SECTION : 1F

ENGINE CONTROLS

CAUTION : Disconnect the negative battery cable before removing or installing any electrical unit o r w hen 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

ENGINE DATA DISPLAY TABLES

Engine Data Display

Parameter	Scaling	Value
Desired Idle Speed	RPM	ECM idle command (varies with temperature)
Engine RPM	RPM	± 50 RPM from desired RPM in drive (A/T) ± 50 RPM from desired RPM in neutral (M/T)
MAP	kPa	29 – 55 (varies with manifold and barometric pressure)
Throttle Position Volt	V	0 v
Start–up IAT	˚C	varies
Intake Air Temperature	˚C	10 – 90 ˚C
Coolant Temperature (Start–up)	˚C	varies
Engine Coolant Temperature	˚C	85 – 105 ˚C
IAC Motor Position	–	1 – 50
O2 Sensor (B1–S1)	mV	1–1000 mV (varies continuously)
O2 Sensor (B1–S2)	mV	1–1000 mV (varies continuously)
Fuel System Status	Closed Loop/Open Loop	”Closed Loop” (may enter ”Open Loop” at extended idle)
Rich/Lean (B1–S1)	Rich/Lean	varies
Lean to Rich Average	mS	10 –211 ms or 0 ms
Rich to Lean Average	mS	10 –211 ms or 0 ms
Engine Load Value	%	0 – 100 % (varies)
Short Term Fuel Trim	%	–30 – 30%
Long Term Fuel Trim	%	–30 – 30%
Linear EGR Feedback	V	varies
EGR Duty Cycle	%	0 %
EGR EWMA Result	–	< = 0
Spark Advance	˚	varies
MIL Odometer	Km	0 Km
MIL On Time	Min	0 Min
Base Injection PWM	mS	1.0 – 5.0 ms
Barometric Pressure	kPa	varies with altitude
Ignition Voltage	V	13.5 – 14.8 V
Air/Fuel Ratio	Ratio	14.6 (Closed Loop Enable)
Calculated Air Flow	G/S	varies
Total Misfire (Current)	–	0
Misfire History Cyl. 1	–	0
Misfire History Cyl. 2	–	0
Misfire History Cyl. 3	–	0
Misfire History Cyl. 4	–	0
Vehicle Speed	Km/H	0 Km/H
A/C Pressure	V	varies

Parameter	Scaling	Value
A/C Request	Yes/No	No
A/C Clutch	On/Off	Off
Fuel Pump Command	On/Off	On
Closed Loop	Yes/No	Yes
Throttle At Idle	Yes/No	No
O2 Ready (B1–S1)	Yes/No	Yes
Knock Present	Yes/No	No
Fan Low	On/Off	On/Off
Fan High	On/Off	On/Off
TCC Engaged (Only AT)	Yes/No	Yes
Park/Neutral (Only AT)	P/N and R/N/D	P/N
Fuel Level Input	V	varies
Fuel Level Output	%	varies
Fuel Trim Cell	–	18
G–Sensor	V	1.1 – 3.7 V (Non–ABS Only)
Engine Runtime	HH:MM:SS	Hours:Minutes:Seconds

* Condition: Warmed up, idle, park or neutral, A/C off

ENGINE DATA DISPLAY TABLE DEFINITIONS

ECM Data Description

The following information will assist in diagnosing emission or driveability problems. A first technician can view the displays while the vehicle is being driven by second technician. Refer to Powertrain On–Board Diagnostic (EOBD) System Check for addition information.

A/C Clutch

The A/C Relay represents the commanded state of the A/C clutch control relay. The A/C clutch should be engaged when the scan tool displays ON.

A/C Pressure

The A/C High Side displays the pressure value of the A/C refrigerant pressure sensor. The A/C High Side helps to diagnose the diagnostic trouble code (DTC) P0533.

A/C Request

The A/C Request represents whether the air conditioning is being requested from the HVAC selector. The input is received by the instrument panel cluster and then sent serial data to the ECM and finally to the scan tool over KWP 2000 serial data.

Air Fuel Ratio

The Air Fuel Ration indicates the air to fuel ratio based on the Front Heated Oxygen Sensor (HO2S1) inputs. The ECM uses the fuel trims to adjust fueling in order to attempt to maintain an air fuel ratio of 14.7:1.

BARO

The Barometric Pressure (BARO) sensor measures the change in the intake manifold pressure which results from altitude changes. This value is updated at ignition ON and also at Wide Open Throttle (WOT).

Base Injection PWM

Indicates the base Pulse Width Modulation (PWM) or ON time of the indicated cylinder injector in milliseconds. When the engine load is increased, the injector pulse width will increase.

Calculated Air Flow

The calculated air flow is a calculation based on manifold absolute pressure. The calculation is used in several diagnostics to determine when to run the diagnostics.

Desired Idle Speed

The ECM commands the idle speed. The ECM compensates for various engine loads in order to maintain the desired idle speed. The actual engine speed should remain close to the desired idle under the various engine loads with the engine idling.

Engine Coolant Temperature

The Engine Coolant Temperature (ECT) sensor sends engine temperature information to the ECM. The ECM supplies 5 volts to the engine coolant temperature sensor circuit. The sensor is a thermistor which changes internal resistance as temperature changes. When the sensor is cold (internal resistance high), the ECM monitors a high voltage which it interprets as a cold engine. As the sensor warms (internal resistance decreases), the voltage signal will decrease and the ECM will interpret the lower voltage as a warm engine.

EGR Desired Position

The desired exhaust gas recirculation (EGR) position is the commanded EGR position. The ECM calculates the desired EGR position. The higher the percentage, the longer the ECM is commanding the EGR valve ON.

Engine Load

Indicates engine load based on manifold absolute pressure. The higher the percentage, the more load the engine is under.

Engine Run Time

The engine run time is a measure of how long the engine has been running. When the engine stops running, the timer resets to zero.

Engine Speed

Engine Speed is computed by the ECM from the fuel control reference input. It should remain close to desired idle under the various engine loads with the engine idling.

Fan

The Fan Control (FC) Relay is commanded by the ECM. The FC Relay displays the command as ON or OFF.

Fuel Level Sensor

The Fuel Level Sensor monitors the fuel level in the tank. The Fuel Level Sensor monitors the rate of change of the air pressure in the EVAP system. Several of the Enhanced EVAP System diagnostics are dependent upon the correct fuel level.

Fuel System Status

The Closed Loop is displayed indicating that the ECM is controlling the fuel delivery according to the Front Heated Oxygen Sensor (HO2S1) voltage as close to an air/fuel ratio of 14.7 to 1 as possible.

IAC Position

The scan tool displays the ECM command for the Idle Air Control (IAC) pintle position in counts. The higher the number of counts, the greater the commanded idle speed reads. The Idle Air Control responds to changes in the engine load in order to maintain the desired idle rpm.

Ignition 1 (Voltage)

The ignition volts represent the system voltage measured by the ECM at the ignition feed circuit.

Intake Air Temperature

The ECM converts the resistance of the Intake Air Temperature (IAT) sensor to degrees in the same manner as the engine coolant temperature (ECT) sensor. In take air temperature is used by the ECM to adjust fuel delivery and spark timing according to incoming air density.

Knock Present

The KS Noise Channel indicates when the ECM detects the KS signal. The ECM should display NO at idle.

Long Term FT

The Long Term Fuel Trim (FT) is derived from the short term fuel trim value. The Long Term FT is used for the long term correction of the fuel delivery. A value of 128 counts (0%) indicates that the fuel delivery requires no compensation in order to maintain a 14.7:1 air to fuel ratio. A value below 128 counts means that the fuel system is too rich and the fuel delivery is being reduced. The ECM is decreasing the injector pulse width. A value above 128 counts indicates that a lean condition exists for which the ECM is compensating.

MAP

The Manifold Absolute Pressure (MAP) sensor measures the change in the intake manifold pressure which results from engine load and speed changes. As the intake manifold pressure increases, the air density in the intake also increases and the additional fuel is required.

Misfire History #1–4

Indicates the number of misfires that have occurred after 195 current misfires have been counted. The current misfire counter will add its misfires to the history misfire counter after 195 total misfires have taken place. If 1 cylinder is misfiring, the misfiring current counter will have 195 misfires counted before adding to its history counter. If 2 cylinders are misfiring, the misfiring current counter will add to their history counters after 97 misfires. The counter increments only after a misfire diagnostic trouble code (DTC) has been set.

Front Heated Oxygen Sensor

The pre–converter Front Heated Oxygen Sensor (HO2S1) reading represents the exhaust oxygen sensor output voltage. This voltage will fluctuate constantly between 100 mv (lean exhaust) and 900 mv (rich exhaust) when the system is operating in a Closed Loop.

Rear Heated Oxygen Sensor

The post–converter Rear Heated Oxygen Sensor (HO2S2) represents the exhaust oxygen output voltage past the catalytic converter. This voltage remains inactive, or the voltage will appear lazy within a range of 100 mv (lean exhaust) and 900 mv (rich exhaust) when operating in a Closed Loop.

Short Term FT

The Short Term FT represents a short term correction to fuel delivery by the ECM in response to the amount of time the oxygen sensor voltage spends above or below the 450 mv threshold. If the oxygen sensor has mainly been below 450 mv, indicating a lean air/fuel mixture, short term fuel trim will increase to tell the ECM to add fuel. If the oxygen sensor voltage stays mainly above the threshold, the ECM will reduce fuel delivery to compensate for the indicated rich condition.

Spark Advance

This is a display of the spark advance Ignition Coil (IC) calculation which the ECM is programming in the ignition system. It computes the desired spark advance using data such as engine temperature, rpm, engine load, vehicle speed and operating mode.

TCC Engaged

When the brake pedal is applied, the Torque Converter Clutch (TCC) brake switch sends a signal to the ECM to disengage the TCC and disable the cruise control.

Total Misfire Current Counter

Indicates the total number of misfires that have been detected in all the cylinders after 100 engine cycles. One cycle equals one complete 4 stroke cycle. The total misfire only increments during the steady state cruise conditions.

TP Sensor

The ECM uses the TP Sensor in order to determine the amount of the throttle demanded by the vehicle's operator. The TP Sensor reads between 0.36–0.96 volts at idle to above 4 volts at WOT.

Vehicle Speed

The vehicle speed sensor signal is converted into mph or km/h for display. The vehicle speed output from the ECM is 4000 pulses per mile. The scan tool uses the KWP 2000 serial data from the ECM to obtain vehicle speed, while the Instrument Panel Cluster (IPC), cruise control module and the chime alarm module use the 4000 ppm output.

FASTENER TIGHTENING SPECIFICATIONS

Application	N•m	Lb–Ft	Lb–In
Camshaft Position Sensor Bolts (1.4L/1.6L DOHC)	7	–	62
Camshaft Position Sensor Bolts (1.8 DOHC)	8	–	71
Crankshaft Position Sensor Retaining Bolt (1.4L/1.6L DOHC)	6.5	–	58
Crankshaft Position Sensor Retaining Bolt (1.8 DOHC)	8	–	71
Electronic Ignition System Ignition Coil Retaining Bolts	10	–	89
Exhaust Gas Recirculation Valve Retaining Bolts	30	22	–
Engine Control Module Bolts	12	–	106
Engine Coolant Temperature Sensor Bolt (1.4L/1.6L DOHC)	17.5	13	–
Engine Coolant Temperature Sensor Bolt (1.8 DOHC)	20	15	–
Evaporative Emission Canister Flange Bolt	4	–	35
Evaporative Emission Canister Purge Solenoid Bracket Bolt	5	–	44
Fuel Filter Mounting Bracket Assembly Bolt	4	–	35
Fuel Tank Retaining Bolts	20	15	–
Fuel Rail Retaining Bolts	25	18	–
Idle Air Control Valve Retaining Bolts (1.8 DOHC)	3	–	27
Intake Air Temperature Sensor	22	16	–
Knock Sensor Bolt	20	15	–
Manifold Absolute Pressure Sensor Bolts (1.4L/1.6L DOHC)	8	–	71
Manifold Absolute Pressure Sensor Bolts (1.8 DOHC)	4	–	35
Oxygen Sensor Bolt	42	31	–
Throttle Body Retaining Nuts (1.4L/1.6L DOHC)	15	11	–
Throttle Body Retaining Nuts (1.8 DOHC)	10	–	89
Throttle Position Sensor Retaining Bolts (1.8 DOHC)	2	–	18

FUEL SYSTEM SPECIFICATIONS

Gasoline

All engines are designed to use unleaded fuel only. Unleaded fuel must be used for proper emission control system operation. Its use will also minimize spark plug fouling and extend engine oil life. Using leaded fuel can damage the emission warranty coverage. The fuel should meet specification ASTM D4814 for the U.S. or CGSB 3.5 M93 for Canada. All engines are designed to use unleaded fuel with a minimum U(R+M)/2e (pump) octane number of 87, where R=research octane number, and M=motor octane number.

Ethanol

You may use fuel containing ethanol (ethyl alcohol) or grain alcohol providing that there is no more than 10 percent ethyl alcohol by volume.

Methanol

Do not use fuels containing methanol. Methanol can corrode metal parts and cause damage to plastic and rubber parts in the fuel system.

Methyl Tertiary–Butyl Ether (MTBE)

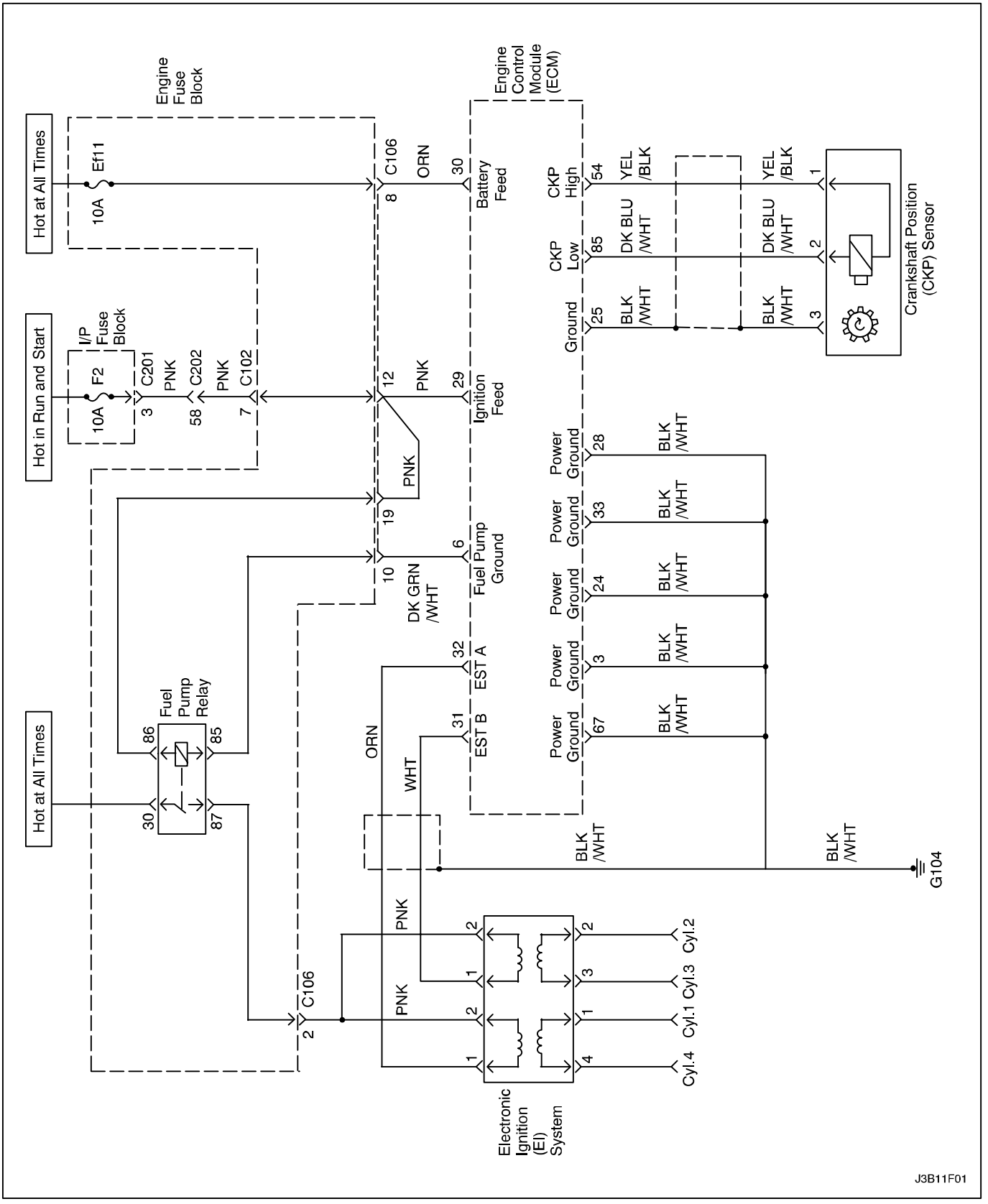
You may use fuel containing Methyl Tertiary–Butyl Ether (MTBE) providing there is no more than 15 percent MTBE by volume.

TEMPERATURE VS RESISTANCE

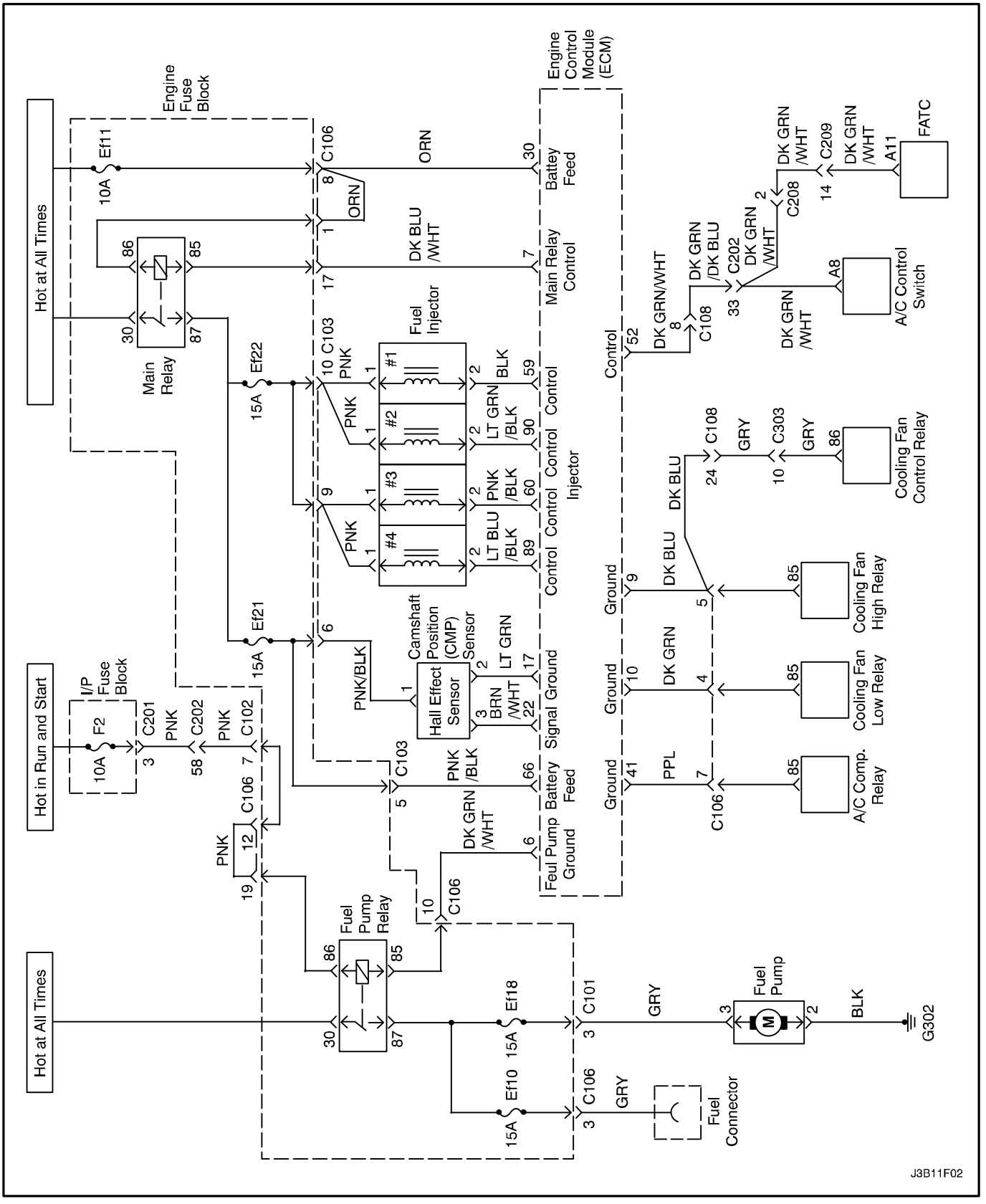
˚C	˚F	ECT Sensor	IAT Sensor
		OHMS	
Temperature vs Resistance Values (Approximate)			
100	212	177	187
90	194	241	246
80	176	332	327
70	158	467	441
60	140	667	603
50	122	973	837
45	113	1188	991
40	104	1459	1180
35	95	1802	1412
30	86	2238	1700
25	77	2796	2055
20	68	3520	2500
15	59	4450	3055
10	50	5670	3760
5	41	7280	4651
0	32	9420	5800
–5	23	12300	7273
–10	14	16180	9200
–15	5	21450	9200
–20	–4	28680	15080
–30	–22	52700	25600
–40	–40	100700	45300

SCHEMATIC AND ROUTING DIAGRAMS

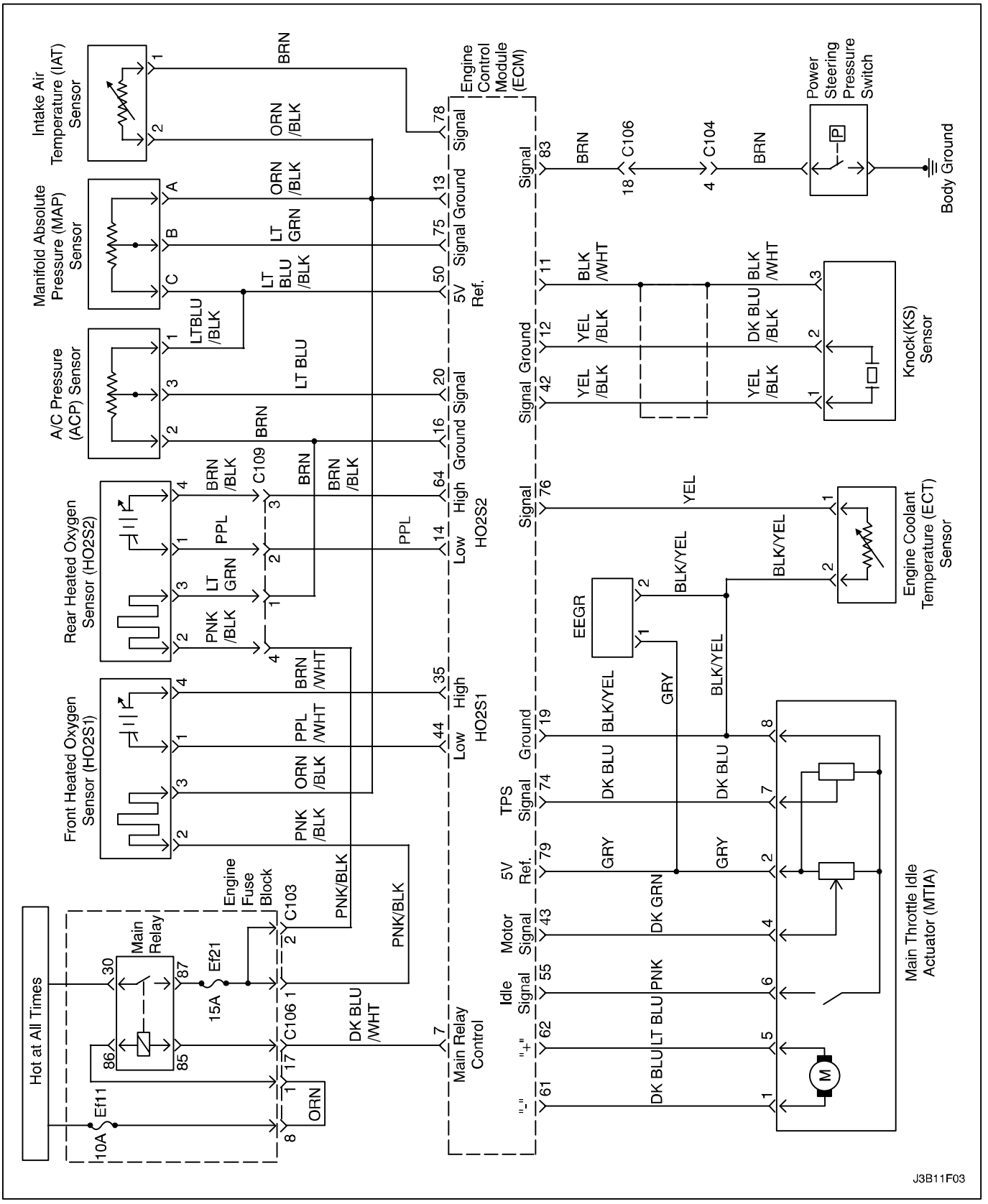
ECM WIRING DIAGRAM (1.4L/1.6L DOHC – 1 OF 6)



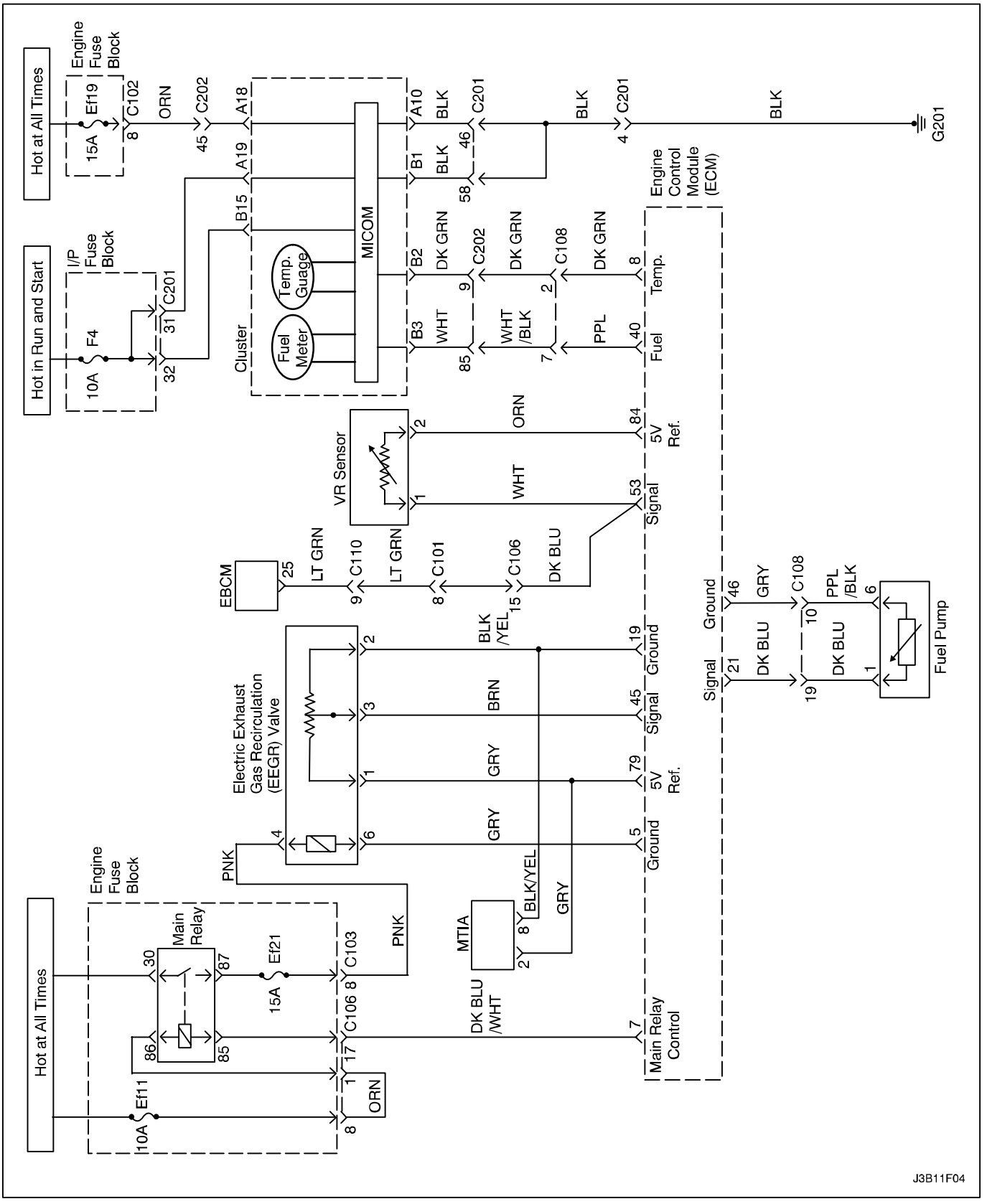
ECM WIRING DIAGRAM (1.4L/1.6L DOHC – 2 OF 6)



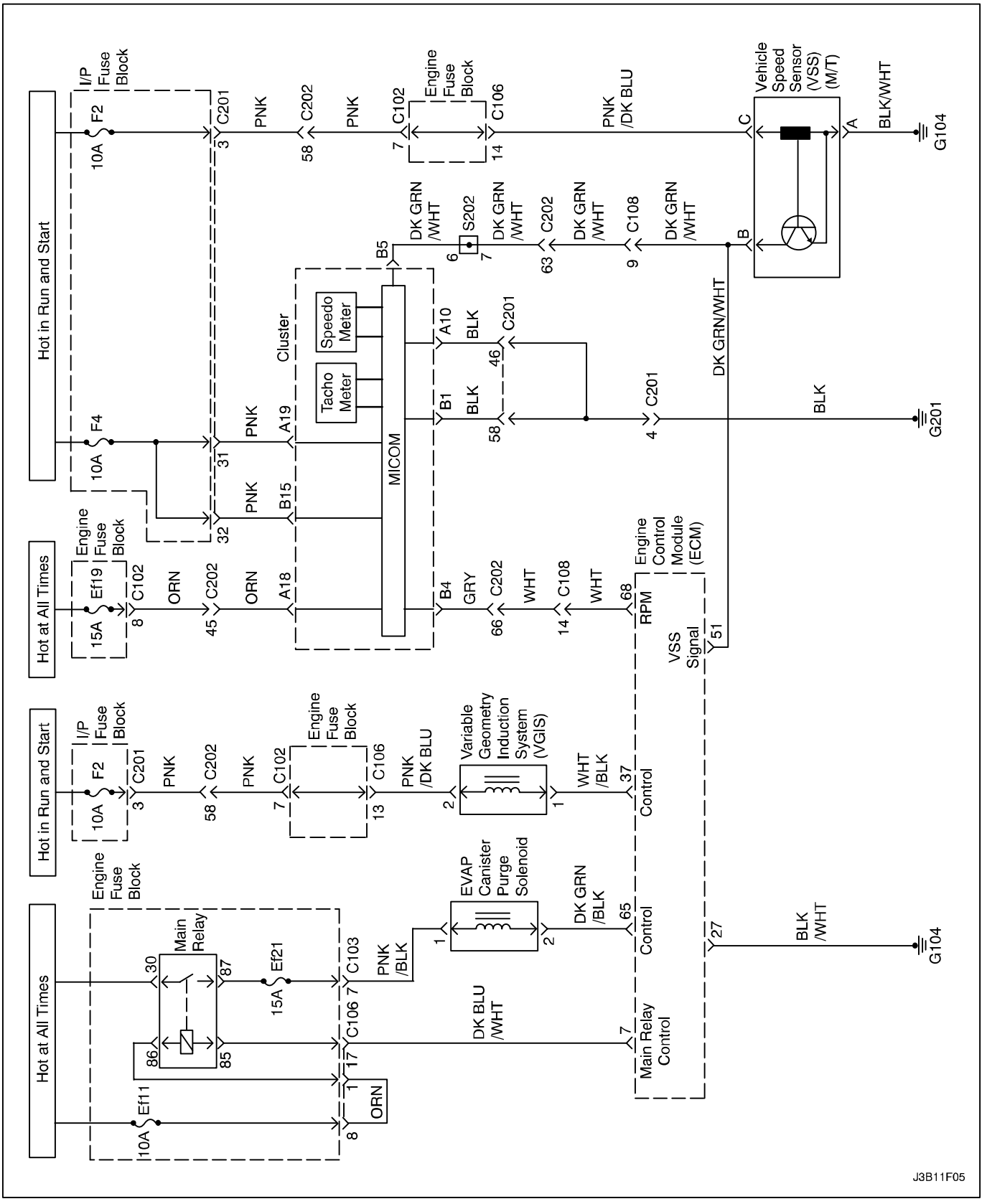
ECM WIRING DIAGRAM (1.4L/1.6L DOHC – 3 OF 6)



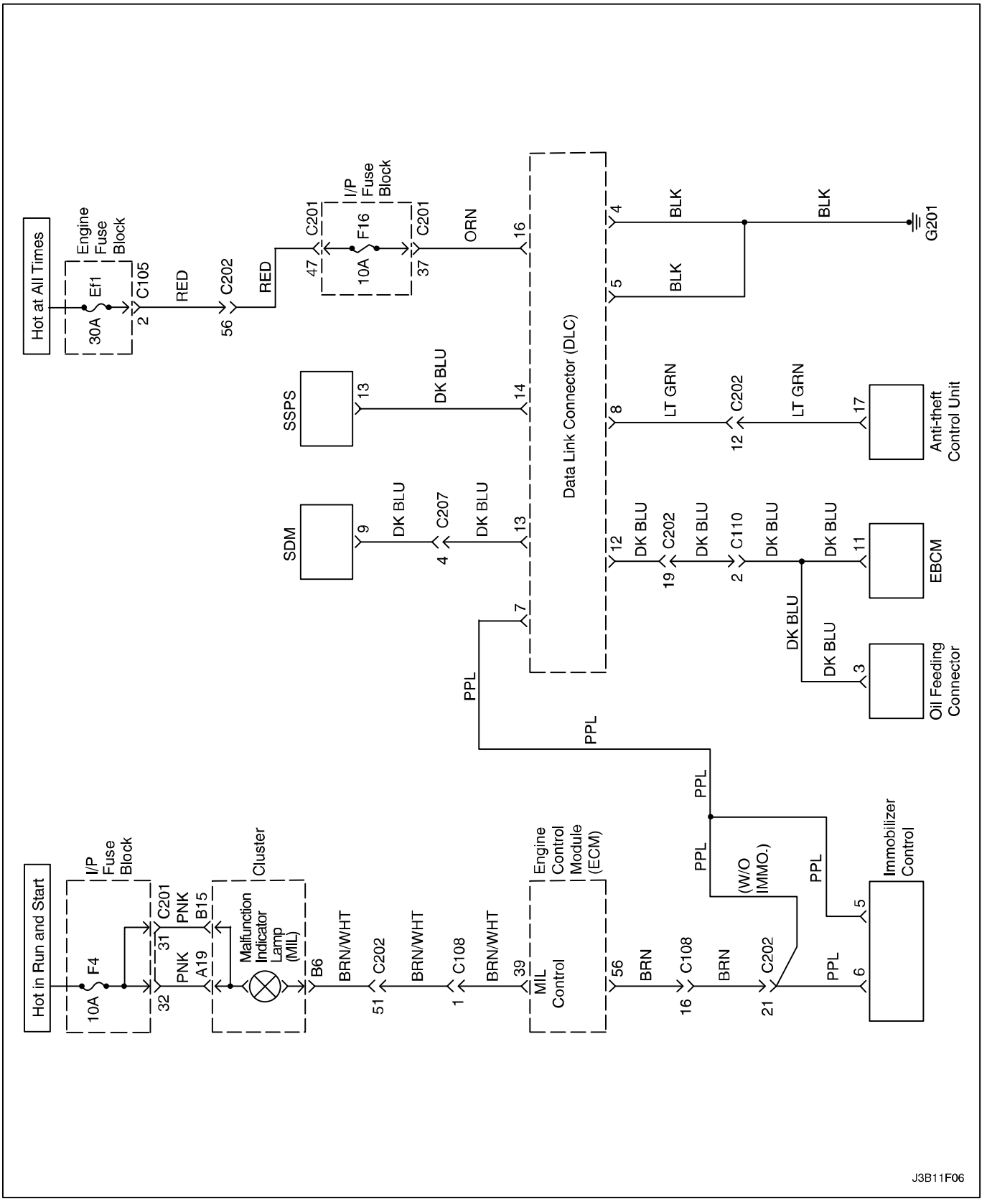
ECM WIRING DIAGRAM (1.4L/1.6L DOHC – 4 OF 6)



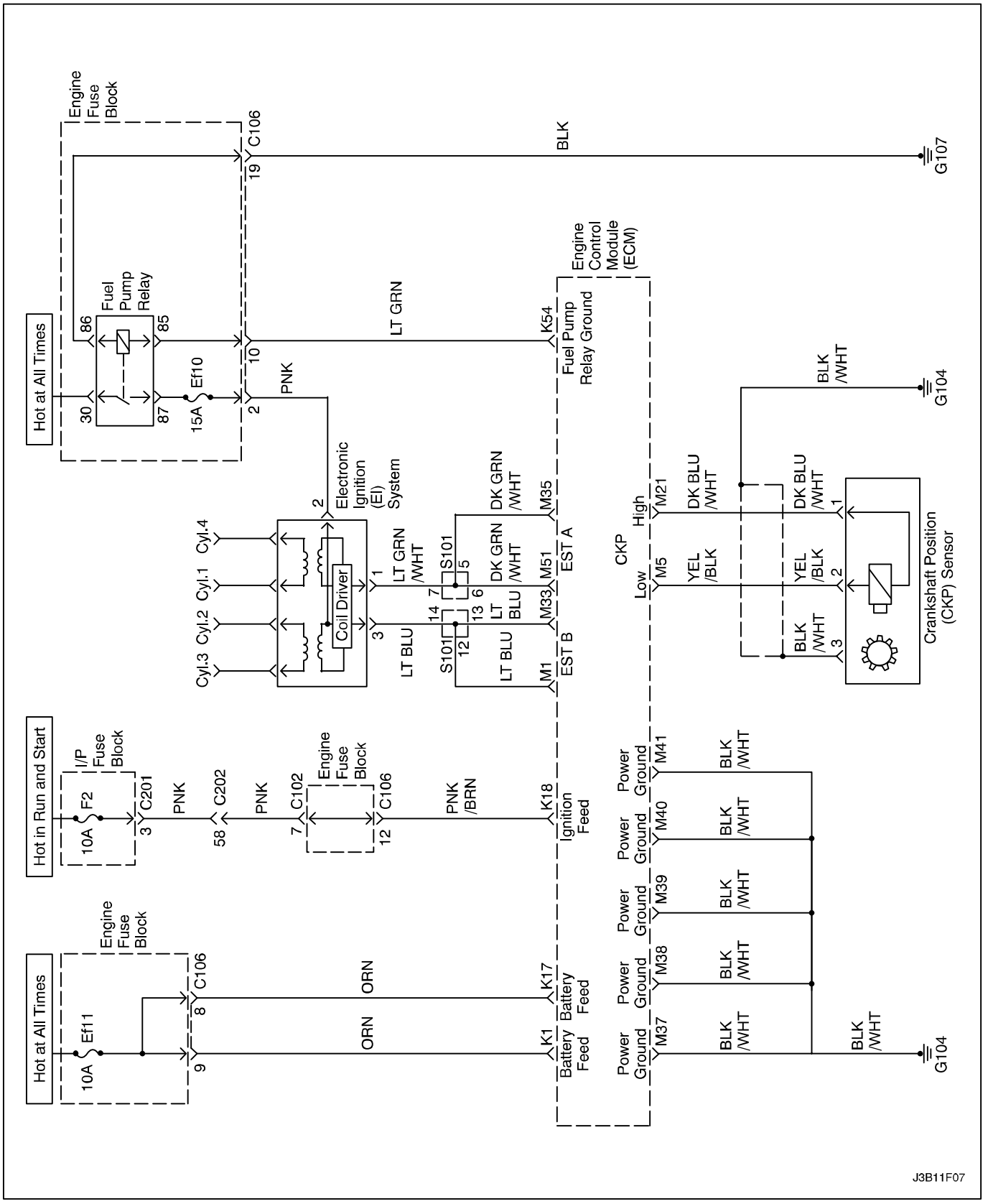
ECM WIRING DIAGRAM (1.4L/1.6L DOHC – 5 OF 6)



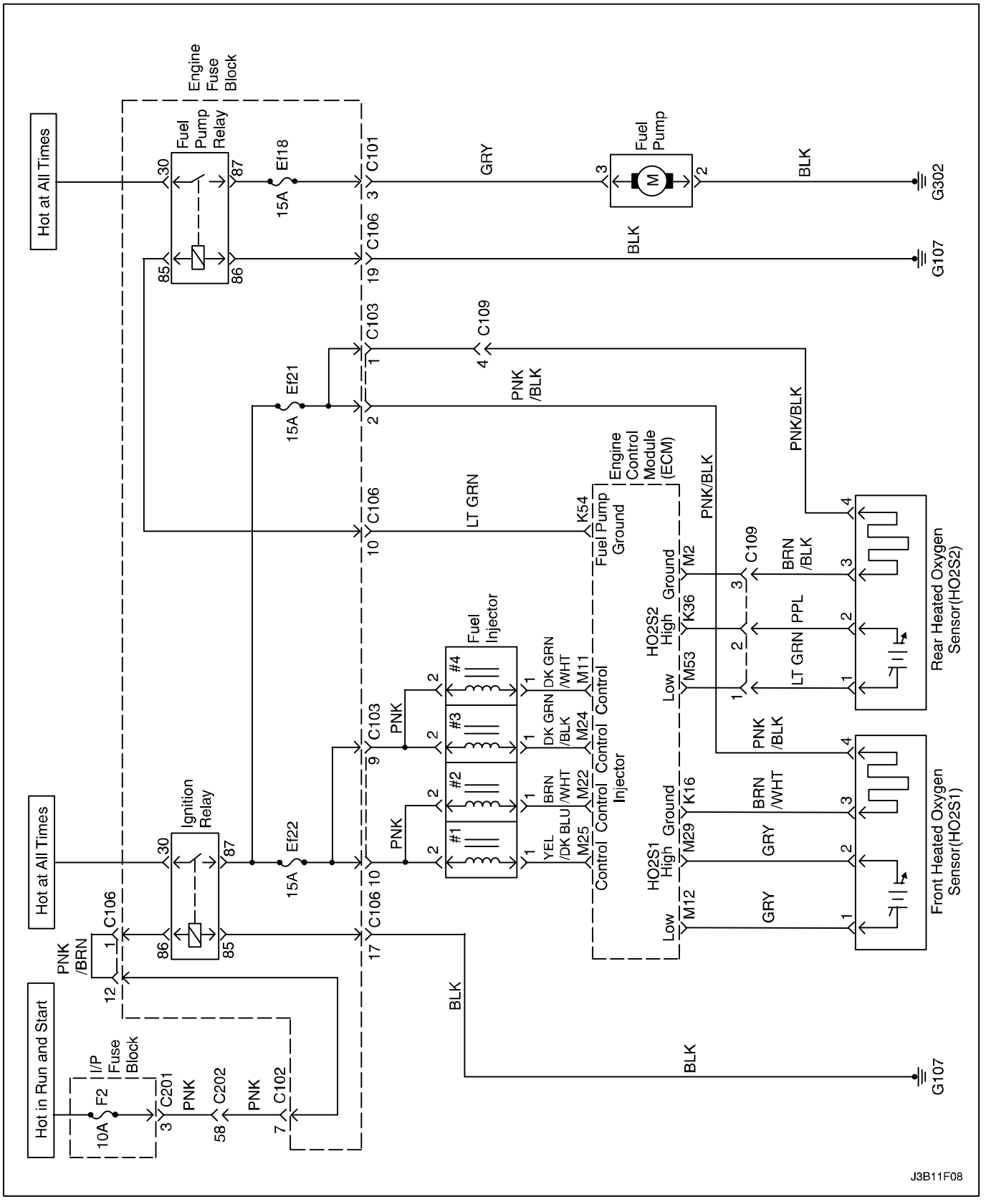
ECM WIRING DIAGRAM (1.4L/1.6L DOHC – 6 OF 6)



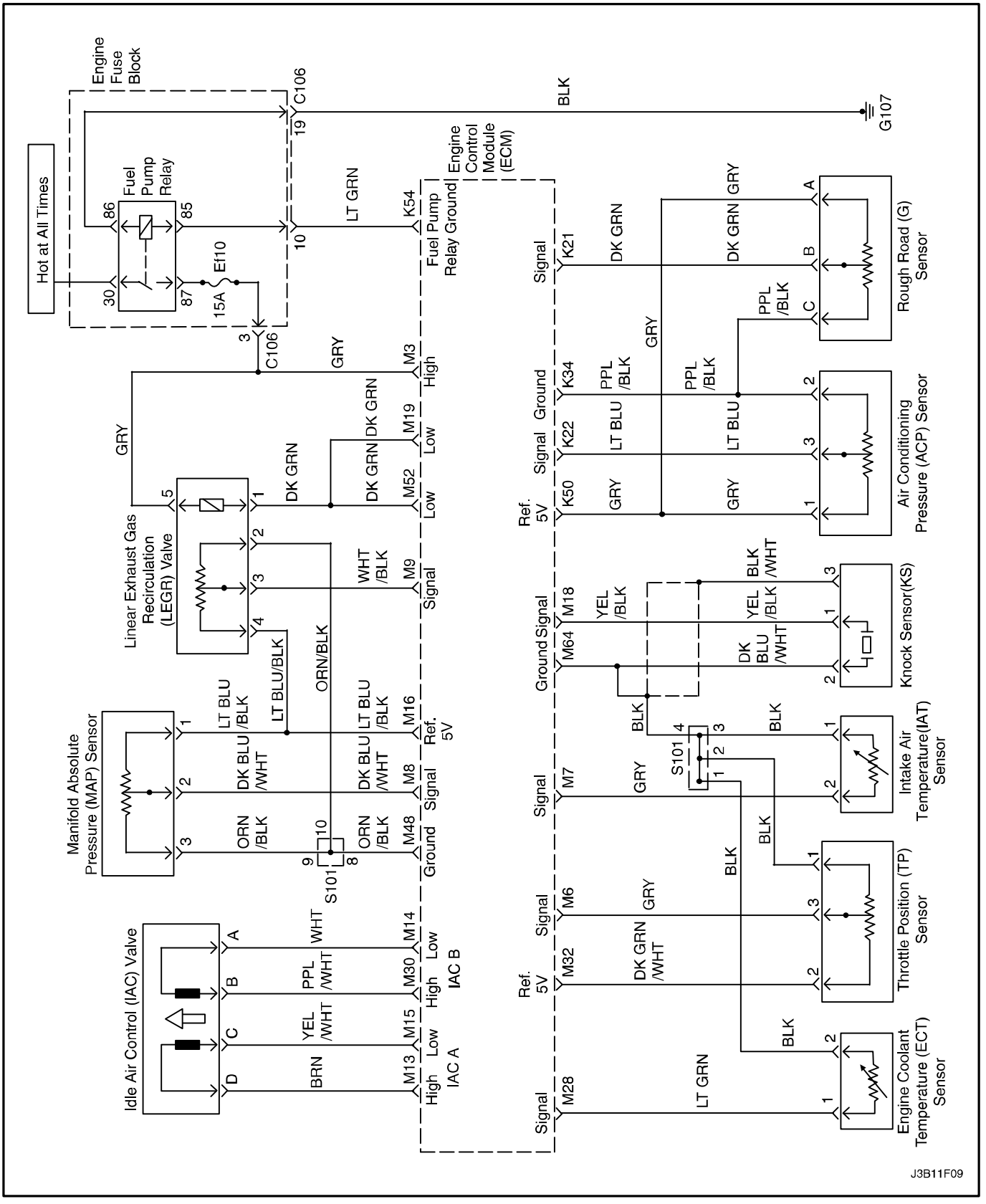
ECM WIRING DIAGRAM (1.8L DOHC – 1 OF 6)



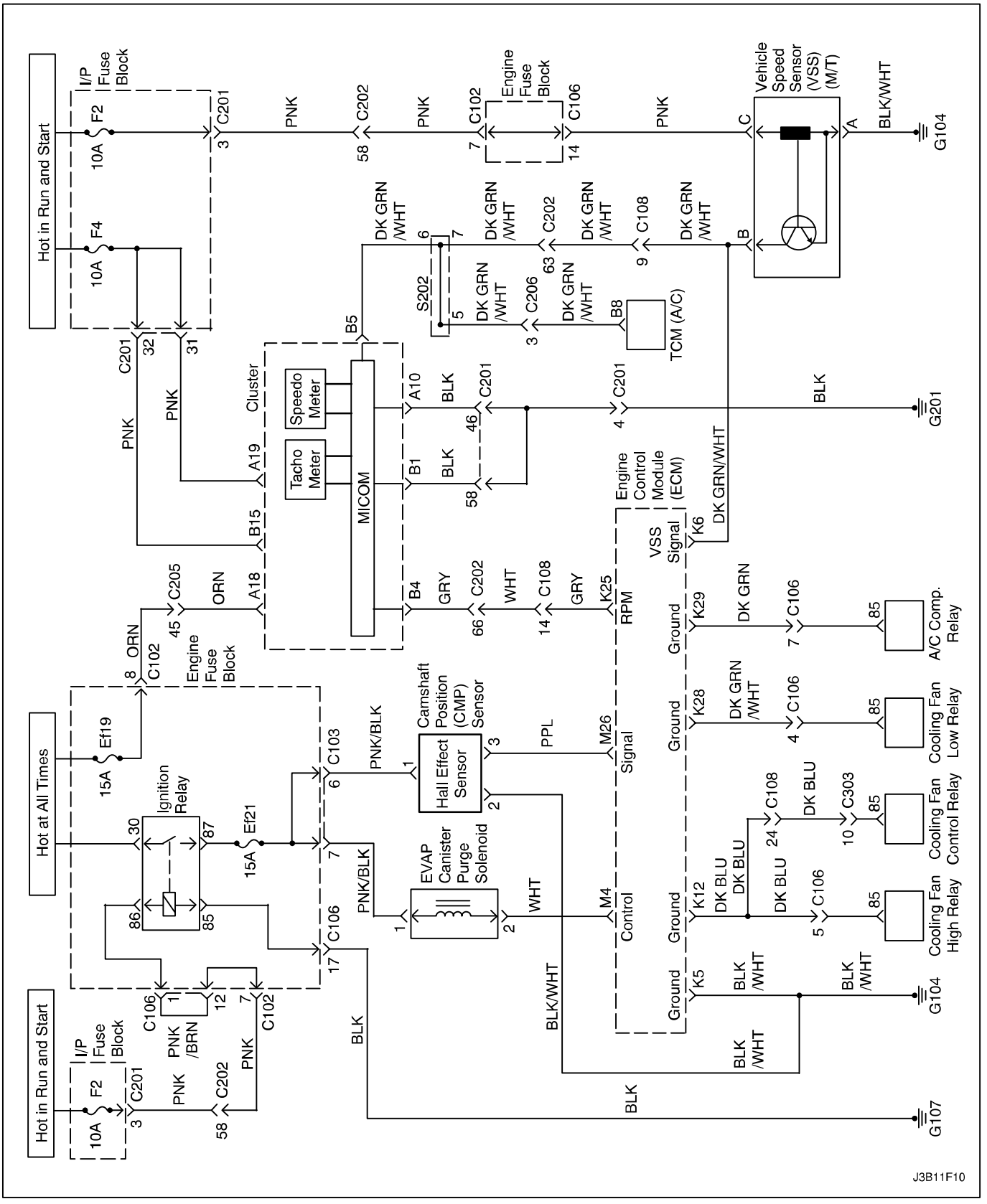
ECM WIRING DIAGRAM (1.8L DOHC – 2 OF 6)



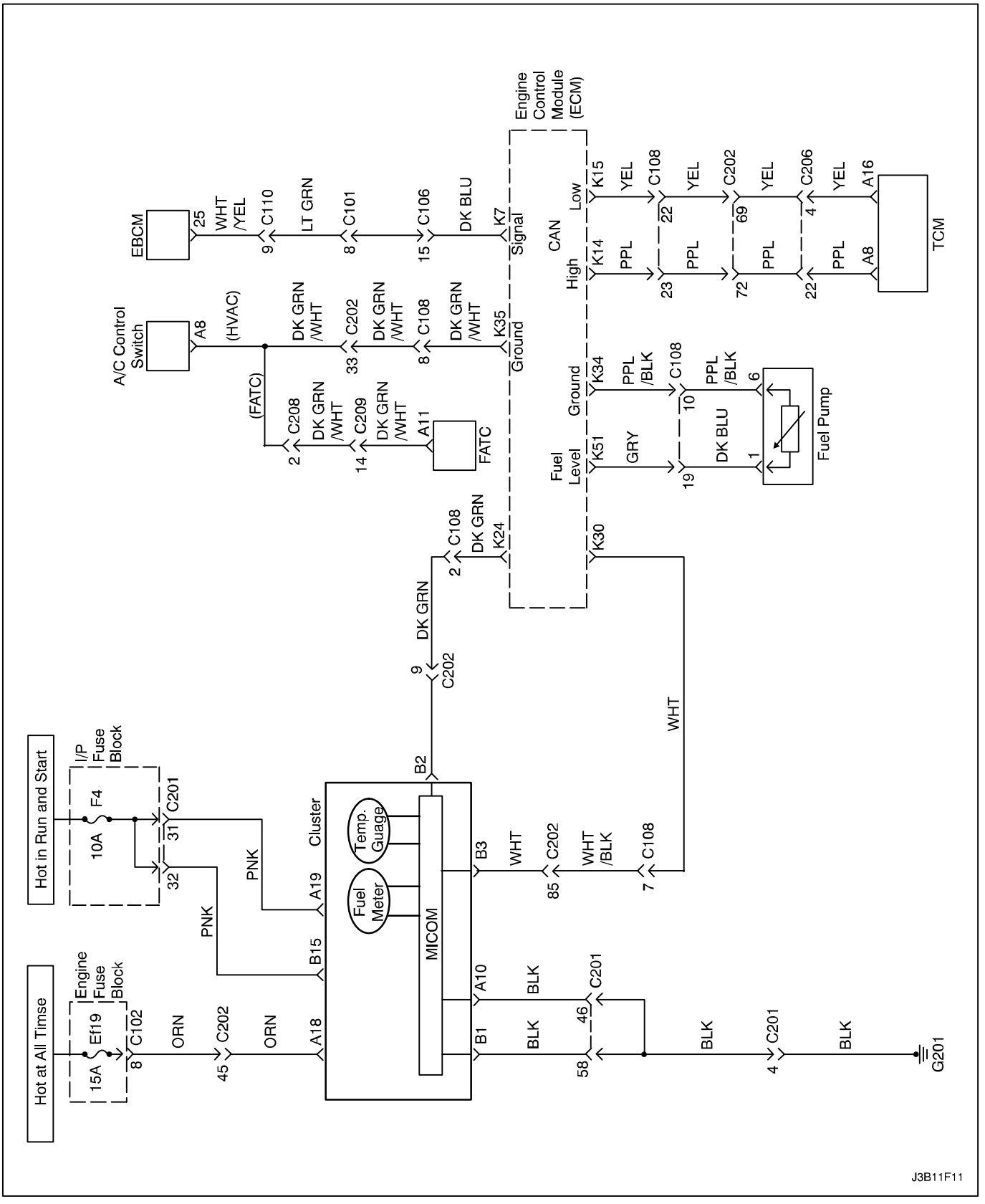
ECM WIRING DIAGRAM (1.8L DOHC – 3 OF 6)



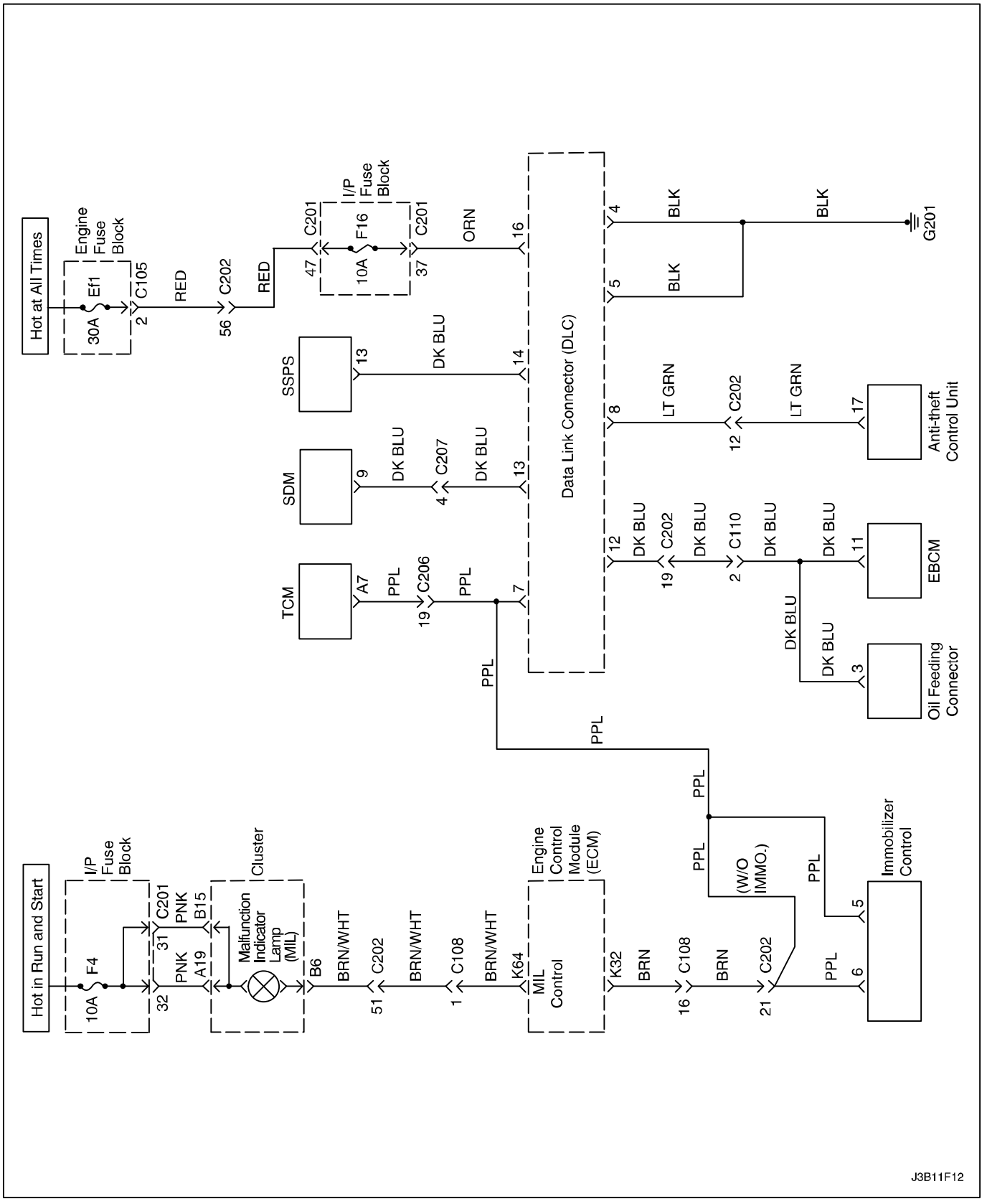
ECM WIRING DIAGRAM (1.8L DOHC – 4 OF 6)



ECM WIRING DIAGRAM (1.8L DOHC – 5 OF 6)



ECM WIRING DIAGRAM (1.8L DOHC – 6 OF 6)



CONNECTOR END VIEW

64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49
48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Engine Control Module (ECM)
MR140

T3D11F40

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64

Engine Control Module (ECM)
MR140

T3D11F41

61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Engine Control Module (ECM)
SIRIUS D4

T3D11F42

76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	

Engine Control Module (ECM)
SIRIUS D4

T3D11F43

A8	A7	A6	A5	A4	A3	A2	A1
A16	A15	A14	A13	A12	A11	A10	A9
B8	B7	B6	B5	B4	B3	B2	B1
B16	B15	B14	B13	B12	B11	B10	B9
C8	C7	C6	C5	C4	C3	C2	C1
C16	C15	C14	C13	C12	C11	C10	C9

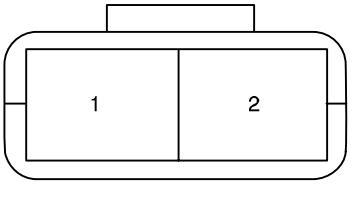
Transmission Control Module
(TCM) (ZF 4HP - 16)

J3B11F87

16	15	14	13	12	11	10	9
8	7	6	5	4	3	2	1

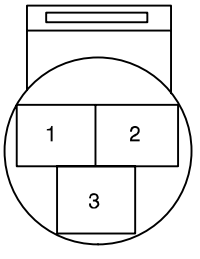
Data Link Connector (DLC)

T3B11F21



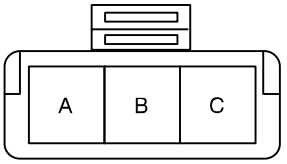
Engine Coolant Temperrature (ECT)
Sensor Connector

T3B11F11



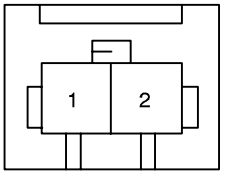
Throttle Position
Sensor (TPS) Connector

T3B11F13



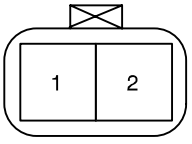
Electronic Ignition (EI) System
Ignition coil
Connector (MR 140)

J3B11F86



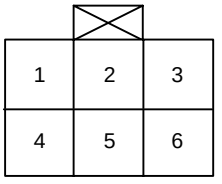
Intake Air
Temperature (IAT) Sensor
Connector

A402F017



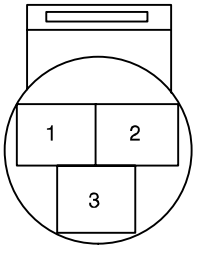
Electronic Ignition (EI) System
Ignition coil
Connector (SIRIUS D4)

J3B11F88



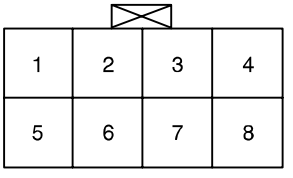
Electric Exhaust Gas
Recirculation(EEGR) Valve
Connector

T3D11F46



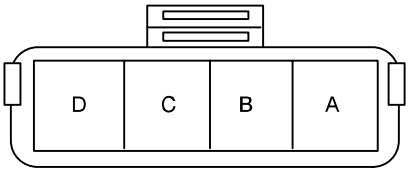
Air Conditioning
Pressure (ACP) Sensor
Connector

T3B11F12



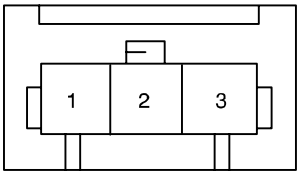
Main Throttle Idle
Actuator (MTIA) (SIRIUS D4)

J3B11F0P



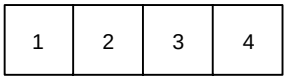
Idle Air Control (IAC) Valve
Connector (MR 140)

J3B11F89



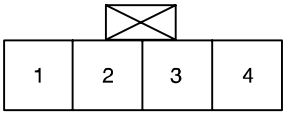
Crankshaft Position
(CKP) Sensor Connector

A402F020



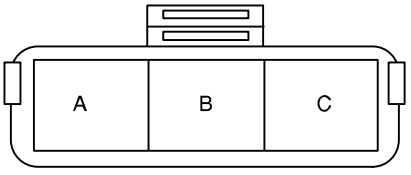
Front Heated Oxygen Sensor
(HO2S1) Connector

T3B11F15



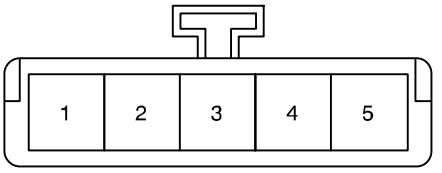
Rear Heated Oxygen Sensor
(HO2S2) Connector

T3B11F16



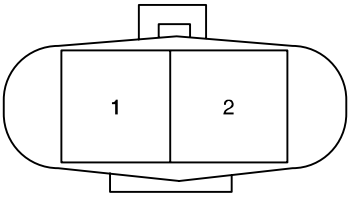
Vehicle Speed
Sensor (VSS) (M/T)
Connector

J3B11F90



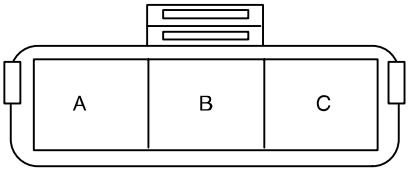
Linear Exhaust Gas Recirculation
(LEGR) Valve
Connector

T3B11F18



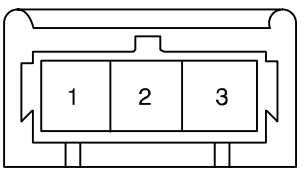
Cooling Fan
Connector

T3B11F22



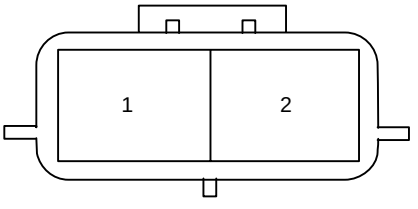
Rough Road (G)
Sensor Connector (MR 140)

