed. Is the repair complete?	-	System OK	-
6	Replace the ECM. Is the repair complete?	-	System OK	-
7	Replace the TCM. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 25
MANIFOLD AIR TEMPERATURE LOW (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The manifold air temperature (MAT) sensor is a thermistor which measures the temperature of the air entering the engine. The electronic control module (ECM) applies 5 volts through a pull-up resistor to the MAT sensor. When the temperature is cold, the MAT sensor resistance is high and the ECM will monitor a high signal voltage on the MAT circuit. If the intake air is warm, the sensor resistance is lower, causing the ECM to monitor a lower voltage.

DTC 25 Will Set When

- The engine has been running longer than 50 seconds.
- The MAT sensor signal voltage indicates a temperature less than * 35°C (* 31°F).

Diagnostic Aids

Inspect the wiring harness for damage. If the harness appears to be OK, observe the MAT sensor display on the scan tool while moving the connectors and the wiring harnesses related to the MAT sensor. A change in the display will indicate the location of the fault.

Test Description

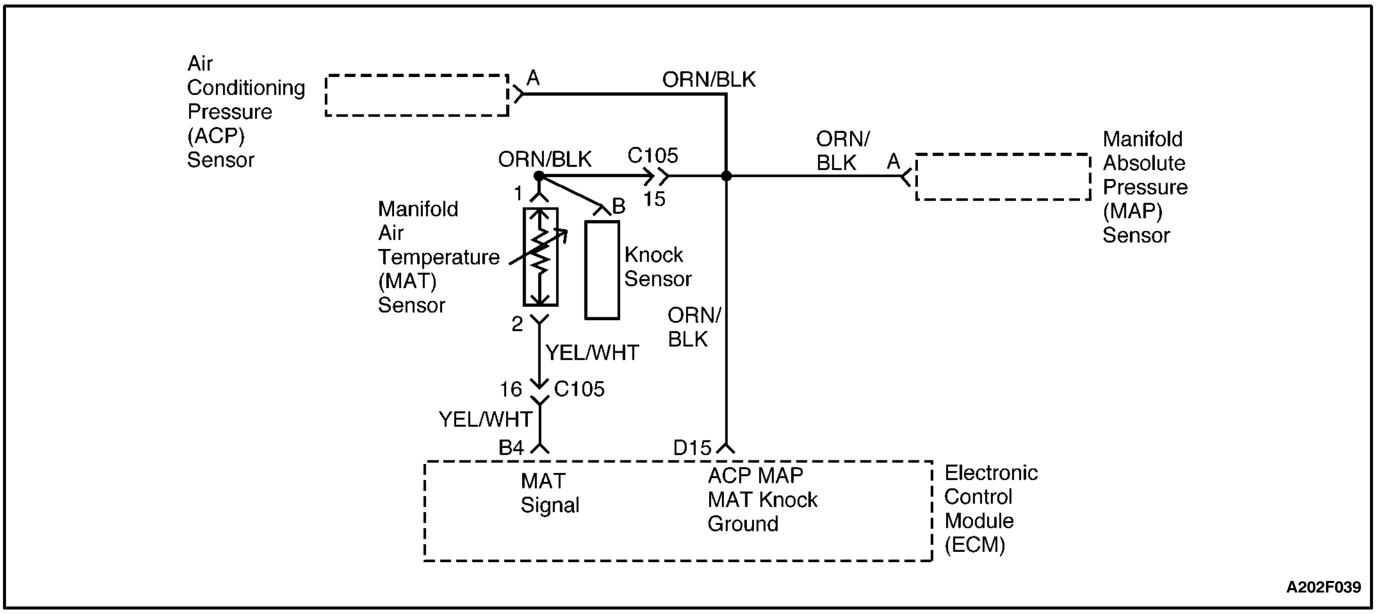
The number(s) below refer to step(s) on the diagnostic table.

6. This step checks for reference voltage and ground from the ECM.

MANIFOLD AIR TEMPERATURE SENSOR TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

DTC 25 – Manifold Air Temperature Low (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool show the manifold air temperature (MAT) sensor reading within the value specified?	10-80°C (50-176°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the MAT sensor connector. 3. Jumper the MAT connector terminals. 4. Turn the ignition ON. Does the scan tool show the MAT sensor reading above the value specified?	180°C (356°F)	Go to Step 4	Go to Step 5
4	Check for a faulty connector or terminals at the MAT sensor connector. Is the problem found?	-	Go to Step 10	Go to Step 9
5	Measure the voltage between terminals 1 and 2 of the MAT connector. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 11	Go to Step 6
6	Measure the voltage between the MAT terminal 2 and the battery ground (negative) post. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Check for an open or short to battery voltage in the wire between the MAT connector terminal 1 and the electronic control module (ECM) connector terminal A11. Is the problem found?	-	Go to Step 10	Go to Step 11
8	1. Turn the ignition OFF. 2. Check for an open or short to battery voltage in the wire between the MAT connector terminal 2 and the ECM connector terminal D3. Is the problem found?	-	Go to Step 10	Go to Step 11
9	1. Turn the ignition OFF. 2. Replace the MAT sensor. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Run the engine until it reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any DTCs from the ECM. 4. Run the engine until it reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Run the vehicle until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 25
MANIFOLD AIR TEMPERATURE LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The manifold air temperature (MAT) sensor is a thermistor which measures the temperature of the air entering the engine. The electronic control module (ECM) applies 5 volts through a pull-up resistor to the MAT sensor. When the temperature is cold, the MAT sensor resistance is high and the ECM will monitor a high signal voltage on the MAT circuit. If the intake air is warm, the sensor resistance is lower, causing the ECM to monitor a lower voltage.

DTC 25 Will Set When

- The engine has been running longer than 120 seconds.
- The MAT sensor signal voltage indicates a temperature less than * 38.5°C (* 37°F).

Diagnostic Aids

Inspect the wiring harness for damage. If the harness appears to be OK, observe the MAT sensor display on the scan tool while moving the connectors and the wiring harnesses related to the MAT sensor. A change in the display will indicate the location of the fault.

Test Description

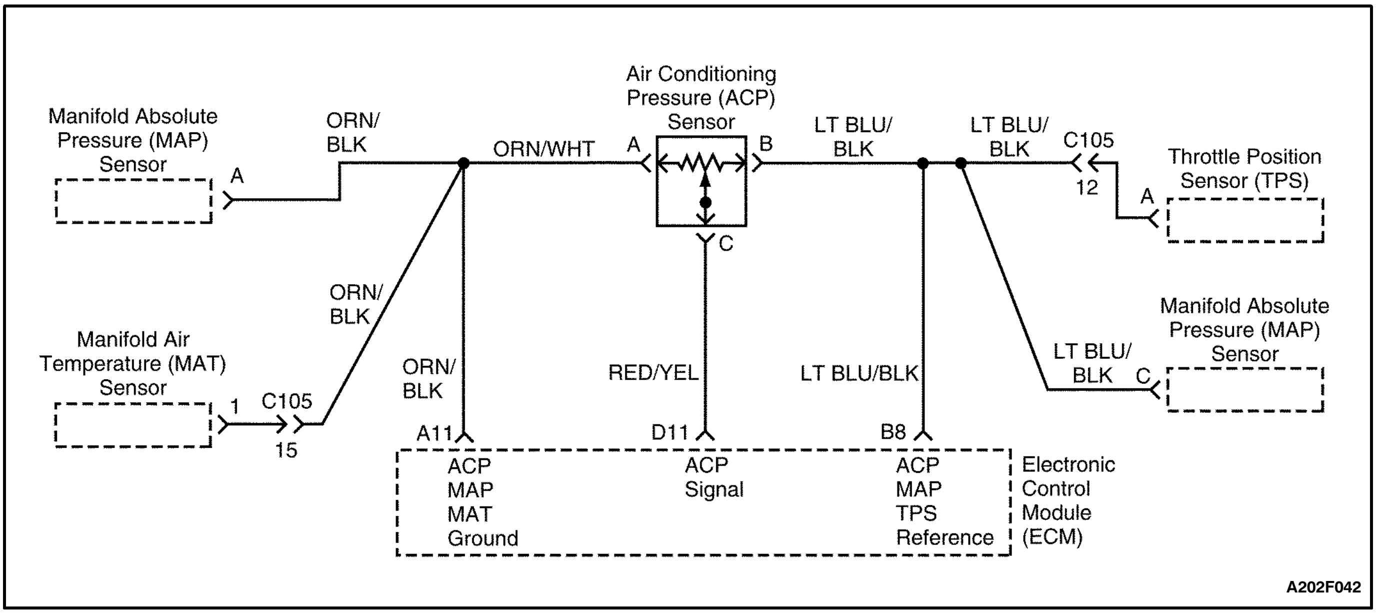
The number(s) below refer to step(s) on the diagnostic table.

6. This step checks for reference voltage and ground from the ECM.

MANIFOLD AIR TEMPERATURE SENSOR		
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)		
°C	°F	OHMS
100	212	177
90	194	241
80	176	332
70	158	467
60	140	667
50	122	973
45	113	1188
40	104	1459
35	95	1802
30	86	2238
25	77	2796
20	68	3520
15	59	4450
10	50	5670
5	41	7280
0	32	9420
* 5	23	12300
* 10	14	16180
* 15	5	21450
* 20	* 4	28680
* 30	* 22	52700
* 40	* 40	100700

DTC 25 – Manifold Air Temperature Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	–	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. Does the scan tool show the manifold air temperature (MAT) sensor reading within the value specified?	10-80°C (50-176°F)	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the MAT sensor connector. 3. Jumper the MAT connector terminals. 4. Turn the ignition ON. Does the scan tool show the MAT sensor reading above the value specified?	180°C (356°F)	Go to Step 4	Go to Step 5
4	Check for a faulty connector or terminals at the MAT sensor connector. Is the problem found?	–	Go to Step 10	Go to Step 9
5	Measure the voltage between terminals 1 and 2 of the MAT connector. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 11	Go to Step 6
6	Measure the voltage between the MAT terminal 2 and the battery ground (negative) post. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Check for an open or short to battery voltage in the wire between the MAT connector terminal 1 and the electronic control module (ECM) connector terminal D15. Is the problem found?	–	Go to Step 10	Go to Step 11
8	1. Turn the ignition OFF. 2. Check for an open or short to battery voltage in the wire between the MAT connector terminal 2 and the ECM connector terminal B4. Is the problem found?	–	Go to Step 10	Go to Step 11
9	1. Turn the ignition OFF. 2. Replace the MAT sensor. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Run the engine until it reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
10	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any DTCs from the ECM. 4. Run the engine until It reaches operating temperature. 5. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
11	1. Replace the ECM. 2. Run the vehicle until it reaches operating temperature. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–



DIAGNOSTIC TROUBLE CODE (DTC) 27
AIR CONDITIONING PRESSURE SENSOR HIGH ERROR
(1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The air conditioning (A/C) system uses an air conditioning pressure (ACP) sensor mounted in the high-pressure side of the A/C refrigerant system to monitor the A/C refrigerant pressure. The electronic control module (ECM) uses this information to turn the cooling fans on at high speed when the A/C refrigerant pressure is high and to keep the A/C compressor disengaged when the A/C refrigerant pressure is excessively high or low.

DTC 27 Will Set When

- The ACP sensor reading is above 3 115 kPa (452 psi).
- This condition is present for 10 seconds.

Diagnostic Aids

- Inspect the wiring harness for damage. If the wiring harness appears OK, observe the A/C pressure display on the scan tool while moving the connectors and the wiring harnesses related to the ACP sensor. A change in the A/C pressure display on the scan tool will indicate the location of the fault.
- A fault in the A/C system or inoperative cooling fans may set an ACP diagnostic trouble code (DTC).

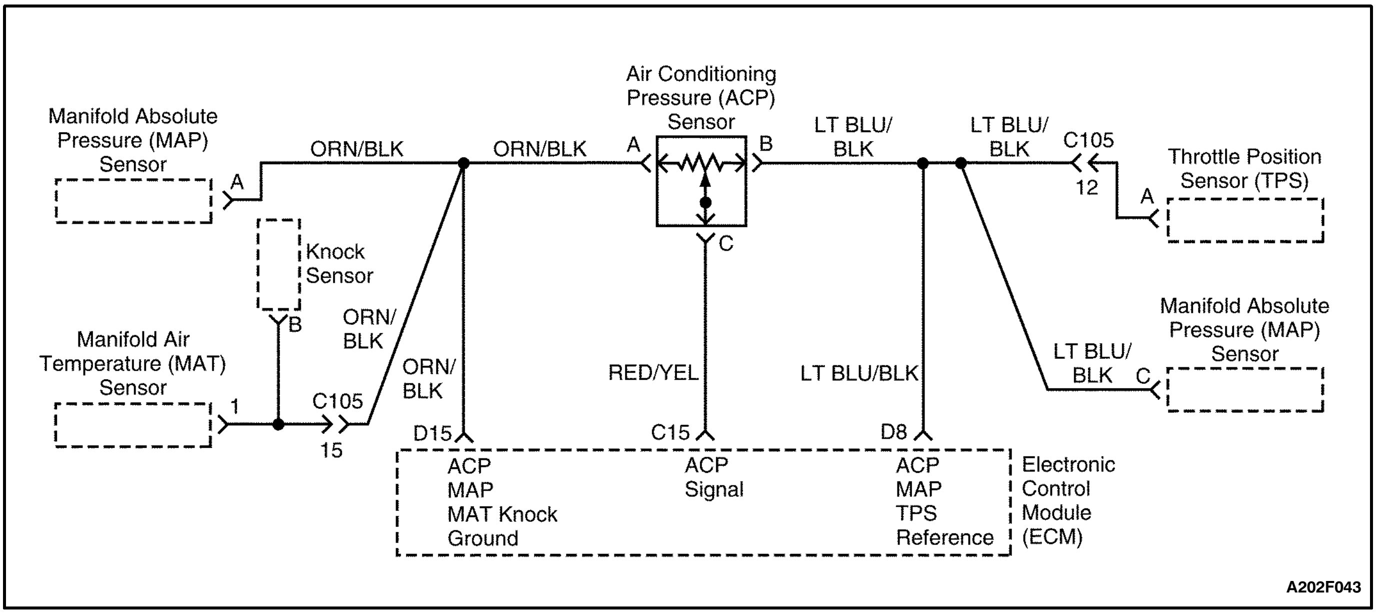
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. This step checks for reference voltage and ground from the ECM.
3. A voltage over 2 volts indicates an A/C refrigerant system pressure over 1 241 kPa (180 psi).

DTC 27 – Air Conditioning Pressure Sensor High Error (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	1. Disconnect the air conditioning pressure (ACP) sensor connector. 2. Turn the ignition ON. 3. Measure the voltage between the ACP connector terminals A and B. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 3	Go to Step 5
3	1. Turn the ignition OFF. 2. Connect the ACP sensor connector. 3. Turn the ignition ON. 4. Measure the voltage at the electronic control module (ECM) connector terminal D11 by backprobing the connector. Does the voltage measure below the value specified?	2 v	Go to “Diagnostic Aids”	Go to Step 4
4	Check for a short to voltage in the wire between the ACP connector terminal C and the ECM connector terminal D11. Is the problem found?	-	Go to Step 8	Go to Step 9
5	Measure the voltage between the ACP connector terminal B and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 6	Go to Step 7
6	Check the wire between the ACP connector terminal A and the ECM connector terminal A11 for a short to the battery voltage. Is the problem found?	-	Go to Step 8	Go to Step 10
7	Check for a short to battery voltage in the wire between the ACP connector terminal B and the ECM connector terminal B8. Is the problem found?	-	Go to Step 8	Go to Step 10
8	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	1. Turn the ignition OFF. 2. Replace the ACP sensor. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 27 AIR CONDITIONING PRESSURE SENSOR HIGH ERROR (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The air conditioning (A/C) system uses an air conditioning pressure (ACP) sensor mounted in the high-pressure side of the A/C refrigerant system to monitor the A/C refrigerant pressure. The electronic control module (ECM) uses this information to turn the cooling fans on at high speed when the A/C refrigerant pressure is high and to keep the A/C compressor disengaged when the A/C refrigerant pressure is excessively high or low.

DTC 27 Will Set When

- The ACP sensor reading is above 3 115 kPa (452 psi).
- This condition is present for 10 seconds.

Diagnostic Aids

- Inspect the wiring harness for damage. If the wiring harness appears OK, observe the A/C pressure display on the scan tool while moving the connectors and the wiring harnesses related to the ACP sensor. A change in the A/C pressure display on the scan tool will indicate the location of the fault.
- A fault in the A/C system or inoperative cooling fans may set an ACP diagnostic trouble code (DTC).

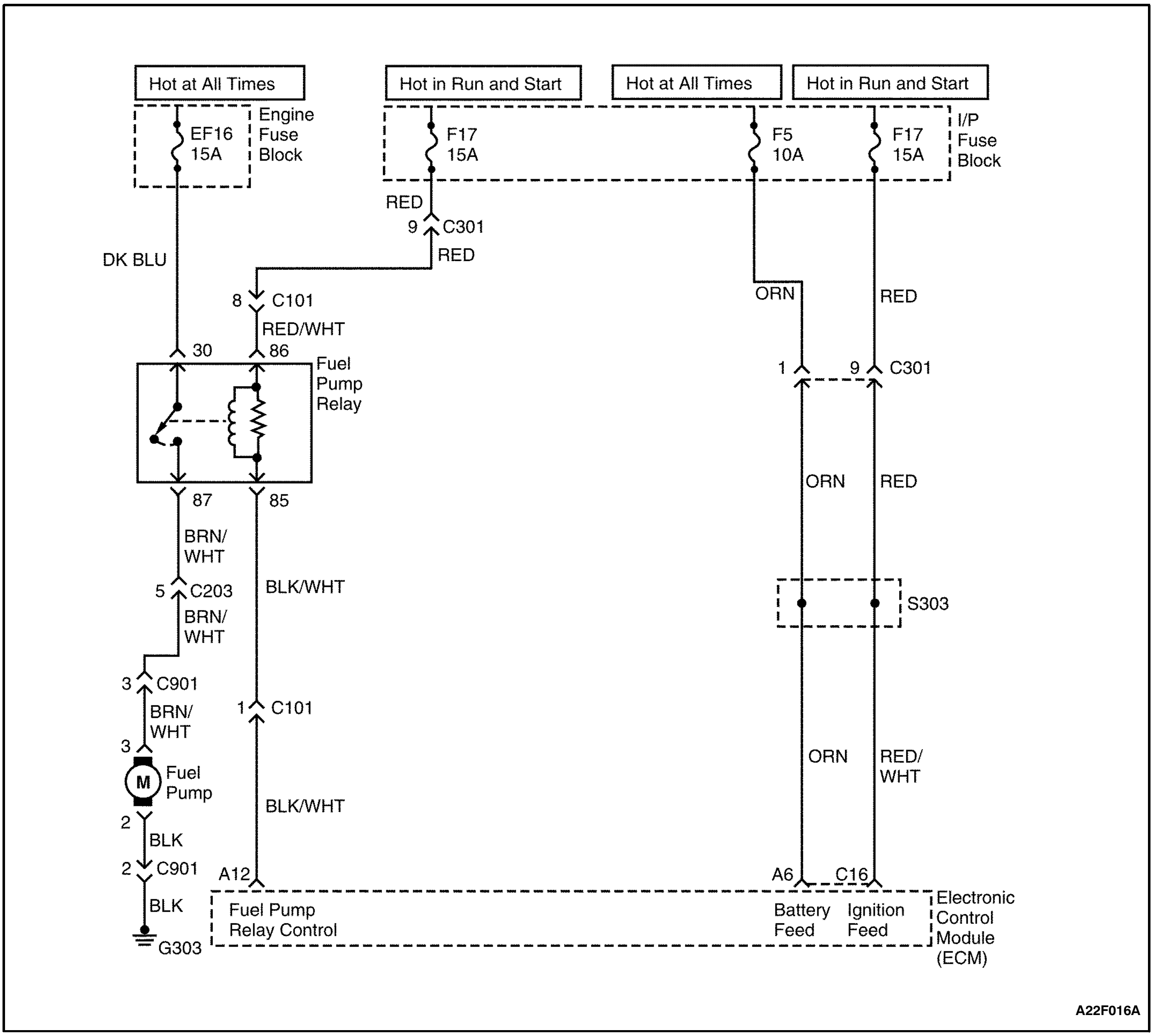
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. This step checks for reference voltage and ground from the ECM.
3. A voltage over 2 volts indicates an A/C refrigerant system pressure over 1 241 kPa (180 psi).

DTC 27 – Air Conditioning Pressure Sensor High Error (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the air conditioning pressure (ACP) sensor connector. 2. Turn the ignition ON. 3. Measure the voltage between the ACP connector terminals A and B. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 3	Go to Step 5
3	1. Turn the ignition OFF. 2. Connect the ACP sensor connector. 3. Turn the ignition ON. 4. Measure the voltage at the electronic control module (ECM) connector terminal C15 by backprobing the connector. Does the voltage measure below the value specified?	2 v	Go to "Diagnostic Aids"	Go to Step 4
4	Check for a short to voltage in the wire between the ACP connector terminal C and the ECM connector terminal C15. Is the problem found?	-	Go to Step 8	Go to Step 9
5	Measure the voltage between the ACP connector terminal B and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 6	Go to Step 7
6	Check the wire between the ACP connector terminal A and the ECM connector terminal D15 for a short to the battery voltage. Is the problem found?	-	Go to Step 8	Go to Step 10
7	Check for a short to battery voltage in the wire between the ACP connector terminal B and the ECM connector terminal D8. Is the problem found?	-	Go to Step 8	Go to Step 10
8	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	1. Turn the ignition OFF. 2. Replace the ACP sensor. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 29
FUEL PUMP RELAY SHORT TO GROUND (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

When the ignition is turned ON, the electronic control module (ECM) applies ground to the fuel pump relay coil side. The ECM will apply this ground for 2 seconds or until reference pulses are received by the ECM from the crankshaft position sensor. This activates the fuel pump relay, applying battery voltage to the fuel pump.

DTC 29 Will Set When

The fuel pump relay circuit is shorted to ground for more than 1.6 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, and a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the fuel pump relay connector terminal 85 and battery positive while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

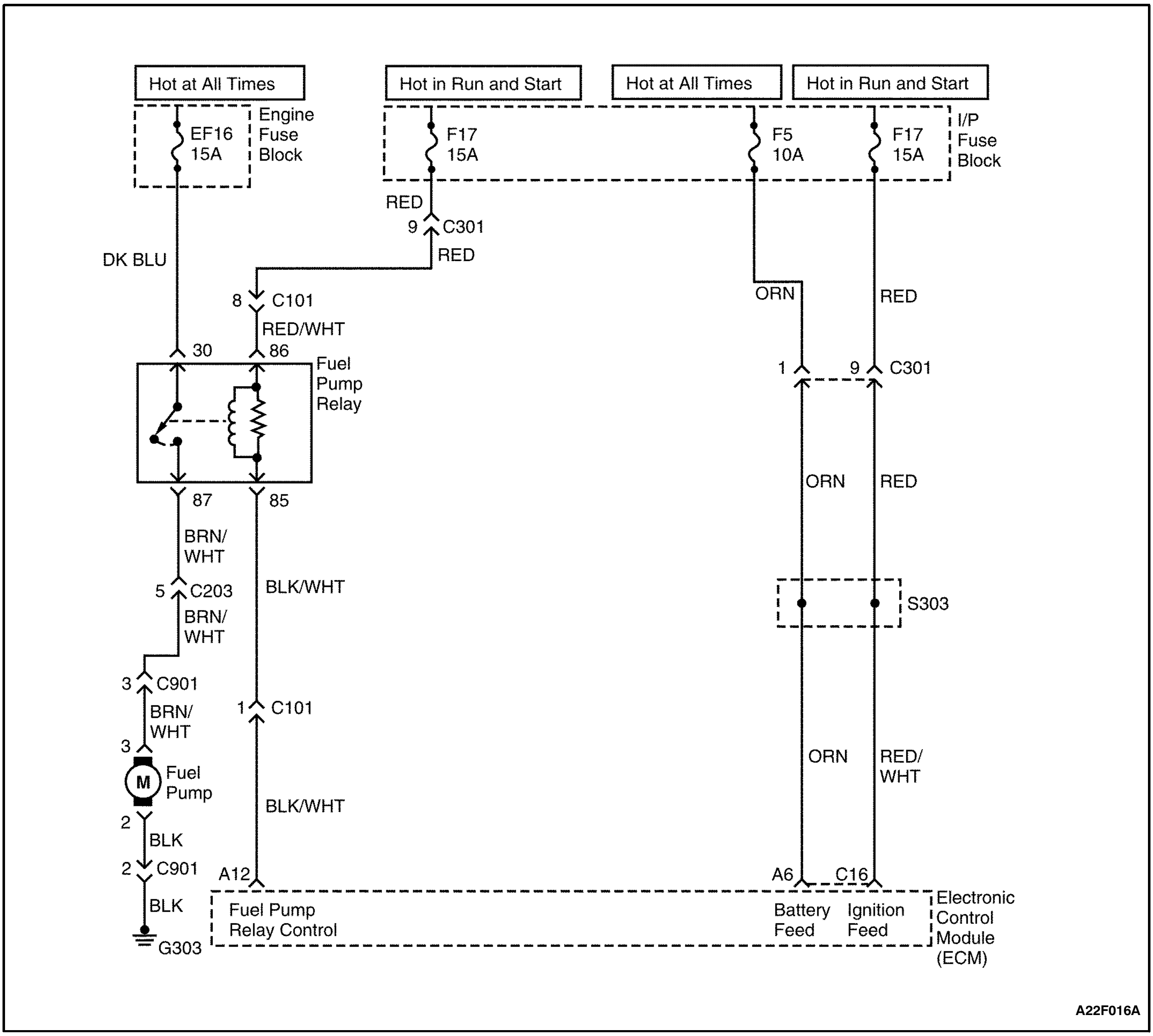
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. With the ignition OFF, the ECM should not be applying ground to the fuel pump relay.
3. If the test light is still on after disconnecting the ECM red connector, the wire between the fuel pump relay and the ECM is shorted to ground. If the test light goes off, the ECM is at fault.

DTC 29 – Fuel Pump Relay Short to Ground (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Perform the Diagnostic System Check. Is the Diagnostic System Check complete?	-	Go to Step 2	-
2	1. Disconnect the fuel pump relay. 2. Connect a test light between the fuel pump relay connector terminal 85 and battery positive. Is the test light on?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Disconnect the electronic control module (ECM) red connector. Is the test light on?	-	Go to Step 4	Go to Step 5
4	1. Repair the short to ground in the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal A12. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
5	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 32 FUEL PUMP RELAY SHORT TO BATTERY (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

When the ignition is turned ON, the electronic control module (ECM) applies ground to the fuel pump relay coil side. The ECM will apply this ground for 2 seconds or until reference pulses are received by the ECM from the crankshaft position sensor. This activates the fuel pump relay, applying battery voltage to the fuel pump.

DTC 32 Will Set When

The fuel pump relay circuit is shorted to battery for more than 1.6 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, and a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the fuel pump relay connector terminal 85 and battery positive while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

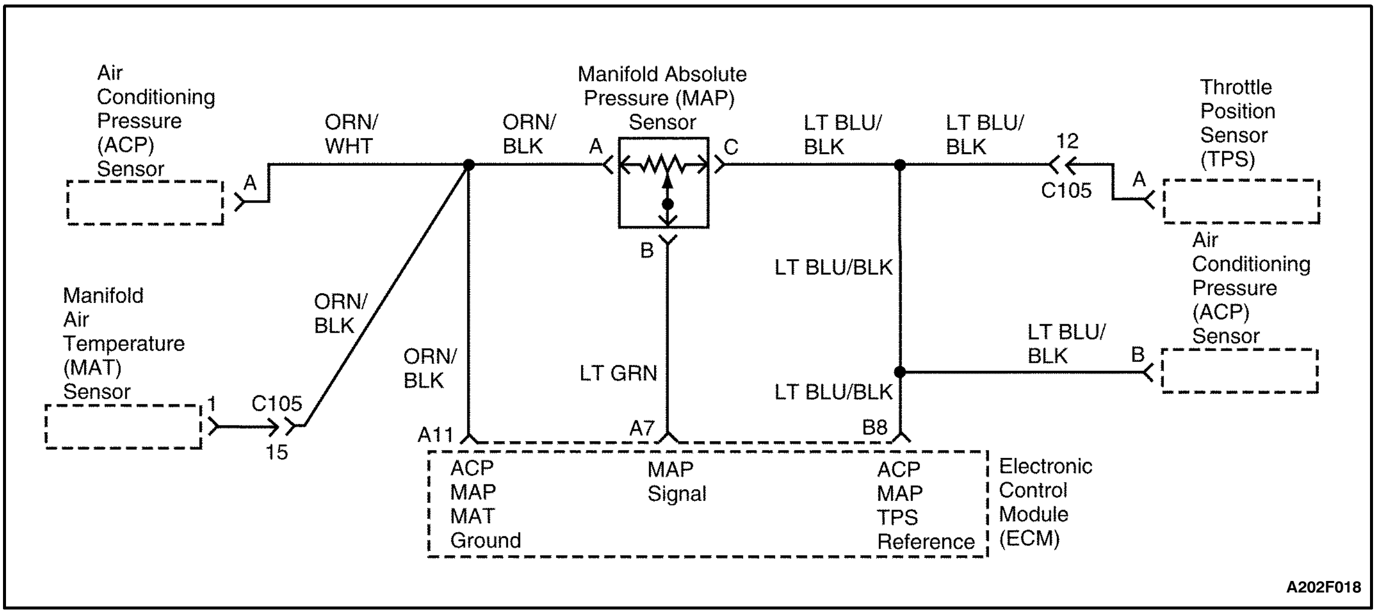
Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. If the test light is still on after disconnecting the ECM red connector, the wire between the fuel pump relay and the ECM is shorted to voltage. If the test light goes off, the ECM is at fault.

DTC 32 – Fuel Pump Relay Short to Battery (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Perform the Diagnostic System Check. Is the Diagnostic System Check complete?	-	Go to Step 2	-
2	1. Disconnect the fuel pump relay. 2. Measure the resistance between the fuel pump relay terminals 85 and 86. Does the resistance measure near the value specified?	9 0 W	Go to Step 6	Go to Step 3
3	Connect a test light between the fuel pump relay connector terminal 86 and ground. Is the test light on?	-	Go to Step 4	Go to "Diagnostic Aids"
4	Disconnect the electronic control module (ECM) red connector. Is the test light on?	-	Go to Step 5	Go to Step 7
5	1. Repair the short to voltage in the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal A12. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Replace the fuel pump relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
7	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 33 MANIFOLD ABSOLUTE PRESSURE SENSOR HIGH (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The manifold absolute pressure (MAP) sensor responds to changes in the manifold vacuum. The electronic control module (ECM) receives this information as a signal voltage that will vary from about 1.0 to 1.5 volts at closed throttle (idle) to 4.5 to 5.0 volts at wide-open throttle.

DTC 33 Will Set When

- Diagnostic trouble codes (DTCs) 21 and 22 are not set.
- The throttle angle is below 3 percent.
- The MAP sensor signal indicates greater than 98 kPa (29 inches of Hg).
- These conditions are present for 5 seconds.

Diagnostic Aids

- If the connections are OK, monitor the MAP sensor signal voltage while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.
- With the ignition ON and the engine OFF, the MAP sensor pressure is equal to the atmospheric pressure. This information is used by the ECM as an indication of altitude. Comparison of these readings with a known good vehicle with the same MAP sensor is a good way to check the accuracy of a questionable MAP sensor. The readings should be the same within 0.4 volt.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. With the ignition ON and the engine OFF, the MAP sensor is reading atmospheric or barometric pressure. If this reading is below 4 volts, the ECM may prevent the engine from starting.
6. This step checks for a reference voltage and a ground from the ECM.
7. This step is checking the voltage reference and the signal return wire to the ECM. If the ECM recognizes the voltage reference and there is not a problem in the ground side of the circuit, the MAP sensor is faulty.

DTC 33 – Manifold Absolute Pressure Sensor High (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Check the vacuum line from the manifold absolute pressure (MAP) sensor for cracks, leaks, or restrictions. Is the problem found?	-	Go to Step 3	Go to Step 4
3	1. Repair or replace the vacuum line as needed. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
4	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. Does the scan tool show the MAP sensor voltage above the value specified?	4 v	Go to Step 5	Go to Step 6
5	1. Disconnect the vacuum line from the MAP sensor. 2. Apply 68 kPa (20 in. of Hg) of vacuum to the MAP sensor. Does the scan tool show the MAP sensor voltage within the value specified?	1.0-1.5 v	Go to "Diagnostic Aids"	Go to Step 6
6	1. Turn the ignition OFF. 2. Disconnect the MAP sensor connector. 3. Turn the ignition ON. 4. Measure the voltage between MAP sensor connector terminals A and C. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 8
7	Connect a fused jumper between the MAP sensor connector terminals B and C. Does the scan tool show the MAP sensor voltage above the value specified?	4 v	Go to Step 13	Go to Step 11
8	Measure the voltage between the MAP sensor connector terminal C and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 9	Go to Step 10
9	Check for a short to battery voltage in the wire between the MAP sensor connector terminal A and the ECM connector terminal A11. Is the problem found?	-	Go to Step 12	Go to Step 11
10	Check for a short to battery voltage in the wire between the MAP sensor connector terminal C and the electronic control module (ECM) connector terminal B8. Is the problem found?	-	Go to Step 12	Go to Step 14
11	Check for a short to voltage in the wire between the MAP sensor connector terminal B and the ECM connector terminal A7. Is the problem found?	-	Go to Step 12	Go to Step 14

DTC 33 – Manifold Absolute Pressure Sensor High (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
12	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	Go to Step 5
13	1. Replace the MAP sensor. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
14	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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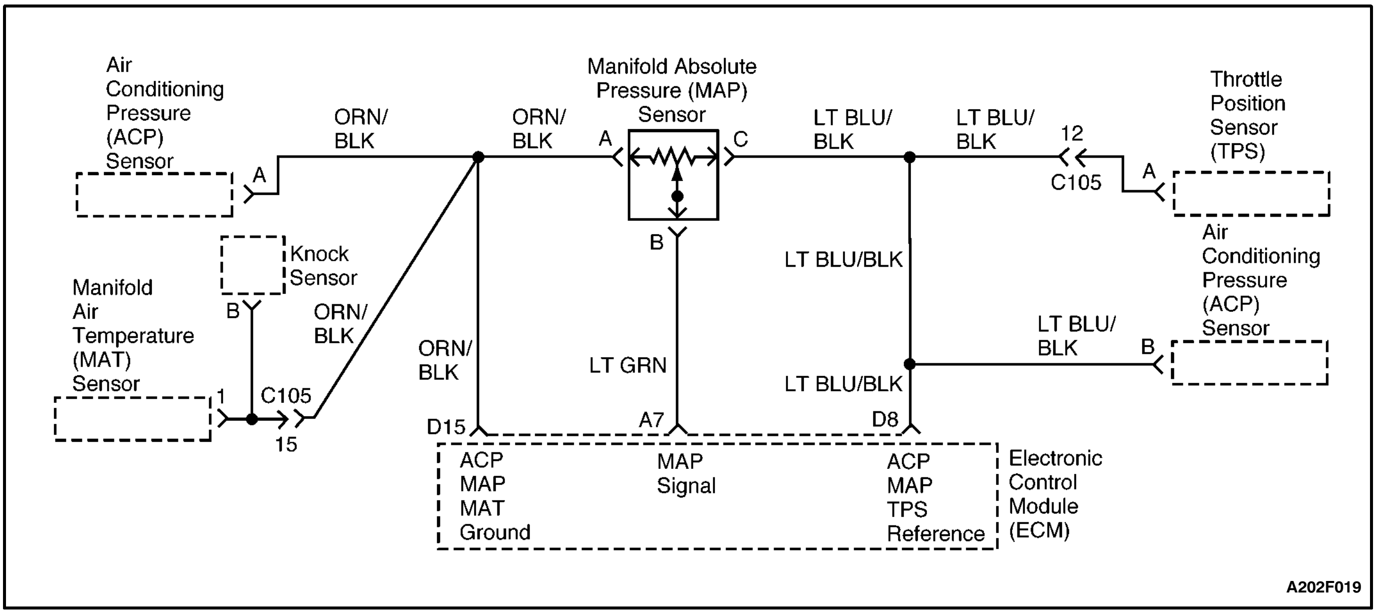

DIAGNOSTIC TROUBLE CODE (DTC) 33 MANIFOLD ABSOLUTE PRESSURE SENSOR HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The manifold absolute pressure (MAP) sensor responds to changes in the manifold vacuum. The electronic control module (ECM) receives this information as a signal voltage that will vary from about 1.0 to 1.5 volts at closed throttle (idle) to 4.5 to 5.0 volts at wide-open throttle.

DTC 33 Will Set When

- Diagnostic trouble codes (DTCs) 21 and 22 are not set.
- The throttle angle is below 5 percent.
- The MAP sensor signal indicates greater than 95 kPa (28 inches of Hg).
- These conditions are present for 5 seconds.

Diagnostic Aids

- If the connections are OK, monitor the MAP sensor signal voltage while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.
- With the ignition ON and the engine OFF, the MAP sensor pressure is equal to the atmospheric pressure. This information is used by the ECM as an indication of altitude. Comparison of these readings with a known good vehicle with the same MAP sensor is a good way to check the accuracy of a questionable MAP sensor. The readings should be the same within 0.4 volt.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. With the ignition ON and the engine OFF, the MAP sensor is reading atmospheric or barometric pressure. If this reading is below 4 volts, the ECM may prevent the engine from starting.
6. This step checks for a reference voltage and a ground from the ECM.
7. This step is checking the voltage reference and the signal return wire to the ECM. If the ECM recognizes the voltage reference and there is not a problem in the ground side of the circuit, the MAP sensor is faulty.