J3B11F0Q



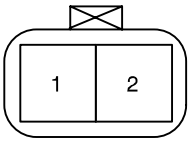
Camshaft Position
(CMP) Sensor Connector

B402F009



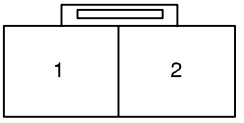
EVAP Canister
Purge Solenoid
Connector

T3D11F47



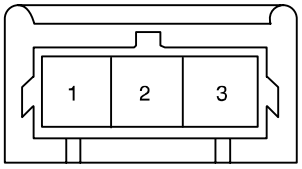
Variable Geometry Induction
System (VGIS) Solenoid

J3B11F0S



Rough Road (VR)
Sensor Connector (SIRIUS D4)

J3B11F0R

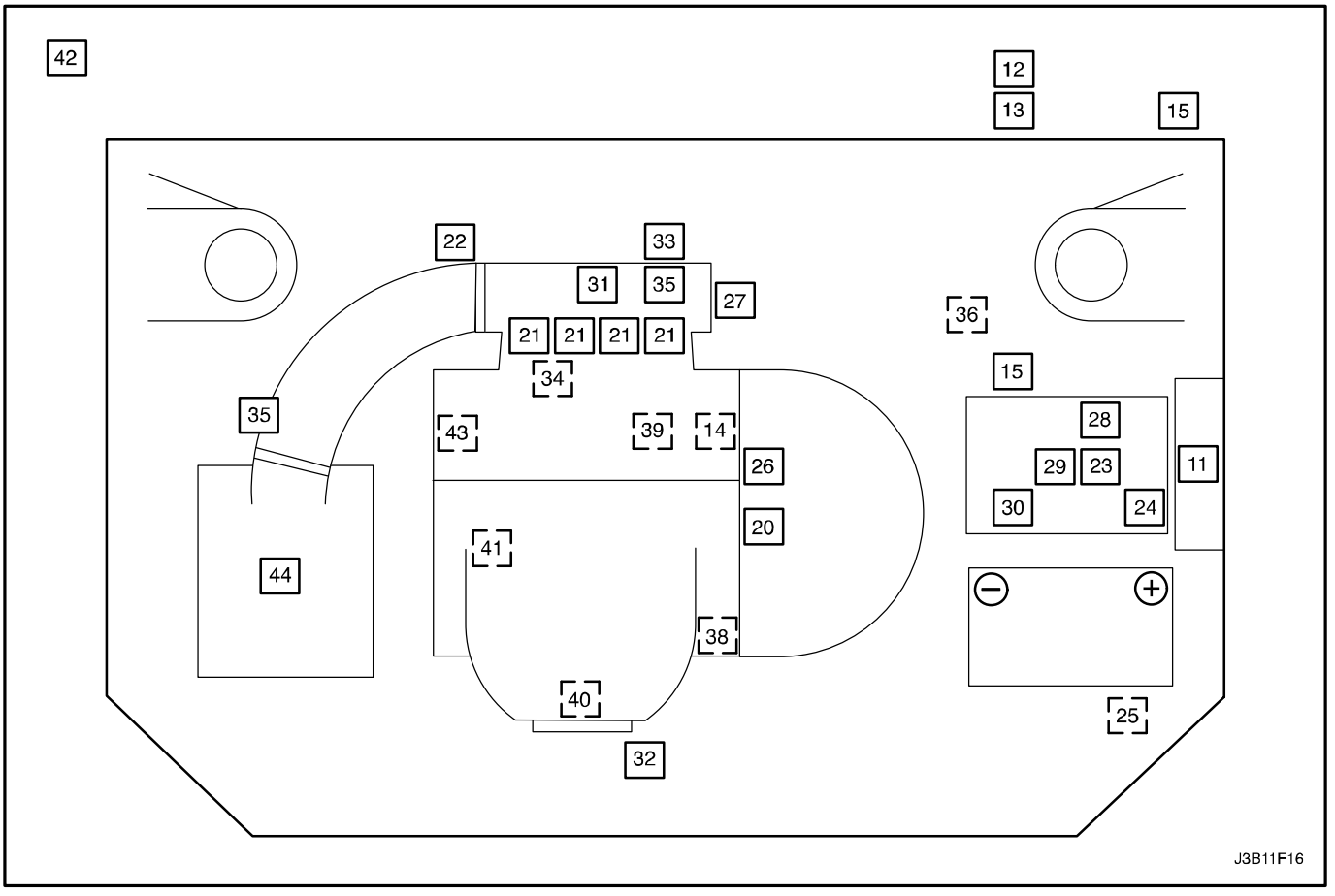


Knock Sensor Connector

T3B11F20

COMPONENT LOCATOR

COMPONENT LOCATOR (1.4L/1.6L DOHC)



Components on ECM Harness

11. Engine Control Module (ECM)
12. Data Link Connector (DLC)
13. Malfunction Indicator Lamp (MIL)
14. ECM/ABS Harness Ground
15. Fuse Panel (2)

ECM Controlled Devices

20. Exhaust Gas Recirculation (EGR) Valve
21. Fuel Injector (4)
22. Main Throttle Idle Actuator (MTIA)
23. Fuel Pump Relay
24. Cooling Fan Relays (High)
25. Cooling Fan Control Relay (A/C Only)
26. Electronic Ignition System Ignition Coil
27. Evaporative Emission (EVAP) Control Purge Solenoid
28. Main Relay
29. A/C Compressor Relay
30. Cooling Fan Relays (Low)

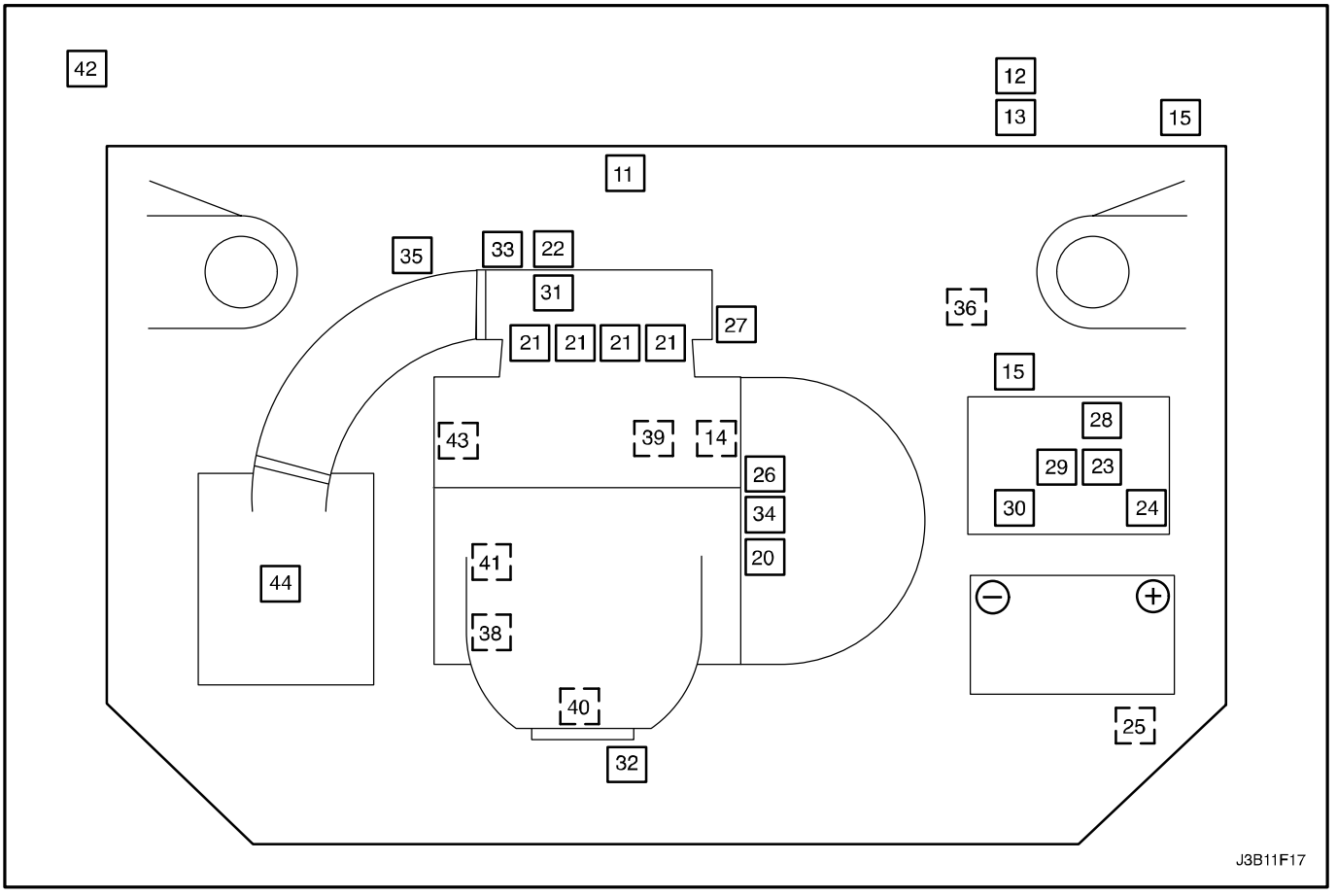
Information Sensors

31. Manifold Absolute Pressure (MAP) Sensor
32. Front Heated Oxygen Sensor (HO2S1)
33. Variable Geometry Induction System (VGIS) Solenoid
34. Engine Coolant Temperature (ECT) Sensor
35. Intake Air Temperature (IAT) Sensor
36. Vehicle Speed Sensor (VSS)
38. Crankshaft Position (CKP) Sensor
39. Knock Sensor
40. Rear Heated Oxygen Sensor (HO2S2)
41. Camshaft Position (CMP) Sensor

Not PCM/ECM Connected

42. Evaporative Emission Canister (under vehicle, behind right rear wheel)
43. Engine Oil Pressure Switch
44. Air Cleaner

COMPONENT LOCATOR (1.8L DOHC)



Components on ECM Harness

11. Engine Control Module (ECM)
12. Data Link Connector (DLC)
13. Malfunction Indicator Lamp (MIL)
14. ECM/ABS Harness Ground
15. Fuse Panel (2)

ECM Controlled Devices

20. Exhaust Gas Recirculation (EGR) Valve
21. Fuel Injector (4)
22. Idle Air Control (IAC) Valve
23. Fuel Pump Relay
24. Cooling Fan Relays (High)
25. Cooling Fan Control Relay (A/C Only)
26. Electronic Ignition System Ignition Coil
27. Evaporative Emission (EVAP) Control Purge Solenoid
28. Main Relay
29. A/C Compressor Relay
30. Cooling Fan Relays (Low)

Information Sensors

31. Manifold Absolute Pressure (MAP) Sensor
32. Front Heated Oxygen Sensor (HO2S1)
33. Throttle Position (TP) Sensor
34. Engine Coolant Temperature (ECT) Sensor
35. Intake Air Temperature (IAT) Sensor
36. Vehicle Speed Sensor (VSS)
38. Crankshaft Position (CKP) Sensor
39. Knock Sensor
40. Rear Heated Oxygen Sensor (HO2S2)
41. Camshaft Position (CMP) Sensor

Not PCM/ECM Connected

42. Evaporative Emission Canister (under vehicle, behind right rear wheel)
43. Engine Oil Pressure Switch
44. Air Cleaner

DIAGNOSIS

SYSTEM DIAGNOSIS

DIAGNOSTIC AIDS

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

Preliminary Checks

Before using this section you should have already performed the ”On–Board 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:

- Engine control module (ECM) grounds for being clean, tight, and in their proper location.
- Vacuum hoses for splits, kinks, collapsing and proper 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, proper routing, and carbon tracking.
- Wiring for proper 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 P0171 and DTC P0172, replace the sensor.

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 that is advertising the lowest price? If so, check the fuel tank for signs of debris, water, or other contamination.

IDLE LEARN PROCEDURE

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

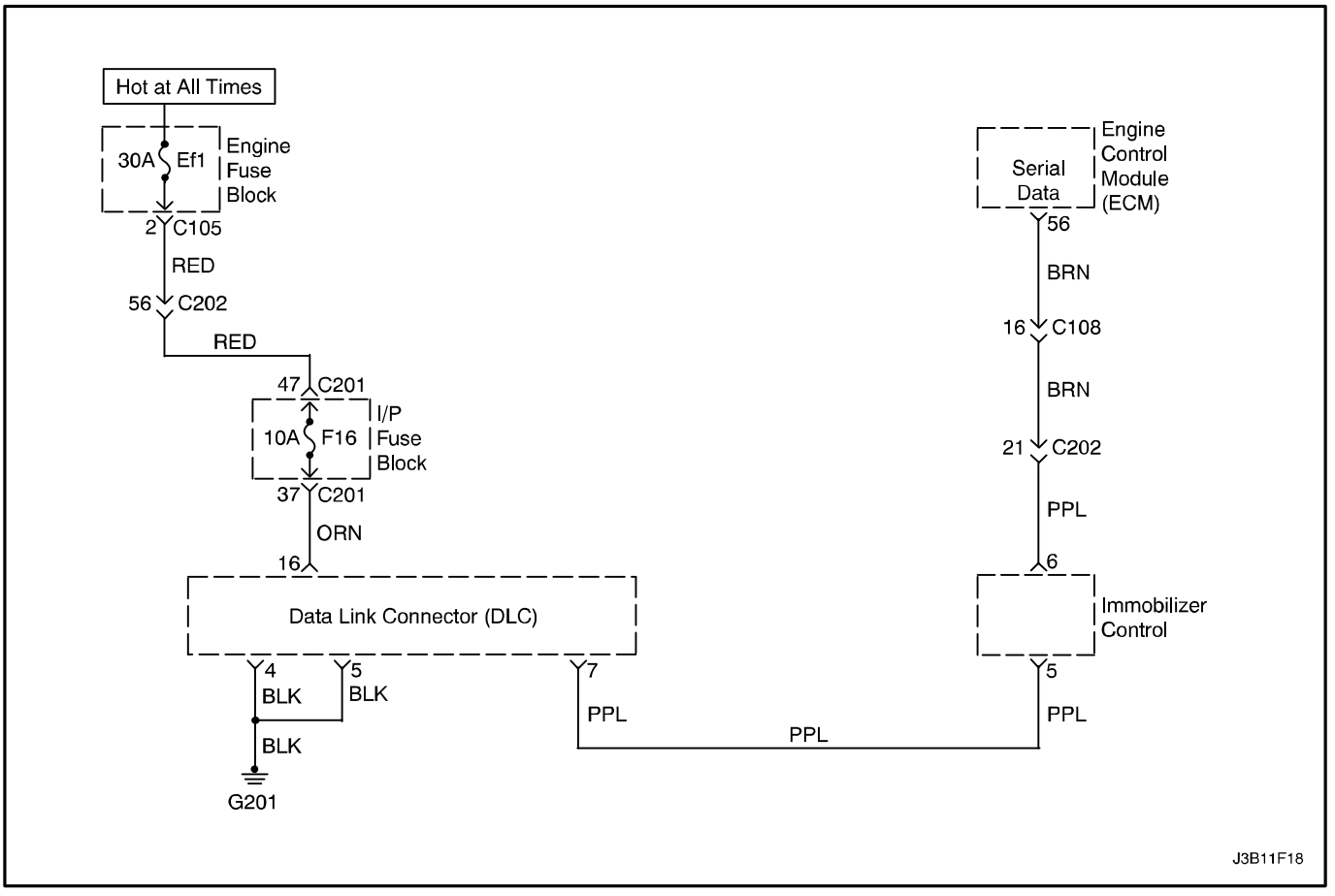
1. Turn the ignition ON for 5 seconds.
2. Turn the ignition OFF for 5 seconds.
3. Turn the ignition ON for 5 seconds.
4. Start the engine in park/neutral.
5. Allow the engine to run until the engine coolant is above 185˚ F (85˚C).
6. Turn the A/C ON for 10 seconds, if equipped.
7. Turn the A/C OFF for 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 D (drive).
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.

TEC (TOOTH ERROR CORRECTION) LEARN PROCEDURE

When an ECM is reflashed, initialized or replaced, and driveplate of fly wheel has been replaced, follow these procedures to relearn the crankshaft position (CKP) system variation :

CAUTION : To avoid personal injury when performing the TEC learn procedure, always set the vehicle parking brake and block the drive wheels. Release the throttle immediately when the engine starts to decelerate. Once the learning procedure is completed, engine control will be learned to the operator, and the engine will respond to throttle position.

1. Stay the gear parking or neutral.
2. Install the scan tool and select ”TEC (Toth Error Correction) LEARN” menu.
3. Start the engine with A/C off.
4. Keep the engine coolant temperature above 65˚C (149˚ F)
5. Put the acceleration pedal above 4000 RPM until the fuel cut–off occurs.
6. Wait 10–15 seconds.
7. Fulfill this procedure again if the scan tool does not display ”OK” message.
8. Turn the ignition switch OFF.
9. Turn the ignition swtich ON and then clear the DTC code.



ON–BOARD DIAGNOSTIC (EOBD) SYSTEM CHECK (1.4L/1.6L DOHC)

Circuit Description

The On–Board Diagnostic (EOBD) system check is the starting point for any driveability complaint diagnosis. Before using this procedure, perform a careful visual/physical check of the engine control module (ECM) and the engine grounds for cleanliness and tightness.

The EOBD system check is an organized approach to identifying a problem created by an electronic engine control system malfunction.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for poor connections or a damaged harness. Inspect the ECM harness and connections for improper mating, broken locks, improperly formed or damaged terminals, poor terminal–to–wire connection, and damaged harness.

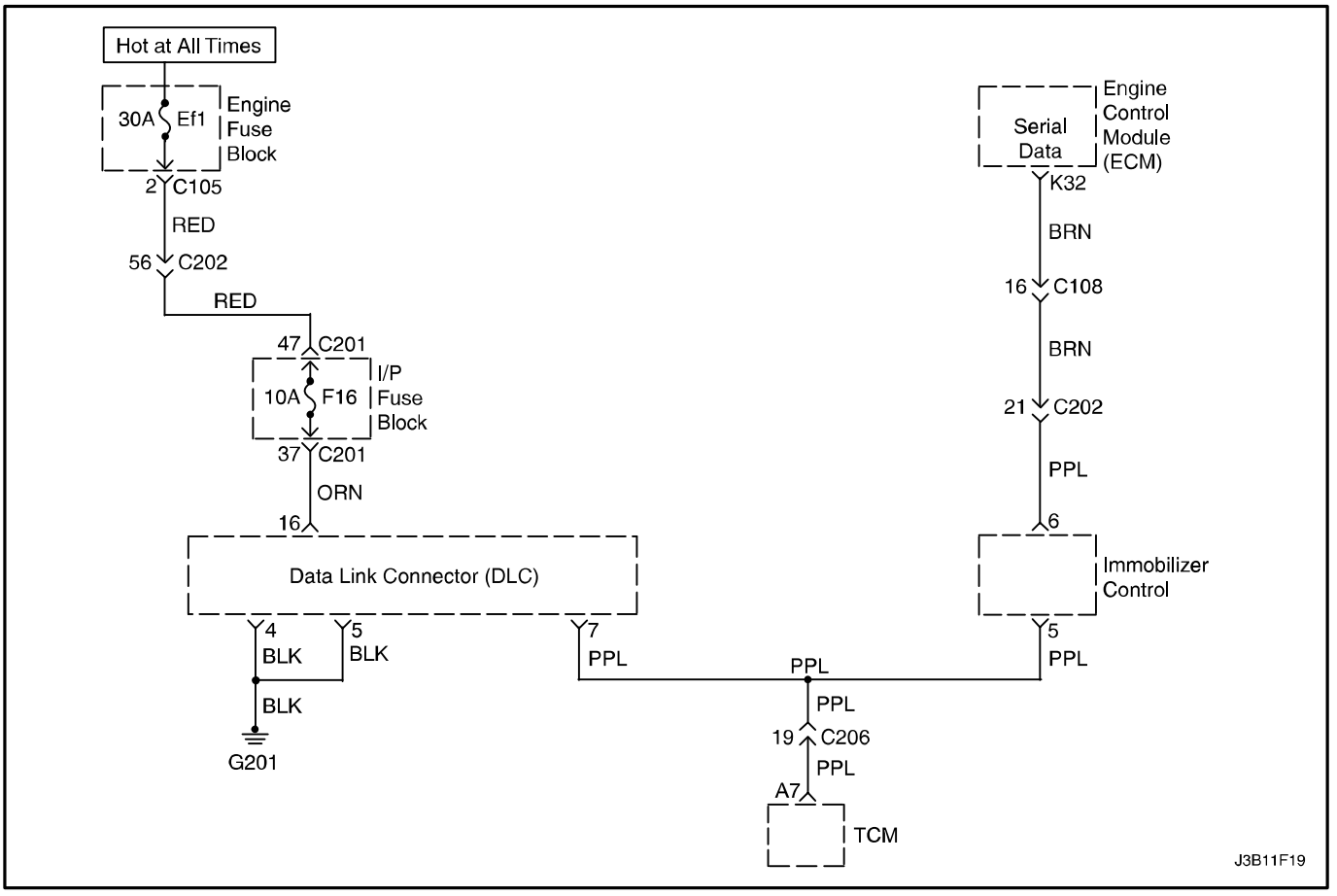
Test Description

Numbers below refer to the step number on the Diagnostic Chart:

1. The Malfunction Indicator Lamp (MIL) should be ON steady with the ignition ON and the engine OFF. If not, go to ”Diagnostic Aids”.
2. Checks the Class 2 data circuit and ensures that the ECM is able to transmit serial data.
3. This test ensures that the ECM is capable of controlling the MIL and the MIL driver circuit is not shorted to ground.
4. If the engine will not start, refer to ”Engine Cranks But Will Not Run” in this section.
7. A scan tool parameter which is not within the typical range may help to isolate the area which is causing the problem.
10. This vehicle is equipped with a ECM which utilizes an Electrically Erasable Programmable Read Only Memory (EEPROM). The replacement ECM must be programmed. Refer to the latest Techline procedure for ECM reprogramming.

On–Board Diagnostic (EOBD) System Check (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to ON. 2. Observe the Malfunction Indicator Lamp (MIL). Is the MIL illuminate?	–	Go to *Step 2*	Go to ”No Malfunction Indicator Lamp”
2	1. Turn the ignition switch to LOCK. 2. Install the scan tool to the Data link Connector (DLC). 3. Turn the ignition switch to ON. 4. Attempt to display the Engine Control Module (ECM) engine data with the scan tool. Does the scan tool display the ECM engine data?	–	Go to *Step 3*	Go to *Step 8*
3	1. Using the scan tool output test function, select the MIL lamp control and command the MIL off. 2. Observe the MIL. Does the MIL turn OFF?	–	Go to *Step 4*	Go to ”Malfunction Indicator Lamp on Steady”
4	Attempt to start the engine. Does the engine start and continue to run?	–	Go to *Step 5*	Go to ”Engine Cranks But Will Not Run”
5	Select DISPLAY DTC with the scan tool. Are any Diagnostic Trouble Codes (DTCs) stored?	–	Go to *Step 6*	Go to *Step 7*
6	Check the display for DTCs P0107, P0108, P0113, P0118, P0122, P0123, P0712, P1392. Are two or more of the following DTCs stored?	–	Go to ”Multiple ECM Information Sensor DTCs Set”	Go to applicable DTC table
7	Compare the ECM data values displayed on the scan tool to the typical engine scan data values. Are the displayed values normal or close to the typical values?	–	Go to ”ECM Output Diagnosis”	Go to indicated component system check
8	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM connector. 3. Turn the ignition switch to ON. 4. Check the serial data circuit for an open, short to ground, or short to voltage. Also check the DLC ignition feed circuit for an open or short to ground, and check the DLC ground circuits for an open. Is a problem found?	–	Go to *Step 9*	Go to *Step 10*
9	Repair the open, short to ground, or short to voltage in the serial data circuit or the DLC ignition feed circuit. Is the repair complete?	–	System OK	–
10	1. Attempt to reprogram the ECM. 2. Attempt to display the ECM data with the scan tool. Does the scan tool display ECM engine data?	–	Go to *Step 2*	Go to *Step 11*
11	Replace the ECM. Is the replacement complete?	–	System OK	–



ON–BOARD DIAGNOSTIC (EOBD) SYSTEM CHECK (1.8L DOHC)

Circuit Description

The On–Board Diagnostic (EOBD) system check is the starting point for any driveability complaint diagnosis. Before using this procedure, perform a careful visual/physical check of the engine control module (ECM) and the engine grounds for cleanliness and tightness.

The EOBD system check is an organized approach to identifying a problem created by an electronic engine control system malfunction.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for poor connections or a damaged harness. Inspect the ECM harness and connections for improper mating, broken locks, improperly formed or damaged terminals, poor terminal–to–wire connection, and damaged harness.

Test Description

Numbers below refer to the step number on the Diagnostic Chart:

1. The Malfunction Indicator Lamp (MIL) should be ON steady with the ignition ON and the engine OFF. If not, go to”Diagnostic Aids”.
2. Checks the Class 2 data circuit and ensures that the ECM is able to transmit serial data.
3. This test ensures that the ECM is capable of controlling the MIL and the MIL driver circuit is not shorted to ground.
4. If the engine will not start, refer to ”Engine Cranks But Will Not Run” in this section.
7. A scan tool parameter which is not within the typical range may help to isolate the area which is causing the problem.
10. This vehicle is equipped with a ECM which utilizes an Electrically Erasable Programmable Read Only Memory (EEPROM). The replacement ECM must be programmed. Refer to the latest Techline procedure for ECM reprogramming.

On–Board Diagnostic (EOBD) System Check (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to ON. 2. Observe the Malfunction Indicator Lamp (MIL). Is the MIL illuminate?	–	Go to *Step 2*	Go to ”No Malfunction Indicator Lamp”
2	1. Turn the ignition switch to LOCK. 2. Install the scan tool to the Data link Connector (DLC). 3. Turn the ignition switch to ON. 4. Attempt to display the Engine Control Module (ECM) engine data with the scan tool. Does the scan tool display the ECM engine data?	–	Go to *Step 3*	Go to *Step 8*
3	1. Using the scan tool output test function, select the MIL lamp control and command the MIL off. 2. Observe the MIL. Does the MIL turn OFF?	–	Go to *Step 4*	Go to ”Malfunction Indicator Lamp on Steady”
4	Attempt to start the engine. Does the engine start and continue to run?	–	Go to *Step 5*	Go to ”Engine Cranks But Will Not Run”
5	Select DISPLAY DTC with the scan tool. Are any Diagnostic Trouble Codes (DTCs) stored?	–	Go to *Step 6*	Go to *Step 7*
6	Check the display for DTCs P0107, P0108, P0113, P0118, P0122, P0123, P0712, P1392. Are two or more of the following DTCs stored?	–	Go to ”Multiple ECM Information Sensor DTCs Set”	Go to applicable DTC table
7	Compare the ECM data values displayed on the scan tool to the typical engine scan data values. Are the displayed values normal or close to the typical values?	–	Go to ”ECM Output Diagnosis”	Go to indicated component system check
8	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM connector. 3. Turn the ignition switch to ON. 4. Check the serial data circuit for an open, short to ground, or short to voltage. Also check the DLC ignition feed circuit for an open or short to ground, and check the DLC ground circuits for an open. Is a problem found?	–	Go to *Step 9*	Go to *Step 10*
9	Repair the open, short to ground, or short to voltage in the serial data circuit or the DLC ignition feed circuit. Is the repair complete?	–	System OK	–
10	1. Attempt to reprogram the ECM. 2. Attempt to display the ECM data with the scan tool. Does the scan tool display ECM engine data?	–	Go to *Step 2*	Go to *Step 11*
11	Replace the ECM. Is the replacement complete?	–	System OK	–

MULTIPLE ECM INFORMATION SENSOR DTCS SET

Circuit Description

The Engine Control Module (ECM) monitors various sensors to determine engine operating conditions. The ECM controls fuel delivery, spark advance, transaxle operation, and emission control device operation based on the sensor inputs.

The ECM provides a sensor ground to all of the sensors. The ECM applies 5 volts through a pull–up resistor and monitors the voltage present between the sensor and the resistor to determine the status of the Engine Coolant Temperature (ECT) sensor, the Intake Air Temperature (IAT) sensor. The ECM provides the Exhaust Gas Recirculation (EGR) Pintle Position Sensor, the Throttle Position (TP) sensor, the Manifold Absolute Pressure (MAP) sensor, and the Fuel Tank Pressure Sensor with a 5 volt reference and a sensor ground signal. The ECM monitors the separate feedback signals from these sensors to determine their operating status.

Diagnostic Aids

Be sure to inspect the ECM and the engine grounds for being secure and clean.

A short to voltage in one of the sensor circuits can cause one or more of the following DTCs to be set: P0108, P0113, P0118, P0123, P1106, P1111, P1115, P1121, P0463, P0533.

If a sensor input circuit has been shorted to voltage, ensure that the sensor is not damaged. A damaged sensor will continue to indicate a high or low voltage after the affected circuit has been repaired. If the sensor has been damaged, replace it.

An open in the sensor ground circuit between the ECM and the splice will cause one or more of the following DTCs to be set: P0107, P0108, P0113, P0118, P0122, P0123, P1106, P1111, P1115, P1121, P0462, P0532.

A short to ground in the 5 volt reference circuit or an open in the 5 volt reference circuit between the ECM and the splice will cause one or more of the following DTCs to be set: P0107, P0112, P0117, P0122, P1107, P1112, P1114, P1122, P0462, P0532.

Check for the following conditions:

- Inspect for a poor connection at the ECM. Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Inspect the wiring harness for damage. If the harness appears to be OK, observe an affected sensor's displayed value on the scan tool with the ignition ON and the engine OFF while moving connectors and wiring harnesses related to the affected sensors. A change in the affected sensor's displayed value will indicate the location of the fault.

Test Description

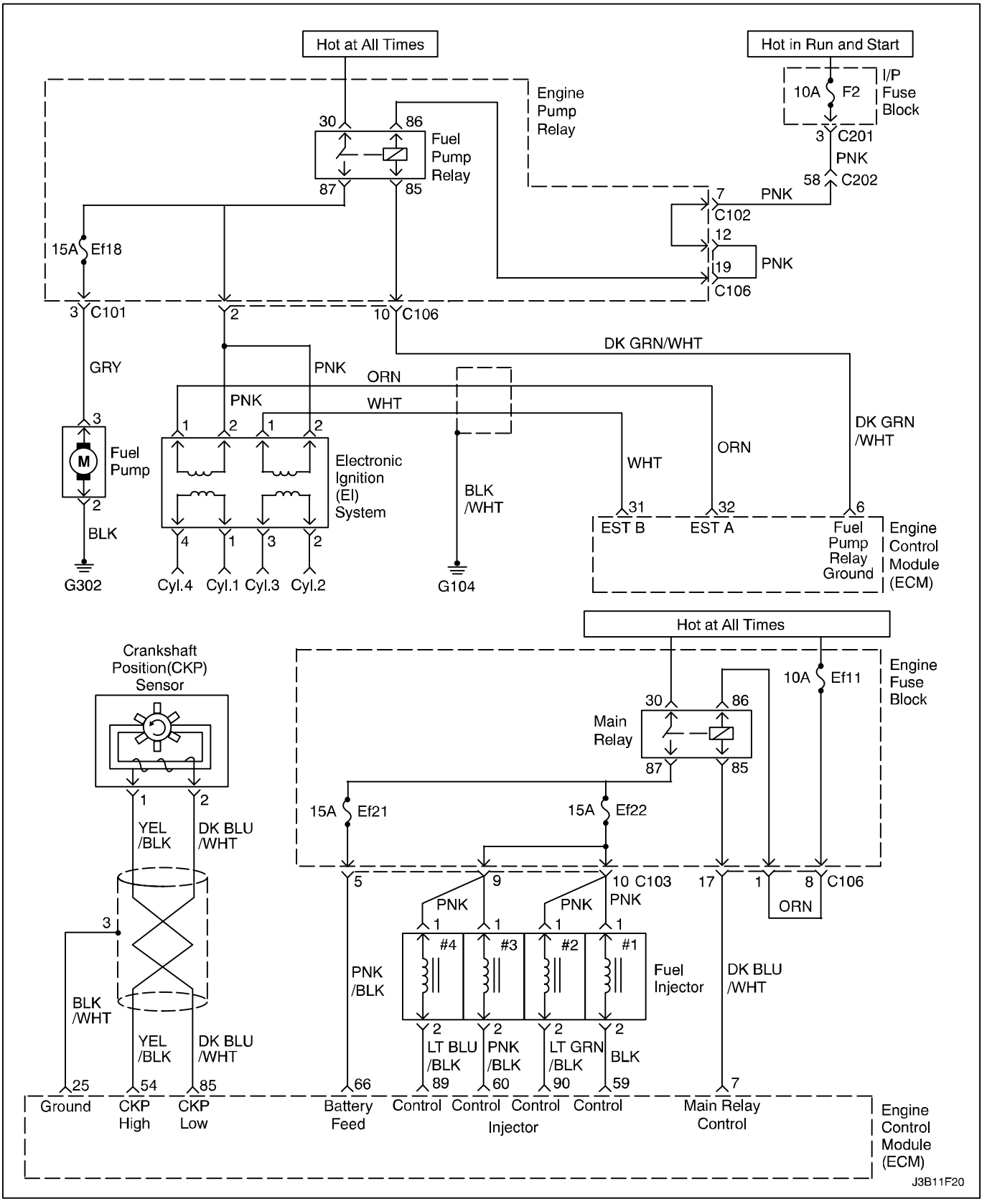
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The Powertrain On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
9. A faulty EGR valve can leak a small amount of current from the ignition feed circuit to the 5 volt reference circuit. If the problem does not exist with the EGR valve disconnected, replace the EGR valve.
0. If a sensor input circuit has been shorted to voltage, ensure that the sensor has not been damaged. A damaged IAT or ECT sensor will continue to indicate a high voltage or low temperature after the affected circuit has been repaired. A damaged ACT, TP, MAP, Fuel Tank Pressure, or EGR Pintle Position sensor will indicate a high or low voltage or may be stuck at a fixed value after the affected circuit has been repaired. If the sensor has been damaged, replace it.
21. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

Multiple ECM Information Sensor DTCs Set

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Is the check complete.	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the Engine Control Module (ECM) connector. 3. Turn the ignition switch to ON. 4. Check the 5V reference circuit for the following conditions: • Poor connection at the ECM. • Open between the ECM connector affected sensors shorted to ground or voltage. 5. If a problem is found, locate and repair the open or short circuit as needed. Is a problem found?	–	Go to *Step 19*	Go to *Step 3*
3	1. Check the sensor ground circuit for the following conditions: • Poor connection at the ECM or affected sensors. • Open between the ECM connector and the affected sensors. 2. If a problem is found, repair it as needed. Is a problem found?	–	Go to *Step 19*	Go to *Step 4*
4	Measure the voltage of the Exhaust Gas Recirculation (EGR) Pintle Position Sensor signal circuit between ECM harness connector and ground. Does the voltage near the specified value?	0 V	Go to *Step 5*	Go to *Step 9*
5	Measure the voltage of the Manifold Absolute Pressure (MAP) sensor signal circuit between the ECM harness connector and ground. Does the voltage near the specified value?	0 V	Go to *Step 6*	Go to *Step 12*
6	Measure the voltage of the Throttle Position (TP) sensor signal circuit between the ECM harness connector and ground. Does the voltage near the specified value?	0 V	Go to *Step 7*	Go to *Step 12*
7	Measure the voltage of the Intake Air Temperature (IAT) sensor signal circuit between the ECM harness connector and ground. Does the voltage near the specified value?	0 V	Go to *Step 8*	Go to *Step 13*
8	Measure the voltage of the Engine Coolant Temperature (ECT) sensor signal circuit between the ECM harness connector and ground. Does the voltage near the specified value?	0 V	Go to *Step 16*	Go to *Step 14*
9	1. Disconnect the EGR valve connector. 2. Measure the voltage of the EGR Pintle Position sensor signal circuit between the ECM harness connector and ground. Does the voltage near the specified value?	0 V	Go to *Step 10*	Go to *Step 15*

Step	Action	Value(s)	Yes	No
10	Replace the EGR valve. Is the replacement complete?	–	Go to *Step 19*	–
11	Locate and repair the short to voltage in the MAP sensor signal circuit. Is the repair complete?	–	Go to *Step 19*	–
12	Locate and repair the short to voltage in the TP sensor signal circuit. Is the repair complete?	–	Go to *Step 19*	–
13	Locate and repair the short to voltage in the IAT sensor signal circuit. Is the repair complete?	–	Go to *Step 19*	–
14	Locate and repair the short to voltage in the ECT sensor signal circuit. Is the repair complete?	–	Go to *Step 19*	–
15	Locate and repair the short to voltage in the EGR Pintle Position sensor circuit. Is the repair complete?	–	Go to *Step 19*	–
16	Measure the voltage of the fuel tank pressure sensor signal circuit between the ECM harness connector and ground. Does the voltage near the specified value?	0 V	Go to *Step 18*	Go to *Step 17*
17	Locate and repair the short to voltage in the fuel tank pressure sensor signal circuit. Is the replacement complete?	–	Go to *Step 19*	–
18	Replace the ECM. Is the repair complete?	–	Go to *Step 19*	
19	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTCs as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 20*	Go to *Step 2*
22	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK


Hot at All Times
Hot in Run and Start
Engine Pump Relay
Fuel Pump Relay
30
86
87
85
I/P Fuse Block
10A
F2
3 C201
PNK
58 C202
7 PNK
C102
12
19 PNK
C106
15A Ef18
3 C101
2
10 C106
DK GRN/WHT
GRY
PNK
ORN
WHT
PNK
3
Fuel Pump
M
2
BLK
G302
1 2 1 2
Electronic Ignition (EI) System
4 1 3 2
Cyl.4 Cyl.1 Cyl.3 Cyl.2
BLK /WHT
G104
WHT
ORN
DK GRN /WHT
31
32
6
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
Hot at All Times
Crankshaft Position(CKP) Sensor
1
2
YEL /BLK
DK BLU /WHT
3
BLK /WHT
YEL /BLK
DK BLU /WHT
25
54
85
Ground
CKP High
CKP Low
30
86
87
85
Main Relay
10A Ef11
Engine Fuse Block
15A Ef21
15A Ef22
5
9
10 C103
17
1
8 C106
ORN
PNK
PNK
PNK
PNK /BLK
#4
#3
#2
#1
Fuel Injector
DK BLU /WHT
LT BLU /BLK
PNK /BLK
LT GRN /BLK
BLK
89
60
90
59
7
66
Battery Feed
Control
Control
Control
Control
Injector
Main Relay Control
Engine Control Module (ECM)
J3B11F20

ENGINE CRANKS BUT WILL NOT RUN (1.4L/1.6L DOHC)

Test Description

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

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the occurred. The information is then stored on the scan tool for later reference.
2. By performing a compression test, it can be determined if the engine has the mechanical ability to run.
3. 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 (CKP) sensor is OK.
19. In checking the engine 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 Run (1.4L/1.6L DOHC)

CAUTION : Use only electrically insulated pliers when handling ignition wires with the engine running to prevent 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	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the check complete.	–	Go to *Step 2*	Go to "Euro On–Board 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 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 23*	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 wire. Is spark present from all of the ignition wires?	30000 Ω	Go to *Step 2*	Go to *Step 11*

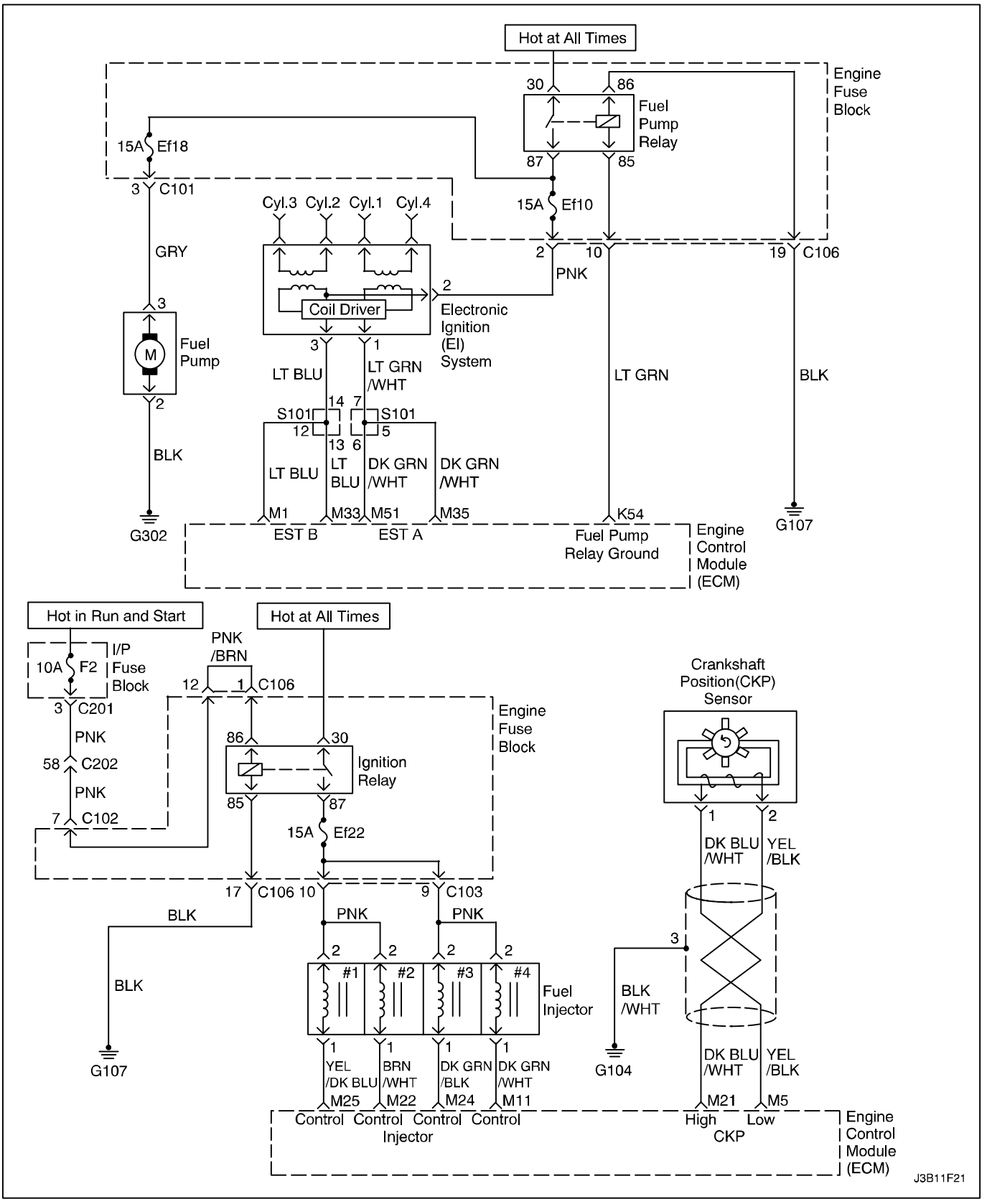
Step	Action	Value(s)	Yes	No
11	1. Turn the ignition OFF. 2. Disconnect the crankshaft position (CKP) sensor connector. 3. Turn the ignition ON. 4. Measure the voltage between following terminals: • Terminal 1 and 3 of the CKP sensor connector. • Terminal 2 and 3 of the CKP sensor connector. • Terminal 1 of the CKP sensor connector and ground. • Terminal 2 of the CKP sensor connector and ground. Are the voltage measure within the value specified?	≈ 1.4 V	Go to *Step 13*	Go to *Step 12*
12	Check for an open or short in the wires between CKP sensor connector and ECM connector and repair as need. Is the repair complete?	–	Go to *Step 2*	–
13	1. Disconnect electronic Ignition (EI) system ignition coil connector to prevent the vehicle from starting. 2. Measure the voltage at ECM connector terminal 85 and 54 by backprobing the ECM connector. Are the voltage readings near the value specified?	1.4V with ignition ON, 1.6V during cranking	Go to *Step 15*	Go to *Step 14*
14	Replace the CKP sensor. Is the repair complete?	–	Go to *Step 2*	–
15	1. Turn the ignition OFF. 2. Disconnect the electrical connector at EI system ignition coil. 3. Connect a test light between terminal 2 of the EI system ignition coil connector and ground. 4. Turn the ignition ON. Is the test light on?	–	Go to *Step 17*	Go to *Step 16*
16	Check for open in wire between the battery and EI system ignition coil connector terminal 2 and repair as needed. Is the repair complete?	–	Go to *Step 2*	–
17	1. Turn the ignition OFF. 2. Disconnect ECM connect and EI system ignition coil connector. 3. Measure the resistance between following terminals: • Terminal 1 of ignition coil and terminal 31 of ECM connector. • Terminal 1 of ignition coil and terminal 32 of ECM connector. Are the resistance within the value specified?	0 Ω	Go to *Step 19*	Go to *Step 18*
18	Check for open circuit and repair as needed. Is the repair complete?	–	Go to *Step 2*	–

Step	Action	Value(s)	Yes	No
19	1. Measure the resistance between following terminals: • Terminal 1 and 2 of ignition coil. • Terminal 2 and 1 of ignition coil. Are the resistance within the value specified. 1. Remove the high tension cable. 2. Measure the resistance between second coil. • Between 1 and 4 • Between 2 and 3 Are the resistance within the value specified.	0.9 Ω 5.3 kΩ	Go to *Step 21*	Go to *Step 20*
20	Replace the EI system ignition coil. Is the repair complete?	–	Go to *Step 2*	–
21	1. Check for any damages or poor connection in ignition wires and repair as needed. 2. Connect the EI system ignition coil connector and ECM connector. 3. Check for the presence of spark from all of the ignition wires. Is the spark present from all of the ignition wires?	–	Go to *Step 2*	Go to *Step 22*
22	Replace ECM. Is the repair complete?	–	Go to *Step 2*	–
23	1. Turn the ignition OFF. 2. Connect a fuel pressure gauge. 3. Crank the engine. Is any fuel pressure present?	–	Go to *Step 26*	Go to *Step 24*
24	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the fuel pump. 3. Connect a test light between the fuel pump terminals 2 and 3. 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 25*	Go to 34
25	Replace the fuel pump. Is the repair complete?	–	Go to *Step 2*	–
26	Is the fuel pressure within the value specified?	283–324 kPa (41–47 psi)	Go to *Step 27*	Go to *Step 29*
27	Check the fuel for contamination. Is the fuel contaminated?	–	Go to *Step 28*	Go to *Step 41*
28	1. Remove the contaminated fuel from the fuel tank. 2. Clean the fuel tank as needed. Is the repair complete?	–	Go to *Step 2*	–
29	1. Check the fuel filter for restriction. 2. Inspect the fuel lines for kinks and restrictions. 3. Repair or replace as needed. 4. Measure the fuel pressure. Is the fuel pressure within the value specified?	283–324 kPa (41–47 psi)	Go to *Step 2*	Go to *Step 30*

Step	Action	Value(s)	Yes	No
30	1. Disconnect 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 31*	Go to *Step 32*
31	Replace the fuel pressure regulator. Is the repair complete?	–	Go to *Step 2*	–
32	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 restriction. Is the problem found?	–	Go to *Step 33*	Go to *Step 25*
33	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*	–
34	1. Turn the ignition OFF. 2. Disconnect the electric connector at the fuel pump. 3. Connect a test light between fuel pump connector terminal 3 and ground. 4. Turn the ignition ON. 5. With the ignition ON, the test light should illuminate for the time specified. Is the test light on?	2 sec	Go to *Step 35*	Go to *Step 36*
35	Repair the open circuit between the fuel pump connector terminal 2 and ground. Is the repair complete?	–	Go to *Step 2*	–
36	1. Turn the ignition OFF. 2. Disconnect the fuel pump relay. 3. Turn the ignition ON. 4. Measure the voltage at terminal 30 and 86 of fuel pump relay. Is the voltage within the value specified?	11–14 V	Go to *Step 38*	Go to *Step 37*
37	Repair open or short circuit for power supply. Is the repair complete?	–	Go to *Step 2*	–
38	1. Turn the ignition OFF. 2. Disconnect ECM connector. 3. Using an ohmmeter, measure the resistance between following terminals. • Terminal 6 of ECM and terminal 85 of fuel pump relay. • Terminal 87 of fuel pump relay and terminal 3 of fuel pump. Does the resistance within the value specified?	0 Ω	Go to *Step 40*	Go to *Step 39*

Step	Action	Value(s)	Yes	No
39	Repair the open or short circuit the following terminals. • Terminal 6 of ECM and terminal 86 of fuel pump relay. • Terminal 87 of fuel pump relay and terminal 3 of fuel pump. Is the repair complete?	–	Go to *Step 2*	–
40	Replace the fuel pump relay. Is the repair complete?	–	Go to *Step 2*	–
41	1. Turn the ignition OFF. 2. Disconnect the fuel inject harness connectors from all of the fuel injectors. 3. Turn the ignition ON. 4. Connect test light between fuel injector harness connector 2 and ground. 5. Repeat step 4 for each of the remaining fuel injectors. Does the test light on at all of the fuel injectors?	–	Go to *Step 42*	Go to *Step 45*
42	1. Turn the ignition OFF. 2. Connect test light between fuel injector harness connector 1 and battery positive. 3. Crank the engine. 4. Repeat step 2 and 3 for each of the remaining fuel injectors. Does the test light flash for all of the fuel injectors?	–	Go to *Step 43*	Go to *Step 46*
43	Measure the resistance of each fuel injectors. Is the resistance within the value specified. **Notice :** the resistance will increase slightly at higher temperature.	11.6–12.4Ω	System OK	Go to *Step 44*
44	Replace any of the fuel injectors with a resistance out of specification. Is the repair complete?	–	Go to *Step 2*	–
45	1. Inspect the fuse EF22 in engine fuse block. 2. Check for an open between the circuit from terminal 2 of the four fuel injectors and terminal 87 of main relay. Is the problem found?	–	Go to *Step 48*	Go to ”Main Relay Circuit Check”
46	Measure the resistance between following terminals. • Terminal 2 of injector 1 connector and terminal 59 of ECM connector. • Terminal 2 of injector 2 connector and terminal 90 of ECM connector. • Terminal 2 of injector 3 connector and terminal 60 of ECM connector. • Terminal 2 of injector 4 connector and terminal 89 of ECM connector. Does the resistance within the specified value?	0 Ω	Go to *Step 49*	Go to *Step 47*
47	Repair the open fuel injector harness wire(s). Is the repair complete?	–	Go to *Step 2*	–

Step	Action	Value(s)	Yes	No
48	Replace the fuse or repair the wiring as needed. Is the repair complete?	–	Go to *Step 2*	–
49	Replace the ECM. Is the repair complete?	–	Go to *Step 2*	–


Hot at All Times
Engine Fuse Block
30
86
Fuel Pump Relay
87
85
15A Ef18
3 C101
GRY
15A Ef10
Cyl.3 Cyl.2 Cyl.1 Cyl.4
2
10
19 C106
PNK
Coil Driver
Electronic Ignition (EI) System
3
1
Fuel Pump
M
LT BLU
LT GRN /WHT
LT GRN
BLK
14 7
S101
12
5
13 6
LT BLU
LT BLU
DK GRN /WHT
DK GRN /WHT
M1
M33
M51
M35
K54
G302
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
G107
Hot in Run and Start
Hot at All Times
10A F2
I/P Fuse Block
PNK /BRN
12
1 C106
3 C201
PNK
58 C202
PNK
7 C102
Engine Fuse Block
86
30
Ignition Relay
85
87
15A Ef22
17 C106 10
9 C103
BLK
PNK
PNK
2
#1
#2
#3
#4
Fuel Injector
BLK
G107
YEL /DK BLU
BRN /WHT
DK GRN /BLK
DK GRN /WHT
M25
M22
M24
M11
Control Injector
Crankshaft Position(CKP) Sensor
1
2
DK BLU /WHT
YEL /BLK
3
BLK /WHT
G104
M21
M5
High CKP
Low
J3B11F21

ENGINE CRANKS BUT WILL NOT RUN (1.8L DOHC)

Test Description

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

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the occurred. The information is then stored on the scan tool for later reference.
2. By performing a compression test, it can be determined if the engine has the mechanical ability to run.
3. 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 (CKP) sensor is OK.

19. In checking the engine 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 Run (1.8L DOHC)

CAUTION : Use only electrically insulated pliers when handling ignition wires with the engine running to prevent 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	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to "On–Board Diagnostic (EOBD) System Check"
2	Check for set Diagnostic Trouble Code (DTC) P0601. Is the DTC set?	–	Go to applicable DTC table	Go to *Step 4*
3	Crank the engine. Does the engine start and continue to run?	–	System OK	Go to *Step 5*
4	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 8*	Go to *Step 5*
5	Inspect the timing belt alignment. Is the timing belt in alignment?	–	Go to *Step 7*	Go to *Step 6*
6	Align or replace the timing belt as needed. Is the repair complete?	–	Go to *Step 3*	–
7	Repair the internal engine damage as needed. Is the repair complete?	–	Go to *Step 3*	–
8	Inspect the fuel pump fuse. Is the problem found?	–	Go to *Step 9*	Go to *Step 10*
9	Replace the fuse. Is the repair complete?	–	Go to *Step 3*	–
10	1. Install a scan tool. 2. Turn the ignition ON, the engine OFF and close the throttle. Does the Throttle Position (TP) sensor read less than the specified value.	1.0 v	Go to *Step 11*	Go to "DTC P0123 Throttle Position Sensor High Voltage"

Step	Action	Value(s)	Yes	No
11	Compare the Engine Coolant Temperature (ECT) with the Intake Air Temperature (IAT). Is the ECT relatively close to the IAT?	–	Go to *Step 12*	Go to ”DTC P0118 Engine Coolant Temperature High Voltage
12	1. Check if the Manifold Absolute Pressure (MAP) sensor reading is over the specified reading. 2. Crank the engine while watching the MAP sensor reading. Does the MAP sensor read above the specified value and then change while cranking the engine?	4 v	Go to *Step 13*	Go to *Step 14*
13	Crank the engine. Does the Crankshaft Position (CKP) Active Counter increment while cranking?	–	Go to *Step 16*	Go to *Step 18*
14	Check the scan data for serial data. Was serial data lost while cranking the engine?	–	Go to *Step 15*	Go to ”MAP Sensor Output Check”
15	Repair voltage loss to the engine control module (ECM) from the ignition switch. Is the repair complete?	–	System OK	–
16	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 41*	Go to *Step 17*
17	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 3*	Go to *Step 18*
18	1. Turn the ignition OFF. 2. Disconnect the Crankshaft Position (CKP) sensor connector. 3. Measure the voltage between the CKP connector terminals 1 and 3. 4. Repair the wiring as needed. Does the voltage measure near the value specified?	1.4 v (2.5 v)*	Go to *Step 19*	Go to *Step 20*
19	Measure the voltage between the CKP connector terminals 2 and 3. Does the voltage measure near the value specified	1.4 v (2.5 v)*	Go to *Step 26*	Go to *Step 21*
20	Measure the voltage between the CKP connector terminals 1 and ground. Does the voltage measure near the value specified?	1.4 v (2.5 v)*	Go to *Step 22*	Go to *Step 23*
21	Measure the voltage between the CKP connector terminals 2 and ground. Does the voltage measure near the value specified?	1.4 v (2.5 v)*	Go to *Step 22*	Go to *Step 24*
22	Check for an open or short in the wire between the CKP connector terminal 3 and ground. Is the problem found?	–	Go to *Step 25*	Go to *Step 40*
23	Check for an open or short in the wire between the CKP connector terminal 1 and the ECM connector terminal M21 Is the problem found?	–	Go to *Step 25*	Go to *Step 40*

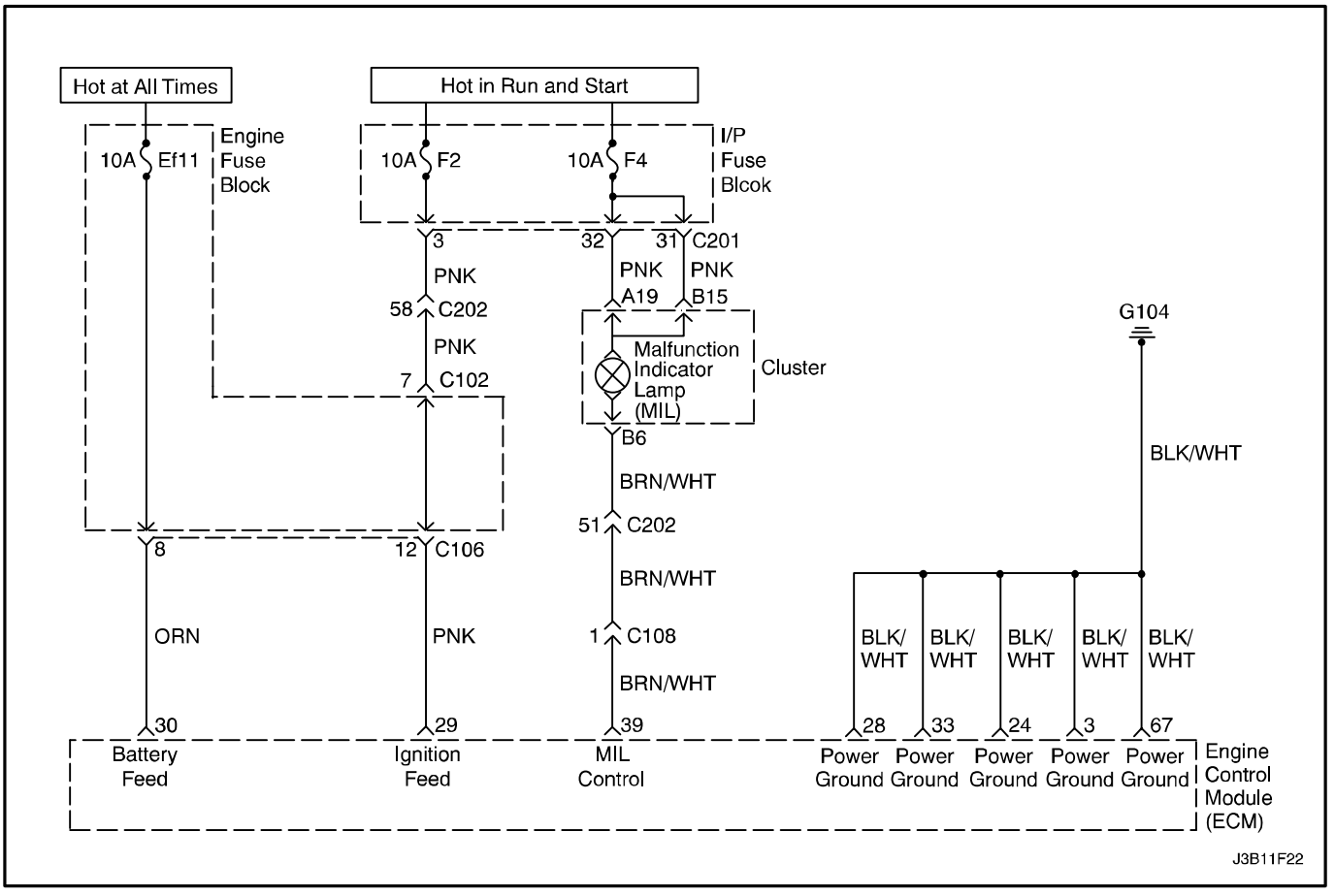
Step	Action	Value(s)	Yes	No
24	Check for an open or short in the wire between the CKP connector terminal 2 and the ECM connector terminal M5. Is the problem found?	–	Go to *Step 25*	Go to *40*
25	Repair the wiring as needed. Is the repair complete?	–	Go to *Step 3*	–
26	1. Disconnect the Electronic Ignition (EI) system ignition coil connector to prevent the vehicle from starting. 2. Measure the voltage at the ECM connector terminal M21 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.4 v (2.5 v)* with ignition ON, 1.6 v (2.6 v)* during cranking	Go to *Step 27*	Go to *Step 28*
27	Measure the voltage at the ECM connector terminal M5 by backprobing the ECM connector. Are the voltage readings near the values specified?	1.4 v (2.5 v)* with ignition ON, 1.6 v (2.6 v)* during cranking	Go to *Step 29*	Go to *Step 28*
28	Replace the CKP sensor. Is the repair complete?	–	Go to *Step 3*	–
29	1. Turn the ignition OFF. 2. Disconnect the electrical connector at the EI system ignition coil. 3. Connect a test light between terminal 2 of the EI system ignition coil connector and ground. 4. Turn the ignition ON. Is the test light on?	–	Go to *Step 30*	Go to *Step 31*
30	Connect a test light of the EI system ignition coil connector and battery positive. Is the test light on?	–	Go to *Step 34*	Go to *Step 32*
31	Check for an open in the wiring between the ignition switch and the EI system ignition coil connector terminal 3. Is the problem found?	–	Go to *Step 33*	–
32	Check for an open in the wire from the EI system ignition coil to ground. Is the problem found?	–	Go to *Step 2*	–
33	1. Repair the wiring as needed. 2. Connect the EI system 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 3*	Go to *Step 34*
34	1. Turn the ignition OFF. 2. Disconnect the EI system ignition coil connector. 3. While cranking the engine, measure the voltage at the EI system ignition coil connector terminal 1. Does the voltage fluctuate within the values specified?	0.2–2.0 v	Go to *Step 39*	Go to *Step 37*

Step	Action	Value(s)	Yes	No
35	While cranking the engine, measure the voltage at the EI system ignition coil connector terminal 3 . Does the voltage fluctuate within the values specified?	0.2–2.0 v	Go to *Step 39*	Go to *Step 37*
36	Check for an open in the wire from the EI system ignition coil connector terminal 1 to the ECM connector terminal M51. Is the problem found?	–	Go to *Step 38*	Go to *Step 40*
37	Check for an open in the wire from the EI system ignition coil connector terminal 3 to the ECM connector terminal M1. Is the problem found?	–	Go to *Step 38*	Go to *Step 40*
38	1. Repair the wiring as needed. 2. Connect the EI system 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 3*	Go to *Step 39*
39	Replace the EI system ignition coil. Is the repair complete?	–	Go to *Step 3*	–
40	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 3*	–
41	1. Turn the ignition OFF. 2. Connect a fuel pressure gauge. 3. Crank the engine. Is any fuel pressure present?	–	Go to *Step 44*	Go to *Step 42*
42	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 43*	Go to *Step 53*
43	Replace the fuel pump. Is the repair complete?	–	Go to *Step 3*	–
44	Is the fuel pressure within the value specified?	283–324 kPa (41–47 psi)	Go to *Step 48*	Go to *Step 45*
45	1. Check the fuel filter for a restriction. 2. Inspect the fuel lines for kinks and restrictions. Is the problem found?	–	Go to *Step 46*	Go to *Step 47*
46	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?	283–324 kPa (41–47 psi)	Go to *Step 3*	Go to *Step 47*

Step	Action	Value(s)	Yes	No
47	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 presen	–	Go to *Step 50*	Go to *Step 51*
48	Check the fuel for contamination. Is the fuel contaminated?	–	Go to *Step 49*	Go to *Step 65*
49	1. Remove the contaminated fuel from the fuel tank. 2. Clean the fuel tank as needed. Is the repair complete?	–	Go to *Step 3*	–
50	Replace the fuel pressure regulator. Is the repair complete?	–	Go to *Step 3*	–
51	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 52*	Go to *Step 43*
52	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 3*	–
53	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 54*	Go to *Step 55*
54	Repair the open wire between the fuel pump connector terminal 2 and ground. Is the repair complete	–	Go to *Step 3*	–
55	1. Turn the ignition OFF. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?	2 sec	Go to *Step 56*	Go to *Step 62*
56	1. Turn the ignition OFF. 2. Connect a test light between the fuel pump relay connector terminal 86 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?	–	Go to *Step 57*	Go to *Step 61*

Step	Action	Value(s)	Yes	No
57	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 58*	Go to*Step 63*
58	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 repair complete?	–	Go to *Step 2*	–
59	Replace the fuel pump relay. Is the repair complete?	–	Go to *Step 3*	–
60	1. Check for an open in the wiring between the fuel pump relay connector terminal 86 and ground. Is the problem found?	–	Go to *Step 71*	–
61	Check the wire between the fuel pump relay connector terminal 85 to the ECM connector terminal K54 for an open. Is the problem found?	–	Go to *Step 62*	Go to *Step 40*
62	Repair the wire between the fuel pump relay connector terminal 85 to the ECM connector terminal K54. Is the repair complete?	–	Go to *Step 3*	–
63	Repair the wire between the fuel pump relay connector terminal 30 and the fuse Ef18. Is the repair complete?	–	Go to *Step 3*	–
64	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 2 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 65*	Go to *Step 68*
65	1. Turn the ignition OFF. 2. Connect a test light between the fuel injector harness connector terminal 1 and battery positive. 3. Crank the engine. 4. Repeat steps two and three for each of the remaining fuel injectors. Does the test light flash for all of the fuel injectors?	–	Go to *Step 66*	Go to *Step 69*
66	Measure the resistance of each fuel injector. Is the resistance within the value specified (the resistance will increase slightly at higher temperatures)?	11.6–12.4 Ω	System OK	Go to *Step 67*
67	Replace any of the fuel injectors with a resistance out of specification. Is the repair complete?	–	Go to *Step 3*	–

Step	Action	Value(s)	Yes	No
68	Repair the open wire(s) between the fuel injector harness connector(s) terminal 2 and the engine harness C103 terminal 10. Is the repair complete?	–	Go to *Step 3*	–
69	1. Check for an open between the #1 fuel injector harness connector terminal 1 and the connector terminal M25. 2. Check for an open between the #2 fuel injector harness connector terminal 1 and the connector terminal M22. 3. Check for an open between the #3 fuel injector harness connector terminal 1 and the connector terminal M24. 4. Check for an open between the #4 fuel injector harness connector terminal 1 and the connector terminal M11. Is the problem found?	–	Go to *Step 70*	Go to *Step 72*
70	Repair the open fuel injector harness wire(s). Is the repair complete?	–	Go to *Step 3*	–
71	Replace the fuse or repair the wiring as needed. Is the repair complete?	–	Go to *Step 3*	–
72	1. Inspect the I/P fuse F2. 2. Check for an open between the circuits from terminal 2 for each of the four fuel injectors and the ignition switch. Is the problem found?	–	Go to *Step 71*	–



NO MALFUNCTION INDICATOR LAMP (1.4L/1.6L DOHC)

Circuit Description

When the ignition is turned ON, the Malfunction Indicator Lamp (MIL) will be turned ON and remain ON until the engine is running, if no Diagnostic Trouble Codes (DTCs) are stored. Battery voltage is supplied through the ignition switch directly to the MIL telltale. The Engine Control Module (ECM) controls the MIL by providing a ground path through the MIL control circuit to turn ON the MIL.