DTC 33 – Manifold Absolute Pressure Sensor High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Check the vacuum line from the manifold absolute pressure (MAP) sensor for cracks, leaks, or restrictions. Is the problem found?	-	Go to Step 3	Go to Step 4
3	1. Repair or replace the vacuum line as needed. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
4	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. Does the scan tool show the MAP sensor voltage above the value specified?	4 v	Go to Step 5	Go to Step 6
5	1. Disconnect the vacuum line from the MAP sensor. 2. Apply 68 kPa (20 in. of Hg) of vacuum to the MAP sensor. Does the scan tool show the MAP sensor voltage within the value specified?	1.0-1.5 v	Go to "Diagnostic Aids"	Go to Step 6
6	1. Turn the ignition OFF. 2. Disconnect the MAP sensor connector. 3. Turn the ignition ON. 4. Measure the voltage between MAP sensor connector terminals A and C. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 8
7	Connect a fused jumper between the MAP sensor connector terminals B and C. Does the scan tool show the MAP sensor voltage above the value specified?	4 v	Go to Step 13	Go to Step 11
8	Measure the voltage between the MAP sensor connector terminal C and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 9	Go to Step 10
9	Check for a short to battery voltage in the wire between the MAP sensor connector terminal A and the ECM connector terminal D15. Is the problem found?	-	Go to Step 12	Go to Step 11
10	Check for a short to battery voltage in the wire between the MAP sensor connector terminal C and the electronic control module (ECM) connector terminal D8. Is the problem found?	-	Go to Step 12	Go to Step 14
11	Check for a short to voltage in the wire between the MAP sensor connector terminal B and the ECM connector terminal A7. Is the problem found?	-	Go to Step 12	Go to Step 14

DTC 33 – Manifold Absolute Pressure Sensor High (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
12	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	Go to Step 5
13	1. Replace the MAP sensor. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
14	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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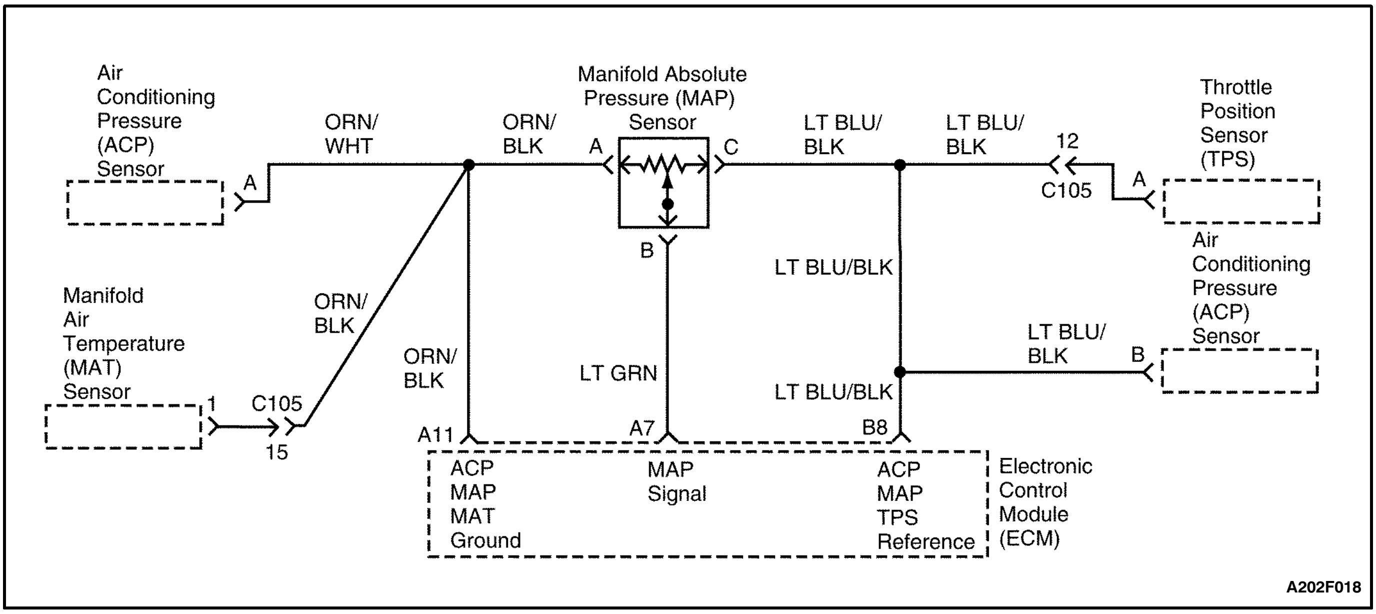

DIAGNOSTIC TROUBLE CODE (DTC) 34 MANIFOLD ABSOLUTE PRESSURE SENSOR LOW (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The manifold absolute pressure (MAP) sensor responds to changes in the manifold vacuum. The electronic control module (ECM) receives this information as a signal voltage that will vary from about 1.0 to 1.5 volts at closed throttle (idle) to 4.5 to 5.0 volts at wide-open throttle.

DTC 34 Will Set When

- Diagnostic trouble codes (DTCs) 21 and 22 are not set.
- The engine speed is less than 1,200 rpm or the engine speed is greater than 1,200 rpm and the throttle angle is greater than 15 percent.
- The MAP sensor signal voltage indicates less the 15 kPa (4.5 inches of Hg).
- These conditions have been present for 0.125 second.

Diagnostic Aids

- If the connections are OK, monitor the MAP sensor signal voltage while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.
- With the ignition ON and the engine OFF, the MAP sensor pressure is equal to the atmospheric pressure. This information is used by the ECM as an indication of altitude. Comparison of these readings with a known good vehicle with the same MAP sensor is a good way to check the accuracy of a questionable MAP sensor. The readings should be the same within 0.4 volt.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. With the ignition ON and the engine OFF, the MAP sensor is reading atmospheric or barometric pressure. If this reading is below 4 volts, the ECM may prevent the engine from starting.
4. This step checks for a reference voltage and a ground from the ECM.
5. This step is checking the voltage reference and the signal return wire to the ECM. If the ECM recognizes the voltage reference and there is not a problem in the ground side of the circuit, the MAP sensor is faulty.

DTC 34 – Manifold Absolute Pressure Sensor Low (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. Does the scan tool show the manifold absolute pressure (MAP) sensor voltage above the value specified?	4 v	Go to Step 3	Go to Step 4
3	1. Disconnect the vacuum line from the MAP sensor. 2. Apply 68 kPa (20 in. of Hg) of vacuum to the MAP sensor. Does the scan tool show the MAP sensor voltage within the value specified?	1.0-1.5 v	Go to “Diagnostic Aids”	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the MAP sensor connector. 3. Turn the ignition ON. 4. Measure the voltage between the MAP sensor connector terminals A and C. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 5	Go to Step 6
5	Connect a fused jumper between the MAP sensor connector terminals B and C. Does the scan tool show the MAP sensor voltage above the value specified?	4 v	Go to Step 11	Go to Step 9
6	Measure the voltage between the MAP sensor connector terminal C and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Check for an open wire between the MAP sensor connector terminal A and the electronic control module (ECM) connector terminal A11. Is the problem found?	-	Go to Step 10	Go to Step 12
8	1. Turn the ignition OFF. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal C and the ECM connector terminal B8. Is the problem found?	-	Go to Step 10	Go to Step 12
9	1. Turn the ignition OFF. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal B and the ECM connector terminal A7. Is the problem found?	-	Go to Step 10	Go to Step 12
10	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 34 – Manifold Absolute Pressure Sensor Low (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Replace the MAP sensor. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
12	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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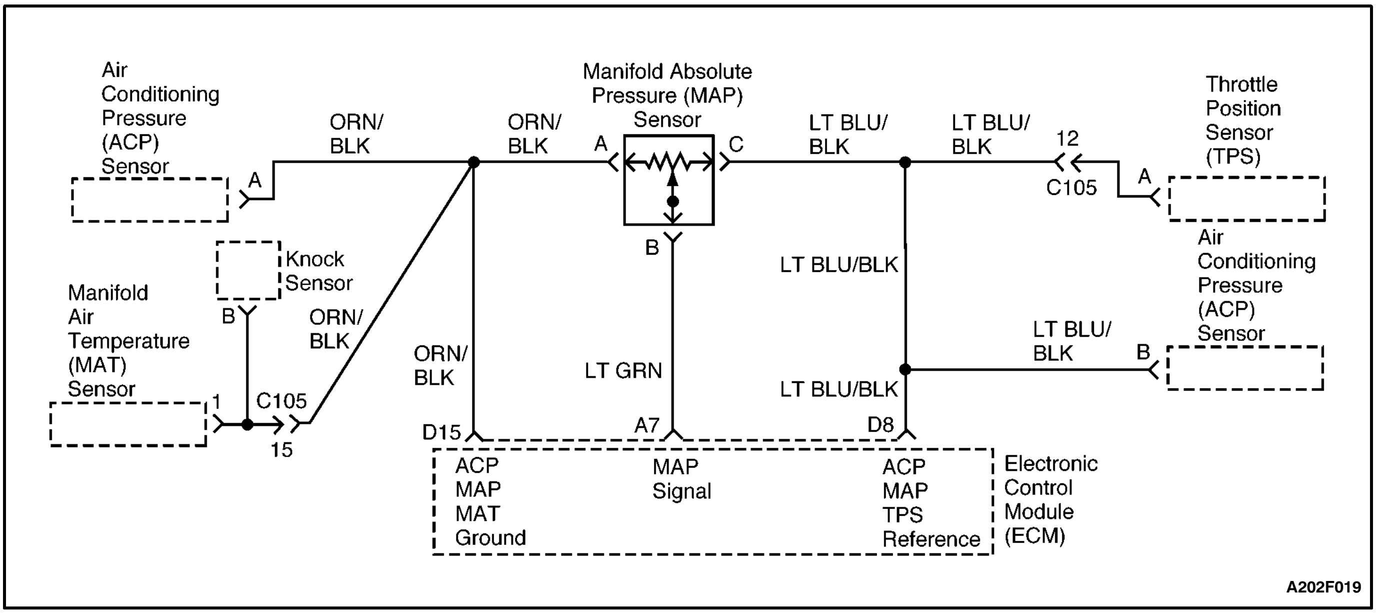

DIAGNOSTIC TROUBLE CODE (DTC) 34 MANIFOLD ABSOLUTE PRESSURE SENSOR LOW (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The manifold absolute pressure (MAP) sensor responds to changes in the manifold vacuum. The electronic control module (ECM) receives this information as a signal voltage that will vary from about 1.0 to 1.5 volts at closed throttle (idle) to 4.5 to 5.0 volts at wide-open throttle.

DTC 34 Will Set When

- Diagnostic trouble codes (DTCs) 21 and 22 are not set.
- The engine speed is less than 1,050 rpm or the engine speed is greater than 1,050 rpm and the throttle angle is greater than 19 percent.
- The MAP sensor signal voltage indicates less than 14 kPa (4.0 inches of Hg).
- These conditions have been present for 1 second.

Diagnostic Aids

- If the connections are OK, monitor the MAP sensor signal voltage while moving related connectors and the wiring harness. If the failure is induced, the display on the scan tool will change. This may help to isolate the location of an intermittent malfunction.
- With the ignition ON and the engine OFF, the MAP sensor pressure is equal to the atmospheric pressure. This information is used by the ECM as an indication of altitude. Comparison of these readings with a known good vehicle with the same MAP sensor is a good way to check the accuracy of a questionable MAP sensor. The readings should be the same within 0.4 volt.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. With the ignition ON and the engine OFF, the MAP sensor is reading atmospheric or barometric pressure. If this reading is below 4 volts, the ECM may prevent the engine from starting.
4. This step checks for a reference voltage and a ground from the ECM.
5. This step is checking the voltage reference and the signal return wire to the ECM. If the ECM recognizes the voltage reference and there is not a problem in the ground side of the circuit, the MAP sensor is faulty.

DTC 34 – Manifold Absolute Pressure Sensor Low (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Turn the ignition ON. Does the scan tool show the manifold absolute pressure (MAP) sensor voltage above the value specified?	4 v	Go to Step 3	Go to Step 4
3	1. Disconnect the vacuum line from the MAP sensor. 2. Apply 68 kPa (20 in. of Hg) of vacuum to the MAP sensor. Does the scan tool show the MAP sensor voltage within the value specified?	1.0-1.5 v	Go to "Diagnostic Aids"	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the MAP sensor connector. 3. Turn the ignition ON. 4. Measure the voltage between the MAP sensor connector terminals A and C. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 5	Go to Step 6
5	Connect a fused jumper between the MAP sensor connector terminals B and C. Does the scan tool show the MAP sensor voltage above the value specified?	4 v	Go to Step 11	Go to Step 9
6	Measure the voltage between the MAP sensor connector terminal C and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Check for an open wire between the MAP sensor connector terminal A and the electronic control module (ECM) connector terminal D15. Is the problem found?	-	Go to Step 10	Go to Step 12
8	1. Turn the ignition OFF. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal C and the ECM connector terminal D8. Is the problem found?	-	Go to Step 10	Go to Step 12
9	1. Turn the ignition OFF. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal B and the ECM connector terminal A7. Is the problem found?	-	Go to Step 10	Go to Step 12
10	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DTC 34 – Manifold Absolute Pressure Sensor Low (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
11	1. Replace the MAP sensor. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
12	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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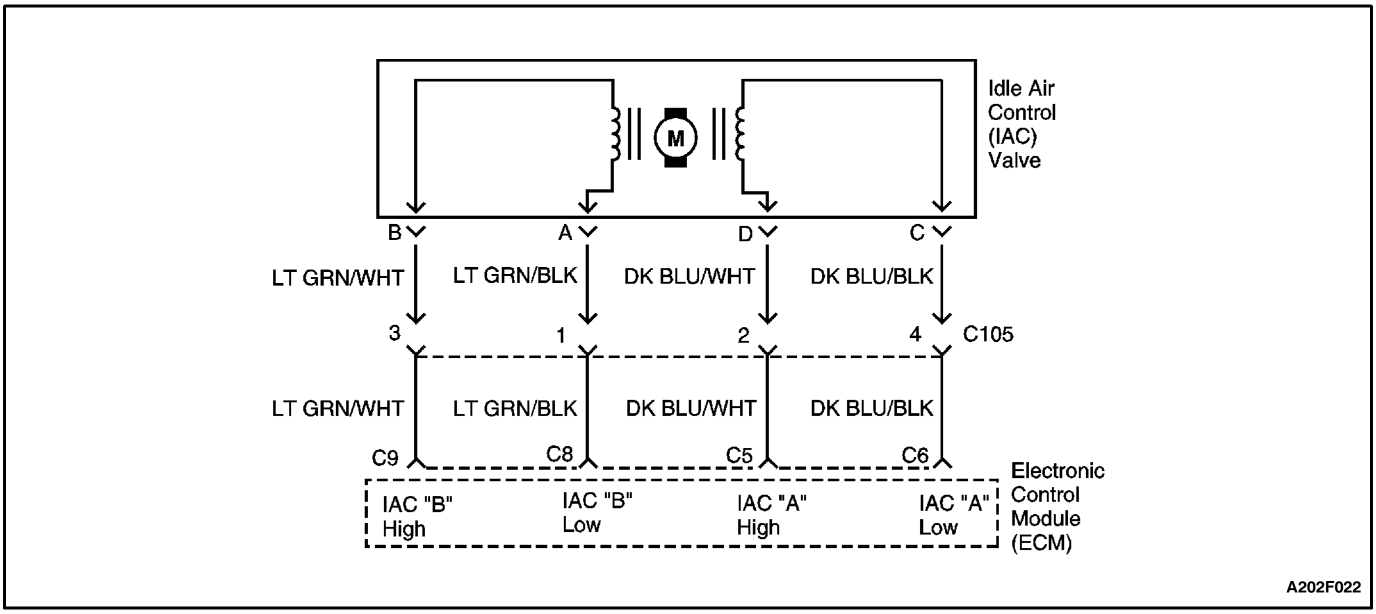

DIAGNOSTIC TROUBLE CODE (DTC) 35
IDLE AIR CONTROL ERROR (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The electronic control module (ECM) controls the idle speed to a calculated rpm based on inputs and the actual engine rpm. This is determined by the ignition reference pulses received by the ECM from the crankshaft position sensor. The ECM uses four circuits to move the idle air control (IAC) valve. The IAC valve allows varying amounts of air to flow into the intake manifold, controlling the idle speed.

DTC 35 Will Set When

- Diagnostic trouble codes (DTCs) 21, 22, and 24 are not set.
- The throttle is closed.
- The engine speed is 150 rpm above or below the commanded idle speed for 30 seconds.

Diagnostic Aids

- Inspect for vacuum leaks, unconnected or brittle vacuum hoses, cuts, etc.
- Inspect the intake manifold and the throttle body gaskets for proper sealing.
- An IAC valve which does not respond to the ECM, an incorrect base idle adjustment, a damaged throttle body, or damage to the throttle body linkage could create the conditions for setting DTC 35.

DTC 35 – Idle Air Control Error (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Connect the scan tool to the assembly line diagnostic link (ALDL). 3. Monitor the engine rpm. 4. Disconnect the idle air control (IAC) valve connector. 5. Connect the IAC driver to the IAC valve. 6. Start the engine. Allow the engine to idle in park (P), or neutral (N) for the manual transaxle, with the air conditioning (A/C) off and the parking brake applied. 7. Using the IAC driver, extend and retract the IAC valve. Does the rpm change as the IAC driver is cycled?	-	Go to Step 5	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the IAC driver from the IAC valve. 3. Remove the IAC valve from the throttle body. 4. Inspect the IAC passages for restrictions. Are the IAC passages restricted?	-	Go to Step 4	Go to Step 14
4	1. Clean the IAC passages. 2. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 3. Perform the IAC valve reset procedure. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
5	Cycle the IAC driver while monitoring the engine rpm. Does the rpm change smoothly within the value specified with each flash of the IAC driver?	700-1500 rpm	Go to Step 6	Go to Step 3
6	1. Turn the ignition OFF. 2. Connect the IAC node light to the IAC connector. 3. Start the engine and cycle the IAC driver. Do both lights of the IAC node light cycle red and green but never turn off as the rpm is changed using the IAC driver?	-	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Disconnect the IAC driver from the IAC valve. 3. Measure the resistance between IAC terminals A and B, then C and D. Is the resistance within the value specified?	40-80 W	Go to Step 8	Go to Step 14
8	Measure the resistance between IAC terminals B and C, then A and D. Does the resistance match the specified value?	R	Go to “Diagnostic Aids”	Go to Step 14
9	1. Turn the ignition OFF. 2. Disconnect the IAC node light from the IAC valve connector. 3. Check for faulty connector terminals. Is the problem found?	-	Go to Step 13	Go to Step 10

DTC 35 – Idle Air Control Error (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
10	Check for any open circuits or open connections between the IAC valve connector terminals and the ECM. Is the problem found?	-	Go to Step 13	Go to Step 11
11	Check for a short to ground between the IAC valve connector terminals and the ECM. Is the problem found?	-	Go to Step 13	Go to Step 12
12	1. Turn the ignition ON. 2. Check for a short to voltage between the IAC valve connector terminals and the ECM. Is the problem found?	-	Go to Step 13	Go to Step 15
13	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any DTCs from the ECM. 4. Perform the IAC valve reset procedure. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
14	1. Replace the IAC valve. 2. Clear any DTCs from the ECM. 3. Perform the IAC valve reset procedure. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
15	1. Replace the ECM. 2. Clear any DTCs from the ECM. 3. Perform the IAC valve reset procedure. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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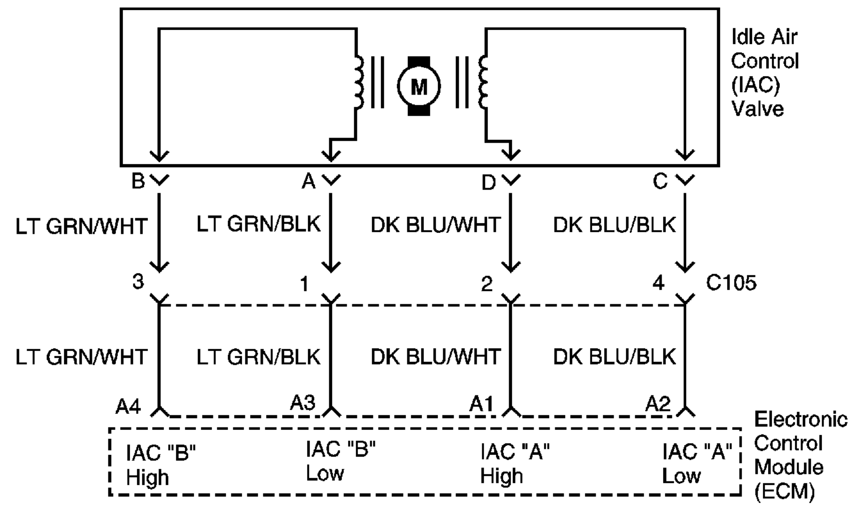

DIAGNOSTIC TROUBLE CODE (DTC) 35
IDLE AIR CONTROL ERROR (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) controls the idle speed to a calculated rpm based on inputs and the actual engine rpm. This is determined by the ignition reference pulses received by the ECM from the crankshaft position sensor. The ECM uses four circuits to move the idle air control (IAC) valve. The IAC valve allows varying amounts of air to flow into the intake manifold, controlling the idle speed.

DTC 35 Will Set When

- Diagnostic trouble codes (DTCs) 21, 22 and 24 are not set.
- The throttle is closed.
- Rpm error (RPMVAR) is 175 rpm above or below the commanded idle speed for more than 20 seconds.

Diagnostic Aids

- Inspect for vacuum leaks, unconnected or brittle vacuum hoses, cuts, etc.
- Inspect the intake manifold and the throttle body gaskets for proper sealing.
- An IAC valve which does not respond to the ECM, an incorrect base idle adjustment, a damaged throttle body, or damage to the throttle body linkage could create the conditions for setting DTC 35.

DTC 35 – Idle Air Control Error (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Connect the scan tool to the assembly line diagnostic link (ALDL). 3. Monitor the engine rpm. 4. Disconnect the idle air control (IAC) valve connector. 5. Connect the IAC driver to the IAC valve. 6. Start the engine. Allow the engine to idle in park (P), or neutral (N) for the manual transaxle, with the air conditioning (A/C) off and the parking brake applied. 7. Using the IAC driver, extend and retract the IAC valve. Does the rpm change as the IAC driver is cycled?	-	Go to Step 5	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the IAC driver from the IAC valve. 3. Remove the IAC valve from the throttle body. 4. Inspect the IAC passages for restrictions. Are the IAC passages restricted?	-	Go to Step 4	Go to Step 14
4	1. Clean the IAC passages. 2. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 3. Perform the IAC valve reset procedure. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
5	Cycle the IAC driver while monitoring the engine rpm. Does the rpm change smoothly within the value specified with each flash of the IAC driver?	700-1500 rpm	Go to Step 6	Go to Step 3
6	1. Turn the ignition OFF. 2. Connect the IAC node light to the IAC connector. 3. Start the engine and cycle the IAC driver. Do both lights of the IAC node light cycle red and green but never turn off as the rpm is changed using the IAC driver?	-	Go to Step 7	Go to Step 9
7	1. Turn the ignition OFF. 2. Disconnect the IAC driver from the IAC valve. 3. Measure the resistance between IAC terminals A and B, then C and D. Is the resistance within the value specified?	40-80 W	Go to Step 8	Go to Step 14
8	Measure the resistance between IAC terminals B and C, then A and D. Does the resistance match the specified value?	R	Go to "Diagnostic Aids"	Go to Step 14
9	1. Turn the ignition OFF. 2. Disconnect the IAC node light from the IAC valve connector. 3. Check for faulty connector terminals. Is the problem found?	-	Go to Step 13	Go to Step 10

DTC 35 – Idle Air Control Error (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
10	Check for any open circuits or open connections between the IAC valve connector terminals and the ECM. Is the problem found?	-	Go to Step 13	Go to Step 11
11	Check for a short to ground between the IAC valve connector terminals and the ECM. Is the problem found?	-	Go to Step 13	Go to Step 12
12	1. Turn the ignition ON. 2. Check for a short to voltage between the IAC valve connector terminals and the ECM. Is the problem found?	-	Go to Step 13	Go to Step 15
13	1. Turn the ignition OFF. 2. Repair the wire or the connector terminal as needed. 3. Clear any DTCs from the ECM. 4. Perform the IAC valve reset procedure. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
14	1. Replace the IAC valve. 2. Clear any DTCs from the ECM. 3. Perform the IAC valve reset procedure. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
15	1. Replace the ECM. 2. Clear any DTCs from the ECM. 3. Perform the IAC valve reset procedure. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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DIAGNOSTIC TROUBLE CODE (DTC) 36
EXHAUST GAS RECIRCULATION ERROR (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

A properly operating exhaust gas recirculation (EGR) system will directly affect the air/fuel requirements of the engine. Since the exhaust gas introduced into the air/ fuel mixture cannot be used in combustion due to the lack of oxygen in the exhaust gas, less fuel is needed to maintain a correct air/fuel ratio. If the EGR system were to fail in a closed position, the exhaust gas would be replaced with air and the air/fuel mixture would be leaner. The electronic control module (ECM) would compensate for the lean condition by adding fuel, resulting in higher long term fuel trim values.

DTC 36 Will Set When

- The EGR valve is installed.
- Barometric pressure is above 90.0 kPa (26.65 inches Hg).
- Diagnostic trouble codes (DTCs) 21, 22, and 34 are not set.
- The engine coolant temperature is above 75°C (167°F).
- The long term fuel trim values are above 151 when the manifold absolute pressure (MAP) sensor indicates greater than 85 kPa (25.17 inches Hg) in open throttle.
- There is no vehicle speed present and the difference between the long term fuel trim values in open throttle and closed throttle is above 20.
- All conditions present for at least 60 seconds.

Diagnostic Aids

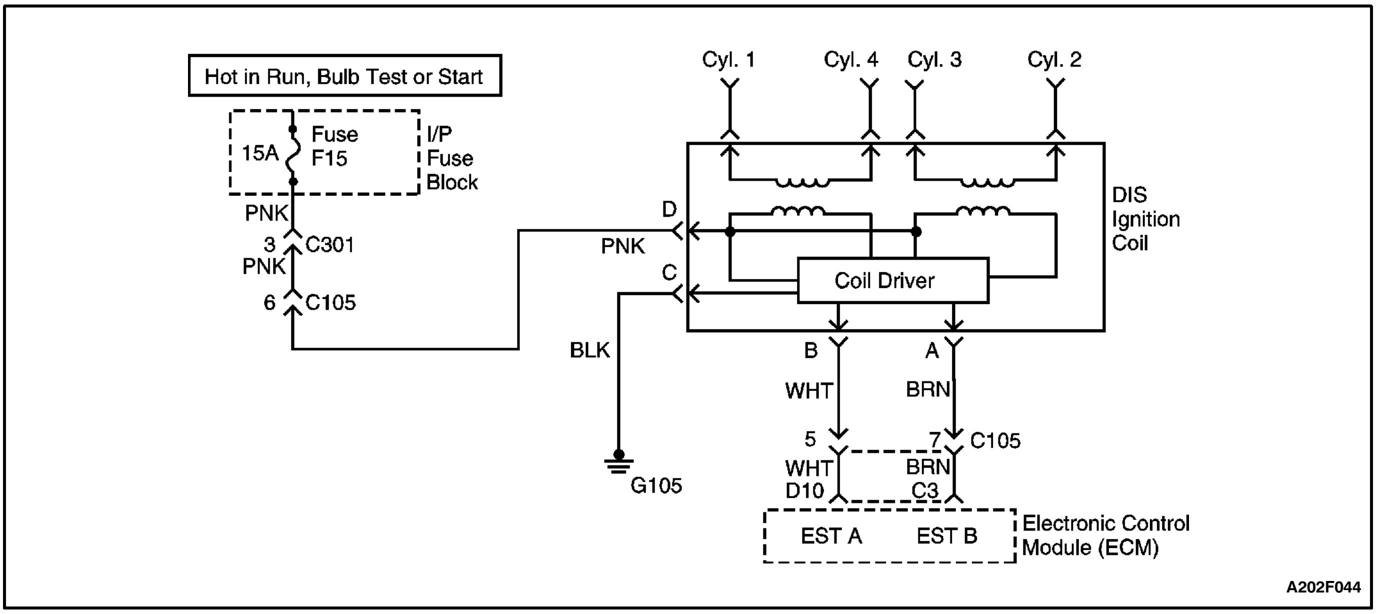
- The DTC 36 table is a functional check of the EGR system. If the EGR system is operating properly but a DTC 36 has been set, check other items that could result in high long term fuel trim values above idle.
- It is very common for the EGR valve spring to weaken over an extended period of time. As the EGR valve spring becomes weak, the EGR valve is allowed to open prematurely and excessively, causing excessive EGR flow. This can create the conditions needed to set the DTC 36.
- Check for restricted or blocked EGR passages.
- Perform a MAP sensor output check.
- Perform an injector balance test to determine if a restricted fuel injector may be causing the lean running condition.
- Vacuum or crankcase leaks will cause a lean running condition.

DTC 36 – Exhaust Gas Recirculation Error (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	Inspect for looseness of the exhaust gas recirculation (EGR) valve by grasping the valve and trying to rotate it in both directions. Is there looseness in the EGR valve?	-	Go to Step 10	Go to Step 3
3	1. Disconnect the vacuum hose from the EGR valve. 2. Apply the specified value of vacuum to the EGR valve vacuum port. 3. Note the EGR valve diaphragm movement. Does the EGR valve diaphragm move?	33.77 kPa (10 in. Hg)	Go to Step 4	Go to Step 10
4	1. Disconnect the vacuum hose from the EGR valve. 2. Apply the specified value of vacuum to the EGR valve vacuum port. Does the EGR valve hold the vacuum?	33.77 kPa (10 in. Hg)	Go to Step 5	Go to Step 10

DTC 36 – Exhaust Gas Recirculation Error (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
5	1. Place the transaxle in park (P) or neutral (N). 2. Run the warm engine at idle. 3. Push on the under side of the EGR valve diaphragm. Does the engine rpm decrease or does the engine stall?	-	Go to Step 6	Go to Step 11
6	1. Increase the engine rpm from idle to 2,000 rpm. 2. Note the EGR valve diaphragm movement. Does the EGR valve diaphragm move?	-	Go to "Diagnostic Aids"	Go to Step 7
7	1. Turn the ignition OFF. 2. Connect a vacuum gauge directly to the EGR valve vacuum source. 3. Start the engine. 4. Increase the engine rpm from idle to 2,000 rpm. 5. Note the vacuum gauge reading. Does the vacuum gauge read above the specified value?	20 kPa (6 in. Hg)	Go to Step 8	Go to Step 9
8	1. Turn the ignition OFF. 2. Check the EGR valve vacuum hose for a restriction or a leak. Is the repair complete?	-	System OK	-
9	1. Turn the ignition OFF. 2. Clean the EGR valve vacuum source at the throttle body vacuum port. Is the repair complete?	-	System OK	-
10	Replace the EGR valve. Is the repair complete?	-	System OK	-
11	1. Turn the ignition OFF. 2. Remove the EGR valve. 3. Inspect the EGR passages of the intake manifold for a restriction. Is the problem found?	-	Go to Step 12	Go to "Diagnostic Aids"
12	1. Clean the EGR passages of the intake manifold. 2. Clean the EGR valve passages. 3. Install the EGR valve. 4. Place the transaxle in park (P) or neutral (N). 5. Run the warm engine at idle. 6. Push on the under side of the EGR valve diaphragm. Does the engine rpm decrease or does the engine stall?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 41 ELECTRONIC SPARK TIMING "B" SHORTED TO BATTERY (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 41 Will Set When

- The ECM receives voltage greater than 12 volts through the EST "B" line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 10 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If the connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

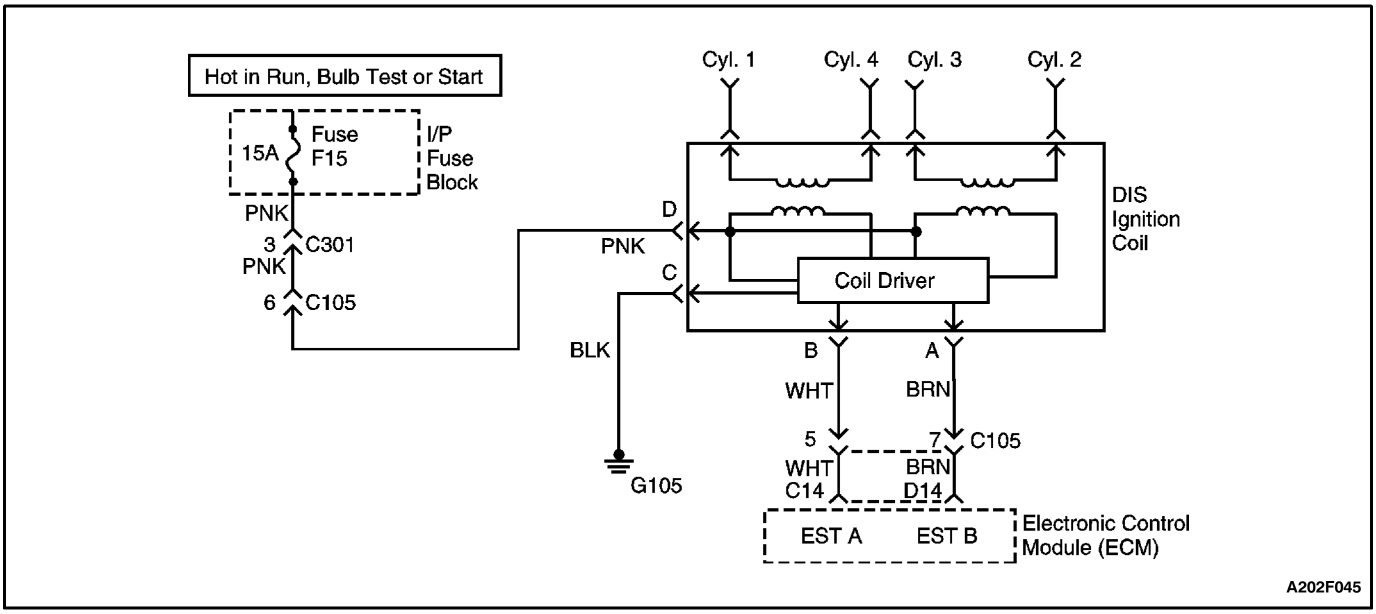
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST "B" and the ground from the ECM.
6. A short to voltage that is intermittent may be at fault in the EST "B" wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 41 – Electronic Spark Timing "B" Shorted to Battery (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	-	Go to Step 9	Go to Step 3
3	1. Measure the voltage between terminal A and terminal C of the DIS ignition coil connector. 2. Crank the engine. Does the voltage fluctuate within the value specified?	0.2-2.0 v	Go to Step 10	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at the ECM connector terminal C3 or near terminal C3. Is the problem found?	-	Go to Step 9	Go to Step 5
5	1. Turn the ignition ON. 2. Measure the voltage at the DIS ignition coil connector terminal A. Is any voltage present?	-	Go to Step 7	Go to Step 6
6	Measure the voltage at the DIS ignition coil connector terminal A while moving the connectors and the wiring harness of the ignition circuit. Is any voltage present?	-	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Repair the short to voltage between the DIS ignition coil connector terminal A and the ECM connector terminal C3. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	1. Turn the ignition OFF. 2. Check the wires and harnesses of the ignition circuit for any damage that could cause an intermittent short to voltage. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 41 ELECTRONIC SPARK TIMING "B" SHORTED TO BATTERY (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 41 Will Set When

- The ECM receives voltage greater than 12 volts through the EST "B" line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 6 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If the connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

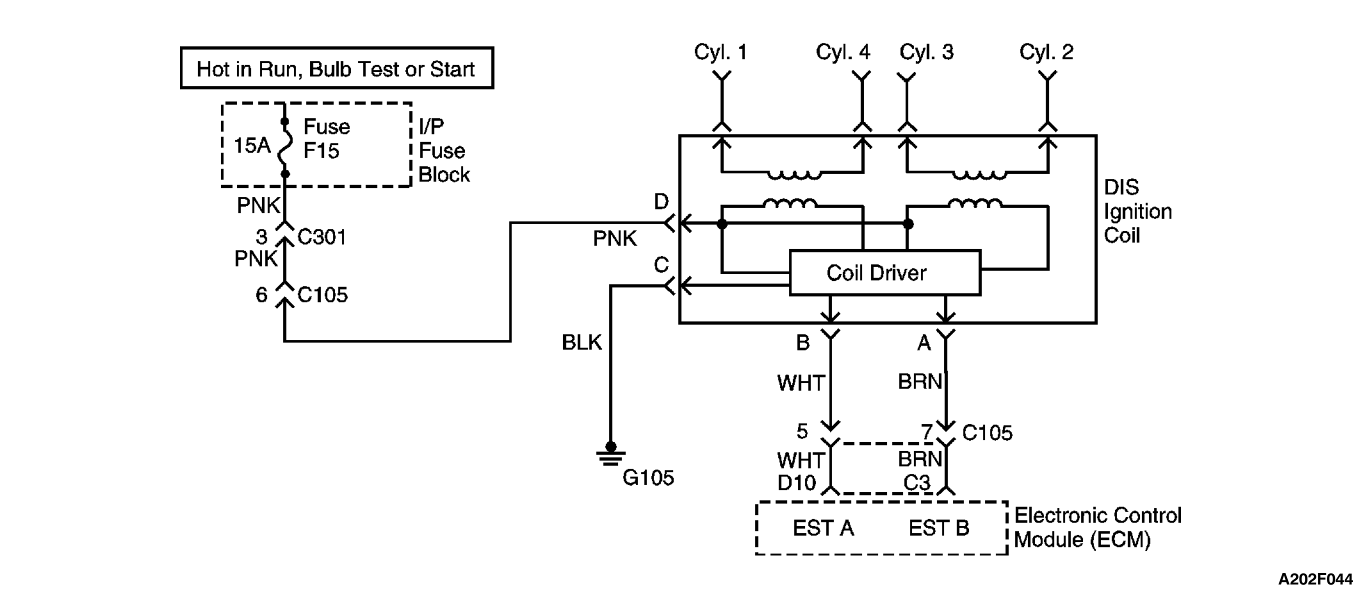
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST "B" and the ground from the ECM.
6. A short to voltage that is intermittent may be at fault in the EST "B" wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 41 – Electronic Spark Timing "B" Shorted to Battery (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	-	Go to Step 9	Go to Step 3
3	1. Measure the voltage between terminal A and terminal C of the DIS ignition coil connector. 2. Crank the engine. Does the voltage fluctuate within the value specified?	0.2-2.0 v	Go to Step 10	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at the ECM connector terminal D14 or near terminal D14. Is the problem found?	-	Go to Step 9	Go to Step 5
5	1. Turn the ignition ON. 2. Measure the voltage at the DIS ignition coil connector terminal A. Is any voltage present?	-	Go to Step 7	Go to Step 6
6	Measure the voltage at the DIS ignition coil connector terminal A while moving the connectors and the wiring harness of the ignition circuit. Is any voltage present?	-	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Repair the short to voltage between the DIS ignition coil connector terminal A and the ECM connector terminal D14. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	1. Turn the ignition OFF. 2. Check the wires and harnesses of the ignition circuit for any damage that could cause an intermittent short to voltage. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 42 ELECTRONIC SPARK TIMING "A" SHORTED TO BATTERY (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 42 Will Set When

- The ECM receives voltage greater than 12 volts through the EST "A" line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 10 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If the connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

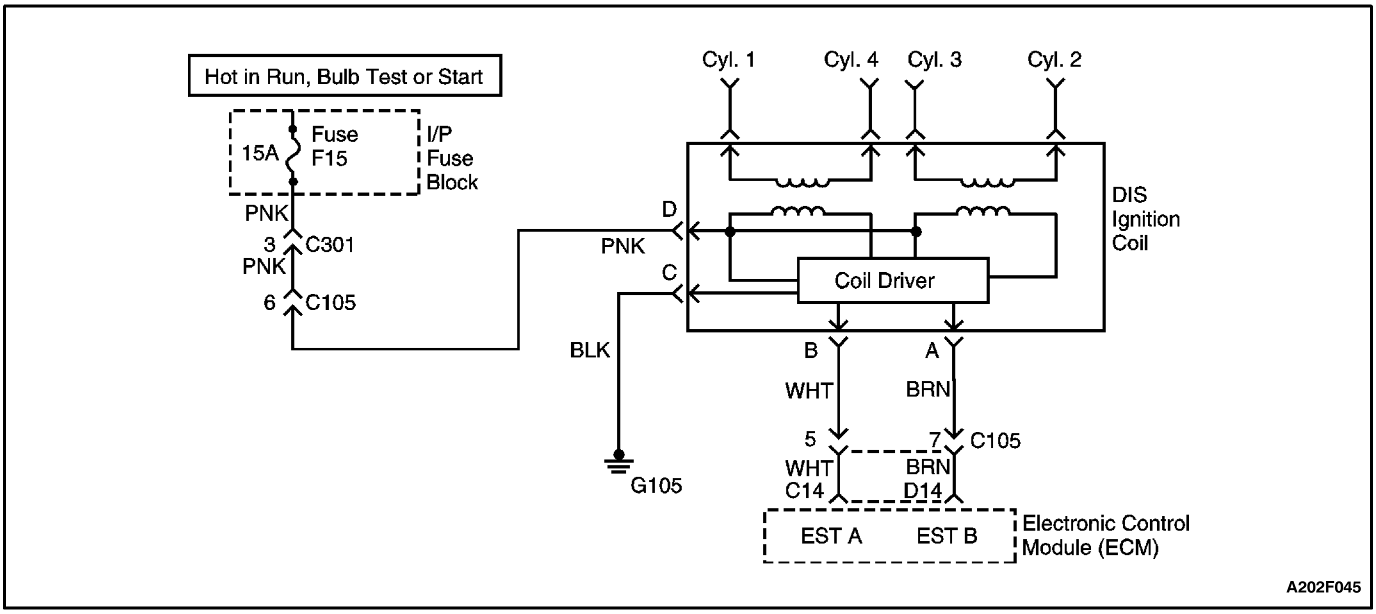
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST "A" and the ground from the ECM.
6. A short to voltage that is intermittent may be at fault in the EST "A" wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 42 – Electronic Spark Timing “A” Shorted to Battery (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	-	Go to Step 9	Go to Step 3
3	1. Measure the voltage between terminal B and terminal C of the DIS ignition coil connector. 2. Crank the engine. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 10	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at the ECM connector terminal D10 or near terminal D10. Is the problem found?	-	Go to Step 9	Go to Step 5
5	1. Turn the ignition ON. 2. Measure the voltage at the DIS ignition coil connector terminal B. Is any voltage present?	-	Go to Step 7	Go to Step 6
6	Measure the voltage at the DIS ignition coil connector terminal B while moving the connectors and the wiring harness of the ignition circuit. Is any voltage present?	-	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Repair the short to voltage between the DIS ignition coil connector terminal B and the ECM connector terminal D10. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	1. Turn the ignition OFF. 2. Check the wires and the harnesses of the ignition circuit for any damage that could cause an intermittent short to voltage. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 42
ELECTRONIC SPARK TIMING "A" SHORTED TO BATTERY
(1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 42 Will Set When

- The ECM receives voltage greater than 12 volts through the EST "A" line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 6 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If the connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

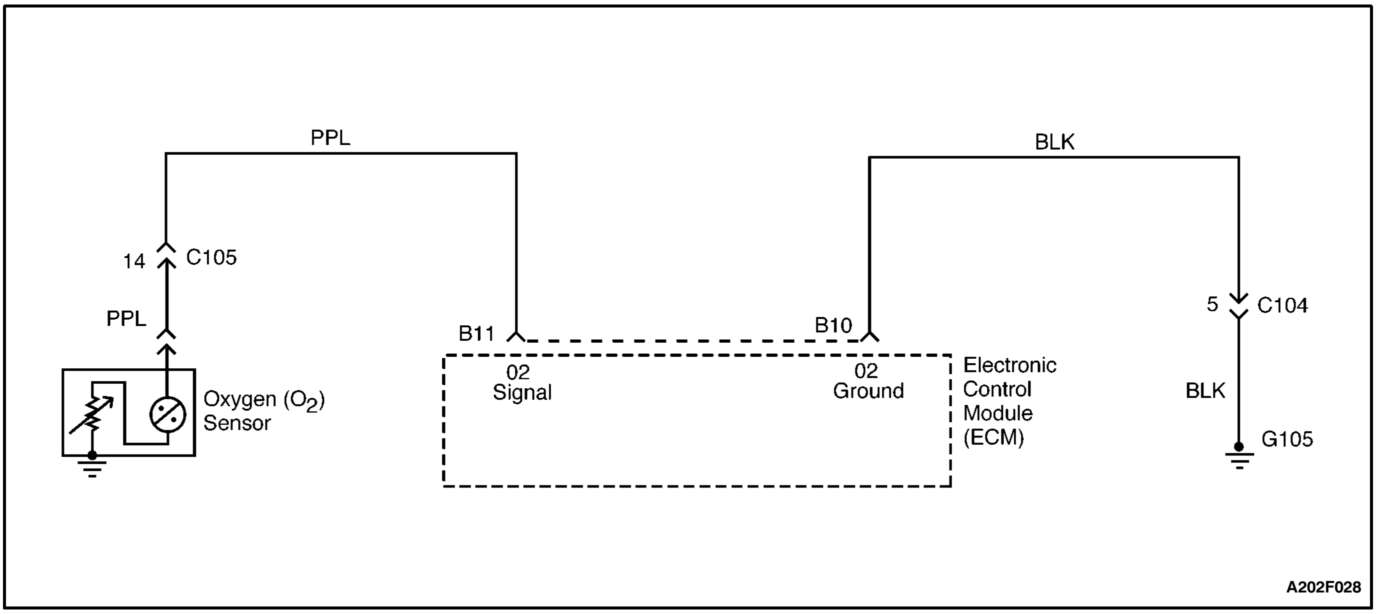
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST "A" and the ground from the ECM.
6. A short to voltage that is intermittent may be at fault in the EST "A" wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 42 – Electronic Spark Timing "A" Shorted to Battery (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	–	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	–	Go to Step 9	Go to Step 3
3	1. Measure the voltage between terminal B and terminal C of the DIS ignition coil connector. 2. Crank the engine. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 10	Go to Step 4
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at the ECM connector terminal C14 or near terminal C14. Is the problem found?	–	Go to Step 9	Go to Step 5
5	1. Turn the ignition ON. 2. Measure the voltage at the DIS ignition coil connector terminal B. Is any voltage present?	–	Go to Step 7	Go to Step 6
6	Measure the voltage at the DIS ignition coil connector terminal B while moving the connectors and the wiring harness of the ignition circuit. Is any voltage present?	–	Go to Step 7	Go to Step 8
7	1. Turn the ignition OFF. 2. Repair the short to voltage between the DIS ignition coil connector terminal B and the ECM connector terminal C14. 3. Clear any diagnostic trouble codes (DTCs) from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Turn the ignition OFF. 2. Check the wires and the harnesses of the ignition circuit for any damage that could cause an intermittent short to voltage. Is the problem found?	–	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–



DIAGNOSTIC TROUBLE CODE (DTC) 44
OXYGEN SENSOR LEAN (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The electronic control module (ECM) supplies a voltage of about 450 millivolts between the ECM terminals B11 and B10. The oxygen (O_2) sensor varies the voltage within a range of about 1 volt if the exhaust is rich, down to about 100 millivolts if the exhaust is lean. The O_2 sensor is like an open circuit and produces no voltage when it is below 360°C (680°F). An open O_2 sensor circuit or a cold O_2 sensor causes "open loop" operation.