Diagnostic Aids

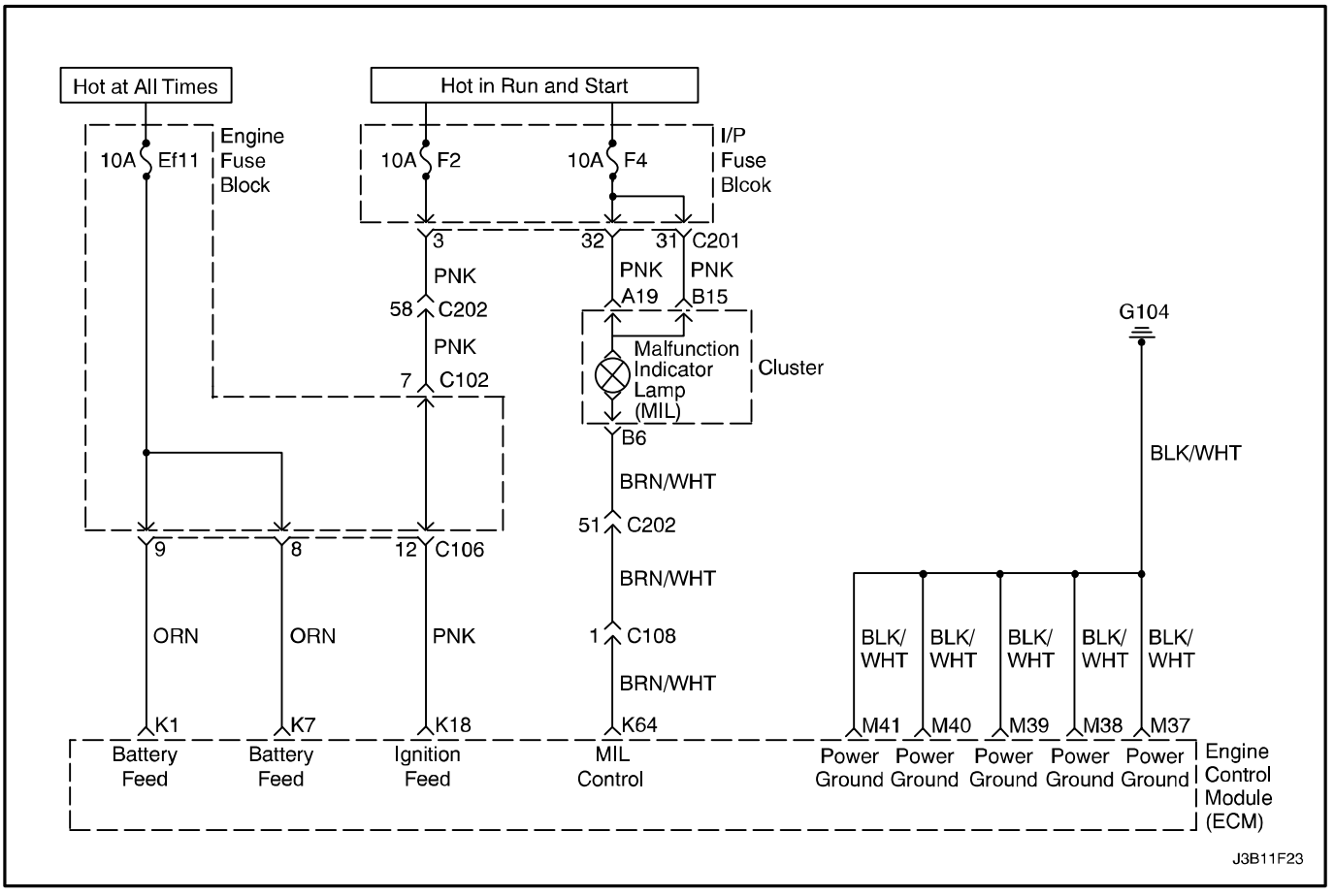
An open ignition fuse F4 will cause the entire cluster to be inoperative.

Check the battery and ignition feed circuits for poor connections if the MIL is intermittent.

Any circuitry, that is suspected as causing an intermittent complaint, should be thoroughly checked for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal–to–wiring connections or physical damage to the wiring harness.

No Malfunction Indicator Lamp (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Attempt to start the engine. Does the engine start?	–	Go to *Step 2*	Go to ”Engine Cranks But Will Not Run”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the Engine Control Module (ECM) connector. 3. Turn the ignition switch to ON. 4. Connect a test light between the ECM connector terminal 39 and ground. Is the test light illuminate?	–	Go to *Step 3*	Go to *Step 6*
3	Check terminals for damage or poor connection. Does any problem found?	–	Go to *Step 5*	Go to *Step 4*
4	Replace the ECM. Is the replacement complete?	–	Go to ”On–Board Diagnostic System Check”	–
5	Repair any damaged terminals or poor connection. Is the repair complete?	–	Go to ”On–Board Diagnostic System Check”	–
6	Check the fuse F4. Is the fuse open?		Go to *Step 7*	Go to *Step 8*
7	1. Check for a short to ground in the circuit and repair as needed. 2. Replace the fuse F4. Is the repair or replacement complete?	–	Go to ”On–Board Diagnostic System Check”	–
8	1. Check for an open circuit between fuse F4 and the ECM connector terminal 39 and repair as needed. 2. Check the MIL bulb and replace if open. Is the repair or replacement complete?	–	Go to ”On–Board Diagnostic System Check”	–



NO MALFUNCTION INDICATOR LAMP (1.8L DOHC)

Circuit Description

When the ignition is turned ON, the Malfunction Indicator Lamp (MIL) will be turned ON and remain ON until the engine is running, if no Diagnostic Trouble Codes (DTCs) are stored. Battery voltage is supplied through the ignition switch directly to the MIL telltale. The Engine Control Module (ECM) controls the MIL by providing a ground path through the MIL control circuit to turn ON the MIL.

Diagnostic Aids

An open ignition fuse F4 will cause the entire cluster to be inoperative.

Check the battery and ignition feed circuits for poor connections if the MIL is intermittent.

Any circuitry, that is suspected as causing an intermittent complaint, should be thoroughly checked for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal–to–wiring connections or physical damage to the wiring harness.

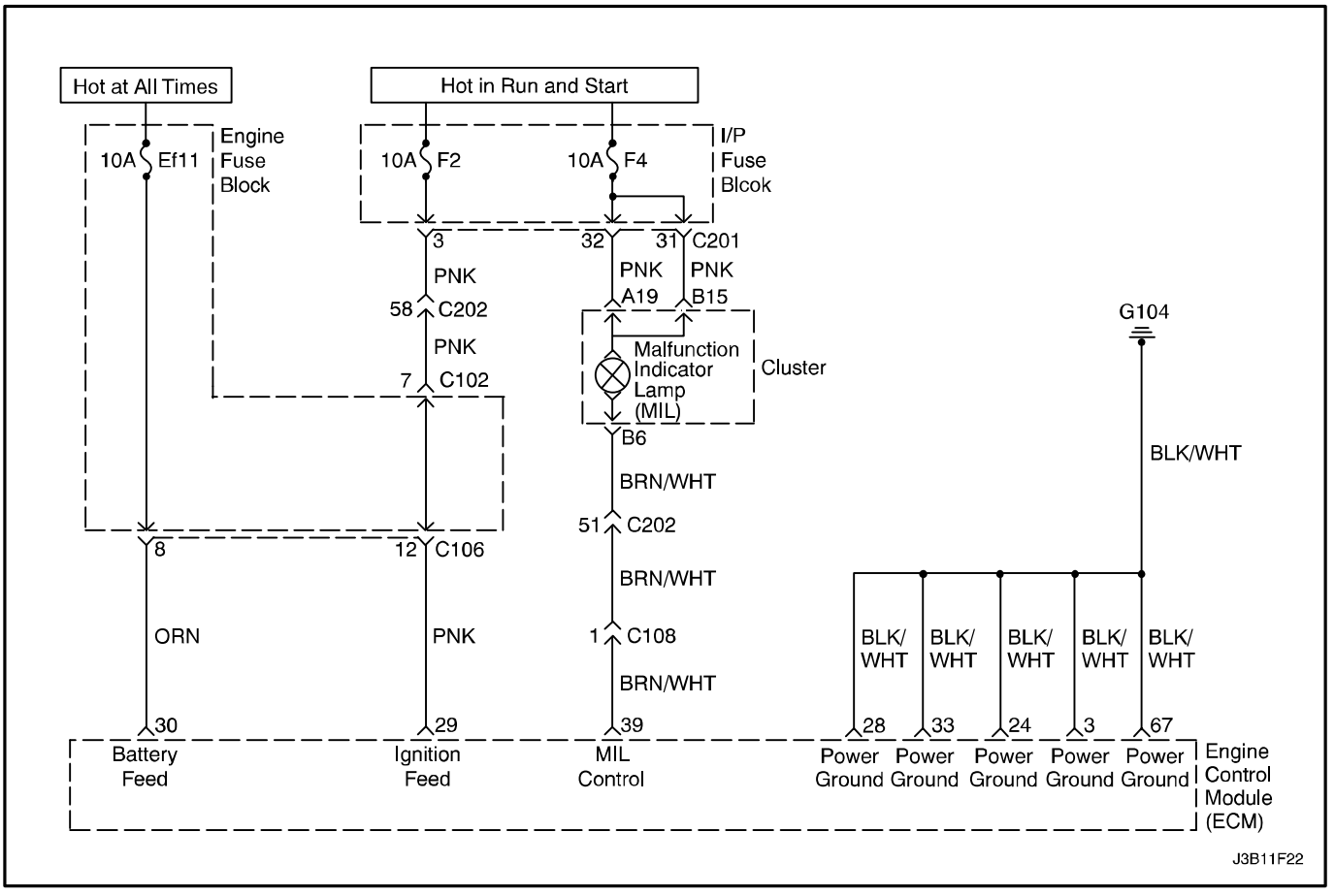
Test Description

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

1. If the engine fails to start and the MIL is inoperative, then the fault can be isolated to either the ECM ignition feed. The battery feed, or a poor ground at the engine block, or the ECM.
2. Probing the MIL circuit with a test light to ground stimulates the ECM's control of the MIL. If the MIL illuminates, then the malfunction can be isolated to the control of the MIL or a poor connection at the MIL terminal to the ECM.

No Malfunction Indicator Lamp (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	Attempt to start the engine. Does the engine start?	–	Go to *Step 2*	Go to ”Engine Cranks But Will Not Run”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the Engine Control Module (ECM) connector. 3. Turn the ignition switch to ON. 4. Connect a test light between the ECM connector terminal K64 and ground. Is the test light illuminate?	–	Go to *Step 3*	Go to *Step 6*
3	Check terminals for damage or poor connection. Does any problem found?	–	Go to *Step 5*	Go to *Step 4*
4	Replace the ECM. Is the replacement complete?	–	Go to ”On Board Diagnostic System Check”	–
5	Repair any damaged terminals or poor connection. Is the repair complete?	–	Go to ”On Board Diagnostic System Check”	–
6	Check the fuse F4. Is the fuse open?		Go to *Step 7*	Go to *Step 8*
7	1. Check for a short to ground in the circuit and repair as needed. 2. Replace the fuse F4. Is the repair or replacement complete?	–	Go to ”On Board Diagnostic System Check”	
8	1. Check for an open circuit between fuse F4 and the ECM connector terminal K64 and repair as needed. 2. Check the MIL bulb and replace if open. Is the repair or replacement complete?	–	Go to ”On Board Diagnostic System Check”	–



MALFUNCTION INDICATOR LAMP ON STEADY (1.4L/1.6L DOHC)

Circuit Description

When the ignition switch is turned ON, the Malfunction Indicator Lamp (MIL) will be turned ON and remain ON until the engine is running, if no Diagnostic Trouble Codes (DTCs) are stored. Battery voltage is supplied through the ignition switch directly to the MIL telltale. The Engine Control Module (ECM) controls the MIL by providing a ground path through the MIL control circuit to turn ON the MIL.

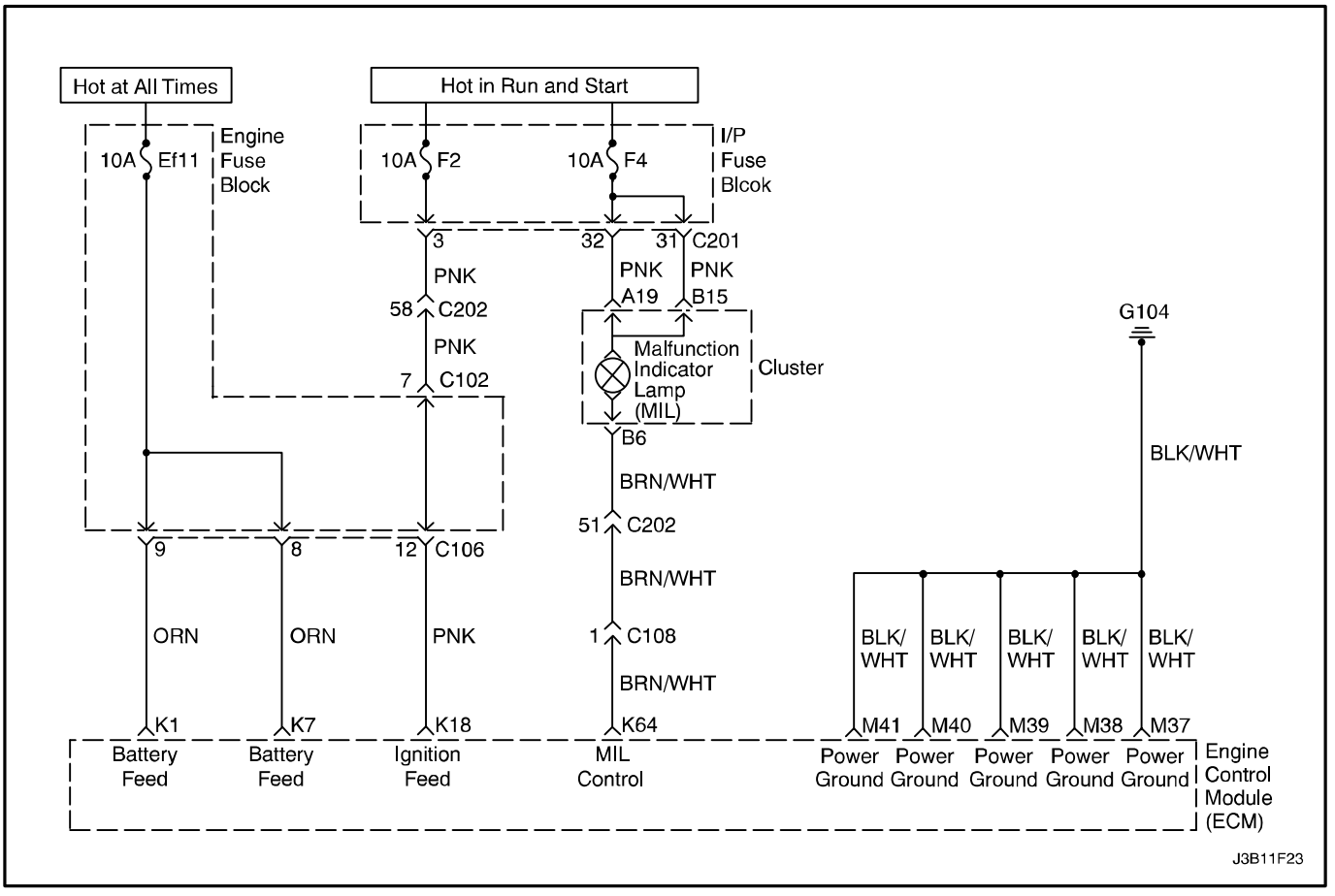
Test Description

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

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool, if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is stored in the scan tool for later reference.
2. When the ignition is turned ON, the MIL should be turned on and remain on until the engine is running or if an emission related DTC is stored. This step checks the ability of the ECM to control the MIL. The scan tool has the ability to command the MIL on and off.
4. A shorted MIL circuit can be diagnosed with a scan tool.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline information for reprogramming procedures.

Malfunction Indicator Lamp On Steady (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Is the check complete.	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Install the scan tool to the Data Link Connector (DLC). 3. Command the Malfunction Indicator Lamp (MIL) ON and OFF. Does the MIL turn ON and OFF when commanded?	–	Go to *Step 7*	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the Engine Control Module (ECM) connector. 3. Turn the ignition switch to ON. Is the MIL off?	–	Go to *Step 6*	Go to *Step 4*
4	Check the MIL control circuit for a short to ground and repair as needed. Is the repair complete?	–	Go to *Step 7*	Go to *Step 5*
5	Replace the instrument panel cluster. Refer to Section 9E, Instrumentation/Driver Information. Is the repair complete?	–	Go to *Step 7*	–
6	Replace the ECM. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Attempt to start the engine. Does the engine start and continue to run?	–	Go to *Step 8*	Go to *Step 1*
8	1. Allow the engine to idle until normal operating temperature is reached. 2. Check if any DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



MALFUNCTION INDICATOR LAMP ON STEADY (1.8L DOHC)

Circuit Description

When the ignition switch is turned ON, the Malfunction Indicator Lamp (MIL) will be turned ON and remain ON until the engine is running, if no Diagnostic Trouble Codes (DTCs) are stored. Battery voltage is supplied through the ignition switch directly to the MIL telltale. The Engine Control Module (ECM) controls the MIL by providing a ground path through the MIL control circuit to turn ON the MIL.

Test Description

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

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool, if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is stored in the scan tool for later reference.
2. When the ignition is turned ON, the MIL should be turned on and remain on until the engine is running or if an emission related DTC is stored. This step checks the ability of the ECM to control the MIL. The scan tool has the ability to command the MIL on and off.
4. A shorted MIL circuit can be diagnosed with a scan tool.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline information for reprogramming procedures.

Malfunction Indicator Lamp On Steady (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Is the check complete.	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Install the scan tool to the Data Link Connector (DLC). 3. Command the Malfunction Indicator Lamp (MIL) ON and OFF. Does the MIL turn ON and OFF when commanded?	–	Go to *Step 7*	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the Engine Control Module (ECM) connector. 3. Turn the ignition switch to ON. Is the MIL off?	–	Go to *Step 6*	Go to *Step 4*
4	Check the MIL control circuit for a short to ground and repair as needed. Is the repair complete?	–	Go to *Step 7*	Go to *Step 5*
5	Replace the instrument panel cluster. Refer to *Section 9E, Instrumentation/Driver Information.* Is the repair complete?	–	Go to *Step 7*	–
6	Replace the ECM. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Attempt to start the engine. Does the engine start and continue to run?	–	Go to *Step 8*	Go to *Step 1*
8	1. Allow the engine to idle until normal operating temperature is reached. 2. Check if any DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to ” Applicable DTC table”	System OK

FUEL SYSTEM DIAGNOSIS

Circuit Description

The fuel pump is an in–tank type mounted to a fuel sender assembly. The fuel pump will remain on as long as the engine is cranking or running and the Engine Control Module (ECM) is receiving reference pulses from the crankshaft position (CKP) sensor. If there are no reference pulses, the ECM will turn off the fuel pump two seconds after the ignition switch is turned ON or two 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 to avoid damage that could cause a fuel leak, resulting in possible fire or personal injury.

Fuel Pressure Relief Procedure

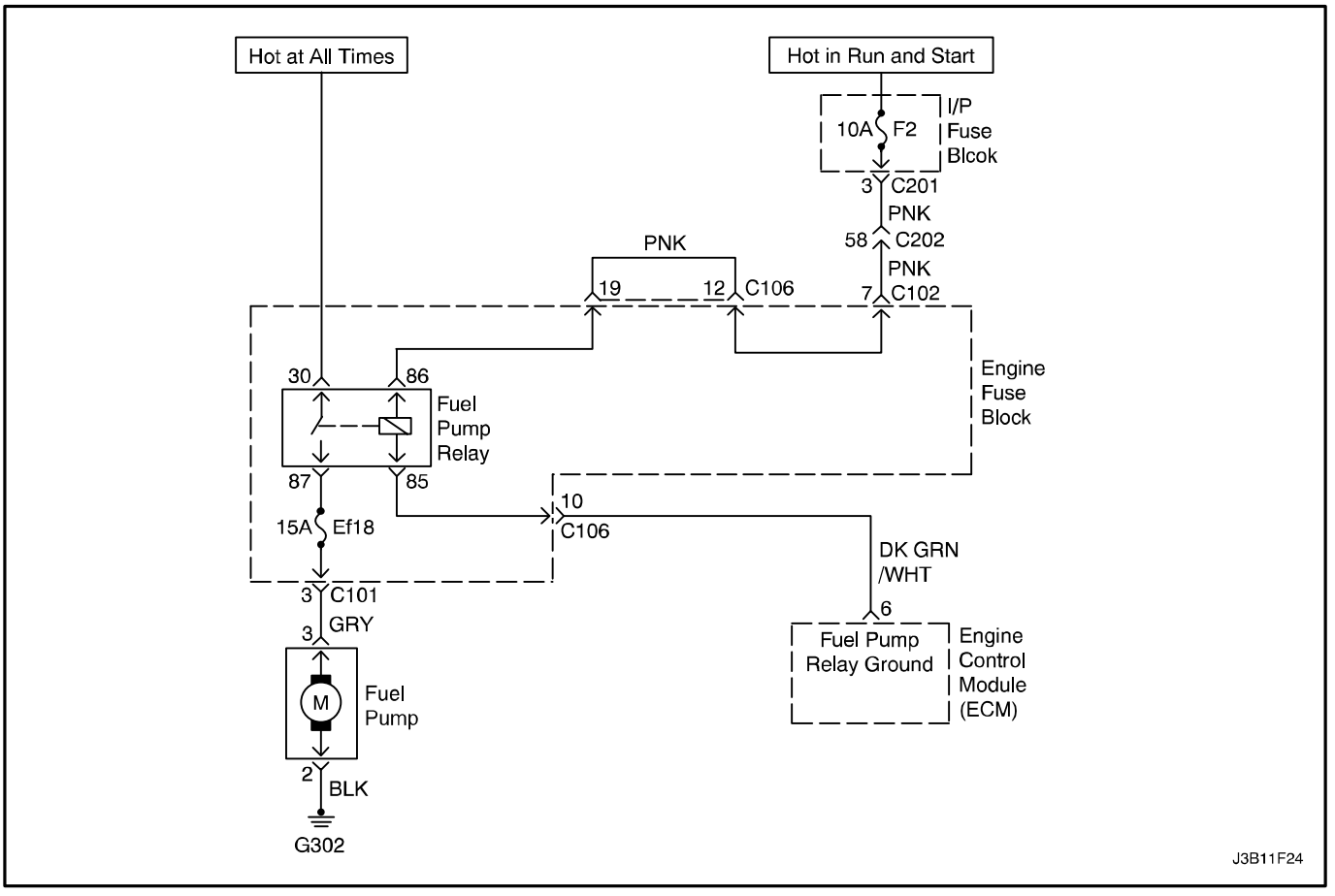
1. Remove the fuel cap.
2. Remove the fuel pump fuse EF18 from the engine fuse box.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

Fuel System Diagnosis

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 (41~47psi)	Go to *Step 2*	Go to *Step 4*
2	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 3*	Go to *Step 15*
3	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	–
4	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 (41~47psi)	Go to *Step 5*	Go to *Step 16*
5	Inspect the fuel lines for a leak. Is the problem found?	–	Go to *Step 6*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
6	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 but not holding steady?	284~325 kPa (41~47psi)	System OK	–
7	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 8*	Go to *Step 9*
8	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 but not holding steady?	41–47 psi (284–325 kPa)	System OK	–
9	With the fuel system under pressure, inspect the fuel return outlet for leaking. Is the problem found?	–	Go to *Step 10*	Go to *Step 11*
10	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 but not holding steady?	284~325 kPa (41~47psi)	System OK	–
11	With the fuel system under pressure, inspect the fuel inlet for leaking. Is the problem found?	–	Go to *Step 12*	Go to *Step 13*
12	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 but not holding steady?	284~325 kPa (41~47psi)	System OK	–
13	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 14*	–
14	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 but not holding steady?	284~325 kPa (41~47psi)	System OK	–
15	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	–

Step	Action	Value(s)	Yes	No
16	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 (41~47psi)	Go to *Step 12*	Go to *Step 17*
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 (41~47psi)	Go to *Step 17*	–
18	Inspect the fuel lines for leaks. Is the problem found?	–	Go to *Step 6*	Go to *Step 19*
19	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 8*	Go to *Step 20*
20	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 10*	Go to *Step 21*
21	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 12*	Go to *Step 22*
22	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 14*	Go to *Step 12*



FUEL PUMP RELAY CIRCUIT CHECK (1.4L/1.6L DOHC)

Circuit Description

When the ignition switch is turned ON, the Engine Control Module (ECM) will supply battery voltage to 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

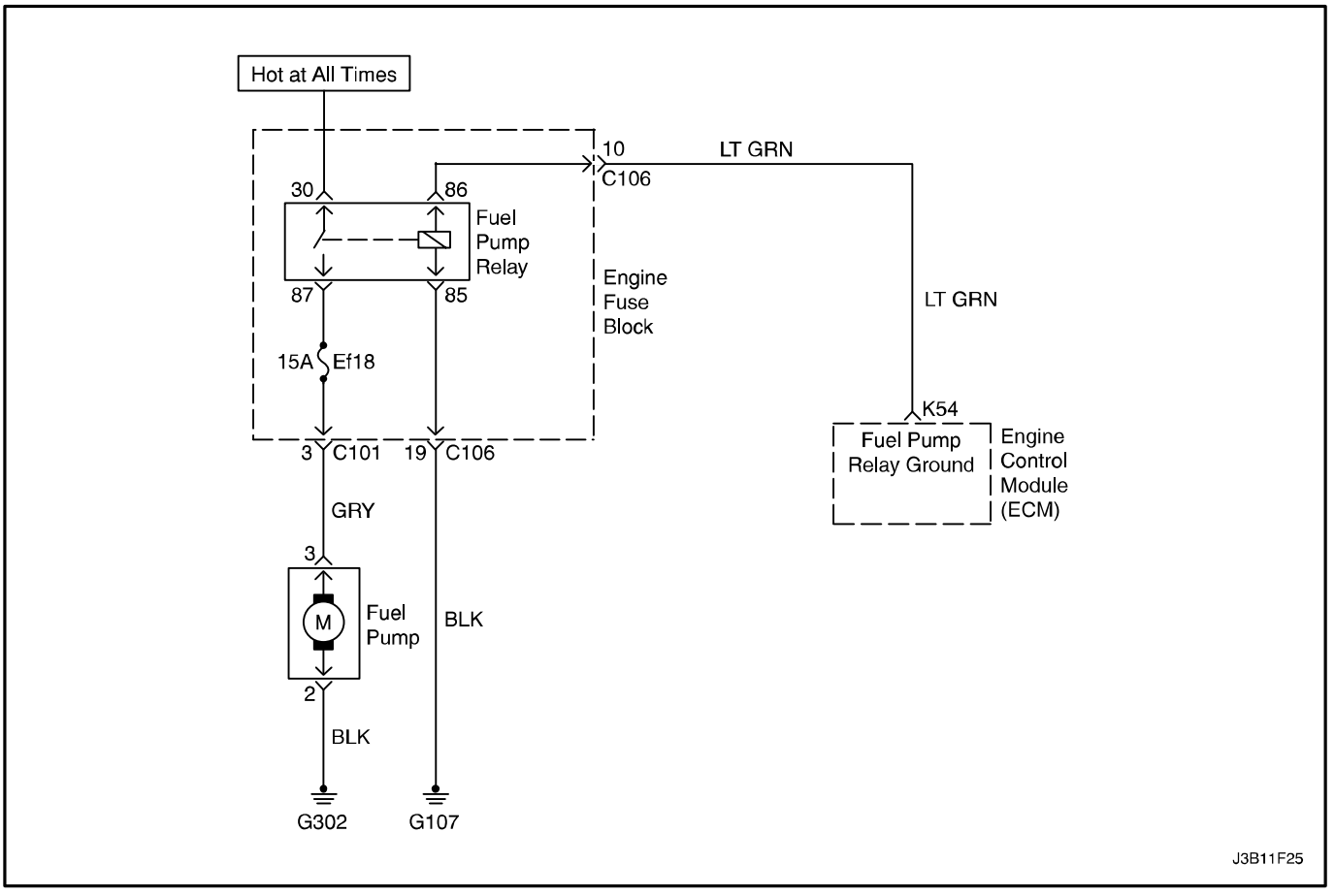
The number(s) below refer to step(s) on the diagnostic table.

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.
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 (1.4L/1.6L DOHC)

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 30 and ground. 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 86 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 30 and the battery. Is the problem found?	–	Go to *Step 13*	–
9	Check for an open wire between the fuel pump relay connector terminal 86 to the engine control module (ECM) connector terminal 6. Is the problem found.	–	Go to *Step 10*	Go to *Step 12*
10	1. Repair the wire between the fuel pump relay connector terminal 86 to the ECM connector terminal 6. 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	–

Step	Action	Value(s)	Yes	No
11	1. Replace the fuse F2 or repair the wire between the fuel pump relay connector terminal 30 and the battery. 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. Turn the ignition OFF. 2. Replace the ECM. 3. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	–
13	1. Replace the fuse F2 or repair the wire between the fuel pump relay connector terminal 30 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	–



FUEL PUMP RELAY CIRCUIT CHECK (1.8L DOHC)

Circuit Description

When the ignition switch is turned ON, the Engine Control Module (ECM) will supply battery voltage to 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

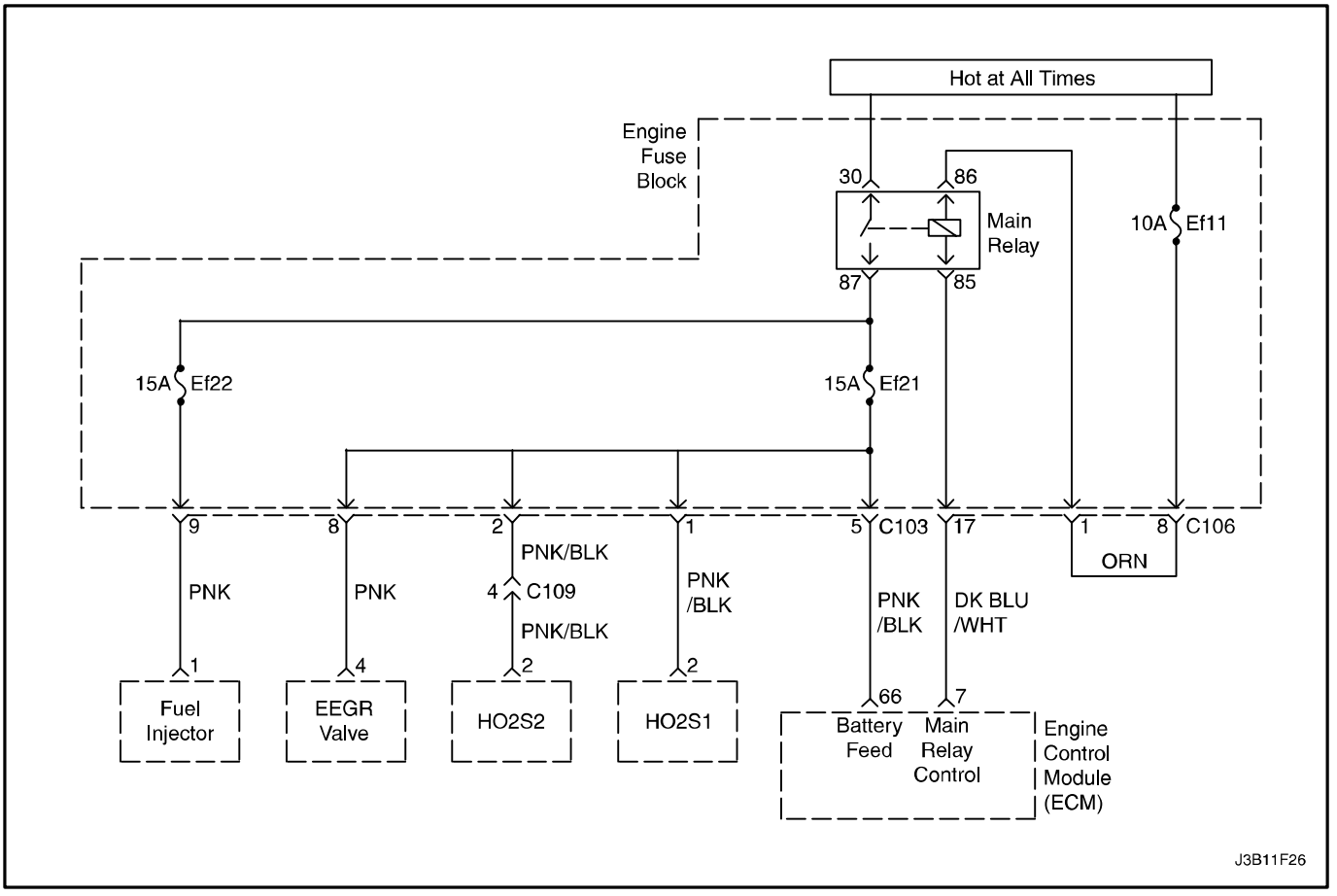
The number(s) below refer to step(s) on the diagnostic table.

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.
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 (1.8L DOHC)

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 30 and ground. 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 30 and the battery. Is the problem found?	–	Go to *Step 13*	–
9	Check for an open wire between the fuel pump relay connector terminal 85 to the engine control module (ECM) connector terminal K54 Is the problem found.	–	Go to *Step 10*	Go to *Step 12*
10	1. Repair the wire between the fuel pump relay connector terminal 85 to the ECM connector terminal K54. 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	–

Step	Action	Value(s)	Yes	No
11	1. Replace the fuse Ef18 or repair the wire between the fuel pump relay connector terminal 30 and the battery. 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. Turn the ignition OFF. 2. Replace the ECM. 3. Turn the ignition ON. Does the fuel pump operate for the time specified?	2 sec	System OK	–
13	1. Replace the fuse Ef18 or repair the wire between the fuel pump relay connector terminal 30 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	–



MAIN RELAY CIRCUIT CHECK (1.4L/1.6L DOHC)

Circuit Description

When the ignition is turned On or to the START position, the main relay is energized. The main relay then supply voltage to the engine fuse block fuse Ef11. The Electronic Ignition (EI) system ignition coil, Evaporative Emission (EVAP) Canister Purge Solenoid and Heated Oxygen Sensor (HO2S) are supplied voltage through the engine fuse block fuse Ef11. The fuel injectors are supplied voltage through the engine fuse block fuse Ef11.

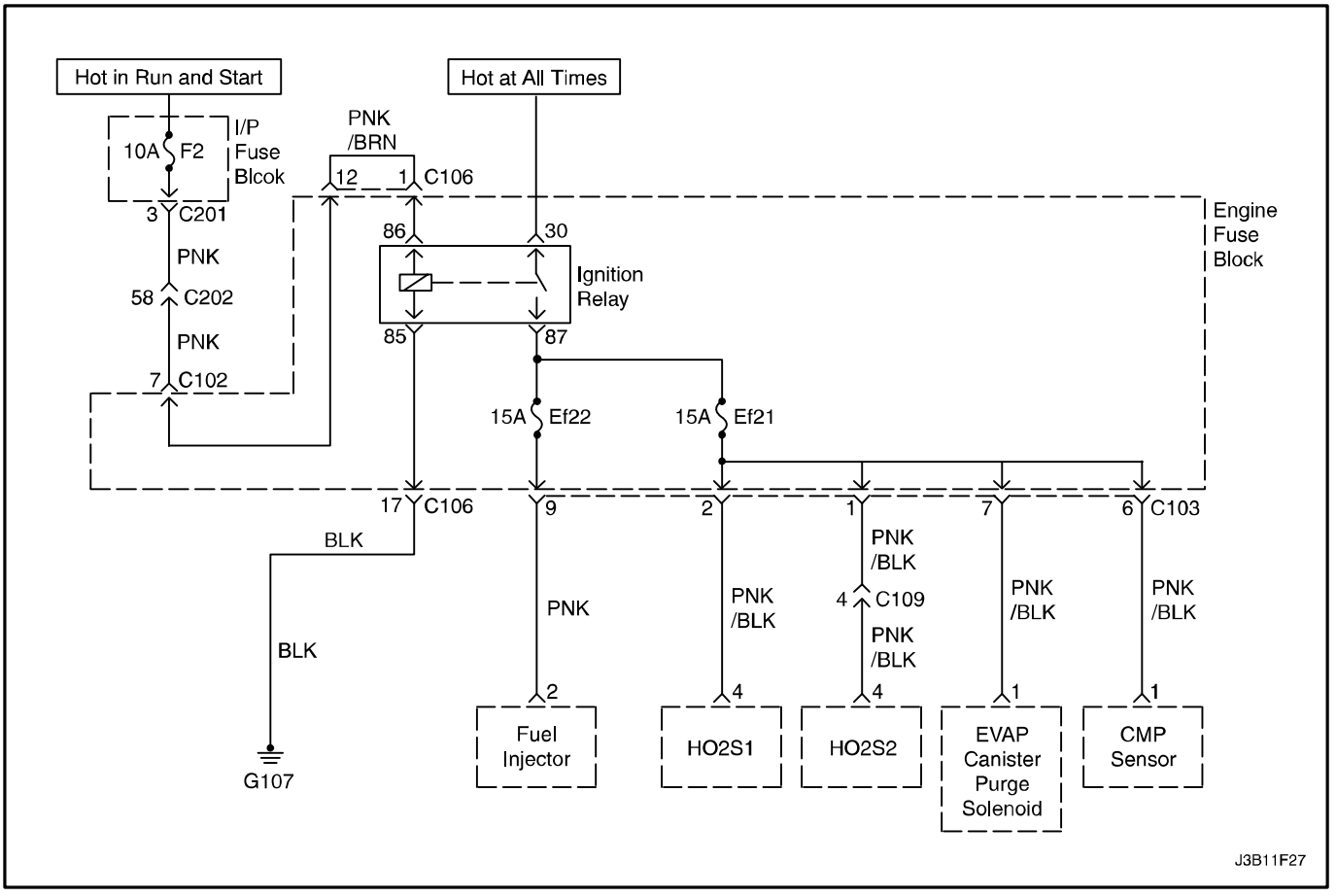
Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.
- A fault main relay will cause a no start condition. There will be no voltage supplied to the EI system ignition coil, or the fuel injectors. Without voltage supplied to these components, they will not operate.

Main Relay Circuit Check (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Disconnect the engine fuse block fuse Ef11. 3. Turn the ignition ON. 4. With a test light connected to the ground, probe the fuse terminals nearest the main relay for fuse Ef11. Is the light on at both terminal?	–	System OK	Go to *Step 2*
2	Is the light on at only one terminal?	–	Go to *Step 3*	Go to *Step 4*
3	Repair the open in the wiring between the main relay connector terminal 87 and the fuse Ef11. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition OFF. 2. Remove the main relay. 3. Turn the ignition ON. 4. With a test light connected to the ground, probe the main relay terminals 85. Is the light on at both terminals.	–	Go to *Step 6*	Go to *Step 5*
5	1. Turn the ignition OFF. 2. Measure the resistance between following terminals. • Terminal 86 of main relay and ground. Is the resistance within the specified value	0 Ω	Go to *Step 7*	Go to *Step 6*
6	Repair open circuit. Is the repair complete?	–	System OK	–
7	Replace the main relay. Is the repair complete?	–	System OK	–



MAIN RELAY CIRCUIT CHECK (1.8L DOHC)

Circuit Description

When the ignition is turned On or to the START position, the main relay is energized. The main relay then supply voltage to the engine fuse block fuse F2. The Electronic Ignition (EI) system ignition coil, Evaporative Emission (EVAP) Canister Purge Solenoid and Heated Oxygen Sensor (HO2S) are supplied voltage through the engine fuse block fuse F2. The fuel injectors are supplied voltage through the engine fuse block fuse F2.

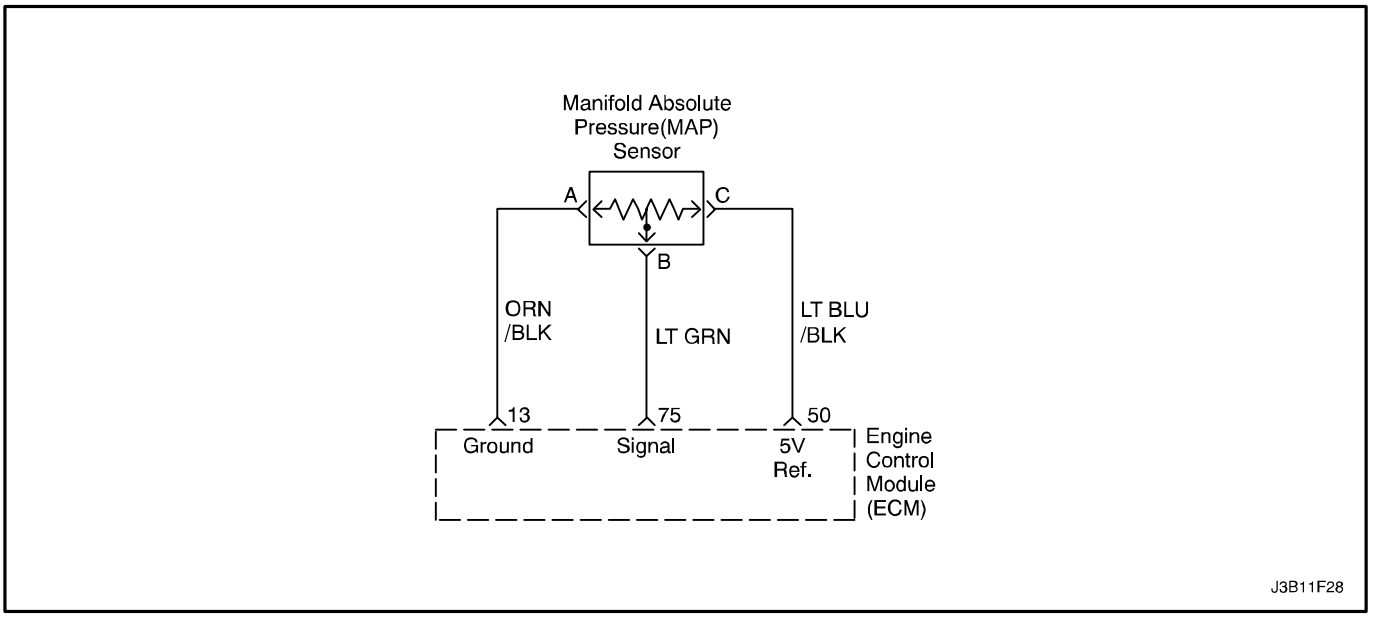
Diagnostic Aids

- An intermittent problem may be caused by a poor connection, rubbed through wire insulation, or a broken wire inside the insulation.
- A fault main relay will cause a no start condition. There will be no voltage supplied to the EI system ignition coil, or the fuel injectors. Without voltage supplied to these components, they will not operate.

Main Relay Circuit Check (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Disconnect the I/P fuse block fuse F2. 3. Turn the ignition ON. 4. With a test light connected to the ground, probe the fuse terminals nearest the ignition relay for fuse F2. Is the light on at both terminal?	–	System OK	Go to *Step 2*
2	Is the light on at only one terminal?	–	Go to *Step 3*	Go to *Step 4*
3	Repair the open in the wiring between the ignition relay connector terminal 87 and the fuse F2. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition OFF. 2. Remove the ignition relay. 3. Turn the ignition ON. 4. With a test light connected to the ground, probe the ignition relay terminals 85. Is the light on at both terminals.	–	Go to *Step 6*	Go to *Step 5*
5	1. Turn the ignition OFF. 2. Measure the resistance between following terminals. • Terminal 86 of main relay and ground. Is the resistance within the specified value	0 Ω	Go to *Step 7*	Go to *Step 6*
6	Repair open circuit. Is the repair complete?	–	System OK	–
7	Replace the ignition relay. Is the repair complete?	–	System OK	–



MANIFOLD ABSOLUTE PRESSURE CHECK (1.4L/1.6L DOHC)

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 engine 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 baro–metric pressure. This allows the ECM to make adjustments for altitude changes. The ECM uses the MAP sensor for fuel delivery and ignition timing changes.

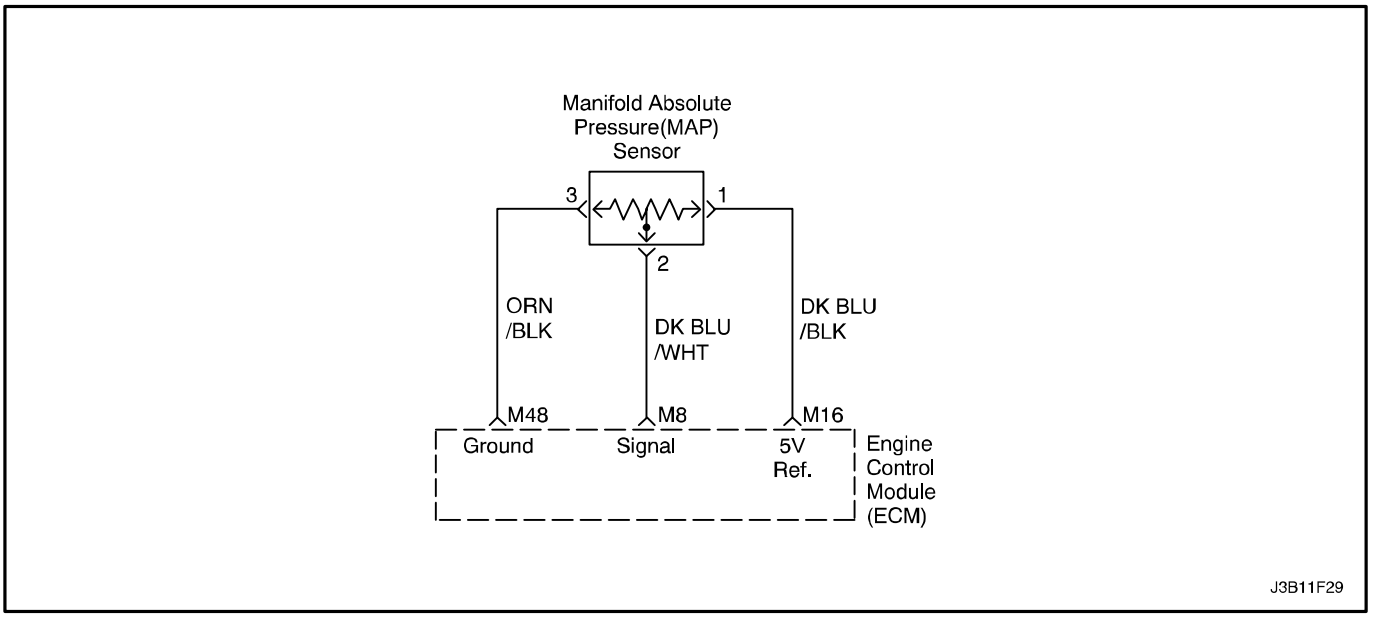
Test Description

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 (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Connect a scan tool to the Data Link Connector (DLC). 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 DLC. 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 10 in. Hg (34 kPa) 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 (1.8L DOHC)

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 engine 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 baro–metric pressure. This allows the ECM to make adjustments for altitude changes. The ECM uses the MAP sensor for fuel delivery and ignition timing changes.

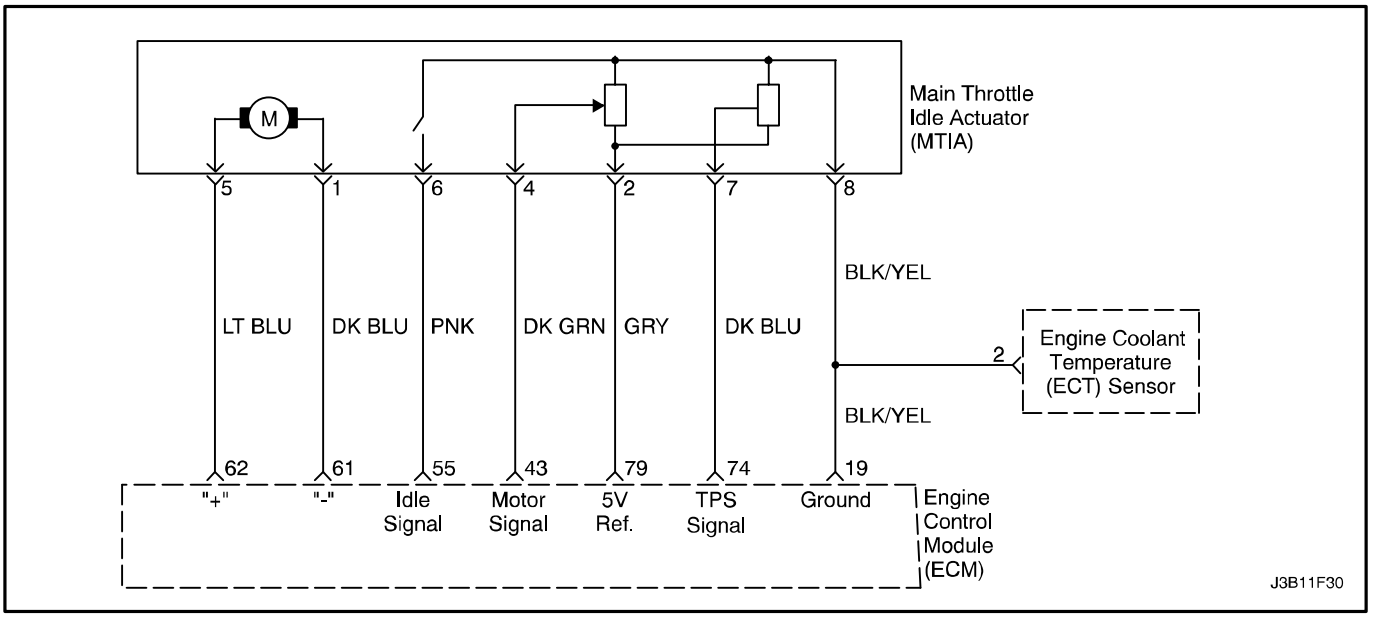
Test Description

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 (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition OFF. 2. Connect a scan tool to the Data Link Connector (DLC). 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 DLC. 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 10 in. Hg (34 kPa) 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	–



IDLE AIR CONTROL SYSTEM CHECK (1.4L/1.6L DOHC)

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (0˚C, 19˚C). The characteristics of the airflow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical bowdencable.

The main throttle idle actuator (MTIA) provides a voltage signal that changes in relation to the throttle plate angle. The signal voltage will vary from about nearly 5.0 V at idles to about 0.2V to 0.4 V at wide–open throttle. The TPS is one of the most important inputs used by the ECM for fuel control and other functions such as idle, wide open throttle, deceleration enleanment, and acceleration enrichment.

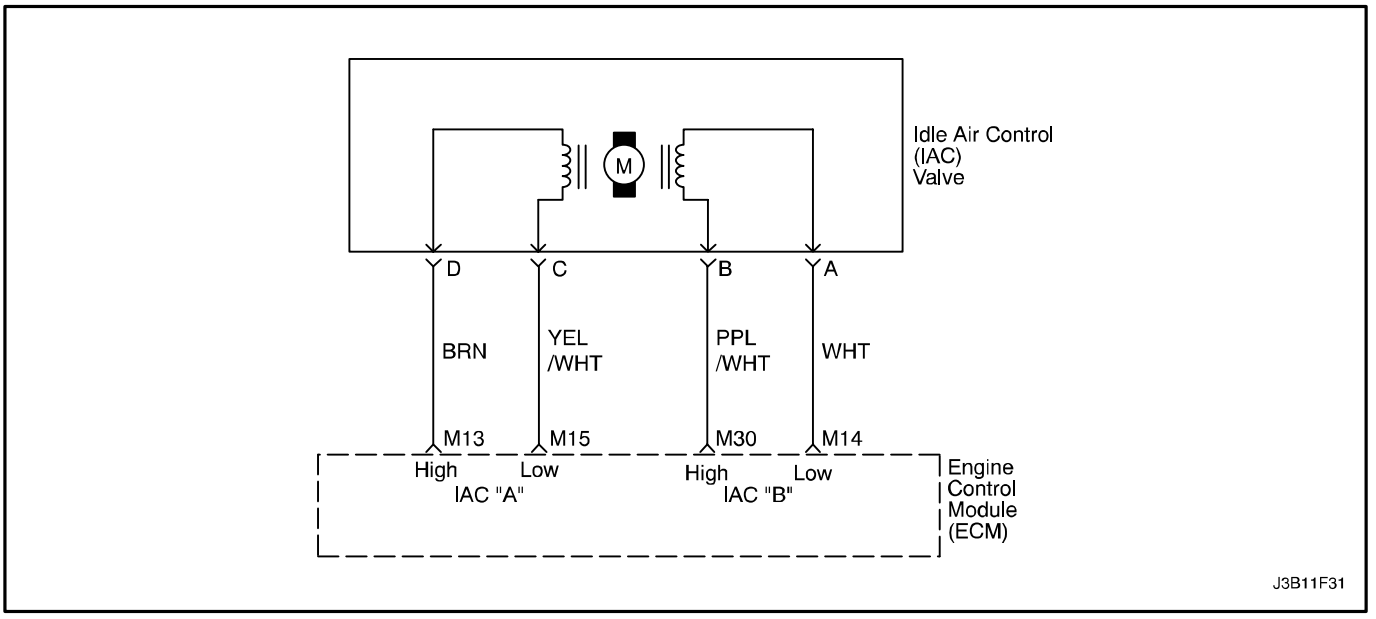
Diagnostic Aids

If the idle is too high, stop the engine. Fully extend the main throttle idle actuator (MTIA) with a IAC driver. 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.

Idle Air Control System Check (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Turn the ignition switch to ON. Is the Malfunction Indicator Lamp (MIL) on steady?	–	Go to *Step 4*	Go to *Step 3*
3	Turn the ignition switch to LOCK. Connect the scan tool to the DLC. Turn the Turn the ignition switch to ON. Are any diagnostic trouble codes (DTCs) displayed?	–	Go to *Step 4*	Try with another scan tool
4	Refer to the applicable DTC table. Is only one DTC identified as valid trouble code P0122?	–	Go to *Step 5*	Go to applicable DTC table And go to ”Multiple DTC”
5	1. Connect the scan tool to the DLC. 2. Turn the ignition switch to ON. 3. Press the accelerator pedal while watching TPS for smooth changes in the voltage. Does the scan tool show the TPS voltage change smoothly within the value specified?	0.3V–4.8V	Go to ”Diagnostic Aids”	Go to *Step 6*
6	1. Turn the ignition switch to lock. 2. Disconnect the MTIA connector. 3. Measure the voltage between terminal 2 and 8. Does the voltage measure within the value specified?	4.8V–5.0V	Go to *Step 7*	Go to *Step 8*
7	Connect a fused jumper between the MTIA connector terminal 2 and terminal 7. Does the scan tool show the TPS voltage above value specified?	4.8V–5.0V	Go to *Step 13*	Go to *Step 11*
8	Measure the voltage between the MTIA connector 2 and ground. Does the voltage measure within the value specified?	>5.0V	Go to *Step 9*	Go to *Step 10*
9	1. Turn the ignition switch to lock. 2. Check for an open or low voltage in the wire between the MTIA connector 8 and ECM connector 19. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*
10	1. Turn the ignition switch to LOCK. 2. Check for an open or low voltage in the wire between the MTIA connector 2 and ECM connector 79. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*
11	1. Turn the ignition switch to LOCK. 2. Check for an open or low voltage in the wire between the MTIA connector 7 and ECM connector 74. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
12	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
13	1. Replace the throttle body assembly. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
14	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 15*	–
15	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



IDLE AIR CONTROL SYSTEM CHECK (1.8L DOHC)

Circuit Description

The Engine 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 body. 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 Idle Air Control (IAC) valve with a IAC driver. 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.

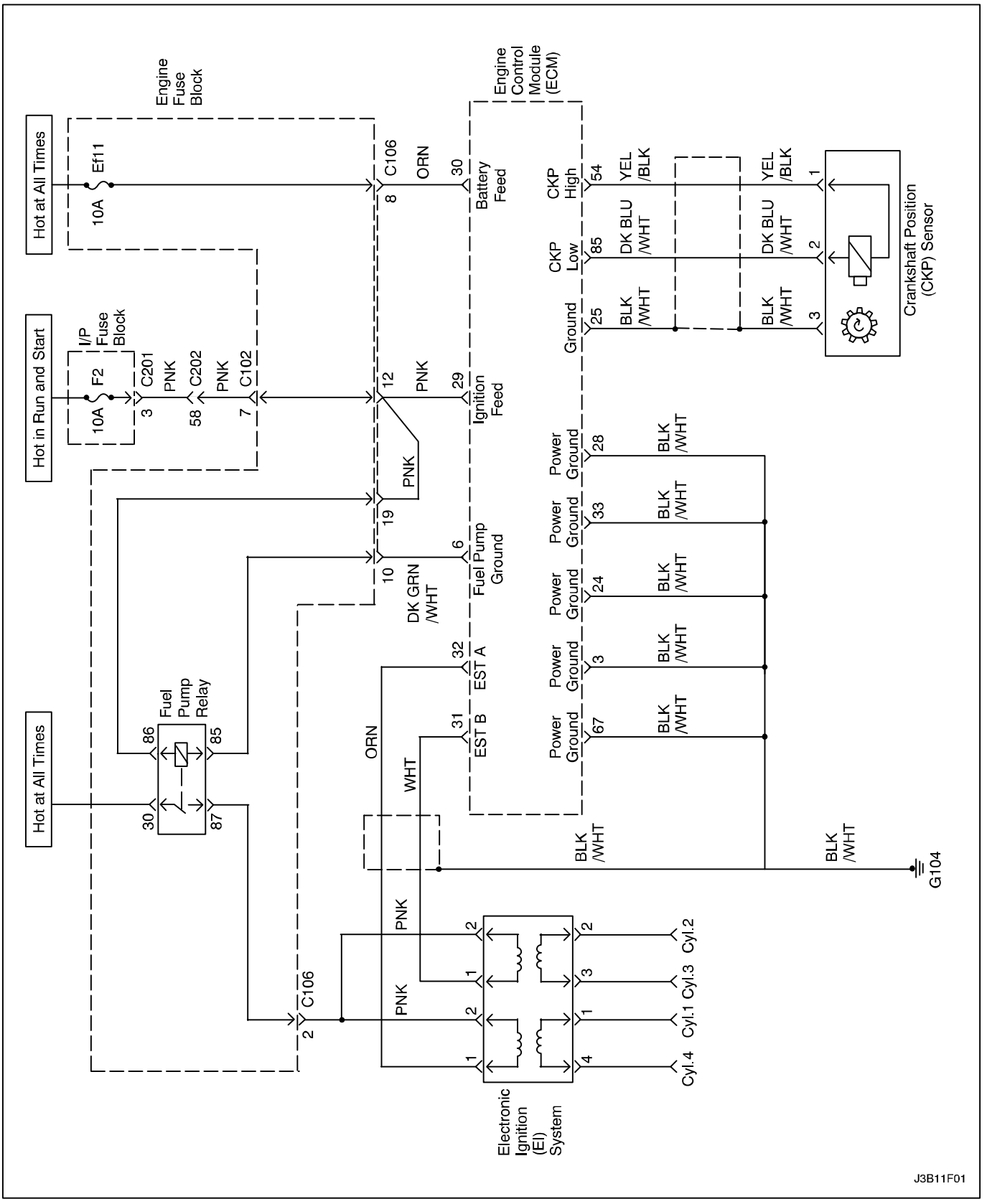
Idle Air Control Valve Reset Procedure

Whenever the battery cable or the Engine Control Module (ECM) connector or the ECM fuse Ef11 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 10 seconds.
3. Turn the ignition ON for 5 seconds.
4. Start the engine in park/neutral.
5. Allow the engine to run until the engine coolant is above 185˚F (85˚C).
6. Turn the 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 D (drive).
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.

Idle Air Control System Check (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Remove Idle Air Control (IAC) valve. 3. Inspect the IAC passages for restrictions. Is the problem found?	–	Go to *Step 3*	Go to *Step 4*
3	Clean the IAC passages. Is the repair complete?	–	System OK	–
4	Measure the resistance between following terminals of IAC valve. 1. Terminal C and D 2. Terminal A and B Does the resistance equal to the value specified?	40–80	Go to *Step 6*	Go to *Step 5*
5	Replace the IAC valve. Is the repair complete?	–	System OK	–
6	1. Disconnect the Engine control Module (ECM) connector. 2. Check for an open or short in the wires between following terminals. • Terminal D of IAC valve connector and terminal M13 of ECM connector • Terminal C of IAC valve connector and terminal M15 of ECM connector • Terminal B of IAC valve connector and terminal M30 of ECM connector • Terminal A of IAC valve connector and terminal M14 of ECM connector Is the problem found?	–	Go to *Step 8*	Go to *Step 7*
7	Repair an open or short circuit as needed. Is the repair complete?	–	System OK	–
8	Inspect the IAC connector terminals and the ECM connector terminals. Is the problem found?	–	Go to *Step 9*	Go to *Step 10*
9	Repair or replace the throttle body assembly and/or ECM connector terminals as needed. Is the repair complete?	–	System OK	–
10	Replace the ECM. Is the repair complete?	–	System OK	–


Engine Fuse Block
Engine Control Module (ECM)
Hot at All Times
Ef11
10A
C106
8
ORN
30
Battery Feed
Hot in Run and Start
I/P Fuse Block
F2
10A
C201
3
PNK
C202
58
PNK
C102
7
12
PNK
29
Ignition Feed
PNK
19
6
Fuel Pump Ground
10
DK GRN /WHT
Fuel Pump Relay
86
85
30
87
Hot at All Times
ORN
WHT
32
EST A
31
EST B
CKP High
54
CKP Low
85
Ground
25
YEL /BLK
DK BLU /WHT
BLK /WHT
Crankshaft Position (CKP) Sensor
1
2
3
Power Ground
28
33
24
3
67
BLK /WHT
G104
C106
2
PNK
PNK
Electronic Ignition (EI) System
Cyl.1
Cyl.2
Cyl.3
Cyl.4
J3B11F01

IGNITION SYSTEM CHECK (1.4L/1.6L DOHC)

Circuit Description

The Electronic Ignition (EI) system uses a waste spark method of spark distribution. In this type of EI system, the Crankshaft Position (CKP) sensor is mounted to the oil pump near a slotted wheel that is a part of the crankshaft pulley. The CKP sensor sends reference pulses to the engine control module (ECM). The ECM then triggers the EI system ignition coil. Once the ECM triggers the EI system 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 CKP sensor 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 EI system 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 EI system ignition coil are OK, it can be determined that a faulty EI system ignition coil is at fault.
11. After confirming proper CKP sensor inputs to the ECM and no wiring problems present, 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 EI system ignition coil.

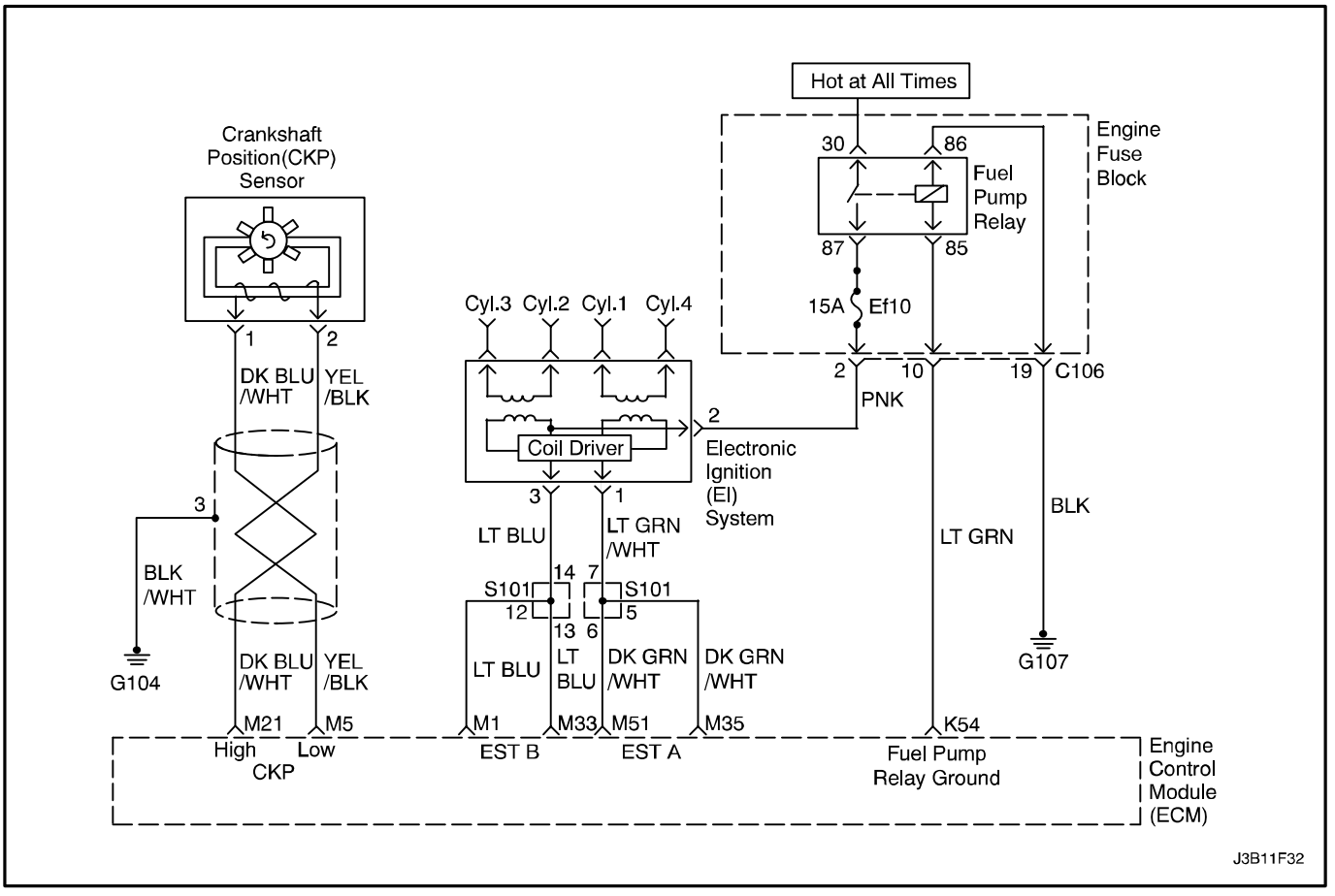
Ignition System Check (1.4L/1.6L DOHC)

CAUTION : Use only electrically insulated pliers when handling ignition wires with the engine running to prevent 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 Ω	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 Electronic Ignition (EI) system ignition coil connector. 3. While cranking the engine, measure the voltage at the EI system ignition coil connector terminal 1. Does the voltage fluctuate within the values specified?	0.2–2.0 v	Go to *Step 6*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
6	While cranking the engine, measure the voltage at the EI system ignition coil connector terminal 1. 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 EI system ignition coil connector terminal 1 to the engine control module (ECM) connector terminal 31. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
8	Check for an open in the wire from the EI system ignition coil connector terminal 1 to the ECM connector terminal 32. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
9	1. Repair the wiring as needed. 2. Connect the EI system 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	–
10	1. Turn the ignition OFF. 2. Replace the electronic ignition system ignition coil. 3. Connect the EI system ignition coil connector. 4. 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. Turn the ignition OFF. 2. Replace the ECM. 3. Connect the EI system ignition coil connector. 4. 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 (CKP) sensor connector. 3. Measure the resistance between the CKP sensor terminals 1 and 2. Is the resistance within the value specified?	400–600 Ω	Go to *Step 13*	Go to *Step 28*
13	1. Measure the resistance between the CKP sensor terminals 1 and 3. 2. Measure the resistance between the CKP sensor terminals 2 and 3. 3. Is the resistance infinite (open circuit)? Is the repair complete?	–	Go to *Step 14*	Go to *Step 28*
14	1. Turn the ignition ON. 2. Measure the voltage between the CKP sensor connector terminals 1 and 3. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 20*	Go to *Step 15*
15	Measure the voltage between the CKP sensor connector terminal 1 and ground. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 17*	Go to *Step 16*

Step	Action	Value(s)	Yes	No
16	Check the wire between the CKP sensor connector terminal 1 and the ECM connector terminal 85 for an open or short. Is the problem found?		Go to *Step 18*	Go to *Step 11*
17	Check the wire between the CKP sensor 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 CKP sensor connector terminal 1 and the ECM connector terminal 85. Is the repair complete?	–	System OK	–
19	Repair the wire between the CKP sensor connector terminal 3 and ground. Is the repair complete?	–	System OK	–
20	1. Turn the ignition ON. 2. Measure the voltage between the CKP sensor connector terminals 2 and 3. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 24*	Go to *Step 21*
21	Measure the voltage between the CKP sensor connector terminal 2 and ground. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 17*	Go to *Step 22*
22	Check the wire between the CKP sensor connector terminal 2 and the ECM connector terminal 54 for an open or short. Is the problem found?	–	Go to *Step 23*	Go to *Step 11*
23	Repair the wire between the CKP sensor connector terminal 2 and the ECM connector terminal 54. Is the repair complete?	–	System OK	–
24	1. Turn the ignition OFF. 2. Connect a test light between the EI system ignition coil connector terminal 2 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 EI system ignition coil connector terminal 2 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 EI system ignition coil connector, terminal 2 and the ignition switch. Is the problem found?	–	Go to *Step 29*	–
27	Repair the wire between the EI system ignition coil connector terminal 1 and ground. Is the repair complete?	–	System OK	–
28	1. Turn the ignition OFF. 2. Replace the CKP sensor. Is the repair complete?	–	System OK	–
29	Replace the fuse F2 or repair the open in the wiring between the EI system ignition coil connector terminal 2 and the ignition switch. Is the repair complete?	–	System OK	–



IGNITION SYSTEM CHECK (1.8L DOHC)

Circuit Description

The Electronic Ignition (EI) system uses a waste spark method of spark distribution. In this type of EI system, the Crankshaft Position (CKP) sensor is mounted to the oil pump near a slotted wheel that is a part of the crankshaft pulley. The CKP sensor sends reference pulses to the engine control module (ECM). The ECM then triggers the EI system ignition coil. Once the ECM triggers the EI system 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 CKP sensor 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 EI system 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 EI system ignition coil are OK, it can be determined that a faulty EI system ignition coil is at fault.
11. After confirming proper CKP sensor inputs to the ECM and no wiring problems present, 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 EI system ignition coil.

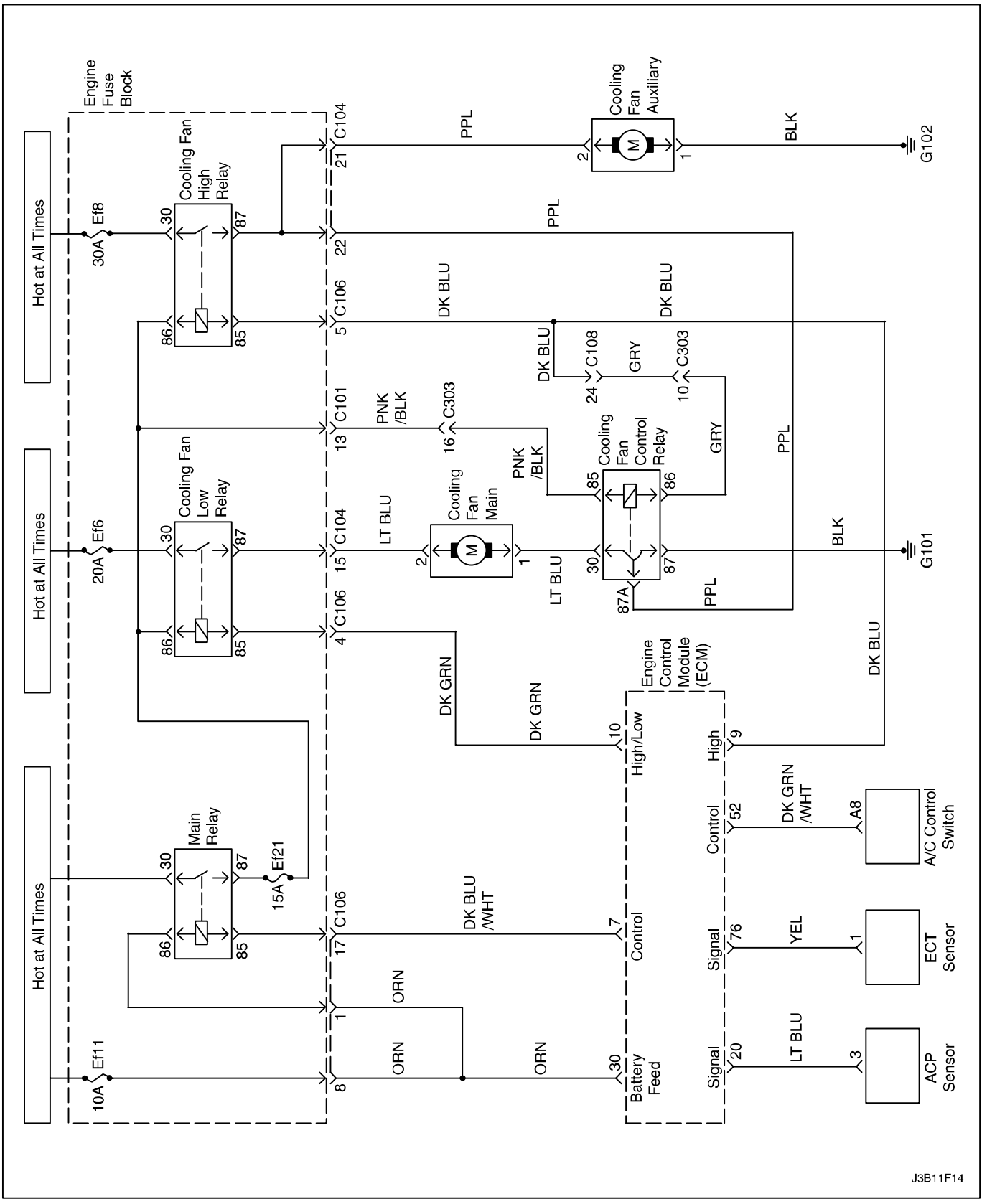
Ignition System Check (1.8L DOHC)

CAUTION : Use only electrically insulated pliers when handling ignition wires with the engine running to prevent 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 Ω	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 Electronic Ignition (EI) system ignition coil connector. 3. While cranking the engine, measure the voltage at the EI system ignition coil connector terminal 1. 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 EI system ignition coil connector terminal 3 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 EI system ignition coil connector terminal 1 to the engine control module (ECM) connector terminal M35 or M51. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
8	Check for an open in the wire from the EI system ignition coil connector terminal 3 to the ECM connector terminal M1 or M33. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
9	1. Repair the wiring as needed. 2. Connect the EI system 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	–

Step	Action	Value(s)	Yes	No
10	1. Turn the ignition OFF. 2. Replace the electronic ignition system ignition coil. 3. Connect the EI system ignition coil connector. 4. 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. Turn the ignition OFF. 2. Replace the ECM. 3. Connect the EI system ignition coil connector. 4. 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 (CKP) sensor connector. 3. Measure the resistance between the CKP sensor terminals 1 and 2. Is the resistance within the value specified?	400–600 Ω	Go to *Step 13*	Go to *Step 28*
13	1. Measure the resistance between the CKP sensor terminals 1 and 3. 2. Measure the resistance between the CKP sensor terminals 2 and 3. 3. Is the resistance infinite (open circuit)? Is the repair complete?	–	Go to *Step 14*	Go to *Step 28*
14	1. Turn the ignition ON. 2. Measure the voltage between the CKP sensor connector terminals 1 and 3. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 20*	Go to *Step 15*
15	Measure the voltage between the CKP sensor connector terminal 1 and ground. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 17*	Go to *Step 16*
16	Check the wire between the CKP sensor connector terminal 1 and the ECM connector terminal M21 for an open or short. Is the problem found?		Go to *Step 18*	Go to *Step 11*
17	Check the wire between the CKP sensor 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 CKP sensor connector terminal 1 and the ECM connector terminal M21. Is the repair complete?	–	System OK	–
19	Repair the wire between the CKP sensor connector terminal 3 and ground. Is the repair complete?	–	System OK	–
20	1. Turn the ignition ON. 2. Measure the voltage between the CKP sensor connector terminals 2 and 3. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 24*	Go to *Step 21*

Step	Action	Value(s)	Yes	No
21	Measure the voltage between the CKP sensor connector terminal 2 and ground. Is the voltage within the value specified?	1.3–1.5 v (2.4–2.7 v)*	Go to *Step 17*	Go to *Step 22*
22	Check the wire between the CKP sensor connector terminal 2 and the ECM connector terminal M5 for an open or short. Is the problem found?	–	Go to *Step 23*	Go to *Step 11*
23	Repair the wire between the CKP sensor connector terminal 2 and the ECM connector terminal M5. Is the repair complete?	–	System OK	–
24	1. Turn the ignition OFF. 2. Connect a test light between the EI system ignition coil connector terminal 2 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 EI system ignition coil connector terminal 2 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 EI system ignition coil connector, terminal 2 and the ignition switch. Is the problem found?	–	Go to *Step 29*	–
27	Repair the wire between the EI system ignition coil connector terminal 1 and ground. Is the repair complete?	–	System OK	–
28	1. Turn the ignition OFF. 2. Replace the CKP sensor. Is the repair complete?	–	System OK	–
29	Replace the fuse Ef10 or repair the open in the wiring between the EI system ignition coil connector terminal 2 and the ignition switch. Is the repair complete?	–	System OK	–


Engine Fuse Block
Hot at All Times
Hot at All Times
Hot at All Times
Ef8
30A
Ef6
20A
Ef11
10A
Ef21
15A
Cooling Fan High Relay
Cooling Fan Low Relay
Main Relay
Cooling Fan Auxiliary
Cooling Fan Main
Cooling Fan Control Relay
C104
C106
C101
C303
C108
PPL
DK BLU
PNK /BLK
LT BLU
DK GRN
ORN
DK BLU /WHT
GRY
BLK
G102
G101
Engine Control Module (ECM)
High/Low
High
Control
Battery Feed
Signal
DK GRN /WHT
YEL
LT BLU
A/C Control Switch
ECT Sensor
ACP Sensor
J3B11F14

ENGINE COOLING FAN CIRCUIT CHECK – DUAL FAN (1.4L/1.6L DOHC)

Circuit Description

The engine cooling fan circuit operates the main cooling fan and the auxiliary cooling fan. The cooling fans are controlled by the engine control module (ECM) based on inputs from the Engine Coolant Temperature (ECT) sensor and the Air Conditioning Pressure (ACP) sensor. The ECM controls the low speed cooling fan operation by internally grounding the ECM connector terminal 10. 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 10 and the ECM connector terminal 9 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 Ef11 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 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 1882 kPa (273 psi) then return to low speed when the high side A/C pressure is 1448 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 (244˚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 connector 2 and grounding the connector terminal 10. This should create low speed cooling fan operation with the ignition ON. By grounding the ECM connector terminals 10 and 9 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 cooling fan relay A, by jumpering connector terminals 30 and 87 it will be determined 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 10 and 9, the main and auxiliary cooling fans should run at high speed.

Engine Cooling Fan Circuit Check – Dual Fan (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Is the check completed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Check the engine fuse block fuse Ef11. 2. Replace the fuse as needed. Is the fuse OK?	–	Go to *Step 3*	Go to ”Diagnostic Aids”

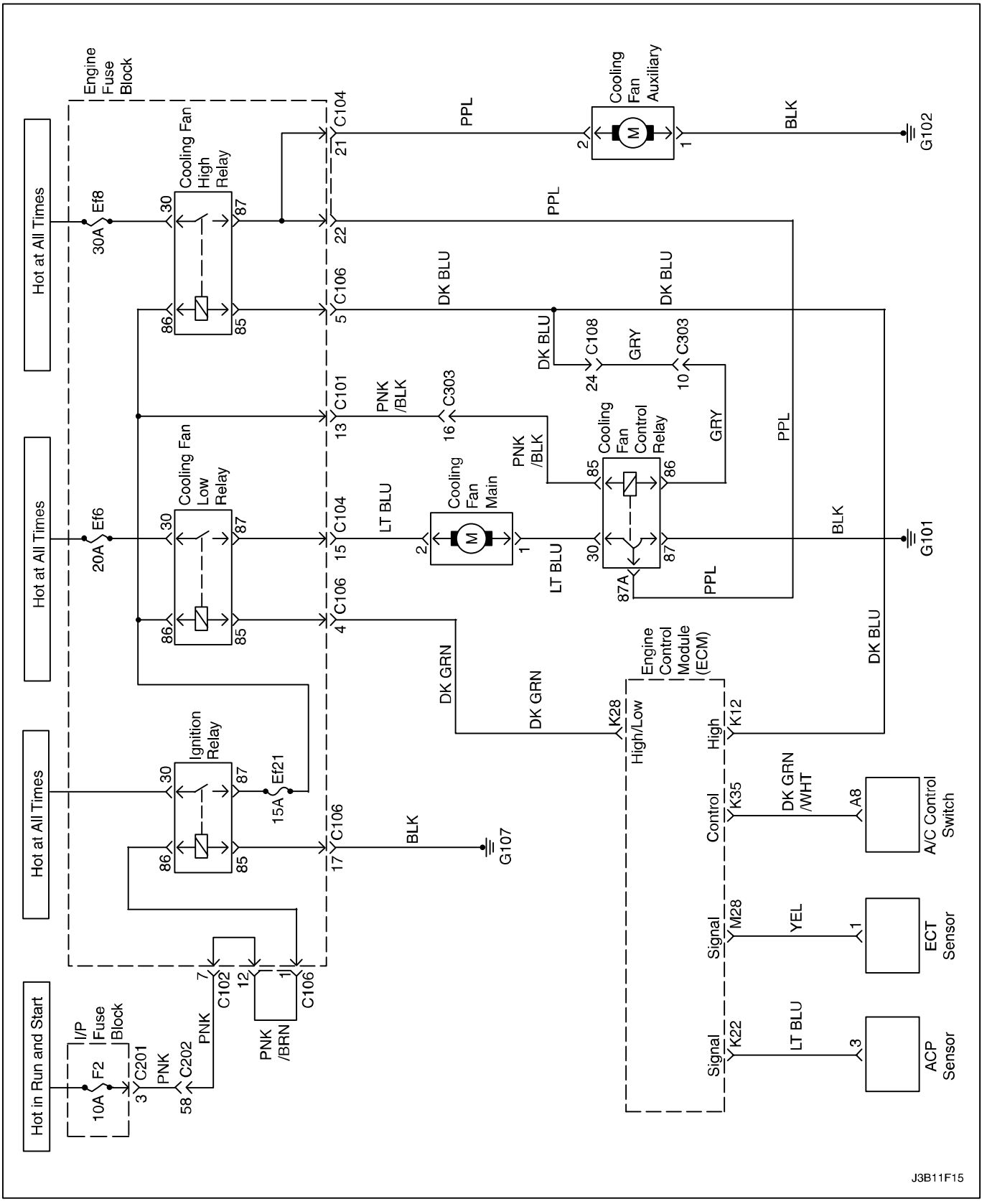
Step	Action	Value(s)	Yes	No
3	1. Check the engine fuse block fuse Ef6 and Ef8. 2. Replace the fuse as needed. Is the fuse OK?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the data link connector (DLC). 4. The cooling fans should 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*
5	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the DLC. 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?	–	Go to *Step 10*	–
10	1. Turn the ignition OFF. 2. Connect a scan tool to the DLC. 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 2 and ground. Is the test light on?	–	Go to *Step 11*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
11	1. Turn the ignition OFF. 2. Connect a scan tool to the DLC. 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 1 and ground. Is the test light on?	–	Go to *Step 28*	Go to *Step 17*
12	1. Turn the ignition OFF. 2. Disconnect the cooling fan relay Low. 3. Connect a test light between the cooling fan relay Low connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?	–	Go to *Step 13*	Go to *Step 24*
13	1. Turn the ignition OFF. 2. Connect the cooling fan relay Low. 3. Disconnect engine control module (ECM) white connector. 4. Connect a fused jumper between the ECM connector terminal 10 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 10. Is the problem found?	–	Go to *Step 25*	Go to *Step 15*
15	1. Turn the ignition OFF. 2. Disconnect the cooling fan relay Low. 3. Connect a test light between the cooling fan relay Low 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 cooling fan relay Low 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 cooling fan control relay. 2. Connect a fused jumper between the cooling fan relay Low connector terminals 30 and 87. 3. Connect a fused jumper between the cooling fan control 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 cooling fan relay Low connector terminal 87 to the main cooling fan connector terminal 2 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 1 and the cooling fan control relay connector terminal 30 for an open. Is the problem found?	–	Go to *Step 22*	Go to *Step 20*

Step	Action	Value(s)	Yes	No
20	Check the wire between the cooling fan control relay connector terminal 87A and the auxiliary cooling fan connector terminal 2 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 1 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 cooling fan relay Low connector terminal 30 and the fuse Ef11. Is the repair complete?	–	System OK	–
24	Repair the open between the cooling fan relay Low connector terminal 86 and the ignition switch. Is the repair complete?	–	System OK	–
25	Repair the open wire between the cooling fan relay Low connector terminal 85 and the ECM connector terminal 10. Is the repair complete?	–	System OK	–
26	Replace the cooling fan relay Low. Is the repair complete?	–	System OK	–
27	Replace the cooling fan control 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 termina 2 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 1 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 cooling fan relay Hi. 3. Connect a test light between the cooling fan relay Hi connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	–	Go to *Step 34*	Go to *Step 44*

Step	Action	Value(s)	Yes	No
34	1. Turn the ignition OFF. 2. Connect a test light between the cooling fan relay Hi connector terminal 30 and ground. Is the test light on?	–	Go to *Step 35*	Go to *Step 45*
35	1. Disconnect the cooling fan control relay. 2. Connect a test light between the cooling fan control relay connector terminal 85 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 cooling fan control relay connector terminal 87 and battery positive. Is the test light on?	–	Go to *Step 37*	Go to *Step 47*
37	1. Connect the main cooling fan connector. 2. Connect the cooling fan relay Hi. 3. Connect the cooling fan control relay. 4. Disconnect the ECM connector. 5. Connect a fused jumper between the ECM connector terminal 10 and ground. 6. Connect a fused jumper between the ECM connector terminal 9 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 cooling fan relay Hi connector terminal 85 and the ECM connector terminal 9. Is the problem found?	–	Go to *Step 22*	Go to *Step 39*
39	1. Disconnect the cooling fan relay Hi. 2. Connect a test light between the cooling fan relay Hi 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 9 and ground. 3. Disconnect the cooling fan relay Hi. 4. Connect a test light between the cooling fan control relay connector terminal 86 and battery positive. Is the test light on?	–	Go to *Step 41*	Go to *Step 49*

Step	Action	Value(s)	Yes	No
41	1. Connect the cooling fan control relay. 2. Connect a fused jumper between the ECM connector terminal 9 and ground. 3. Disconnect the cooling fan relay Hi. 4. Connect a fused jumper between the cooling fan relay Hi 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 9 and ground. 3. Disconnect the cooling fan control relay. 4. Connect a fused jumper between the cooling fan control 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*	–
43	Replace the cooling fan relay Hi. Is the repair complete?	–	System OK	–
44	Repair the open wire between the cooling fan relay Hi connector terminal 86 and the ignition switch. Is the repair complete?	–	System OK	–
45	Repair the open wire between the cooling fan relay Hi connector terminal 30 and the battery. Is the repair complete?	–	System OK	–
46	Repair the open wire between the cooling fan control relay connector terminal 85 and the ignition switch Is the repair complete?	–	System OK	–
47	Repair the open wire between the cooling fan control relay connector terminal 87 and ground. Is the repair complete?	–	System OK	–
48	Repair the open wire between the cooling fan relay Hi connector terminal 87 and the auxiliary cooling fan connector terminal 2. Is the repair complete?	–	System OK	–
49	Repair the open wire between the cooling fan control relay connector terminal 85 and the ECM connector terminal 9. Is the repair complete?	–	System OK	–


Hot at All Times
Hot at All Times
Hot at All Times
Hot in Run and Start
Engine Fuse Block
Ef8
30A
Ef6
20A
Ef21
15A
10A
F2
I/P Fuse Block
C201
C202
Cooling Fan High Relay
Cooling Fan Low Relay
Ignition Relay
Cooling Fan Auxiliary
Cooling Fan Main
Cooling Fan Control Relay
Engine Control Module (ECM)
High/Low
High
Control
Signal
Signal
A/C Control Switch
ECT Sensor
ACP Sensor
G101
G102
G107
PPL
DK BLU
PNK /BLK
LT BLU
DK GRN
BLK
GRY
PNK
PNK /BRN
DK GRN /WHT
YEL
LT BLU
J3B11F15

ENGINE COOLING FAN CIRCUIT CHECK – DUAL FAN (1.8L DOHC)

Circuit Description

The engine cooling fan circuit operates the main cooling fan and the auxiliary cooling fan. The cooling fans are controlled by the engine control module (ECM) based on inputs from the Engine Coolant Temperature (ECT) sensor and the Air Conditioning Pressure (ACP) sensor. The ECM controls the low speed cooling fan operation by internally grounding the ECM connector terminal K28. 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 K28 and the ECM connector terminal K12 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 Ef21, Ef6, 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 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 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 1882 kPa (273 psi) then return to low speed when the high side A/C pressure is 1448 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 (244˚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 connector 2 and grounding the connector terminal K28. This should create low speed cooling fan operation with the ignition ON. By grounding the ECM connector terminals K28 and K12 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 cooling fan relay A, by jumpering connector terminals 30 and 87 it will be determined 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 K28 and K12, the main and auxiliary cooling fans should run at high speed.

Engine Cooling Fan Circuit Check – Dual Fan (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Is the check completed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Check the I/P fuse block fuse F2. 2. Replace the fuse as needed. Is the fuse OK?	–	Go to *Step 3*	Go to ”Diagnostic Aids”

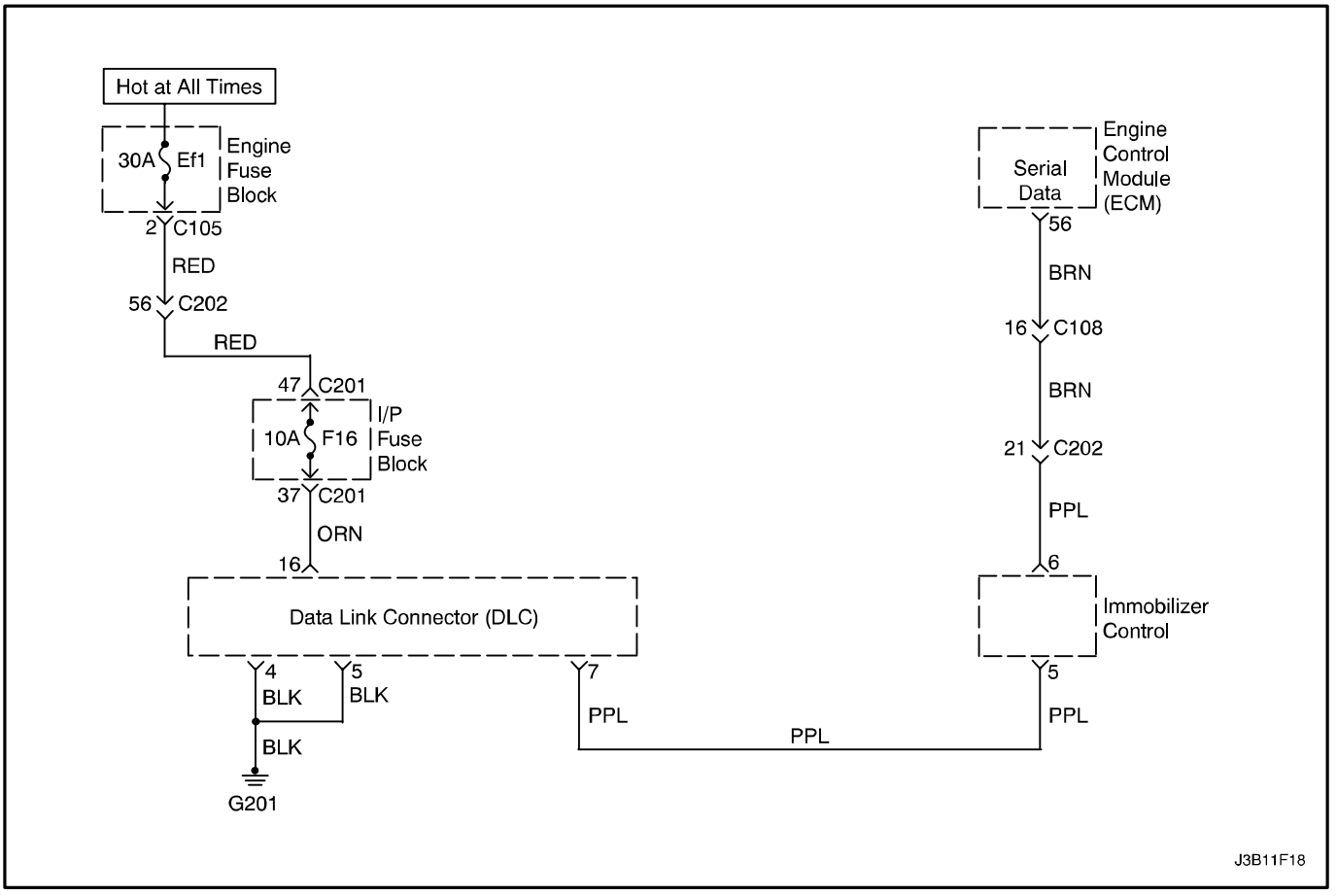
Step	Action	Value(s)	Yes	No
3	1. Check the engine fuse block fuse Ef21, Ef6, Ef8. 2. Replace the fuse as needed. Is the fuse OK?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the data link connector (DLC). 4. The cooling fans 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*
5	1. Turn the ignition OFF. 2. Turn the A/C switch OFF. 3. Connect a scan tool to the DLC. 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?	–	Go to *Step 10*	–
10	1. Turn the ignition OFF. 2. Connect a scan tool to the DLC. 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 2 and ground. Is the test light on?	–	Go to *Step 11*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
11	1. Turn the ignition OFF. 2. Connect a scan tool to the DLC. 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 1 and ground. Is the test light on?	–	Go to *Step 28*	Go to *Step 17*
12	1. Turn the ignition OFF. 2. Disconnect the cooling fan relay Low. 3. Connect a test light between the cooling fan relay Low connector terminal 85 and ground. 4. Turn the ignition ON. Is the test light on?	–	Go to *Step 13*	Go to *Step 24*
13	1. Turn the ignition OFF. 2. Connect the cooling fan relay Low. 3. Disconnect engine control module (ECM) white connector. 4. Connect a fused jumper between the ECM connector terminal K28 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 K28. Is the problem found?	–	Go to *Step 25*	Go to *Step 15*
15	1. Turn the ignition OFF. 2. Disconnect the cooling fan relay Low. 3. Connect a test light between the cooling fan relay Low 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 cooling fan relay Low 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 cooling fan control relay. 2. Connect a fused jumper between the cooling fan relay Low connector terminals 30 and 87. 3. Connect a fused jumper between the cooling fan control 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 cooling fan relay Low connector terminal 87 to the main cooling fan connector terminal 2 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 1 and the cooling fan control relay connector terminal 30 for an open. Is the problem found?	–	Go to *Step 22*	Go to *Step 20*

Step	Action	Value(s)	Yes	No
20	Check the wire between the cooling fan control relay connector terminal 87A and the auxiliary cooling fan connector terminal 2 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 1 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 cooling fan relay Low connector terminal 30 and the fuse Ef21. Is the repair complete?	–	System OK	–
24	Repair the open between the cooling fan relay Low connector terminal 86 and the ignition switch. Is the repair complete?	–	System OK	–
25	Repair the open wire between the cooling fan relay Low connector terminal 85 and the ECM connector terminal K28. Is the repair complete?	–	System OK	–
26	Replace the cooling fan relay Low. Is the repair complete?	–	System OK	–
27	Replace the cooling fan control 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 termina 2 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 1 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 cooling fan relay Hi. 3. Connect a test light between the cooling fan relay Hi connector terminal 86 and ground. 4. Turn the ignition ON. Is the test light on?	–	Go to *Step 34*	Go to *Step 44*

Step	Action	Value(s)	Yes	No
34	1. Turn the ignition OFF. 2. Connect a test light between the cooling fan relay Hi connector terminal 30 and ground. Is the test light on?	–	Go to *Step 35*	Go to *Step 45*
35	1. Disconnect the cooling fan control relay. 2. Connect a test light between the cooling fan control relay connector terminal 85 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 cooling fan control relay connector terminal 87 and battery positive. Is the test light on?	–	Go to *Step 37*	Go to *Step 47*
37	1. Connect the main cooling fan connector. 2. Connect the cooling fan relay Hi. 3. Connect the cooling fan control relay. 4. Disconnect the ECM connector. 5. Connect a fused jumper between the ECM connector terminal K28 and ground. 6. Connect a fused jumper between the ECM connector terminal K12 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 cooling fan relay Hi connector terminal 85 and the ECM connector terminal K12. Is the problem found?	–	Go to *Step 22*	Go to *Step 39*
39	1. Disconnect the cooling fan relay Hi. 2. Connect a test light between the cooling fan relay Hi 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 K12 and ground. 3. Disconnect the cooling fan relay Hi. 4. Connect a test light between the cooling fan control relay connector terminal 86 and battery positive. Is the test light on?	–	Go to *Step 41*	Go to *Step 49*

Step	Action	Value(s)	Yes	No
41	1. Connect the cooling fan control relay. 2. Connect a fused jumper between the ECM connector terminal K12 and ground. 3. Disconnect the cooling fan relay Hi. 4. Connect a fused jumper between the cooling fan relay Hi 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 K12 and ground. 3. Disconnect the cooling fan control relay. 4. Connect a fused jumper between the cooling fan control 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*	–
43	Replace the cooling fan relay Hi. Is the repair complete?	–	System OK	–
44	Repair the open wire between the cooling fan relay Hi connector terminal 86 and the ignition switch. Is the repair complete?	–	System OK	–
45	Repair the open wire between the cooling fan relay Hi connector terminal 30 and the battery. Is the repair complete?	–	System OK	–
46	Repair the open wire between the cooling fan control relay connector terminal 85 and the ignition switch Is the repair complete?	–	System OK	–
47	Repair the open wire between the cooling fan control relay connector terminal 87 and ground. Is the repair complete?	–	System OK	–
48	Repair the open wire between the cooling fan relay Hi connector terminal 87 and the auxiliary cooling fan connector terminal 2. Is the repair complete?	–	System OK	–
49	Repair the open wire between the cooling fan control relay connector terminal 85 and the ECM connector terminal K12. Is the repair complete?	–	System OK	–



DATA LINK CONNECTOR DIAGNOSIS (1.4L/1.6L DOHC)

Circuit Description

The provision for communicating with the Engine Control Module (ECM) is the Data Link Connector (DLC). It is located under the instrument panel. The DLC is used to connect the scan tool. Battery power and ground is supplied for the scan tool through the DLC. The Keyword 2000 serial data circuit to the DLC allows the ECM to communicate with the scan tool. A Universal Asynchronous Receiver Transmitter (UART) serial data line is used to communicate with the other modules such as the Electronic Brake Control Module (EBCM), the Supplemental Inflatable Restraint (SIR) system. and the Instrument Panel Cluster.

Diagnostic Aids

Ensure that the correct application (model line, car year, etc.) has been selected on the scan tool. If communication still cannot be established, try the scan tool on another vehicle to ensure that the scan tool or cables are not the cause of the condition.

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

Any circuitry that is suspected of causing an intermittent complaint should be thoroughly checked for the following conditions:

- Backed–out terminals.
- Improper mating of terminals.
- Broken locks.
- Improperly formed or damaged terminals.
- Poor terminal–to–wiring connection.
- Physical damage to the wiring harness.
- Corrosion.

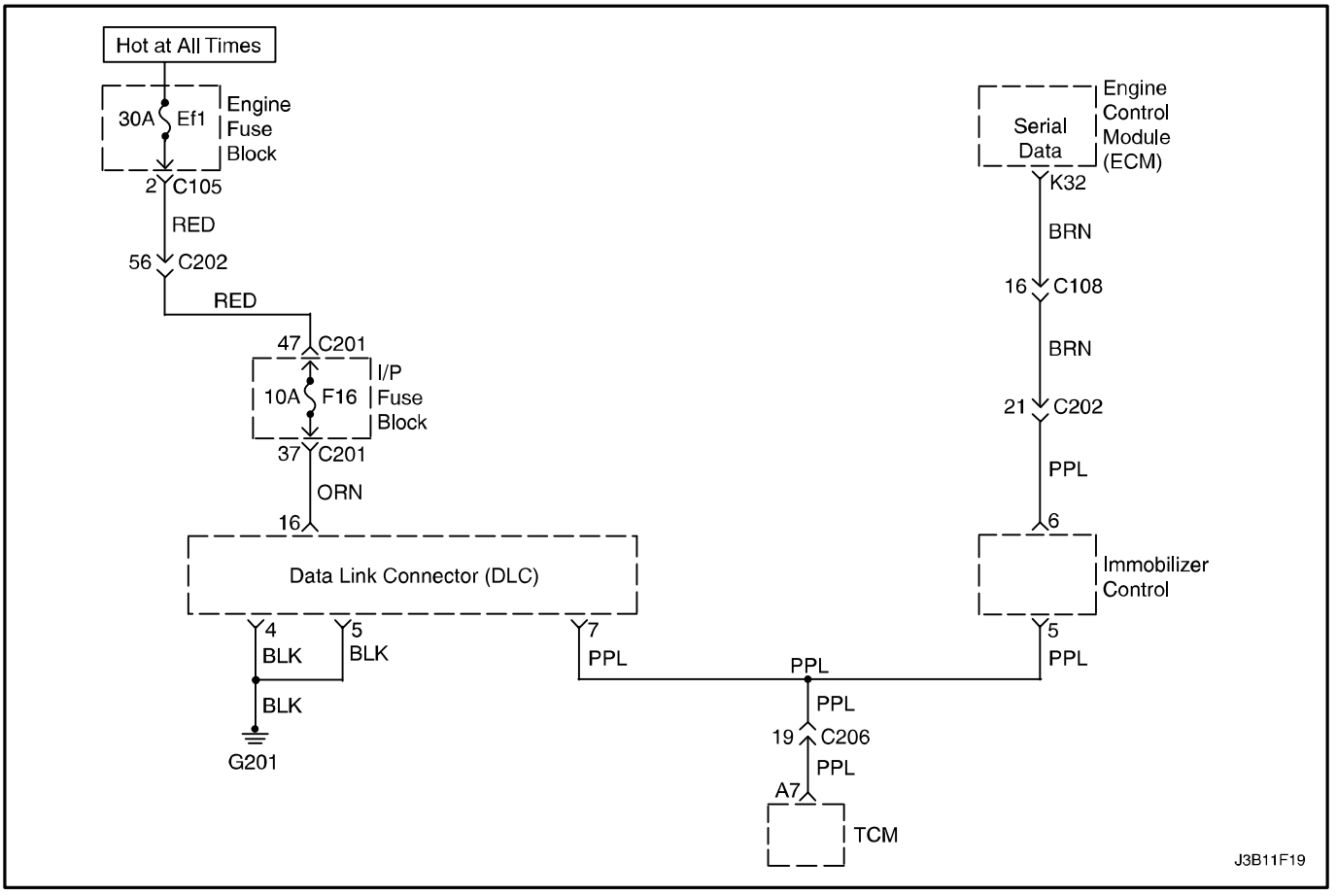
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Unlike the UART serial data circuit, the only time a Class II serial data circuit has any voltage on it is when a scan tool asks the ECM for information and sends the information out.
5. Locate and repair any shorts that may have caused the fuse to open before replacement, if the no voltage condition was due to an open fuse.
10. The scan tool or associated cables could be malfunctioning. Refer to the scan tool's manual for repair information.

Data Link Connector Diagnosis (1.4L/1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	With a test light connected to the ground, probe the Data Link Connector (DLC) battery feed terminal 16. Is the test light illuminate?	–	Go to *Step 4*	Go to *Step 3*
3	Repair an open or short to ground in the DLC battery feed circuit . Is the repair complete?	–	Go to *Step 4*	–
4	With a test light connected to the battery, probe the DLC ground terminal 4. Is the test light illuminate?	–	Go to *Step 6*	Go to *Step 5*
5	Repair an open circuit. Is the repair complete?	–	Go to *Step 6*	–
6	1. Turn the ignition switch to LOCK. 2. Install the scan tool to the DLC. 3. Turn the ignition switch to ON. Does the scan tool power up?	–	Go to *Step 8*	Go to *Step 7*
7	Check for damages in the terminal of DLC and scan tool, and repair as needed. Is the repair complete?	–	Go to *Step 8*	–
8	Using a scan tool, request engine data of Engine Control Module (ECM). Does the scan tool display any data?	–	Go to *Step 12*	Go to *Step 9*
9	Install the scan tool on another vehicle and check for proper operation. Does the scan tool work properly on a different vehicle.	–	Go to *Step 11*	Go to *Step 10*
10	The scan tool is malfunctioning. Refer to the scan tool’s manual for repair. Is the repair complete?	–	Go to *Step 12*	–
11	Repair communication circuit between ECM and DLC. Is the repair complete?	–	Go to *Step 12*	–
12	1. Using a scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Attempt to start the engine. Does the engine and continue to run?	–	Go to *Step 13*	Go to *Step 2*
13	1. Allow the engine to idle until normal operation temperature reached. 2. Check if any DTCs are set? Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC Table”	System OK



DATA LINK CONNECTOR DIAGNOSIS (1.8L DOHC)

Circuit Description

The provision for communicating with the Engine Control Module (ECM) is the Data Link Connector (DLC). It is located under the instrument panel. The DLC is used to connect the scan tool. Battery power and ground is supplied for the scan tool through the DLC. The Keyword 2000 serial data circuit to the DLC allows the ECM to communicate with the scan tool. A Universal Asynchronous Receiver Transmitter (UART) serial data line is used to communicate with the other modules such as the Electronic Brake Control Module (EBCM), the Supplemental Inflatable Restraint (SIR) system. and the Instrument Panel Cluster.

Diagnostic Aids

Ensure that the correct application (model line, car year, etc.) has been selected on the scan tool. If communication still cannot be established, try the scan tool on another vehicle to ensure that the scan tool or cables are not the cause of the condition.

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

Any circuitry that is suspected of causing an intermittent complaint should be thoroughly checked for the following conditions:

- Backed–out terminals.
- Improper mating of terminals.
- Broken locks.
- Improperly formed or damaged terminals.
- Poor terminal–to–wiring connection.
- Physical damage to the wiring harness.
- Corrosion.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Unlike the UART serial data circuit, the only time a Class II serial data circuit has any voltage on it is when a scan tool asks the ECM for information and sends the information out.
5. Locate and repair any shorts that may have caused the fuse to open before replacement, if the no voltage condition was due to an open fuse.
10. The scan tool or associated cables could be malfunctioning. Refer to the scan tool's manual for repair information.

Data Link Connector Diagnosis (1.8L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) system check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	With a test light connected to the ground, probe the Data Link Connector (DLC) battery feed terminal 16. Is the test light illuminate?	–	Go to *Step 4*	Go to *Step 3*
3	Repair an open or short to ground in the DLC battery feed circuit . Is the repair complete?	–	Go to *Step 4*	–
4	With a test light connected to the battery, probe the DLC ground terminal 4 and 5. Is the test light illuminate?	–	Go to *Step 6*	Go to *Step 5*
5	Repair an open circuit. Is the repair complete?	–	Go to *Step 6*	–
6	1. Turn the ignition switch to LOCK. 2. Install the scan tool to the DLC. 3. Turn the ignition switch to ON. Does the scan tool power up?	–	Go to *Step 8*	Go to *Step 7*
7	Check for damages in the terminal of DLC and scan tool, and repair as needed. Is the repair complete?	–	Go to *Step 8*	–
8	Using a scan tool, request engine data of Engine Control Module (ECM). Does the scan tool display any data?	–	Go to *Step 12*	Go to *Step 9*
9	Install the scan tool on another vehicle and check for proper operation. Does the scan tool work properly on a different vehicle.	–	Go to *Step 11*	Go to *Step 10*
10	The scan tool is malfunctioning. Refer to the scan tool’s manual for repair. Is the repair complete?	–	Go to *Step 12*	–
11	Repair communication circuit between ECM and DLC. Is the repair complete?	–	Go to *Step 12*	–
12	1. Using a scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Attempt to start the engine. Does the engine and continue to run?	–	Go to *Step 13*	Go to *Step 2*
13	1. Allow the engine to idle until normal operation temperature reached. 2. Check if any DTCs are set? Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC Table”	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.

Fuel 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. Turn the ignition switch to ON in order to get the fuel pressure to its maximum level.
2. 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.
3. 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.
4. Disconnect the fuel injector tester from the fuel injector.
5. After turning the ignition switch to 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.
6. Retest any of the fuel injectors that the pressure drop exceeds the 10 kPa (1.5 psi) of the average pressure drop value.
7. Replace any of the fuel injectors that fail the retest.
8. If the pressure drop of all of the fuel injectors is within 10 kPa (1.5 psi) of the average pressure drop value, then the fuel injectors are flowing normally and no replacement should be necessary.
9. Reconnect the fuel injector harness and review the symptom diagnostic tables.
10. An engine cool down period of 10 minutes is necessary in order to avoid irregular readings due to hot soak fuel boiling.
11. Connect the fuel pressure gauge carefully to avoid any fuel spillage.
12. The fuel pump should run about 2 seconds after the ignition is turned to the ON position.
13. Insert a clear tube attached to the vent valve of the fuel pressure gauge into a suitable container.
14. Bleed the air from the fuel pressure gauge and hose until all of the air is bled from the fuel pressure gauge.
15. The ignition switch must be in the OFF position at least 10 seconds in order to complete the Engine Control Module (ECM) shutdown cycle.

TROUBLE CODE DIAGNOSIS (1.4L/1.6L DOHC)

CLEARING TROUBLE CODES

Notice : To prevent Engine Control Module (ECM) damage, the key must be OFF when disconnecting or reconnecting the power to the ECM (for example battery cable, ECM pigtail connector, ECM fuse, jumper cables, etc.).When the ECM sets a Diagnostic Trouble Code (DTC), the Malfunction Indicator Lamp (MIL) lamp will be turned on only for type A, B and E but a DTC will be stored in the ECM's memory for all types of DTC. If the problem is intermittent, the MIL will go out after 10 seconds if the fault is no longer present. The DTC will stay in the ECM's memory until cleared by scan tool. Removing battery voltage for 10 seconds will clear some stored DTCs.

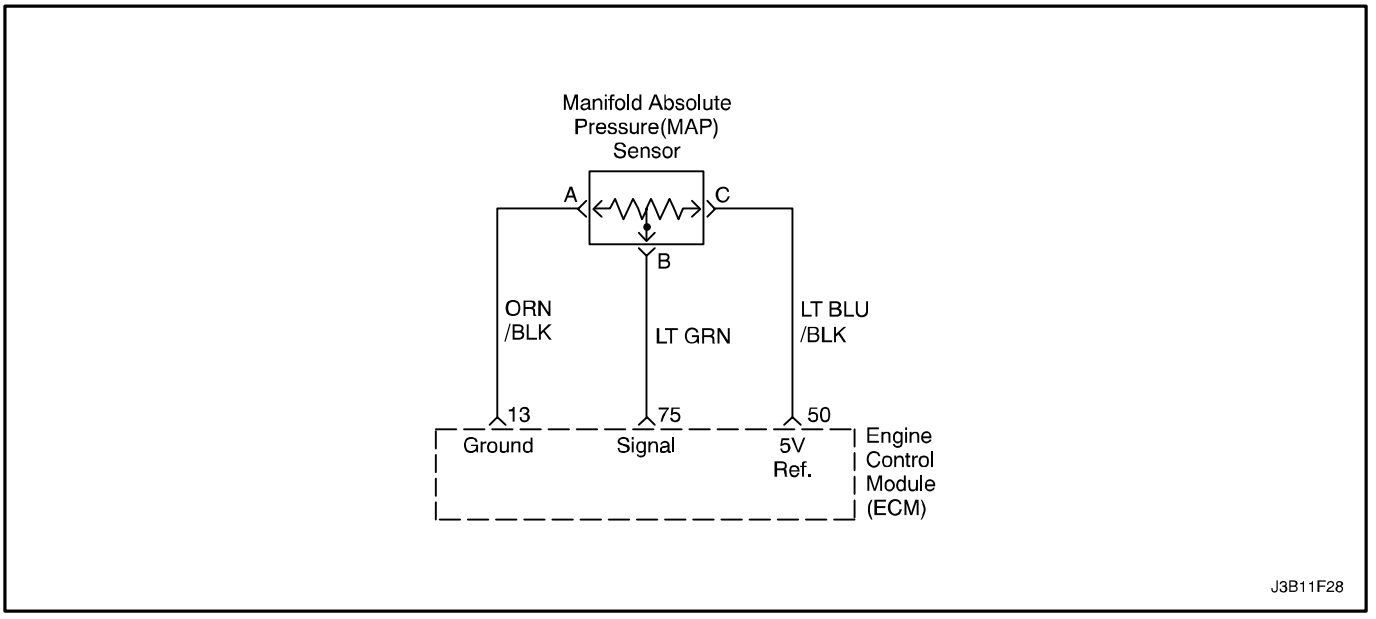
DTCs should be cleared after repairs have been completed. Some diagnostic tables will tell you to clear the codes before using the chart. This allows the ECM to set the DTC while going through the chart, which will help to find the cause of the problem more quickly.

DIAGNOSTIC TROUBLE CODES (1.4L/1.6L DOHC)

DTC	Function	Error Type	Illuminate MIL
P0107	Manifold Absolute Pressure Sensor Low Voltage	A	YES
P0108	Manifold Absolute Pressure Sensor High Voltage	A	YES
P0112	Intake Air Temperature Sensor Low Voltage	E	YES
P0113	Intake Air Temperature Sensor High Voltage	E	YES
P0117	Engine Coolant Temperature Sensor Low Voltage	A	YES
P0118	Engine Coolant Temperature Sensor High Voltage	A	YES
P0122	Throttle Position Sensor Low Voltage	A	YES
P0123	Throttle Position Sensor High Voltage	A	YES
P0131	Front Heated Oxygen Sensor Low Voltage	A	YES
P0132	Front Heated Oxygen Sensor High Voltage	A	YES
P0133	Front Heated Oxygen Sensor No Activity	E	YES
P0135	Front Heated Oxygen Sensor Heater Circuit Not Functioning	E	YES
P0137	Rear Heated Oxygen Sensor Low Voltage	E	YES
P0138	Rear Heated Oxygen Sensor High Voltage	E	YES
P0140	Rear Heated Oxygen Sensor No Activity	E	YES
P0141	Rear Heated Oxygen Sensor Heater Malfuction	E	YES
P0171	Fuel Trim System Too Lean	E	YES
P0172	Fuel Trim System Too Rich	E	YES
P0222	Main Throttle Idle Actuactor (MTIA) Low Voltage	A	YES
P0223	Main Throttle Idle Actuactor (MTIA) High Voltage	A	YES
P0261	Injector 1 Low Voltage	A	YES
P0262	Injector 1 High Voltage	A	YES
P0264	Injector 2 Low Voltage	A	YES
P0265	Injector 2 High Voltage	A	YES
P0267	Injector 3 Low Voltage	A	YES
P0268	Injector 3 High Voltage	A	YES
P0270	Injector 4 Low Voltage	A	YES
P0271	Injector 4 High Voltage	A	YES
P0300	Multiple Cylinder Misfire (Catalyst Damage)	A	BLINKING

DTC	Function	Error Type	Illuminate MIL
P0300	Multiple Cylinder Misfire (Increase Emission)	E	YES
P0327	Knock Sensor Circuit Fault (1.4L DOHC)	Cnl	NO
P0327	Knock Sensor Circuit Fault (1.6L DOHC)	E	YES
P0335	Magnetic Crankshaft Position Sensor Electrical Error	E	YES
P0336	58X Crankshaft Position Sensor Extra/missing Pulse	E	YES
P0337	58X Crankshaft Sensor No Signal	E	YES
P0341	Camshaft Position Sensor Rationality	E	YES
P0342	Camshaft Position Sensor No Signal	E	YES
P0351	Ignition Signal Coil A Fault	A	YES
P0352	Ignition Signal Coil B Fault	A	YES
P0400	Exhaust Gas Recirculation Out of Limit	E	YES
P0404	Exhaust Gas Recirculation (EGR) Ppend	E	YES
P0405	EGR Pintle Position Sensor Low Voltage	E	YES
P0406	EGR Pintle Position Sensor High voltage	E	YES
P0420	Catalyst Low Efficiency	A	YES
P0444	EVAP Purge Control Circuit No Signal	E	YES
P0445	EVAP Purge Control Circuit Fault	E	YES
P0462	Fuel Level Sensor Low Voltage (1.6L DOHC Only)	Cnl	NO
P0463	Fuel Level Sensor High Voltage (1.6L DOHC Only)	Cnl	NO
P0480	Low Speed Cooling Fan Relay Circuit Fault (1.4L DOHC)	E	YES
P0480	Low Speed Cooling Fan Relay Circuit Fault (1.6L DOHC)	Cnl	NO
P0481	High Speed Cooling Fan Relay High Voltage (1.4L DOHC)	E	YES
P0481	High Speed Cooling Fan Relay High Voltage (1.6L DOHC)	Cnl	NO
P0501	Vehicle Speed No Signal (M/T Only)	A	YES
P0510	Throttle Positon Switch Circuit Fault (1.4L DOHC)	Cnl	NO
P0510	Throttle Positon Switch Circuit Fault (1.6L DOHC)	A	YES
P0532	A/C Pressure Sensor Low Voltage	Cnl	NO
P0533	A/C Pressure Sensor High Voltage	Cnl	NO
P0562	System Voltage (Engine Side) Too Low	Cnl	NO
P0563	System Voltage (Engine Side) Too High	Cnl	NO
P0601	Engine Control Module Checksum Error	E	YES
P0604	Engine Control Module RAM Error	E	YES
P0605	Engine Control Module INMVY Write Error	E	YES
P0656	Fuel Level Gauge High Circuit Fault	Cnl	NO
P1181	Variable Intake Manifold Solenoid Low Voltage	E	YES
P1182	Variable Intake Manifold Solenoid High Voltage	E	YES
P1230	Fuel Pump Relay Low Voltage (1.4L DOHC)	Cnl	NO
P1230	Fuel Pump Relay Low Voltage (1.6L DOHC)	A	YES
P1231	Fuel Pump Relay High Voltage (1.4L DOHC)	Cnl	NO
P1231	Fuel Pump Relay High Voltage (1.6L DOHC)	A	YES
P1320	Crankshaft Segment Period Segment Adaptation At Limit	E	YES

DTC	Function	Error Type	Illuminate MIL
P1321	Crankshaft Segment Period Tooth Error	E	YES
P1382	Rough Road Data Invalid (Non ABS)	Cnl	NO
P1382	Rrough Road Data Invalid (ABS)	Cnl	NO
P1385	Rough Road Sensor Circuit Fault (Non ABS)	Cnl	NO
P1402	Exhaust Gas Recirculation Blocked	E	YES
P1403	Exhaust Gas Recirculation Valve Failure	E	YES
P1404	Exhaust Gas Recirculation (EGR) Closed	E	YES
P1511	Idle Charge Actuactor Circuit Fault	E	YES
P1512	Idle Charge Actuactor Mechanical Error	E	YES
P1513	Idle Charge Actuactor Functionnal Error	Cnl	NO
P1537	A/C Compressor Relay High Voltage	Cnl	NO
P1538	A/C Compressor Relay Low Voltage	Cnl	NO
P1610	Main Relay High Voltage (1.4L DOHC)	Cnl	NO
P1610	Main Relay High Voltage (1.6L DOHC)	A	YES
P1611	Main Relay Low Voltage (1.4L DOHC)	Cnl	NO
P1611	Main Relay Low Voltage (1.6L DOHC)	A	YES
P1628	Immobilizer No Successful Communication	Cnl	NO
P1629	Immobilizer Wrong Computation	Cnl	NO
P1660	Malfunction Indicator Lamp(MIL) High Voltage	E	YES
P1661	Malfunction Indicator Lamp(MIL) Low Voltage	E	YES



DIAGNOSTIC TROUBLE CODE (DTC) P0107

MANIFOLD ABSOLUTE PRESSURE SENSOR LOW VOLTAGE

Circuit Description

The engine control module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure, which results from engine load (intake manifold vacuum) and the rpm changes; and converts these into voltage outputs. The ECM sends a 5 volt–reference voltage to the MAP sensor. As the manifold pressure changes, the output voltage of the MAP sensor also changes. By monitoring the MAP sensor output voltage, the ECM knows the manifold pressure. A low–pressure (low voltage) output voltage will be about 1.0 to 1.5 volts at idle, while higher pressure (high voltage) output voltage will be about 4.5 to 4.8 at wide open throttle (WOT). The MAP sensor is metric pressure, allowing the ECM to make adjustments for different altitudes.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.

(Case A)

- When the engine idling.
- No throttle position(TP) sensor MTIA fail conditions present.
- Engine speed(rpm) is less than 2,500rpm.
- The MAP is less than 12.0 kPa.

(Case A)

- When the engine part load.
- The engine revolution speed is less than 4,000rpm.
- No Throttle Position (TP) Sensor fails conditions present.
- The Throttle Position (TP) angle greather than 30.0˚.
- The MAP is less than 11.5 kPa.
- An open or low voltage condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.
- The ECM will substitutes a fixed MAP value and use TP to control the fuel delivery (the scan tool will not show defaulted)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmosphere pressure and the signal voltage will be high.

The ECM as an indication of vehicle altitude uses this information. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same ± 0.4volt.

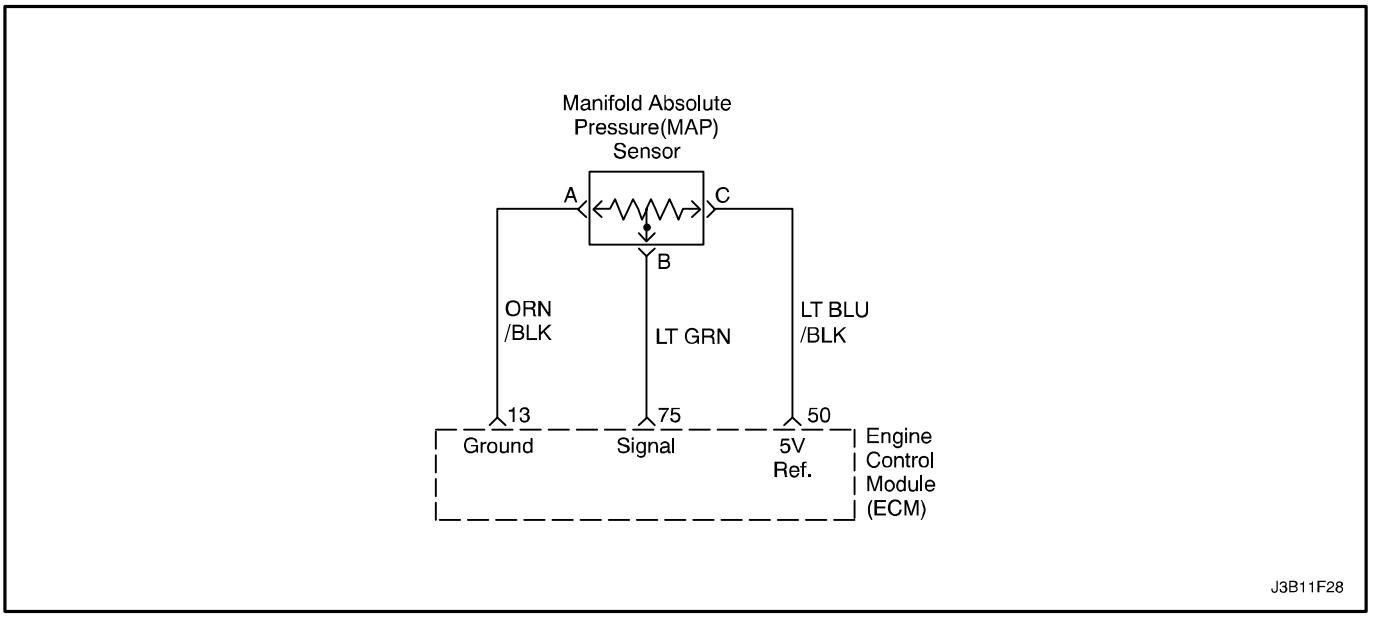
If a DTC P0107 is intermittent, refer to ”Manifold Absolute Pressure Check” in this section for further diagnosis.

If the connections are OK monitor the manifold absolute pressure (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.

DTC P0107 – Manifold Absolute Pressure Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the data link connector (DLC). 2. Turn the ignition switch to ON. Does the scan tool show the manifold absolute pressure (MAP) sensor voltage above the value specified?	4V	Go to *Step 3*	Go to *Step 4*
3	1. Disconnect the vacuum line from the MAP sensor. 2. Apply 88kPA (20in.of Hg) of vacuum to the MAP sensor. Does the scan tool show the MAP sensor voltage within the value specified?	1.0–1.5V	Go to ”Diagnostic Aids”	Go to *Step 4*
4	1. Turn the ignition switch to LOCK. 2. Disconnect the MAP sensor connector. 3. Turn the ignition switch to ON. 4. Measure the voltage between the MAP sensor connector terminals A and C. Does the voltage measure within the value specified?	4.5–5.5V	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?	4V	Go to *Step 11*	Go to *Step 9*
6	Measure the voltage between the MAP sensor connector terminal A and ground. Does the voltage measure within the value specified?	4.5–5.5V	Go to *Step 7*	Go to *Step 8*
7	1. Turn the ignition switch to LOCK. 2. Check for open wires between the MAP sensor connector terminal A and the ECM connector terminal 13. Is the problem found?	–	Go to *Step 10*	Go to *Step 12*
8	1. Turn the ignition switch to LOCK. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal C and the ECM connector terminal 50. Is the problem found ?	–	Go to *Step 10*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition switch to LOCK. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal B and the ECM connector terminal 75. 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 DTCs from the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
11	1. Replace the manifold absolute pressure sensor. 2. Clear any DTCs from the ECM. 3. Perform the diagnostic system check. Is the replacement complete?	–	System OK	–
12	Replace the ECM. Is the replacement complete?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0108

MANIFOLD ABSOLUTE PRESSURE SENSOR HIGH VOLTAGE

Circuit Description

The engine control module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure, which results from engine load (intake manifold vacuum) and the rpm changes; and converts these into voltage outputs. The ECM sends a 5 volt–reference voltage to the MAP sensor. As the manifold pressure changes, the output voltage of the MAP sensor also changes. By monitoring the MAP sensor output voltage, the ECM knows the manifold pressure. A low–pressure (low voltage) output voltage will be about 1.0 to 1.5 volts at idle, while higher pressure (high voltage) output voltage will be about 4.5 to 4.8 at wide open throttle (WOT). The MAP sensor is metric pressure, allowing the ECM to make adjustments for different altitudes.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.
- When the engine idling.
- Engine speed is greater than 700rpm.
- No throttle position sensor (TPS) fail conditions present.
- The MAP is greater than 95kPA.
- A high voltage condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will substitutes a fixed MAP value and use TP to control the fuel delivery (the scan tool will not show defaulted)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmosphere pressure and the signal voltage will be high.

The ECM as an indication of vehicle altitude uses this information. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same ±0.4volt.

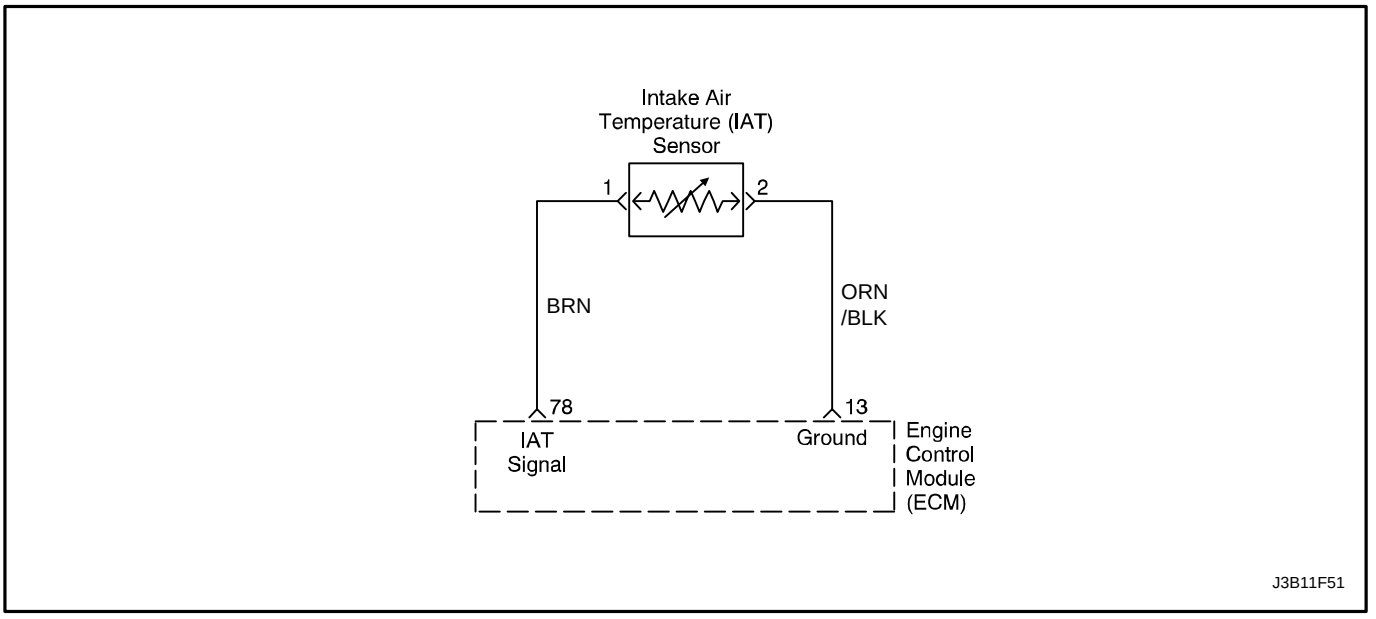
If a DTC P0108 is intermittent, refer to ”Manifold Absolute Pressure Check” in this section for further diagnosis.