DTC 44 Will Set When

- The engine has been running for at least 50 seconds.
- Diagnostic trouble codes (DTCs) 21, 22, 33, and 34 are not set.
- The throttle angle is above 5 percent.
- The coolant temperature is above 80°C (176°F).
- The engine controls system is in closed loop.
- The O_2 sensor voltage is below 200 millivolts for at least 30 seconds.

Diagnostic Aids

- Normal scan tool voltage varies between 100 millivolts and 999 millivolts while in closed loop.
- Inspect the O_2 sensor wire. The O_2 sensor pigtail may be positioned incorrectly and contacting the exhaust manifold.
- Check for an intermittent ground in the wire between the O_2 sensor and the ECM.
- Perform an injector balance test to determine if a restricted fuel injector may be causing the lean running condition.
- Vacuum or crankcase leaks will cause a lean running condition.
- An exhaust manifold gasket leak or a cracked exhaust manifold may cause outside air to be pulled into the exhaust and past the sensor.

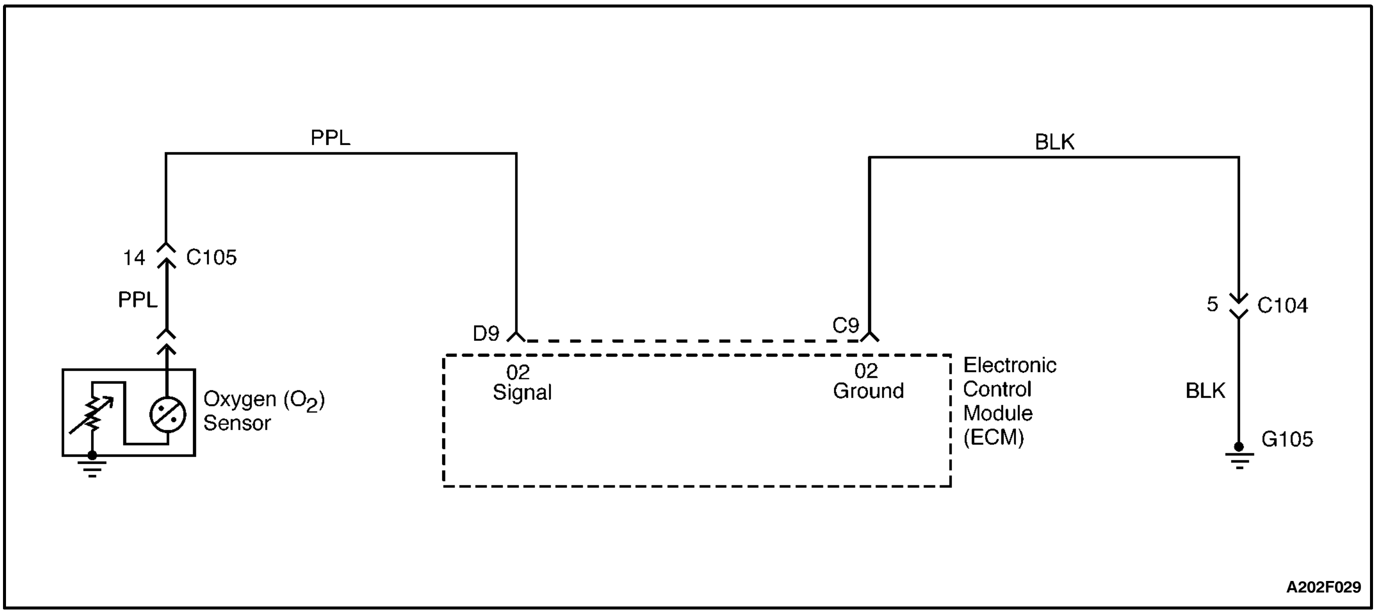
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. Running the engine at 1,200 rpm keeps the O_2 sensor hot so an accurate display voltage can be maintained.
4. If the O_2 sensor voltage stays fixed below 350 millivolts after disconnecting the O_2 sensor, there is either a short to ground in the O_2 sensor wire to the ECM or a faulty ECM.

DTC 44 – Oxygen Sensor Lean (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. 3. Run the engine at 1,200 rpm. Does the scan tool read the oxygen (O_2) sensor voltage fixed below the value specified?	220 mv	Go to Step 3	Go to "Diagnostic Aids"
3	1. Disconnect the O_2 sensor connector. 2. Run the warm engine at idle. Does the scan tool read O_2 sensor voltage within the value specified?	350-550 mv	Go to "Diagnostic Aids"	Go to Step 4
4	1. Turn the ignition OFF. 2. Check the O_2 sensor signal wire between the O_2 sensor and electronic control module (ECM) connector terminal B11 for a short to ground. Is the problem found?	-	Go to Step 5	Go to Step 6
5	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Replace the ECM. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 44
OXYGEN SENSOR LEAN (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) supplies a voltage of about 450 millivolts between the ECM terminals D9 and C9. The oxygen (O_2) sensor varies the voltage within a range of about 1 volt if the exhaust is rich, down to about 100 millivolts if the exhaust is lean. The O_2 sensor is like an open circuit and produces no voltage when it is below 360°C (680°F). An open O_2 sensor circuit or a cold O_2 sensor causes "open loop" operation.

DTC 44 Will Set When

- The engine has been running for at least 60 seconds.
- Diagnostic trouble codes (DTCs) 21, 22, 33, and 34 are not set.
- The throttle angle is above 5 percent.
- The coolant temperature is above 70°C (158°F).
- The engine controls system is in closed loop.
- The O_2 sensor voltage is below 274 millivolts.
- The conditions are present for 40 seconds.

Diagnostic Aids

- Normal scan tool voltage varies between 100 millivolts and 999 millivolts while in closed loop.
- Inspect the O_2 sensor wire. The O_2 sensor pigtail may be positioned incorrectly and contacting the exhaust manifold.
- Check for an intermittent ground in the wire between the O_2 sensor and the ECM.
- Perform an injector balance test to determine if a restricted fuel injector may be causing the lean running condition.
- Vacuum or crankcase leaks will cause a lean running condition.
- An exhaust manifold gasket leak or a cracked exhaust manifold may cause outside air to be pulled into the exhaust and past the sensor.

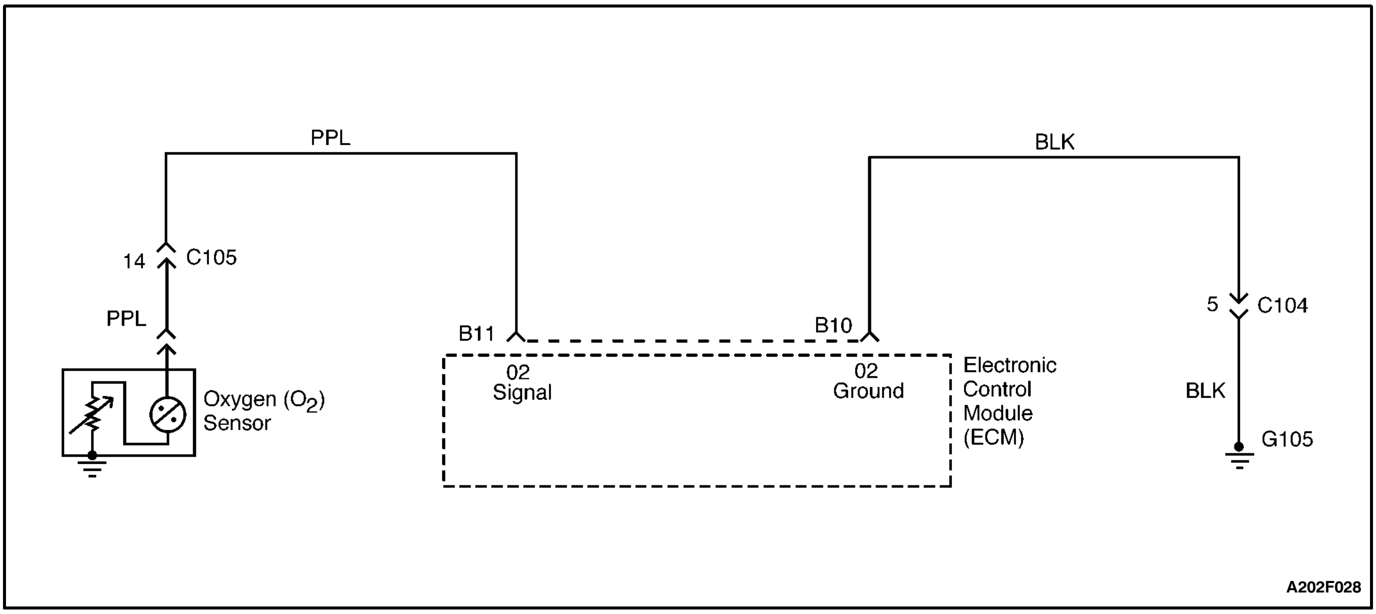
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. Running the engine at 1,200 rpm keeps the O_2 sensor hot so an accurate display voltage can be maintained.
4. If the O_2 sensor voltage stays fixed below 350 millivolts after disconnecting the O_2 sensor, there is either a short to ground in the O_2 sensor wire to the ECM or a faulty ECM.

DTC 44 – Oxygen Sensor Lean (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. 3. Run the engine at 1,200 rpm. Does the scan tool read the oxygen (O_2) sensor voltage fixed below the value specified?	274 mv	Go to Step 3	Go to "Diagnostic Aids"
3	1. Disconnect the O_2 sensor connector. 2. Run the warm engine at idle. Does the scan tool read O_2 sensor voltage within the value specified?	350-550 mv	Go to "Diagnostic Aids"	Go to Step 4
4	1. Turn the ignition OFF. 2. Check the O_2 sensor signal wire between the O_2 sensor and electronic control module (ECM) connector terminal D9 for a short to ground. Is the problem found?	-	Go to Step 5	Go to Step 6
5	1. Repair the wire or the connector terminal as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Replace the ECM. 2. Road test the vehicle. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 45 OXYGEN SENSOR RICH (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The electronic control module (ECM) supplies a voltage of about 450 millivolts between the ECM terminals B11 and B10. The oxygen (O_2) sensor varies the voltage within a range of about 1 volt if the exhaust is rich, down to about 100 millivolts if the exhaust is lean. The O_2 sensor is like an open circuit and produces no voltage when it is below 360°C (680°F). An open O_2 sensor circuit or a cold O_2 sensor causes "open loop" operation.

DTC 45 Will Set When

- The engine has been running for at least 50 seconds.
- Diagnostic trouble codes (DTCs) 21, 22, 33, and 34 are not set.
- The throttle angle is above 5 percent.
- The coolant temperature is above 80°C (176°F).
- The engine controls system is in closed loop.
- The O_2 sensor voltage is above 800 millivolts for at least 30 seconds.

Diagnostic Aids

- Normal scan tool voltage varies between 100 millivolts and 999 millivolts while in closed loop.
- Fuel pressure that is too high may cause a rich running condition.
- A leaking fuel pressure regulator diaphragm will cause a rich running condition.
- Check for leaking fuel injectors by performing a fuel injector balance test.
- An intermittent throttle position sensor output will cause a rich running condition due to a false indication of the engine accelerating.
- A false rich indication due to silicone contamination of the O_2 sensor. This will be indicated by the presence of the DTC 45 accompanied by lean driveability conditions and a powdery white deposit on the O_2 sensor.

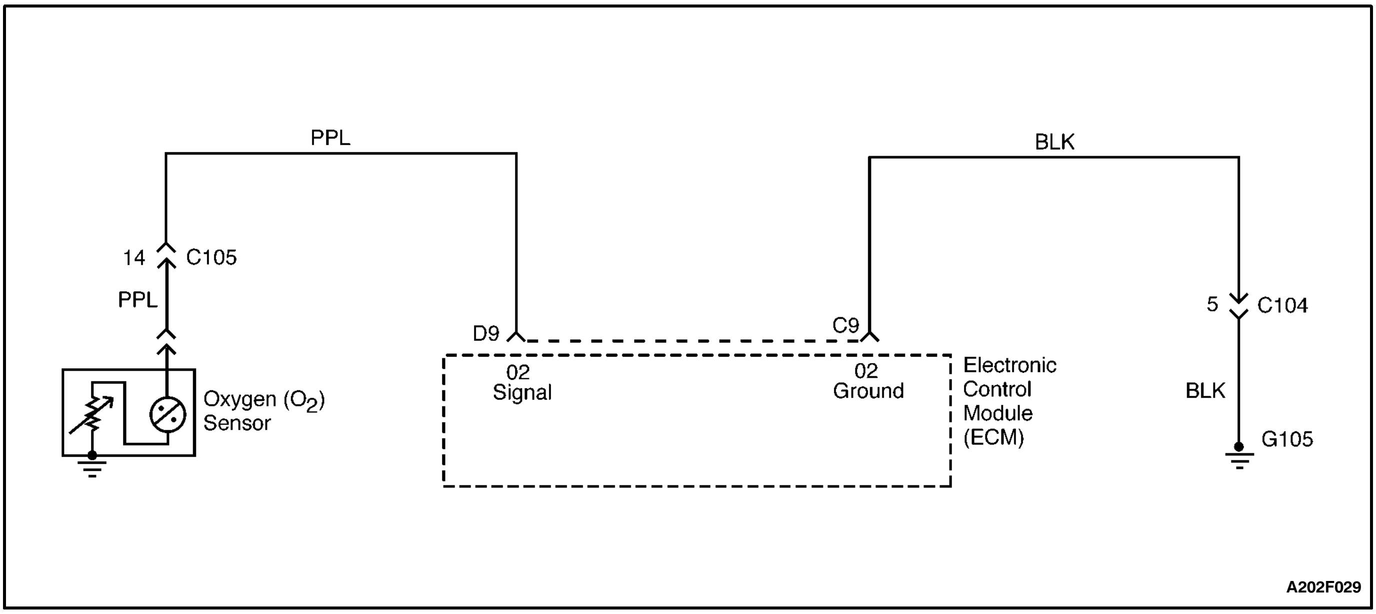
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. Running the engine at 1,200 rpm keeps the O_2 sensor hot so an accurate display voltage can be maintained.
3. This step checks for the electronic control module ability to read a simulated lean O_2 sensor signal.

DTC 45 – Oxygen Sensor Rich (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. 3. Run the engine at 1,200 rpm. Does the scan tool read the oxygen (O_2) sensor voltage fixed above the value specified?	800 mv	Go to Step 3	Go to "Diagnostic Aids"
3	1. Disconnect the O_2 sensor connector and jumper the connector terminal to ground on the side of the electronic control module (ECM). 2. Run the warm engine at idle. Does the scan tool read the O_2 sensor voltage below the value specified?	350 mv	Go to "Diagnostic Aids"	Go to Step 4
4	1. Turn the ignition OFF. 2. Replace the ECM. 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 45
OXYGEN SENSOR RICH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) supplies a voltage of about 450 millivolts between the ECM terminals D9 and C9. The oxygen (O_2) sensor varies the voltage within a range of about 1 volt if the exhaust is rich, down to about 100 millivolts if the exhaust is lean. The O_2 sensor is like an open circuit and produces no voltage when it is below 360°C (680°F). An open O_2 sensor circuit or a cold O_2 sensor causes “open loop” operation.

DTC 45 Will Set When

- The engine has been running for at least 60 seconds.
- Diagnostic trouble codes (DTCs) 21, 22, 33, and 34 are not set.
- The throttle angle is above 5 percent.
- The coolant temperature is above 70°C (158°F).
- The engine controls system is in closed loop.
- The O_2 sensor voltage is above 865 millivolts.
- These conditions are present for more than 10 seconds.

Diagnostic Aids

- Normal scan tool voltage varies between 100 millivolts and 999 millivolts while in closed loop.
- Fuel pressure that is too high may cause a rich running condition.
- A leaking fuel pressure regulator diaphragm will cause a rich running condition.
- Check for leaking fuel injectors by performing a fuel injector balance test.
- An intermittent throttle position sensor output will cause a rich running condition due to a false indication of the engine accelerating.
- A false rich indication due to silicone contamination of the O_2 sensor. This will be indicated by the presence of the DTC 45 accompanied by lean driveability conditions and a powdery white deposit on the O_2 sensor.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. Running the engine at 1,200 rpm keeps the O_2 sensor hot so an accurate display voltage can be maintained.
3. This step checks for the electronic control module ability to read a simulated lean O_2 sensor signal.

DTC 45 – Oxygen Sensor Rich (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Run the engine until it reaches operating temperature. 3. Run the engine at 1,200 rpm. Does the scan tool read the oxygen (O_2) sensor voltage fixed above the value specified?	800 mv	Go to Step 3	Go to "Diagnostic Aids"
3	1. Disconnect the O_2 sensor connector and jumper the connector terminal to ground on the side of the electronic control module (ECM). 2. Run the warm engine at idle. Does the scan tool read the O_2 sensor voltage below the value specified?	350 mv	Go to "Diagnostic Aids"	Go to Step 4
4	1. Turn the ignition OFF. 2. Replace the ECM. 3. Road test the vehicle. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DIAGNOSTIC TROUBLE CODE (DTC) 49
BATTERY VOLTAGE TOO HIGH (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) monitors the battery voltage at the ECM connector terminal C16. If the ECM detects voltage above the tolerance, the diagnostic trouble code (DTC) 49 will be set.

DTC 49 Will Set When

- The battery voltage (ADBAT) is greater than 17.2 volts for more than 2 seconds.

Diagnostic Aids

- Charging the battery with a battery charger and starting the engine may set the DTC 49.
- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wire connection, or a damaged harness.
- If the connections and the wiring harness check OK, monitor the battery voltage display on the scan tool while moving related connectors. If the fault is induced, the battery voltage will abruptly change. This may help to isolate the location of the problem.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. If the scan tool is showing incorrect battery voltage, the ECM is at fault.

DTC 49 – Battery Voltage Too High (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Start the engine and raise the engine speed to 1,200 rpm. 3. Monitor the battery voltage on the scan tool. Is the voltage at or above the value specified?	17.2 v	Go to Step 3	Go to Step 4
3	Measure the voltage across the battery. Is the voltage at or above the value specified?	17.2 v	Go to Step 5	Go to Step 6
4	1. Turn the headlamps ON. 2. Turn the air conditioning (A/C) ON. 3. Turn the blower switch to HIGH. 4. Raise the engine speed to 2,000 rpm. 5. Monitor the battery voltage on the scan tool. Is the voltage at or above the value specified?	17.2 v	Go to Step 5	Go to "Diagnostic Aids"
5	1. Turn the ignition OFF. 2. Repair the generator or the generator circuit as needed. 3. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Turn the ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

DIAGNOSTIC TROUBLE CODE (DTC) 51 ECM ERROR (CHECKSUM OR KKPGMID ERROR) (1.3L AND 1.5L SOHC IEFI-6, 1.3L SOHC AND 1.6L DOHC ITMS-6F)

DTC Will Set When

- KKPGMID is not set into $95 for the IEFI-6 ($99 for the ITMS-6F), or the calculated CHECKSUM is not consistent with the KKSUM.

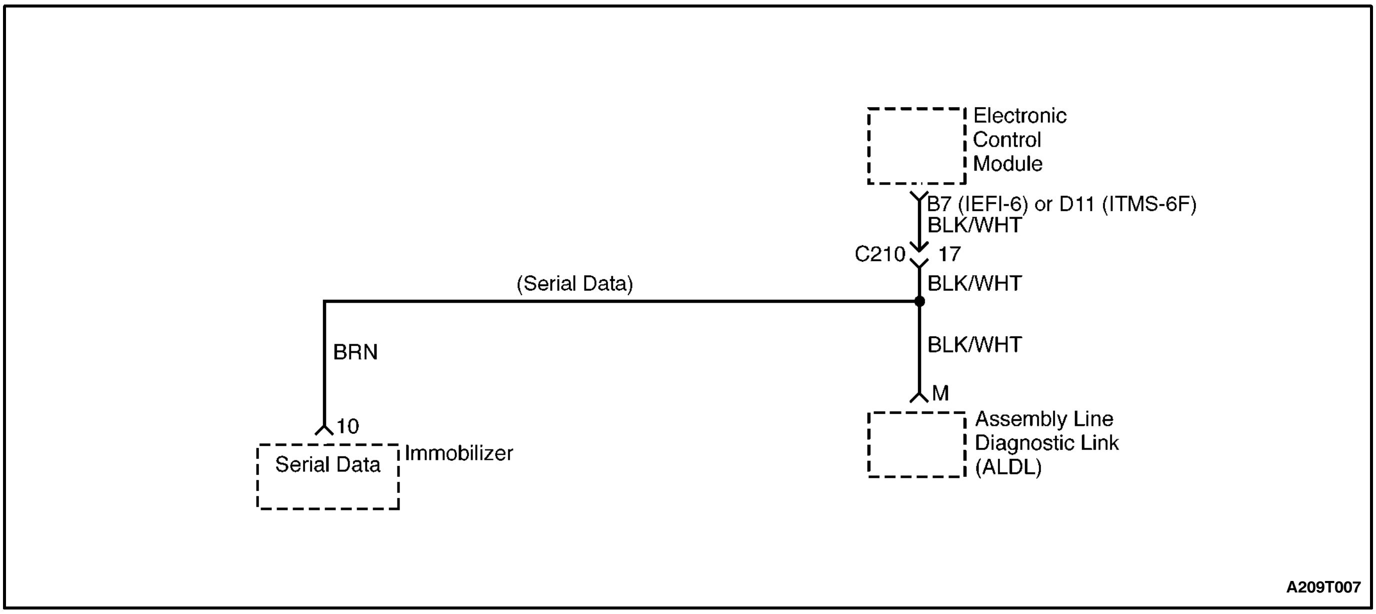
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. A programmable read-only memory (PROM) that is incorrectly installed will set the diagnostic trouble code (DTC) 51.

DTC 51 – ECM Error (CHECKSUM or KKPGMID Error)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	Check that all of the programmable read-only memory (PROM) pins are fully inserted in the socket. Is the problem found?	-	Go to Step 3	Go to Step 4
3	1. Install the PROM correctly in the socket. 2. Clear any diagnostic trouble codes (DTCs) from the electronic control module (ECM). 3. Check for the presence of any DTCs. Does the DTC 51 reappear?	-	Go to Step 4	Go to “Diagnostic System Check”
4	1. Replace the PROM. 2. Clear any DTCs from the ECM. 3. Check for the presence of any DTCs. Does the DTC 51 reappear?	-	Go to Step 5	Go to “Diagnostic System Check”
5	1. Replace the ECM. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 53 ECM IMMOBILIZED ERROR (1.3L AND 1.5L SOHC IEFI-6, 1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

When the ignition is turned ON, the key is tested by the immobilizer anti-theft system. While the key code is being read by the immobilizer control unit, the engine can start and run with any key that will turn the lock cylinder. The key code is read and compared with key codes that have been stored in the memory of the immobilizer control unit. If a valid key is detected, the immobilizer control unit sends a serial data release message to the electronic control module (ECM). Included in the release message is an identification (ID) code which assures that neither the immobilizer control unit nor the ECM have been substituted to defeat the system. If the ECM receives an invalid release message, the ECM performs the following actions:

- **Disables the fuel injector circuit.**
- **Disables the fuel pump circuit.**

DTC 53 Will Set When

- **The ECM does not receive the signal from the immobilizer control module within .562 seconds when the vehicle is stationary, or within 1.5 seconds when the vehicle is moving.**
- **The ECM receives an incorrect release message from the immobilizer control unit more than five times.**

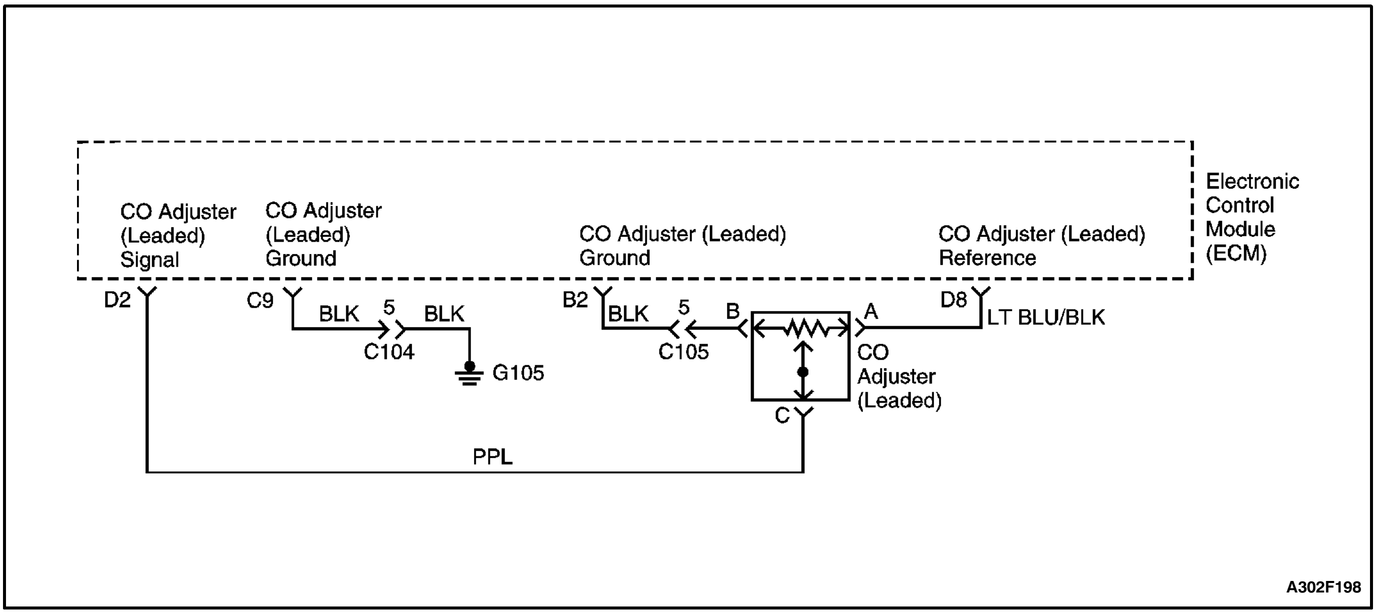
The above conditions are maintained until the ignition is switched OFF.

DTC 53 Will Clear When

- **The ignition switch is turned OFF or the scan tool CLEAR CODES command is issued.**

DTC 53 – ECM Immobilized Error (1.3L and 1.5L SOHC IEFI-6, 1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value	Yes	No
1	Connect the scan tool using the following procedure: 1. Insert the immobilizer data cartridge into the scan tool. 2. Turn the ignition switch OFF. 3. Connect the scan tool to the assembly line diagnostic link (ALDL). 4. Connect the scan tool's power cord to the cigar lighter socket. 5. Turn the ignition ON, but do not start the engine. Is communication established between the scan tool and the immobilizer control unit?	-	Go to Step 2	Go to Section 9T, ImĆ mobilizer AntiĆ Theft System
2	1. Select SYSTEM DIAGNOSIS from the scan tool menu. 2. Read the KEY STATUS message. Does the KEY STATUS message indicate POS NR (position number) 00?	-	Go to Section 9T, ImĆ mobilizer AntiĆ Theft System	Go to Step 3
3	1. Select SYSTEM DIAGNOSIS from the scan tool menu. 2. Read the IMMO & ECM ID CODE (immobilization and electronic control module identification code) message. Does the ID CODE DIFFERENT message appear?	-	Go to Section 9T, ImĆ mobilizer AntiĆ Theft System	Go to Step 4
4	Check for an open serial data wire between the immobilizer control unit and the electronic control module (ECM). Is the circuit open?	-	Go to Step 5	Go to Step 6
5	Repair the open serial data wire between the ECM and the immobilizer control unit. Is the repair complete?	-	System OK	-
6	1. Replace the ECM. 2. Reprogram the ID code. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 54
CO ADJUST ERROR (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The CO adjuster is only used on vehicles that use leaded fuel. The CO adjuster is used in place of the O_2 sensor.

DTC 54 Will Set When

- The engine control system is in open loop.
- The CO potentiometer is greater than 250 counts or less than 5 counts.

Diagnostic Aids

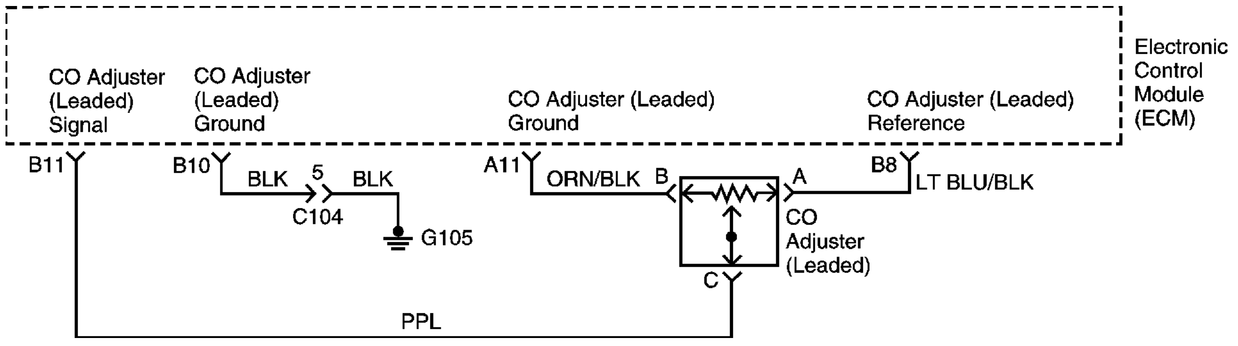
- Inspect the electronic control module (ECM) wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.

DTC 54 – CO Adjust Error (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Adjust the CO adjuster. Is the CO adjustable and in proper adjustment?	-	System OK	Go to Step 3
3	1. To check the ability of the electronic control module (ECM) to provide a 5-volt supply to the CO adjuster, begin by turning the ignition OFF. 2. Disconnect the electrical connector at the CO adjuster. 3. Turn the ignition ON. 4. Measure the voltage between the CO adjuster terminal A and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 4
4	1. Turn the ignition OFF. 2. Check for a short to battery voltage, a short to ground, or an open in the wire between the CO adjuster terminal A and the ECM connector terminal B8. Is the problem found?	-	Go to Step 8	Go to Step 7

DTC 54 – CO Adjust Error (1.3L and 1.5L SOHC IEFI-6) (Cont'd)

Step	Action	Value(s)	Yes	No
5	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	Check for a short to battery voltage, a short to ground, or an open in the wire between the CO adjuster terminal C and the ECM connector terminal B11. Is the problem found?	-	Go to Step 8	Go to Step 9
7	Check for a short to battery voltage, a short to ground, or an open in the wire between the CO adjuster terminal B and the ECM connector terminal A11. Is the problem found?	-	Go to Step 8	Go to Step 6
8	1. Repair the wire or the connector terminal, as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	1. Disconnect the electrical connector at the CO adjuster. 2. Measure the resistance between terminal A and terminal B of the CO adjuster. Is the resistance the value specified?	12.6 W	Go to Step 10	Go to Step 11
10	To check the ability of the CO adjuster to vary the resistance in the circuit, begin by measuring the resistance between terminal A and terminal C of the CO adjuster. Does the resistance vary with the turn of the CO adjuster screw?	-	Go to Step 12	Go to Step 11
11	1. Replace the CO adjuster. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
12	Check for an open or a short to battery voltage between terminal B10 of the ECM and ground. Is the problem found?	-	Go to Step 8	Go to Step 5



DIAGNOSTIC TROUBLE CODE (DTC) 54
CO ADJUST ERROR (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The CO adjuster is only used on vehicles that use leaded fuel. The CO adjuster is used in place of the O_2 sensor.

DTC 54 Will Set When

- The engine control system is in open loop.
- CO potentiometer is greater than 250 counts or less than 5 counts.

Diagnostic Aids

- Inspect the electronic control module (ECM) wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.

DTC 54 – CO Adjust Error (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	Adjust the CO adjuster. Is the CO adjustable and in proper adjustment?	-	System OK	Go to Step 3
3	1. To check the ability of the electronic control module (ECM) to provide a 5-volt supply to the CO adjuster, begin by turning the ignition OFF. 2. Disconnect the electrical connector at the CO adjuster. 3. Turn the ignition ON. 4. Measure the voltage between the CO adjuster terminal A and ground. Does the voltage measure within the value specified?	4.5-5.5 v	Go to Step 7	Go to Step 4
4	1. Turn the ignition OFF. 2. Check for a short to battery voltage, a short to ground, or an open in the wire between the CO adjuster terminal A and the ECM connector terminal D8. Is the problem found?	-	Go to Step 8	Go to Step 7

DTC 54 – CO Adjust Error (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
5	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Check for a short to battery voltage, a short to ground, or an open in the wire between the CO adjuster terminal C and the ECM connector terminal D2. Is the problem found?	-	Go to Step 8	Go to Step 9
7	Check for a short to battery voltage, a short to ground, or an open in the wire between the CO adjuster terminal B and the ECM connector terminal B2. Is the problem found?	-	Go to Step 8	Go to Step 6
8	1. Repair the wire or the connector terminal, as needed. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
9	1. Disconnect the electrical connector at the CO adjuster. 2. Measure the resistance between terminal A and terminal B of the CO adjuster. Is the resistance the value specified?	12.6 W	Go to Step 10	Go to Step 11
10	To check the ability of the CO adjuster to vary the resistance in the circuit, begin by measuring the resistance between terminal A and terminal C of the CO adjuster. Does the resistance vary with the turn of the CO adjuster screw?	-	Go to Step 12	Go to Step 11
11	1. Replace the CO adjuster. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
12	Check for an open or a short to battery voltage between terminal C9 of the ECM and ground. Is the problem found?	-	Go to Step 8	Go to Step 5

DIAGNOSTIC TROUBLE CODE (DTC) 55
EEPROM OR CONFIG REG ERROR (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) utilizes an electronically erasable programmable read-only memory (EEPROM). The EEPROM contains program information and the calibrations required for engine diagnostics operation.

DTC 55 Will Set When

- Microprocessor configuration register is not equal to $0B.

Diagnostic Aids

The diagnostic trouble code (DTC) 55 indicates that the contents of the EEPROM have changed since the ECM was programmed. The only possible repair is ECM replacement. Remember to program the replacement ECM with the correct software and calibration for the vehicle.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. When the ECM is being replaced, the new ECM must be programmed.