If the connections are OK monitor the manifold absolute pressure(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.

DTC P0108 – Manifold Absolute Pressure Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the data link connector (DLC). 2. Turn the ignition switch to ON. Does the scan tool show the manifold absolute pressure (MAP) sensor voltage above the value specified?	4V	Go to *Step 3*	Go to *Step 4*
3	1. Disconnect the vacuum line from the MAP sensor. 2. Apply 66kPA (20in.of Hg) of vacuum to the MAP sensor. Does the scan tool show the MAP sensor voltage within the value specified?	1.0–1.5V	Go to ”Diagnostic Aids”	Go to *Step 4*
4	1. Turn the ignition switch to LOCK. 2. Disconnect the MAP sensor connector. 3. Turn the ignition switch to ON. 4. Measure the voltage between the MAP sensor connector terminals A and C. Does the voltage measure within the value specified?	4.5–5.5V	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?	4V	Go to *Step 11*	Go to *Step 9*
6	Measure the voltage between the MAP sensor connector terminal A and ground. Does the voltage measure within the value specified?	4.5–5.5V	Go to *Step 7*	Go to *Step 8*
7	1. Turn the ignition switch to LOCK. 2. Check for open wires between the MAP sensor connector terminal A and the ECM connector terminal 13. Is the problem found?	–	Go to *Step 10*	Go to *Step 12*
8	1. Turn the ignition switch to LOCK. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal C and the ECM connector terminal 50. Is the problem found ?	–	Go to *Step 10*	Go to *Step 12*
9	1. Turn the ignition switch to LOCK. 2. Check for an open or short to ground in the wire between the MAP sensor connector terminal B and the ECM connector terminal 75. Is the problem found ?	–	Go to *Step 10*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
10	1. Repair the wire or 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 manifold absolute pressure sensor. 2. Clear any DTCs from the ECM. 3. Perform the diagnostic system check. Is the replacement complete?	–	System OK	–
12	Replace the ECM. Is the replacement complete?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0112

INTAKE AIR TEMPERATURE SENSOR LOW VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) Sensor uses a thermistor to control the signal voltage to the engine control module (ECM). The ECM supplies a 5 volt reference voltage and a ground to the sensor. When the air is cold, the resistance is high ; therefore IAT sensor signal voltage will be high. If the intake air is warm, resistance is low ; therefore the IAT sensor signal voltage will be low.

Conditions for Setting the DTC

- IAT voltage is less than 0.01V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will default to 605C(1405F) for intake air temperature. The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

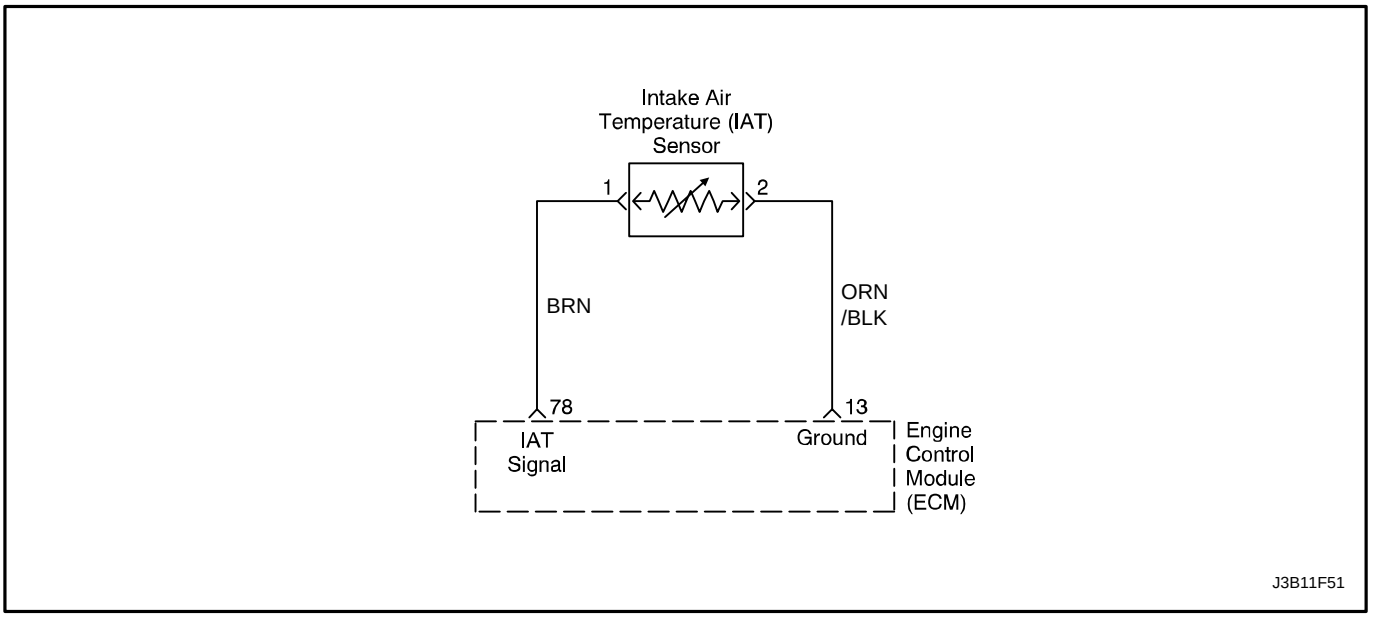
- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

If the vehicle is at ambient temperature, compare the IAT sensor to the engine coolant temperature(ECT) sensor. The IAT sensor and the ECT sensor should be relatively close to each other. Use the temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

DTC P0112 – Intake Air Temperature Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the data link connector(DLC). 2. Run the engine until it reaches operating temperature. Does the scan tool show the IAT sensor reading within the value specified?	15~80˚C	Go to ”Diagnostic Aids”	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the IAT sensor connector. 3. Turn the ignition switch to ON. Does the scan tool show the IAT sensor reading within the value specified?	≤ –30˚C	Go to *Step 4*	Go to *Step 5*
4	Check for a faulty connector or terminals at the IAT sensor connector. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
5	Check for wire for a short to ground between the IAT connector terminal 1 and the ECM connector terminal 78. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	Check for wire for a short to ECM reference voltage between the IAT sensor connector terminal 2 and the ECM connector terminal 13. Is the problem found?	4.5 – 5.5V	Go to *Step 7*	Go to *Step 9*
7	1. Turn the ignition switch to LOCK. 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	–
8	1. Turn the ignition switch to LOCK. 2. Replace the IAT 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 switch to LOCK. 2. Replace the engine control module(ECM). 3. Run the engine until it reaches operating temperature. 4. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to the applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0113

INTAKE AIR TEMPERATURE SENSOR HIGH VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) Sensor uses a thermistor to control the signal voltage to the engine control module (ECM). The ECM supplies a 5 volt reference voltage and a ground to the sensor . when the air is cold, the resistance is high ; therefore IAT sensor signal voltage will be high. If the intake air is warm, resistance is low ; therefore the IAT sensor signal voltage will be low.

Conditions for Setting the DTC

- IAT voltage is less than 4.99V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will default to 605C(1405F) for intake air temperature. The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

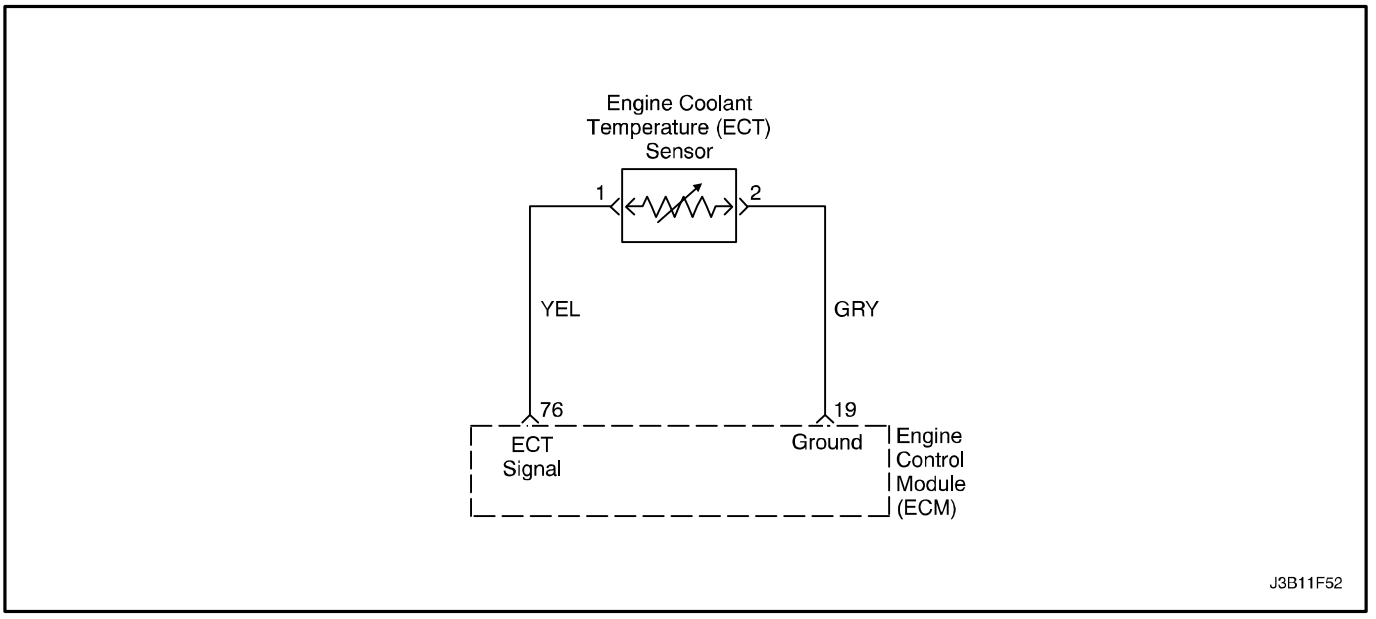
Diagnostic Aids

- If the vehicle is at ambient temperature, compare the IAT sensor to the engine coolant temperature (ECT) sensor. The IAT sensor and the ECT sensor should be relatively close to each other.
- Use the temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

DTC P0113 – Intake Air Temperature Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Connect the scan tool to the data link connector (DLC). 2. Run the engine unit it reaches operating temperature. Does the scan tool show the intake air temperature (IAT) sensor reading within the value specified?	15~80˚C (10~176˚F)	Go to "Diagnostic Aids"	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the IAT sensor connector. 3. Jumper to IAT sensor connector terminals. 4. Turn the ignition switch to ON. Does the scan tool show the IAT sensor reading the value specified?	180˚C (356˚F)	Go to *Step 4*	Go to *Step 5*
4	Check for a faulty connector or terminals 1 and 2 of the IAT sensor connector. Is the problem found?	–	Go to *Step 10*	Go to *Step 9*
5	Measure the voltage between terminals 1 and 2 of IAT sensor connector. Does the voltage measure within the value specified?	4.5~5.5V	Go to *Step 11*	Go to *Step 6*
6	Measure the voltage between the IAT sensor connector terminal 2 and the battery ground(negative) post. Does the voltage measure within the value specified?	4.5~5.5V	Go to *Step 7*	Go to *Step 8*
7	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the IAT sensor connector terminal 2 and the engine control module(ECM) connector terminal 13. Is the problem found?	–	Go to *Step 10*	Go to *Step 11*
8	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the IAT sensor connector terminal 1 and the ECM connector terminal 78. Is the problem found?	–	Go to *Step 10*	Go to *Step 11*
9	1. Turn the ignition switch to LOCK. 2. Replace the IAT 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 switch to LOCK. 2. Repair the wire of the connector terminals as needed. 3. Clear any DTCs from the ECM. 4. Perform the diagnostic system check. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
11	1. Replace the ECM. 2. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 12*	–
12	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0117

ENGINE COOLANT TEMPERATURE SENSOR LOW VOLTAGE

Circuit Description

The Engine Coolant Temperature sensor (ECT) uses a thermistor to control the signal voltage to the engine control module (ECM).

The ECM supplies a voltage on the signal circuit to the sensor. When the engine coolant is cold, the resistance is high; therefore the ECT signal voltage will be high.

As the engine warms, the sensor resistance becomes less, and the voltage drops. At normal engine operating temperature, the voltage will be between 1.5 and 2.0 volts at the ECT signal terminal.

The ECT sensor is used to the following items:

- Fuel delivery.
- Lock Up Clutch (LUC).
- Ignition.
- Evaporative Emission (EVAP) Canister Purge Valve.
- Electric cooling fan.

Conditions for Setting the DTC

- ECT voltage is less than 0.03V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.
- The ECM will default to 20˚C (68˚F) for the first 60 seconds of the engine run time, and then 92 ˚C (198 ˚F).
- The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

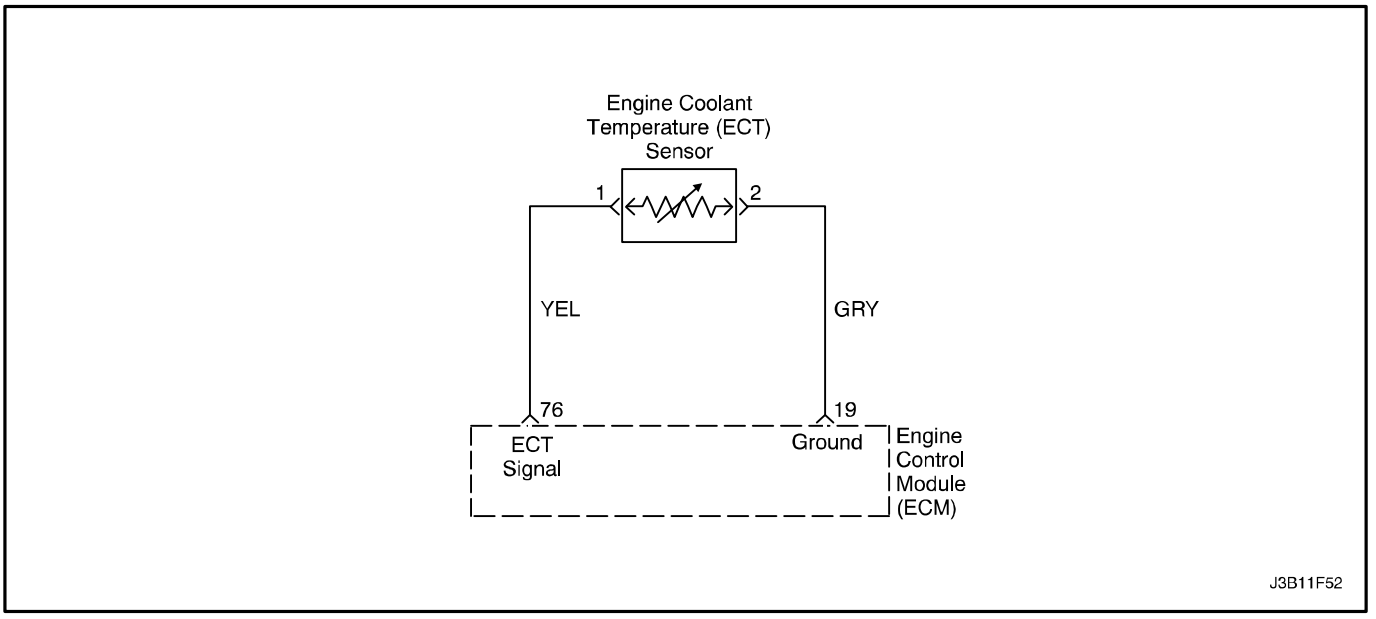
After the engine has started, the ECT should rise steadily to about 90˚C (194˚F) then stabilize when the thermostat opens.

Use the temperature vs. Resistance values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

DTC P0117 – Engine Coolant Temperature Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the data link connector (DLC). 2. Run the engine until it reaches operating temperature. Does the scan tool show the ECT sensor reading within the value specified?	80~110˚C (176~260˚F)	Go to ”Diagnostic Aids”	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the ECT sensor connector. 3. Turn the ignition switch to ON. Does the scan tool show the IAT sensor reading within the value specified?	≥ –30˚C (–22˚F)	Go to *Step 4*	Go to *Step 6*
4	1. Jumper the ECT sensor signal circuits at terminal 1 and 2. 2. Turn the ignition switch to ON. Does the scan tool show the ECT sensor reading within the value specified?	≥ 120˚C	Go to *Step 5*	Go to *Step 6*
5	1. Replace the ECT sensor. 2. Clear any DTCs from the ECM. 3. Perform the diagnostic system check. Is the replacement complete?	–	System OK	–
6	Measure the voltage between ECT terminal 2 and ground. Does the voltage measure within the value specified?	4.5–5.5V	Go to *Step 7*	Go to *Step 8*
7	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM wiring connector. 3. Check for a faulty connector or terminals at the ECT sensor connectors and ECM connectors for short to ECM reference voltage. Is the problem found?	–	Go to *Step 9*	Go to *Step 8*
8	1. Turn the ignition switch to LOCK. 2. Repair the wire of the connector terminals 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	–

Step	Action	Value(s)	Yes	No
9	1. Replace the ECM. 2. Run the engine until it reaches operating temperature. 3. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0118

ENGINE COOLANT TEMPERATURE SENSOR HIGH VOLTAGE

Circuit Description

The coolant temperature sensor (ECT) uses a thermistor to control the signal voltage to the engine control module (ECM).

he ECM supplies a voltage on the signal circuit to the sensor. When the air is cold, the resistance is high; therefore the ECT sensor signal voltage will be high.

As the engine warms, the sensor resistance becomes less, and the voltage drops. At normal engine operating temperature, the voltage will be between 1.5 and 2.0 volts at the ECT sensor signal terminal.

The ECT sensor is used to the following items:

- Fuel delivery.
- Lock Up Clutch (LUC).
- Ignition.
- Evaporative Emission (EVAP) Canister Purge Valve.
- Electric cooling fan.

Conditions for Setting the DTC

- ECT voltage is greater than 4.98V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.
- The ECM will substitutes a fixed MAP value and use TP to control the fuel delivery (the scan tool will not show defaulted)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

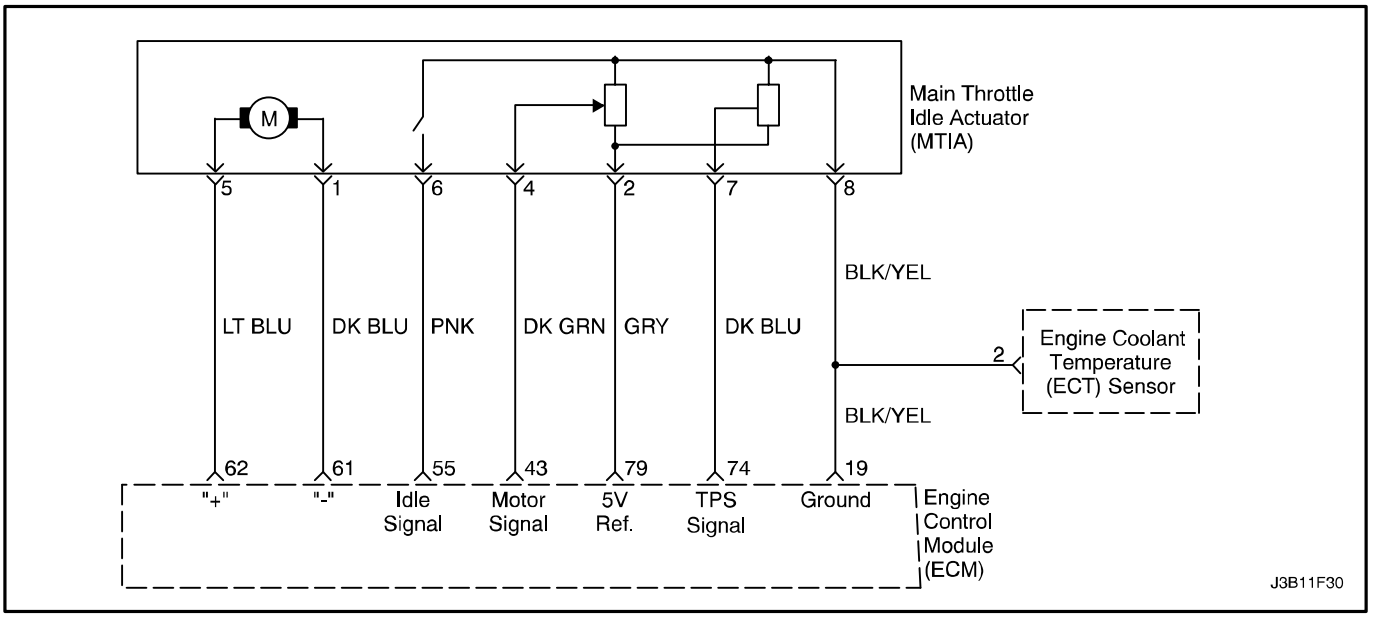
After the engine has started, the ECT should rise steadily to about 90˚C (194˚F) then stabilize when the thermostat opens.

Use the temperature vs. Resistance values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

DTC P0118 – Engine Coolant Temperature Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the data link connector (DLC). 2. Run the engine until it reaches operating temperature. Does the scan tool show the ECT sensor reading within the value specified?	80~110˚C (176~260˚F)	Go to ”Diagnostic Aids”	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the ECT sensor connector. 3. Turn the ignition switch to ON. Does the scan tool show the ECT sensor reading within the value specified?	≥ –30˚C	Go to *Step 4*	Go to *Step 6*
4	1. Jumper the ECT sensor signal circuits at terminal 1 and 2. 2. Turn the ignition switch to ON. Does the scan tool show the ECT sensor reading within the value specified?	≥ 180˚C (356˚F)	Go to *Step 5*	Go to *Step 6*
5	1. Replace the ECT sensor. 2. Clear any DTCs from the ECM. 3. Perform the diagnostic system check. Is the replacement complete?	–	System OK	–
6	Measure the voltage between ECT terminal 1 and ground. Does the voltage measure within the value specified?	4.5–5.5V	Go to *Step 7*	Go to *Step 8*
7	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM wiring connector. 3. Check for a faulty connector or terminals at the ECT sensor connector terminal 2 and the ECM connector terminal 19 for an open or short to battery voltage. Is the problem found?	–	Go to *Step 8*	Go to *Step 9*
8	1. Turn the ignition switch to LOCK. 2. Repair the wire of the connector terminals 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	–

Step	Action	Value(s)	Yes	No
9	1. Replace the ECM. 2. Run the engine until it reaches operating temperature. 3. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0122

THROTTLE POSITION SENSOR LOW VOLTAGE

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (05, 195). The characteristics of the airflow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical bowdencable.

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 nearly 5.0 V at idles to about 0.2V to 0.4 V at wide–open throttle. The TPS is one of the most important inputs used by the ECM for fuel control and other functions such as idle, wide open throttle, deceleration enleanment, and acceleration enrichment.

Conditions for Setting the DTC

- TPS voltage is less than 0.3V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.
- The ECM will default to 20˚C (68˚F) for the first 60 seconds of the engine run time, and then 92 ˚C (198 ˚F).
- The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

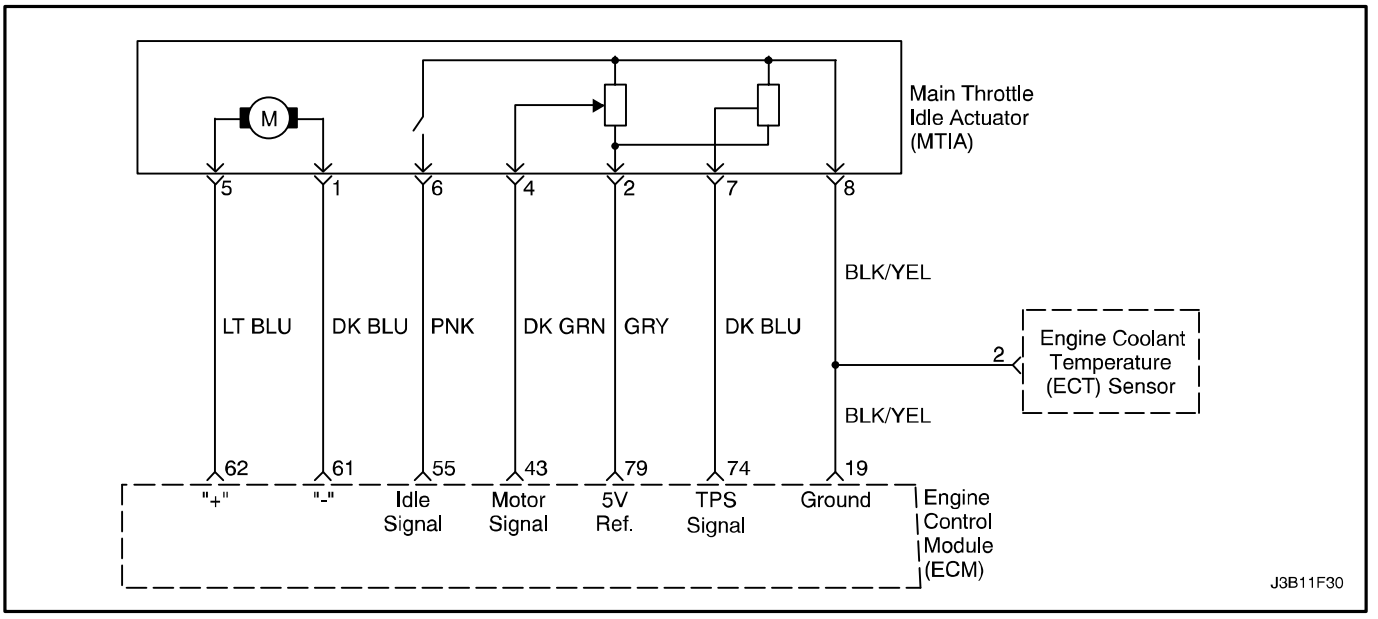
Diagnostic Aids

If the DTC P0122 cannot be duplicated, the information included in the Freeze Frame data can be useful. Use the scan tool DTC information data to determine the status of the DTC. If the DTC occurs intermittently, using the DTC P0121 diagnostic table may help isolate the problem.

DTC P0122 – Throttle Position Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Turn the ignition switch to ON. Is the Malfunction Indicator Lamp (MIL) on steady?	–	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Connect the scan tool to the DLC. 3. Turn the Turn the ignition switch to ON. Are any diagnostic trouble codes (DTCs) displayed?	–	Go to *Step 4*	Try with another scan tool
4	Refer to the applicable DTC table. Is only one DTC identified as valid trouble code P0122?	–	Go to *Step 5*	Go to applicable DTC table and Go to ”Multiple DTC”
5	1. Connect the scan tool to the DLC. 2. Turn the ignition switch to ON. 3. Press the accelerator pedal while watching TPS for smooth changes in the voltage. Does the scan tool show the TPS voltage change smoothly within the value specified?	0.3V–4.8V	Go to ”Diagnostic Aids”	Go to *Step 6*
6	1. Turn the ignition switch to lock. 2. Disconnect the MTIA connector. 3. Measure the voltage between terminal 2 and 8. Does the voltage measure within the value specified?	4.8V–5.0V	Go to *Step 7*	Go to *Step 8*
7	Connect a fused jumper between the MTIA connector terminal 2 and terminal 7. Does the scan tool show the TPS voltage above value specified?	4.8V–5.0V	Go to *Step 13*	Go to *Step 11*
8	Measure the voltage between the MTIA connector 2 and ground. Does the voltage measure within the value specified?	5.0V	Go to *Step 9*	Go to *Step 10*
9	1. Turn the ignition switch to lock. 2. Check for an open or short to ground in the wire between the MTIA connector 8 and ECM connector 19. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*
10	1. Turn the ignition switch to lock. 2. Check for an open or short to ground in the wire between the MTIA connector 2 and ECM connector 79. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*
11	1. Turn the ignition switch to lock. 2. Check for an open or short to ground in the wire between the MTIA connector 7 and ECM connector 74. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
12	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
13	1. Replace the MTIA. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
14	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 15*	–
15	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0123

THROTTLE POSITION SENSOR HIGH VOLTAGE

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (05, 195). The characteristics of the airflow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical bowdencable.

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 nearly 5.0 V at idles to about 0.2V to 0.4 V at wide–open throttle. The TPS is one of the most important inputs used by the ECM for fuel control and other functions such as idle, wide open throttle, deceleration enleanment, and acceleration enrichment.

Conditions for Setting the DTC

- TPS voltage is greater than 4.8V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.
- The ECM will default to 20˚C (68˚F) for the first 60 seconds of the engine run time, and then 92 ˚C (198 ˚F).

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

If the DTC P0123 cannot be duplicated, the information included in the Freeze Frame data can be useful. Use the scan tool DTC information data to determine the status of the DTC. If the DTC occurs intermittently, using the DTC P0121 diagnostic table may help isolate the problem.

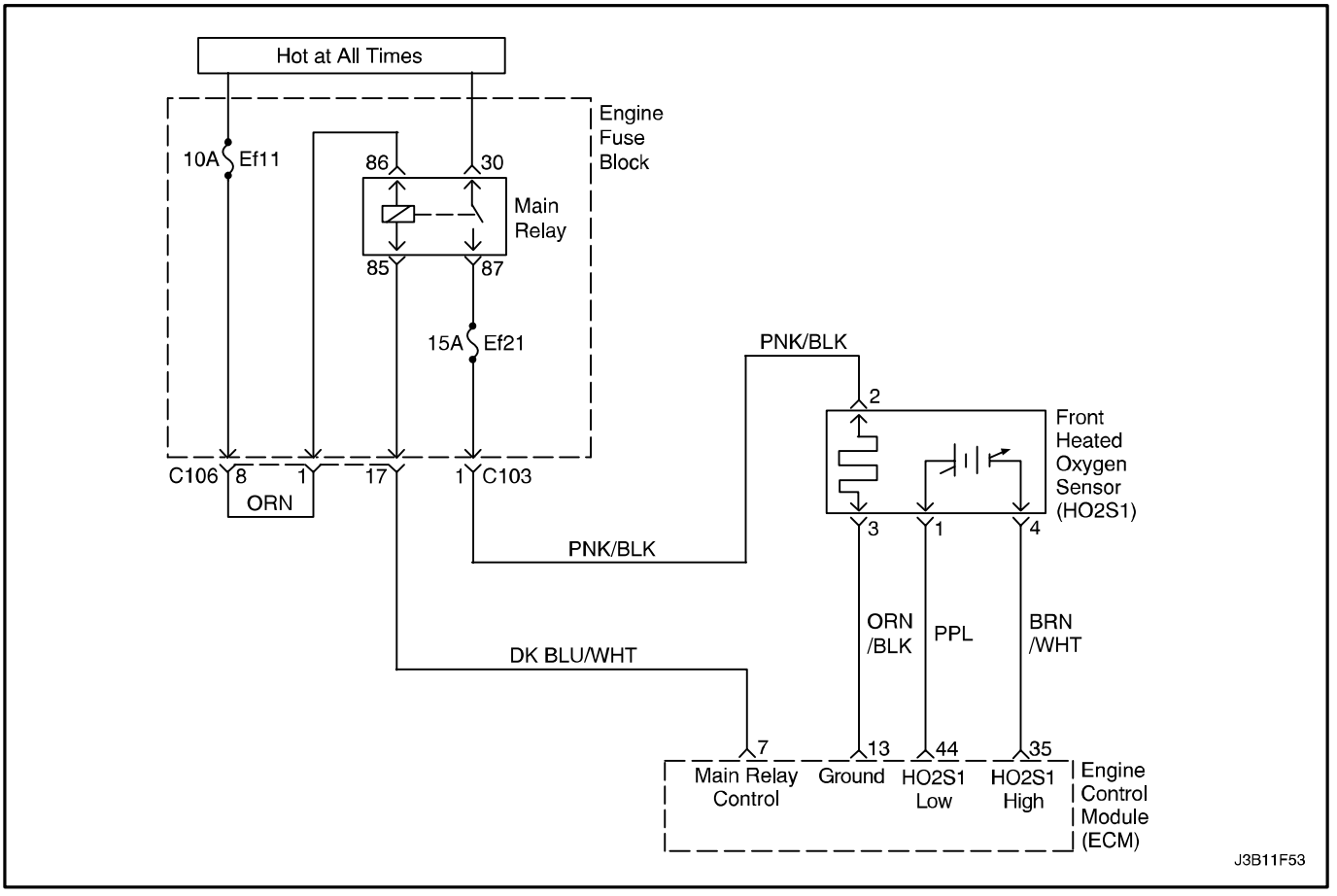
With the ignition ON and the throttle at closed position the voltage should read between 0.20 V and 0.90V and increase steadily to over 4.5V at WOT.

DTCs P0123 and P0113 stored at the same time could be the result of an open sensor ground circuit.

DTC P0123 – Throttle Position Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Turn the ignition switch to ON. Is the Malfunction Indicator Lamp (MIL) on steady?	–	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Connect the scan tool to the DLC. 3. Turn the Turn the ignition switch to ON. Are any diagnostic trouble codes (DTCs) displayed?	–	Go to *Step 4*	Try with another scan tool
4	Refer to the applicable DTC table. Is only one DTC identified as valid trouble code P0122?	–	Go to *Step 5*	Go to applicable DTC table and Go to ”Multiple DTC”
5	1. Connect the scan tool to the DLC. 2. Turn the ignition switch to ON. 3. Press the accelerator pedal while watching TPS for smooth changes in the voltage. Does the scan tool show the TPS voltage change smoothly within the value specified?	0.3V–4.8V	Go to ”Diagnostic Aids”	Go to *Step 6*
6	1. Turn the ignition switch to lock. 2. Disconnect the MTIA connector. 3. Measure the voltage between terminal 2 and 8. Does the voltage measure within the value specified?	4.8V–5.0V	Go to *Step 7*	Go to *Step 8*
7	Connect a fused jumper between the MTIA connector terminal 2 and terminal 7. Does the scan tool show the TPS voltage above value specified?	4.8V–5.0V	Go to *Step 13*	Go to *Step 11*
8	Measure the voltage between the MTIA connector 2 and ground. Does the voltage measure within the value specified?	< 5.0V	Go to *Step 9*	Go to *Step 10*
9	1. Turn the ignition switch to lock. 2. Check for short to battery voltage in the wire between the MTIA connector 8 and ECM connector 19. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*
10	1. Turn the ignition switch to lock. 2. Check for short to battery voltage in the wire between the MTIA connector 2 and ECM connector 79. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*
11	1. Turn the ignition switch to lock. 2. Check for short to battery voltage in the wire between the MTIA connector 7 and ECM connector 74. Is the problem found?	–	Go to *Step 12*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
12	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
13	1. Replace the MTIA. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
14	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 15*	–
15	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0131

FRONT HEATED OXYGEN SENSOR LOW VOLTAGE

Circuit Description

The engine control module (ECM) supplies a voltage of about 450mm volts between the ECM terminals 44 and 13. The oxygen (O2) sensor varies the voltage within a range of about 1volt if the exhaust is rich, down to about 100mm volts if the exhaust is lean. The O2 sensor is like an open circuit and produces no voltage when it is below 360˚C(600˚F). An open O2 sensor circuit or a cold O2 sensor causes ”open loop” operation.

Conditions for Setting the DTC

(Case A)

- The engine controls system is in closed loop.
- Engine speed is less than 6,000rpm.
- The oxygen sensor voltage is below 0.07V for at least 40seconds.
- DTCs P0107, P0108, P0117, P0118, P0122, P0123, P0335, P0336, P0341, P0342, P0400, P0404, P0405, P0406 are NOT SET.

(Case B)

- The engine controls system is in closed loop.
- Engine speed is less than 6,000rpm.
- The oxygen sensor voltage is between 0.352 and 0.499 at least 10 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Normal scan tool voltage varies between 0.1volts and 0.9 volts while in closed loop.

Inspect the oxygen (O2) sensor wire. The O2 sensor may be positioned incorrectly and contacting the exhaust manifold.

Check for an intermittent ground in the wire between the O2 sensor and the engine control module.

Perform an injector 2alance test to determine if a restricted fuel injector may be causing the lean condition.

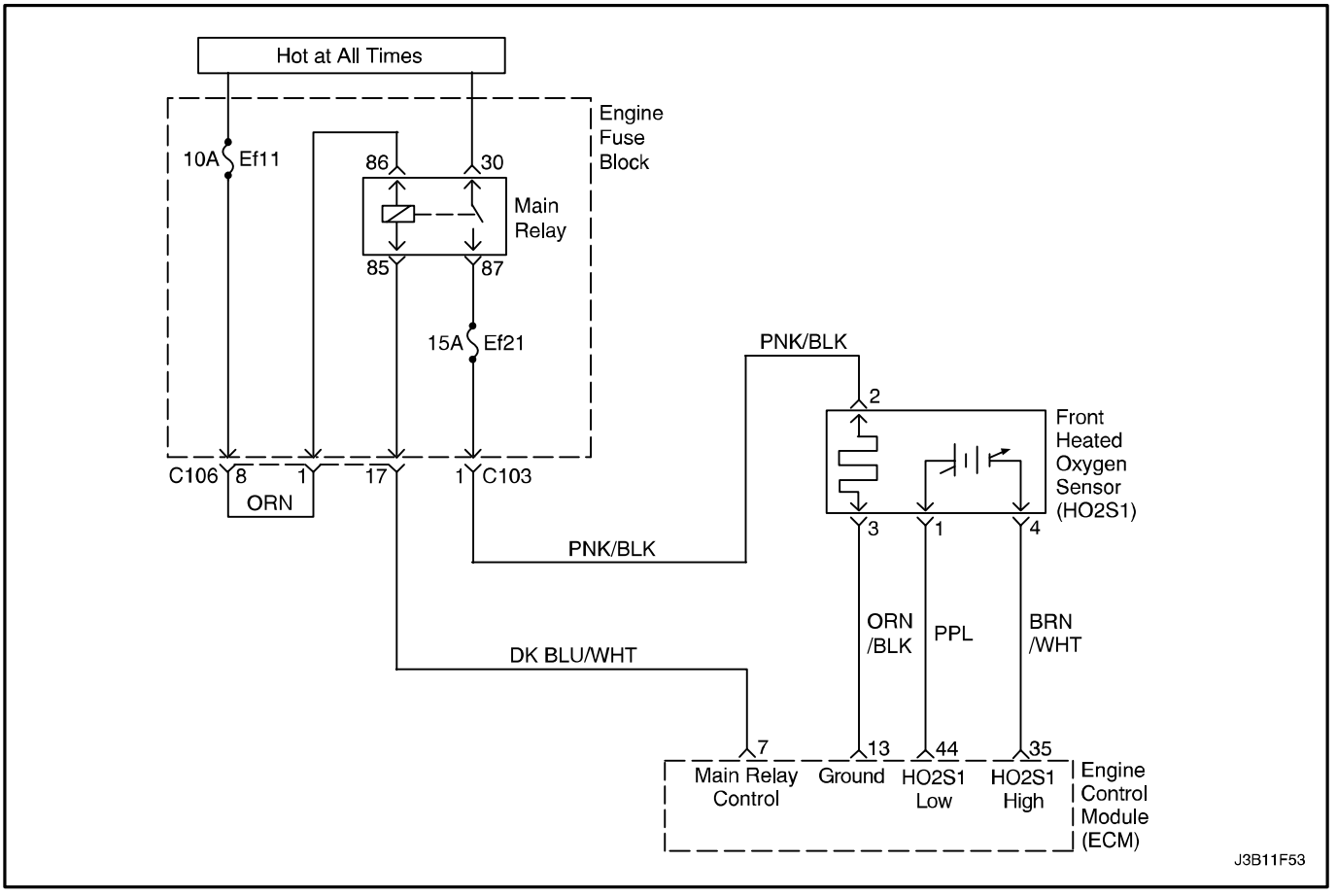
Vacuum of crankcase leaks will cause a lean running condition.

An exhaust manifold gasket leak of a cracked exhaust manifold may cause outside air to be pulled into the exhaust and past the sensor.

DTC P0131 – Front Heated Oxygen Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the data link connector (DLC). 2. Run the engine until it reaches operating temperature. 3. Check for closed loop operation. Does the engine control module(ECM) go into closed loop?	–	Go to *Step 3*	Go to *Step 9*
3	1. Run the until until it reaches operating temperature? 2. Run the engine at 1,200rpm. Does the scan tool read the upstream oxygen(O2) sensor signal voltage between the valve specified?	0.25~0.65V	Go to *Step 5*	Go to *Step 4*
4	Does the scan tool read the Oxygen sensor signal voltage fixed below the valve specified?	0.01V	Go to *Step 7*	Go to ”Diagnostic Aids”
5	1. Disconnect the Oxygen sensor connector. 2. Run the warm engine at idle. Does the scan tool read the Oxygen sensor signal voltage between the valve specified?	0.25~0.65V	Go to ”Diagnostic Aids”	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check the Oxygen sensor wire between the Oxygen sensor and the ECM connector terminal 44 and 13 is open. Is the problem found?	–	Go to *Step 8*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Check the Oxygen sensor wire between the Oxygen sensor and the ECM connector terminal 44 for a short to ground. Is the problem found?	–	Go to *Step 8*	Go to *Step 11*
8	1. Repair the wire or the connector terminal as needed. 2. Clear the any DTCs from the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
9	1. Turn the ignition switch to LOCK. 2. Disconnect the Oxygen sensor connector. 3. Turn the ignition switch to ON. Does the scan tool the Oxygen sensor signal voltage between the valve specified?	0.3~0.6V	Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
10	1. Replace the Oxygen sensor. 2. Clear the 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?	–	Go to *Step 12*	–
12	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0132

FRONT HEATED OXYGEN SENSOR HIGH VOLTAGE

Circuit Description

The engine control module (ECM) supplies a voltage of about 450mm volts between the ECM terminals 44 and 13. The oxygen (O2) sensor varies the voltage within a range of about 1volt if the exhaust is rich, down to about 100mm volts if the exhaust is lean. The O2 sensor is like an open circuit and produces no voltage when it is below 360˚C(600˚F). An open O2 sensor circuit or a cold O2 sensor causes ”open loop” operation.

Conditions for Setting the DTC

- The oxygen sensor voltage is more than 1.2V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

Normal scan tool voltage varies between 0.1volts and 0.9 volts while in closed loop.

Inspect the oxygen (O2) sensor wire. The O2 sensor may be positioned incorrectly and contacting the exhaust manifold.

Check for an intermittent ground in the wire between the O2 sensor and the engine control module.

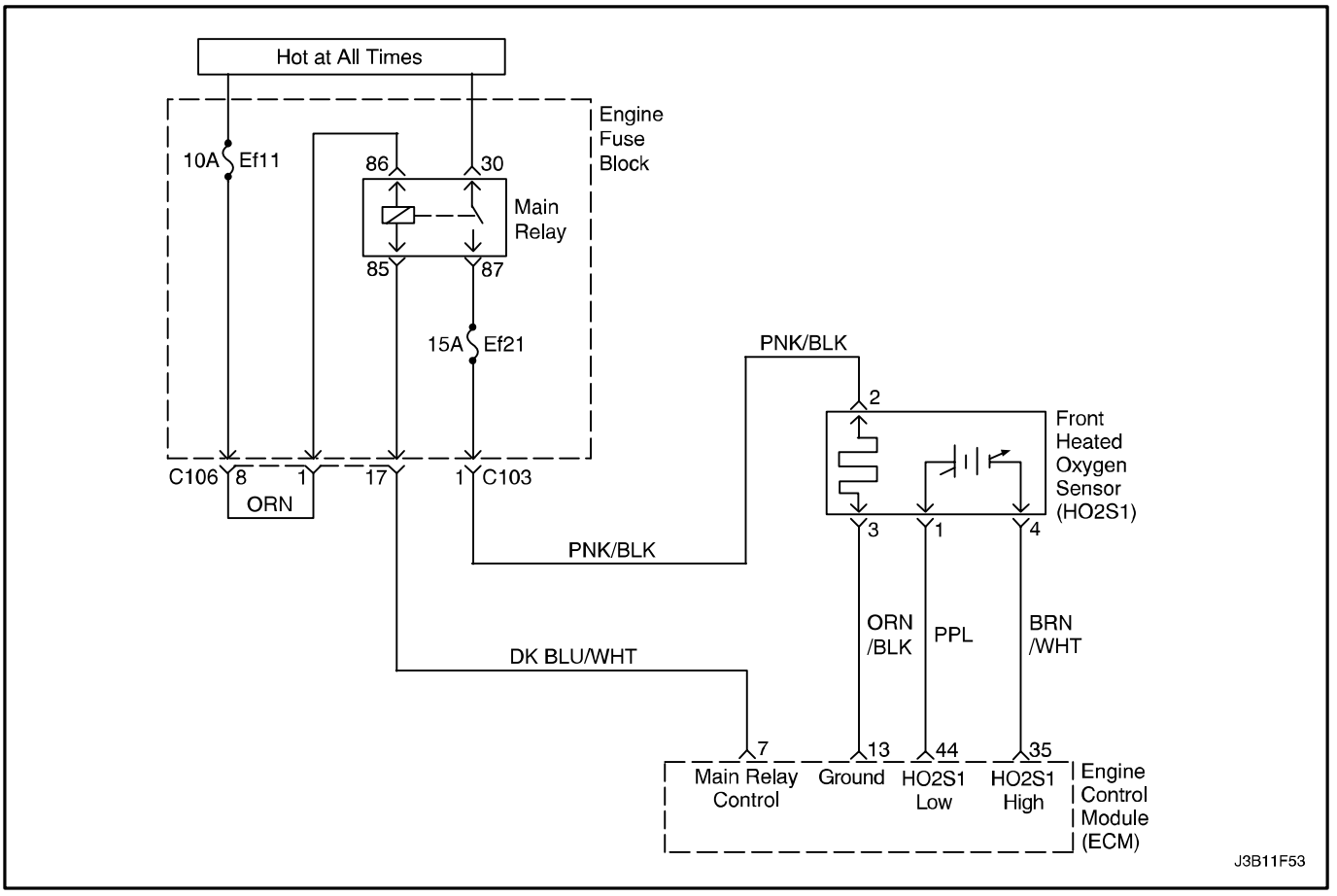
Perform an injector 2alance test to determine if a restricted fuel injector may be causing the lean condition.

Vacuum of crankcase leaks will cause a lean running condition.

An exhaust manifold gasket leak of a cracked exhaust manifold may cause outside air to be pulled into the exhaust and past the sensor.

DTC P0132 – Front Heated Oxygen Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON, with the engine OFF. 2. Install a scan tool. 3. Engine at operating temperature. 4. Run the engine at 1,200rpm. Does the scan tool the upstream oxygen(O2) sensor1 voltage within the value specified?	More than 1.2V	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the O2 sensor connector and engine control module (ECM) connector. 3. Check the O2 sensor wire between the O2 sensor and ECM connector terminal 44 for short to battery voltage. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	1. Repair the wire of the connector terminal as needed. 2. Clear the DTCs from the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
5	1. Turn the ignition switch to LOCK. 2. Replace the O2 sensor. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 7*	–
6	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 7*	–
7	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0133

FRONT HEATED OXYGEN SENSOR NO ACTIVITY

Circuit Description

The engine control module (ECM) supplies a voltage of about 450mm volts between the ECM terminals 44 and 13. The oxygen (O2) sensor varies the voltage within a range of about 1volt if the exhaust is rich, down to about 100mm volts if the exhaust is lean. The O2 sensor is like an open circuit and produces no voltage when it is below 360˚C(600˚F). An open O2 sensor circuit or a cold O2 sensor causes ”open loop” operation.

Conditions for Setting the DTC

- The engine controls system is in closed loop.
- Engine Coolant Temperature is higher than 70˚C(158˚F). (1.4L DOHC)
- Engine Coolant Temperature is higher than 60˚C(140˚F). (1.6L DOHC)
- The mass air flow (MAF) is between 100mg/tdc and 250mg/tdc. (1.4L DOHC)
- The mass air flow (MAF) is between 60mg/tdc and 160mg/tdc. (1.6L DOHC)
- The engine speed is between 1,700 rpm and 2,200 rpm. (1.4L DOHC)
- The engine speed is between 1,800 rpm and 2,900 rpm. (1.6L DOHC)
- The vehicle speed is between 40 km/h (24.9 mph) and 60 km/h (37.3 mph). (1.4L DOHC)
- The vehicle speed is between 45 km/h (28.0 mph) and 55 km/h (34.2 mph). (1.6L DOHC)
- The manifold air pressure is higher than 700hPa.
- The ignition is at 10 volts.
- The upstream O2 sensor periods higher than 1.6 seconds.
- A number of glitches higher than 5 during the test.
- DTCs P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0132, P0137, P0138, P1671, P0300, P0335, P0336, P0341, P0400, P0404, P0405, P0444, P0445 are NOT SET.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

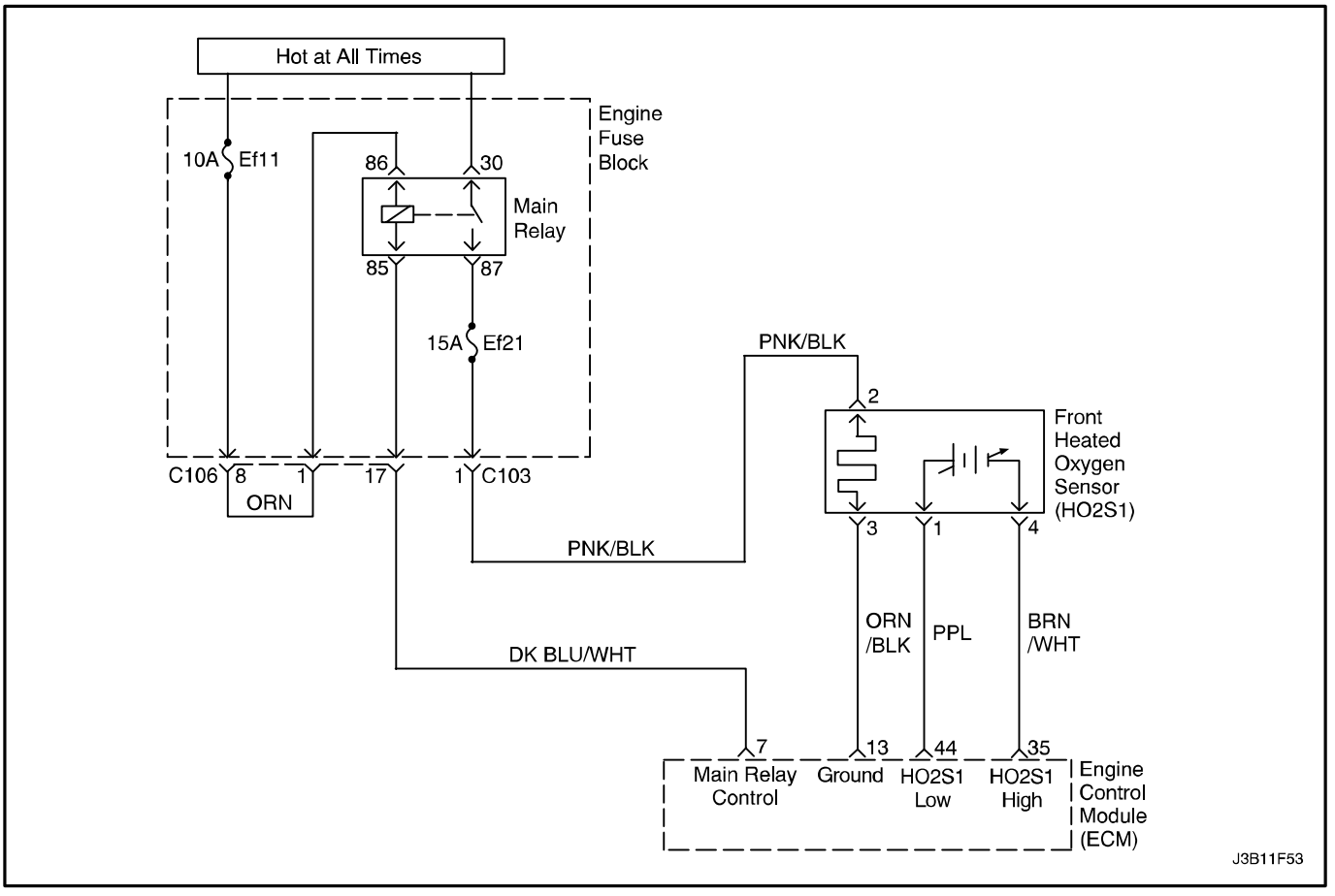
Diagnostic Aids

Normal scan tool voltage varies between 0.15 to 8.5mV while in Closed Loop. If DTC P0133 is intermittent, refer to ”Intermittents” in this section.

DTC P0133 – Front Heated Oxygen Sensor No Activity

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the data link connector (DLC). 2. Run the engine until it reaches operating temperature. 3. Check for the closed loop operation. Does the scan tool indicate the closed loop?	–	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition switch to LOCK. 2. Review the freeze frame data and note the parameters. 3. Operate the vehicle within the freeze frame conditions and Conditions for Setting the DTC. Does the scan tool indicate the closed loop?	–	Go to *Step 12*	Go to *Step 4*
4	1. Disconnect the upstream oxygen(O2) sensor connector. 2. Jumper the oxygen sensor connector terminal 1 to ground. 3. Turn the ignition switch to ON. Does the scan tool read the oxygen sensor signal voltage the specified valve?	0.4~0.5V	Go to *Step 5*	Go to *Step 8*
5	Check the oxygen sensorconnector for malfunction terminals or poor connection and repair as necessary. Is repair necessary?	–	Go to *Step 12*	Go to *Step 6*
6	1. Run the engine at idle. 2. Remove the jumper wire. 3. Measure the voltage between the oxygen sensor connector terminal 3 and ground. Does the oxygen sensor voltage measure above the specified value?	0.6V	Go to *Step 7*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Measure the voltage between the upstream O2 sensor connector terminal 3 and ground. Does the oxygen sensor voltage measure above the specified value?	0.3V	Go to *Step 9*	Go to *Step 11*
8	Repair the wire or the connector between the upstre O2 sensor terminal 1 and the engine control module (ECM) terminal 44 is open or a short to ground. Is the repair complete?	–	Go to *Step 11*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
9	Repair the wire and the connector terminal between the oxygen sensor connector terminal 3 and the ECM connector terminal 13 is open or a short to ground. Is the repair complete?	–	Go to *Step 12*	Go to *Step 10*
10	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
11	Replace the O2 sensor. Is the repair complete?	–	Go to *Step 12*	–
12	1. Clear any DTCs from the ECM. 2. Perform the diagnostic system check. Is the repair complete.	–	Go to *Step 13*	–
13	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0135

FRONT HEATED OXYGEN SENSOR HEATER CIRCUIT NOT FUNCTIONING

Circuit Description

Heated oxygen sensors (HO2S) are used for fuel control and post catalyst monitoring. Each HO2S compares the oxygen content of the surrounding air with the oxygen content in the exhaust stream. The HO2S must reach operating temperature to provide an accurate voltage signal. A heating element inside the HO2S minmizes the time required for the sensor to reach operating temperature. Voltage is provided to the heater by the ignition 1 voltage circuit through a fuse. With the engine running, ground is provided to the heater by the HO2S heater low control circuit, through a low side driver within the engine control module (ECM). The ECM monitors the current flow through the heater for diagnosis.

If the ECM detects that the HO2S heater current is above or blelow a specified range, DTC P0135 seats.

Conditions for Setting the DTC

- DTCs P0106, P0117, P0118, P1017 are not set.
- Engine run time is greater than 30 seconds.
- Filtered O2 heater current is less than 0.1 amps.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history Diagnostic Trouble Code (DTC) is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

An intermittent may be caused by rubbed through wire insulation or a wire contacting the exhaust.

Check for poor connection or damaged harness – inspect harness connectors for the following conditions:

- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection

- Damaged harness

Test Description

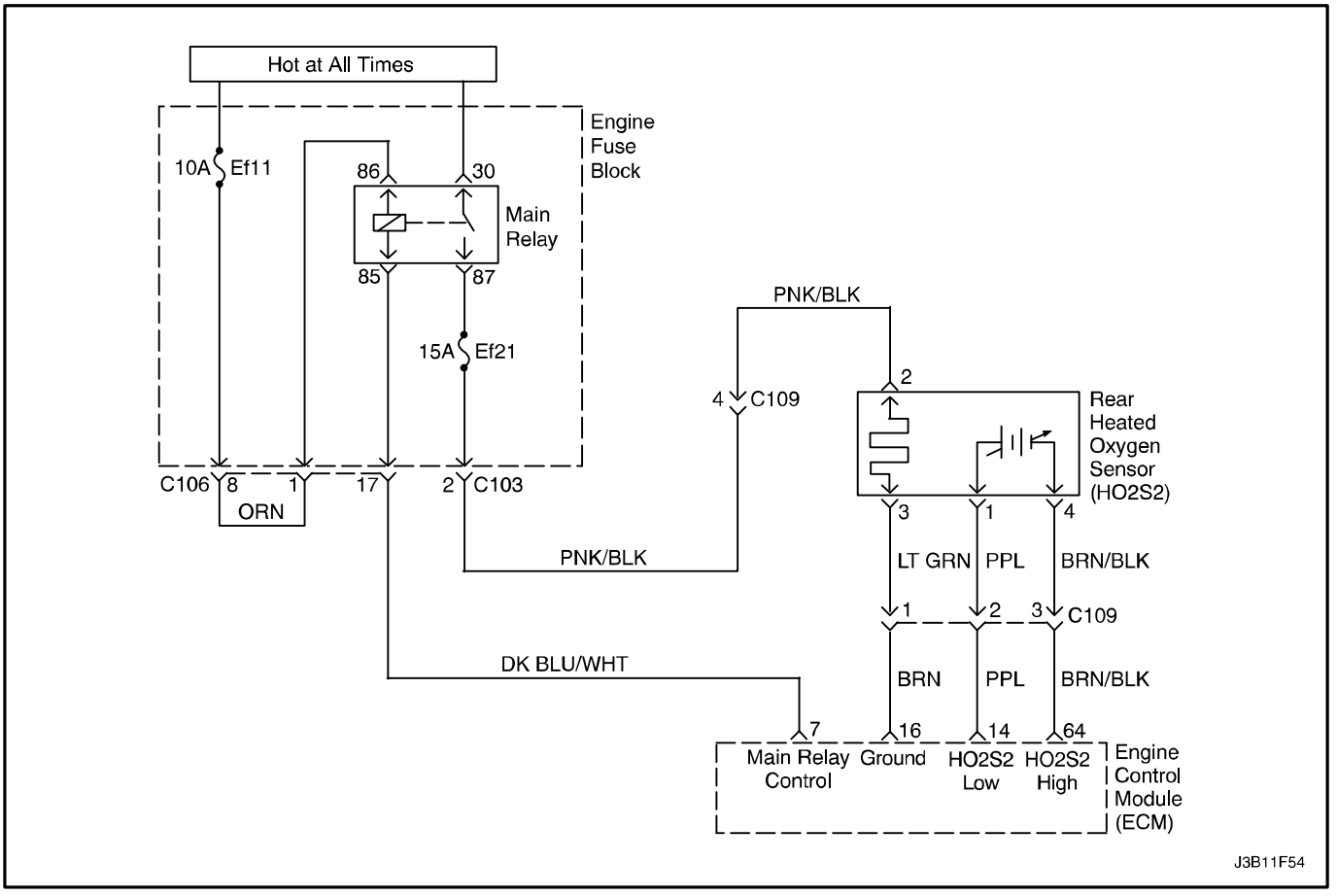
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0135 is the result of a hard failure or an intermittent condition. With the ignition ON, engine OFF, the HO2S1 voltage displayed on the scan tool should change within several minutes toward 0 or 1 volt, indicating that the heater is working properly.
3. Probing terminal 4 of the HO2S1 connector verifies if voltage is available to the HO2S1 heater.
4. If voltage is available at the connector, than it becomes a good voltage source to check for a ground at terminal 3.
5. Determines if voltage is not available at the HO2S1 due to an open in the HO2S1 fuse or open ignition feed circuit. If the fuse is open, determine if it was due to a short in the ignition feed circuit before replacing the fuse.

DTC P0135 – Front Heated Oxygen Sensor Heater Circuit Not Functioning

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	**Notice :** If the engine has just been operating, allow the engine to cool for about one–half hour before proceeding. 1. Turn the ignition switch ON, with the engine OFF. 2. Install a scan tool. Does the Front Heated Oxygen Sensor (HO2S1) voltage gradually change toward the specified voltage?	0 v or 1 v	Go to *Step 13*	Go to *Step 3*
3	1. Disconnect the HO2S1 electrical connector. 2. With a test light connected to ground, probe the ignition feed circuit, terminal 2 of the connector. Does the test light illuminate?	–	Go to *Step 4*	Go to *Step 5*
4	Connect a test light between the ignition feed and ground circuits, terminal 2 and 3 of the connector. Does the test light illuminate?	–	Go to *Step 6*	Go to *Step 7*
5	Inspect the fuse in the engine fuse block. Is the fuse open?	–	Go to *Step 8*	Go to *Step 9*
6	Check the connections terminal 2 and 1 at the HO2S2 connector and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 10*
7	Check the connections terminal 4 at the HO2S1 connector and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 11*
8	1. Check for a short to ground in the HO2S1 ignition feed circuit and repair as necessary? 2. Replace open fuse. Is the action complete?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
9	Check the connections terminal 2 at the HO2S1 connector and repair as necessary. Is the repair complete?	–	Go to *Step 13*	Go to *Step 12*
10	Replace the HO2S1 sensor. Is the action complete?	–	Go to *Step 13*	–
11	Repair the open in the ground circuit. Is the action complete?	–	Go to *Step 13*	–
12	Repair the open in the ignition feed circuit. Is the action complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0137

REAR HEATED OXYGEN SENSOR LOW VOLTAGE

Circuit Description

The engine control module (ECM) supplies a voltage of about 450mm volts between the ECM terminals 14 and 16. The oxygen (O2) sensor varies the voltage within a range of about 1volt if the exhaust is rich, down to about 100mm volts if the exhaust is lean. The O2 sensor is like an open circuit and produces no voltage when it is below 360˚C(600˚F). An open O2 sensor circuit or a cold O2 sensor causes ”open loop” operation.

Conditions for Setting the DTC

(Case A)

- The engine controls system is in closed loop.
- Engine speed is less than 6,000rpm.
- The heated oxygen sensor voltage is below 0.07V for at least 40 seconds.
- DTCs P0107, P0108, P0117, P0118, P0122, P0123, P0335, P0336, P0341, P0342, P0400, P0404, P0405, P0406 are NOT SET.

(Case B)

- The engine controls system is in full fuel cut off.
- Engine speed is less than 6,000rpm.
- The heated oxygen sensor voltage is between 0.352 and 0.499 at least 10 seconds.
- DTCs P0107, P0108 and P0141 are NOT SET.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

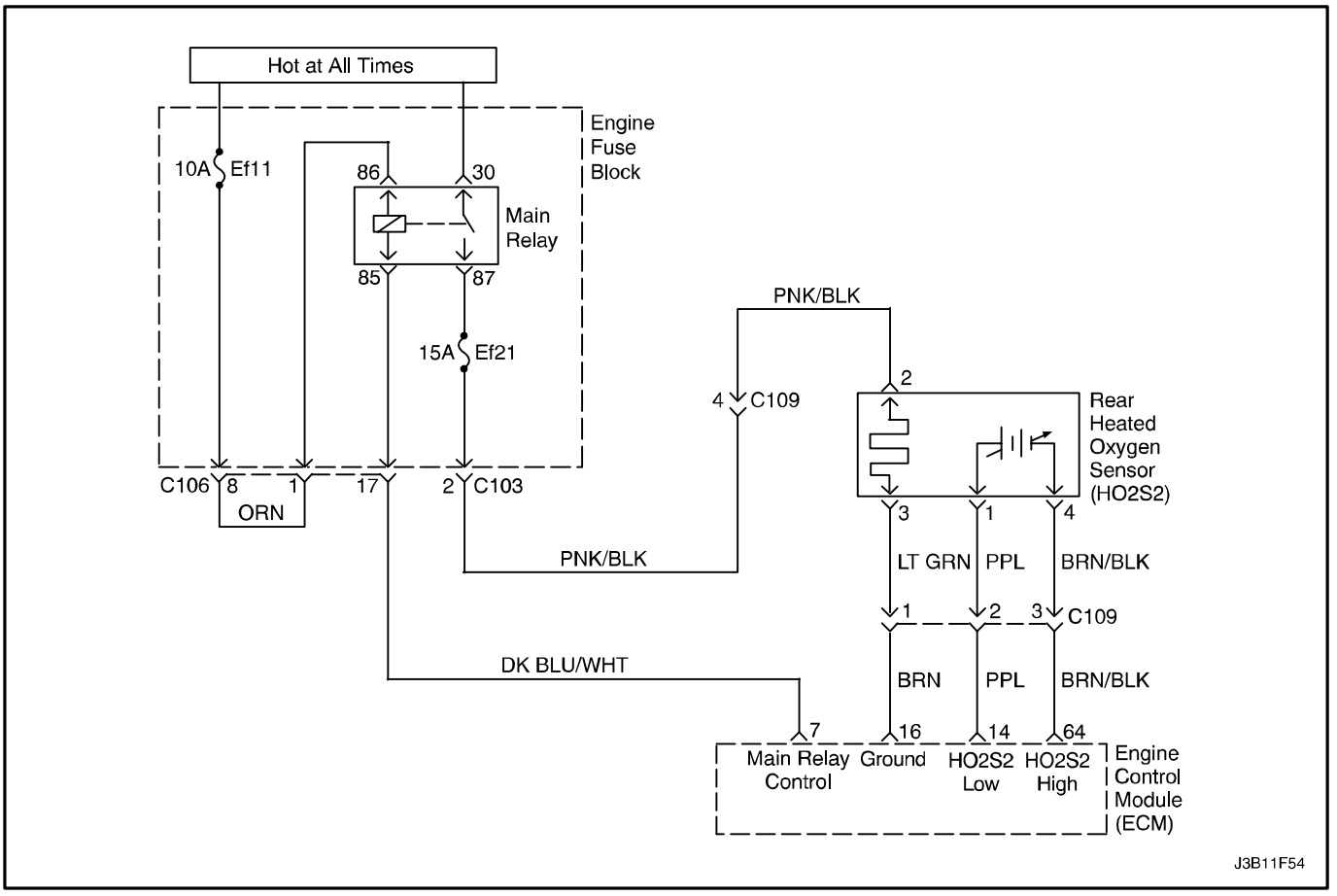
- Normal scan tool voltage varies between 0.1 volts and 0.9 volts while in closed loop.
- Inspect the oxygen (O2) sensor wire. The O2 sensor may be positioned incorrectly and contacting the exhaust manifold.

- Check for an intermittent ground in the wire between the O2 sensor and the engine control module.
- Perform an injector 2alance test to determine if a restricted fuel injector may be causing the lean condition.
- Vacuum of crankcase leaks will cause a lean running condition.
- An exhaust manifold gasket leak of a cracked exhaust manifold may cause outside air to be pulled into the exhaust and past the sensor.

DTC P0137 – Rear Heated Oxygen Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON, with the engine OFF. 2. Install a scan tool. 3. Engine at operating temperature. 4. Run the engine at 1,200rpm. Does the scan tool the downstream oxygen (O2) sensor1 voltage within the value specified?	0.07–0.52V	Go to *Step 4*	Go to *Step 3*
3	Does the scan tool the heated oxygen (O2) sensor1 voltage within the value specified?	0.1V	Go to *Step 9*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch to LOCK. 2. Disconnect the Heated O2 sensor connector and engine control module (ECM) connector. 3. Check the Heated O2 sensor wire between the Heated O2 sensor connector terminal 3 and ECM connector terminal 36 for short to ground. Is the problem found?	–	Go to *Step 5*	Go to *Step 6*
5	1. Repair the wire of the connector terminal as needed. 2. Clear the DTCs from the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
6	1. Turn the ignition switch to LOCK. 2. Disconnect the Heated O2 sensor connector and engine control module (ECM) connector. 3. Check the O2 sensor wire between the O2 sensor connector terminal 2 and ECM connector terminal 64 for short to ground. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire of the connector terminal as needed. 2. Clear the DTCs from the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
8	1. Turn the ignition switch to LOCK. 2. Replace the Heated O2 sensor. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0138

REAR HEATED OXYGEN SENSOR HIGH VOLTAGE

Circuit Description

The engine control module (ECM) supplies a voltage of about 450mm volts between the ECM terminals 64 and 16. The Heated oxygen (O2) sensor varies the voltage within a range of about 1volt if the exhaust is rich, down to about 100mm volts if the exhaust is lean. The Heated O2 sensor is like an open circuit and produces no voltage when it is below 360˚C(600˚F). An open O2 sensor circuit or a cold O2 sensor causes ”open loop” operation.

Conditions for Setting the DTC

- The Heated oxygen sensor voltage is more than 1.2V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

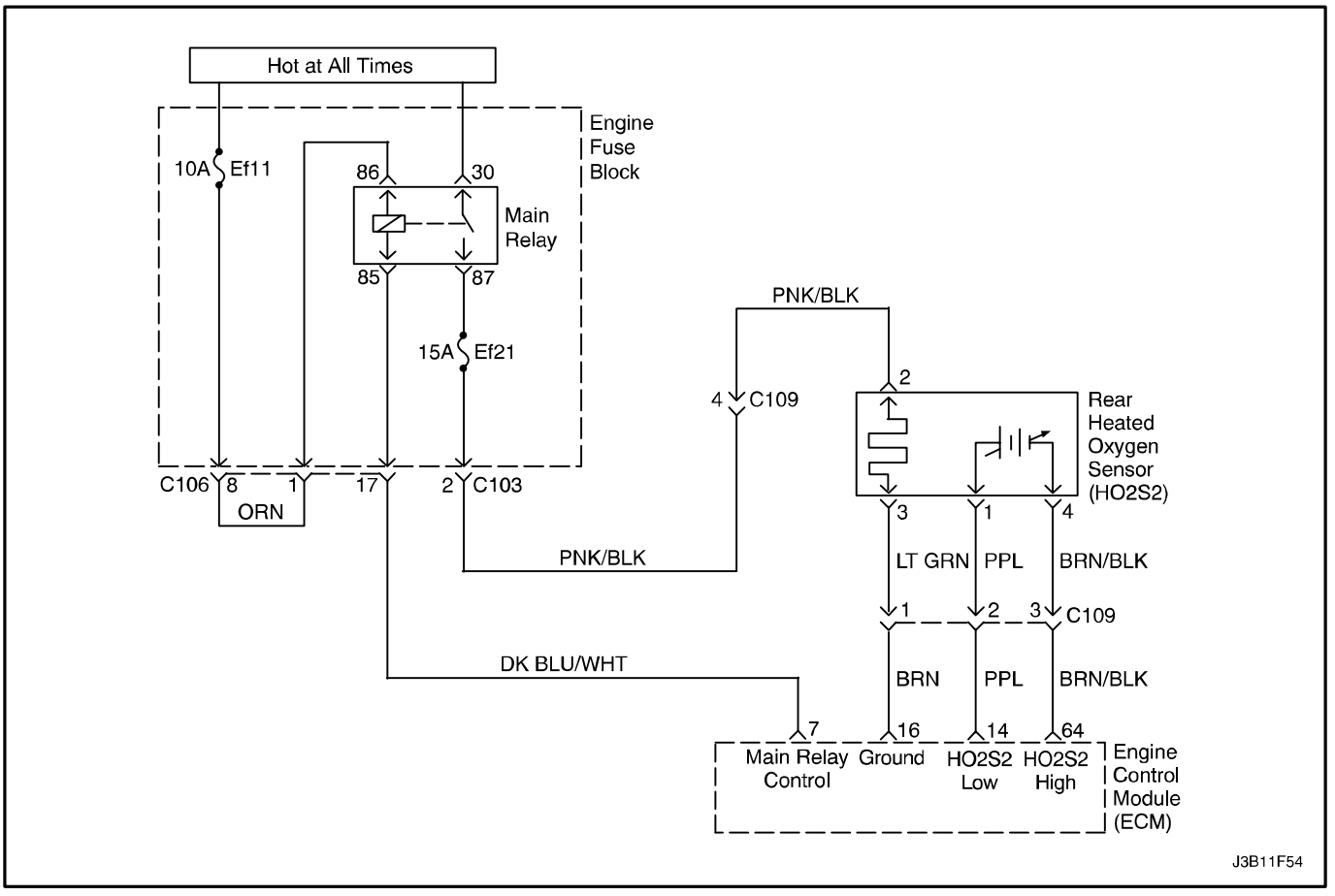
- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

- Normal scan tool voltage varies between 0.1volts and 0.9volts while in closed loop.
- Inspect the oxygen (O2) sensor wire. The O2 sensor may be positioned incorrectly and contacting the exhaust manifold.
- Check for an intermittent ground in the wire between the O2 sensor and the engine control module.
- Perform an injector balance test to determine if a restricted fuel injector may be causing the lean condition.
- Vacuum of crankcase leaks will cause a lean running condition.
- An exhaust manifold gasket leak of a cracked exhaust manifold may cause outside air to be pulled into the exhaust and past the sensor.

DTC P0138 – Rear Heated Oxygen Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON, with the engine OFF. 2. Install a scan tool. 3. Engine at operating temperature. 4. Run the engine at 1,200rpm. Does the scan tool the Heated oxygen(O2) sensor voltage within the value specified?	More than 1.2V	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the Heated O2 sensor connector and engine control module (ECM) connector. 3. Check the Heated O2 sensor wire between the Heated O2 sensor connector terminal 4 and ECM connector terminal 64 for an open or short to battery voltage. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	1. Repair the wire of the connector terminal as needed. 2. Clear the DTCs from the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
5	1. Turn the ignition switch to LOCK. 2. Replace the Heated O2 sensor. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 7*	–
6	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 7*	–
7	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0140

REAR HEATED OXYGEN SENSOR NO ACTIVITY

Circuit Description

The engine control module (ECM) supplies a voltage of about 450mm volts between the ECM terminals 64 and 16. The oxygen (O2) sensor varies the voltage within a range of about 1volt if the exhaust is rich, down to about 100mm volts if the exhaust is lean. The O2 sensor is like an open circuit and produces no voltage when it is below 360˚C(600˚F). An open O2 sensor circuit or a cold O2 sensor causes ”open loop” operation.

Conditions for Setting the DTC

- The engine controls system is in closed loop.
- Engine Coolant Temperature is higher than 75˚C (167˚F). (1.4L DOHC)
- Engine Coolant Temperature is higher than 70˚C (158˚F). (1.6L DOHC)
- The engine speed is between 1,760 rpm and 2,368 rpm. (1.4L DOHC)
- The engine speed is between 1,300 rpm and 3,000 rpm. (1.6L DOHC)
- The vehicle speed is between 47 km/h (29.2 mph) and 80 km/h (49.7 mph). (1.4L DOHC)
- The vehicle speed is between 26 km/h (16.2 mph) and 54 km/h (33.6 mph). (1.6L DOHC)
- The manifold air pressure is higher than 700hPa.
- No transition from rich side to lean side or lean side to rich side during 7.8 seconds even with a forcing of O2 sensor controller.
- DTCs P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0137, P0138, P1671, P0300, P0335, P0336, P0341, P0400, P0404, P0405, P0644, P0645 are NOT SET.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

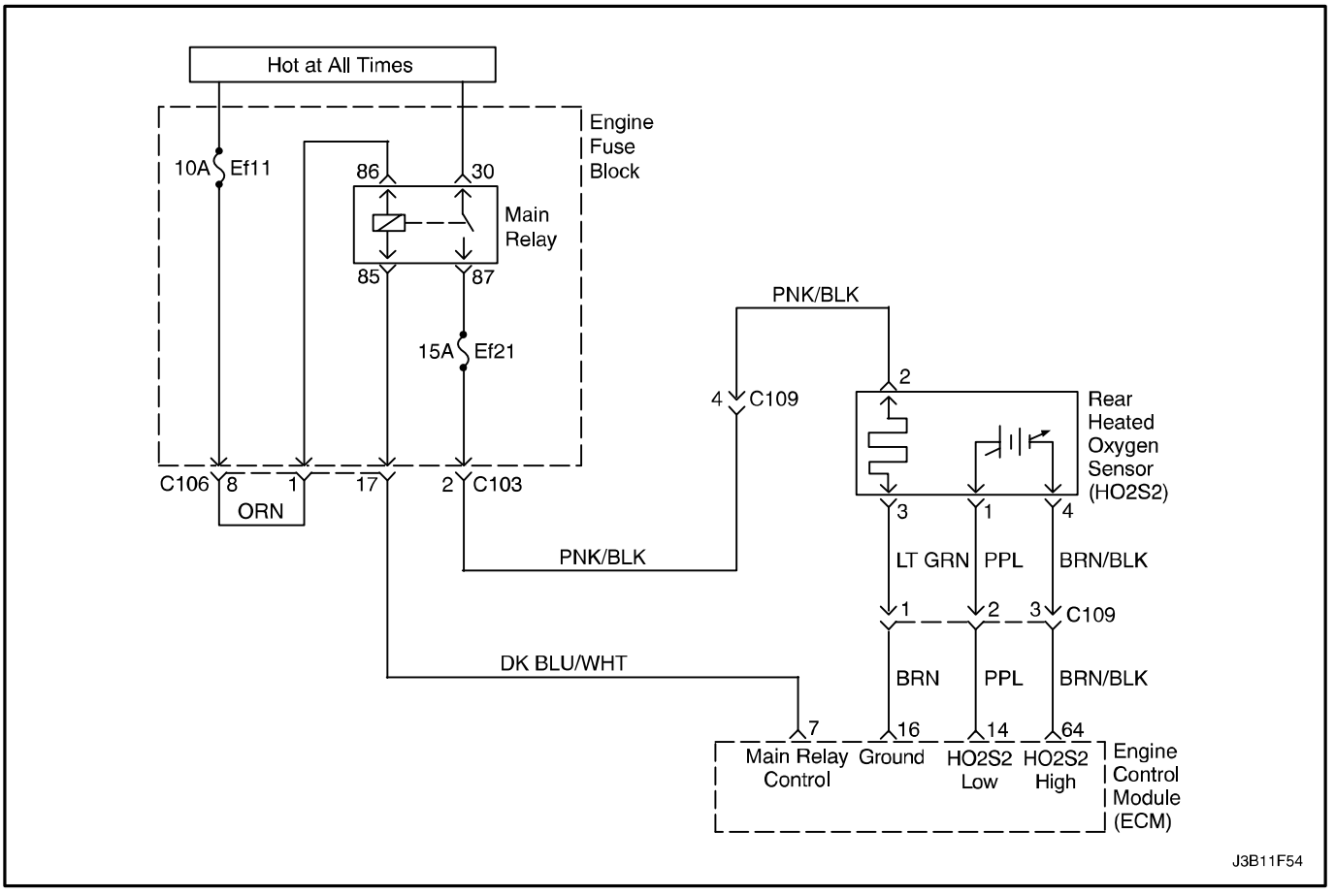
Diagnostic Aids

Normal scan tool voltage varies between 0.15 to 8.5mV while in Closed Loop. If DTC P0140 is intermittent, refer to ”Intermittents” in this section.

DTC P0140 – Rear Heated Oxygen Sensor No Activity

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Run the engine to above the specified operating temperature. 2. Install a scan tool. 3. Operate the engine above the specified rpm for 2 minuets. Does the scan tool the indicate Closed Loop?	80˚C(176˚F) 1,200rpm	Go to *Step 3*	Go to *Step 4*
3	1. Turn the Turn the ignition switch to ON. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the freeze frame conditions and Conditions for Setting the DTC as noted? Does the scan tool the indicate Closed Loop?	–	Go to *Step 12*	Go to *Step 4*
4	Disconnect the Heated O2 sensor connector and jumper the Heated O2 sensor low circuit, terminal 3 to ground. Is the HO2 voltage below the specified value and does the scan tool indicate the heated oxygen sensor heater voltage within the specified value?	0.5V	Go to *Step 5*	Go to *Step 6*
5	Check the Heated O2 sensor connector for malfunction terminals or poor connection and repair as necessary. Is repair necessary?	–	Go to *Step 12*	Go to *Step 9*
6	1. Turn the ignition switch to On. 2. Remove the jumper wire. 3. Using a digital voltmeter(DVM), measure the voltage between the Heated O2 sensor signal circuit, terminal 4 to ground. Does the Heated O2 sensor voltage measure above the specified value?	0.6V	Go to *Step 10*	Go to *Step 9*
7	Does the Heated O2 sensor voltage measure below the specified value?	0.3V	Go to *Step 11*	Go to *Step 8*
8	Check the Heated O2 sensor ground circuit, terminal 3 for an open or poor connection and repair as necessary. Is repair necessary?	–	Go to *Step 12*	Go to *Step 8*
9	Check the Heated O2 sensor signal circuit, terminal 4 for an open or poor connection and repair as necessary. Is repair necessary?	–	Go to *Step 12*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
10	1. If disconnected, reconnect Heated O2 sensor connector. 2. Using the scan tool, clear the DTCs. 3. Start the engine and idle at normal operating temperature. 4. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicated that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
11	1. Turn the ignition switch to LOCK. 2. Replace the Heated O2 sensor. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 15*	–
12	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 15*	–
13	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0141

REAR HEATED OXYGEN SENSOR HEATER MALFUNCTION

Circuit Description

The engine control module (ECM) supplies a voltage of about 450mm volts between the ECM terminals 14 and 16. The oxygen (O2) sensor varies the voltage within a range of about 1volt if the exhaust is rich, down to about 100mm volts if the exhaust is lean. The O2 sensor is like an open circuit and produces no voltage when it is below 360˚C(600˚F). An open O2 sensor circuit or a cold O2 sensor causes ”open loop” operation.

Conditions for Setting the DTC

- The heated O2 sensor heater resistance is less than 0 Ω or greater than 160 Ω. (1.4L DOHC)
- The heated O2 sensor heater resistance is less than 10 Ω or greater than 30 Ω. (1.6L DOHC)

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The coolant fan turns ON.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

- Normal scan tool voltage varies between 0.1volts and 0.9 volts while in closed loop.
- Inspect the oxygen (O2) sensor wire. The O2 sensor may be positioned incorrectly and contacting the exhaust manifold.
- Check for an intermittent ground in the wire between the O2 sensor and the engine control module.
- Perform an injector 2alance test to determine if a restricted fuel injector may be causing the lean condition.
- Vacuum of crankcase leaks will cause a lean running condition.

- An exhaust manifold gasket leak of a cracked exhaust manifold may cause outside air to be pulled into the exhaust and past the sensor.

DTC P0141 – Rear Heated Oxygen Sensor Heater Malfunction

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the Heated O2 sensor connector and engine control module (ECM) connector. 3. Check the Heated O2 sensor heater wire between the Heated O2 sensor connector terminal 3 and ECM connector terminal 16 for an open or short to ground. Is the problem found?	–	Go to *Step 3*	Go to *Step 4*
3	1. Repair the wire of the connector terminal as needed. 2. Clear the DTCs from the ECM. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
4	1. Turn the ignition switch to LOCK. 2. Replace the Heated O2 sensor. 3. Road tests the vehicle. 4. Perform the diagnostic system check. Is the replacement complete?	–	Go to *Step 6*	–
5	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0171

FUEL TRIM SYSTEM TOO LEAN

System Description

If the adaptation value threshold is permanently exceeded, the deviation of the adaptive terms enables to detect a slow default coming out. Two time counters (one for the rich side and another one for the lean side) are increased while the lambda controller exceeds the adaptation thresholds. As soon as one of the time counters reaches its maximum value, the error is detected.

The aim of this test is to simulate a failure that would result in exceeding the adaptive terms. Two kinds of failure must be created.

- A lean side deviation: P0171
- A rich side deviation : P0172

It is thus necessary to determine, for each kind of failure, the limit good and the limit bad. For a given failure, measure the emission threshold until the legal emission thresholds are exceeded.

Note that the problem is due to the emission thresholds required, it is not simple to disturb the system so that the emission thresholds will be exceeded. The tuning has been made thanks to a dedicated calibration but, as such a procedure is not permitted by the regulation, it is necessary to create some material malfunction (fuel pressure regulator, fuel injector, air leakage...).

Conditions for Setting the DTC

- DTCs P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0132, P0337, P0338, P0341, P0342, P0400, P1319, P1402, P1404, P1405, P1671 and P1672 are not set.
- Coolant temperature is greater than 20˚C (68˚F). (1.4L DOHC)
- Coolant temperature is greater than 80˚C (176˚F). (1.6L DOHC)
- Manifold Absolute Pressure (MAP) is greater than 70 kPa (10.2 psi).
- System is in closed loop.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

Important : After repairs, use the scan tool Fuel Trim Reset function to reset the long–term fuel trim to 128 (0%).

- Fuel pressure – The system will be lean if the pressure is too low. It may be necessary to monitor fuel pressure while driving the vehicle at various road speeds and/or loads to confirm.
- Map sensor – An output that causes the ECM to sense a lower than normal manifold pressure (high vacuum) can cause the system to go lean. Disconnecting the MAP sensor will allow the ECM to substitute a fixed (default) value for the MAP sensor. If the lean condition is gone when the sensor is disconnected, substitute a known good sensor and recheck.
- Fuel contamination – Water, in even small amounts, near the in–tank fuel pump inlet can be delivered to the injector. The water causes a lean exhaust and can set DTC P0171.

Check for poor O2S or MAP sensor connection at the ECM. Inspect the harness connectors for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection

Inspect the wiring harness for damage. If the harness appears to be OK, observe the O2S display on the scan tool while moving the connectors and the wiring harness related to the engine harness. A change in the display will indicate the location of the fault.

Check the brake power booster check valve for possible leaks.

DTC P0171 – Fuel Trim System Too Lean

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Install the scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Are any component related Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	With the engine running, operate the vehicle until the LOOP STATUS indicates closed. Is the Long Term Fuel Trim value below the specified value?	27%	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Does the Long Term Fuel Trim value go below the specified value while operating under the specified conditions?	27%	Go to *Step 16*	Go to *Step 5*
5	Visually/physically check the following items: • Vacuum hoses for splits, kinks and improper connections. • Crankcase ventilation oil/air separator for proper installation. • Exhaust system for corrosion, leaks, loose or missing hardware. • Oxygen sensor (O2S) is installed securely and the pigtail harness is not contacting exhaust manifold or engine. • Fuel for excessive water, alcohol, or other contaminants. • Engine Control Module (ECM) and sensor grounds are clean, tight, and in their proper locations. Do any of the above checks isolate a condition requiring repair?	–	Go to *Step 7*	Go to *Step 6*
6	1. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector. 2. Operate the vehicle in Closed Loop while monitoring the Long Term Fuel Trim value. Is the Long Term Fuel Trim value below the specified value?	27%	Go to *Step 15*	Go to *Step 9*
7	1. Repair the malfunction found in Step 5. 2. Recheck the Long Term Fuel Trim value while operating the engine. Is the Long Term Fuel Trim value below the specified value?	27%	Go to *Step 8*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
8	Lean condition is not present. Does a driveability problem exist?	–	Go to ”Symptom Diagnosis”	Go to *Step 16*
9	1. Visually/physically inspect the following items for vacuum leaks: • Intake manifold. • Throttle body. • Injector O–rings. 2. Repair any leaks found as necessary. Is the repair complete?	–	Go to *Step 16*	Go to *Step 16*
10	Allow the engine to idle. Are the Idle Air Control (IAC) counts above the specified value?	5	Go to *Step 11*	Go to *Step 12*
11	Check the fuel for excessive water, alcohol, or other contaminants and correct the contaminated fuel condition if present. Is the repair complete?	–	Go to *Step 16*	Go to *Step 13*
12	Check the IAC valve performance. Refer to ”DTC P0506 Idle Speed RPM Lower Than Desired Idle Speed” or ”DTC P0507 Idle Speed RPM Higher Than Desired Idle Speed” in this section and repair as necessary. Is the repair complete?	–	Go to *Step 16*	Go to *Step 13*
13	1. Connect a fuel pressure gauge to the fuel system. 2. Turn the ignition OFF for at least 10 seconds. 3. Turn the ignition ON, with the engine OFF. The fuel pump will run for approximately 2–3 seconds. It may be necessary to cycle the ignition switch ON more than once to obtain maximum fuel pressure. 4. Note the fuel pressure with the fuel pump running. The pressure should be within the specified value. When the fuel pump stops, the pressure may vary slightly then hold steady. Is the fuel pressure steady and does the fuel pressure hold?	241–276 kPa (35–40 psi)	Go to *Step 14*	Go to ”Fuel System Diagnosis”
14	1. Start and idle the engine at normal operating temperature. 2. The fuel pressure noted in the above step should drop by the indicated value. Does the fuel pressure drop by the indicated value?	21–69 kPa (3–10 psi)	Go to ”Fuel Injector Balance Test”	Go to ”Fuel System Diagnosis”
15	Replace the MAP sensor. Is the action complete?	–	Go to *Step 16*	–

Step	Action	Value(s)	Yes	No
16	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 17*	Go to *Step 2*
17	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0172

FUEL TRIM SYSTEM TOO RICH

System Description

If the adaptation value threshold is permanently exceeded, the deviation of the adaptive terms enables to detect a slow default coming out. Two time counters (one for the rich side and another one for the lean side) are increased while the lambda controller exceeds the adaptation thresholds. As soon as one of the time counters reaches its maximum value, the error is detected.The aim of this test is to simulate a failure that would result in exceeding the adaptive terms. Two kinds of failure must be created.

- A lean side deviation: P0171
- A rich side deviation : P0172

It is thus necessary to determine, for each kind of failure, the limit good and the limit bad. For a given failure, measure the emission threshold until the legal emission thresholds are exceeded.Note that the problem is due to the emission thresholds required, it is not simple to disturb the system so that the emission thresholds will be exceeded. The tuning has been made thanks to a dedicated calibration but, as such a procedure is not permitted by the regulation, it is necessary to create some material malfunction (fuel pressure regulator, fuel injector, air leakage...).

Conditions for Setting the DTC

- DTCs P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0132, P0337, P0338, P0341, P0342, P0400, P1319, P1402, P1404, P1405, P1671 and P1672 are not set.
- Coolant temperature is greater than 20˚C (68˚F). (1.4L DOHC)
- Coolant temperature is greater than 80˚C (176˚F). (1.6L DOHC)
- Manifold Absolute Pressure (MAP) is greater than 70 kPa (10.2 psi).
- System is in closed loop.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

Important : After repairs, use the scan tool Fuel Trim Reset function to reset the long–term fuel trim to 128 (0%).

Check for poor connection at the ECM. Inspect the harness connectors for the following conditions:

- Backed–out terminals.
- Improper mating.
- Broken locks.
- Improperly formed.
- Damaged terminals.
- Poor terminal–to–wire connection.

Inspect the wiring harness for damage. If the harness appears to be OK, observe the O2S display on the scan tool while moving the connectors and the wiring harness related to the engine harness. A change in the display will indicate the location of the fault.

If a DTC P1404 is also set, check the 5 volt reference circuits for a short to voltage.

Check for a restricted exhaust system.

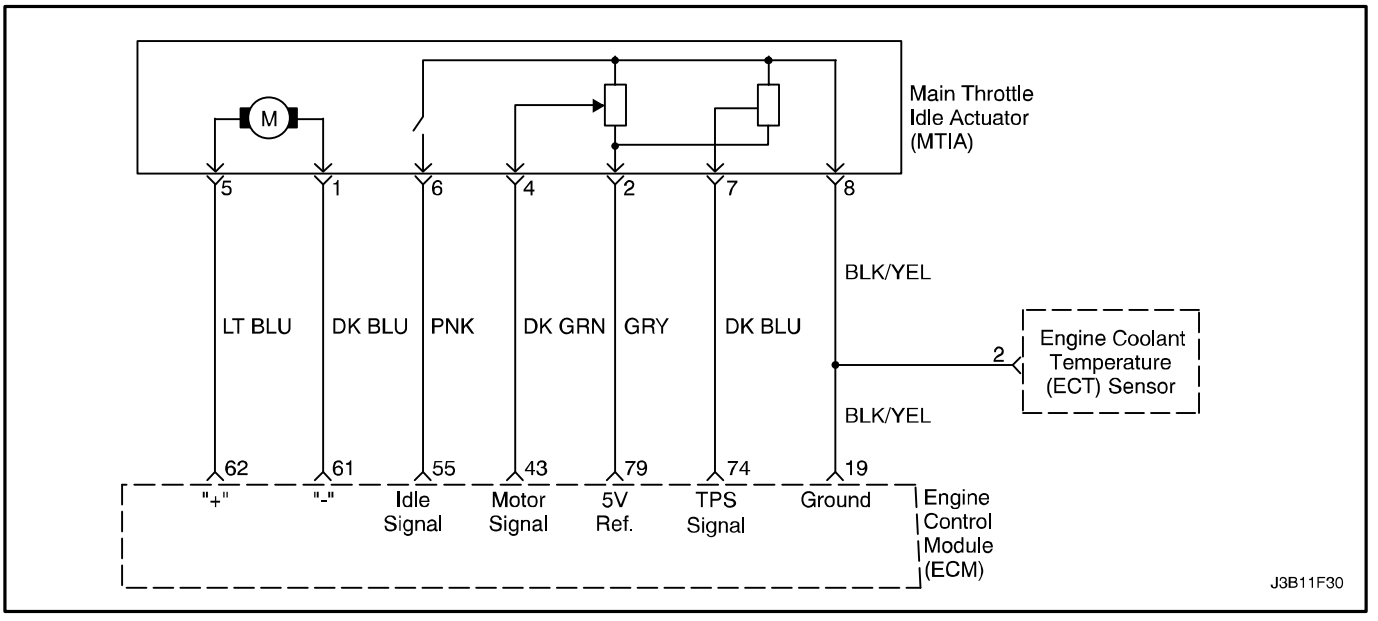
A shorted 5 volt reference circuit may cause a DTC P0172 to set. Check the 5 volt reference sensors for abnormal readings.

DTC P0172 – Fuel Trim System Too Rich

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install the scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Are any component related Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*

Step	Action	Value(s)	Yes	No
3	With the engine running, operate the vehicle until the LOOP STATUS indicates closed. Is the Long Term Fuel Trim value above the specified value?	–30%	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Does the Long Term Fuel Trim value above the specified value while operating under the specified conditions?	–30%	Go to *Step 21*	Go to *Step 5*
5	Visually/physically check the air cleaner filter for excessive dirt or being plugged and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 6*
6	Visually/physically check the air intake system for collapsed or restricted and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 7*
7	Inspect the throttle body inlet for damaged or foreign objects which may partially block the airflow and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 8*
8	1. Turn the ignition OFF. 2. Inspect the throttle bore, throttle plate and Idle Air Control (IAC) passages for clocking and foreign objects and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 9*
9	Start the engine with the vehicle in park or neutral and A/C off and note the idle quality. Is a low or unsteady idle being experienced?	–	Go to *Step 10*	Go to *Step 12*
10	Idle the engine. Are the IAC counts below the specified value?	100	Go to *Step 12*	Go to *Step 11*
11	1. Turn the ignition OFF. 2. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector. 3. Start the engine. 4. Operate the vehicle in Closed Loop while monitoring the Long Term Fuel Trim value. Does the Long Term Fuel Trim value increase above the specified value?	–30%	Go to *Step 20*	Go to *Step 12*
12	Check the IAC valve performance. Refer to ”DTC P0506 Idle Speed RPM Lower Than Desired Idle Speed” or ”DTC P0507 Idle Speed RPM Higher Than Desired Idle Speed” in this section and repair as necessary. Is the repair complete?	–	Go to *Step 21*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
13	1. Disconnect the vacuum hose from the fuel pressure regulator and inspect the hose for the presence of fuel. 2. If fuel is presence in the vacuum hose, replace the fuel pressure regulator. Is the repair complete?	–	Go to *Step 21*	Go to *Step 14*
14	1. Turn the ignition ON. 2. Slowly press the acceleration pedal. Does the Throttle Position (TP) sensor display increase steady and evenly from its minimum voltage at closed throttle to its maximum voltage at Wide–Open Throttle (WOT).	–	Go to *Step 15*	Go to *Step 19*
15	1. Perform the Fuel System Diagnosis. 2. If the table isolate a problem, repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 16*
16	1. Perform the Evaporative Emission (EVAP) Control System Diagnosis. 2. If the table isolate a problem, repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 17*
17	1. Perform the Fuel Injector Balance Test. 2. If the table isolate a problem, repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 18*
18	1. Remove the Oxygen Sensor (O2S). 2. Visually/physically inspect the O2S for silicone contamination. 3. Note: this will be indicated by a powdery white deposit on the portion of the O2S exposed to the exhaust stream. 4. If contamination is present on the O2S, find the source and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to ”Diagnostic Aids”
19	1. Check the TP sensor mounting screws. 2. If they are too loose or missing tighten or replace them as needed. 3. If the screws are OK, replace the TP sensor. Is the repair complete?	–	Go to *Step 21*	–
20	1. Turn the ignition OFF. 2. Replace the MAP sensor. Is the repair complete?	–	Go to *Step 21*	–
21	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 21*	Go to *Step 2*
22	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0222

MAIN THROTTLE IDLE ACTUATOR (MTIA) LOW VOLTAGE

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (05, 22.55). The characteristics of the air flow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical bowdencable.

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 nearly 5.0 V at idle to about 0.2 V to 0.4 V at wide open throttle. The TPS is one of the most important inputs used by the ECM for fuel control and other functions such as idle, wide open throttle, deceleration enleanment, and acceleration enrichment.

Conditions for Setting the DTC

- MTIA voltage is less than 0.275V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

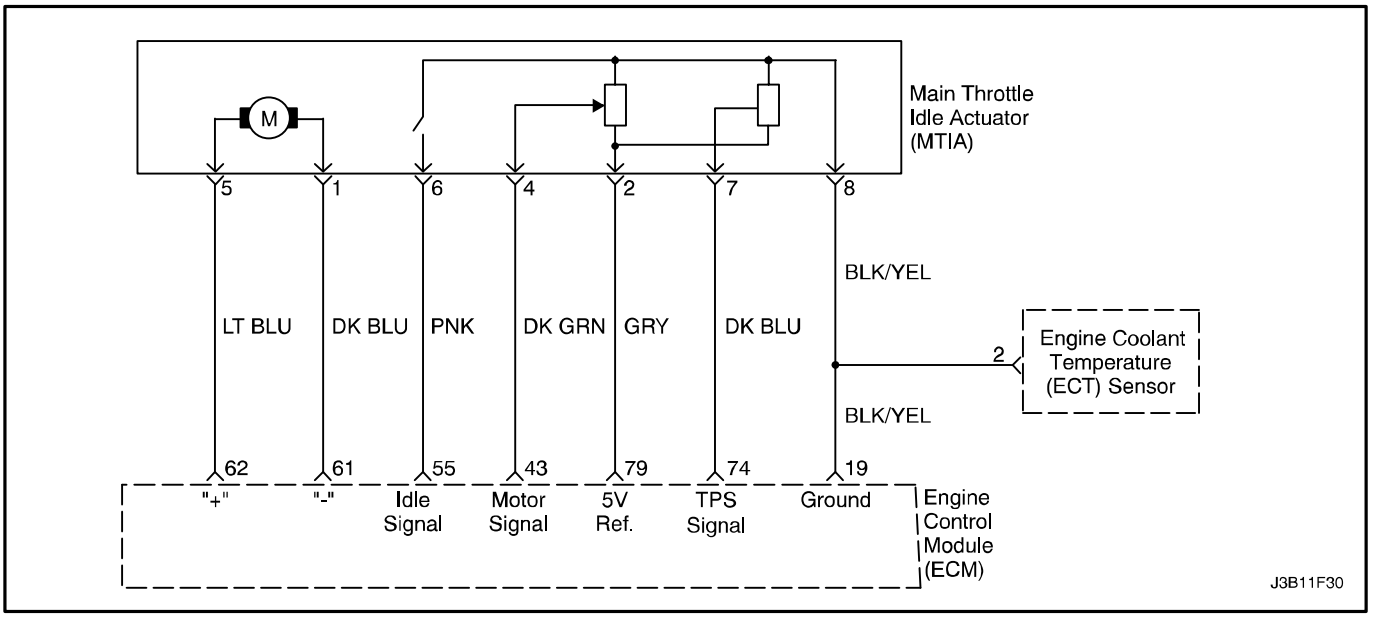
Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P0222 – Main Throttle Idle Actuator (MTIA) Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Connect the scan tool to the DLC. 2. Turn the ignition switch to ON. 3. Press the accelerator pedal while watching TPS for smooth changes in the voltage. Does the scan tool show the TPS voltage change smoothly within the value specified?	0.3V–4.8V	Go to "Diagnostic Aids"	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the MTIA connector. 3. Measure the voltage between terminal 1 and 5. Does the voltage measure within the value specified?	4.8–5.0V	Go to *Step 4*	Go to *Step 5*
4	Connect a fused jumper between the MTIA connector terminal 1 and terminal 6. Does the scan tool show the TPS voltage above value specified?	More than 4.8–5.0V	Go to *Step 10*	Go to *Step 8*
5	Measure the voltage between the MTIA connector 1 and ground. Does the voltage measure within the value specified?	Below 5.0V	Go to *Step 6*	Go to *Step 7*
6	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module(ECM). 3. Check for a short to ground in the wire between the MTIA connector 5 and ECM connector 62. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Check for a short to ground in the wire between the MTIA connector 1 and ECM connector 61. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
8	1. Turn the ignition switch to LOCK. 2. Check for a short to ground in the wire between the MTIA connector 6 and ECM connector 55. 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 DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
10	1. Replace the throttle body assembly. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
11	1. Ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 12*	–
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0223

MAIN THROTTLE IDLE ACTUATOR (MTIA) HIGH VOLTAGE

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (05, 22.55). The characteristics of the air flow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical bowdencable.

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 nearly 5.0 V at idle to about 0.2 V to 0.4 V at wide open throttle. The TPS is one of the most important inputs used by the ECM for fuel control and other functions such as idle, wide open throttle, deceleration enleanment, and acceleration enrichment.

Conditions for Setting the DTC

- MTIA voltage is higher than 4.9V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

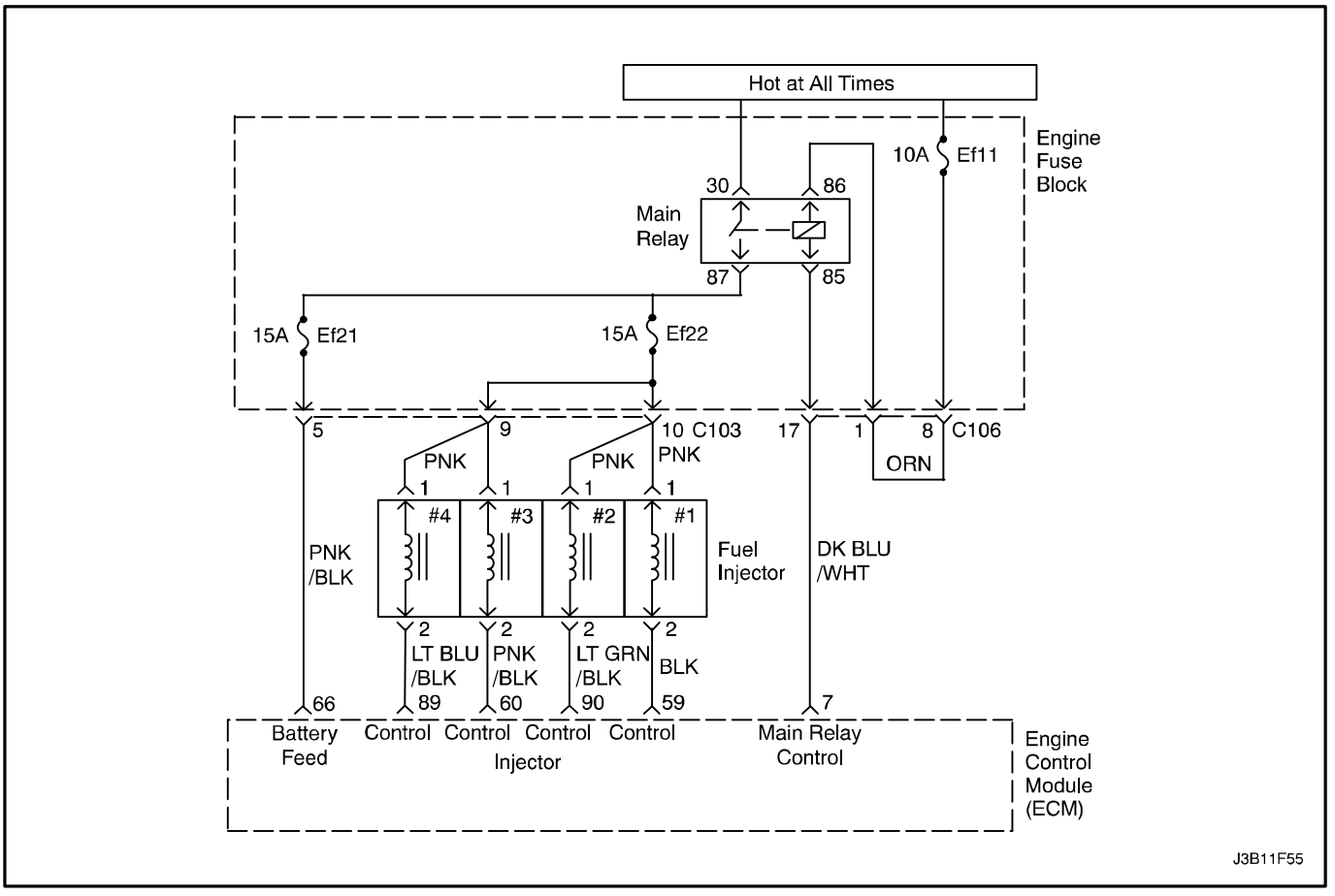
Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P0223 – Main Throttle Idle Actuator (MTIA) High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Connect the scan tool to the DLC. 2. Turn the ignition switch to ON. 3. Press the accelerator pedal while watching TPS for smooth changes in the voltage. Does the scan tool show the TPS voltage change smoothly within the value specified?	0.3V–4.8V	Go to ”Diagnostic Aids”	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the MTIA connector. 3. Measure the voltage between terminal 1 and 5. Does the voltage measure within the value specified?	4.8–5.0V	Go to *Step 4*	Go to *Step 5*
4	Connect a fused jumper between the MTIA connector terminal 1 and terminal 6. Does the scan tool show the TPS voltage above value specified?	More than 4.8–5.0V	Go to *Step 10*	Go to *Step 8*
5	Measure the voltage between the MTIA connector 1 and ground. Does the voltage measure within the value specified?	Below 5.0V	Go to *Step 6*	Go to *Step 7*
6	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module(ECM). 3. Check for an open or short to battery voltage in the wire between the MTIA connector 5 and ECM connector 62. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the MTIA connector 1 and ECM connector 61. Is the problem found?	–	Go to *Step 9*	Go to *Step 11*
8	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the MTIA connector 6 and ECM connector 55. 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 DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
10	1. Replace the throttle body assembly. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
11	1. Ignition OFF. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 12*	–
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0261

INJECTOR 1 LOW VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 1 circuit is an open or a short to ground condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

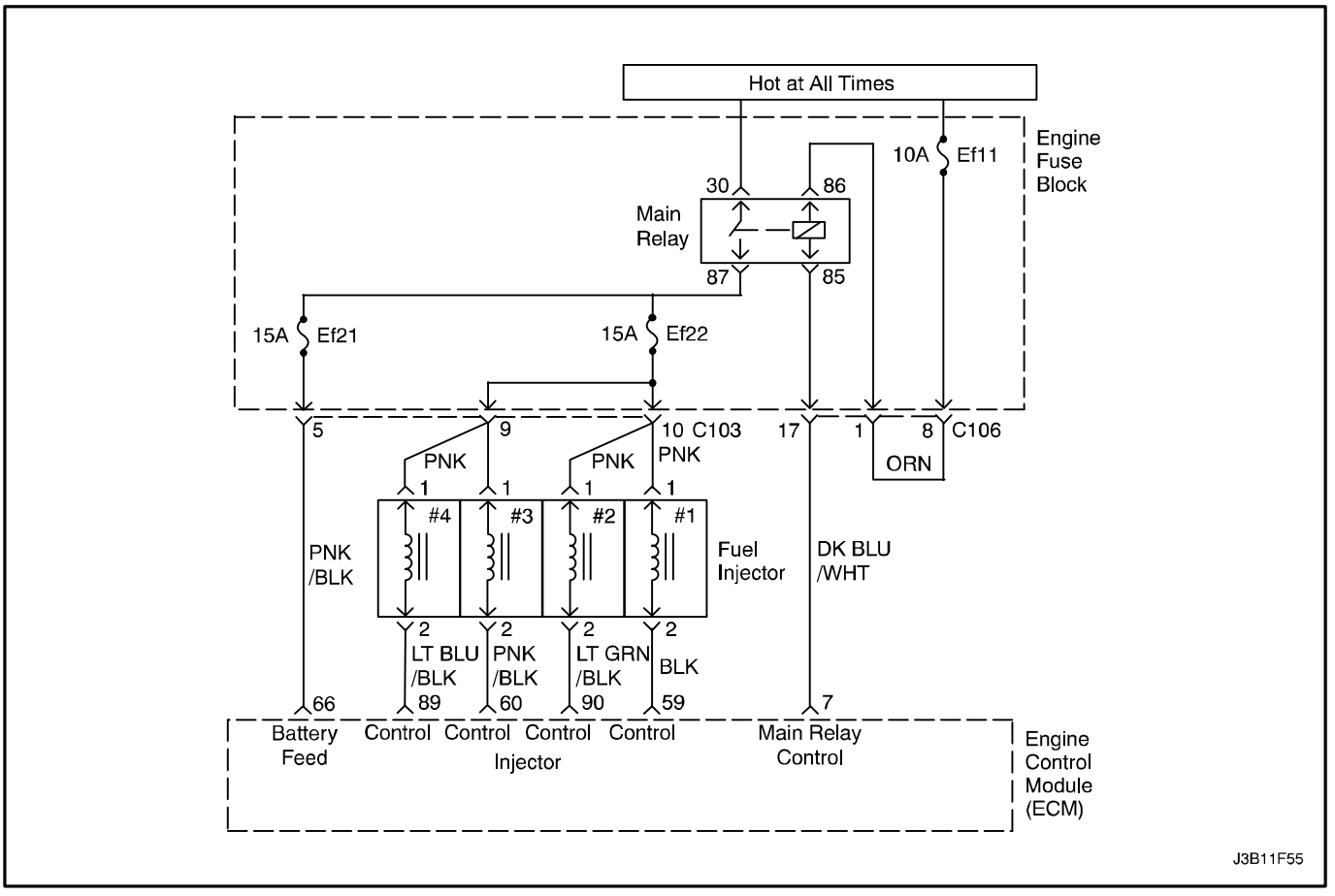
An injector driver circuit that is open or shorted to voltage will causes a DTC P0261 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0261 – Injector 1 Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0261 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0261 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 1 connector terminal 2 and ECM connector terminal 59. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 1 connector terminal 1 and battery positive. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Does DTC P0261 reset?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0262

INJECTOR 1 HIGH VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 1 circuit is a short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

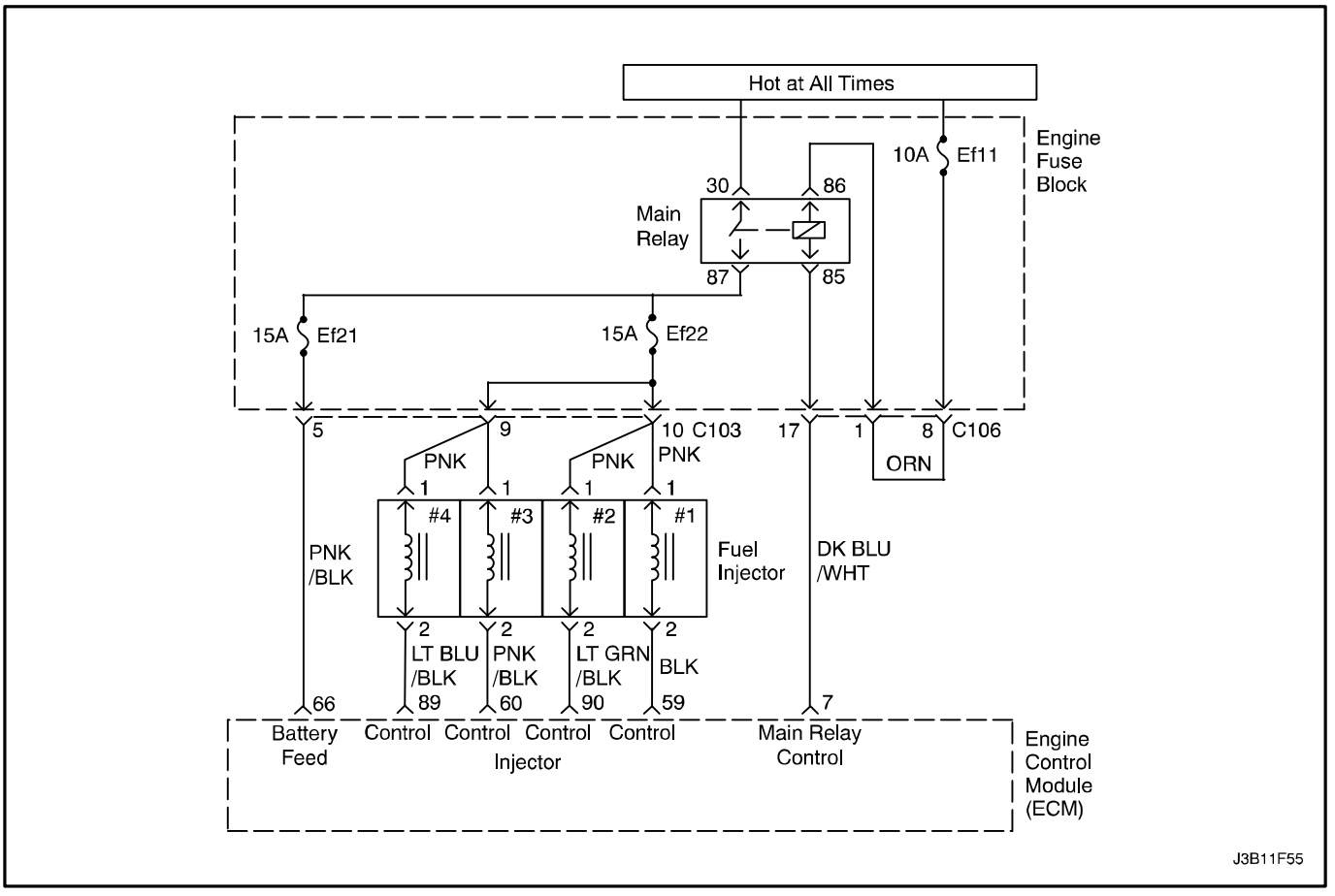
An injector driver circuit that is open or shorted to voltage will causes a DTC P0262 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0262 – Injector 1 High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0262 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0262 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the injector 1 connector terminal 2 and ECM connector terminal 59. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for short to battery voltage in the wire between the injector 1 connector terminal 1. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Does DTC P0262 reset?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0264

INJECTOR 2 LOW VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 2 circuit is an open or a short to ground condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

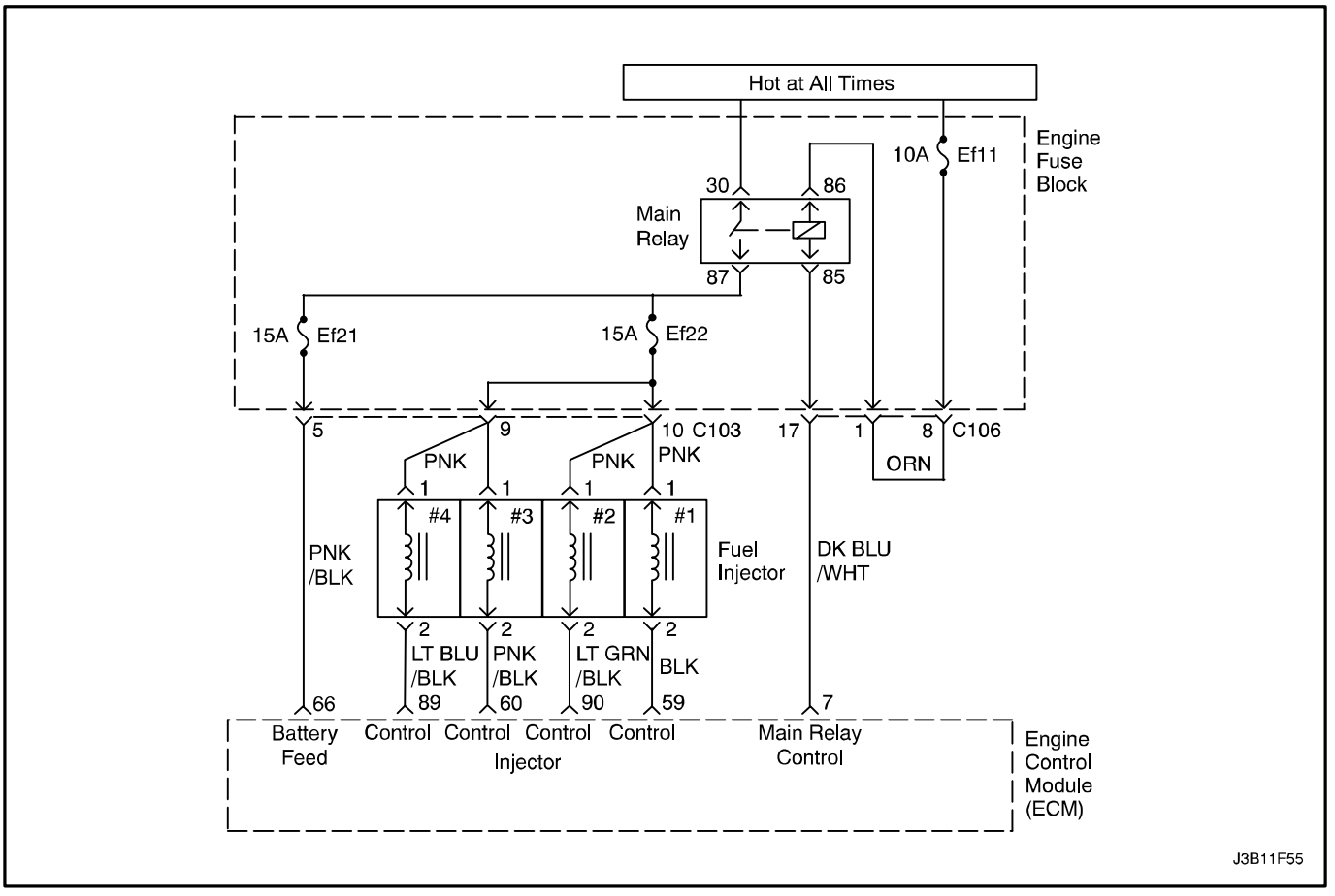
An injector driver circuit that is open or shorted to voltage will causes a DTC P0264 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0264 – Injector 2 Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0264 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0264 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 2 connector terminal 2 and ECM connector terminal 90. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 2 connector terminal 1 and battery positive. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Does DTC P0264 reset?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0265

INJECTOR 2 HIGH VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 2 circuit is a short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

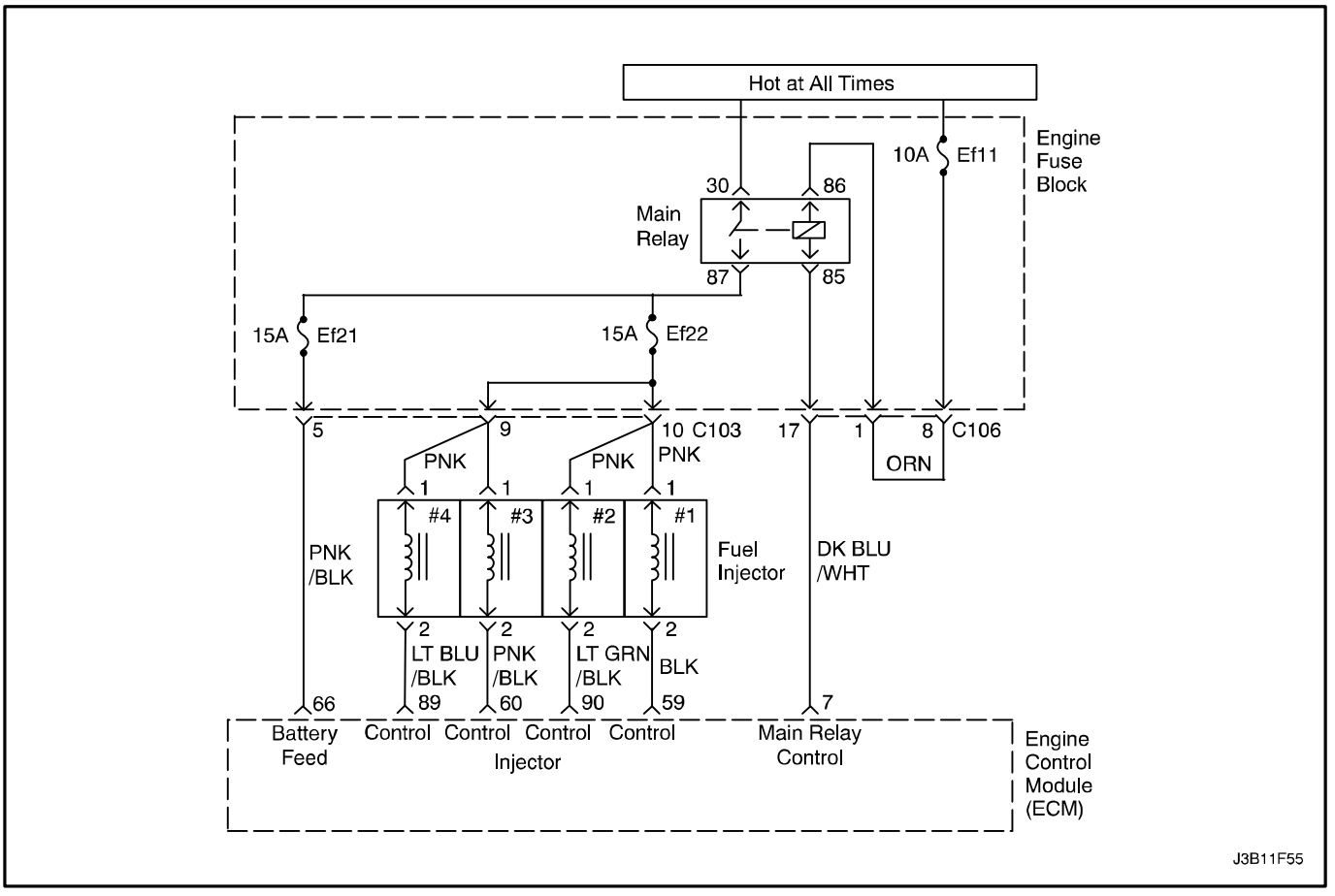
An injector driver circuit that is open or shorted to voltage will causes a DTC P0265 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0265 – Injector 2 High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	Does the engine start?	–	Go to *Step 3*	Go to "Engine Cranks But Will Not Run"
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0265 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0265 reset?	–	Go to *Step 5*	Go to "Diagnostic Aids"
5	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the injector 2 connector terminal 2 and ECM connector terminal 90. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for high voltage in the wire between the injector 2 connector terminal 1. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Does DTC P0265 reset?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0267

INJECTOR 3 LOW VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 3 circuit is an open or a short to ground condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

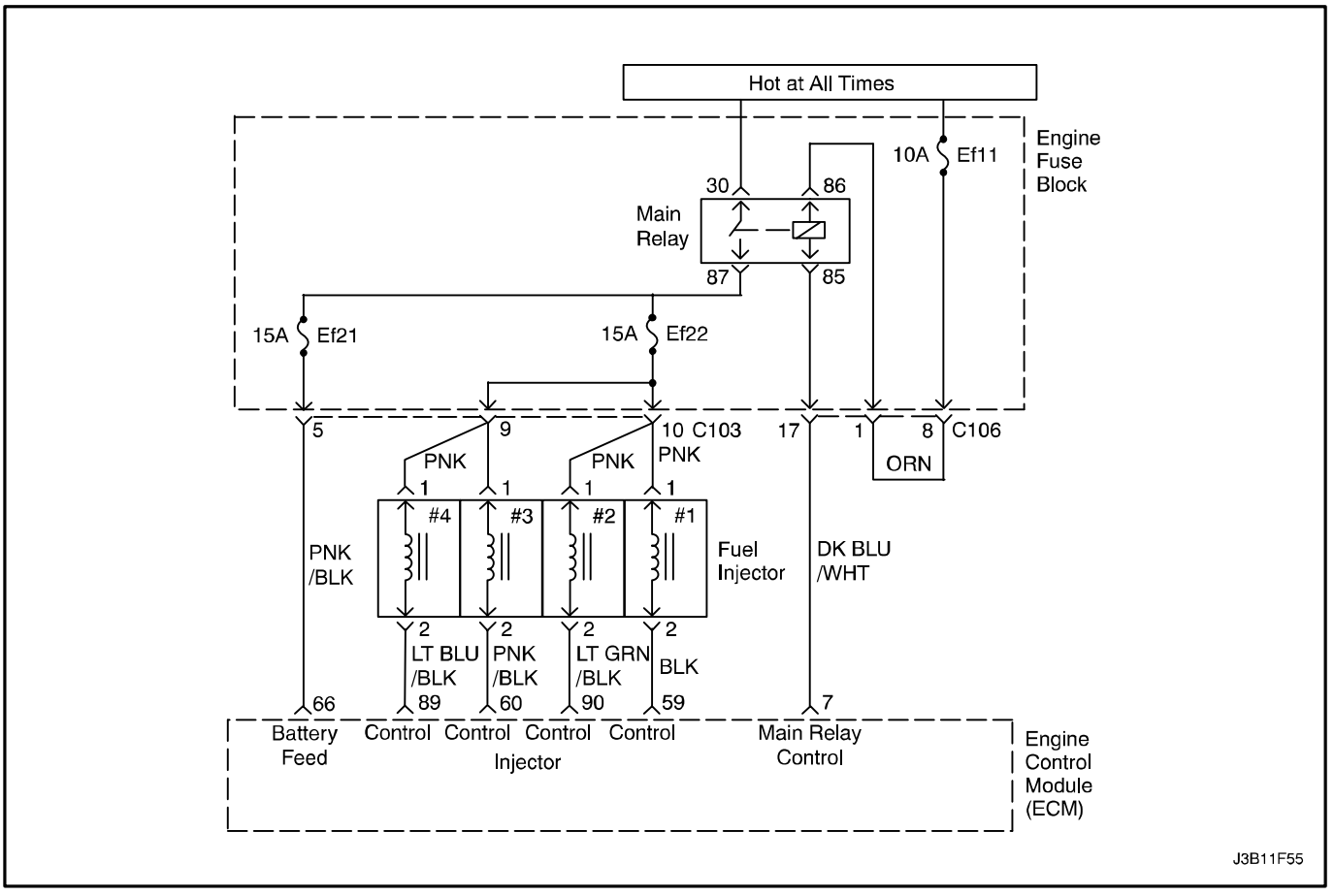
An injector driver circuit that is open or shorted to voltage will causes a DTC P0267 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0267 – Injector 3 Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0267 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0267 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 3 connector terminal 2 and ECM connector terminal 60. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 3 connector terminal 1 and battery positive. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Does DTC P0267 reset?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0268

INJECTOR 3 HIGH VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 3 circuit is a short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

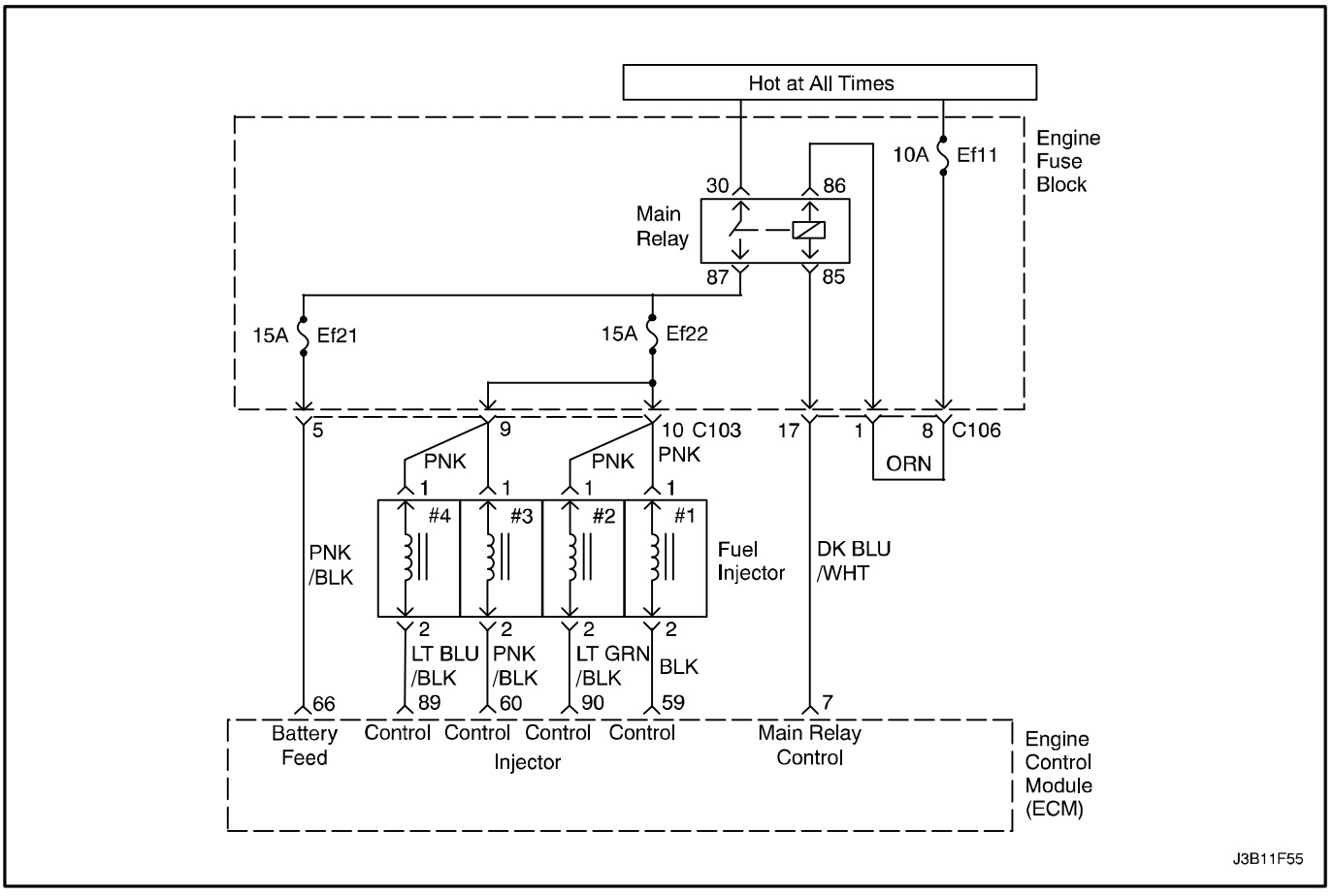
An injector driver circuit that is open or shorted to voltage will causes a DTC P0268 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0268 – Injector 3 High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	Does the engine start?	–	Go to *Step 3*	Go to "Engine Cranks But Will Not Run"
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0268 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0268 reset?	–	Go to *Step 5*	Go to "Diagnostic Aids"
5	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the injector 3 connector terminal 2 and ECM connector terminal 60. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for short to battery voltage in the wire between the injector 3 connector terminal 1. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Does DTC P0268 reset?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0270

INJECTOR 4 LOW VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 4 circuit is an open or a short to ground condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

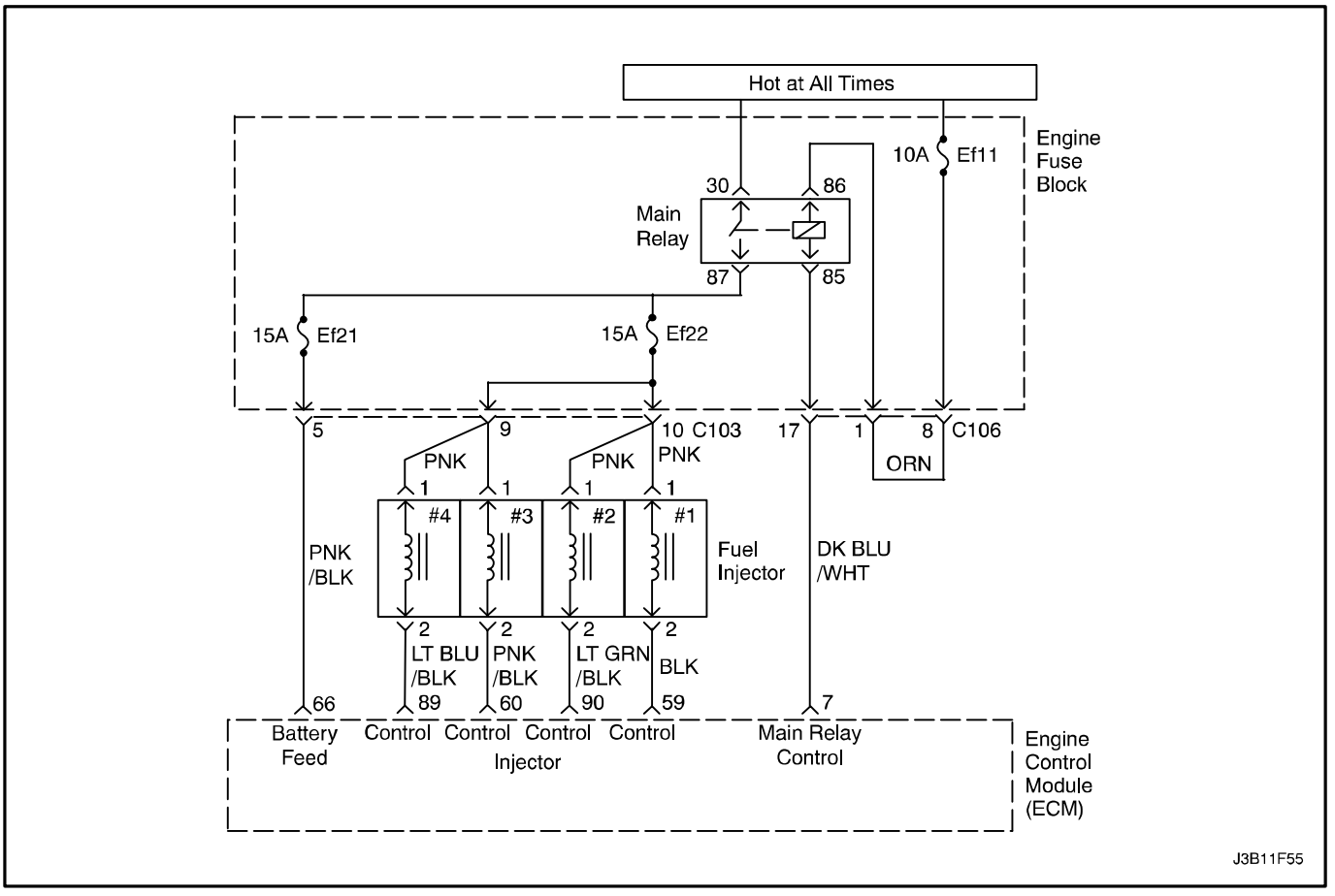
An injector driver circuit that is open or shorted to voltage will causes a DTC P0270 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0270 – Injector 4 Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0270 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0270 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 4 connector terminal 2 and ECM connector terminal 89. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for short to ground in the wire between the injector 4 connector terminal 1 and battery positive. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Does DTC P0270 reset?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0271

INJECTOR 4 HIGH VOLTAGE

Circuit Description

The transaxle control module(TCM)/engine control module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a low voltage and/or an open circuit and high voltage conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- The injector 4 circuit is a short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

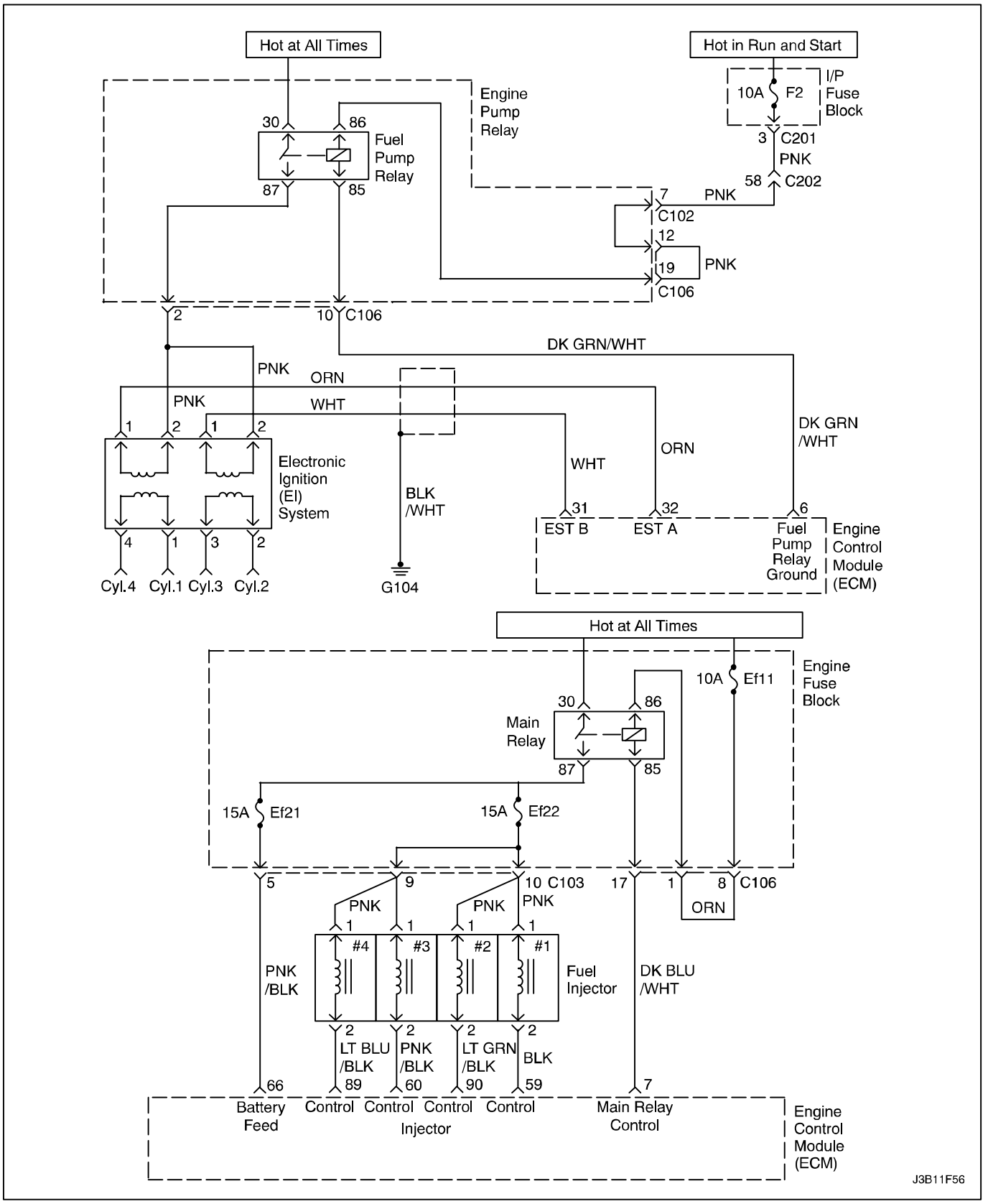
An injector driver circuit that is open or shorted to voltage will causes a DTC P0271 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–terms fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than it tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5Ω.