DTC 55 – EEPROM or Config Reg Error (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Replace the electronic control module (ECM). 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

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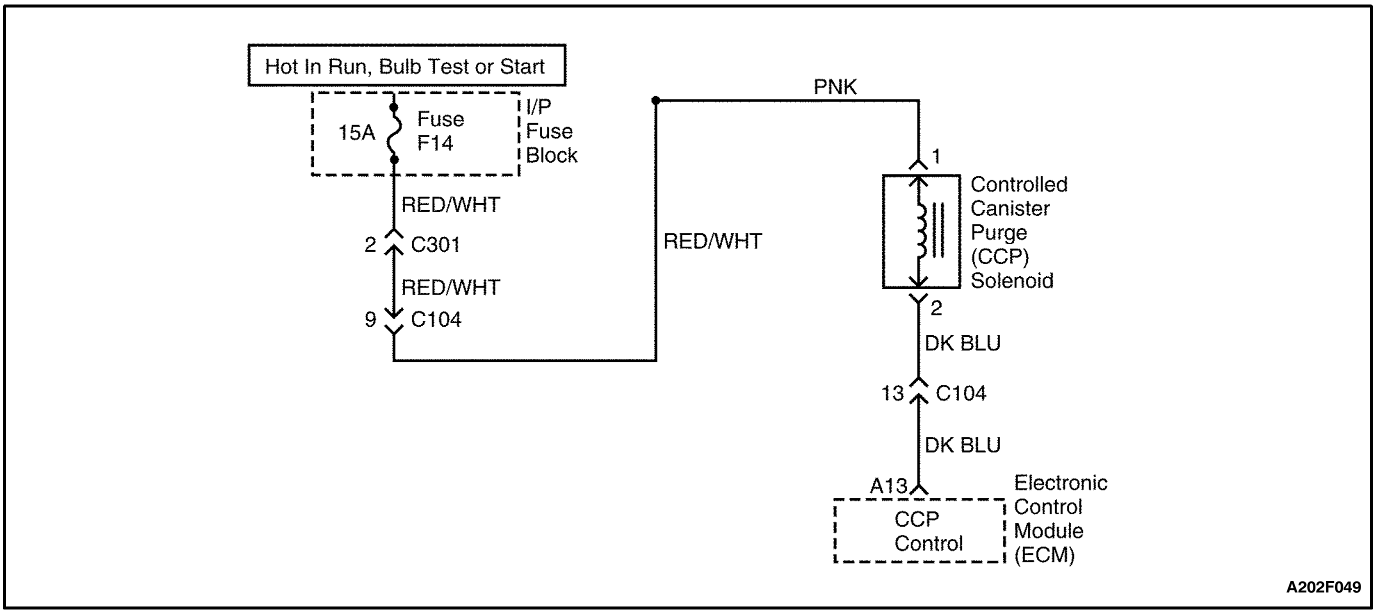


DIAGNOSTIC TROUBLE CODE (DTC) 61
CCP SOLENOID SHORTED TO GROUND (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

Evaporative canister purge is controlled by the electronic control module (ECM). The ECM applies a ground to the controlled canister purge (CCP) solenoid. The ECM determines when to activate the CCP solenoid depending on operating conditions, including throttle position, engine speed, coolant temperature, and ambient temperature.

DTC 61 Will Set When

- A short to ground condition exits.
- This condition is present for more than 2 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the CCP solenoid connector terminal 2 and battery positive while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

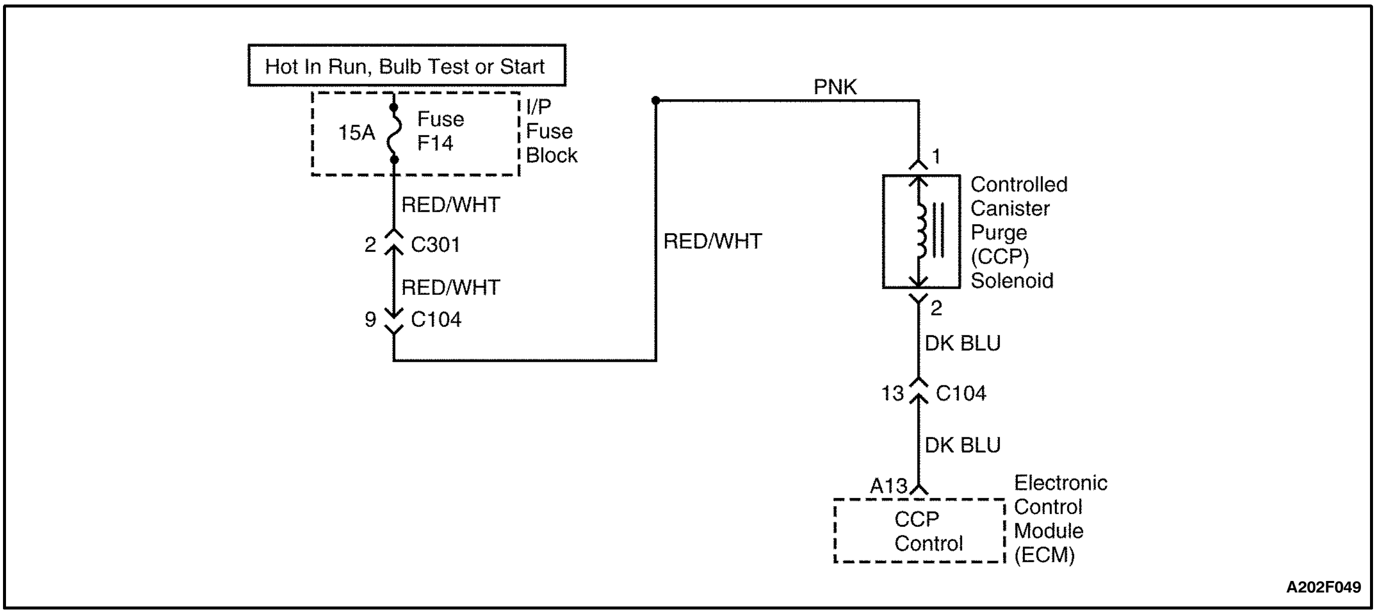
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. With the ignition OFF, the ECM should not be applying ground to the CCP solenoid.
3. If the test light is still on after disconnecting the ECM red connector, the wire between the CCP solenoid and the ECM is shorted to ground. If the test light goes off, the ECM is at fault.

DTC 61 – CCP Solenoid Shorted to Ground (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the controlled canister purge (CCP) solenoid connector. 2. Connect a test light between the CCP solenoid connector terminal 2 and battery positive. Is the test light on?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Disconnect the electronic control module (ECM) red connector. Is the test light on?	-	Go to Step 4	Go to Step 5
4	1. Repair the short to ground in the wire between the CCP solenoid connector terminal 2 and the ECM connector terminal A13. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
5	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 62
CCP SOLENOID SHORTED TO BATTERY (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

Evaporative canister purge is controlled by the electronic control module (ECM). The ECM applies a ground to the controlled canister purge (CCP) solenoid. The ECM determines when to activate the CCP solenoid depending on operating conditions, including throttle position, engine speed, coolant temperature, and ambient temperature.

DTC 62 Will Set When

- A short to battery voltage condition exits.
- This condition is present for more than 2 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the CCP solenoid connector terminal 2 and battery positive while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

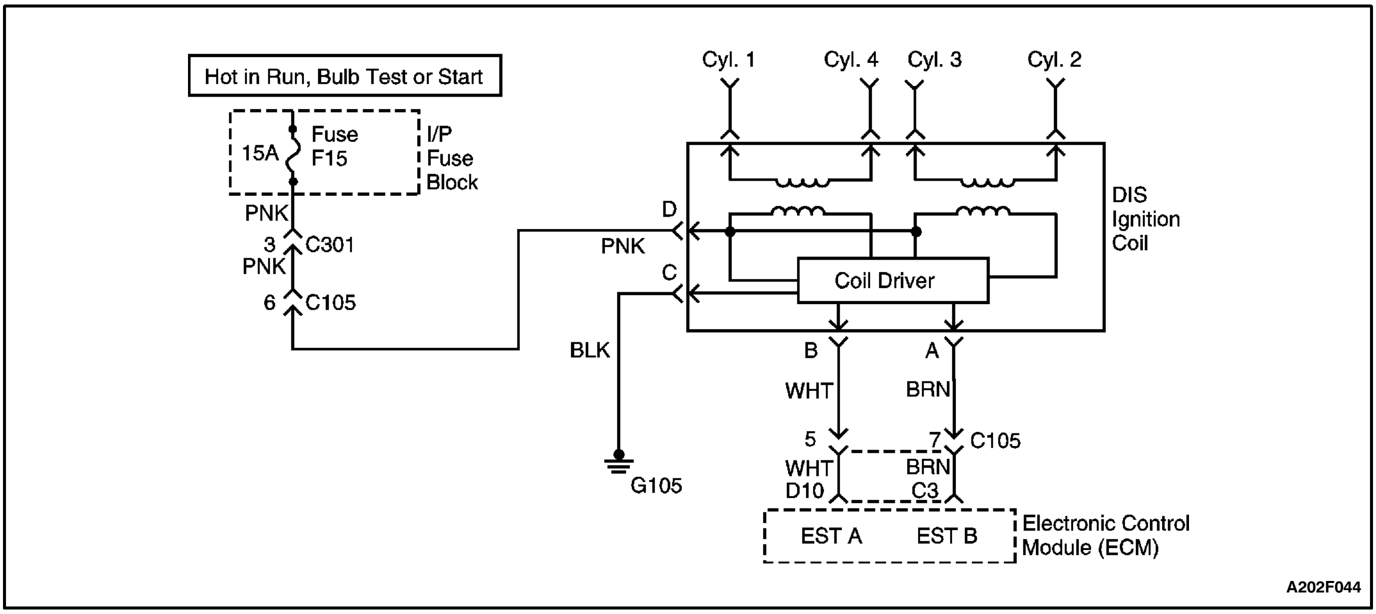
Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. If the test light is still on after disconnecting the ECM red connector, the wire between the CCP solenoid and the ECM is shorted to voltage. If the test light goes off, the ECM is at fault.

DTC 62 – CCP Solenoid Shorted to Battery (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to “Diagnostic System Check”
2	1. Disconnect the controlled canister purge (CCP) solenoid connector. 2. Measure the resistance of the CCP solenoid. Does the resistance measure near the value specified?	[0 W	Go to Step 6	Go to Step 3
3	1. Disconnect the CCP solenoid connector. 2. Connect a test light between the CCP solenoid connector terminal 2 and ground. Is the test light on?	-	Go to Step 4	Go to “Diagnostic Aids”
4	Disconnect the electronic control module (ECM) red connector. Is the test light on?	-	Go to Step 5	Go to Step 7
5	1. Repair the short to voltage in the wire between the CCP solenoid connector terminal 2 and the ECM connector terminal A13. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Replace the CCP solenoid. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
7	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 63
ELECTRONIC SPARK TIMING “B” SHORTED TO GROUND
(1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 63 Will Set When

- No voltage is supplied by the ECM through the EST “B” line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 10 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

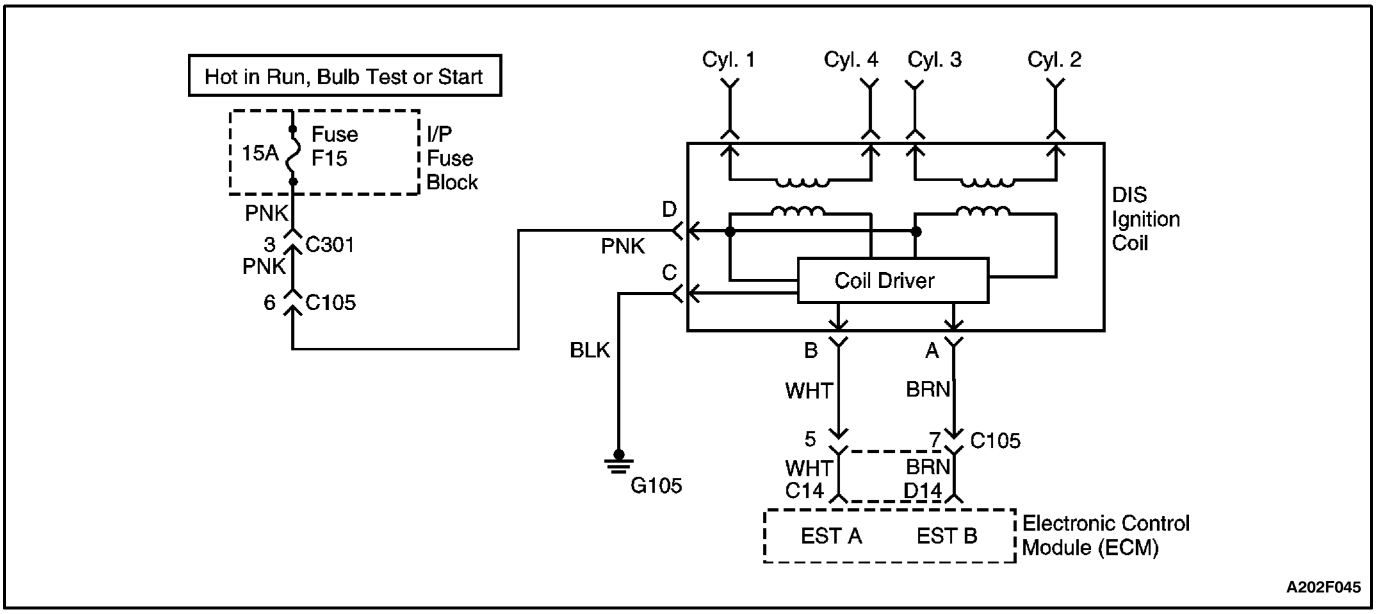
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST “B” and the ground from the ECM.
6. An open circuit or short to ground that is intermittent may be at fault in the EST “B” wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 63 – Electronic Spark Timing "B" Shorted to Ground (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	-	Go to Step 9	Go to Step 3
3	1. Connect a voltmeter between terminal A and terminal C of the DIS ignition coil. 2. Crank the engine. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 4	Go to Step 10
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at the ECM connector terminal C3 or near terminal C3. Is the problem found?	-	Go to Step 9	Go to Step 5
5	Check for an open or short to ground between the DIS ignition coil connector terminal A and the ECM connector terminal C3. Is the problem found?	-	Go to Step 7	Go to Step 6
6	Check for an open or short to ground between the DIS ignition coil connector terminal A and the ECM connector terminal C3 while moving the connectors and the wiring harness of the ignition circuit. Is the problem found?	-	Go to Step 7	Go to Step 8
7	1. Repair the open or short to ground between the DIS ignition coil connector terminal A and the ECM connector terminal C3. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	Check the wires and wiring harnesses of the ignition circuit for any damage that could cause an intermittent open or short to ground. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 63 ELECTRONIC SPARK TIMING "B" SHORTED TO GROUND (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 63 Will Set When

- No voltage is supplied by the ECM through the EST "B" line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 6 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

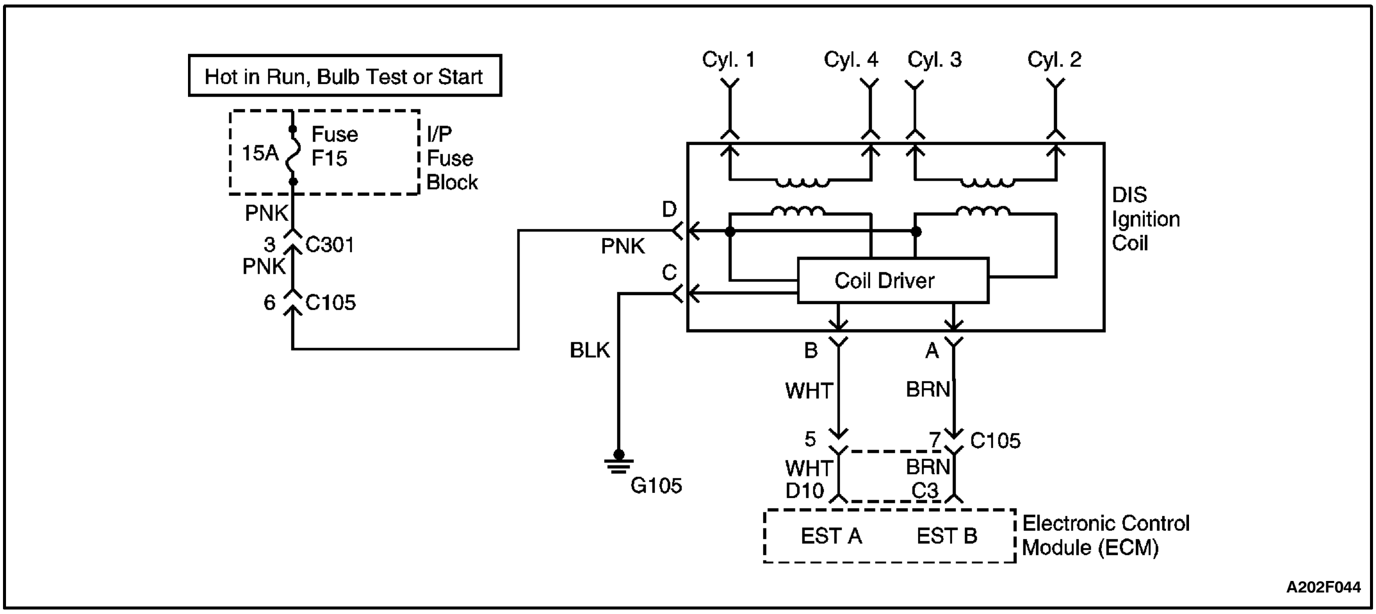
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST "B" and the ground from the ECM.
6. An open circuit or short to ground that is intermittent may be at fault in the EST "B" wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 63 – Electronic Spark Timing "B" Shorted to Ground (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	-	Go to Step 9	Go to Step 3
3	1. Connect a voltmeter between terminal A and terminal C of the DIS ignition coil. 2. Crank the engine. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 4	Go to Step 10
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at or near the ECM connector terminal D14. Is the problem found?	-	Go to Step 9	Go to Step 5
5	Check for an open or short to ground between the DIS ignition coil connector terminal A and the ECM connector terminal D14. Is the problem found?	-	Go to Step 7	Go to Step 6
6	Check for an open or short to ground between the DIS ignition coil connector terminal A and the ECM connector terminal D14 while moving the connectors and the wiring harness of the ignition circuit. Is the problem found?	-	Go to Step 7	Go to Step 8
7	1. Repair the open or short to ground between the DIS ignition coil connector terminal A and the ECM connector terminal D14. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	Check the wires and wiring harnesses of the ignition circuit for any damage that could cause an intermittent open or short to ground. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 64 ELECTRONIC SPARK TIMING "A" SHORTED TO GROUND (1.3L AND 1.5L SOHC IEFI-6)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 64 Will Set When

- No voltage is supplied by the ECM through the EST "A" line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 10 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

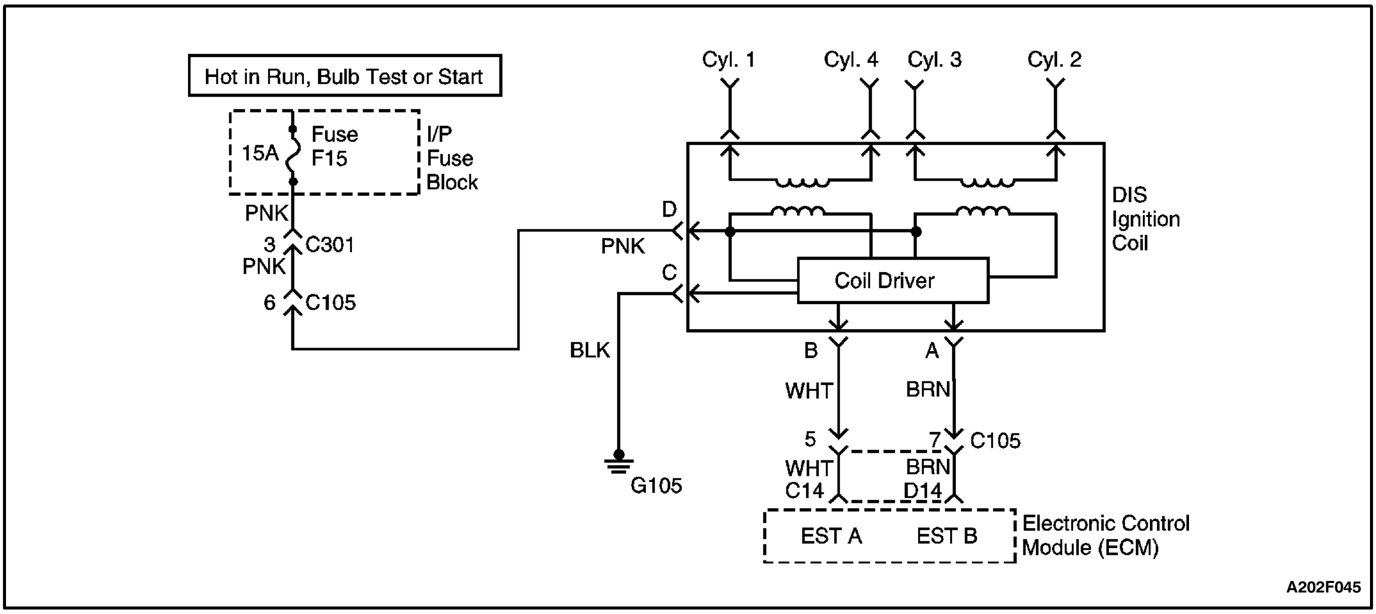
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST "A" and the ground from the ECM.
6. An open circuit or short to ground that is intermittent may be at fault in the EST "A" wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 64 – Electronic Spark Timing "A" Shorted to Ground (1.3L and 1.5L SOHC IEFI-6)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	-	Go to Step 9	Go to Step 3
3	1. Connect a voltmeter between terminal B and terminal C of the DIS ignition coil. 2. Crank the engine. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 4	Go to Step 10
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at the ECM connector terminal D10 or near terminal D10. Is the problem found?	-	Go to Step 9	Go to Step 5
5	Check for an open or short to ground between the DIS ignition coil connector terminal B and the ECM connector terminal D10. Is the problem found?	-	Go to Step 7	Go to Step 6
6	Check for an open or short to ground between the DIS ignition coil connector terminal B and the ECM connector terminal D10 while moving the connectors and the wiring harness of the ignition circuit. Is the problem found?	-	Go to Step 7	Go to Step 8
7	1. Repair the open or short to ground between the DIS ignition coil connector terminal B and the ECM connector terminal D10. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	Check the wires and wiring harnesses of the ignition circuit for any damage that could cause an intermittent open or short to ground. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 64
ELECTRONIC SPARK TIMING "A" SHORTED TO GROUND
(1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The direct ignition system (DIS) ignition coil is supplied with battery voltage when the ignition is ON. The electronic control module (ECM) triggers the circuit for the DIS ignition coil. Voltage is then induced in the secondary portion of the DIS ignition coil. Control of the DIS ignition coil is monitored separately for the two electronic spark timing (EST) lines.

DTC 64 Will Set When

- No voltage is supplied by the ECM through the EST "A" line while reference pulses are received by the ECM from the crankshaft position sensor.
- This error occurs over 6 times.

Diagnostic Aids

- Inspect the ECM harness connectors for backed-out terminals, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged wiring harness.
- If connections and the harness are OK, connect a digital voltmeter or an oscilloscope between the affected terminal and ground while moving the related connectors and the wiring harness. If the fault is induced, the voltage reading or the scope pattern will change.

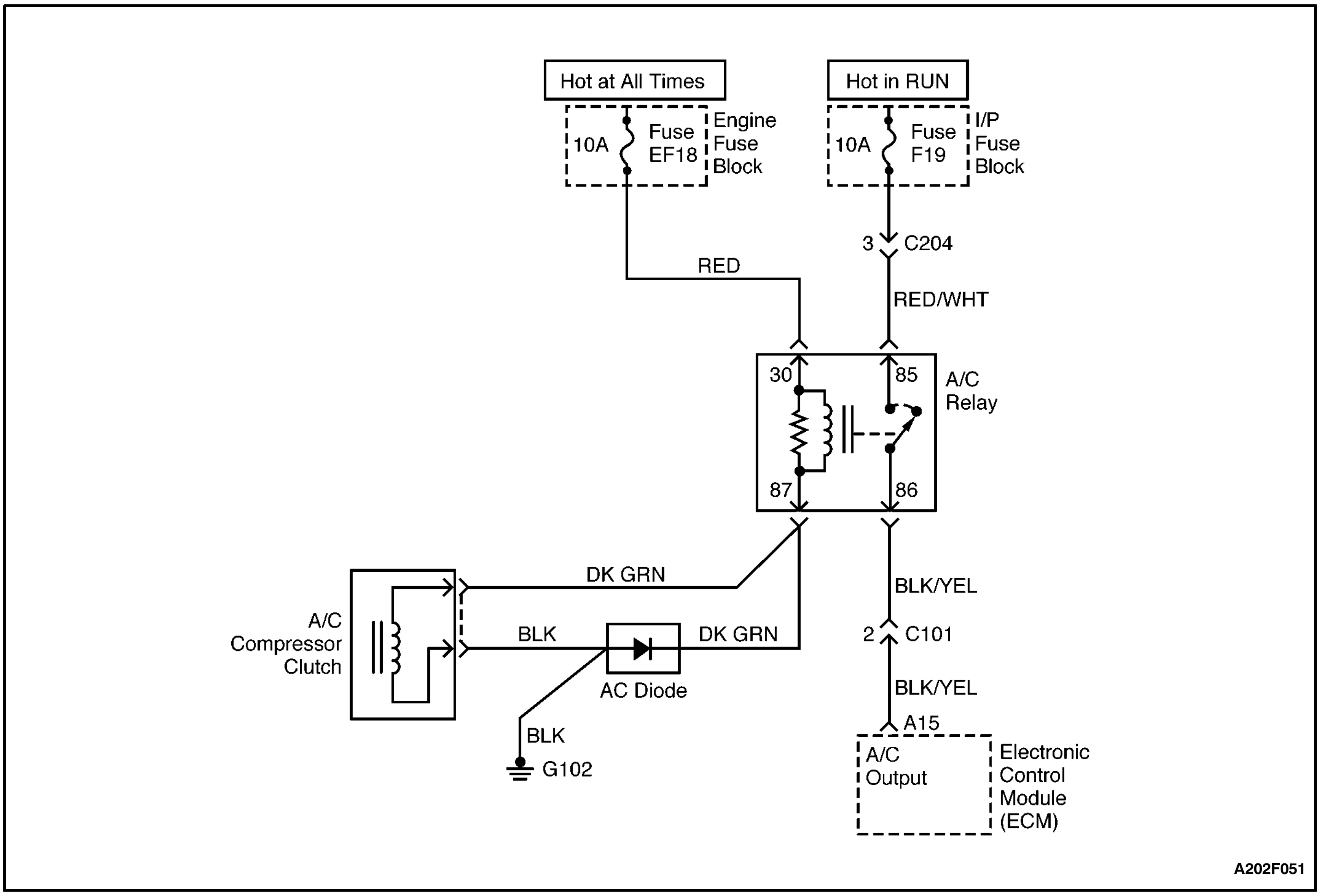
Test Description

The number(s) below refer to step(s) on the diagnostic table.

3. This step checks both the EST "A" and the ground from the ECM.
6. An open circuit or short to ground that is intermittent may be at fault in the EST "A" wire from the ECM.
11. If there are not any problems in the wiring of the circuit, yet no output from the ECM, the ECM is faulty.

DTC 64 – Electronic Spark Timing "A" Shorted to Ground (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the direct ignition system (DIS) ignition coil connector. 2. Check the DIS ignition coil connector terminals to ensure that the terminals are correctly installed and none of them are touching. Is the problem found?	-	Go to Step 9	Go to Step 3
3	1. Connect a voltmeter between terminal B and terminal C of the DIS ignition coil. 2. Crank the engine. Does the voltage fluctuate within the values specified?	0.2-2.0 v	Go to Step 4	Go to Step 10
4	1. Turn the ignition OFF. 2. Disconnect the electronic control module (ECM) white connector. 3. Check for any damaged pins or terminals at the ECM connector terminal C14 or near terminal C14. Is the problem found?	-	Go to Step 9	Go to Step 5
5	Check for an open or short to ground between the DIS ignition coil connector terminal B and the ECM connector terminal C14. Is the problem found?	-	Go to Step 7	Go to Step 6
6	Check for an open or short to ground between the DIS ignition coil connector terminal B and the ECM connector terminal C14 while moving the connectors and the wiring harness of the ignition circuit. Is the problem found?	-	Go to Step 7	Go to Step 8
7	1. Repair the open or short to ground between the DIS ignition coil connector terminal B and the ECM connector terminal C14. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	Check the wires and wiring harnesses of the ignition circuit for any damage that could cause an intermittent open or short to ground. Is the problem found?	-	Go to Step 9	Go to Step 11
9	1. Repair any wire or connector terminal as needed. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
10	1. Turn the ignition OFF. 2. Replace the DIS ignition coil assembly. 3. Clear any DTCs from the ECM. 4. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 87
A/C CUT SHORTED TO GROUND (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

When the air conditioning (A/C) switch is turned ON, the electronic control module (ECM) grounds the A/C compressor relay to initiate A/C compressor operation. Under various operating conditions, the ECM will interrupt A/C compressor operation.

DTC 87 Will Set When

- A short to ground condition exits and is present for more than 2 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the A/C compressor relay connector terminal 85 and battery positive while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

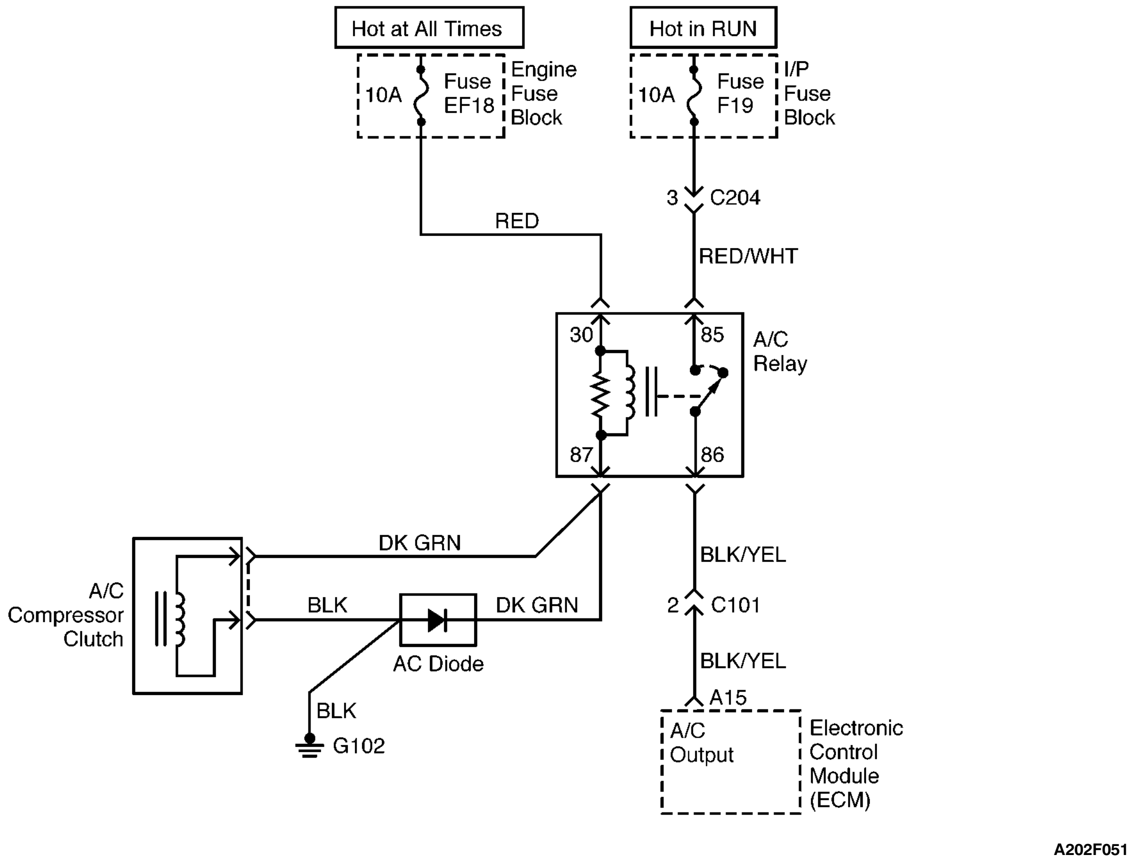
Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. With the ignition OFF, the ECM should not be applying ground to the A/C compressor relay.
3. If the test light is still on after disconnecting the ECM red connector, the wire between the A/C compressor relay and the ECM is shorted to ground. If the test light goes off, the ECM is at fault.

DTC 87 – A/C Cut Shorted to Ground (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the air conditioning (A/C) compressor relay. 2. Connect a test light between the A/C compressor relay connector terminal 86 and battery positive. Is the test light on?	-	Go to Step 3	Go to "Diagnostic Aids"
3	Disconnect the electronic control module (ECM) red connector. Is the test light on?	-	Go to Step 4	Go to Step 5
4	1. Repair the short to ground in the wire between the A/C compressor relay connector terminal 86 and the ECM connector terminal A15. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
5	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 88
A/C CUT SHORTED TO BATTERY (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

When the air conditioning (A/C) switch is turned ON, the electronic control module (ECM) grounds the A/C compressor relay to initiate A/C compressor operation. Under various operating conditions, the ECM will interrupt A/C compressor operation.

DTC 88 Will Set When

- A short to battery voltage condition exits and is present for more than 2 seconds.

Diagnostic Aids

- Inspect the ECM wiring harness connectors for improper mating, broken locks, improperly formed or damaged terminals, a poor terminal-to-wire connection, or a damaged harness.
- If the connections and the wiring harness are in good condition, connect a test light between the A/C compressor relay connector terminal 85 and ground while moving related connectors. If the fault is induced, the test light will turn on. This may help to isolate the location of an intermittent problem.

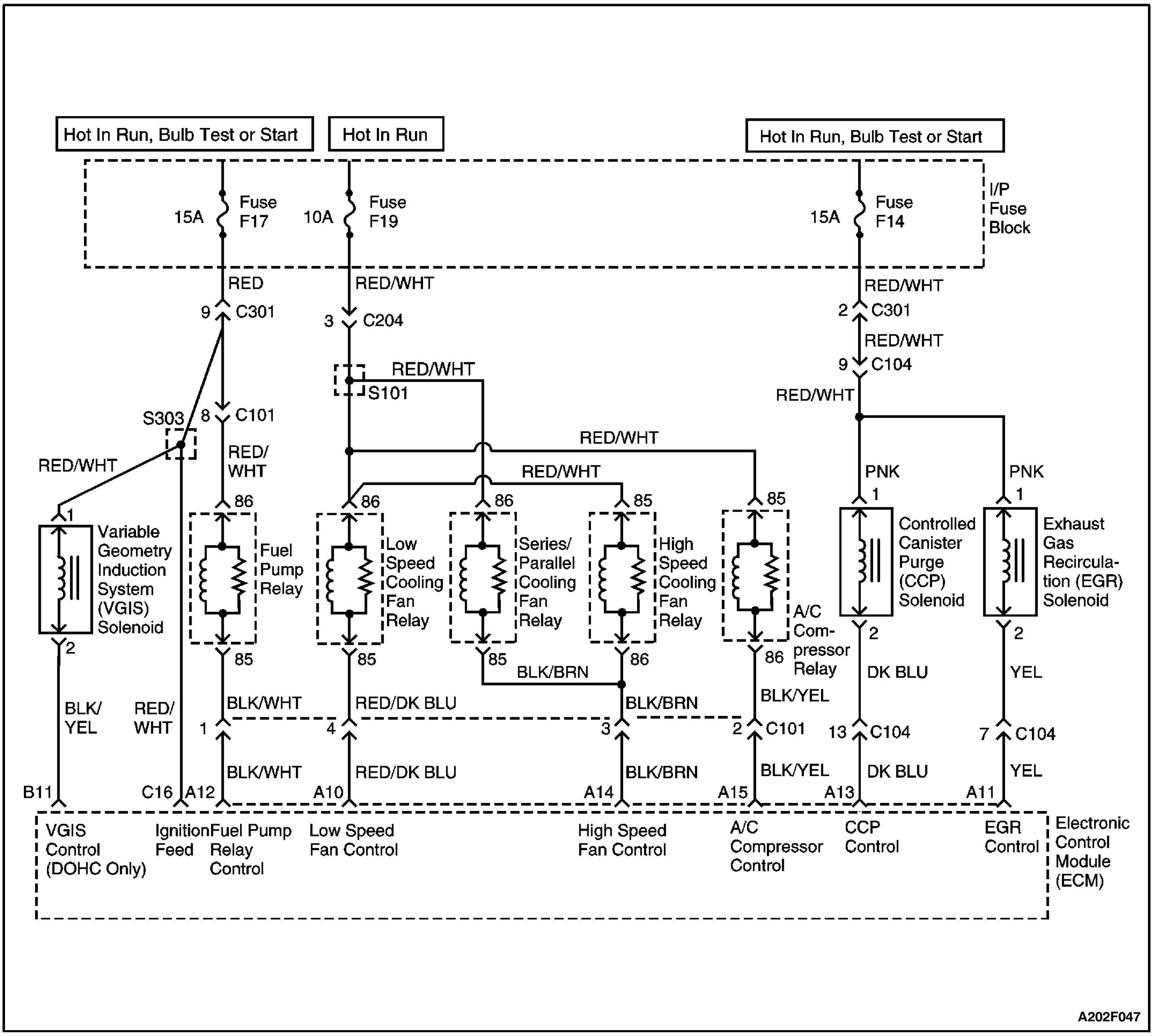
Test Description

The number(s) below refer to step(s) on the diagnostic table.

4. If the test light is still on after disconnecting the ECM red connector, the wire between the A/C compressor relay and the ECM is shorted to voltage. If the test light goes off, the ECM is at fault.

DTC 88 – A/C Cut Shorted to Battery (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Determine whether the Diagnostic System Check has been performed. Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the air conditioning (A/C) compressor relay. 2. Measure the resistance between the A/C compressor relay terminals 85 and 86. Does the resistance measure near the value specified?	[0 W	Go to Step 6	Go to Step 3
3	Connect a test light between the A/C compressor relay connector terminal 86 and ground. Is the test light on?	-	Go to Step 4	Go to "Diagnostic Aids"
4	Disconnect the electronic control module (ECM) red connector. Is the test light on?	-	Go to Step 5	Go to Step 7
5	1. Repair the short to voltage in the wire between the A/C compressor relay connector terminal 86 and the ECM connector terminal A15. 2. Clear any diagnostic trouble codes (DTCs) from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
6	1. Replace the A/C compressor relay. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
7	1. Replace the ECM. 2. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-



DIAGNOSTIC TROUBLE CODE (DTC) 93
QDM ERROR (1.3L SOHC AND 1.6L DOHC ITMS-6F)

Circuit Description

The electronic control module (ECM) is used to control several components such as those illustrated above. The ECM controls these devices through the use of a quad-driver module (QDM). When the ECM is commanding a component on, the voltage potential of the output circuit will be low (near 0 volts). When the ECM is commanding the output circuit to a component off, the voltage potential of the circuit will be high (near battery voltage). The primary function of the QDM is to supply the ground for the component being controlled.

The ECM has an internally protected QDM. This internal protection can be compared to a circuit breaker. If too much current flows in a controlled circuit, this type of QDM turns itself off. This allows the QDM to survive a shorted relay, solenoid, or wire. Repair the fault in the output circuit and the QDM will return to normal operation. It is not necessary to replace the ECM unless it is determined that the ECM itself is faulty.

Each QDM has a fault line which is monitored by the ECM. The ECM will compare the voltage at the QDM based on accepted values of the fault line. If the QDM fault detection circuit senses a voltage other than the accepted value, the diagnostic trouble code (DTC) 93 will be set.

DTC 93 Will Set When

- A QDM fault has been detected consecutively three times.