DTC P0271 – Injector 4 High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Idle the engine for one minuet. Does DTC P0271 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Review the Freeze Frame data with the ignition ON and the engine OFF and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions as notes. Does DTC P0271 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition switch to LOCK. 2. Check for an open or short to battery voltage in the wire between the injector 3 connector terminal 4 and ECM connector terminal 89. Is the problem found?	–	Go to *Step 7*	Go to *Step 6*
6	1. Turn the ignition switch to LOCK. 2. Check for short to battery voltage in the wire between the injector 4 connector terminal 1. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	System OK	–
8	1. Replace the injector valve. 2. Clear any DTCs from ECM. 3. Perform the Diagnostic System Check. Does DTC P0271 reset?	–	Go to *Step 9*	System OK
9	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the Diagnostic System Check. Is the repair complete?	–	Go to *Step 10*	–
10	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to applicable DTC table	System OK


Hot at All Times
Hot in Run and Start
Engine Pump Relay
Fuel Pump Relay
30
86
87
85
10A
F2
I/P Fuse Block
3
C201
PNK
58
C202
7
PNK
C102
12
19
PNK
C106
2
10
C106
DK GRN/WHT
PNK
ORN
WHT
PNK
1
2
1
2
Electronic Ignition (EI) System
BLK /WHT
WHT
ORN
DK GRN /WHT
31
32
6
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
4
1
3
2
Cyl.4
Cyl.1
Cyl.3
Cyl.2
G104
Hot at All Times
Engine Fuse Block
10A
Ef11
30
86
Main Relay
87
85
15A
Ef21
15A
Ef22
5
9
10
C103
17
1
8
C106
ORN
PNK
PNK
PNK
1
1
1
1
#4
#3
#2
#1
Fuel Injector
PNK /BLK
DK BLU /WHT
2
2
2
2
LT BLU /BLK
PNK /BLK
LT GRN /BLK
BLK
66
89
60
90
59
7
Battery Feed
Control
Control
Control
Control
Injector
Main Relay Control
Engine Control Module (ECM)
J3B11F56

DIAGNOSTIC TROUBLE CODE (DTC) P0300

MULTIPLE CYLINDER MISFIRE (CATALYST DAMAGE)

System Description

The Engine Control Module (ECM) monitors the crankshaft and camshaft positions to detect if the engine is misfiring. The ECM looks for a quick drop in crankshaft speed. This test is executed in blocks of 200 engine revolution tests. It may take between one to several tests to store a Diagnostic Trouble Code (DTC), the Malfunction Indicator Lamp (MIL). Severe misfire will flash the MIL, indicating that catalyst damage is possible.

Conditions for Setting the DTC

- The engine speed is less than 4,500 rpm.
- The fuel tank level is greater than 20%.
- No anti–jerk correction.
- No rough road detection.
- No crankshaft oscillation detection.
- DTCs P0107, P0108, P0122, P0123, P0341, P0342, P0336 and P0337 are not set.

Action Taken When the DTC Sets

- The malfunction Indicator Lamp (MIL) will blinking.
- The ECM will record operating conditions at the time the diagnostic fails. The information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

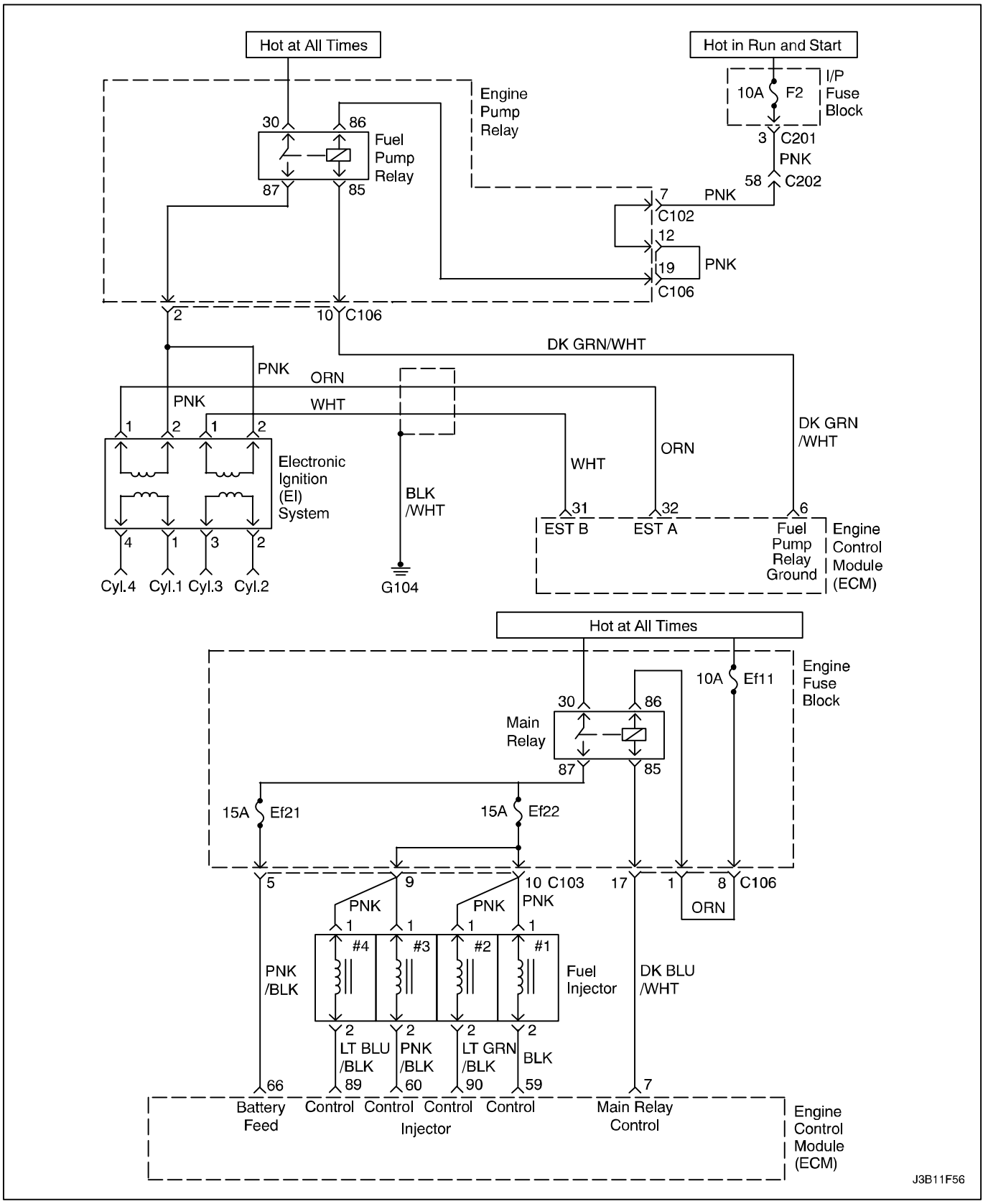
An intermittent can also be the result of a defective reluctor wheel. Remove the CKP sensor and inspect the reluctor wheel through the sensor mount hole. Check for porosity and the condition of wheel. If the DTC is intermittent refer to ”Symptoms Diagnosis” in this section.

DTC P0300 – Multiple Cylinder Misfire(Catalyst Damage)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs). Are DTCs P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 set?	–	Go to Applicable DTC table	Go to *Step 3*
3	Perform a visual/physical inspection. Make any repairs that are necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 4*
4	Start the engine and allow it to idle. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to *Step 6*
5	Are all counters equal (within a percentage of each other)?	–	Go to *Step 7*	Go to *Step 11*
6	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data, and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for setting this DTC as noted. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to ”Diagnostic Aids”

Step	Action	Value(s)	Yes	No
7	1. Turn the engine OFF. 2. Install a fuel pressure gauge to the fuel rail. 3. Observe the fuel pressure with the engine running. Is the fuel pressure within the specified value?	284–325 kPa (41–47 psi)	Go to *Step 8*	Go to "Fuel System Diagnosis"
8	Check the fuel for contamination. Is the fuel OK?	–	Go to *Step 9*	Go to *Step 10*
9	Check for a basic engine problem and repair as necessary. Is the repair complete?	–	Go to *Step 27*	–
10	Replace the contaminated fuel. Is the repair complete?	–	Go to *Step 27*	–
11	1. Turn the engine OFF. 2. Disconnect the fuel injector harness connector. 3. Install a spark tester on cylinder #1 spark plug cable. 4. Crank the engine and check for spark. 5. Repeat the above procedure on cylinders #2, #3 and #4. Is a spark observed on all four spark plug cables?	–	Go to *Step 12*	Go to *Step 20*
12	Replace any malfunctioning spark plugs if necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 13*
13	1. Turn the engine OFF. 2. Disconnect the fuel injector connectors from the injectors. 3. Install an injector test light on the injector harness connector for the cylinders that had misfired. 4. Crank the engine and note the test light. Does the injector test light blink?	–	Go to *Step 14*	Go to *Step 15*
14	Perform the Fuel Injector Balance Test. Are the fuel injectors OK?	–	Go to *Step 9*	Go to *Step 16*
15	1. Disconnect the injector test light. 2. With a test light connected to ground, probe the ignition feed terminal 2 of the injector harness connector for each cylinder that had misfire. 3. Crank the engine. Does the test light illuminate?	–	Go to *Step 17*	Go to *Step 19*
16	Replace any malfunctioning fuel injectors. Is the repair complete?		Go to *Step 27*	–
17	Check the affected fuel injector driver circuit at terminals 59, 89, 90, and 60 for an open, short, or short to voltage. Is a problem found?	–	Go to *Step 18*	Go to *Step 24*
18	Repair the open or the shorted fuel injector driver circuit. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
19	Repair the open ignition feed circuit between the fuel injector harness connector and the fuel injector connector. Is the repair complete?	–	Go to *Step 27*	–
20	Measure the resistance of the spark plug cable that the spark plug tester did not spark. Is the resistance of the spark plug cable less than the specified value?	30000Ω	Go to *Step 21*	Go to *Step 25*
21	Inspect the Engine Control Module (ECM) connector and connections. Are the connections OK?	–	Go to *Step 22*	Go to *Step 23*
22	Check the affected cylinders ignition control circuit for an open or short and repair as necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 26*
23	Repair the connector or connections. Is the repair complete?	–	Go to *Step 27*	–
24	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 27*	–
25	Replace the spark plug cable. Is the repair complete?	–	Go to *Step 27*	–
26	Replace the faulty ignition coil. Is the repair complete?	–	Go to *Step 27*	Go to *Step 24*
27	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 28*	Go to *Step 2*
28	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK


Hot at All Times
Hot in Run and Start
Engine Pump Relay
Fuel Pump Relay
30
86
87
85
10A
F2
I/P Fuse Block
3
C201
PNK
58
C202
7
PNK
C102
12
19
PNK
C106
2
10
C106
DK GRN/WHT
PNK
ORN
WHT
PNK
1
2
1
2
Electronic Ignition (EI) System
BLK /WHT
WHT
ORN
DK GRN /WHT
31
32
6
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
4
1
3
2
Cyl.4
Cyl.1
Cyl.3
Cyl.2
G104
Hot at All Times
Engine Fuse Block
10A
Ef11
30
86
Main Relay
87
85
15A
Ef21
15A
Ef22
5
9
10
C103
17
1
8
C106
PNK
PNK
PNK
ORN
1
1
1
1
#4
#3
#2
#1
PNK /BLK
Fuel Injector
DK BLU /WHT
2
2
2
2
LT BLU /BLK
PNK /BLK
LT GRN /BLK
BLK
66
89
60
90
59
7
Battery Feed
Control
Control
Control
Control
Injector
Main Relay Control
Engine Control Module (ECM)
J3B11F56

DIAGNOSTIC TROUBLE CODE (DTC) P0300

MULTIPLE CYLINDER MISFIRE (INCREASE EMISSION)

System Description

The Engine Control Module (ECM) monitors the crankshaft and camshaft positions to detect if the engine is misfiring. The ECM looks for a quick drop in crankshaft speed. This test is executed in blocks of 1,000 engine revolution tests. It may take between one to several tests to store a Diagnostic Trouble Code (DTC) and illuminate the Malfunction Indicator Lamp (MIL).

Conditions for Setting the DTC

- The engine speed is less than 4,500 rpm.
- The fuel tank level is greater than 20%.
- No anti–jerk correction.
- No rough road detection.
- No crankshaft oscillation detection.
- DTCs P0107, P0108, P0122, P0123, P0341, P0342, P0336 and P0337 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. The information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

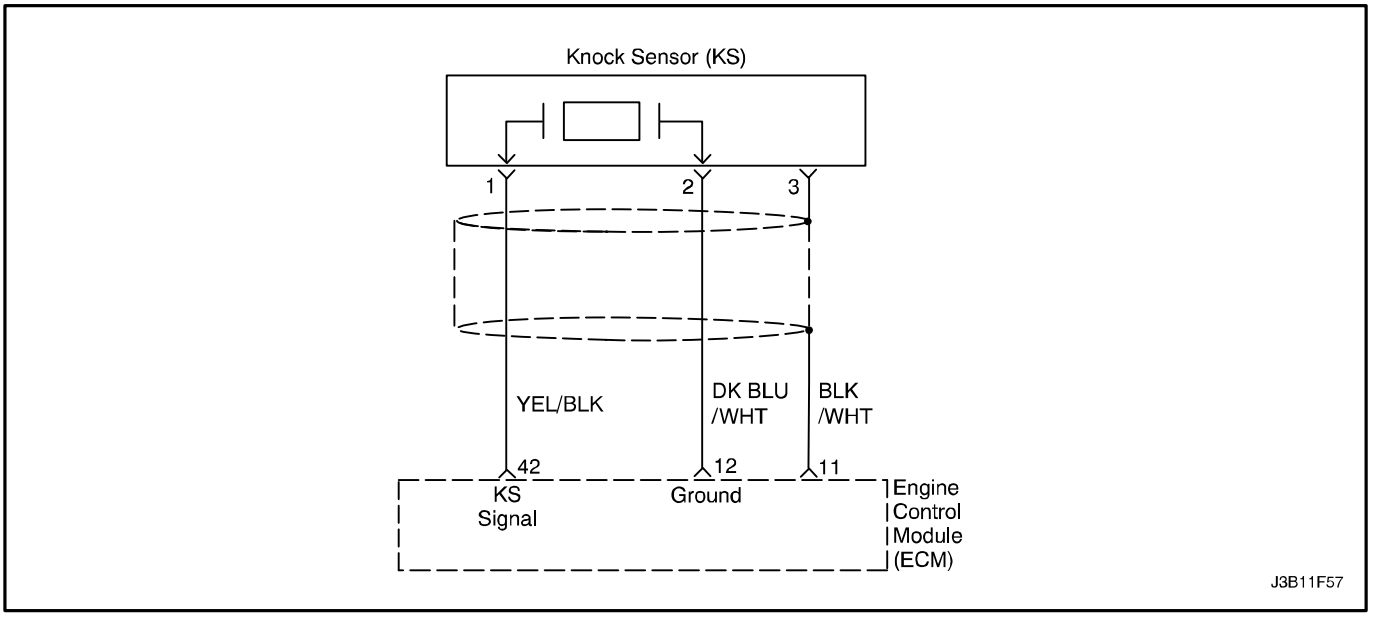
An intermittent can also be the result of a defective reluctor wheel. Remove the CKP sensor and inspect the reluctor wheel through the sensor mount hole. Check for porosity and the condition of wheel. If the DTC is intermittent refer to ”Symptoms Diagnosis” in this section.

DTC P0300 – Multiple Cylinder Misfire(Increase Emission)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs). Are DTCs P0261, P0262, P0264, P0265, P0267, P0268, P0270, P0271 set?	–	Go to Applicable DTC table	Go to *Step 3*
3	Perform a visual/physical inspection. Make any repairs that are necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 4*
4	Start the engine and allow it to idle. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to *Step 6*
5	Are all counters equal (within a percentage of each other)?	–	Go to *Step 7*	Go to *Step 11*
6	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data, and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for setting this DTC as noted. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to ”Diagnostic Aids”

Step	Action	Value(s)	Yes	No
7	1. Turn the engine OFF. 2. Install a fuel pressure gauge to the fuel rail. 3. Observe the fuel pressure with the engine running. Is the fuel pressure within the specified value?	284–325 kPa (41–47 psi)	Go to *Step 8*	Go to "Fuel System Diagnosis"
8	Check the fuel for contamination. Is the fuel OK?	–	Go to *Step 9*	Go to *Step 10*
9	Check for a basic engine problem and repair as necessary. Is the repair complete?	–	Go to *Step 27*	–
10	Replace the contaminated fuel. Is the repair complete?	–	Go to *Step 27*	–
11	1. Turn the engine OFF. 2. Disconnect the fuel injector harness connector. 3. Install a spark tester on cylinder #1 spark plug cable. 4. Crank the engine and check for spark. 5. Repeat the above procedure on cylinders #2, #3 and #4. Is a spark observed on all four spark plug cables?	–	Go to *Step 12*	Go to *Step 20*
12	Replace any malfunctioning spark plugs if necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 13*
13	1. Turn the engine OFF. 2. Disconnect the fuel injector connectors from the injectors. 3. Install an injector test light on the injector harness connector for the cylinders that had misfired. 4. Crank the engine and note the test light. Does the injector test light blink?	–	Go to *Step 14*	Go to *Step 15*
14	Perform the Fuel Injector Balance Test. Are the fuel injectors OK?	–	Go to *Step 9*	Go to *Step 16*
15	1. Disconnect the injector test light. 2. With a test light connected to ground, probe the ignition feed terminal 2 of the injector harness connector for each cylinder that had misfire. 3. Crank the engine. Does the test light illuminate?	–	Go to *Step 17*	Go to *Step 19*
16	Replace any malfunctioning fuel injectors. Is the repair complete?		Go to *Step 27*	–
17	Check the affected fuel injector driver circuit at terminals 59, 89, 90, and 60 for an open, short, or short to voltage. Is a problem found?	–	Go to *Step 18*	Go to *Step 24*
18	Repair the open or the shorted fuel injector driver circuit. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
19	Repair the open ignition feed circuit between the fuel injector harness connector and the fuel injector connector. Is the repair complete?	–	Go to *Step 27*	–
20	Measure the resistance of the spark plug cable that the spark plug tester did not spark. Is the resistance of the spark plug cable less than the specified value?	30000Ω	Go to *Step 21*	Go to *Step 25*
21	Inspect the Engine Control Module (ECM) connector and connections. Are the connections OK?	–	Go to *Step 22*	Go to *Step 23*
22	Check the affected cylinders ignition control circuit for an open or short and repair as necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 26*
23	Repair the connector or connections. Is the repair complete?	–	Go to *Step 27*	–
24	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 27*	–
25	Replace the spark plug cable. Is the repair complete?	–	Go to *Step 27*	–
26	Replace the faulty ignition coil. Is the repair complete?	–	Go to *Step 27*	Go to *Step 24*
27	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 28*	Go to *Step 2*
28	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0327

KNOCK SENSOR CIRCUIT FAULT (1.4L DOHC)

Circuit Description

The knock sensor (KS) system is used to detect engine detonation, allowing the engine control module (ECM) to retard ignition control spark timing based on the KS signal being received. The KS produces an AC signal so that under a no knock condition the signal on the KS circuit measures about 0.007V AC. The KS 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 KS 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, a DTC P0327 will set.

Conditions for Setting the DTC

- The knock sensor SPI bus in failure during 8 seconds.

Or

- The knock sensor voltage is less than 0.3V.
- The engine coolant temperature is greater than 60˚C (145˚F).
- The engine speed is greater than 1,500 rpm.
- The mass air flow is higer than 180mg/tdc.

Or

- When difference between a original signal valve and filtering valve is less than 5%.
- The engine coolant temperature is greater than 60˚C (145˚F).
- The mass air flow is greater than 180mg/tdc.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store wnditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check and correct any abnormal engine noise before using the diagnostic table.

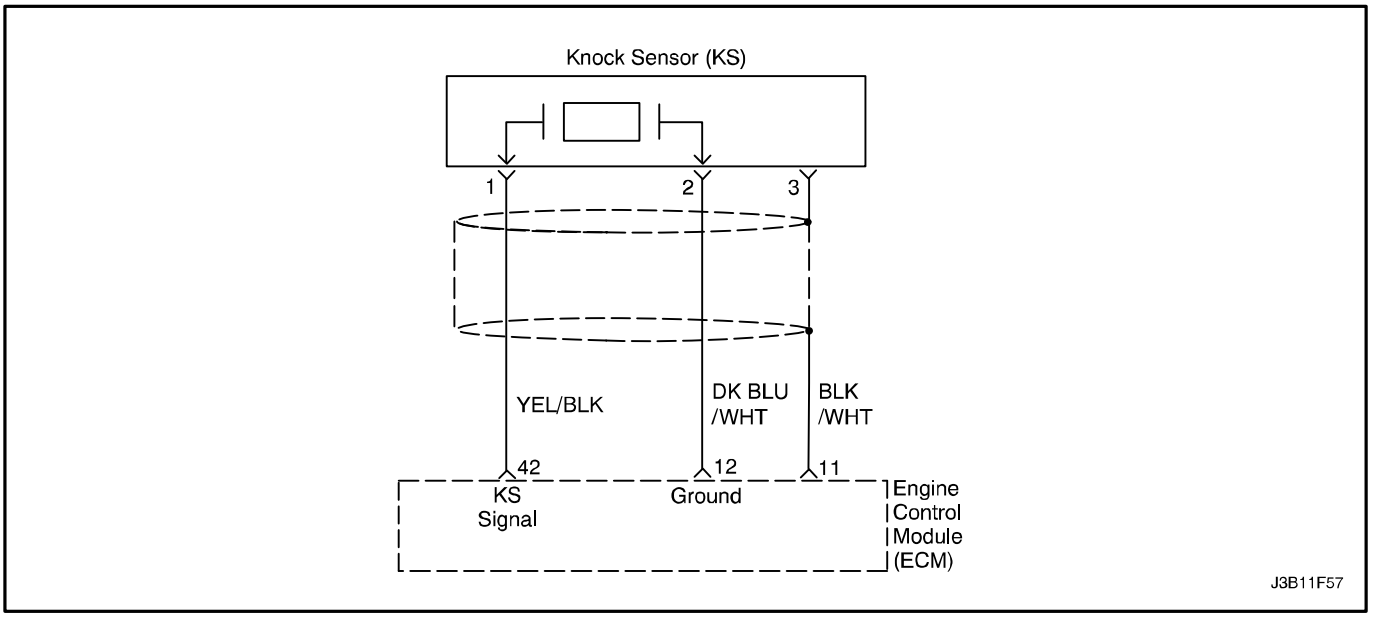
Any circuitry that is suspected as causing engine noise complaint should be thoroughly checked for the following conditions :

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

DTC P0327 – Knock Sensor Circuit Fault (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Start the engine. 2. Install a scan tool. 3. Clear the Diagnostic Trouble Codes (DTCs). 4. Operate the vehicle within the Freeze Frame conditions and conditions for setting the DTC as noted. Does the Malfunction Indicator (MIL) illuminate?	–	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for Setting The DTC as noted. Does the Malfunction Indicator (MIL) illuminate?	–	Go to *Step 4*	Go to *Step 12*
4	Listen to the engine while raising and lowering the engine speed. Is a knock or audible noise present?	–	Go to *Step 5*	Go to *Step 6*
5	Repair the mechanical engine problem or a loose bracket or component. Is the repair complete?	–	Go to *Step 12*	–
6	1. Turn the ignition switch to lock. 2. Disconnect the engine control module(ECM). 3. With a digital voltmeter (DVM) connected to ground, measure the resistance of the knock sensor through the knock sensor signal circuit, terminal 42. Is the measured value within the specified value?	90–100KΩ	Go to *Step 7*	Go to *Step 9*
7	Check for a poor connection at the ECM connector, knock sensor (KS) signal circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 8*
8	Replace the engine control module(ECM). Is the replacement complete?	–	Go to *Step 12*	Go to *Step 10*
9	Check the KS electrical connector for a poor connection and repair an necessary. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 10*
10	Check the KS signal circuit for an open or a low voltage or voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 11*
11	Replace the KS. Is the replacement complete?	–	Go to *Step 12*	–

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the DTCs. • Start the engine and idle at normal operating temperature. • Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0327

KNOCK SENSOR CIRCUIT FAULT (1.6L DOHC)

Circuit Description

The knock sensor (KS) system is used to detect engine detonation, allowing the transaxle control module (TCM)/engine control module (ECM) to retard ignition control spark timing based on the KS signal being received. The KS produces an AC signal so that under a no knock condition the signal on the KS circuit measures about 0.007V AC. The KS 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 KS 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, a DTC P0327 will set.

Conditions for Setting the DTC

- The knock sensor SPI bus in failure during 10 seconds.

Or

- The knock sensor voltage is less than 0.3V.
- The engine coolant temperature is greater than 60˚C(145˚F).
- The engine speed is greater than 1,500rpm.
- The mass air flow is higer than 180mg/tdc.

Or

- When difference between a original signal valve and filtering valve is less than 5%.
- The engine coolant temperature is greater than 60˚C(145˚F).
- The mass air flow is greater than 170mg/tdc.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check and correct any abnormal engine noise before using the diagnostic table.

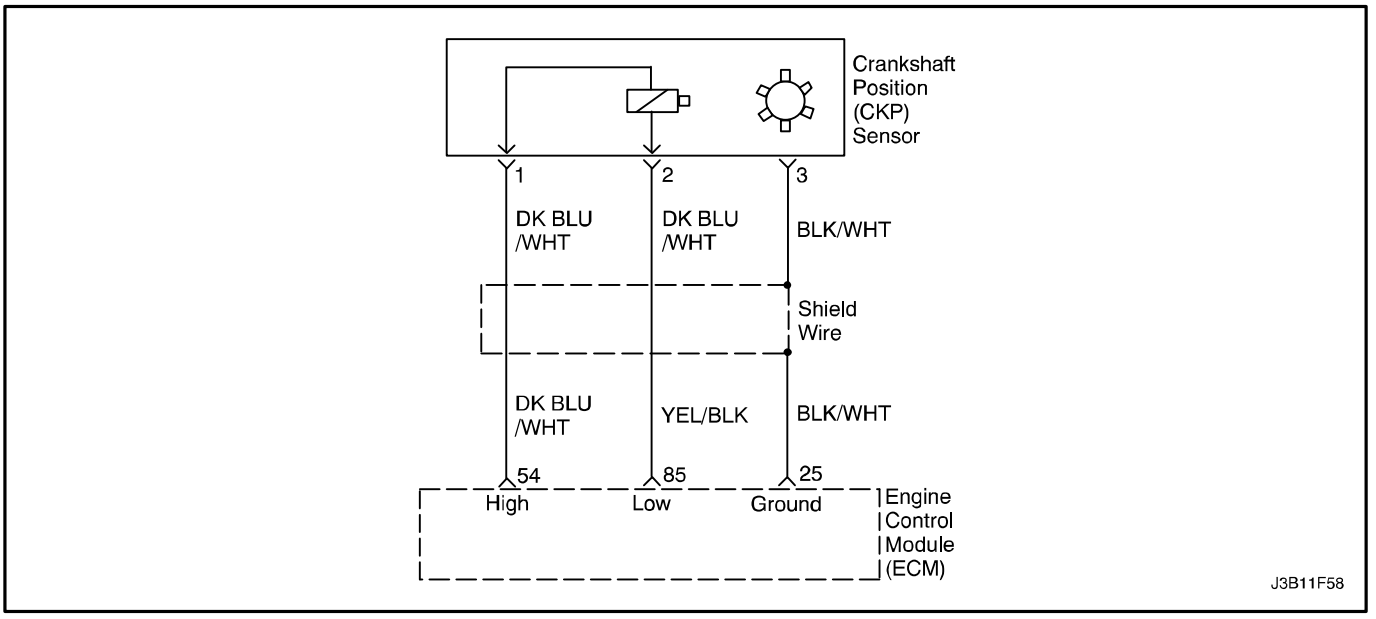
Any circuitry that is suspected as causing engine noise complaint should be thoroughly checked for the following conditions :

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

DTC P0327 – Knock Sensor Circuit Fault (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Start the engine. 2. Install a scan tool. 3. Clear the Diagnostic Trouble Codes (DTCs). 4. Operate the vehicle within the Freeze Frame conditions and conditions for setting the DTC as noted. Does the Malfunction Indicator (MIL) illuminate?	–	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for Setting The DTC as noted. Does the Malfunction Indicator (MIL) illuminate?	–	Go to *Step 4*	Go to *Step 12*
4	Listen to the engine while raising and lowering the engine speed. Is a knock or audible noise present?	–	Go to *Step 5*	Go to *Step 6*
5	Repair the mechanical engine problem or a loose bracket or component. Is the repair complete?	–	Go to *Step 12*	–
6	1. Turn the ignition switch to lock. 2. Disconnect the engine control module(ECM). 3. With a digital voltmeter (DVM) connected to ground, measure the resistance of the knock sensor through the knock sensor signal circuit, terminal 42. Is the measured value within the specified value?	90–100KΩ	Go to *Step 7*	Go to *Step 9*
7	Check for a poor connection at the ECM connector, knock sensor (KS) signal circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 8*
8	Replace the engine control module(ECM). Is the replacement complete?	–	Go to *Step 12*	Go to *Step 10*
9	Check the KS electrical connector for a poor connection and repair an necessary. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 10*
10	Check the KS signal circuit for an open or a low voltage or voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 11*
11	Replace the KS. Is the replacement complete?	–	Go to *Step 12*	–

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the DTCs. • Start the engine and idle at normal operating temperature. • Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0335

MAGNETIC CRANKSHAFT POSITION SENSOR ELECTRICAL ERROR

Circuit Description

The 58X reference signal is produced by the crankshaft position (CKP) sensor. During one crankshaft revolution, 58 crankshaft pulses will be produced. The transaxle control module(TCM)/engine control module(ECM) uses the 58X reference signal to calculate engine rpm and CKP. The ECM constantly monitors the number of pulses on the 58X reference circuit and compares them to the number of camshaft position (CKP) signal pulses being received. If the ECM receive and incorrect number of pulses on the 58X reference circuit, DTC P0335 will set.

Conditions for Setting the DTC

- The magnetic crankshaft position sensor is greater than 0.2V.

Or

- The minimum value of magnetic crankshaft position sensor is less than 1.5V.

Or

- The maximum value of magnetic crankshaft position sensor is higher than 2.2V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for :

Poor connection – inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

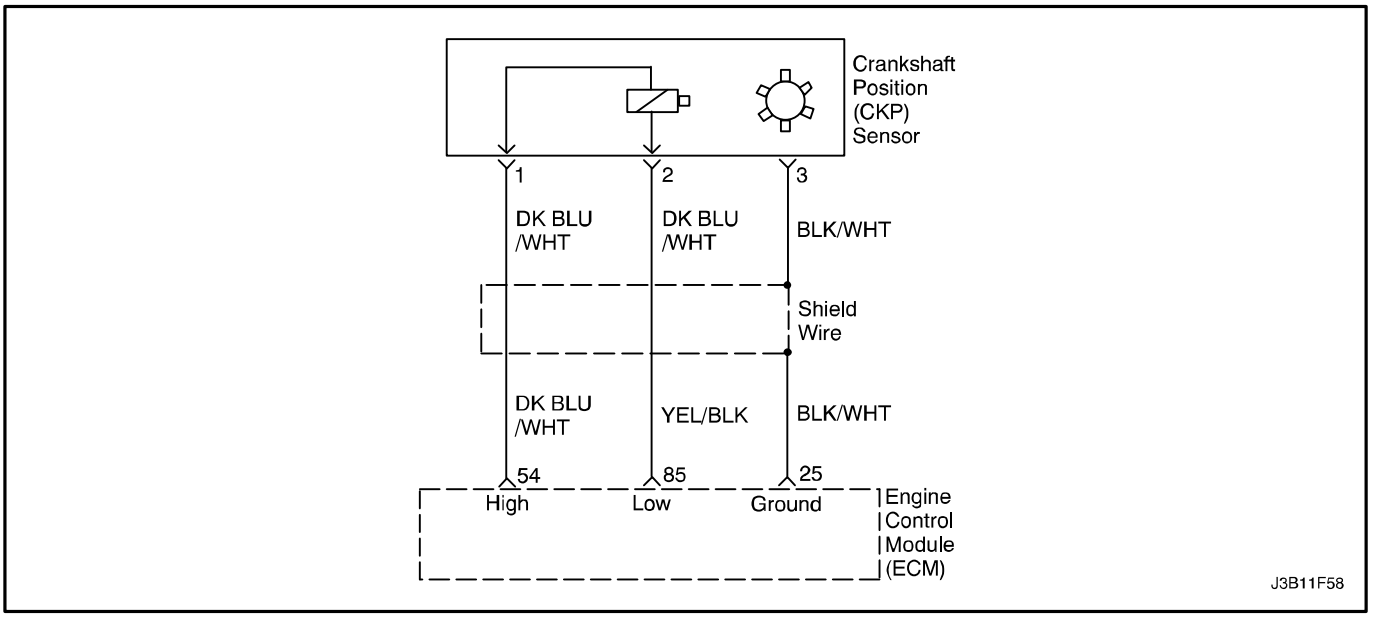
Damaged harness – inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition ON and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving the connectors and the wiring harness related to the ECM. A change in voltage will indicate the location of the fault.

Review the failure records vehicle mileage since the diagnostic test failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0335 – Magnetic Crankshaft Position Sensor Electrical Error

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Attempt to start the engine. Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Review and record Failure Records information. 2. Clear the DTC P0335. 3. Start the engine and idle for 1 minute. 4. Observe the diagnostic trouble codes (DTCs). Is the DTC P0335 set?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Disconnect the engine control module(ECM) and the crankshaft position (CKP) sensor. 2. Check for an open or an open or short to ground in the CKP sensor connector and the ECM harness connector. Is the problem found?	–	Go to *Step 5*	Go to *Step 6*
5	Repair the open or an open or short to ground in the 58X reference circuit between the CKP sensor connector and the ECM harness connector. Is the repair complete?	–	Go to *Step 11*	–
6	1. Reconnect the ECM and CKP sensor. 2. Connect a digital voltmeter (DVM) to measure voltage on the 58X reference circuit, terminal 54 at the ECM connector. 3. Observe the voltage while cranking the engine. Is the voltage near the specified value?	2.5V	Go to *Step 9*	Go to *Step 7*
7	Check the connection at the CKP sensor and replace the terminals if necessary. Do any terminals require replacement?	–	Go to *Step 11*	Go to *Step 8*
8	Replace the CKP sensor. Is the replacement complete?	–	Go to *Step 11*	–
9	Check the connections at the ECM and replace the terminals if necessary. Do any terminal require replacement?	–	Go to *Step 11*	Go to *Step 10*
10	Replace the ECM. Is the replacement complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0336

58X CRANKSHAFT POSITION SENSOR NO PLAUSIBLE SIGNAL

Circuit Description

The 58X reference signal is produced by the crankshaft position (CKP) sensor. During one crankshaft revolution, 58 crankshaft pulses will be produced. The transaxle control module(TCM)/engine control module(ECM) uses the 58X reference signal to calculate engine rpm and CKP. The ECM constantly monitors the number of pulses on the 58X reference circuit and compares them to the number of camshaft position (CKP) signal pulses being received. If the ECM receive and incorrect number of pulses on the 58X reference circuit, DTC P0336 will set.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.
- Detected number of teeth is differs by 3 or higher.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for :

Poor connection – inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

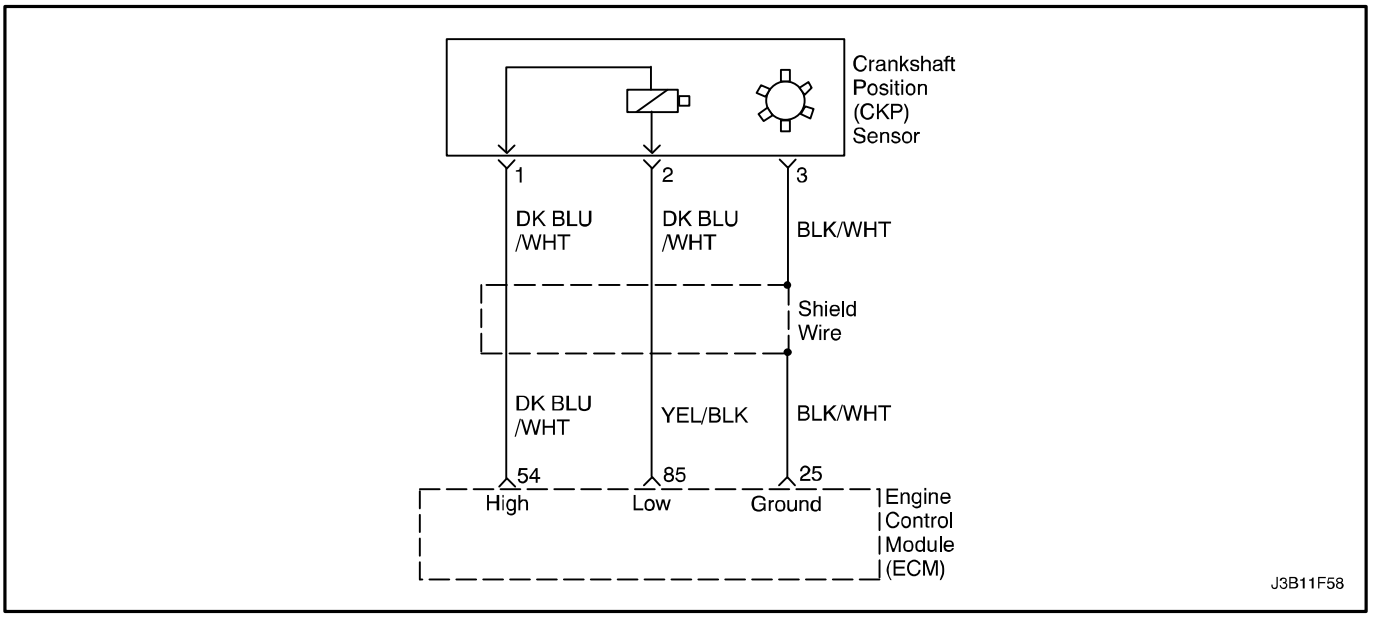
Damaged harness – inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition ON and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving the connectors and the wiring harness related to the ECM. A change in voltage will indicate the location of the fault.

Review the failure records vehicle mileage since the diagnostic test failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0336 – 58X Crankshaft Position Sensor No Plausible Signal

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	Attempt to start the engine. Does the engine start?	–	Go to *Step 3*	Go to "Engine Cranks But Will Not Run"
3	1. Review and record Failure Records information. 2. Clear the DTC P0336. 3. Start the engine and idle for 1 minute. 4. Observe the diagnostic trouble codes (DTCs). Is the DTC P0336 set?	–	Go to *Step 4*	Go to "Diagnostic Aids"
4	1. Disconnect the engine control module(ECM) and the crankshaft position (CKP) sensor. 2. Check for an open or a low voltage in the CKP sensor connector and the ECM harness connector. Is the problem found?	–	Go to *Step 5*	Go to *Step 6*
5	Repair the open or low voltage in the 58X reference circuit between the CKP sensor connector and the ECM harness connector. Is the repair complete?	–	Go to *Step 11*	–
6	1. Reconnect the ECM and CKP sensor. 2. Connect a digital voltmeter (DVM) to measure voltage on the 58X reference circuit, terminal 54 at the ECM connector. 3. Observe the voltage while cranking the engine. Is the voltage near the specified value?	2.5V	Go to *Step 9*	Go to *Step 7*
7	Check the connection at the CKP sensor and replace the terminals if necessary. Do any terminals require replacement?	–	Go to *Step 11*	Go to *Step 8*
8	Replace the CKP sensor. Is the replacement complete?	–	Go to *Step 11*	–
9	Check the connections at the ECM and replace the terminals if necessary. Do any terminal require replacement?	–	Go to *Step 11*	Go to *Step 10*
10	Replace the ECM. Is the replacement complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0337

58X CRANKSHAFT POSITION SENSOR NO SIGNAL

Circuit Description

The 58X reference signal is produced by the crankshaft position (CKP) sensor. During one crankshaft revolution, 58 crankshaft pulses will be produced. The transaxle control module(TCM)/engine control module(ECM) uses the 58X reference signal to calculate engine rpm and CKP. The ECM constantly monitors the number of pulses on the 58X reference circuit and compares them to the number of camshaft position (CKP) signal pulses being received. If the ECM receive and incorrect number of pulses on the 58X reference circuit, DTC P0336 will set.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.
- No crankshaft teeth detected.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for :

Poor connection – inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

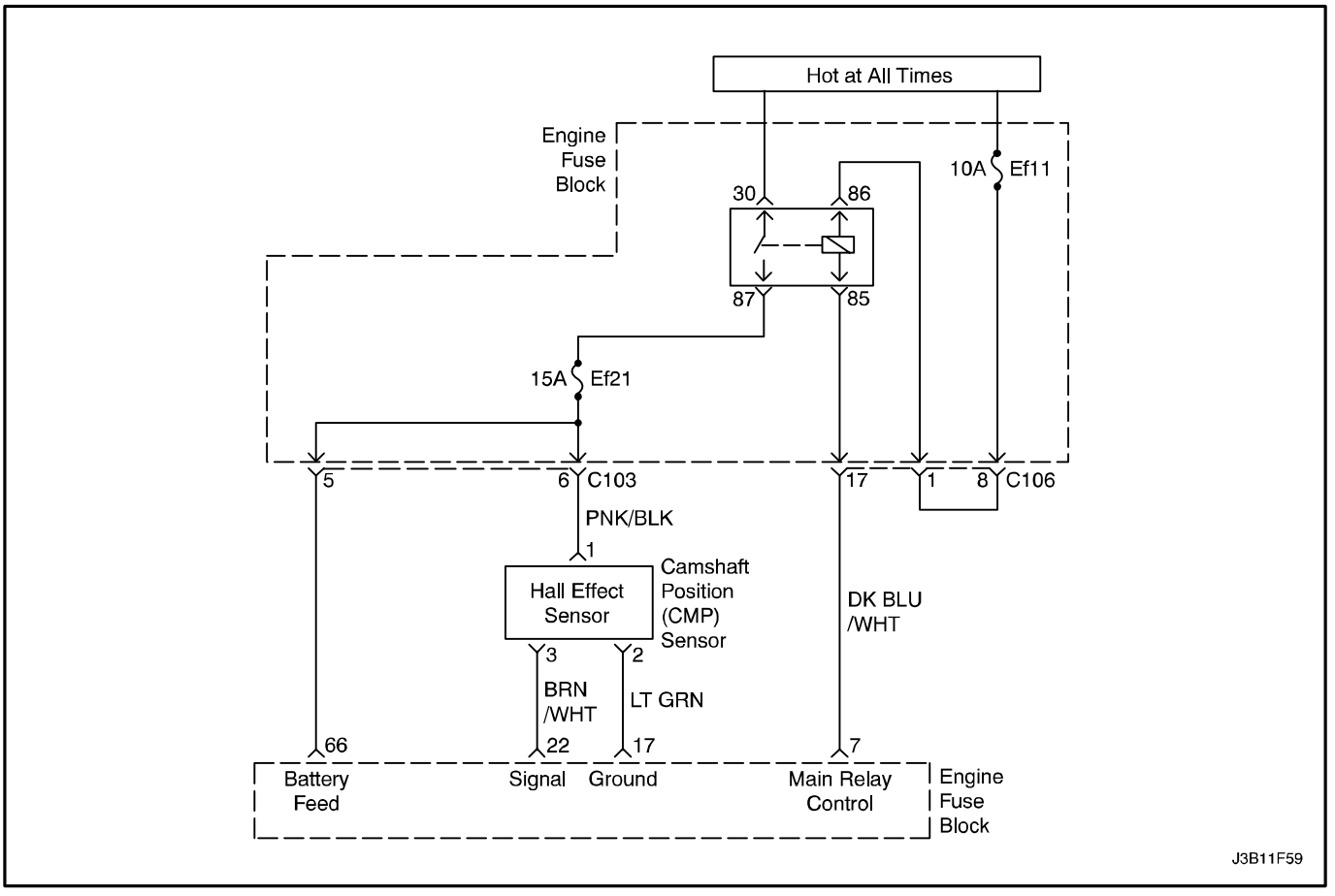
Damaged harness – inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition ON and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving the connectors and the wiring harness related to the ECM. A change in voltage will indicate the location of the fault.

Review the failure records vehicle mileage since the diagnostic test failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0337 – 58X Crankshaft Position Sensor No Signal

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Attempt to start the engine. Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Review and record Failure Records information. 2. Clear the DTC P0337. 3. Start the engine and idle for 1 minute. 4. Observe the diagnostic trouble codes (DTCs). Is the DTC P0337 set?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Disconnect the engine control module(ECM) and the crankshaft position (CKP) sensor. 2. Check for an open or a low voltage in the CKP sensor connector and the ECM harness connector. Is the problem found?	–	Go to *Step 5*	Go to *Step 6*
5	Repair the open or low voltage in the 58X reference circuit between the CKP sensor connector and the ECM harness connector. Is the repair complete?	–	Go to *Step 11*	–
6	1. Reconnect the ECM and CKP sensor. 2. Connect a digital voltmeter (DVM) to measure voltage on the 58X reference circuit, terminal 54 at the ECM connector. 3. Observe the voltage while cranking the engine. Is the voltage near the specified value?	2.5V	Go to *Step 9*	Go to *Step 7*
7	Check the connection at the CKP sensor and replace the terminals if necessary. Do any terminals require replacement?	–	Go to *Step 11*	Go to *Step 8*
8	Replace the CKP sensor. Is the replacement complete?	–	Go to *Step 11*	–
9	Check the connections at the ECM and replace the terminals if necessary. Do any terminal require replacement?	–	Go to *Step 11*	Go to *Step 10*
10	Replace the ECM. Is the replacement complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displaced that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0341

CAMSHAFT POSITION SENSOR RATIONALITY

Circuit Description

The Camshaft Position Sensor is used to detect Camshaft position and to have correlation with Crankshaft position so that the ECM can determine which cylinder is ready to be fueled by the injector. The polarity of camshaft sensor signal must be changed only once per crankshaft position.

Conditions for Setting the DTC

- No traction of CMP signal between teeth 25 and 33 but change in polarity.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

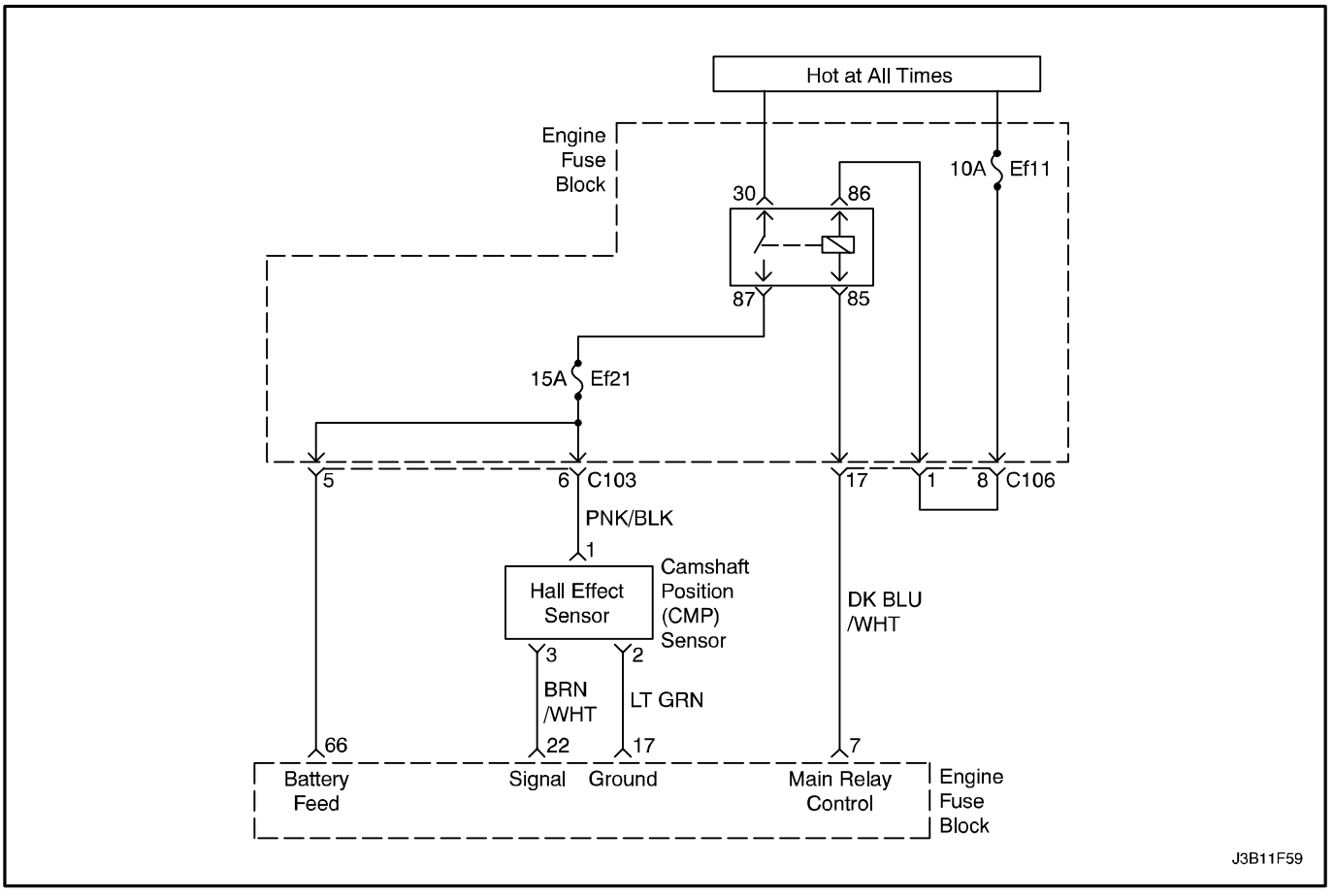
Check and correct any abnormal engine noise before using the diagnostic table.

Any circuitry that is suspected as causing engine noise complaint should be thoroughly checked for the following conditions :

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

DTC P0341 – Camshaft Position Sensor Rationality

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the CMP sensor connector. 3. Check for a faulty connector or terminals. Is the problem found?	–	Go to *Step 4*	Go to *Step 3*
3	1. Turn the Turn the ignition switch to ON. 2. Disconnect the ECM connector. 3. Inspect the ECM pins and connector for bent or damaged terminals. 4. Check the wire between the CMP sensor terminal 2 and ECM connector 17 for an open or short to ground or short to battery voltage while related connectors and wiring harness. 5. Check the wires between the CMP sensor terminal 3 and ECM connector 22 for an open while moving related connectors and wiring harness. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch to LOCK. 2. Repair or replace the wire or the connector. 3. Clear any DTCs from the ECM. 4. Run the engine. 5. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
5	1. Turn the ignition switch to LOCK. 2. Replace the CMP sensor. 3. Clear any DTCs from the ECM. 4. Run the engine. 5. Perform the diagnostic system check. Does DTC P0341 reset?	–	System OK	Go to *Step 6*
6	1. Replace the ECM. 2. Run the engine. 3. Perform the Diagnostic system check. Is the replacement complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic run and passed?	–	Go to *Step 8*	–
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0342

CAMSHAFT POSITION SENSOR SIGNAL

Circuit Description

The Camshaft Position Sensor is used to detect Camshaft position and to have correlation with Crankshaft position so that the ECM can determine which cylinder is ready to be fueled by the injector. The polarity of camshaft sensor signal must be changed only once per crankshaft position.

Conditions for Setting the DTC

- No traction of CMP signal between teeth 25 and 33 but change in polarity.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

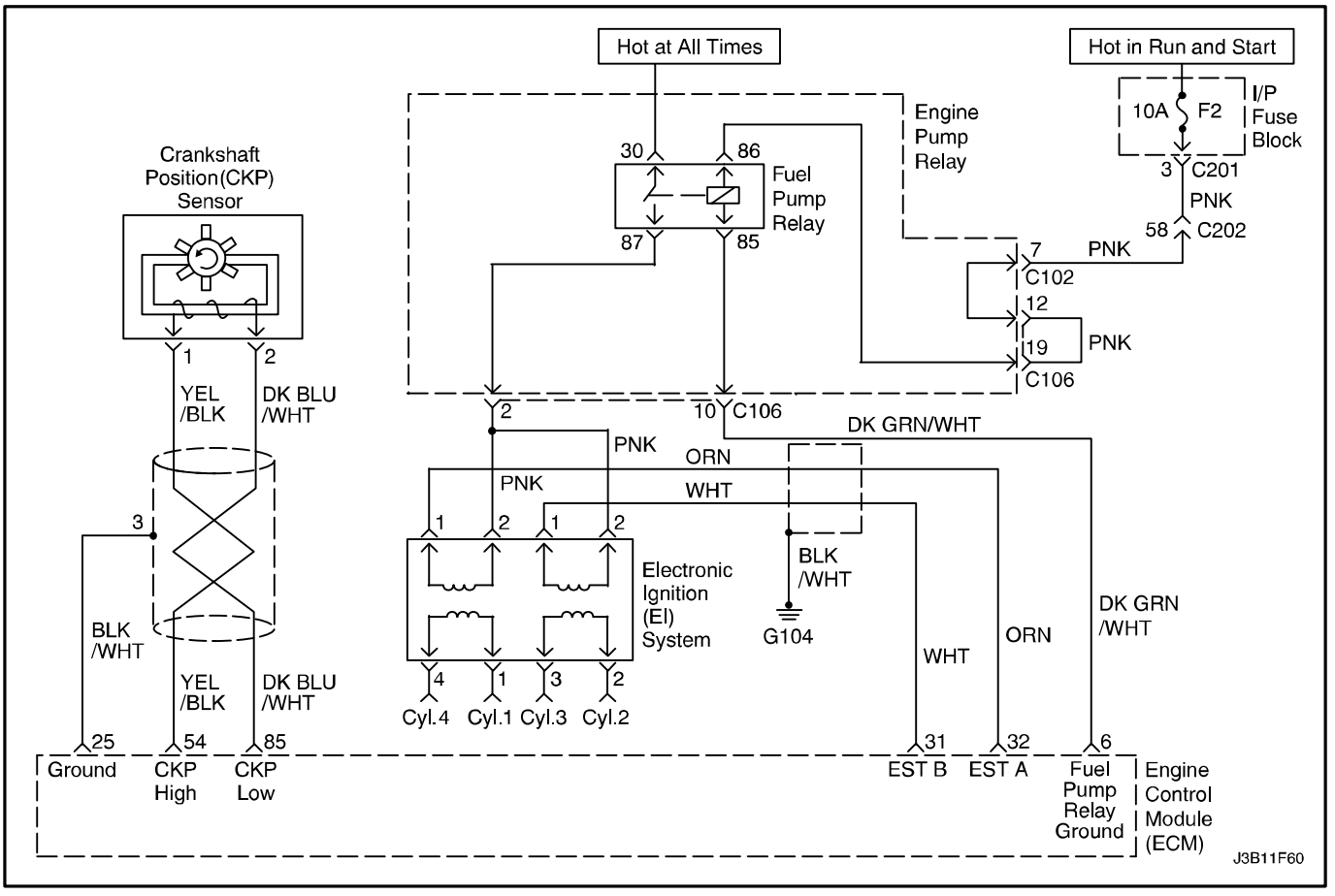
Check and correct any abnormal engine noise before using the diagnostic table.