Diagnostic Aids

- Related symptoms of a QDM fault, such components on all the time or never on, will isolate the problem circuit.
- Monitor the voltage at connector terminals shown in the wiring diagram while moving related harness connectors, including the ECM harness. This may help in locating an intermittent condition.
- Check for bent connector terminals at the ECM connectors and the connectors of the relays and solenoids.
- Check for bent pins at the ECM.
- If the DTC 93 reoccurs with no apparent connector problem, replace the ECM.

Test Description

The number(s) below refer to step(s) on the diagnostic table.

2. The ECM does not know which controlled circuit caused the DTC 93. This step will go through each of the circuits to determine which is at fault.
3. By grounding the assembly line diagnostic link (ALDL), this causes the ECM to actuate all relays and solenoids.
4. By removing the jumper from the ALDL, only the ignition feed should be present to the relay or solenoid. The ECM should no longer be supplying a ground to complete the circuit.
5. With the ECM connectors disconnected, only a short to ground in the wiring between the affected component and the ECM will allow the test light to turn on.
7. If there are no problems found in the wiring and the connections are OK, replace the affected relay or solenoid.
11. If there is no ignition feed to the affected component, check for a blown fuse or open in the wiring. If the fuse is blown, locate and repair the short to ground in that ignition feed circuit.

DTC 93 – QDM ERROR (1.3L SOHC and 1.6L DOHC ITMS-6F)

Step	Action	Value(s)	Yes	No
1	Was the Diagnostic System Check performed?	-	Go to Step 2	Go to "Diagnostic System Check"
2	1. Disconnect the electronic control module (ECM) red connector. 2. Turn the ignition ON. 3. Connect an ammeter (set to 2 amp scale) between each of the following ECM connector terminals and ground: • A10 - Fan low relay. • A14 - Fan high relay. • A15 - Air conditioning (A/C) compressor relay. • A12 - Fuel pump relay. • A13 - Controlled canister purge (CCP) solenoid. Does the amperage of all circuits measure within the value specified?	<0.75 amps but not 0.0 amps	Go to "Diagnostic Aids"	Go to Step 3
3	1. Turn the ignition OFF. 2. Connect the ECM red connector. 3. Use the wiring diagram to determine the specific component terminals to be tested. 4. Disconnect the relay/solenoid from the affected circuit. 5. Jumper terminals A and B of the assembly line diagnostic link (ALDL). 6. Turn the ignition ON. 7. Connect a test light between the connector terminals for the component of the affected circuit. Is the test light on?	-	Go to Step 4	Go to Step 8

DTC 93 – QDM ERROR (1.3L SOHC and 1.6L DOHC ITMS-6F) (Cont'd)

Step	Action	Value(s)	Yes	No
4	Remove the jumper from the ALDL. Is the test light on?	-	Go to Step 5	Go to Step 7
5	1. Turn the ignition OFF. 2. Disconnect the ECM red connector. 3. Turn the ignition ON. 4. Connect a test light between the connector terminals for the component of the affected circuit. Is the test light on?	-	Go to Step 6	Go to Step 12
6	1. Turn the ignition OFF. 2. Repair the short to ground between the component of the affected circuit and the ECM. 3. Connect the ECM red connector. 4. Clear any diagnostic trouble codes (DTCs) from the ECM. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
7	1. Turn the ignition OFF. 2. Check for poor connections and repair as needed. 3. If the connections are OK, replace the component of the affected circuit. 4. Clear any DTCs from the ECM. 5. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
8	Connect the test light between the ignition feed connector terminal for the component of the affected circuit and ground. Is the test light on?	-	Go to Step 9	Go to Step 11
9	1. Turn the ignition OFF. 2. Check for an open in the wiring between the component of the affected circuit and the ECM. Is the problem found?	-	Go to Step 10	Go to Step 12
10	1. Repair the open wire. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
11	1. Repair the open in the affected component ignition feed circuit. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-
12	1. Replace the ECM. 2. Clear any DTCs from the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	-	System OK	-

SYMPTOM DIAGNOSIS

IMPORTANT PRELIMINARY CHECKS

Important: Several symptom procedures call for a careful visual/physical inspection. Always perform the visual/physical test first. Visual inspections may lead to correcting a problem without further checks and can save valuable time.

Step	Action	Value(s)	Yes	No
1	Perform the Diagnostic System Check. Are any diagnostic trouble code(s) (DTCs) stored in the electronic control module (ECM) memory?	-	Go to Appropriate DTC Table	Go to Step 2
2	1. Inspect all of the ECM ground connections. 2. Inspect all of the vacuum hoses for splits, kinks, or improper connections. 3. Check for air leaks at all of the mounting areas of the intake manifold sealing surfaces. 4. Inspect the ignition wires for cracking, hardness, proper routing, or carbon tracking. 5. Inspect the wiring for proper connections, pinches, or cuts. Are all checks complete?	-	Go to Appropriate Symptom Table	-

INTERMITTENTS

Definition: The problem may or may not turn on the service engine soon (SES) warning or store a diagnostic trouble code (DTC).

Important: Do not use the DTC tables for intermittent problems. A fault must be present in order to locate the problem. If a fault is intermittent, use of DTC tables may result in the replacement of good parts.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	1. Perform a careful inspection of any suspect circuits. 2. Inspect for poor mating of the connector halves, or terminals not fully seated into the connector body. 3. Inspect for improperly formed or damaged terminals. 4. Inspect for poor terminal-to-wire connections. This requires removing the terminal from the connector body to inspect it. Are any problems present?	-	Go to Step 3	Go to Step 4
3	Repair the electrical connections as needed. Is the repair complete?	-	System OK	-
4	Road test the vehicle with a voltmeter connected to a suspected circuit or a scan tool connected to the assembly line diagnostic link (ALDL). Does the voltmeter or the scan tool indicate an abnormal voltage or scan reading?	-	Go to Step 5	Go to Step 6

Intermittents (Cont'd)

Step	Action	Value(s)	Yes	No
5	Replace the sensor in the affected circuit, if a diagnostic trouble code (DTC) is stored for this circuit (except for the DTCs 44 and 45). Is the repair complete?	-	System OK	-
6	Does an intermittent service engine soon (SES) warning or a DTC occur?	-	Go to Step 7	Go to Step 8
7	1. Check for a faulty relay, electronic control module (ECM) driven solenoid, or switch. 2. Check for improper installation of electrical devices, such as lights, two-way radios, electric motors, etc. 3. Inspect the ignition control wires for proper routing away from ignition wires, ignition system components, and the generator. 4. Check for a short to ground in the SES circuit or the ALDL "test" terminal. 5. Inspect the ECM ground connections. 6. Correct or repair the affected circuits as needed. Is the repair complete?	-	System OK	-
8	1. Check for a loss of DTC memory. 2. Disconnect the throttle position sensor (TPS). 3. Run the engine at idle until the SES comes on. 4. Turn the ignition OFF. Is DTC 22 stored in memory?	-	Go to Step 10	Go to Step 9
9	Replace the ECM. Is the repair complete?	-	System OK	-
10	Does the vehicle stall while driving?	-	Go to Step 11	Go to Step 12
11	Monitor the oxygen (O_2) sensor and the injector base pulse width with the scan tool. Does the scan tool display a steady low voltage (about 0 mv) for the O_2 sensor with the control module commanding an injector base pulse width of the value specified?	8 ms	Go to Step 9	Go to Step 12
12	1. Check for an open diode across the air conditioning (A/C) clutch and for other open diodes. 2. Repair or replace any components as needed. Is the repair complete?	-	System OK	-

HARD START

Definition: The engine cranks OK, but does not start for a long time. The engine eventually runs or may start and immediately die.

Important: Ensure that the driver is using the correct starting procedure. Before diagnosing, check service bulletins for updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Check the coolant temperature sensor (CTS) and the manifold air temperature (MAT) sensor using the scan tool. 3. Compare the coolant temperature and the MAT with the ambient temperature when the engine is cold. Do the CTS and the MAT readings differ from the ambient temperature by more than the value specified?	3°C (5°F)	Go to Step 3	Go to Step 4
3	1. Measure the resistance of the CTS and the MAT sensor. 2. Compare the resistance value to specifications using the Temperature Vs. Resistance tables for diagnostic trouble codes (DTCs) 14 and 23. 3. If the resistance is not the same, replace the faulty sensor. Is the repair complete?	-	System OK	-
4	1. Check for a sticking throttle shaft or a binding linkage that may cause a high throttle position sensor (TPS) voltage. Repair or replace the parts as needed. 2. Check the TPS voltage reading with the throttle closed. Does the voltage measure within the value specified?	0.4-0.8 v	Go to Step 5	Go to Step 26
5	1. Check the manifold absolute pressure (MAP) sensor response and accuracy. 2. Replace the MAP sensor as needed. Is the repair complete?	-	System OK	Go to Step 6
6	Check the fuel pump operation. Does the fuel pump operate for the specified time when the ignition switch is turned ON?	2 sec	Go to Step 7	Go to "Fuel Pump Relay Circuit Check"
7	Check the fuel system pressure. Is the fuel pressure within the specifications?	284-325 kPa (41-47 psi)	Go to Step 29	Go to Step 8
8	Check for water contamination in the fuel. Is the fuel contaminated?	-	Go to Step 9	Go to Step 10
9	Replace the contaminated fuel. Is the repair complete?	-	System OK	-

Hard Start (Cont'd)

Step	Action	Value(s)	Yes	No
10	1. Check the fuel injector driver circuit. 2. Disconnect all of the fuel injector harness connectors at the fuel injectors. 3. Connect an injector test light between the harness terminals of each fuel injector connector. 4. Note the test light while cranking the engine. Does the test light blink at all connectors?	-	Go to Step 13	Go to Step 11
11	Check the fuel injector driver wiring harness, the connectors, and the connector terminals for the proper connections. Is the problem found?	-	Go to Step 12	Go to Step 30
12	Repair the wiring harness, the connector, or the connector terminal as needed. Is the repair complete?	-	System OK	-
13	Measure the resistance of each fuel injector. The resistance will increase slightly at higher temperatures. Is the fuel injector resistance within the value specified at 20°C (68°F)?	11.6-12.4 W	Go to Step 15	Go to Step 14
14	Replace any fuel injector with a resistance that is out of specifications. Is the repair complete?	-	System OK	-
15	Perform an injector balance test. Is the problem found?	-	Go to Step 16	Go to Step 17
16	Replace any restricted or leaking fuel injectors as needed. Is the repair complete?	-	System OK	-
17	1. Check for the proper ignition voltage output for each cylinder with a spark tester. 2. Inspect the spark plugs for cracks, wear, improper gap, burned electrodes, or heavy deposits. 3. Inspect the ignition wires for short conditions. 4. Inspect all of the ignition grounds for loose connections. 5. Inspect the electronic control module (ECM) for the proper operation. Is the problem found?	-	Go to Step 18	Go to Step 19
18	Correct or replace any faulty ignition components. Is the repair complete?	-	System OK	-
19	Does the engine misfire or cut out under load or at idle?	-	Go to "Ignition System Check"	Go to Step 20
20	Does the engine start, but then immediately stall?	-	Go to Step 21	Go to Step 23
21	1. Remove the crankshaft position sensor (CPS). 2. Inspect for faulty connections and repair as needed. Is the problem found?	-	Go to Step 22	Go to Step 25
22	Repair the faulty connections as needed. Is the repair complete?	-	System OK	-

Hard Start (Cont'd)

Step	Action	Value(s)	Yes	No
23	1. Check for the proper valve timing. 2. Check the cylinder compression. 3. Inspect the pushrods, the rocker arms, the valve springs, and the camshaft lobes for excessive wear. 4. Inspect the intake manifold and the exhaust manifold passages for casting flash. Is the problem found?	-	Go to Step 24	Go to Step 25
24	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
25	Check the idle air control (IAC) valve operation. Repair or replace components as needed. Is the repair complete?	-	System OK	-
26	Check the base idle setting of the throttle body. Is the base idle setting properly adjusted?	-	Go to Step 27	Go to Step 28
27	Check the TPS circuit for proper operation. Repair or replace components as needed. Is the repair complete?	-	System OK	-
28	Adjust the base idle setting to specifications. Is the repair complete?	-	System OK	-
29	Repair the fuel system as needed. Is the repair complete?	-	System OK	-
30	Replace the ECM. Is the repair complete?	-	System OK	-

SURGES OR CHUGGLES

Definition: Engine power varies under steady throttle or cruise and feels as if the vehicle speeds up and slows down with no change in the accelerator pedal position.

Important: Make sure the driver understands torque converter clutch (TCC) and air conditioning (A/C) compressor operation as described in the owner's manual.

The speedometer reading and the speed reading on the scan tool should be equal.

Before diagnosing the symptom, check service bulletins for updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	Connect the scan tool to the assembly line diagnostic link (ALDL). Does the oxygen (O_2) sensor respond quickly to different throttle positions?	-	Go to Step 4	Go to Step 3
3	1. Check the O_2 sensor for silicone or other contaminants from fuel or use of improper room temperature vulcanizing (RTV) sealant. 2. Replace the contaminated O_2 sensor. Is the repair complete?	-	System OK	-

Surges or Chuggles (Cont'd)

Step	Action	Value(s)	Yes	No
4	1. Drive the vehicle at the speed of the complaint. 2. Monitor the long-term fuel trim reading using the scan tool. Is the long-term fuel trim reading within the value specified?	115-150 counts	Go to Step 7	Go to Step 5
5	Is the long-term fuel trim reading below the value specified?	115 counts	Go to "Diagnostic Aids for DTC 45"	Go to Step 6
6	Is the long-term fuel trim reading above the value specified?	150 counts	Go to "Diagnostic Aids for DTC 44"	-
7	Check the fuel system pressure while the condition exists. Is the fuel system pressure within specifications?	284-325 kPa (41-47 psi)	Go to Step 8	Go to Step 17
8	Check the in-line fuel filter. Is the filter dirty or plugged?	-	Go to Step 18	Go to Step 9
9	Perform an injector balance test. Does the injector balance test pinpoint the problem?	-	Go to Step 19	Go to Step 10
10	1. Check for proper ignition voltage output using a spark tester. 2. Inspect the spark plugs for cracks, wear, improper gap, burned electrodes, or heavy deposits. Is the problem found?	-	Go to Step 11	Go to Step 12
11	Repair or replace any ignition system components as needed. Is the repair complete?	-	System OK	-
12	1. Inspect the electronic control module (ECM) grounds for being clean, tight, and in their proper locations. 2. Inspect the vacuum lines for kinks or leaks. Is the problem found?	-	Go to Step 13	Go to Step 14
13	Repair the electrical connections or the vacuum lines as needed. Is the repair complete?	-	System OK	-
14	Check the generator output voltage. Is the generator voltage within the value specified?	12-16 v	Go to Step 16	Go to Step 15
15	Repair the generator. Is the repair complete?	-	System OK	-
16	1. Check for intermittent exhaust gas recirculation (EGR) valve operation. 2. Check torque converter clutch (TCC) operation. 3. Repair or replace any components as needed. Is the repair complete?	-	System OK	-
17	Repair the fuel system as needed. Is the repair complete?	-	System OK	-
18	Replace the fuel filter. Is the repair complete?	-	System OK	-
19	Replace the leaking or restricted fuel injectors. Is the repair complete?	-	System OK	-

LACK OF POWER, SLUGGISHNESS, OR SPONGINESS

Definition: The engine delivers less than expected power. There is little or no increase in speed when the accelerator pedal is partially applied.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	1. Verify the customer's complaint. 2. Compare the performance of the customer's vehicle with a similar unit. Does the problem exist?	-	Go to Step 3	System OK
3	1. Inspect the air filter for excessive contamination. 2. Replace the air filter as needed. 3. Check the transaxle shift pattern and downshift operation. Does the transaxle operate properly?	-	Go to Step 4	Go to Step 5
4	Check the fuel system pressure. Is the fuel system pressure within specifications?	284-325 kPa (41-47 psi)	Go to Step 7	Go to Step 6
5	Repair the transaxle as needed. Is the repair complete?	-	System OK	-
6	Repair the fuel system as needed. Is the repair complete?	-	System OK	-
7	Check for a restricted fuel filter or contaminated fuel. Is the problem found?	-	Go to Step 8	Go to Step 9
8	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
9	1. Check the ignition system output for all of the cylinders using a spark tester. 2. Check for proper ignition control operation. Is the ignition system operating properly?	-	Go to Step 10	Go to Step 11
10	1. With the engine at normal operating temperature, connect a vacuum gauge to a vacuum port on the intake manifold. 2. Operate the engine at 1,000 rpm. 3. Record the vacuum reading. 4. Increase the engine speed to 2,500 rpm. 5. Note the vacuum reading at a steady 2,500 rpm. Does the vacuum decrease more than the value specified?	10 kPa (3 in. Hg)	Go to Step 12	Go to Step 15
11	Repair or replace any ignition system components as needed. Is the repair complete?	-	System OK	-
12	Inspect the exhaust system for restrictions and damaged or collapsed pipes. Is the problem found?	-	Go to Step 13	Go to Step 14
13	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
14	1. Check the cylinder compression and valve timing. 2. Inspect the camshaft for excessive wear. Is the problem found?	-	Go to Step 15	Go to Step 16

Lack of Power, Sluggishness, or Sponginess (Cont'd)

Step	Action	Value(s)	Yes	No
15	Repair or replace any engine components as needed. Is the repair complete?	-	System OK	-
16	1. Check the electronic control module (ECM) grounds for being clean, tight, and in their proper location. 2. Check the exhaust recirculation gas (EGR) valve for being open or partially open all the time. 3. Check the torque converter clutch (TCC) operation. 4. Check the air conditioning (A/C) system operation. 5. Check the generator output. 6. Repair the generator if the output is not within the specified range. Are all checks and repairs complete?	12-16 v	System OK	-

DETONATION/SPARK KNOCK

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to Important Preliminary Checks"
2	1. Fill the fuel tank with a known good grade of gasoline that has the octane rating of the value specified. 2. Reevaluate the vehicle's performance. Does the detonation problem still exist?	87-89 octane	Go to Step 3	System OK
3	1. Inspect for low engine coolant. 2. Check for restricted airflow to the radiator or restricted coolant flow. 3. Check for a faulty thermostat. 4. Check for an incorrect coolant solution. Is the problem found?	-	Go to Step 4	Go to Step 5
4	Repair or replace any cooling system components as needed. Is the repair complete?	-	System OK	-
5	1. Check the voltage using the scan tool. 2. Replace the coolant temperature sensor (CTS) if the resistance is not within specifications as listed in the Diagnostic Aids for Diagnostic Trouble Code (DTC) 14. Is the problem found?	-	Go to Step 6	Go to Step 7
6	Replace the CTS or repair the circuit as needed. Is the repair complete?	-	System OK	-
7	1. Check the ignition system output with a spark tester. 2. Inspect the spark plugs for the proper heat range and gap. 3. Check for the proper operation of the ignition controls. Is the ignition system operating properly?	-	Go to Step 9	Go to Step 8

Detonation/Spark Knock (Cont'd)

Step	Action	Value(s)	Yes	No
8	Repair or replace the ignition system components as needed. Is the repair complete?	-	System OK	-
9	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Road test the vehicle at the speed of the complaint. 3. Monitor the long-term fuel trim reading from the scanner data stream. Is the long-term fuel trim reading above the value specified?	150 counts	Go to "Diagnostic Aids for DTC 44"	Go to Step 10
10	Check the fuel system pressure. Is the problem found?	284-325 kPa (41-47 psi)	Go to Step 11	Go to Step 12
11	Repair or replace the fuel system components as needed. Is the repair complete?	-	System OK	-
12	1. Inspect for carbon buildup inside the engine. 2. Remove the carbon with a top engine cleaner. Follow the instructions supplied with the product. 3. Check the basic engine parts such as the camshaft, the cylinder head, the pistons, etc. for excessive wear. 4. Replace any excessively worn parts. Is the procedure complete?	-	Go to Step 13	-
13	1. Check the exhaust gas recirculation (EGR) valve for proper operation. 2. Check the air intake system for proper operation. 3. Check the torque converter clutch (TCC) operation and transaxle shift points. 4. Check the service bulletins for programmable read-only memory (PROM) updates. 5. Check the cylinder compression. 6. Repair or replace any faulty components. Are all checks and repairs complete?	-	System OK	-

HESITATION, SAG, STUMBLE

Definition: There is a momentary lack of response as the accelerator is pushed down. This can occur at any vehicle speed. It is usually the most severe when first trying to make the vehicle move, as from a stop. Hesitation, sag, or stumble may cause the engine to stall if severe enough.

Important: Before diagnosing this condition, check service bulletins for programmable read-only memory (PROM) updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to “Important Preliminary Checks”
2	1. Check the fuel system pressure. If the pressure is not within the value specified, service the fuel system as needed. 2. Inspect the throttle position sensor (TPS) for binding or sticking. The TPS voltage should increase at a steady rate as the throttle is moved toward wide-open throttle (WOT). Is the problem found?	284-325 kPa (41-47 psi)	Go to Step 3	Go to Step 4
3	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
4	1. Check the manifold absolute pressure (MAP) sensor response and accuracy. 2. Inspect the fuel for water contamination. 3. Check the canister purge system for proper operation. Is the problem found?	-	Go to Step 5	Go to Step 6
5	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
6	1. Disconnect all of the fuel injector harness connectors. 2. Connect an injector test light between the harness terminals of each fuel injector. 3. Note the test light while cranking the engine. Does the test light blink on all connectors?	-	Go to Step 8	Go to Step 7
7	1. Repair or replace the faulty fuel injector drive harness, the connector, or the connector terminal. 2. If the connections and the harnesses are good, replace the electronic control module (ECM) for an internal open in the fuel injector driver circuit. Is the repair complete?	-	System OK	-
8	Measure the resistance of each fuel injector. The resistance will increase slightly at higher temperatures. Is the fuel injector resistance within the value specified?	11.6-12.4 W	Go to Step 10	Go to Step 9
9	Replace any of the fuel injectors for which there is a resistance that is out of specifications. Is the repair complete?	-	System OK	-
10	Perform an injector balance test. Is the problem found?	-	Go to Step 11	Go to Step 12

Hesitation, Sag, Stumble (Cont'd)

Step	Action	Value(s)	Yes	No
11	Replace any restricted or leaking fuel injectors. Is the repair complete?	-	System OK	-
12	Check the fuel system pressure after a cold start or during moderate or full throttle acceleration. Is the fuel pressure within specifications?	284-325 kPa (41-47 psi)	Go to Step 14	Go to Step 13
13	Repair the restriction in the fuel system or replace the faulty fuel pump. Is the repair complete?	-	System OK	-
14	1. Check for faulty ignition wires. 2. Inspect for fouled spark plugs. 3. Check the ignition system output on each cylinder with a spark tester. Is the problem found?	-	Go to Step 15	Go to Step 16
15	Repair or replace any ignition components as needed. Is the repair complete?	-	System OK	-
16	1. Check the generator output voltage. 2. Repair or replace the generator if the generator output is less than the value specified. 3. Check the exhaust gas recirculation (EGR) valve operation. Are all checks and needed repairs complete?	12-16 v	System OK	-

CUTS OUT, MISSES

Definition: There is a steady pulsation or jerking that follows engine speed, usually more pronounced as engine load increases. The exhaust has a steady spitting sound at idle or low speed.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to “Important Preliminary Checks”
2	Check the ignition system output voltage for all of the cylinders using a spark tester. Is spark present on all of the cylinders?	-	Go to Step 3	Go to “Ignition System Check”
3	1. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 2. Check the resistance of the ignition wires. Replace any ignition wires that have a resistance greater than the value specified. Is the problem found?	30,000 W	Go to Step 4	Go to Step 5
4	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
5	With the engine running, spray the ignition wires with a fine water mist to check for arcing and shorting to ground. Is the problem found?	-	Go to Step 6	Go to Step 7
6	Replace the ignition wires. Is the repair complete?	-	System OK	-

Cuts Out, Misses (Cont'd)

Step	Action	Value(s)	Yes	No
7	1. Perform a cylinder compression test. 2. If the compression is low, repair the engine as needed. 3. Inspect for proper valve timing, bent pushrods, worn rocker arms, broken or weak valve springs, and worn camshaft lobes. 4. Inspect the intake manifold and the exhaust manifold passages for casting flash. Is the problem found?	-	Go to Step 8	Go to Step 9
8	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
9	1. Check the fuel system for a plugged in-line fuel filter. 2. Check the fuel system for low fuel pressure. If the fuel pressure is below the value specified, service the fuel system as needed. 3. Inspect for contaminated fuel. Is the problem found?	284-325 kPa (41-47 psi)	Go to Step 10	Go to Step 11
10	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
11	1. Disconnect all of the fuel injector harness connectors at the fuel injectors. 2. Connect an injector test light to the harness terminals of each fuel injector connector. 3. Note the test light while cranking the engine for each fuel injector. Does the test light blink for all of the fuel injectors?	-	Go to Step 13	Go to Step 12
12	1. Repair or replace the faulty injector drive circuit harness, the connector, or the connector terminal. 2. If the harness, the connectors, and the terminals are OK, replace the electronic control module (ECM). Is the repair complete?	-	System OK	-
13	Measure the resistance of each fuel injector. The resistance will increase slightly at higher temperatures. Is the injector resistance within the value specified?	11.6-12.4 W	Go to Step 15	Go to Step 14
14	Replace any fuel injectors with a resistance that is out of specifications. Is the repair complete?	-	System OK	-
15	Perform an injector balance test. Is the problem found?	-	Go to Step 16	Go to Step 17
16	Replace any restricted or leaking fuel injectors. Is the repair complete?	-	System OK	-
17	1. Check for electromagnetic interference. 2. Monitor the engine rpm with a scan tool. Does the scan tool rpm change greatly with little change in actual engine rpm?	-	Go to Step 18	-
18	1. Inspect the routing of the ignition wires. 2. Inspect all of the ignition system grounds. 3. Correct the routing or repair the ground connections as needed. Are all checks and needed repairs complete?	-	System OK	-

POOR FUEL ECONOMY

Definition: Fuel economy, as measured by an actual road test, is noticeably lower than expected. Also, fuel economy is noticeably lower than it was on this vehicle at one time, as previously shown by an actual road test.

Important: Driving habits affect fuel economy. Check the owner's driving habits by asking the following questions:

1. Is the air conditioning (A/C) system (i.e. defroster mode) turned on all the time?
2. Are the tires at the correct air pressure?
3. Have excessively heavy loads been carried?
4. Does the driver accelerate too much and too often? Suggest the driver read the section in the owner's manual about fuel economy.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	1. Inspect the air filter for excessive contamination. 2. Inspect for fuel system leaks. Are all needed checks complete?	-	Go to Step 3	-
3	1. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 2. Replace any faulty spark plugs. 3. Inspect the ignition wires for cracking, hardness, and proper connections. Are all needed checks and repairs complete?	-	Go to Step 4	-
4	1. Inspect the engine coolant level. 2. Check the thermostat for being always open or for an incorrect heat range. 3. Replace the thermostat as needed. Are all needed checks and repairs complete?	-	Go to Step 5	-
5	1. Check the transaxle shift pattern. Ensure that all transaxle gears are functioning. 2. Check the torque converter clutch (TCC) operation with a scan tool. The scan tool should indicate rpm drop when the TCC is commanded on. 3. Check for proper calibration of the speedometer. 4. Check the brakes for dragging. 5. Check the cylinder compression. 6. Repair, replace, or adjust any components as needed. Are all checks and needed repairs complete?	-	System OK	-

ROUGH, UNSTABLE, OR INCORRECT IDLE, STALLING

Definition: The engine runs unevenly at idle. If the condition is bad enough, the vehicle may shake. Also, the idle varies in rpm (called "hunting"). Either condition may be severe enough to cause stalling. The engine idles at incorrect idle speed.

Important: Before diagnosing the symptom, check service bulletins for updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Monitor the oxygen (O_2) sensor reading at different throttle positions. Does the O_2 sensor change quickly from rich to lean at the different throttle positions?	-	Go to Step 5	Go to Step 3
3	Check the O_2 sensor for contamination from fuel or improper use of room temperature vulcanizing (RTV) sealant. Is the O_2 sensor contaminated?	-	Go to Step 4	Go to Step 5
4	Replace the contaminated O_2 sensor as needed. Is the repair complete?	-	System OK	-
5	1. Check for a sticking throttle shaft or binding throttle linkage that may cause incorrect throttle position sensor (TPS) voltage. 2. Check the TPS voltage reading with the throttle closed. Is the TPS voltage within the value specified?	0.4-0.8 v	Go to Step 6	Go to "Diagnostic Aids for DTC 21"
6	1. Check the coolant temperature sensor (CTS) voltage reading using the scan tool. 2. Compare the CTS reading with the ambient temperature when the engine is cold. Does the CTS temperature reading differ from the ambient temperature by more than the value specified?	3°C (5°F)	Go to Step 7	Go to Step 9
7	Check for high resistance in the CTS circuit or the sensor itself. Is the problem found?	-	Go to Step 8	Go to Step 9
8	Replace the CTS or repair the circuit as needed. Is the repair complete?	-	System OK	-
9	Check the manifold absolute pressure (MAP) sensor for response and accuracy. Is the problem found?	-	Go to Step 10	Go to Step 11
10	Replace the MAP sensor or repair the MAP sensor circuit as needed. Is the repair complete?	-	System OK	-
11	1. Road test the vehicle at the speed of the complaint. 2. Monitor the fuel trim reading using the scan tool. Is the fuel trim reading within the value specified?	115-150 counts	Go to Step 14	Go to Step 12
12	Is the fuel trim reading below the value specified?	115 counts	Go to "Diagnostic Aids for DTC 45"	Go to Step 13

Rough, Unstable, or Incorrect Idle, Stalling (Cont'd)

Step	Action	Value(s)	Yes	No
13	Is the fuel trim reading above the value specified?	150 counts	Go to "Diagnostic Aids for DTC 44"	-
14	1. Disconnect all of the fuel injector harness connectors at the fuel injectors. 2. Connect an injector test light between the harness terminals of each fuel injector connector. 3. Note the test light while cranking the engine. Does the test light blink for all of the fuel injectors?	-	Go to Step 16	Go to Step 15
15	1. Repair or replace the faulty injector drive circuit harness, the connector, or the connector terminals as needed. 2. If the harness, the connectors, and the terminals are OK, replace the electronic control module (ECM). Is the repair complete?	-	System OK	-
16	Measure the resistance of each of the fuel injectors. The resistance will increase slightly at higher temperatures. Is the resistance within the value specified?	11.6-12.4 W	Go to Step 18	Go to Step 17
17	Replace any fuel injectors with a resistance that is out of specifications. Is the repair complete?	-	System OK	-
18	Perform an injector balance test. Is the problem found?	-	Go to Step 19	Go to Step 20
19	Replace any leaking or restricted fuel injectors. Is the repair complete?	-	System OK	-
20	1. With the engine OFF, disconnect the fuel pressure regulator vacuum hose. 2. Thoroughly inspect the fuel pressure regulator vacuum port and the fuel pressure regulator vacuum hose for the presence of fuel. Is the problem found?	-	Go to Step 21	Go to Step 22
21	Replace the fuel pressure regulator as needed. Is the repair complete?	-	System OK	-
22	1. Check the ignition system output voltage for all of the cylinders using a spark tester. 2. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 3. Inspect the ignition wires for cracking, hardness, or improper connections. 4. Replace any ignition wires that have a resistance over the value specified. Is the problem found?	30,000 W	Go to Step 23	Go to Step 24
23	Repair or replace any ignition system components as needed. Is the repair complete?	-	System OK	-
24	1. Inspect for vacuum leaks. 2. Check for proper positive crankcase ventilation (PCV) operation. 3. Check the idle air control (IAC) valve operation. 4. Inspect the ECM ground connections. Is the problem found?	-	Go to Step 25	Go to Step 26

Rough, Unstable, or Incorrect Idle, Stalling (Cont'd)

Step	Action	Value(s)	Yes	No
25	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
26	1. Check the exhaust gas recirculation (EGR) valve for proper operation. 2. Inspect the battery cables and the ground straps for proper connections. 3. Check the generator voltage output. Repair or replace the generator if the voltage output is not within the value specified. Is the problem found?	12-16 v	Go to Step 27	Go to Step 28
27	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
28	1. Inspect for broken engine mounts. 2. Check for proper valve timing. 3. Perform a cylinder compression test. 4. Inspect for bent pushrods, worn rocker arms, broken or weak valve springs, and a worn camshaft. 5. Perform repairs as needed. Are all of the checks and needed repairs complete?	-	System OK	-

EXCESSIVE EXHAUST EMISSIONS OR ODORS

Definition: Excessive exhaust emissions cause a vehicle to fail an emission test or have an excessive rotten egg smell. Excessive odors do not necessarily indicate excessive emissions.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	1. Run the engine until it reaches operating temperature. 2. Perform an emission test. Does the vehicle pass the emission test?	-	System OK	Go to Step 3
3	1. Connect the scan tool to the assembly line diagnostic link (ALDL). 2. Road test the vehicle. 3. Monitor the long-term fuel trim memory. Is the long-term fuel trim memory within the value specified?	115-150 counts	Go to Step 6	Go to Step 4
4	Is the long-term fuel trim memory below the value specified?	115 counts	Go to "Diagnostic Aids for DTC 45"	Go to Step 5
5	Is the long-term fuel trim memory above the value specified?	150 counts	Go to "Diagnostic Aids for DTC 44"	-
6	1. Check for a properly installed fuel cap. 2. Check the fuel system pressure. 3. Perform an injector balance test. Is the problem found?	-	Go to Step 7	Go to Step 8

Excessive Exhaust Emissions or Odors (Cont'd)

Step	Action	Value(s)	Yes	No
7	1. Repair or replace any fuel system components as needed. 2. Perform an emission test. Does the vehicle pass the emission test?	-	System OK	-
8	1. Check the ignition system for proper operation. 2. Inspect the spark plugs for excessive wear, insulation cracks, improper gap, or heavy deposits. 3. Check the ignition wires for cracking, hardness, or improper connections. Is the problem found?	-	Go to Step 9	Go to Step 10
9	1. Repair or replace any ignition system components as needed. 2. Perform an emission test. Does the vehicle pass the emission test?	-	System OK	-
10	1. Inspect for vacuum leaks. 2. Inspect the catalytic converter for contamination. 3. Inspect for carbon buildup on the throttle body, the throttle plate, and inside the engine. Remove any carbon buildup with a top engine cleaner. 4. Check the exhaust gas recirculation (EGR) valve for not opening. 5. Check for proper positive crankcase ventilation (PCV) operation. Are all checks and needed repairs complete?	-	System OK	-

DIESELING, RUN-ON

Definition: Dieseling is a condition in which an engine continues to run after the ignition switch is turned OFF.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	Does the engine run smoothly after the ignition switch is turned OFF?	-	Go to Step 3	Go to Step 4
3	1. Check the ignition switch and the ignition switch adjustment. 2. Replace the ignition switch if needed. Is the repair complete?	-	System OK	-
4	1. Check the evaporative emission system. 2. Check for leaking fuel injectors. 3. Check the idle air control (IAC) valve operation. 4. Inspect for vacuum leaks. 5. Check for the proper base idle setting. Are all checks and repairs complete?	-	System OK	-

BACKFIRE

Definition: A backfire occurs when fuel ignites in the intake manifold, or in the exhaust system, making a loud popping noise.

Important: Before diagnosing the symptom, check service bulletins for updates.

Step	Action	Value(s)	Yes	No
1	Were the Important Preliminary Checks performed?	-	Go to Step 2	Go to "Important Preliminary Checks"
2	1. Inspect for crossed or crossfiring ignition wires. 2. Check the ignition system output voltage for all cylinders using a spark tester. 3. Inspect the spark plugs for excessive wear, burned electrodes, improper gap, or heavy deposits. Is the problem found?	-	Go to Step 3	Go to Step 4
3	Repair or replace any ignition system components as needed. Is the repair complete?	-	System OK	-
4	1. Check the fuel system operation. 2. Check the fuel injectors by performing an injector balance test. Is the problem found?	-	Go to Step 5	Go to Step 6
5	Repair or replace any fuel system components as needed. Is the repair complete?	-	System OK	-
6	1. Inspect the exhaust gas recirculation (EGR) gasket for a leak or a loose fit. 2. Check the EGR valve for proper operation. 3. Inspect the intake manifold and the exhaust manifold for a casting flash. Is the problem found?	-	Go to Step 7	Go to Step 8
7	Repair or replace any components as needed. Is the repair complete?	-	System OK	-
8	1. Inspect the timing belt for proper installation and tension. 2. Check the engine compression. 3. Inspect the intake manifold gasket and the exhaust manifold gasket for leaks. 4. Check for sticking or leaking valves. 5. Repair or replace any components as needed. Are all checks and corrections complete?	-	System OK	-

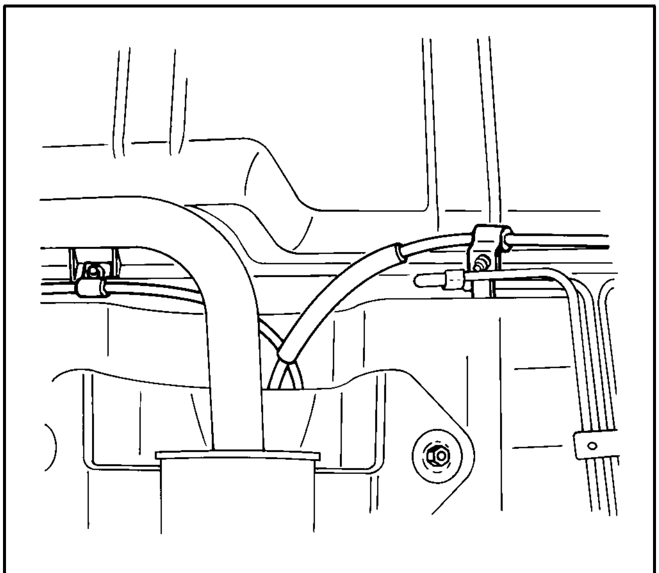
MAINTENANCE AND REPAIR

ON-VEHICLE SERVICE

FUEL TANK

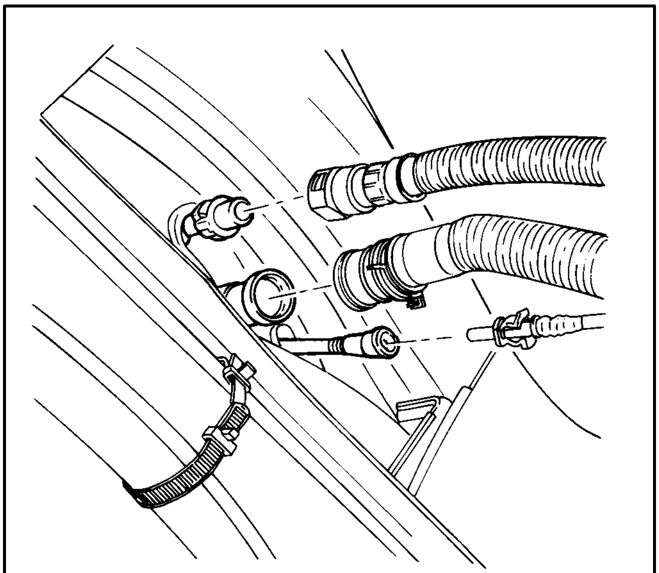
Removal Procedure

Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.



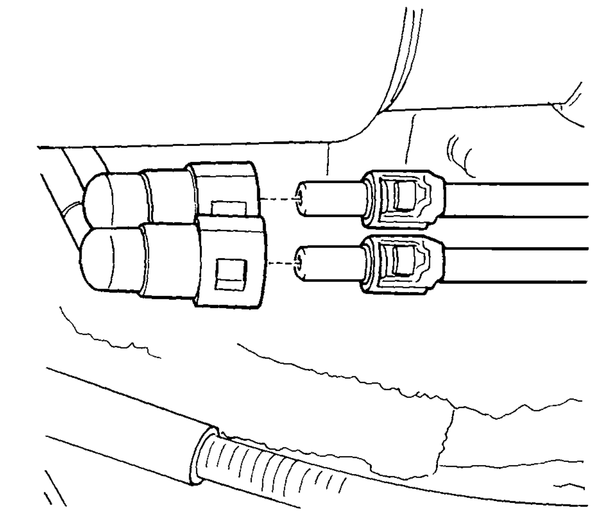
A102F090

1. Relieve the fuel pressure. Refer to "Fuel Pump" in this section.
2. Disconnect the negative battery cable.
3. Drain the fuel tank.
4. Disconnect the parking brake cable retainer clamps and the support along the fuel tank to provide clearance for the tank.



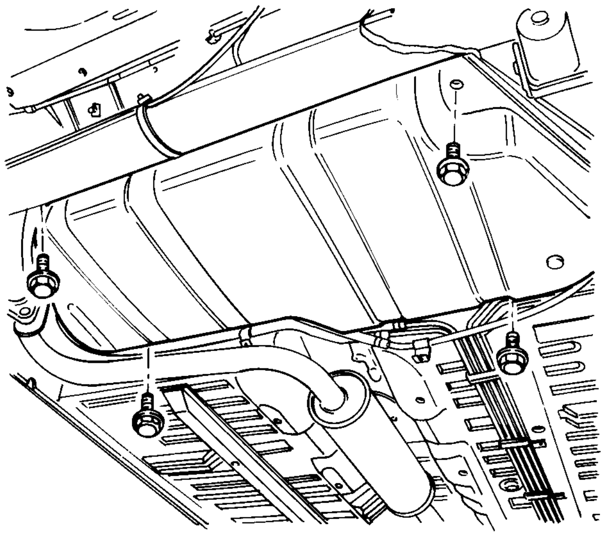
A102F068

5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube.
7. Disconnect the fuel tank vent tube at the fuel tank.
8. Disconnect the fuel vapor line near the fuel tank filler tube.



A102F069

9. Disconnect the fuel pump harness connector at the right rear corner of the fuel tank.
10. Disconnect the fuel inlet line and the fuel return line near the right front of the fuel tank.
11. Disconnect the wiring harness clips and the fuel line clips as needed.



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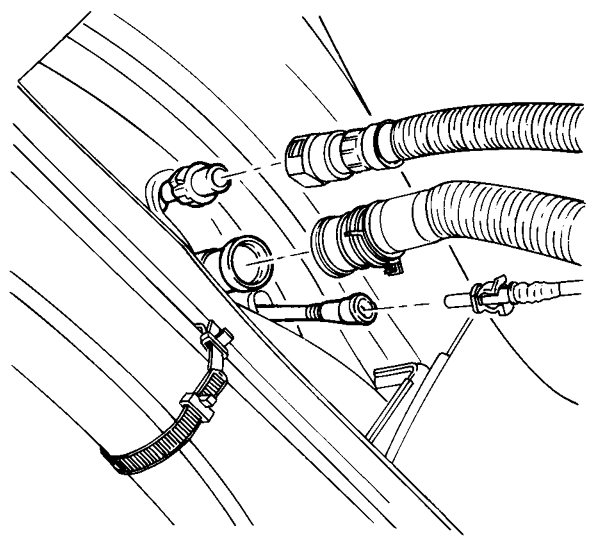
12. Support the fuel tank.
13. Remove the fuel tank retaining bolts.
14. Carefully lower the fuel tank.
15. Remove the fuel tank.
16. Transfer any parts as needed.



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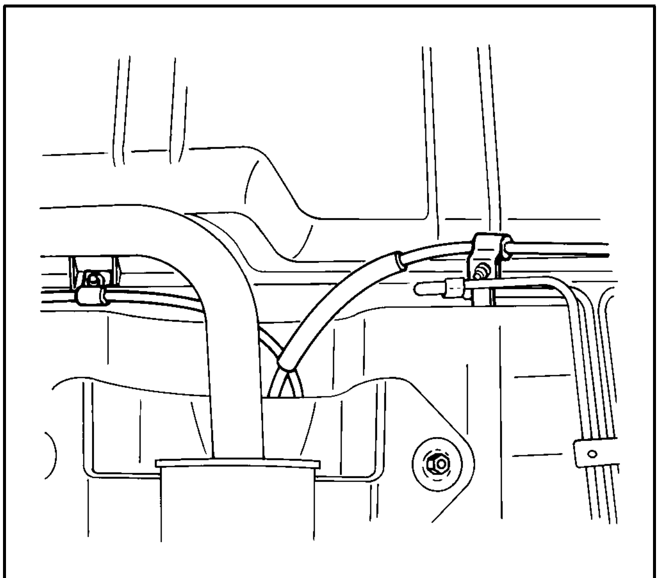
Installation Procedure

1. Raise the fuel tank into position.
2. Install the fuel tank mounting bolts.

Tighten

Tighten the fuel tank retaining bolts to 20 N•m (15 lb-ft).

3. Connect the fuel outlet line and the fuel return line.
4. Connect the wiring harness clips and the fuel line clips as needed.
5. Connect the fuel pump electrical connector.
6. Connect the fuel vapor line.
7. Connect the fuel tank filler tube.
8. Connect the fuel tank vent tube.
9. Install the fuel tank filler tube clamp at the fuel tank.



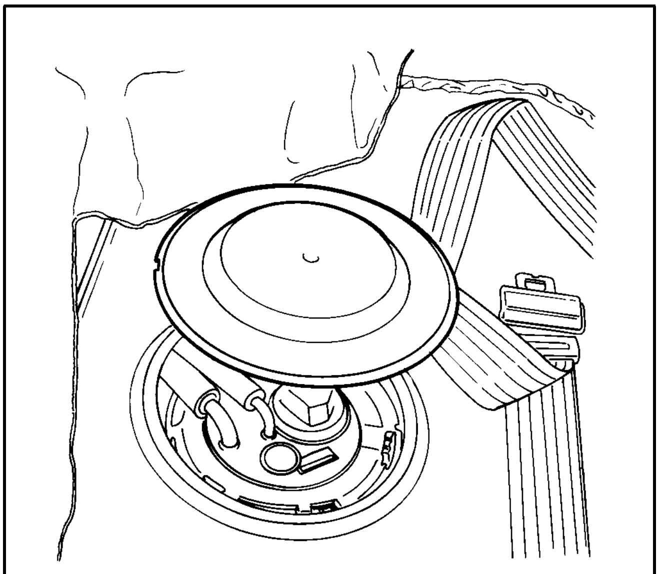
A102F090

10. Install the parking brake cable retainer clamps and the support.

Tighten

Tighten the parking brake cable retainer clamps to 10 N•m (89 lb-in).

11. Connect the negative battery cable.
12. Fill the fuel tank.
13. Perform a leak check of the fuel tank and the fuel line connections.



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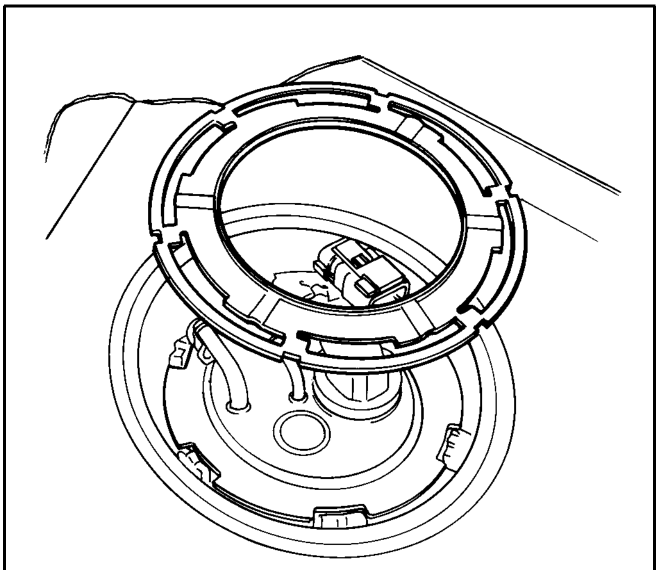
FUEL PUMP

Removal Procedures

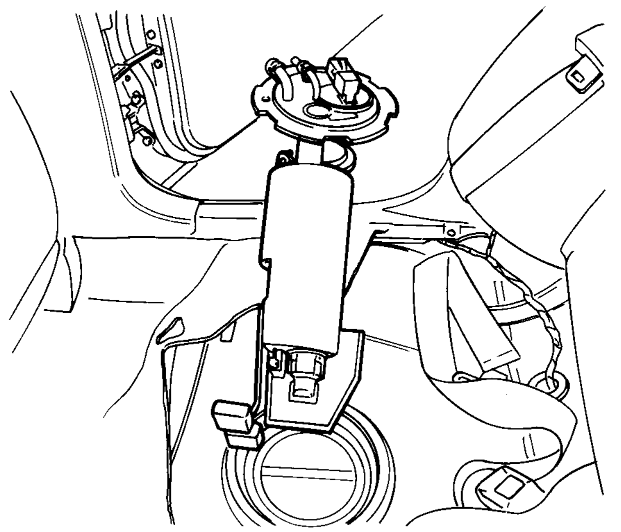
Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

1. Relieve the fuel system pressure.
   1.1. Remove the fuel cap.
   1.2. Remove fuel pump fuse EF8 from the engine fuse block.
   1.3. Start the engine and allow the engine to stall.
   1.4. Crank the engine for an additional 10 seconds.
2. Disconnect the negative battery cable.
3. Remove the rear seat. Refer to Section 9H, Seats.
4. Remove the fuel pump access cover.



A102F025

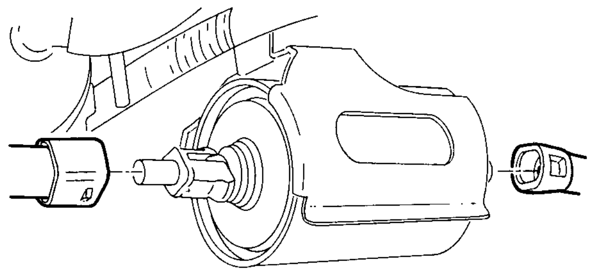
5. Disconnect the electrical connector at the fuel pump assembly.
6. Disconnect the fuel outlet line.
7. Disconnect the fuel tank return line.
8. Turn the lock ring counterclockwise to clear the tank tabs.
9. Remove the fuel pump assembly from the tank.
10. Remove and discard the gasket.



A102F026

Installation Procedure

1. Clean the gasket mating surface on the fuel tank.
2. Position the new gasket in place.
3. Install the fuel pump into the fuel tank in the same location as removed for ease of line and connector installation.
4. Position the lock ring in place and turn it clockwise until it contacts the tank stop.
5. Connect the fuel pump assembly connector.
6. Install the fuel pump outlet line.
7. Install the fuel tank return line.
8. Install the pump access cover.
9. Connect the negative battery cable.
10. Perform an operational check of the fuel pump.
11. Install the rear seat. Refer to Section 9H, Seats.



A102F091

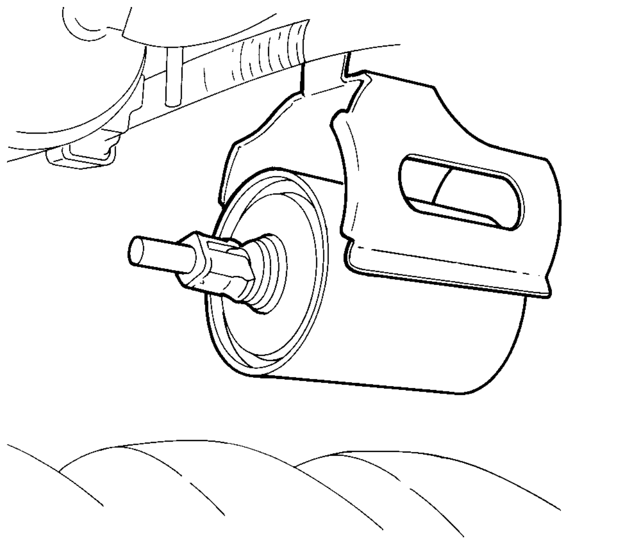
FUEL FILTER

Removal Procedure

1. Disconnect the negative battery cable.

Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

2. Relieve the fuel system pressure. Refer to "Fuel Pump" in this section.
3. Disconnect the inlet/outlet fuel lines by moving the line connector lock forward and pulling the hose off of the fuel filter tube.
4. Pull the fuel filter out of the retaining clamp.



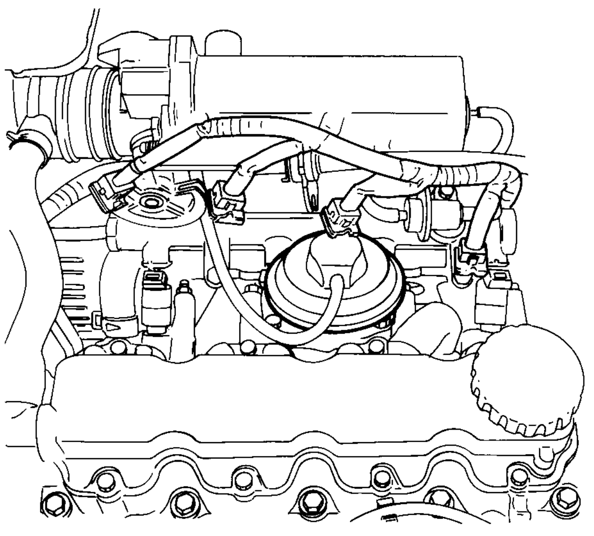
A102F014

Installation Procedure

1. Install the new fuel filter into the retaining clamp. Note the flow direction.
2. Connect the inlet/outlet lines. Secure the lines with the connector lock.
3. Connect the negative battery cable.
4. Perform a leak test of the fuel filter.

FUEL RAIL AND INJECTORS (SOHC)

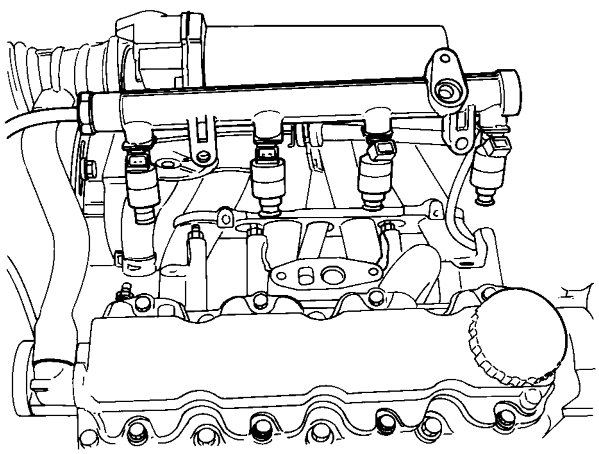
Removal Procedure



A102F005

Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

1. Relieve the fuel pressure. Refer to "Fuel Pump" in this section.
2. Disconnect the negative battery cable.
3. Disconnect the fuel injector harness connectors.
4. Remove the exhaust gas recirculation valve. Refer to "Exhaust Gas Recirculation Valve (SOHC)" in this section.
5. Remove the fuel pressure regulator. Refer to "Fuel Pressure Regulator (SOHC)" in this section.



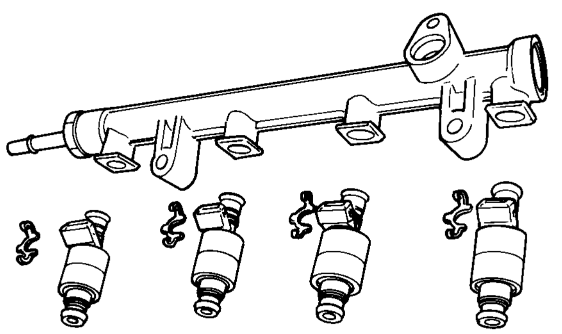
A102F006

6. Remove the fuel inlet line.
7. Remove the fuel rail mounting bolts.

Notice: Before removal, the fuel rail assembly may be cleaned with a spray-type cleaner, following package instructions. Do not immerse the fuel rails in liquid cleaning solvent. Use care in removing the fuel rail assembly to prevent damage to the electrical connectors and the injector spray tips. Prevent dirt and other contaminants from entering open lines and passages. Fittings should be capped and holes plugged during service.

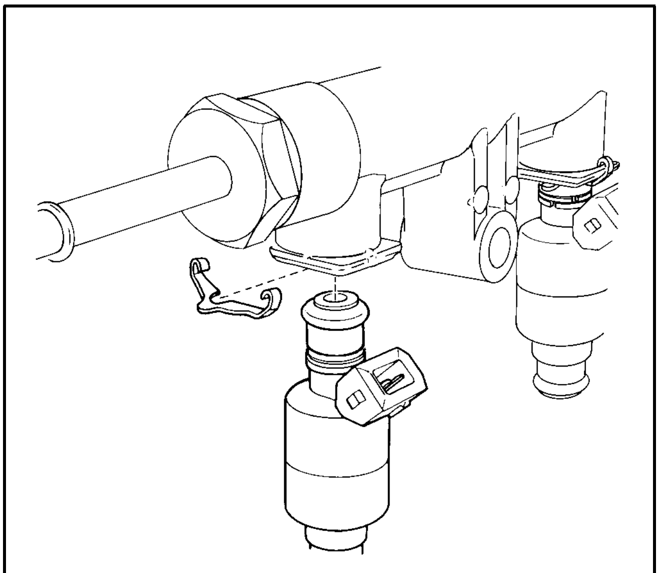
Important: If a fuel injector becomes separated from the fuel rail and remains in the cylinder head, replace the fuel injector O-ring seals and the retaining clip.

8. Remove the fuel rail with the fuel injectors attached.



A102F007

9. Remove the fuel injector retainer clips.
10. Remove the fuel injectors by pulling them down and out.
11. Discard the fuel injector O-rings.

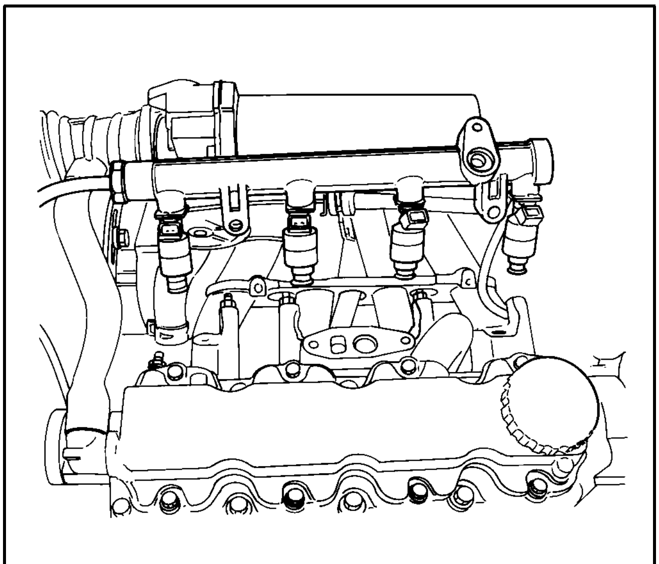


A102F008

Installation Procedure

Important: Different fuel injectors are calibrated for different flow rates. When ordering new fuel injectors, be certain to order the identical part number that is inscribed on the old fuel injector.

1. Lubricate the new fuel injector O-rings with engine oil. Install the new O-rings on the fuel injectors.
2. Install the fuel injectors into the fuel rail sockets with the fuel injector terminals facing outward.
3. Install the fuel injector retainer clips onto the fuel injectors and the fuel rail ledge.
4. Make sure that the clip is parallel to the fuel injector harness connector.



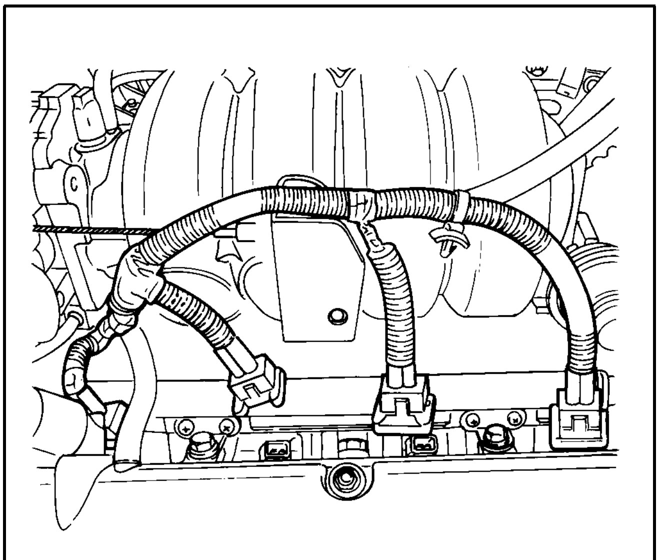
A102F006

5. Install the fuel rail assembly into the cylinder head.
6. Install the fuel rail retaining bolts.

Tighten

Tighten the fuel rail retaining bolts to 25 N•m (18 lb-ft).

7. Connect the fuel inlet hose line.
8. Connect the fuel injector harness connectors. Rotate the fuel injector as required to avoid stretching the wire harness.
9. Install the fuel pressure regulator. Refer to "Fuel Pressure Regulator (SOHC)" in this section.
10. Install the exhaust gas recirculation valve, if equipped. Refer to "Exhaust Gas Recirculation Valve (SOHC)" in this section.
11. Connect the negative battery cable.
12. Perform a leak check of the fuel rail and the fuel injectors.



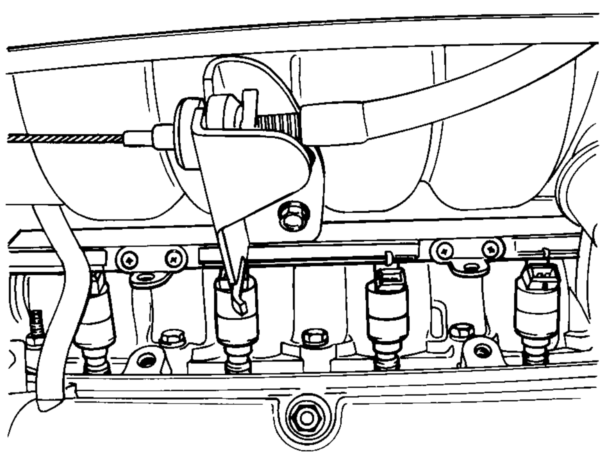
A102F033

FUEL RAIL AND INJECTORS (DOHC)

Removal Procedure

Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

1. Relieve the fuel system pressure. Refer to "Fuel Pump" in this section.
2. Disconnect the negative battery cable.
3. Disconnect the fuel injector harness connectors.
4. Remove the fuel line at the fuel pressure regulator. Refer to "Fuel Pressure Regulator (DOHC)" in this section.



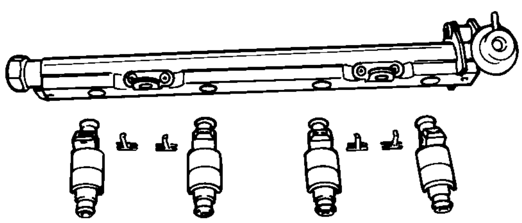
A102F035

5. Remove the fuel inlet line.
6. Remove the fuel rail mounting bolts.

Notice: Before removal, the fuel rail assembly may be cleaned with a spray-type cleaner, following package instructions. Do not immerse the fuel rails in liquid cleaning solvent. Use care in removing the fuel rail assembly to prevent damage to the electrical connectors and the injector spray tips. Prevent dirt and other contaminants from entering open lines and passages. Fittings should be capped and holes plugged during service.

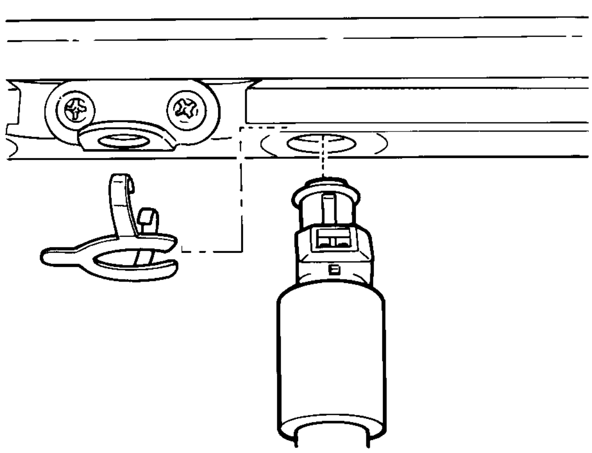
Important: If an injector becomes separated from the rail and remains in the cylinder head, replace the injector O-ring seals and the retaining clip.

7. Remove the fuel rail with the fuel injectors attached.



A102F036

8. Remove the fuel injector retainer clips.
9. Remove the fuel injectors by pulling down and out.
10. Discard the fuel injector O-rings.

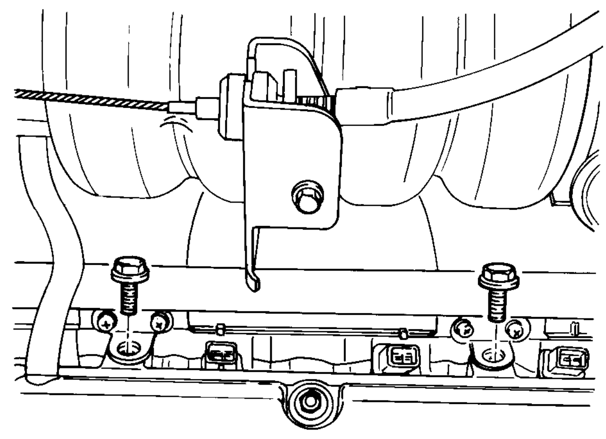


A102F063

Installation Procedure

Important: Different injectors are calibrated for different flow rates. When ordering new fuel injectors, be certain to order the identical part number that is inscribed on the old injector.

1. Lubricate the new fuel injector O-rings with engine oil. Install the new O-rings on the fuel injectors.
2. Install the fuel injectors into the fuel rail sockets with the fuel injector terminals facing outward.
3. Install the fuel injector retainer clips onto the fuel injectors and the fuel rail ledge.
4. Make sure that the clip is parallel to the fuel injector harness connector.

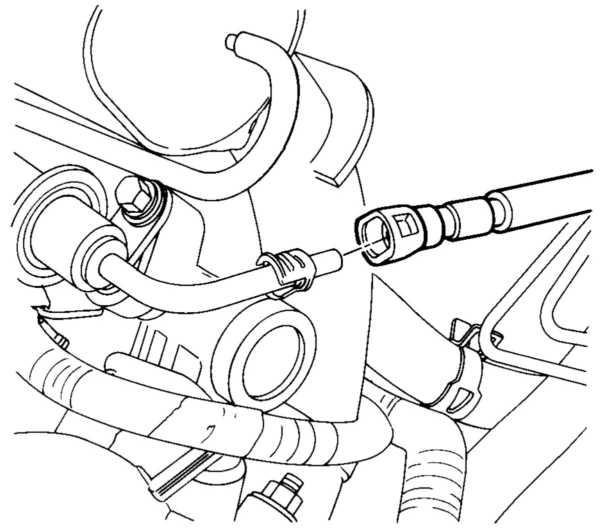

A102F034

5. Install the fuel rail assembly into the cylinder head.
6. Install the fuel rail retaining bolts.

Tighten

Tighten the fuel rail retaining bolts to 25 N•m (18 lb-ft).

7. Connect the fuel inlet hose.
8. Connect the fuel injector harness connectors. Rotate each fuel injector as required to avoid stretching the wire harness.
9. Install the fuel pressure regulator. Refer to "Fuel Pressure Regulator (DOHC)" in this section.
10. Connect the negative battery cable.
11. Perform a leak check of the fuel rail and fuel injectors.

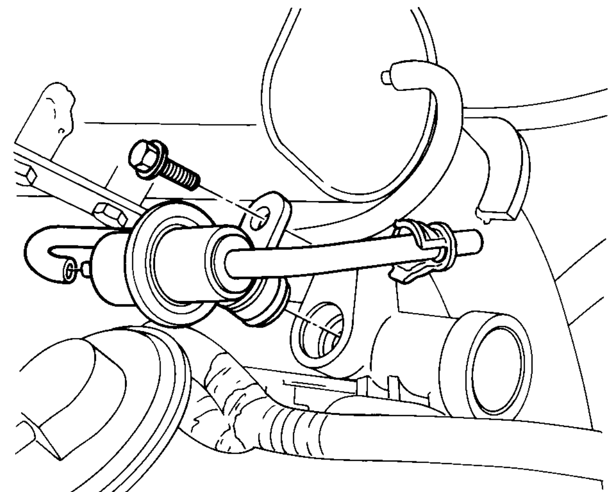

A102F004

FUEL PRESSURE REGULATOR (SOHC)

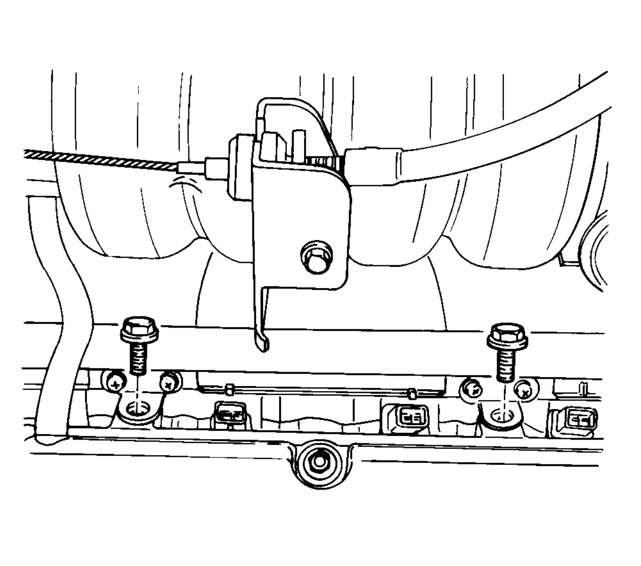
Removal Procedure

Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

1. Relieve the fuel pressure. Refer to "Fuel Pump" in this section.
2. Disconnect the negative battery cable.
3. Disconnect the fuel line at the fuel pressure regulator by sliding the connector lock forward and pulling the line off.


A102F003

4. Disconnect the vacuum hose from the fuel pressure regulator.
5. Remove the fuel pressure regulator retaining bolt.
6. Remove the fuel pressure regulator by turning it back and forth and then pulling it out.
7. Discard the O-ring.



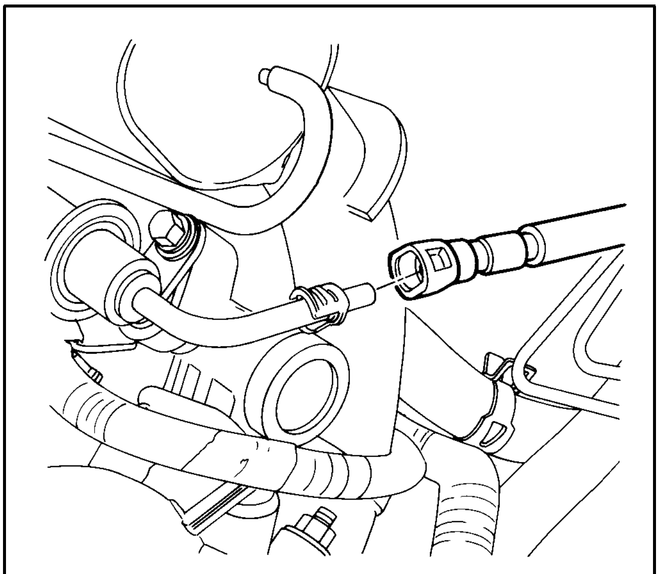
A102F092

Installation Procedure

1. Lubricate a new O-ring with engine oil. Install the new O-ring onto the fuel pressure regulator body.
2. Insert the fuel pressure regulator into the fuel rail body.
3. Install the retaining bolt.

   Tighten

   Tighten the fuel pressure regulator retaining bolt to 12 N•m (106 lb-in).
4. Connect the vacuum hose to the fuel pressure regulator.
5. Connect the fuel line to the fuel pressure regulator by pushing the lock into place.
6. Connect the negative battery cable.
7. Perform a leak test of the fuel pressure regulator with the engine OFF and the ignition ON.



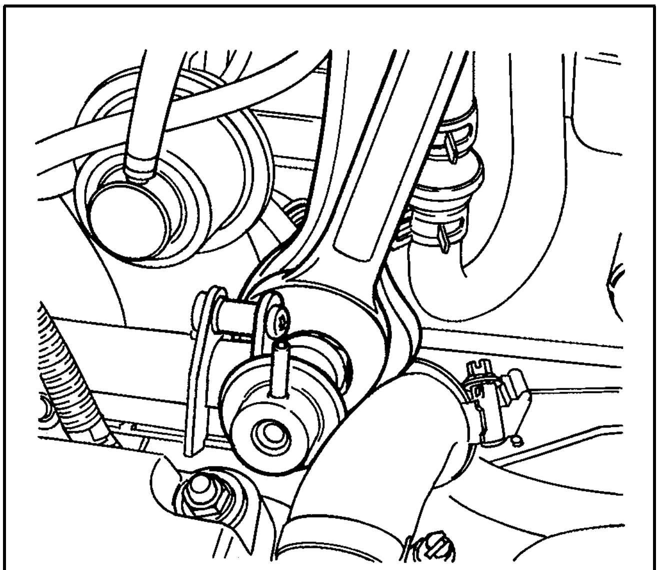
A102F093

FUEL PRESSURE REGULATOR (DOHC)

Removal Procedure

Caution: The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

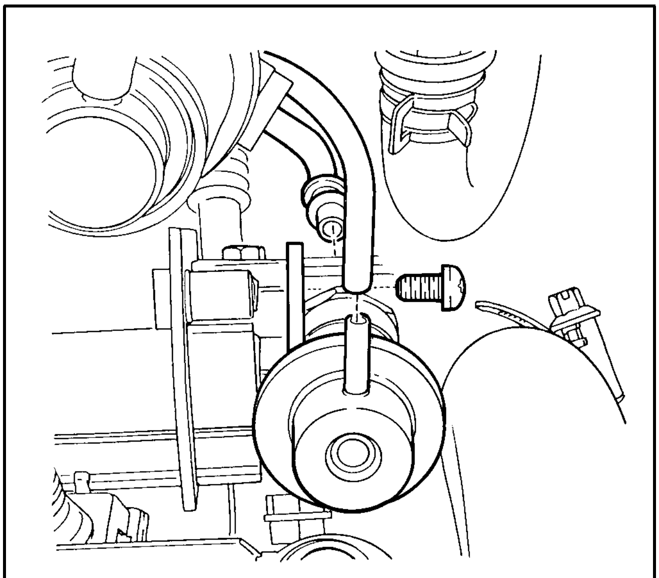
1. Relieve the fuel pressure. Refer to "Fuel Pump" in this section.
2. Disconnect the negative battery cable.
3. Remove the vacuum hose from the fuel pressure regulator.



A102F031

Notice: Use a backup wrench when removing or installing the fuel lines. Damage to the fuel rail can occur if two wrenches are not used.

3. Remove the fuel return line using two wrenches.
4. Remove the retaining screw.
5. Remove the fuel pressure regulator by turning it back and forth and then pulling it out.
6. Discard the O-ring.



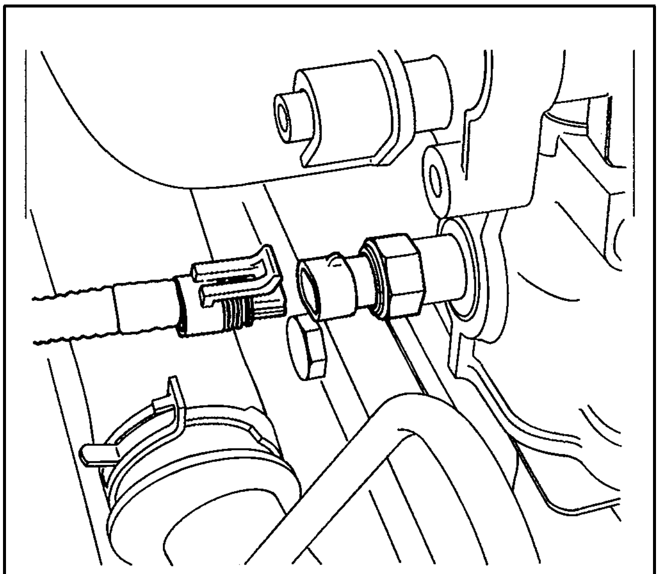
A102F032

Installation Procedure

1. Lubricate a new O-ring with engine oil. Install the O-ring onto the fuel pressure regulator.
2. Insert the fuel pressure regulator into the fuel rail body.
3. Install the retaining screw.

   Tighten

   Tighten the fuel pressure regulator retaining screw to 12 N•m (106 lb-in).
4. Connect the fuel line using two wrenches.
5. Connect the vacuum hose to the fuel pressure regulator.
6. Connect the negative battery cable.
7. Perform a leak test of the fuel pressure regulator with the engine OFF and the ignition ON.



A102F001

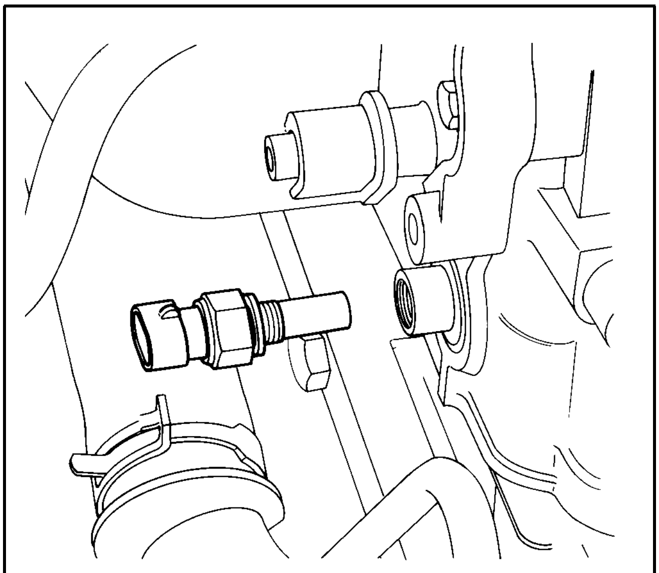
COOLANT TEMPERATURE SENSOR (SOHC)

Removal Procedure

1. Relieve the coolant system pressure.
2. Disconnect the negative battery cable.
3. Disconnect the coolant temperature sensor (CTS) connector.

Notice: Use care when handling the CTS. Damage to the sensor will affect the proper operation of the fuel injection system.

4. Carefully remove the CTS from the cylinder head underneath the direct ignition system (DIS) ignition coil.



A102F002

Installation Procedure

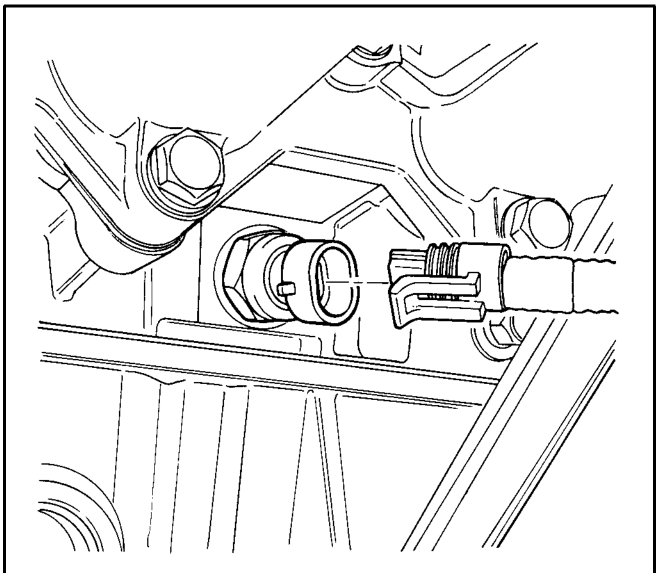
1. Coat the threads on the CTS with sealer.

Notice: Use care when handling the CTS. Damage to the sensor will affect the proper operation of the fuel injection system.

2. Install the CTS into the cylinder head.

   Tighten

   Tighten the coolant temperature sensor to 20 N•m (15 lb-ft).
3. Connect the CTS connector.
4. Fill the coolant system.
5. Connect the negative battery cable.



A102F094

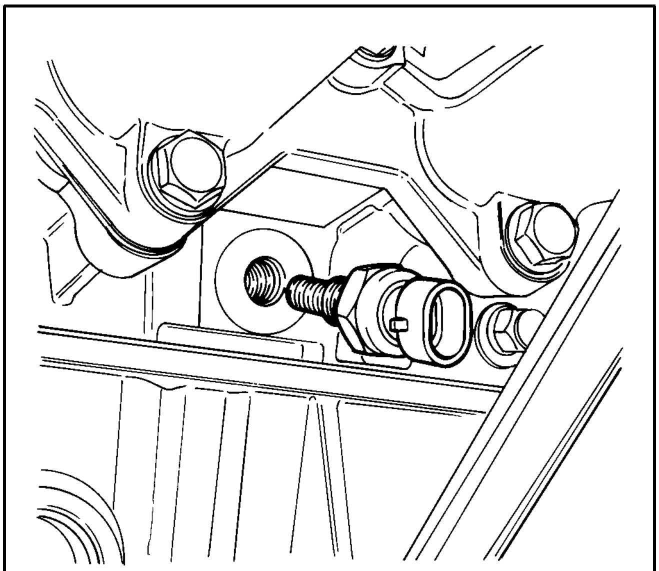
COOLANT TEMPERATURE SENSOR (DOHC)

Removal Procedure

1. Relieve the coolant system pressure.
2. Disconnect the negative battery cable.
3. Disconnect the coolant temperature sensor (CTS) connector.

Notice: Use care when handling the sensor. Damage will affect the proper operation of the fuel injection system.

4. Carefully remove the CTS from the cylinder head underneath the intake manifold.



A102F017

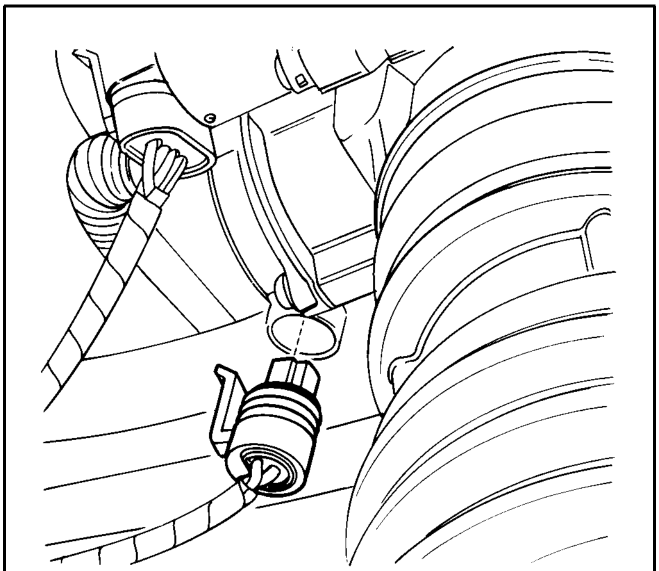
Installation Procedure

1. Coat the threads on the CTS with sealer.
2. Install the CTS into the cylinder head.

   Tighten

   Tighten the coolant temperature sensor to 20 N•m (15 lb-ft).

3. Connect the CTS connector.
4. Fill the cooling system.
5. Connect the negative battery cable.

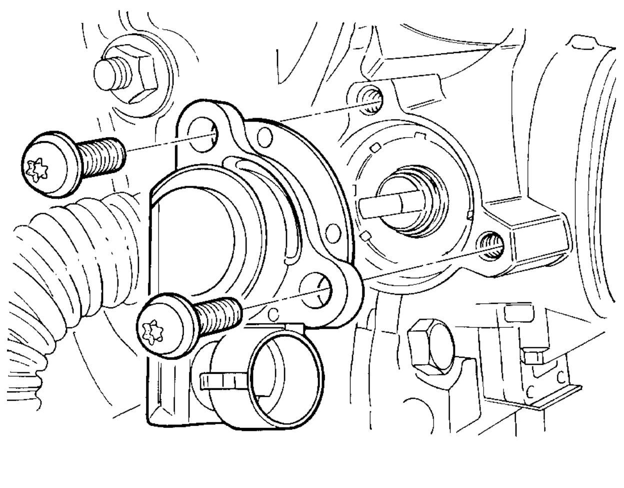


A102F023

THROTTLE POSITION SENSOR (TYPICAL)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the throttle position sensor (TPS) connector.
3. Remove the TPS retaining bolts and the TPS.



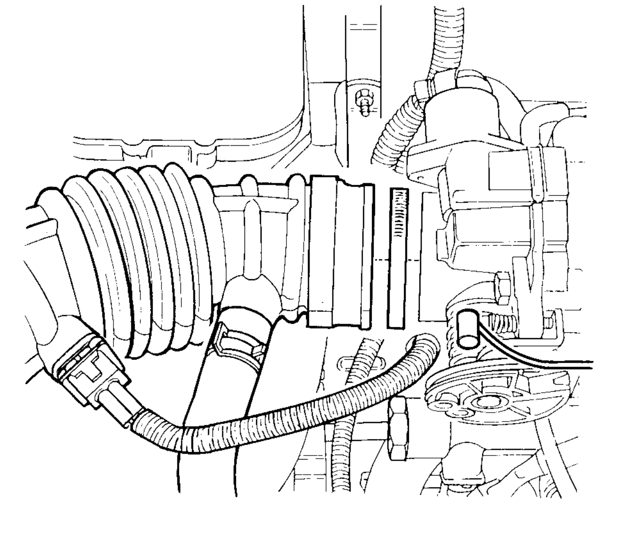
A102F022

Installation Procedure

1. With the throttle valve closed, position the TPS on the throttle shaft. Align the TPS with the bolt holes.
2. Install the TPS retaining bolts.

   Tighten

   Tighten the throttle position sensor retaining bolts to 2 N•m (18 lb-in).
3. Connect the TPS connector.
4. Connect the negative battery cable.

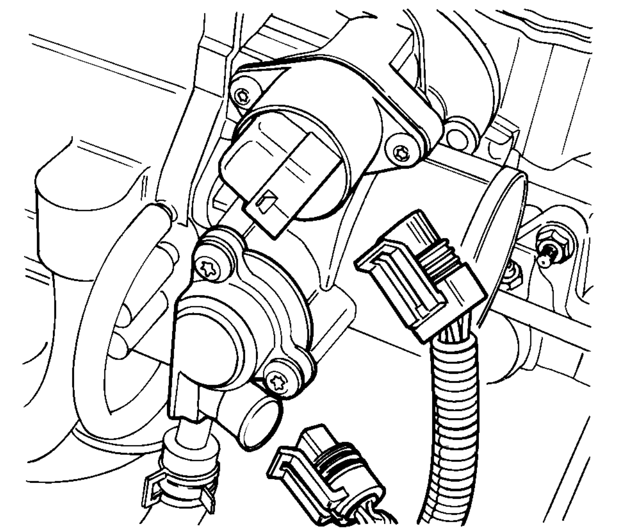


A102F095

THROTTLE BODY (TYPICAL)

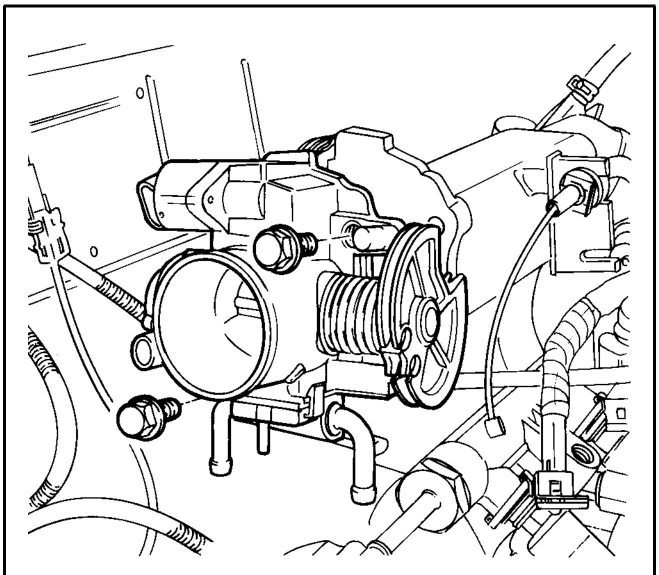
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the air intake tube from the throttle body.
3. Disconnect the throttle cables by opening the throttle and moving the cable through the release slot.



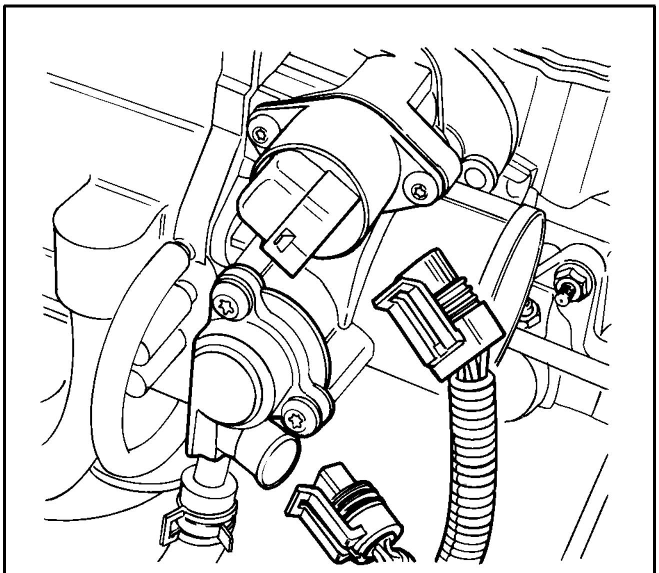
A102F066

4. Disconnect the vacuum hoses from the throttle body.
5. Disconnect the throttle position sensor (TPS) and the idle air control valve connectors.



A102F067

6. Remove the coolant hoses from the throttle body.
7. Remove the throttle body retaining bolts.
8. Remove the throttle body and discard the gasket.
9. Remove the TPS. Refer to “Throttle Position Sensor” in this section.
10. Remove the idle air control (IAC) valve. Refer to “Idle Air Control Valve” in this section.



A102F066

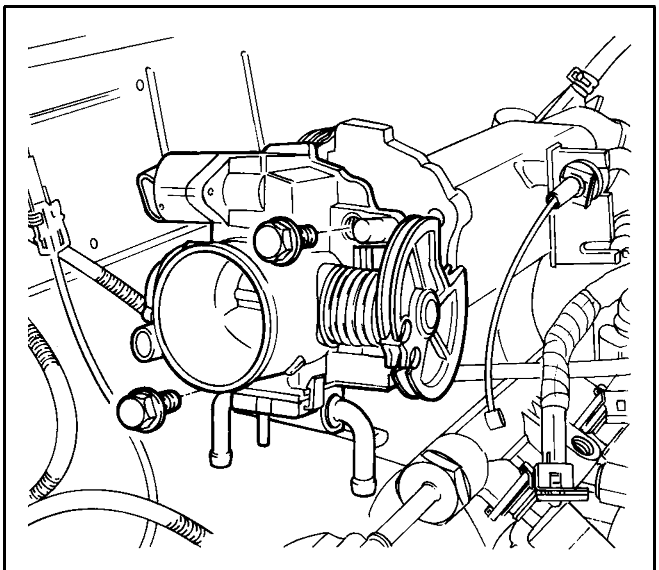
Installation Procedure

Notice: Use care in cleaning old gasket material from machined aluminum surfaces. Sharp tools may damage sealing surfaces.

1. Clean the gasket mating surface on the intake manifold.

Notice: The throttle body may be cleaned in a cold immersion-type cleaner following disassembly. The TPS and the IAC valve should not come in contact with any solvent or cleaner as they may be damaged.

2. Clean the throttle body.
3. Install the TPS. Refer to “Throttle Position Sensor” in this section.
4. Install the IAC valve. Refer to “Idle Air Control Valve” in this section.



A102F067

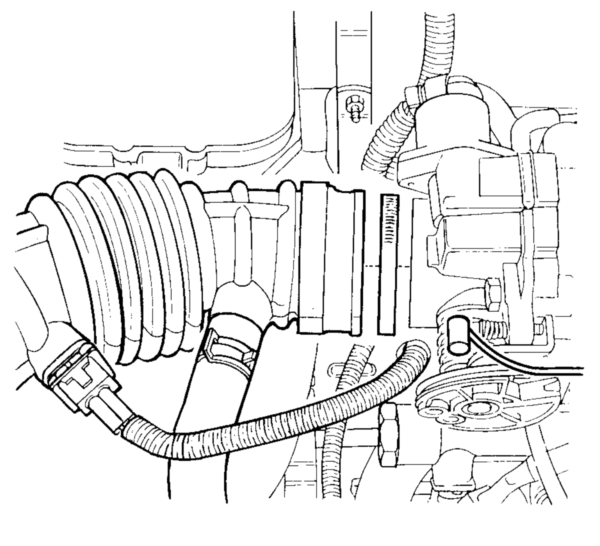
5. Install the throttle body assembly to the intake manifold with a new gasket.
6. Install the throttle body retaining bolts.

   Tighten

   Tighten the throttle body retaining bolts to 15 N•m (11 lb-ft).
7. Install the coolant hoses.
8. Connect the vacuum hoses to the throttle body.

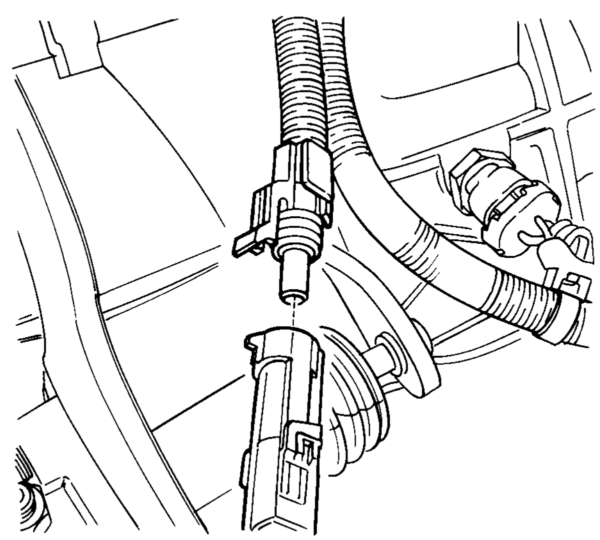
Important: Make sure the throttle control cables do not hold the throttle open. With the engine OFF, check to see that the accelerator pedal is free.

9. Connect the throttle cables.



A102F095

10. Install the air intake tube.
11. Connect the TPS connector and the IAC valve connector.
12. Connect the negative battery cable.
13. Fill the cooling system.



A102F029

OXYGEN SENSOR (TYPICAL)

Removal Procedure

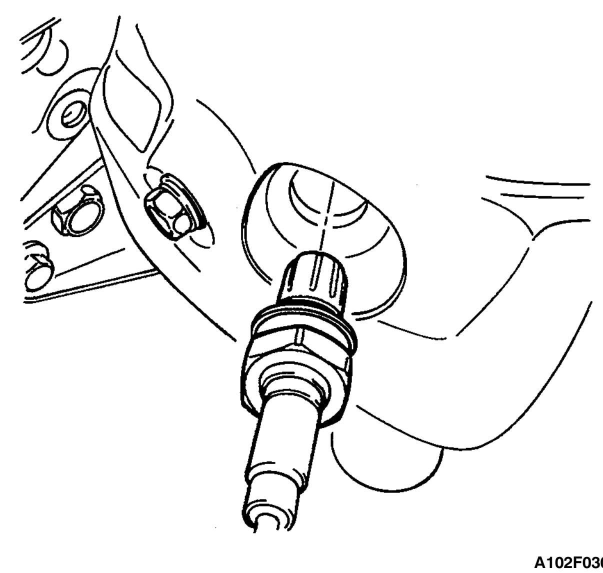
1. Disconnect the negative battery cable.

Notice: The oxygen (O_2) sensor uses a permanently attached pigtail and connector. This pigtail should not be removed from the O_2 sensor. Damage or removal of the pigtail or the connector could affect proper operation of the O_2 sensor. Take care when handling the O_2 sensor. Do not drop or the O_2 sensor.

2. Disconnect the O_2 sensor connector.

Notice: The O_2 sensor may be difficult to remove when engine temperature is below 48°C (118°F). Excessive force may damage threads in the exhaust manifold.

3. Carefully remove the O_2 sensor from the exhaust manifold.



A102F030

Installation Procedure

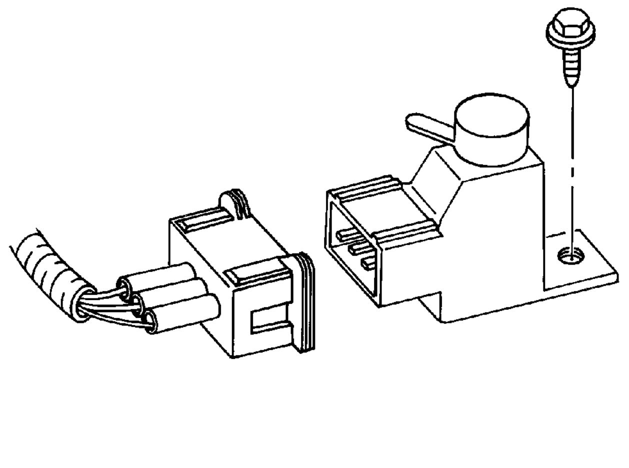
Important: A special anti-seize compound is used on the O_2 sensor threads. This compound consists of a liquid graphite and glass beads. The graphite will burn away, but the glass beads will remain, making the sensor easier to remove. New or service sensors will already have the compound applied to the threads. If a sensor is removed from any engine and, if for any reason, it is to be reinstalled, the threads must have anti-seize compound applied before reinstallation.

1. Coat the threads of the O_2 sensor with an anti-seize compound, if needed.
2. Install the O_2 sensor into the exhaust manifold.

Tighten

Tighten the oxygen sensor to 41 N•m (30 lb-ft).

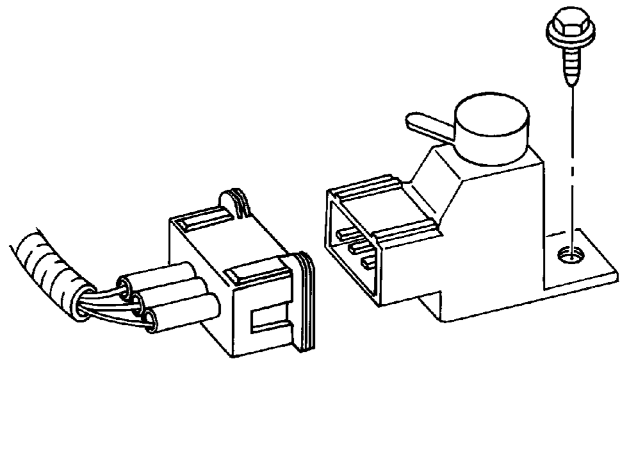
3. Connect the O_2 sensor connector.
4. Connect the negative battery cable.


B302F201

CO POTENTIOMETER (LEADED FUEL ONLY)

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the CO potentiometer mounting bolt.
3. Remove the electrical connector.

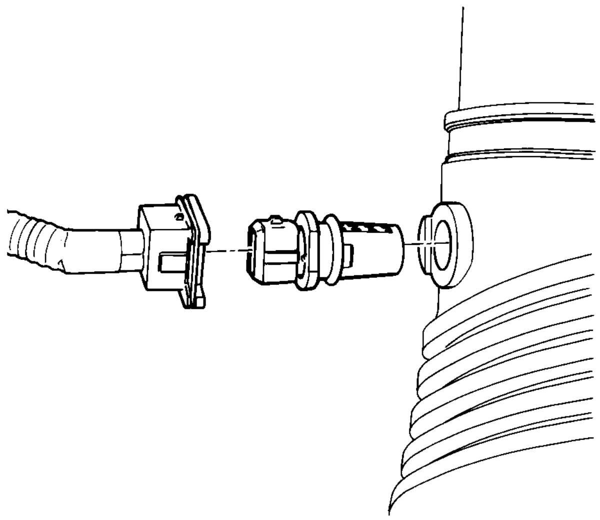

B302F201

Installation Procedure

1. Install the electrical connector.
2. Install the CO potentiometer mounting.

   Tighten

   Tighten the CO potentiometer mounting bolt to 8 N•m (71 lb-in).
3. Connect the negative battery cable.


A102F012

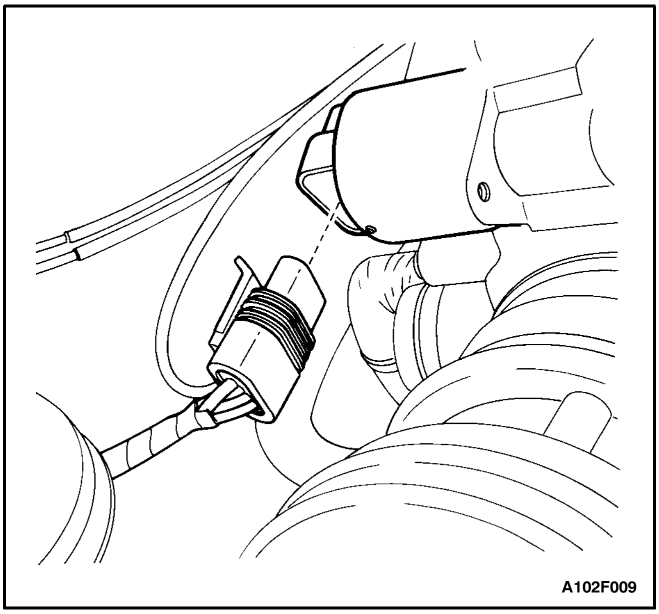
MANIFOLD AIR TEMPERATURE SENSOR (TYPICAL)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the manifold air temperature sensor (MAT) connector.
3. Remove the MAT sensor by pulling it out of the air intake tube.

Installation Procedure

1. Insert the MAT sensor into the air intake tube.
2. Connect the MAT connector.
3. Connect the negative battery cable.


A102F009

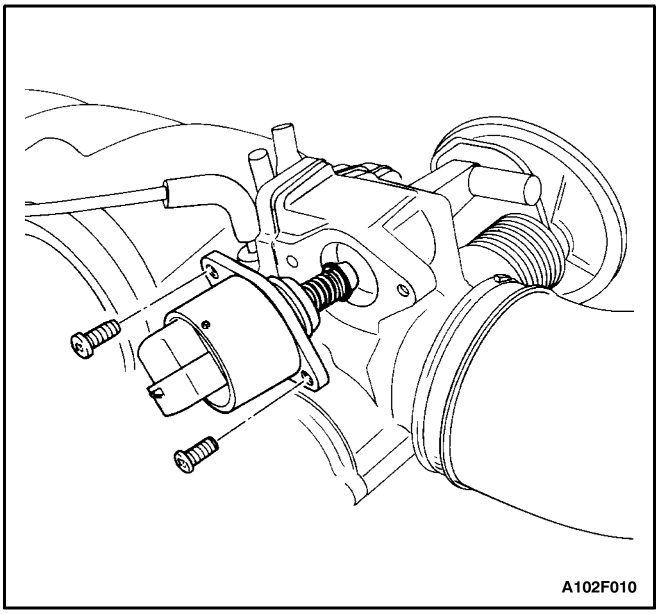
IDLE AIR CONTROL VALVE (TYPICAL)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the idle air control (IAC) valve connector.
3. Remove the IAC valve retaining bolts.

Notice: On IAC valves that have been in service, do not push on the valve pintle. The force required to move the pintle may damage the threads on the worm drive.

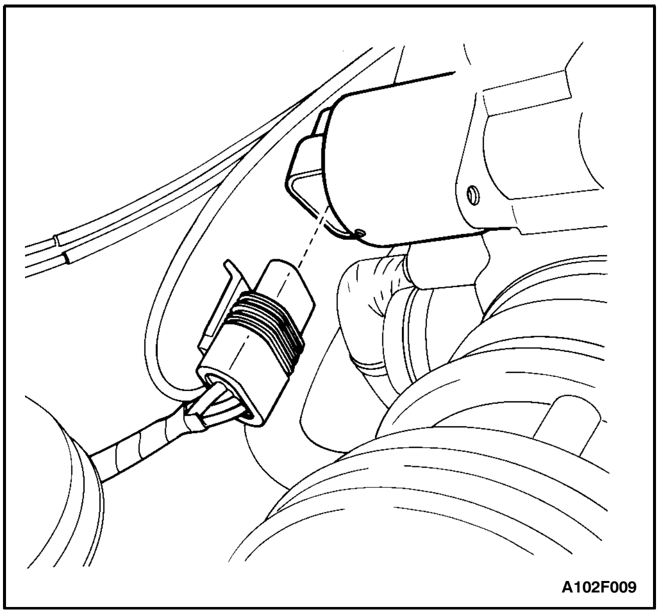
4. Remove the IAC valve.
5. Clean the IAC valve O-ring seal area, the pintle valve seat and the air passage with a suitable fuel system cleaner. Do not use methyl ethyl ketone.


A102F010

Installation Procedure

Important: If installing a new IAC valve, be sure to replace it with an identical part. The IAC valve pintle shape and diameter are designed for the specific application. Measure the distance between the tip of the IAC valve pintle and the mounting flange. If the distance is greater than 28 mm, use finger pressure to slowly retract the pintle. The force required to retract the pintle will not damage the IAC valve. The purpose of the 28 mm setting is to prevent the IAC pintle from bottoming out on the pintle seat. This 28 mm setting is also an adequate setting for controlled idle on a restart.

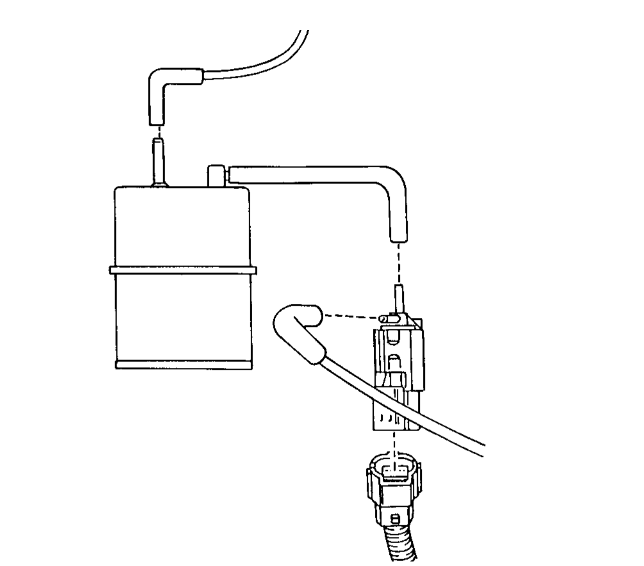
1. Lubricate a new O-ring with engine oil. Install the new O-ring onto the valve.
2. Install the IAC valve into the throttle body.


A102F009

3. Install the IAC valve retaining bolts.

   Tighten

   Tighten the idle air control valve retaining bolts to 3 N•m (27 lb-in).
4. Connect the IAC valve connector.
5. Connect the negative battery cable.
6. Start the engine and check for the proper idle speed.

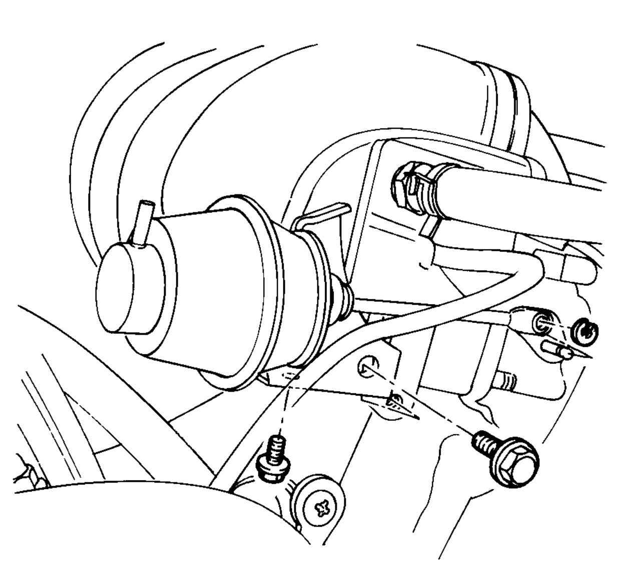


A102F064

VARIABLE GEOMETRY INDUCTION SYSTEM

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the vacuum hoses from the variable geometry induction system (VGIS) solenoid. Note the location of the hoses for ease of installation.
3. Disconnect the VGIS solenoid connector.
4. Remove the VGIS solenoid by pressing the lock in and pulling down on the solenoid.
5. Remove the VGIS vacuum canister.
6. Remove the circlip at the VGIS actuator lever.
7. Remove the VGIS actuator mounting bracket bolt.
8. Remove the VGIS actuator assembly.



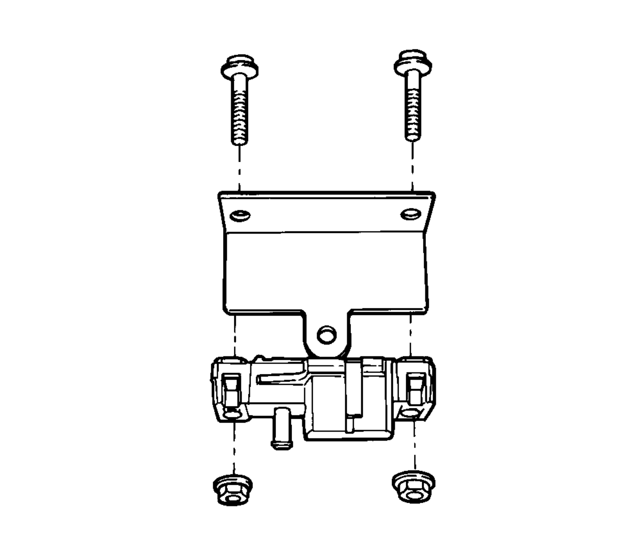
A102F065

Installation Procedure

1. Install the VGIS actuator assembly on the plenum with the mounting bracket bolt.

   Tighten

   Tighten the variable geometry induction system actuator assembly mounting bracket bolt to 16 N•m (12 lb-ft).
2. Connect the VGIS actuator assembly rod into the plenum lever.
3. Install the rod circlip.
4. Install the VGIS solenoid into the snap lock.
5. Push the vacuum canister into the bracket.
6. Connect the VGIS solenoid connector.
7. Connect the vacuum hoses.
8. Connect the negative battery cable.

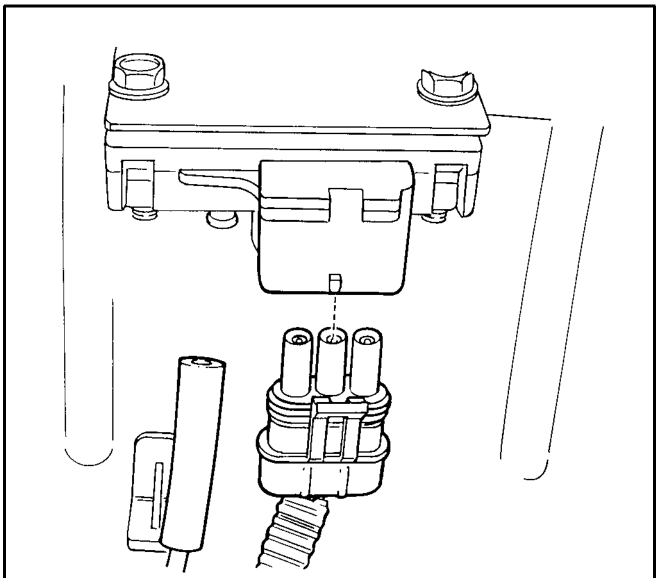


A102F028

MANIFOLD ABSOLUTE PRESSURE SENSOR (TYPICAL)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the vacuum hose from the manifold absolute pressure (MAP) sensor.
3. Disconnect the MAP connector.
4. Remove the MAP sensor mounting bracket bolt.
5. Remove the bolts and the nuts that secure the MAP sensor to the mounting bracket.


A102F027

Installation Procedure

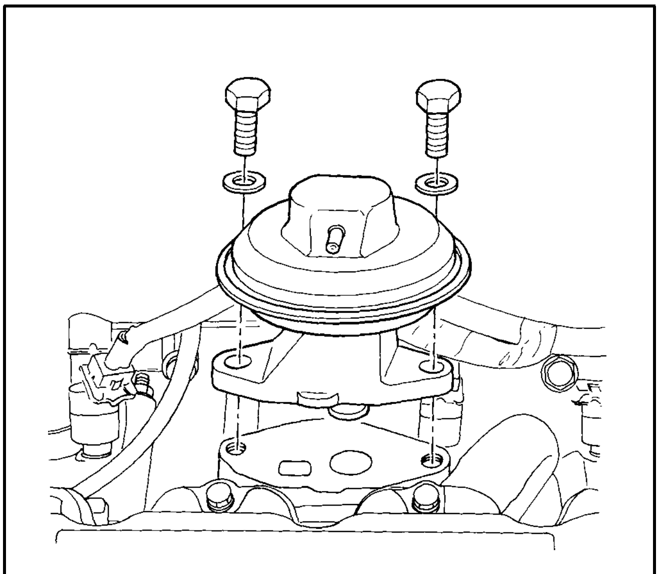
1. Insert the MAP sensor into the mounting bracket.
2. Install the bolts through the MAP sensor and the bracket. Install the retaining nuts.

   Tighten

   Tighten the manifold absolute pressure sensor retaining bolts and the nuts to 8 N•m (71 lb-in).
3. Install the MAP sensor and the mounting bracket to the fire wall with the mounting bracket bolt.

   Tighten

   Tighten the manifold absolute pressure sensor mounting bracket bolt to 10 N•m (89 lb-in).
4. Connect the MAP sensor connector.
5. Connect the vacuum hose to the MAP sensor.
6. Connect the negative battery cable.


A102F013

EXHAUST GAS RECIRCULATION VALVE (SOHC)

Removal Procedure

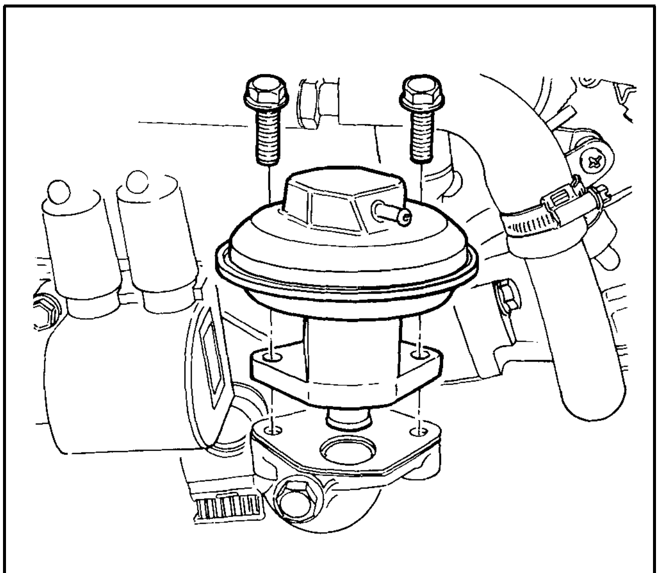
1. Disconnect the vacuum hose from the exhaust gas recirculation (EGR) valve.
2. Remove the bolts and the EGR valve.

Installation Procedure

1. Clean the cylinder head mating surface.
2. Install the new EGR valve gasket.
3. Install the EGR valve with the retaining bolts.

   Tighten

   Tighten the exhaust gas recirculation valve retaining bolts to 20 N•m (15 lb-ft).
4. Connect the vacuum hose to the EGR valve.


A102F018

EXHAUST GAS RECIRCULATION VALVE (DOHC)

Removal Procedure

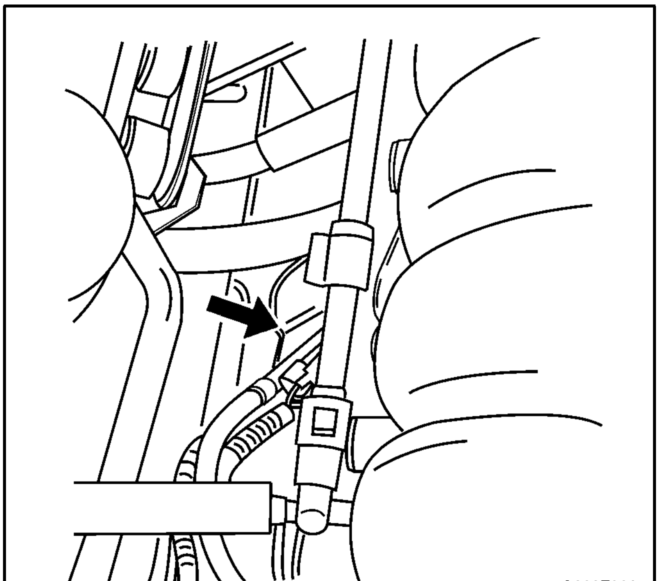
1. Disconnect the vacuum hose from the exhaust gas recirculation (EGR) valve.
2. Remove the bolts and the EGR valve.

Installation Procedure

1. Clean the cylinder head mating surface.
2. Install a new EGR valve gasket.
3. Install the EGR valve with the retaining bolts.

   Tighten

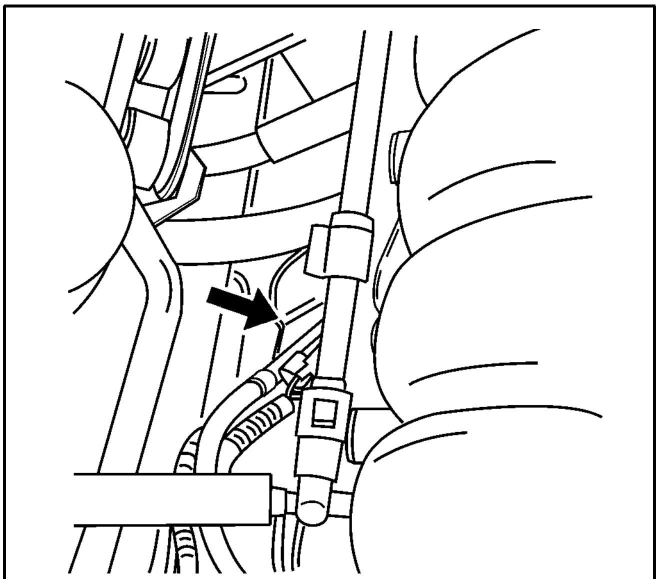
   Tighten the exhaust gas recirculation valve retaining bolts to 20 N•m (15 lb-ft).
4. Connect the vacuum hose to the EGR valve.


A202F061

EXHAUST GAS RECIRCULATION VALVE SOLENOID (TYPICAL)

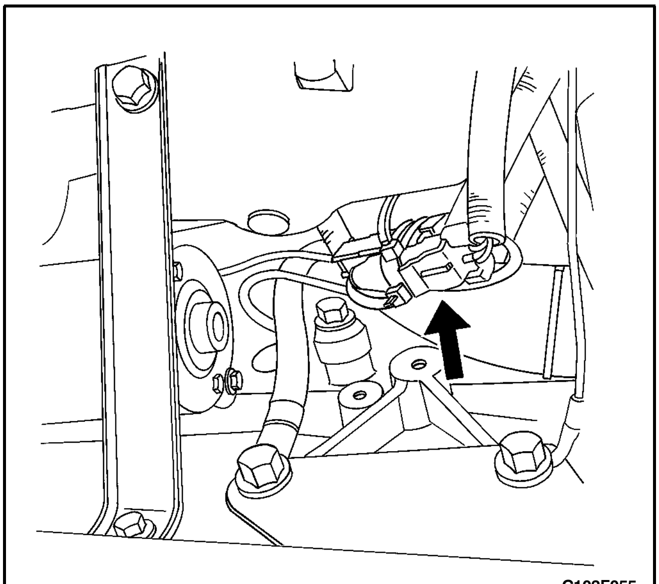
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the canister purge solenoid. Refer to “Canister Purge Solenoid” in this section.
3. Pry off the exhaust gas recirculation (EGR) valve solenoid from the mounting bracket.
4. Disconnect the electrical connector at the EGR valve solenoid.
5. Disconnect the vacuum lines at the EGR valve solenoid.


A202F061

Installation Procedure

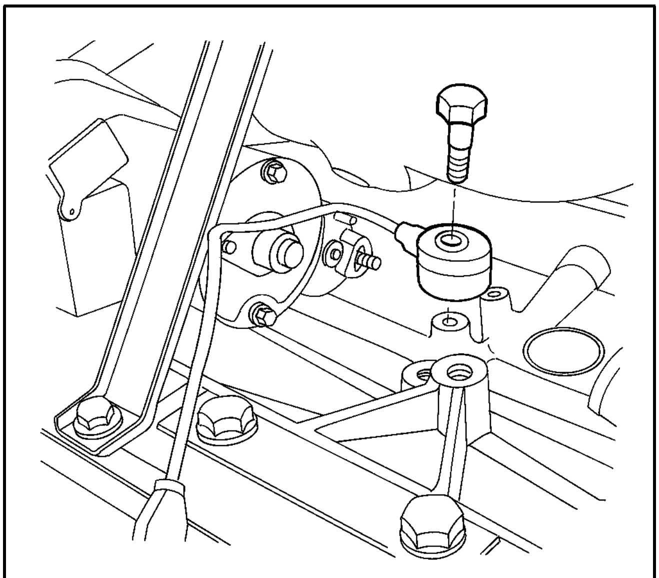
1. Connect the vacuum lines at the EGR valve solenoid.
2. Connect the electrical connector at the EGR valve solenoid.
3. Push the EGR valve solenoid onto the mounting bracket.
4. Install the canister purge solenoid. Refer to “Canister Purge Solenoid” in this section.
5. Connect the negative battery cable.


C102F055

KNOCK SENSOR

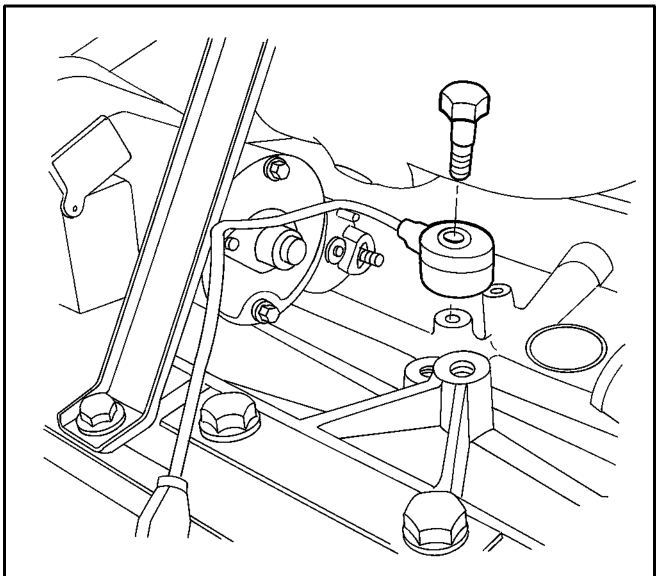
Removal Procedure

1. Disconnect the negative battery cable.
2. For vehicles equipped with an automatic transaxle, remove the intake manifold. Refer to Section 1B, SOHC Engine Mechanical, or Section 1C, DOHC Engine Mechanical.
3. Disconnect the electrical connector at the knock sensor.



C102F056

4. Remove the knock sensor.



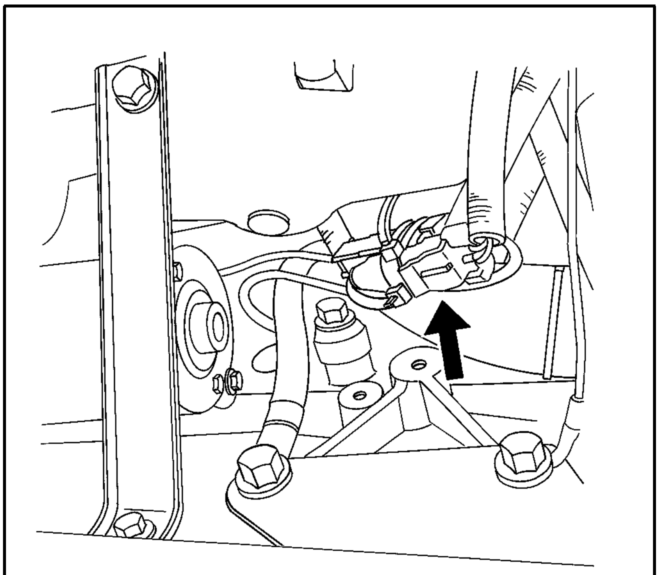
C102F056

Installation Procedure

1. Install the knock sensor.

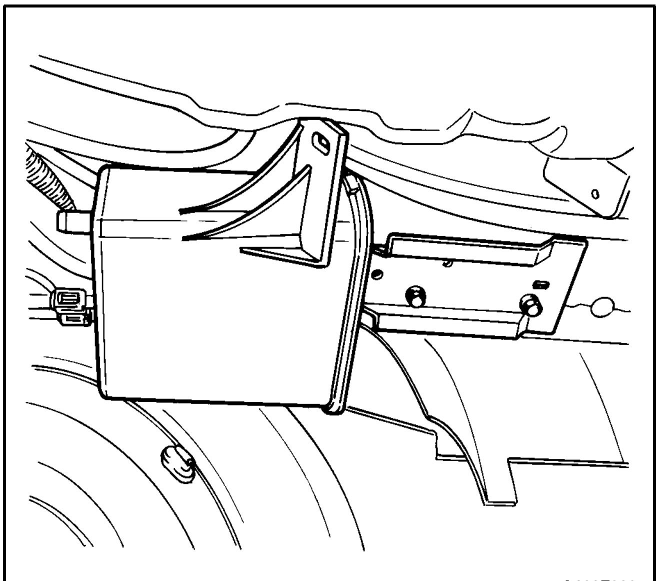
Tighten

Tighten the knock sensor bolt to 20 N•m (15 lb-ft).



C102F055

2. Connect the electrical connector at the knock sensor.
3. For vehicles equipped with an automatic transaxle, remove the intake manifold. Refer to Section 1B, SOHC Engine Mechanical, or Section 1C, DOHC Engine Mechanical.
4. Connect the negative battery cable.



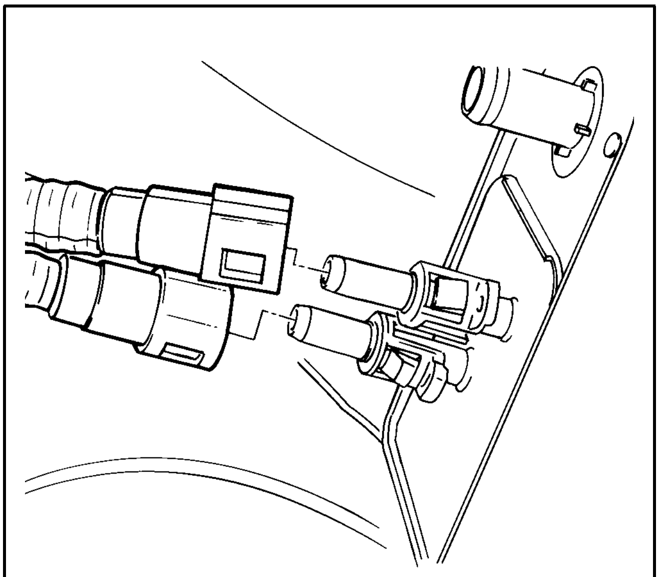
A102F020

EVAPORATIVE EMISSION CANISTER

Removal Procedure

Caution: Canister and vacuum hoses contain fuel vapors. To avoid injury, do not smoke in the area or permit an open flame.

1. Disconnect the canister fuel vapor hoses.
2. Remove the bolt that secures the canister flange to the vehicle.
3. Slide the canister out of the track holder.
4. Remove the canister.



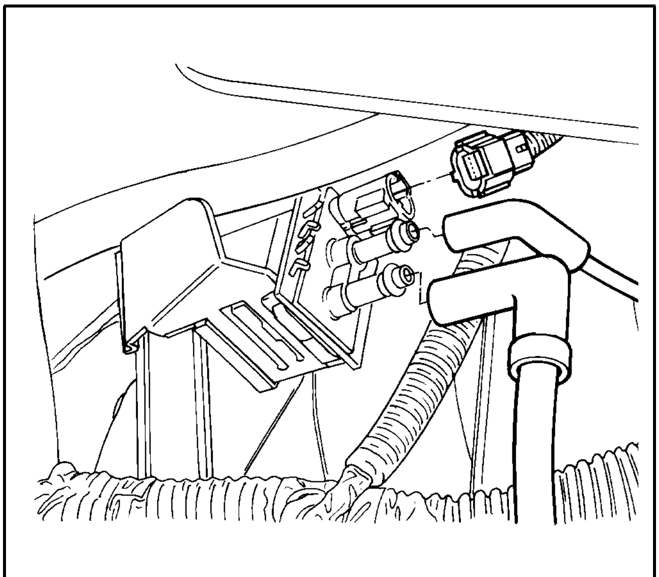
A102F021

Installation Procedure

1. Insert the canister into the track and slide it into position.
2. Install the canister flange bolt.

   Tighten

   Tighten the evaporative emission canister flange bolt to 20 N•m (15 lb-ft).
3. Connect the canister fuel vapor hoses.

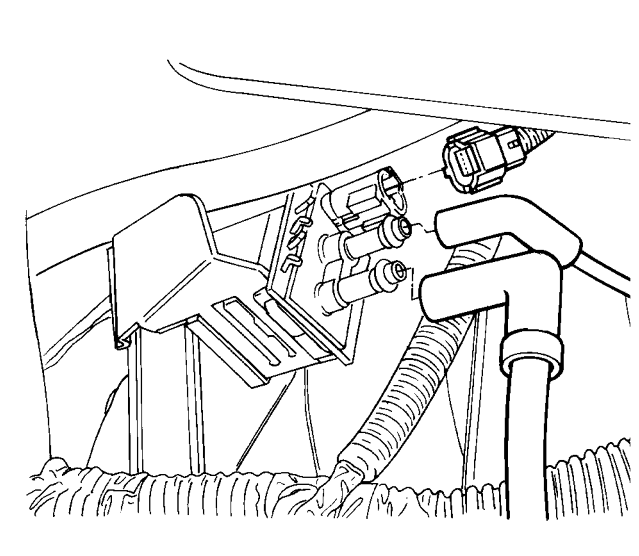


A202F060

CANISTER PURGE SOLENOID (TYPICAL)

Removal Procedure

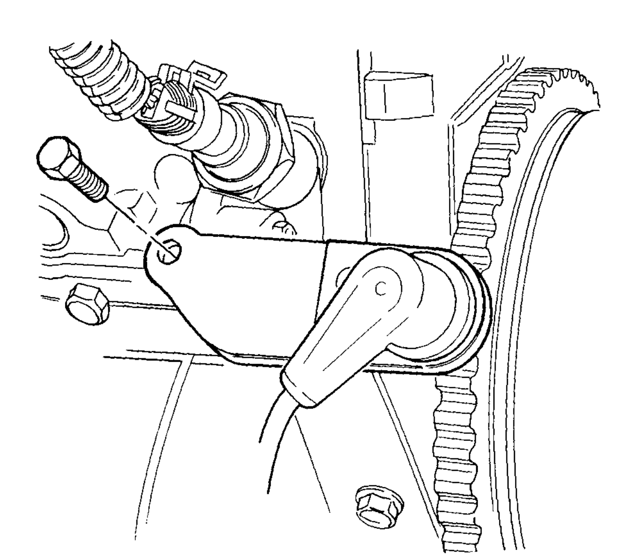
1. Disconnect the negative battery cable.
2. Disconnect the controlled canister purge (CCP) solenoid connector.
3. Disconnect the vacuum hoses from the CCP solenoid.
4. Unclip the CCP solenoid from the mounting bracket.



A202F060

Installation Procedure

1. Attach the CCP solenoid to the mounting bracket.
2. Connect the CCP solenoid connector.
3. Connect the vacuum hoses to the CCP solenoid.
4. Connect the negative battery cable.

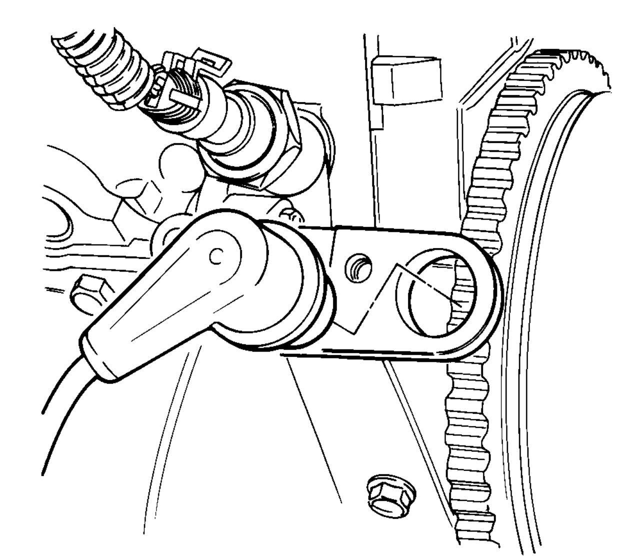


A102F096

CRANKSHAFT POSITION SENSOR (TYPICAL)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the crankshaft position sensor (CPS) connector at the frame bracket.
3. Remove the wiring tie straps as needed.
4. Remove the CPS retaining bolt.
5. Remove the CPS.



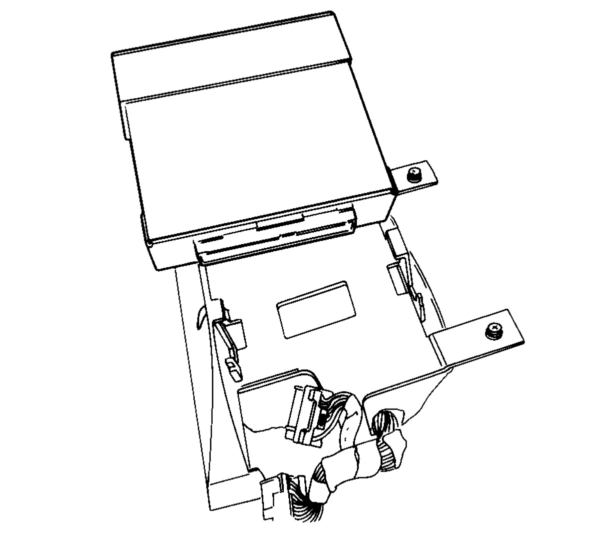
A102F019

Installation Procedure

1. Install the CPS with the retaining bolt.

   Tighten

   Tighten the crankshaft position sensor retaining bolt to 10 N•m (89 lb-in).
2. Connect the CPS connector at the frame bracket.
3. Secure the wire with the tie straps as needed.
4. Connect the negative battery cable.

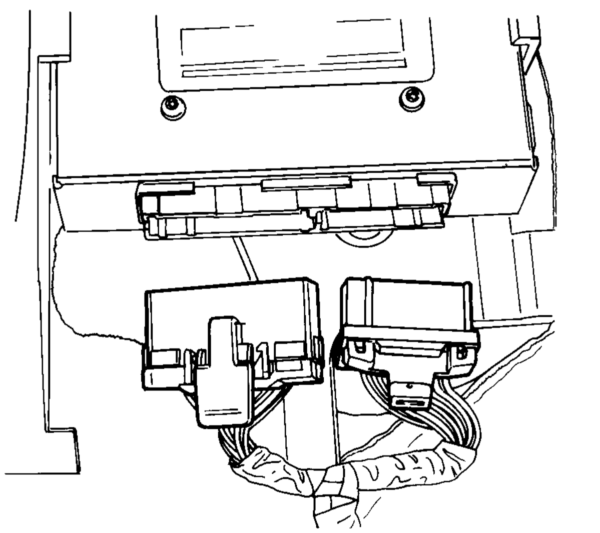


A102F015

ELECTRONIC CONTROL MODULE (TYPICAL)

Removal Procedure

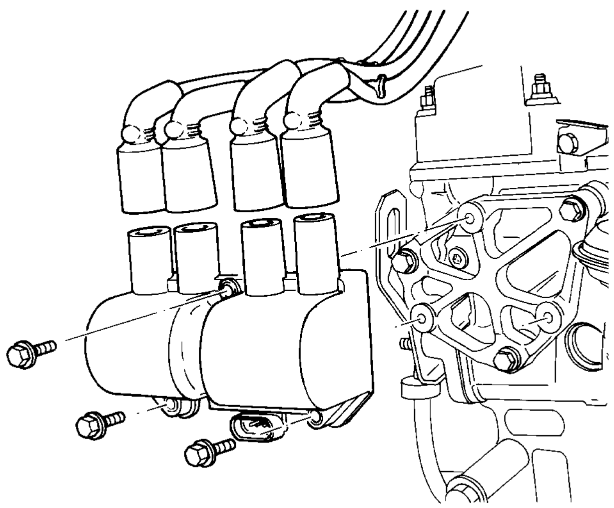
1. Disconnect the negative battery cable.
2. Remove the passenger seat. Refer to Section 9H, Seats.
3. Disconnect the electronic control module (ECM) connectors.
4. Remove the ECM from the ECM mount.



A102F016

Installation Procedure

1. Position the ECM in place.
2. Install the ECM to the ECM mount.
3. Connect the ECM connectors.
4. Install the passenger seat. Refer to Section 9H, Seats.
5. Connect the negative battery cable.

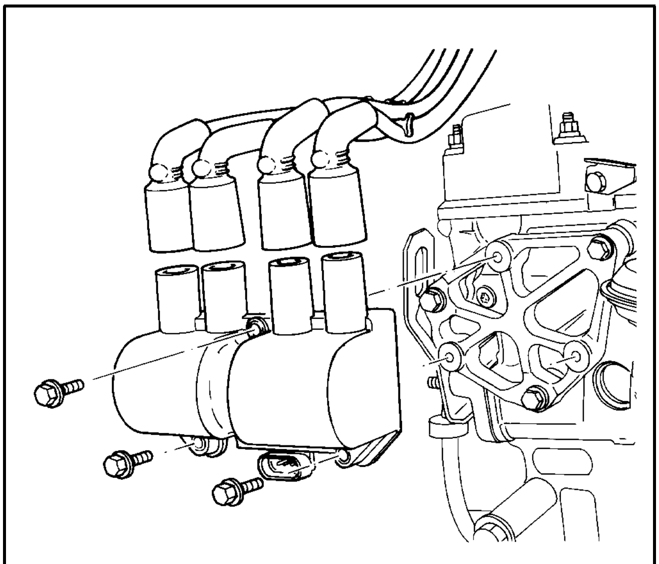


A102F011

DIRECT IGNITION SYSTEM IGNITION COIL (TYPICAL)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the direct ignition system (DIS) ignition coil connector.
3. Note the ignition wire location and remove the ignition wires.
4. Remove the DIS ignition coil retaining bolts.
5. Remove the DIS ignition coil.



A102F011

Installation Procedure

1. Install the DIS ignition coil into the mounting location and install the retaining bolts.

   ### Tighten

   Tighten the direct ignition system ignition coil retaining bolts to 10 N•m (89 lb-in).

2. Connect the DIS ignition coil connector.
3. Install the ignition wires.
4. Connect the negative battery cable.

GENERAL DESCRIPTION AND SYSTEM OPERATION

IGNITION SYSTEM OPERATION

This ignition system does not use a conventional distributor and coil. It uses a crankshaft position sensor (CPS) input to the electronic control module (ECM). The ECM then determines electronic spark timing (EST) and triggers the direct ignition system (DIS) ignition coil.

This type of distributorless ignition system uses a "waste spark" method of spark distribution. Each cylinder is paired with the cylinder that is opposite it (1-4 or 2-3). The spark occurs simultaneously in the cylinder coming up on the compression stroke and in the cylinder coming up on the exhaust stroke. The cylinder on the exhaust stroke requires very little of the available energy to fire the spark plug. The remaining energy is available to the spark plug in the cylinder on the compression stroke.

These systems use the EST signal from the ECM to control the EST. The ECM uses the following information:

- Engine load (manifold pressure or vacuum).
- Atmospheric (barometric) pressure.
- Engine temperature.
- Intake air temperature.
- Crankshaft position.
- Engine speed (rpm).

DIRECT IGNITION SYSTEM IGNITION COIL

The direct ignition system (DIS) ignition coil is mounted near the rear of the camshaft carrier on the single overhead camshaft engine. On the dual overhead camshaft engine, the DIS ignition coil is mounted near the rear of the cylinder head. Each pair of terminals of the DIS ignition coil provides the spark for two spark plugs simultaneously. The DIS ignition coil is not serviceable and must be replaced as an assembly.

CRANKSHAFT POSITION SENSOR

This direct ignition system (DIS) uses a magnetic crankshaft position sensor (CPS) mounted just ahead of the block below the intake manifold. This sensor protrudes through its mount to within approximately 1.3 mm (0.05 inch) of the crankshaft reluctor. The reluctor is a special wheel attached to the crankshaft pulley with 58 slots machined into it, 57 of which are equally spaced in 6-degree intervals. The last slot is wider than the others and serves to generate a "sync pulse." As the crankshaft rotates, the slots in the reluctor change the magnetic field of the sensor, creating an induced voltage pulse. The longer pulse of the 58th slot identifies a specific orientation of the crankshaft and allows the electronic control module (ECM) to determine the crankshaft orientation at all times. The ECM uses this information to generate timed ignition and injection pulses that it sends to the ignition coils and to the fuel injectors.

IDLE AIR SYSTEM OPERATION

The idle air system operation is controlled by the base idle setting of the throttle body and the idle air control (IAC) valve.

The electronic control module (ECM) uses the IAC valve to set the idle speed dependent on conditions. The ECM uses information from various inputs, such as coolant temperature, manifold vacuum, etc., for the effective control of the idle speed.

FUEL CONTROL SYSTEM OPERATION

The function of the fuel metering system is to deliver the correct amount of fuel to the engine under all operating conditions. The fuel is delivered to the engine by the individual fuel injectors mounted into the intake manifold near each cylinder.

The two main fuel control sensors are the manifold absolute pressure (MAP) sensor and the oxygen (O_2) sensor.

The MAP sensor measures or senses the intake manifold vacuum. Under high fuel demands, the MAP sensor reads a low vacuum condition, such as wide-open throttle. The electronic control module (ECM) uses this information to richen the mixture, thus increasing the fuel injector on-time, to provide the correct amount of fuel. When decelerating, the vacuum increases. This vacuum change is sensed by the MAP sensor and read by the ECM, which then decreases the fuel injector on-time due to the low fuel demand conditions.

The O_2 sensor is located in the exhaust manifold. The O_2 sensor indicates to the ECM the amount of oxygen in the exhaust gas and the ECM changes the air/fuel ratio to the engine by controlling the fuel injectors. The best air/fuel ratio to minimize exhaust emissions is 14.7 to 1, which allows the catalytic converter to operate most efficiently. Because of the constant measuring and adjusting of the air/fuel ratio, the fuel injection system is called a "closed loop" system.

The ECM uses voltage inputs from several sensors to determine how much fuel to provide to the engine. The fuel is delivered under one of several conditions, called "modes."

Starting Mode

When the ignition is turned ON, the ECM turns the fuel pump relay on for 2 seconds. The fuel pump then builds fuel pressure. The ECM also checks the coolant temperature sensor (CTS) and the throttle position sensor (TPS) to determine the proper air/fuel ratio for starting the engine. This ranges from 1.5 to 1 at * 36°C (* 33°F) coolant temperature to 14.7 to 1 at 94°C (201°F) coolant temperature. The ECM controls the amount of fuel delivered in the starting mode by changing how long the fuel injector is turned on and off. This is done by "pulsing" the fuel injectors for very short times.

Clear Flood Mode

If the engine floods with excessive fuel, it may be cleared by pushing the accelerator pedal down all the way. The ECM will then completely turn off the fuel by eliminating any fuel injector signal. The ECM holds this injector rate as long as the throttle stays wide open and the engine is below approximately 400 rpm. If the throttle position becomes less than approximately 80 percent, the ECM returns to the starting mode.

Run Mode

The run mode has two conditions called "open loop" and "closed loop."

Open Loop

When the engine is first started and it is above 400 rpm, the system goes into "open loop" operation. In "open loop," the ECM ignores the signal from the O_2 sensor and calculates the air/fuel ratio based on inputs from the CTS and the MAP sensor. The sensor stays in "open loop" until the following conditions are met:

- The O_2 sensor has a varying voltage output, showing that it is hot enough to operate properly.
- The CTS is above a specified temperature.
- A specific amount of time has elapsed after starting the engine.

Closed Loop

The specific values for the above conditions vary with different engines and are stored in the electronically erasable programmable read-only memory (EEPROM). When these conditions are met, the system goes into "closed loop" operation. In "closed loop," the ECM calculates the air/fuel ratio (fuel injector on-time) based on the signal from the O_2 sensor. This allows the air/fuel ratio to stay very close to 14.7 to 1.

Acceleration Mode

The ECM responds to rapid changes in throttle position and airflow and provides extra fuel.

Deceleration Mode

The ECM responds to changes in throttle position and airflow and reduces the amount of fuel. When deceleration is very fast, the ECM can cut off fuel completely for short periods of time.

Battery Voltage Correction Mode

When the battery voltage is low, the ECM can compensate for a weak spark delivered by the ignition module by using the following methods:

- Increasing the fuel injector pulse width.
- Increasing the idle speed rpm.
- Increasing the ignition dwell time.

Fuel Cutoff Mode

No fuel is delivered by the fuel injectors when the ignition is OFF. This prevents dieseling or engine run-on. Also, the fuel is not delivered if there are no reference pulses received from the crankshaft position sensor (CPS). This prevents flooding.

EVAPORATIVE EMISSION CONTROL SYSTEM OPERATION

The basic evaporative emission (EVAP) control system used is the charcoal canister storage method. This method transfers fuel vapor from the fuel tank to an activated carbon (charcoal) storage device (canister) to hold the vapors when the vehicle is not operating. When the engine is running, the fuel vapor is purged from the carbon element by intake airflow and is consumed in the normal combustion process.

Gasoline vapors from the fuel tank flow into the tube labeled TANK. These vapors are absorbed into the carbon. The canister is purged by electronic control module (ECM) when the engine has been running for a specified amount of time. Air is drawn into the canister and mixed with the vapor. This mixture is then drawn into the intake manifold.

The ECM supplies a ground to energize the controlled canister purge (CCP) solenoid valve. This valve is pulse-width modulated (PWM) or turned on and off several times a second. The CCP PWM duty cycle varies according to operating conditions determined by mass airflow, fuel trim, and intake air temperature.

Poor idle, stalling, and poor driveability can be caused by the following conditions:

- An inoperative CCP valve.
- A damaged canister.
- Hoses that are split, cracked, or not connected to the proper tubes.

EVAPORATIVE EMISSION CANISTER

The evaporative emission canister is an emission control device containing activated charcoal granules. The evaporative emission canister is used to store fuel vapors from the fuel tank. Once certain conditions are met, the electronic control module (ECM) activates the controlled canister purge (CCP) solenoid, allowing the fuel vapors to be drawn into the engine cylinders and burned.

VARIABLE GEOMETRY INDUCTION SYSTEM OPERATION

The variable geometry induction system (VGIS) is used to add more responsive acceleration to the dual overhead camshaft (DOHC) engines. Under certain conditions, the electronic control module (ECM) activates the VGIS solenoid, allowing stored vacuum to actuate the secondary throttle control valve. The secondary throttle control valve then opens the secondary throttle plates, which are internal to the intake manifold and plenum assembly. This allows for increased airflow into the engine, creating more responsive acceleration.

POSITIVE CRANKCASE VENTILATION CONTROL SYSTEM OPERATION

A positive crankcase ventilation (PCV) system is used to provide complete use of the crankcase vapors. Fresh air from the air cleaner is supplied to the crankcase. The fresh air is mixed with blowby gases and then passes through a vacuum hose into the intake manifold.

Periodically inspect the hoses and the clamps. Replace any crankcase ventilation components as required.

A restricted or plugged PCV hose may cause the following conditions:

- Rough idle.
- Stalling or low idle speed.
- Oil leaks.
- Oil in the air cleaner.
- Sludge in the engine.

A leaking PCV hose may cause the following conditions:

- Rough idle.
- Stalling.
- High idle speed.

COOLANT TEMPERATURE SENSOR

The coolant temperature sensor (CTS) is a thermistor (a resistor which changes value based on temperature) mounted in the engine coolant stream. Low coolant temperature produces a high resistance (100,000 ohms at * 40°C [* 40°F]) while high temperature causes low resistance (70 ohms at 130°C [266°F]).

The electronic control module (ECM) supplies 5 volts to the coolant sensor through a resistor in the ECM and measures the change in voltage. The voltage will be high when the engine is cold, and low when the engine is hot. By measuring the change in voltage, the ECM can determine the coolant temperature. The engine coolant temperature affects most of the systems that the ECM controls. A failure in the coolant sensor circuit should set Diagnostic Trouble Code (DTC) 14 or 15. Remember, these DTCs indicate a failure in the coolant temperature circuit, so proper use of the chart will lead either to repairing a wiring problem or to replacing the sensor to repair a problem properly.

THROTTLE POSITION SENSOR

The throttle position sensor (TPS) is a potentiometer connected to the throttle shaft of the throttle body. The TPS electrical circuit consists of a 5-volt supply line and a ground line, both provided by the electronic control module (ECM). The ECM calculates the throttle position by monitoring the voltage on this signal line. The TPS output changes as the accelerator pedal is moved, changing the throttle valve angle. At a closed throttle position, the output of the TPS is low, about 0.5 volt. As the throttle valve opens, the output increases so that, at wide-open throttle (WOT), the output voltage will be about 5 volts.

The ECM can determine fuel delivery based on throttle valve angle (driver demand). A broken or loose TPS can cause intermittent bursts of fuel from the injector and an unstable idle, because the ECM thinks the throttle is moving. A problem in any of the TPS circuits should set DTC 21 or 22. Once the DTC is set, the ECM will substitute a default value for the TPS and some vehicle performance will return. A DTC 21 will cause a high idle speed.

OXYGEN SENSOR

The oxygen (O_2) sensor is mounted in the exhaust system where it can monitor the oxygen content of the exhaust gas stream. The oxygen content in the exhaust reacts with the sensor to produce a voltage output. This voltage ranges from approximately 0.1 volt (high O_2 - lean mixture) to 0.9 volt (low O_2 - rich mixture). This voltage can be measured with a digital voltmeter having at least 10 megohms input impedance. Use of standard shop type voltmeters will result in very inaccurate readings.

The electronic control module (ECM) monitors the O_2 sensor output and determines what changes are necessary in the fuel mixture command.

The O_2 sensor circuit sets Diagnostic Trouble Code (DTC) 13 when it is open. A constant low voltage in the sensor circuit, indicating a lean mixture, sets DTC 44. A constant high voltage, indicating a rich mixture, sets DTC 45. Refer to the DTC charts for conditions that could cause a lean or a rich system.

CO POTENTIOMETER (LEADED FUEL ONLY)

The CO potentiometer is a manually adjustable variable resistor which controls carbon monoxide (CO) emissions in vehicles that use leaded fuel. In these vehicles, the CO potentiometer takes the place of the O_2 sensor in controlling the fuel injector pulse width. The electronic control module (ECM) supplies a 5V reference voltage to the CO potentiometer. The technician can adjust the voltage of the return signal back to the ECM by turning a small screw on the CO potentiometer. By adjusting the voltage, the ECM will adjust the pulse width of the fuel injectors to minimize CO emissions.

EXHAUST GAS RECIRCULATION VALVE AND SOLENOID

The exhaust gas recirculation (EGR) system is used on engines to lower NOX (oxides of nitrogen) emission levels caused by high combustion temperature. The system is operated by the electronic control module (ECM) through the EGR solenoid. The EGR valve feeds small amounts of exhaust gas into the intake manifold to decrease combustion temperature. The amount of exhaust gas recirculated is controlled by variations in vacuum and exhaust back pressure. If too much exhaust gas enters, combustion will not take place. For this reason, very little exhaust gas is allowed to pass through the valve, especially at idle.

The EGR valve is usually open under the following conditions:

- Warm engine operation.
- Above idle speed.

Results of Incorrect Operation

Too much EGR flow tends to weaken combustion, causing the engine to run roughly or to stop. With too much EGR flow at idle, cruise, or cold operation, any of the following conditions may occur:

- The engine stops after a cold start.
- The engine stops at idle after deceleration.
- The vehicle surges during cruise.
- Rough idle.

If the EGR valve stays open all the time, the engine may not idle. Too little or no EGR flow allows combustion temperatures to get too high during acceleration and load conditions. This could cause the following conditions:

- Spark knock (detonation).
- Engine overheating.
- Emission test failure.

MANIFOLD AIR TEMPERATURE SENSOR

The manifold air temperature (MAT) sensor is a thermistor, a resistor which changes value based on the temperature of the air entering the engine. Low temperature produces a high resistance (100,000 ohms at * 40°C [* 40°F]), while high temperature causes a low resistance (70 ohms at 130°C [266°F]).

The electronic control module (ECM) provides 5 volts to the MAT sensor through a resistor in the ECM and measures the change in voltage to determine the MAT. The voltage will be high when the manifold air is cold and low when the air is hot. The ECM knows the intake MAT by measuring the voltage.

The MAT sensor is also used to control spark timing when the manifold air is cold.

A failure in the MAT sensor circuit sets a Diagnostic Trouble Code (DTC) 23 or 25.

IDLE AIR CONTROL VALVE

Notice: Do not attempt to remove the protective cap and readjust the stop screw. Misadjustment may result in damage to the idle air control (IAC) valve or to the throttle body.

The IAC valve is mounted on the throttle body where it controls the engine idle speed under the command of the electronic control module (ECM). The ECM sends voltage pulses to the IAC valve motor windings, causing the IAC valve pintle to move in or out a given distance (a step or count) for each pulse. The pintle movement controls the airflow around the throttle valves which, in turn, control the engine idle speed.

The desired idle speeds for all engine operating conditions are programmed into the calibration of the ECM.

These programmed engine speeds are based on the coolant temperature, the park/neutral switch status, the vehicle speed, the battery voltage, and the air conditioning (A/C) system pressure (if equipped).

The ECM "learns" the proper IAC valve positions to achieve warm, stabilized idle speeds (rpm) desired for the various conditions (park/neutral or drive, A/C on or off, if equipped). This information is stored in ECM "keep alive" memories (information is retained after the ignition is turned OFF). All other IAC valve positioning is calculated based on these memory values. As a result, engine variations due to wear and variations in the minimum throttle valve position (within limits) do not affect engine idle speeds. This system provides correct idle control under all conditions. This also means that disconnecting power to the ECM can result in incorrect idle control or the necessity to partially press the accelerator when starting until the ECM relearns idle control.

Engine idle speed is a function of total airflow into the engine based on the IAC valve pintle position, the throttle valve opening, and the calibrated vacuum loss through accessories. The minimum throttle valve position is set at the factory with a stop screw. This setting allows enough airflow by the throttle valve to cause the IAC valve pintle to be positioned a calibrated number of steps (counts) from the seat during "controlled" idle operation. The minimum throttle valve position setting on this engine should not be considered the "minimum idle speed," as on other fuel injected engines. The throttle stop screw is covered with a plug at the factory following adjustment.

If the IAC valve is suspected as being the cause of improper idle speed, refer to "Idle Air Control System Check" in this section.

MANIFOLD ABSOLUTE PRESSURE SENSOR

The manifold absolute pressure (MAP) sensor measures the changes in the intake manifold pressure which result from engine load and speed changes, and converts these to a voltage output.

A closed throttle on engine coast down produces a relatively low MAP output. MAP is the opposite of vacuum. When manifold pressure is high, vacuum is low. The

MAP sensor is also used to measure barometric pressure. This is performed as part of MAP sensor calculations. With the ignition ON and the engine not running, the electronic control module (ECM) will read the manifold pressure as barometric pressure and adjust the air/fuel ratio accordingly. This compensation for altitude allows the system to maintain driving performance while holding emissions low. The barometric function will update periodically during steady driving or under a wide open throttle condition. In the case of a fault in the barometric portion of the MAP sensor, the ECM will set to the default value.

A failure in the MAP sensor circuit sets a Diagnostic Trouble Code (DTC) 33 or 34.

The following tables show the difference between absolute pressure and vacuum related to MAP sensor output, which appears as the top row of both tables.

MAP

Volts	4.9	4.4	3.8	3.3	2.7	2.2	1.7	1.1	0.6	0.3	0.3
kPa	100	90	80	70	60	50	40	30	20	10	0
in Hg	29.6	26.6	23.7	20.7	17.7	14.8	11.8	8.9	5.9	2.9	0

VACUUM

Volts	4.9	4.4	3.8	3.3	2.7	2.2	1.7	1.1	0.6	0.3	0.3
kPa	0	10	20	30	40	50	60	70	80	90	100
in Hg	0	2.9	5.9	8.9	11.8	14.8	17.7	20.7	23.7	26.7	29.6

ELECTRONIC CONTROL MODULE

The electronic control module (ECM), located under the passenger seat, is the control center of the fuel injection system. It constantly looks at the information from various sensors and controls the systems that affect the vehicle's performance. The ECM also performs the diagnostic functions of the system. It can recognize operational problems, alert the driver through the service engine soon (SES) warning, and store diagnostic trouble codes (DTCs) which identify the problem areas to aid the technician in making repairs.

There are no serviceable parts in the ECM. The calibrations are stored in the ECM in the programmable read-only memory (PROM).

The ECM supplies either 5 or 12 volts to power the sensors or switches. This is done through resistances in the ECM which are so high in value that a test light will not come on when connected to the circuit. In some cases, even an ordinary shop voltmeter will not give an accurate reading because its resistance is too low. You must use a digital voltmeter with a 10 megohm input impedance to get accurate voltage readings. The ECM controls output circuits such as the fuel injectors, the idle air control (IAC) valve, the A/C clutch relay, etc., by controlling the ground circuit through transistors or a device called a "quad-driver."

FUEL INJECTOR

The multi-port fuel injection (MPFI) assembly is a solenoid-operated device controlled by the electronic control module (ECM) that meters pressurized fuel to a single engine cylinder. The ECM energizes the fuel injector or solenoid to a normally closed ball or pintle valve. This allows fuel to flow into the top of the injector, past the ball or pintle valve, and through a recessed flow director plate at the injector outlet.

The director plate has six machined holes that control the fuel flow, generating a conical spray pattern of finely atomized fuel at the injector tip. Fuel from the tip is directed at the intake valve, causing the fuel to become further atomized and vaporized before entering the combustion chamber. A fuel injector which is stuck partially open would cause a loss of fuel pressure after the engine is shut down. Also, an extended crank time would be noticed on some engines. Dieseling could also occur because some fuel could be delivered to the engine after the ignition is turned OFF.

KNOCK SENSOR

The knock sensor detects abnormal knocking in the engine.

The sensor is mounted in the engine block near the cylinders.

The sensor produces an AC output voltage which increases with the severity of the knock. This signal is sent to the electronic control module (ECM). The ECM then adjusts the ignition timing to reduce the spark knock.

OCTANE NUMBER CONNECTOR

The octane number connector is a jumper harness (White) that signals to the electronic control module (ECM) the octane rating of the fuel.

The connector is located under the passenger seat next to the ECM.

There are four different octane number connector settings available. The vehicle is shipped from the factory with a label attached to the jumper harness to indicate the octane rating setting of the ECM.

The ECM will alter fuel delivery and spark timing based on the octane number setting.

The following table shows which terminals to jump on the octane number connector in order to achieve the correct fuel octane rating. Terminal 2 is ground on the octane number connector.

To find the appropriate wiring diagram, refer to "ECM Wiring Diagrams" in this section.

Octane Number Selecting

	95	91	87	83
1.5L IEFI-6 (ECM) Terminal D12	Open	Open	Ground	Ground
1.5L IEFI-6 (ECM) Terminal D13	Ground	Open	Open	Ground
1.3L/1.6L ITMS-6F (ECM) Terminal D6	Open	Open	Ground	Ground
1.3L/1.6L ITMS-6F (ECM) Terminal C13	Ground	Open	Open	Ground