Any circuitry that is suspected as causing engine noise complaint should be thoroughly checked for the following conditions :

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

DTC P0342 – Camshaft Position Sensor Signal

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the CMP sensor connector. 3. Check for a faulty connector or terminals. Is the problem found?	–	Go to *Step 4*	Go to *Step 3*
3	1. Turn the Turn the ignition switch to ON. 2. Disconnect the ECM connector. 3. Inspect the ECM pins and connector for bent or damaged terminals. 4. Check the wire between the CMP sensor terminal 2 and ECM connector 17 for an open or short to ground or short to battery voltage while related connectors and wiring harness. 5. Check the wires between the CMP sensor terminal 3 and ECM connector 22 for an open while moving related connectors and wiring harness. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch to LOCK. 2. Repair or replace the wire or the connector. 3. Clear any DTCs from the ECM. 4. Run the engine. 5. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
5	1. Turn the ignition switch to LOCK. 2. Replace the CMP sensor. 3. Clear any DTCs from the ECM. 4. Run the engine. 5. Perform the diagnostic system check. Does DTC P0342 reset?	–	System OK	Go to *Step 6*
6	1. Replace the ECM. 2. Run the engine. 3. Perform the Diagnostic system check. Is the replacement complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic run and passed?	–	Go to *Step 8*	–
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0351

IGNITION SIGNAL COIL A FAULT

Circuit Description

The engine control module (ECM) provides a ground for the electronic spark timing 1 circuit. When the ECM removes the ground path of the ignition primary coil, the magnetic field produced by the coil collapses. The collapsing magnetic field produces a voltage in the secondary coil which fires the spark plug. The circuit between the ECM and the electronic ignition system is monitored for an open circuit, short to voltage, and low voltage. When the ECM detects a problem in the spark timing 1 circuit, it will set DTC P0351.

Conditions for Setting the DTC

- The ignition signal coil A circuit is an open or a short to ground or short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

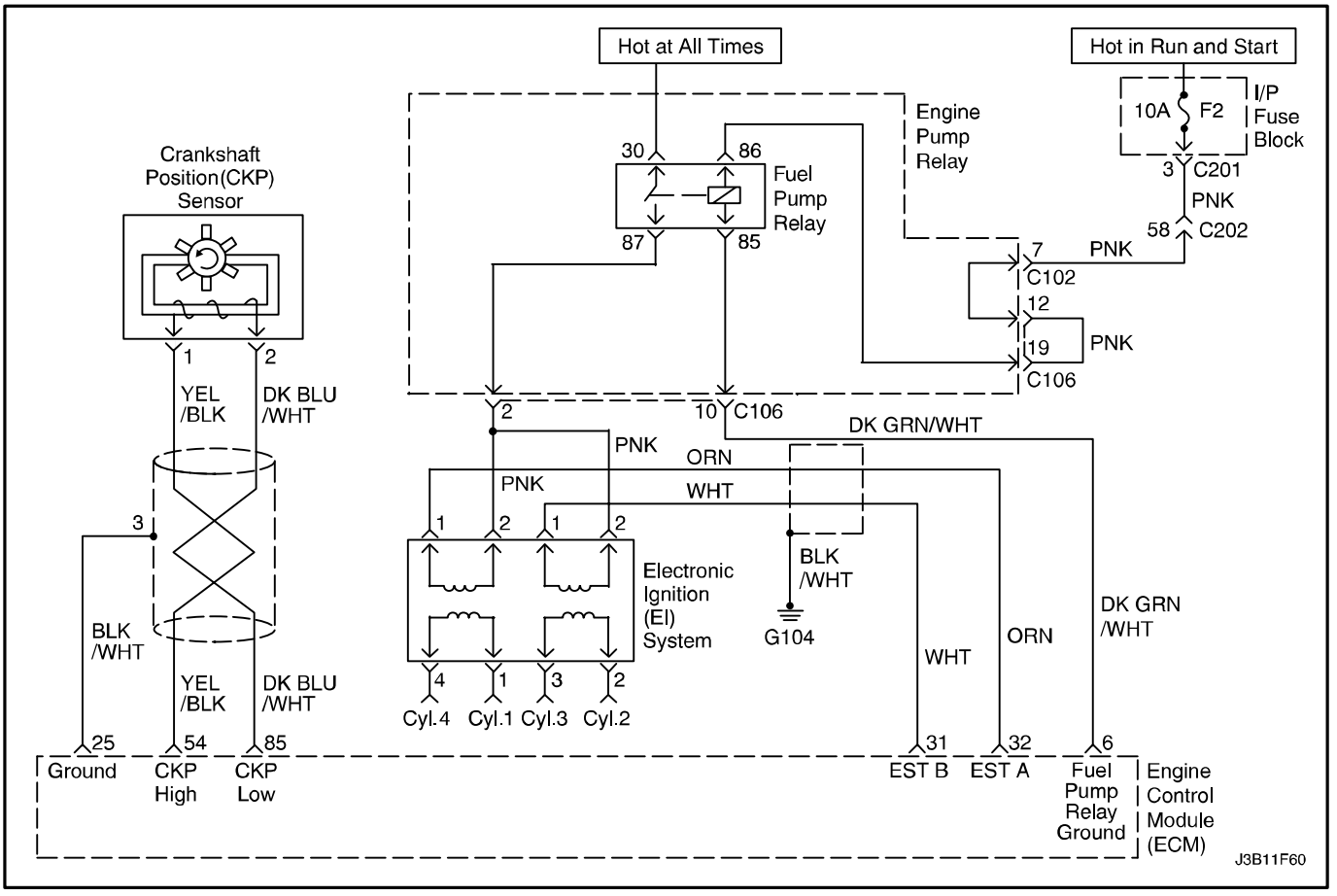
Check and correct any abnormal engine noise before using the diagnostic table.

Any circuitry that is suspected as causing engine noise complaint should be thoroughly checked for the following conditions :

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

DTC P0351 – Ignition Signal Coil A Fault

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Check for a faulty connection or a damaged terminal A at the ignition coil. Is a problem found?	–	Go to *Step 8*	Go to *Step 3*
3	Check for a faulty connection or a damaged terminal 32 at the engine control module(ECM) connector. Is the problem found?	–	Go to *Step 8*	Go to *Step 4*
4	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM. 3. Check the ignition control circuit for a short to ground. Is the problem found?	–	Go to *Step 8*	Go to *Step 5*
5	Check the ignition control circuit for a short to battery voltage. Is the problem found?	–	Go to *Step 8*	Go to *Step 6*
6	Check for an open in the ignition control. Is the problem found?	–	Go to *Step 8*	Go to *Step 7*
7	Replace the ECM. Is the replacement complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). • Start the engine and Idle at normal operating temperature. • Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 9*	–
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0352

IGNITION SIGNAL COIL B FAULT

Circuit Description

The engine control module (ECM) provides a ground for the electronic spark timing 3 circuit. When the ECM removes the ground path of the ignition primary coil, the magnetic field produced by the coil collapses. The collapsing magnetic field produces a voltage in the secondary coil, which fires the spark plug. The circuit between the ECM and the electronic ignition system is monitored for an open circuit, short to voltage, and low voltage. When the ECM detects a problem in the spark timing 3 circuit, it will set DTC P0352.

Conditions for Setting the DTC

- The ignition signal coil B circuit is an open or a short ground or short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will default to 6 degree timing.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- Using the scan tool can clear DTC(s).
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

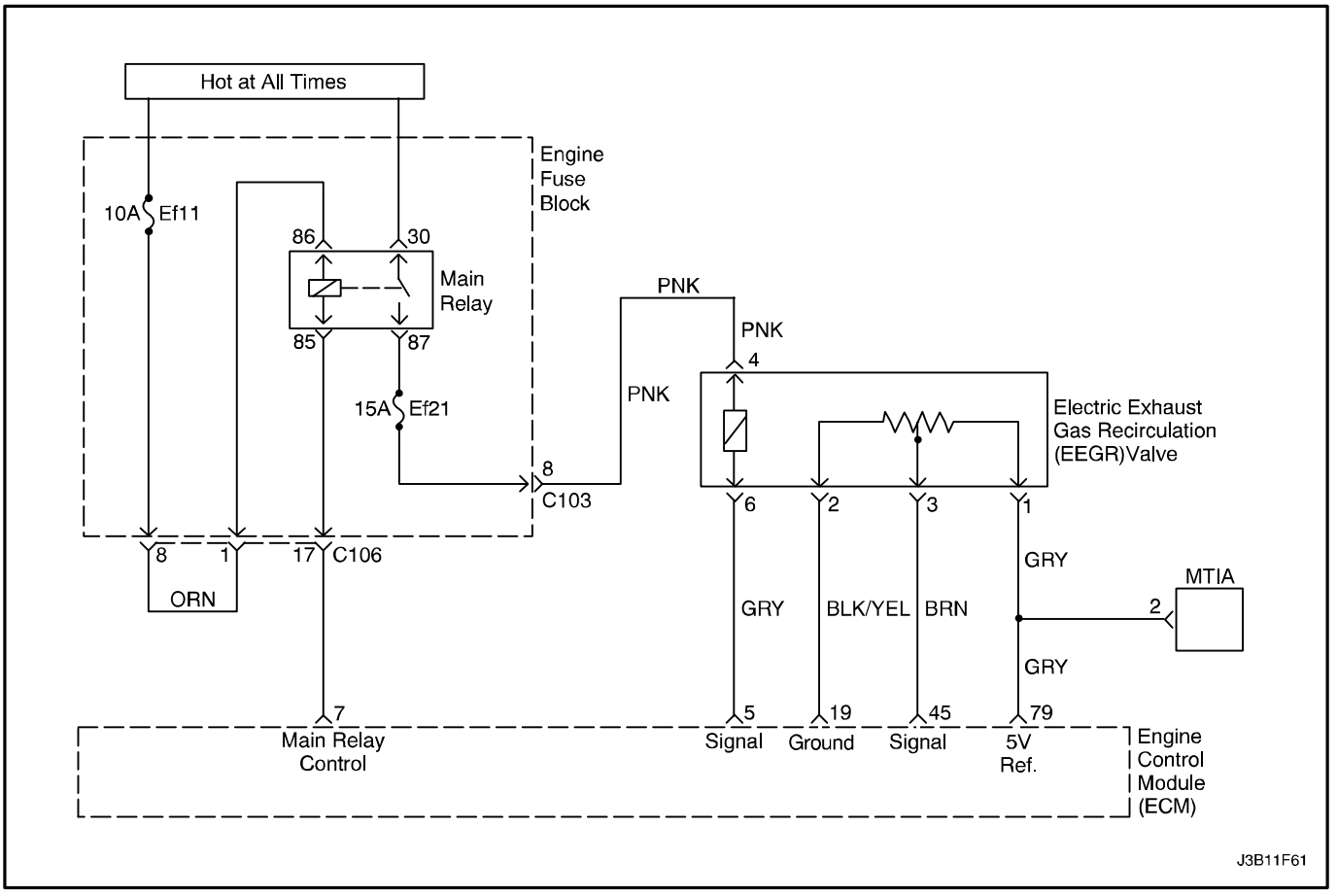
Check and correct any abnormal engine noise before using the diagnostic table.

Any circuitry that is suspected as causing engine noise complaint should be thoroughly checked for the following conditions :

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

DTC P0352 – Ignition Signal Coil B Fault

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Check for a faulty connection or a damaged terminal C at the ignition coil. Is a problem found?	–	Go to *Step 8*	Go to *Step 3*
3	Check for a faulty connection or a damaged terminal 31 at the engine control module(ECM) connector. Is the problem found?	–	Go to *Step 8*	Go to *Step 4*
4	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM. 3. Check the ignition control circuit for a short to ground. Is the problem found?	–	Go to *Step 8*	Go to *Step 5*
5	Check the ignition control circuit for a short to battery voltage. Is the problem found?	–	Go to *Step 8*	Go to *Step 6*
6	Check for an open in the ignition control. Is the problem found?	–	Go to *Step 8*	Go to *Step 7*
7	Replace the ECM. Is the replacement complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). • Start the engine and Idle at normal operating temperature. • Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 9*	–
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0400

EXHAUST GAS RECIRCULATION OUT OF LIMIT

Circuit Description

An Exhaust Gas Re–circulation (EGR) system is used to lower oxides of nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with a engine control module(ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and the Manifold Absolute Pressure (MAP) sensor. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The actual EGR position should always be near the commanded or Desired EGR position.

This Diagnostic Trouble Code(DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- The vehicle is part load.
- The engine controls system is in closed loop.
- Engine Coolant Temperature (ECT) is higher than 70˚C (158˚F). (1.4L DOHC)
- Engine Coolant Temperature (ECT) is higher than 60˚C (140˚F). (1.6L DOHC)
- Mass Air Flow is between 120~230mg/tdc. (1.4L DOHC)
- Mass Air Flow is between 71~174mg/tdc. (1.6L DOHC)
- Engine Speed is Between 1,800~2,400rpm. (1.4L DOHC)
- Engine Speed is Between 1,950~2,600rpm. (1.6L DOHC)
- Intake Air Temperature(IAT) is higher than 15˚C(59˚F).
- Manifold Absolute Pressure is greater than 75kPA.
- The EGR is higher than 10%.

- DTCs P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0300, P0335, P0336, P0341, P0342, P1671, P1672, P1673 are NOT SET.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

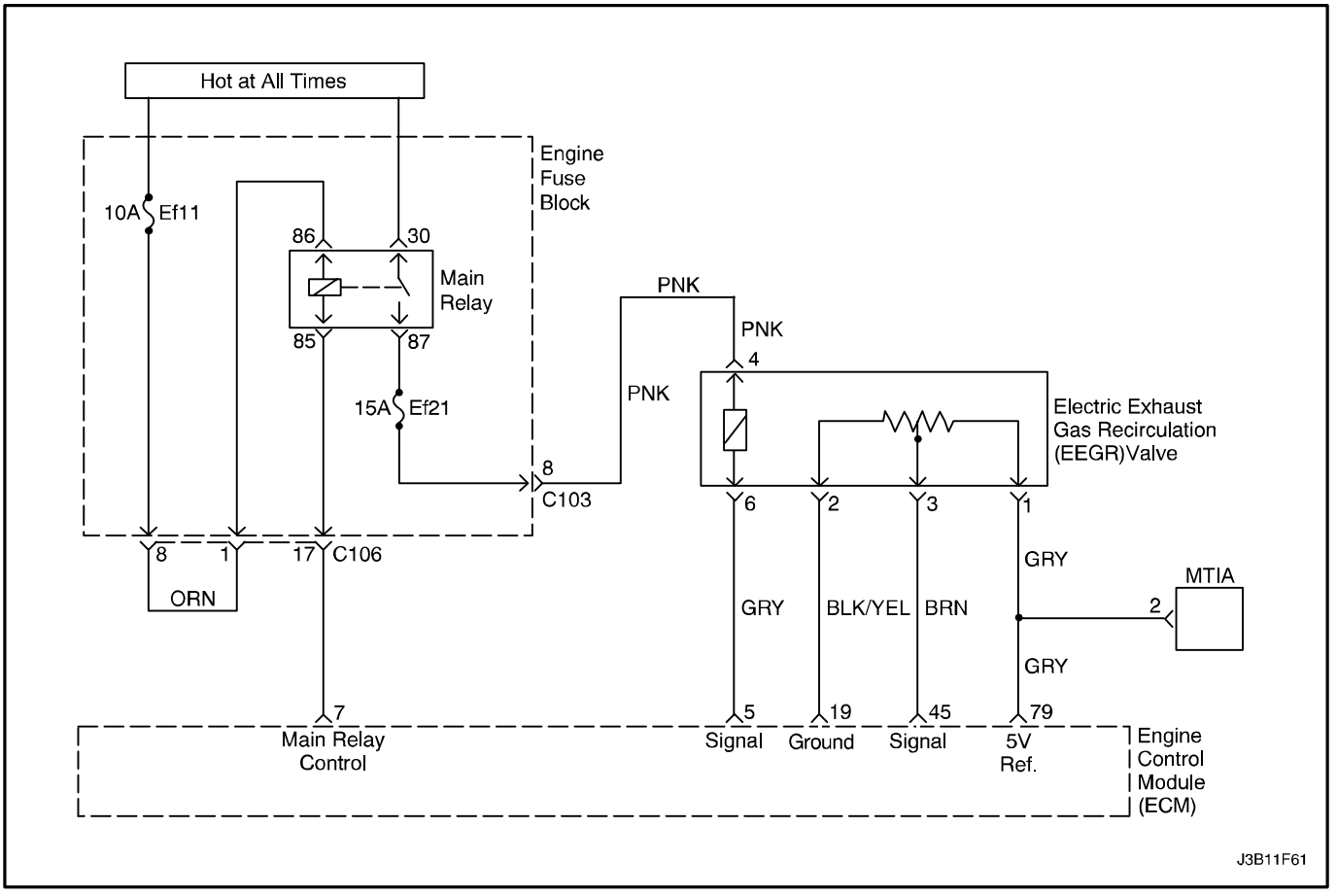
Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P0400 – Exhaust Gas Recirculation Out of Limit

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to with the engine OFF. 2. Install the scan tool. 3. Command the exhaust gas recirculation (EGR) valve to the specified values. Does the Actual EGR Position follow the desired EGR position?	25%, 50% 75%, 100%	Go to *Step 19*	Go to *Step 3*
3	1. Turn the ignition switch to ON. 2. Disconnect the EGR valve electrical connector. 3. With a test light connected to B+, probe the ground circuit to the EGR valve. Does the test light illuminate?	–	Go to *Step 4*	Go to *Step 5*
4	1. Connect the test light to ground. 2. Probe the EGR control circuit at terminal 3 to the EGR valve. 3. Command the EGR valve to the specified values using a scan tool. After the command is raised, does the test light glow brighter, flash or maintain a steady glow?	25%, 50% 75%, 100%	Go to *Step 6*	Go to *Step 7*
5	Repair the open or poor connection in the EGR ground circuit. Is the repair complete?	–	Go to *Step 19*	–
6	With a test light still connected to ground, probe the signal circuit at terminal 3. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
7	With a test light still connected to ground, again probe the signal circuit without commanding the EGR valve with the scan tool. Does the test light illuminate?	–	Go to *Step 10*	Go to *Step 11*
8	Check the signal circuit for a short to voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
9	With a digital voltmeter (DVM) connected to ground, probe the 5V reference circuit at terminal 1. Is the voltage measured near the specified value?	5V	Go to *Step 13*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
10	Check the control circuit for a short to battery voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
11	Connect the test light to B+ and again probe the control circuit at terminal 4. Does the test light illuminate?	–	Go to *Step 15*	Go to *Step 16*
12	Replace the engine control module (ECM). Is the replacement complete?	–	Go to *Step 19*	–
13	Check the EGR ground circuit for a poor connection or proper terminal tension at the ECM and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 17*
14	Check the 5V reference circuit for a shortage to battery voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
15	Check the control circuit for a shortage to ground and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
16	Check the control circuit for an open or poor connection at the EGR valve electrical connector and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 18*
17	Replace the EGR valve. Is the replacement complete?	–	Go to *Step 19*	–
18	Check the ECM electrical connector for a poor connection and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
19	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 20*	Go to *Step 2*
20	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0404

EXHAUST GAS RECIRCULATION OPENED

Circuit Description

An Exhaust Gas Re–circulation (EGR) system is used to lower oxides of nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with a engine control module(ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and the Manifold Absolute Pressure (MAP) sensor. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The actual EGR position should always be near the commanded or Desired EGR position.

This Diagnostic Trouble Code(DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- EGR circuit is a short to ground or an open condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

- Disconnecting the ECM battery feed for more than 10 seconds.

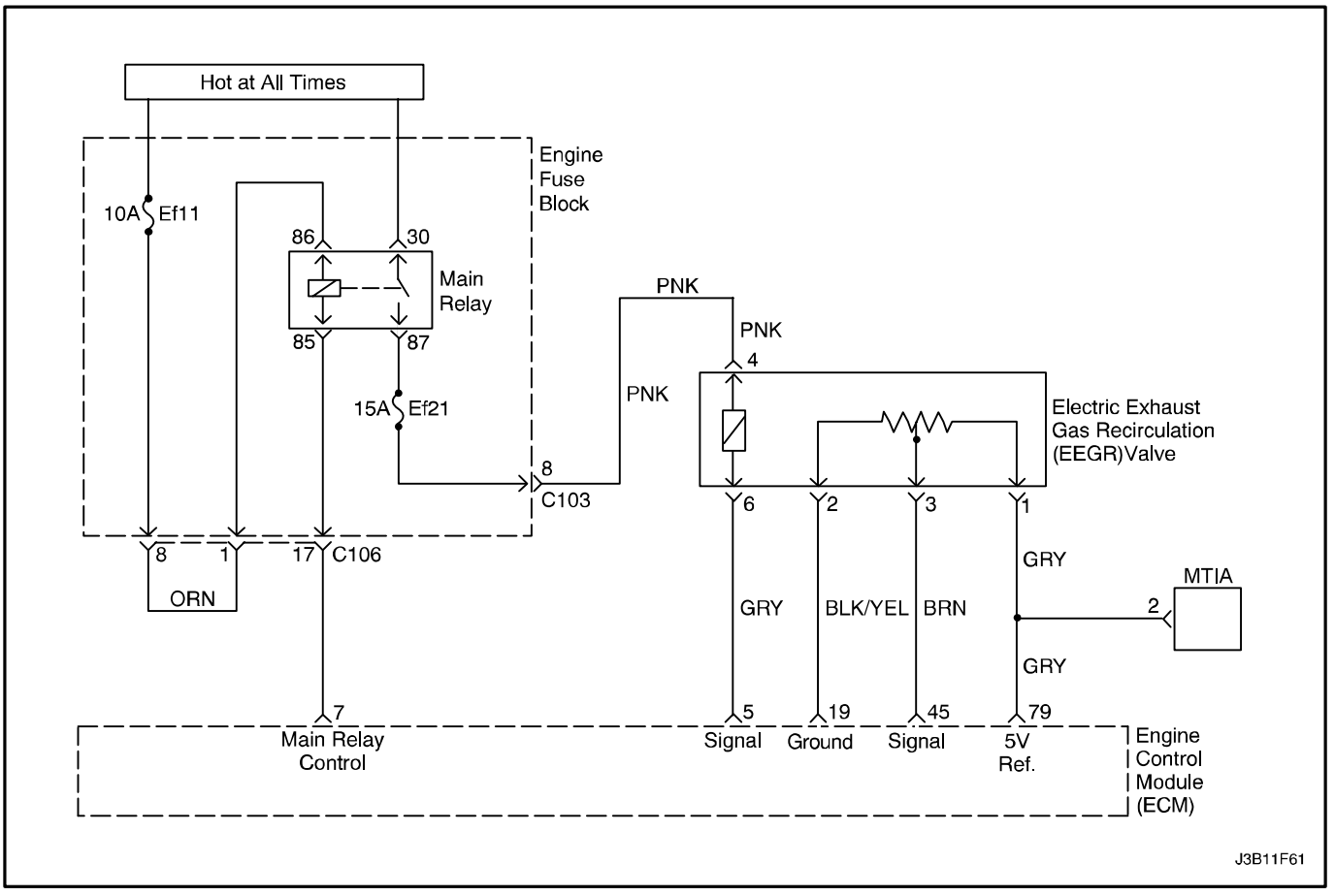
Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and desired EGR positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the Freeze Frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

DTC P0404 – Exhaust Gas Recirculation Opened

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to with the engine OFF. 2. Install the scan tool. 3. Command the exhaust gas recirculation (EGR) valve to the specified values. Does the Actual EGR Position follow the desired EGR position?	25%, 50% 75%, 100%	Go to *Step 19*	Go to *Step 3*
3	1. Turn the ignition switch to ON. 2. Disconnect the EGR valve electrical connector. 3. With a test light connected to B+, probe the ground circuit to the EGR valve. Does the test light illuminate?	–	Go to *Step 4*	Go to *Step 5*
4	1. Connect the test light to ground. 2. Probe the EGR control circuit at terminal 3 to the EGR valve. 3. Command the EGR valve to the specified values using a scan tool. After the command is raised, does the test light glow brighter, flash or maintain a steady glow?	25%, 50% 75%, 100%	Go to *Step 6*	Go to *Step 7*
5	Repair the open or poor connection in the EGR ground circuit. Is the repair complete?	–	Go to *Step 19*	–
6	With a test light still connected to ground, probe the signal circuit at terminal 3. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
7	With a test light still connected to ground, again probe the signal circuit without commanding the EGR valve with the scan tool. Does the test light illuminate?	–	Go to *Step 10*	Go to *Step 11*
8	Check the signal circuit for a short to voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
9	With a digital voltmeter (DVM) connected to ground, probe the 5V reference circuit at terminal 1. Is the voltage measured near the specified value?	5V	Go to *Step 13*	Go to *Step 14*
10	Check the control circuit for a short to battery voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
11	Connect the test light to B+ and again probe the control circuit at terminal 4. Does the test light illuminate?	–	Go to *Step 15*	Go to *Step 16*

Step	Action	Value(s)	Yes	No
12	Replace the engine control module (ECM). Is the replacement complete?	–	Go to *Step 19*	–
13	Check the EGR ground circuit for a poor connection or proper terminal tension at the ECM and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 17*
14	Check the 5V reference circuit for a shortage to battery voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
15	Check the control circuit for a shortage to ground and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
16	Check the control circuit for an open or poor connection at the EGR valve electrical connector and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 18*
17	Replace the EGR valve. Is the replacement complete?	–	Go to *Step 19*	–
18	Check the ECM electrical connector for a poor connection and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
19	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 20*	Go to *Step 2*
20	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0405

EGR PINTLE POSITION SENSOR LOW VOLTAGE

Circuit Description

An Exhaust Gas Re–circulation (EGR) system is used to lower oxides of nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with a engine control module(ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and the Manifold Absolute Pressure (MAP) sensor. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The actual EGR position should always be near the commanded or Desired EGR position.

This Diagnostic Trouble Code(DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- EGR voltage is less than 0.01V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

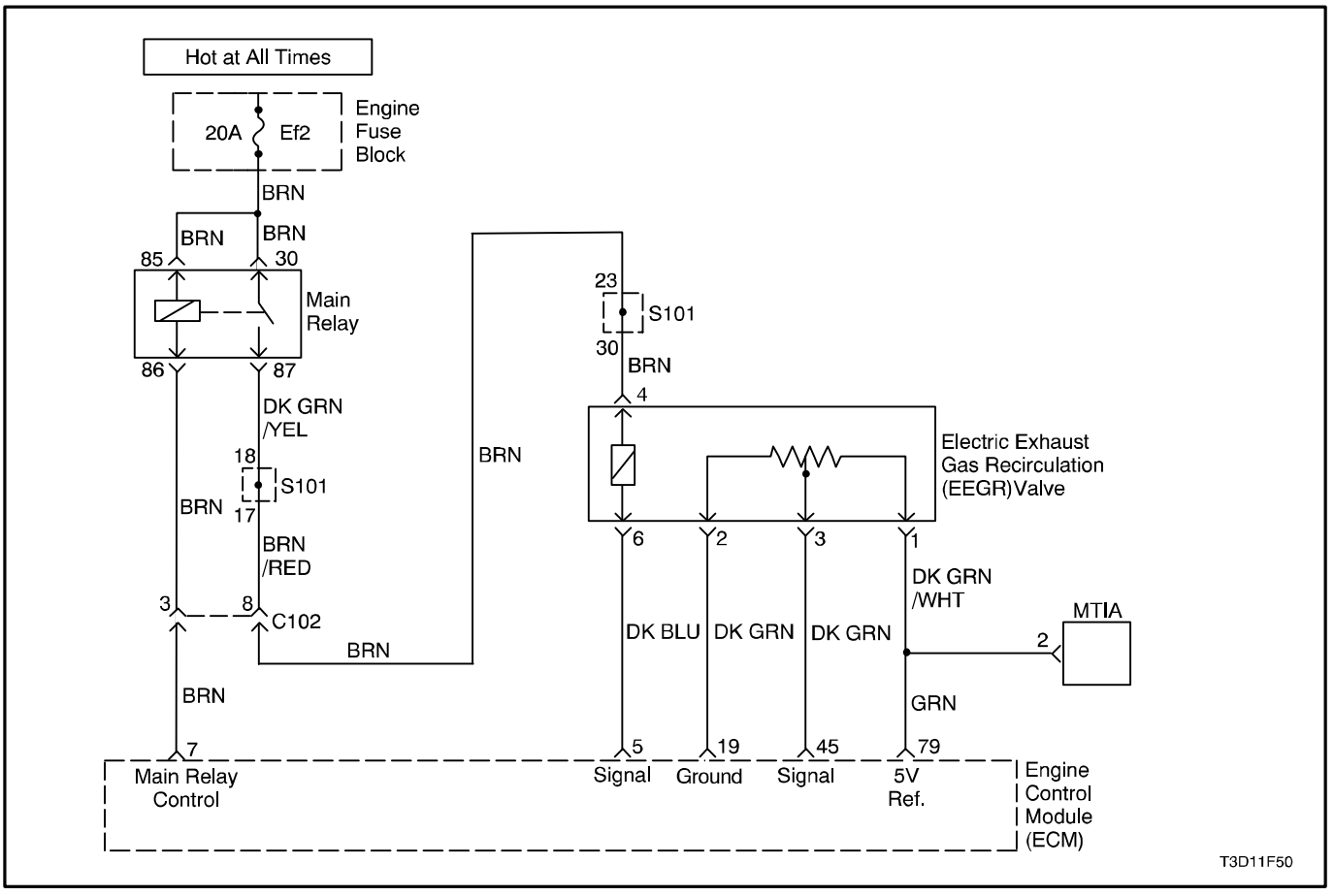
Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and desired EGR positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the Freeze Frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

DTC P0405 – EGR Pintle Position Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch ON with the engine OFF. 2. Install the scan tool. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specified values. Does the Actual EGR Position follow the desired EGR position?	25%, 50% 75%, 100%	Go to *Step 15*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF. 2. Disconnect the EGR valve electrical connector. 3. With a Digital Voltmeter (DVM) connected to ground, probe the 5 volt reference circuit at terminal 1 to the EGR valve. Does the DVM read near the specified value?	5V	Go to *Step 4*	Go to *Step 5*
4	Jumper the 5 volt reference circuit to the signal circuit at terminals 1 and 3. Does the actual EGR position display the specified value ?	100%	Go to *Step 6*	Go to *Step 7*
5	1. Connect the test light to B+. 2. robe the 5 volt reference circuit to the EGR valve. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
6	Check the 5 volt reference and signal circuit for a poor connection or proper terminal tension and repair as necessary. Is a repair necessary?	–	Go to *Step 15*	Go to *Step 10*
7	1. Connect the test light to B+. 2. Probe the signal circuit at terminal 3 to the EGR valve. Does the test light illuminate?	–	Go to *Step 11*	Go to *Step 12*
8	Check for a short to ground in the EGR valve 5 volt reference circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 15*	Go to *Step 13*
9	Check for an open in the EGR valve 5 volt reference circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 15*	Go to *Step 14*
10	Replace the EGR valve. Is the action complete?	–	Go to *Step 15*	–
11	Check for a short to ground in the EGR valve signal circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 15*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
12	Check for an open in the EGR valve signal circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 15*	Go to *Step 14*
13	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the action complete?	–	Go to *Step 15*	–
14	Check the affected circuit for a poor connection or proper terminal at the ECM and repair as necessary. Is a repair necessary?	–	Go to *Step 15*	Go to *Step 13*
15	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 16*	Go to *Step 2*
16	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0406

EGR PINTLE POSITION SENSOR HIGH VOLTAGE

Circuit Description

An Exhaust Gas Re–circulation (EGR) system is used to lower oxides of nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with a engine control module(ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and the Manifold Absolute Pressure (MAP) sensor. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The actual EGR position should always be near the commanded or Desired EGR position.

This Diagnostic Trouble Code(DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- EGR voltage is higher than 4.99V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and desired EGR positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the Freeze Frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

DTC P0406 – EGR Pintle Position Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition switch ON with the engine OFF. 2. Install the scan tool. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specified values. Does the Actual EGR Position follow the desired EGR position?	25%, 50% 75%, 100%	Go to *Step 14*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF. 2. Disconnect the EGR valve electrical connector. 3. With a Digital Voltmeter (DVM) connected to ground, probe the 5 volt reference circuit at terminal 1 to the EGR valve. Does the DVM read near the specified value?	5V	Go to *Step 4*	Go to *Step 5*
4	Jumper the 5 volt reference circuit to the signal circuit at terminals 1 and 3. Does the actual EGR position display the specified value ?	100%	Go to *Step 6*	Go to *Step 7*
5	1. Connect the test light to B+. 2. robe the 5 volt reference circuit to the EGR valve. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
6	Check the 5 volt reference and signal circuit for a poor connection or proper terminal tension and repair as necessary. Is a repair necessary?	–	Go to *Step 14*	Go to *Step 10*
7	1. Connect the test light to ground. 2. Probe the signal circuit at terminal 3 to the EGR valve. Does the test light illuminate?	–	Go to *Step 11*	Go to *Step 13*
8	Check for a short to ground in the EGR valve 5 volt reference circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 14*	Go to *Step 12*
9	Check for an open in the EGR valve 5 volt reference circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 14*	Go to *Step 13*
10	Replace the EGR valve. Is the action complete?	–	Go to *Step 14*	–
11	Check for a short to voltage in the EGR valve signal circuit and repair as necessary. Is a repair necessary?	–	Go to *Step 14*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
12	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the action complete?	–	Go to *Step 14*	–
13	Check the affected circuit for a poor connection or proper terminal at the ECM and repair as necessary. Is a repair necessary?	–	Go to *Step 14*	Go to *Step 12*
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0420
CATALYST LOW EFFICIENCY

Circuit Description

In order to control exhaust emissions of Hydrocarbons (HC), Carbon Monoxide (CO) and Nitrogen Oxide (NOx), a Three–Way Catalytic Converter (TWC) is used. The catalyst within the converter promotes a chemical reaction which oxidizes the HC and CO present in the exhaust gas, converting them into harmless water vapor and carbon dioxide, it also reduces NOx, converting it into nitrogen. The catalytic converter also has the ability to store oxygen.

The Engine Control Module (ECM) has the capability to monitor this process using a Heated Oxygen Sensor (HO2S) located in the exhaust stream past the TWC. The HO2S produces an output signal which indicates the oxygen storage capacity of the catalyst; this in turn indicates the catalyst's ability to convert exhaust emissions effectively. The ECM monitors the catalyst efficiency by first allowing the catalyst to heat up, waiting for a stabilization period while the engine is idling, and then adding and removing fuel while monitoring the reaction of the HO2S. When the catalyst is functioning properly, the HO2S response to the extra fuel is slow compared to the Oxygen Sensor (O2S). When the HO2S response is close to that of the O2S, the Oxygen storage capability or efficiency of the catalyst is considered to be bad, and the Malfunction Indicator Lamp (MIL) will illuminate.

Conditions for Setting the DTC

- Closed loop stoichiometry.
- Engine Coolant Temperature (ECT) is more than 75˚C (167˚F) . (1.4L DOHC)
- Engine Coolant Temperature (ECT) is more than 70˚C (158˚F) . (1.6L DOHC)
- Engine speed between 1,766rpm and 2,368rpm. (1.4L DOHC)
- Engine speed between 1,760rpm and 2,530rpm. (1.6L DOHC)
- Vehicle speed is between 47km/h (29.2mph) and 80km/h (49.7mph). (1.4L DOHC)
- Vehicle speed is between 60km/h (37.3mph) and 76km/h (47.2mph). (1.6L DOHC)
- The manifold absolute pressure is greater than 70 kpa. (1.4L DOHC)
- The manifold absolute pressure is greater than 76 kpa. (1.6L DOHC)
- Activity of the heated oxygen sensor excited by lambda controller stimuli higher than a threshold.
- DTC(s) P0107, P0108, P0117, P0118, P0122, P0123, P0131, P0132, P0133, P0137, P0138, P0140, P0141, P0171, P0172, P0300, P0336, P0337, P0341, P0342, P0351, P0352, P0404, P0405, P0405 and P0562 are not sets.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

The catalyst test may abort due to a change in the engine load. Do not change the engine load (i.e. A/C, coolant fan, heater motor) while a catalyst test is in progress.

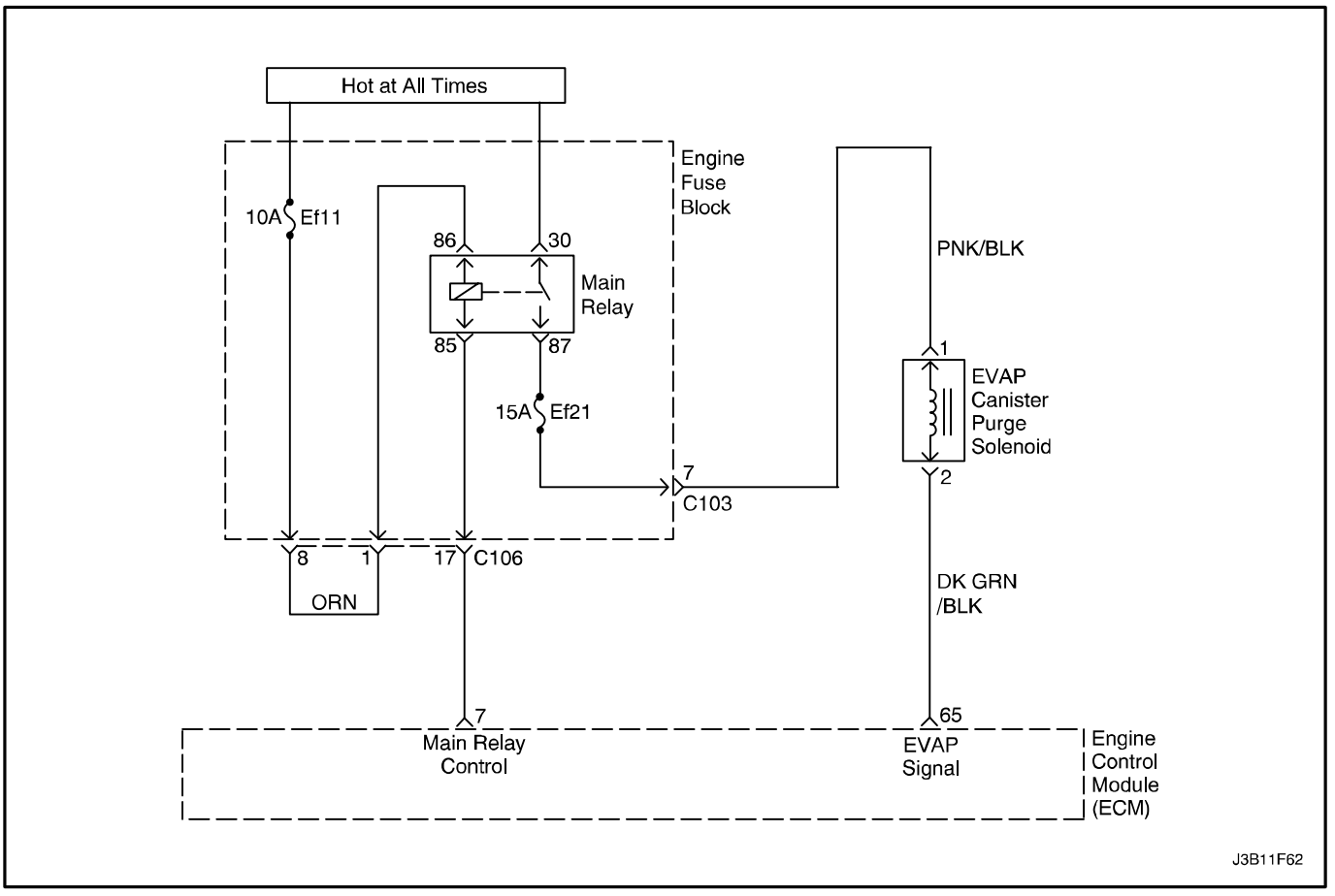
An intermittent problem may be caused by a poor connection, rubbed–through wire insulation, or a wire that is broken inside the insulation.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection.

DTC P0420 – Catalyst Low Efficiency

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data link Connector (DLC). 2. Turn the ignition ON. Are any component Diagnostic Trouble Codes (DTCs) set?	–	Go to Applicable DTC table	Go to *Step 3*
3	1. Visually/physically check the following: 2. Exhaust system for a leak. 3. Heated Oxygen Sensor (HO2S). Is a problem found?	–	Go to *Step 4*	Go to *Step 5*
4	Repair the exhaust system as needed. Is the repair complete?	–	Go to *Step 6*	–
5	Replace the Three Way Catalytic Converter (TWC). Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0444

EVAP PURGE CONTROL CIRCUIT NO SIGNAL

Circuit Description

The evaporative emission (EVAP) system includes the following components :

- Fuel tank.
- EVAP vent solenoid.
- Fuel tank pressure sensor.
- Fuel pipes and hoses.
- Fuel vapor lines.
- Fuel cap.
- EVAP canister.
- Purge lines.
- EVAP canister purge valve.
- EVAP service port.

The evaporative emission system is checked by applying vacuum to the EVAP system and monitoring for a vacuum decay. The engine control module(ECM) monitors the vacuum level through the fuel tank pressure sensor signal. At the appropriate time, the EVAP canister purge valve and the EVAP vent solenoid are turned on, allowing the engine to draw a small vacuum on the entire EVAP system. After the desired vacuum level has been achieved, the EVAP canister purge valve is turned OFF, sealing the system. If a sufficient vacuum level cannot be achieved, a large leak is indicated. This can be caused by the following conditions :

Missing or faulty fuel cap.

Disconnected or faulty fuel tank pressure sensor.

Disconnected, damaged, pinched, or blocked EVAP purge line.

Disconnected or faulty EVAP canister purge valve.

Disconnected or faulty EVAP vent solenoid.

Open ignition feed circuit to the EVAP vent or purge solenoid.

Damaged EVAP canister.

Leaking fuel sensor assembly O–ring.

Leaking fuel tank or fuel filler beck.

Any of the above conditions can set DTC P0444.

The test is failed if the tank vacuum is less than 10 in H20 for 15 seconds and the manifold vacuum integral is greater than 49512 (proportional to purge mass from the tank).

Conditions for Setting the DTC

- The canister purge solenoid circuit is an open condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Although this DTC is considered a type. A diagnostic, it acts like a type B diagnostic under certain conditions. Whenever this diagnostic reports the system has passed, or if the battery is disconnected, the diagnostic must fail twice before setting a DTC. The initial failure is not reported to the diagnostic executive or displayed on a scan tool. A passing system always reports to the diagnostic executive immediately.

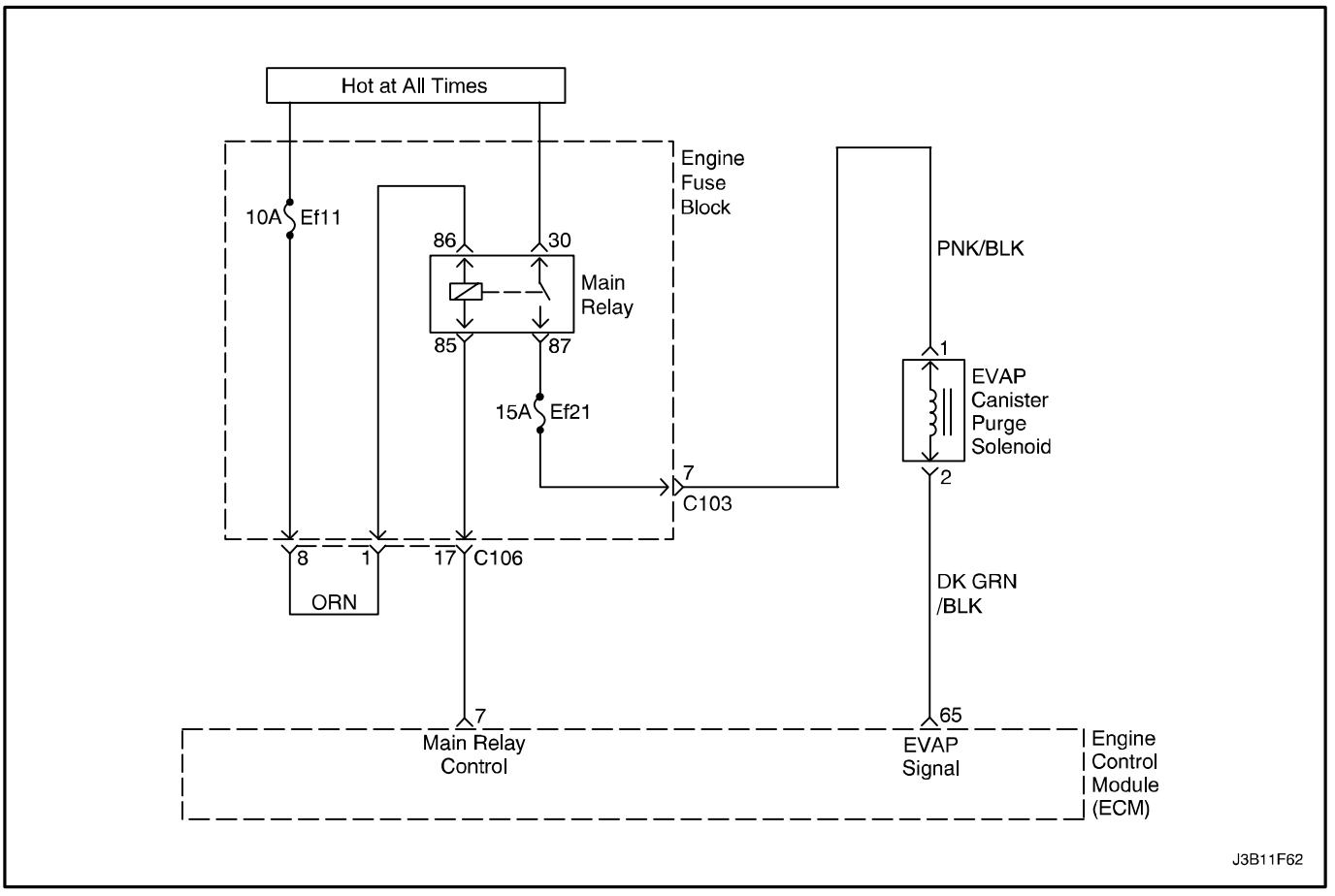
Check for the following conditions :

- Missing or damaged fuel cap.
- Missing or damaged O–rings at fuel vapor and EVAP purge line canister fittings.
- Cracked or punctured EVAP canister.
- Damaged source vacuum line, EVAP purge line, EVAP vent hose or fuel tank vapor line.
- Poor connection at the ECM. Inspect the harness connectors for the following conditions.
- Backed–out terminals.
- Improper mating.
- Broken locks.
- Improperly formed.
- Damaged terminals.
- Poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness to the EVAP vent solenoid, EVAP canister purge valve, and the fuel tank pressure sensor for an intermittent open or short circuit.
- Kinked, pinched or plugged vacuum source, EVAP purge, or fuel tank vapor line. Verify that the lines are not restricted.

DTC P0444 – EVAP Purge Control Circuit No Signal

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Disconnect the evaporative emission (EVAP) canister purge valve connector. 2. Connect a test light between the EVAP canister purge valve connector terminal 1 and battery positive. Is the test light ON?	–	Go to *Step 3*	Go to *Step 5*
3	1. Disconnect the ECM connector. 2. Connect a test light between the ECM connector terminal 65 and ground. Is the test light ON?	–	Go to *Step 4*	Go to *Step 6*
4	1. Repair the line break in the wire between the EVAP canister purge valve connector 2 and the ECM connector terminal 65. 2. Clear any Diagnostic Trouble Codes (DTCs) from the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
5	1. Repair the line break in the wire between the EVAP canister purge valve connector 1 and the main relay connector terminal 65. 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 ECM. 2. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0445

EVAP PURGE CONTROL CIRCUIT FAULT

Circuit Description

The evaporative emission (EVAP) system includes the following components :

- Fuel tank.
- EVAP vent solenoid.
- Fuel tank pressure sensor.
- Fuel pipes and hoses.
- Fuel vapor lines.
- Fuel cap.
- EVAP canister.
- Purge lines.
- EVAP canister purge valve.
- EVAP service port.

The evaporative emission system is checked by applying vacuum to the EVAP system and monitoring for a vacuum decay. The engine control module(ECM) monitors the vacuum level through the fuel tank pressure sensor signal. At the appropriate time, the EVAP canister purge valve and the EVAP vent solenoid are turned on, allowing the engine to draw a small vacuum on the entire EVAP system. After the desired vacuum level has been achieved, the EVAP canister purge valve is turned OFF, sealing the system. If a sufficient vacuum level cannot be achieved, a large leak is indicated. This can be caused by the following conditions :

Missing or faulty fuel cap.

Disconnected or faulty fuel tank pressure sensor.

Disconnected, damaged, pinched, or blocked EVAP purge line.

Disconnected or faulty EVAP canister purge valve.

Disconnected or faulty EVAP vent solenoid.

Open ignition feed circuit to the EVAP vent or purge solenoid.

Damaged EVAP canister.

Leaking fuel sensor assembly O–ring.

Leaking fuel tank or fuel filler beck.

Any of the above conditions can set DTC P0445.

The test is failed if the tank vacuum is less than 10 in H20 for 15 seconds and the manifold vacuum integral is greater than 49512 (proportional to purge mass from the tank).

Conditions for Setting the DTC

- The canister purge solenoid valve circuit is a short to battery or short to ground condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Although this DTC is considered a type. A diagnostic, it acts like a type B diagnostic under certain conditions. Whenever this diagnostic reports the system has passed, or if the battery is disconnected, the diagnostic must fail twice before setting a DTC. The initial failure is not reported to the diagnostic executive or displayed on a scan tool. A passing system always reports to the diagnostic executive immediately.

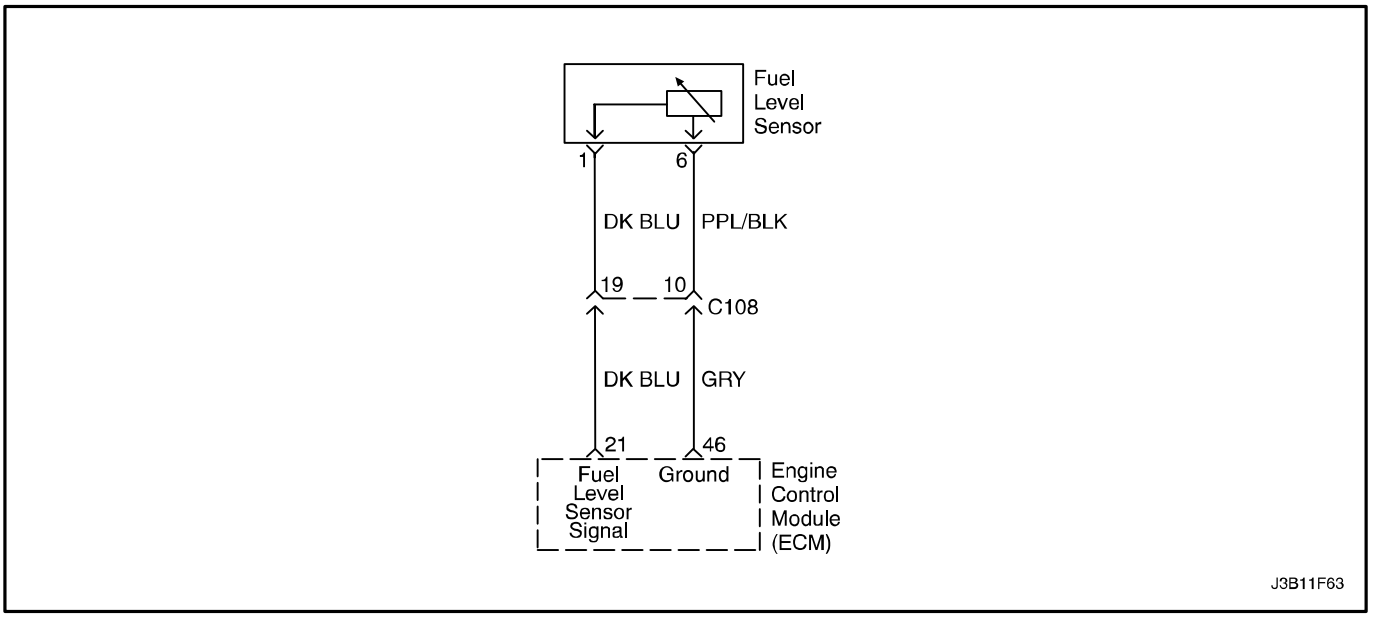
Check for the following conditions :

- Missing or damaged fuel cap.
- Missing or damaged O–rings at fuel vapor and EVAP purge line canister fittings.
- Cracked or punctured EVAP canister.
- Damaged source vacuum line, EVAP purge line, EVAP vent hose or fuel tank vapor line.
- Poor connection at the ECM. Inspect the harness connectors for the following conditions.
- Backed–out terminals.
- Improper mating.
- Broken locks.
- Improperly formed.
- Damaged terminals.
- Poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness to the EVAP vent solenoid, EVAP canister purge valve, and the fuel tank pressure sensor for an intermittent open or short circuit.
- Kinked, pinched or plugged vacuum source, EVAP purge, or fuel tank vapor line. Verify that the lines are not restricted.

DTC P0445 – EVAP Purge Control Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Disconnect the evaporative emission (EVAP) canister purge valve connector. 2. Measure the resistance of the EVAP canister purge valve connector. Does the resistance measure near within the value specified?	30Ω	Go to *Step 3*	Go to *Step 9*
3	Connect a test light between EVAP canister purge valve connector terminal 2 and ground. Is the test light ON?	–	Go to *Step 4*	Go to *Step 6*
4	1. Disconnect the ECM connector. 2. Connect a test light between the ECM connector terminal 65 and ground. Is the test light ON?	–	Go to *Step 5*	Go to *Step 7*
5	1. Repair the high voltage or ground in the wire between the EVAP canister purge valve connector terminal 2 and the ECM connector terminal 65. 2. Clear any Diagnostic Trouble Codes (DTCs) from the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
6	1. Disconnect the EVAP canister purge valve connector. 2. Connect a test light between the EVAP canister purge valve connector terminal 1 and battery. Is the test light ON?	–	Go to *Step 7*	Go to *Step 9*
7	1. Disconnect the ECM connector. 2. Connect a test light between the ECM connector terminal 65 and ground. Is the test light ON?	–	Go to *Step 8*	Go to *Step 10*
8	1. Repair the low voltage in the wire between the EVAP canister purge valve connector terminal 2 and the ECM connector terminal 65. 2. Clear any Diagnostic Trouble Codes (DTCs) from the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
9	1. Replace the EVAP canister purge valve. 2. Clear any Diagnostic Trouble Codes (DTCs) from the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 10*	–
10	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 11*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0462

FUEL LEVEL SENSOR LOW VOLTAGE (1.6L DOHC ONLY)

Circuit Description

The engine control module(ECM) uses the fuel level input from the Fuel Level Sensor to calculate expected vapor pressures within the fuel system. Vapor pressure vary as the fuel level changes. Vapor pressure is critical in determining if the evaporative emission (EVAP) system is operating properly. Fuel Level is also used to determine if the Fuel level is too high or too low to be able to accurately detect EVAP system faults. This Diagnostic Trouble Code(DTC) detects a stuck fuel level sender.

Conditions for Setting the DTC

- Fuel Level Sensor voltage is less than 0.2V.
- Fuel Level Sensor circuit low voltage.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connectors for backed–out terminal, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

Inspect the wiring harness for damage.

A stuck Fuel Level Sensor may cause the DTC to set. If DTC P0463 cannot be duplicated, the information included in the Freeze Frame data can be useful in determining vehicle operating conditions when the DTC was first set.

Resistance check for the Fuel Level Sensor.

Empty = 100 ohms or over.

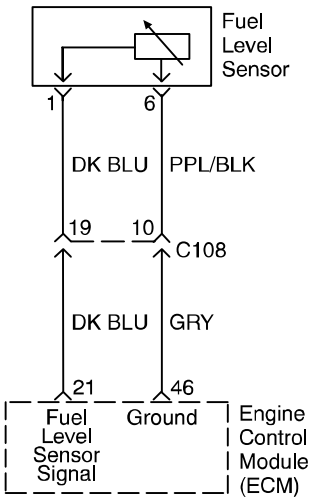
Half full = about 32.5 ohms.

Full = 10 ohms or less.

DTC P0462 – Fuel Level Sensor Low Voltage (1.6L DOHC Only)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition switch to ON. 2. Install a scan tool. 3. Operate the vehicle within Freeze Frame conditions as noted. Is the Diagnostic Trouble Code (DTC) P0462 set?	–	Go to *Step 3*	Go to "Diagnostic Aids"
3	1. Disconnect the fuel sender electircal connector from the fuel pump. 2. Using a digital voltmeter (DVM), measure the voltage in the signal circuit at terminal 1. Is the voltage within the specified value?	0.2–4.8V	Go to *Step 4*	Go to *Step 6*
4	Check for a proper ground connection at the fuel tank and repair as necessary. Is a repair necessary?	–	Go to *Step 11*	Go to *Step 5*
5	1. Remove the fuel sender from the fuel tank. 2. Reconnect the fuel sender electrical connector. 3. Monitor the Fuel Level Sensor parameter on the scan tool while moving the Fuel Level Sensor float from the empty position to the full position. 4. Repeat the procedure several times. Does the Fuel Level Sensor value on the scan tool increase and then decrease steadily when the float is moved?	–	Go to "Diagnostic Aids"	Go to *Step 8*
6	Check for an open or short to ground in the Fuel Level Sensor circuit and repair as necessary. Is the repair necessary?	–	Go to *Step 11*	Go to *Step 9*
7	Repair the open or short to ground in the Fuel Level Sensor circuit between the Fuel Level Sensor harness connector and the Fuel Level Sensor. Is the repair complete?	–	Go to *Step 11*	–
8	Replace the fuel sender assembly. Is the replacement complete?	–	Go to *Step 11*	–
9	1. Connect the fuel sender electrical connector. 2. Disconnect the engine control module(ECM) connector. 3. Using a digital voltmeter (DVM) measure the voltage in the signal circuit, at terminal 46. Does the DVM read within the specified value?	0.2–4.8V	Go to *Step 10*	Go to Section 9E, Instrumentation/ Driver Information
10	Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



J3B11F63

DIAGNOSTIC TROUBLE CODE (DTC) P0463

FUEL LEVEL SENSOR HIGH VOLTAGE (1.6L DOHC ONLY)

Circuit Description

The engine control module(ECM) uses the fuel level input from the Fuel Level Sensor to calculate expected vapor pressures within the fuel system. Vapor pressure vary as the fuel level changes. Vapor pressure is critical in determining if the evaporative emission (EVAP) system is operating properly. Fuel Level is also used to determine if the Fuel level is too high or too low to be able to accurately detect EVAP system faults. This Diagnostic Trouble Code(DTC) detects a stuck fuel level sender.

Conditions for Setting the DTC

- Fuel Level Sensor voltage is higher than 4.8V.
- Fuel Level Sensor circuit high voltage.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connectors for backed–out terminal, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

Inspect the wiring harness for damage.

A stuck Fuel Level Sensor may cause the DTC to set. If DTC P0463 cannot be duplicated, the information included in the Freeze Frame data can be useful in determining vehicle operating conditions when the DTC was first set.

Resistance check for the Fuel Level Sensor.

Empty = 100 ohms or over.

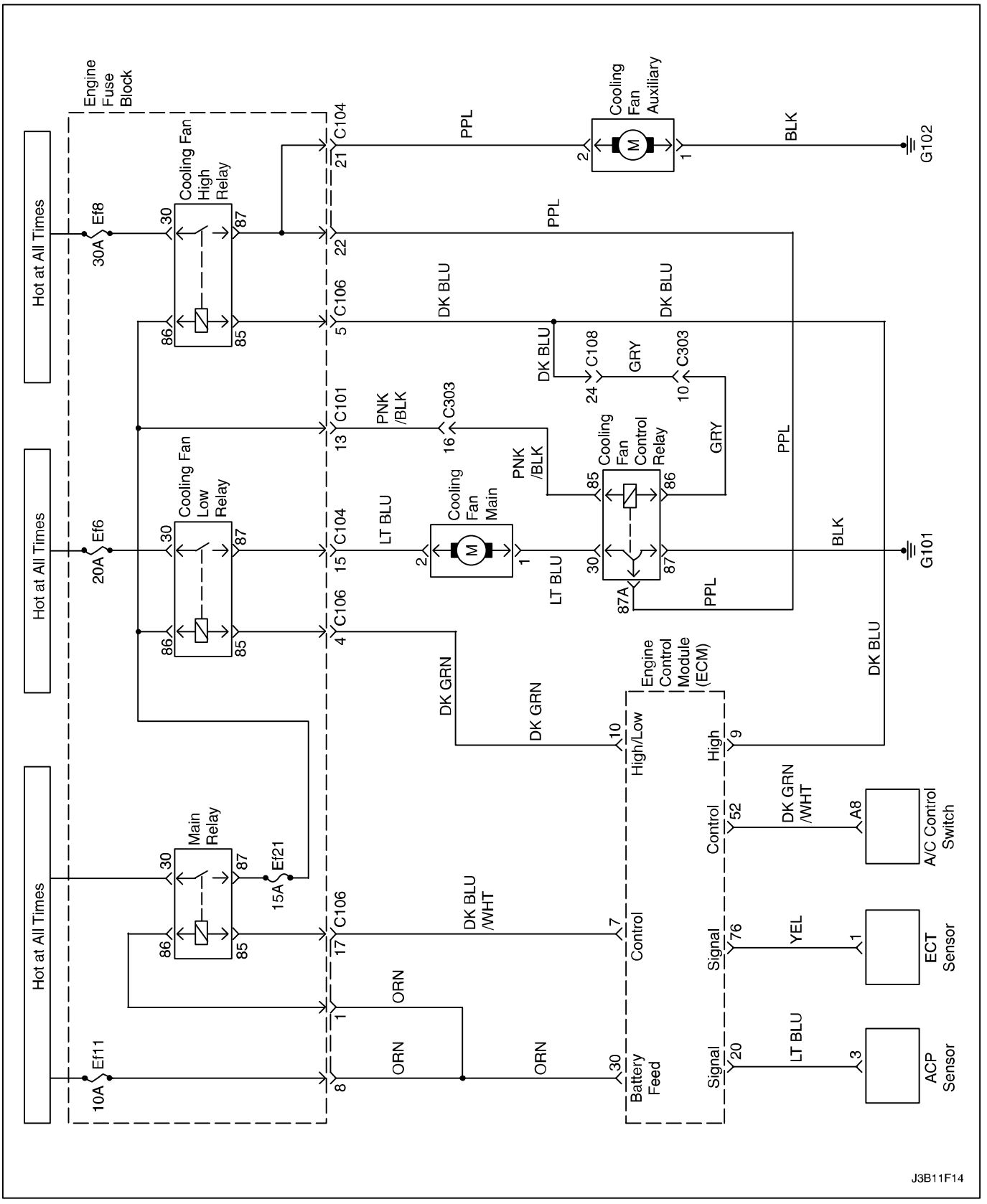
Half full = about 32.5 ohms.

Full = 10 ohms or less.

DTC P0463 – Fuel Level Sensor High Voltage (1.6L DOHC Only)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON. 2. Install a scan tool. 3. Operate the vehicle within Freeze Frame conditions as noted. Is the Diagnostic Trouble Code (DTC) P0463 set?	–	Go to *Step 3*	Go to ”Diagnostic Aids”
3	1. Disconnect the fuel sender electircal connector from the fuel pump. 2. Using a digital voltmeter (DVM), measure the voltage in the signal circuit at terminal 1. Is the voltage within the specified value?	0.2–4.8V	Go to *Step 4*	Go to *Step 6*
4	Check for a proper ground connection at the fuel tank and repair as necessary. Is a repair necessary?	–	Go to *Step 11*	Go to *Step 5*
5	1. Remove the fuel sender from the fuel tank. 2. Reconnect the fuel pump electrical connector. 3. Monitor the Fuel Level Sensor parameter on the scan tool while moving the Fuel Level Sensor float from the empty position to the full position. 4. Repeat the procedure several times. Does the Fuel Level Sensor value on the scan tool increase and then decrease steadily when the float is moved?	–	Go to ”Diagnostic Aids”	Go to *Step 8*
6	Check for an open or short to battery voltage in the Fuel Level Sensor circuit and repair as necessary. Is the repair necessary?	–	Go to *Step 11*	Go to *Step 9*
7	Repair the open or short to battery voltage in the Fuel Level Sensor circuit between the Fuel Level Sensor harness connector and the Fuel Level Sensor. Is the repair complete?	–	Go to *Step 11*	–
8	Replace the fuel sender assembly. Is the replacement complete?	–	Go to *Step 11*	–
9	1. Connect the fuel sender electrical connector. 2. Disconnect the engine control module(ECM) connector. 3. Using a digital voltmeter (DVM) measure the voltage in the signal circuit, at terminal 46. Does the DVM read within the specified value?	0.2–4.8V	Go to *Step 10*	Go to Section 9E, Instrumentation/ Driver Information
10	Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK


Engine Fuse Block
Hot at All Times
Hot at All Times
Hot at All Times
Ef8
30A
Ef6
20A
Ef11
10A
Ef21
15A
Cooling Fan High Relay
Cooling Fan Low Relay
Main Relay
Cooling Fan Auxiliary
Cooling Fan Main
Cooling Fan Control Relay
C104
C106
C101
C303
C108
PPL
DK BLU
PNK /BLK
LT BLU
GRY
BLK
DK GRN
ORN
DK BLU /WHT
DK GRN /WHT
YEL
G102
G101
Engine Control Module (ECM)
High/Low
High
Control
Signal
Battery Feed
A/C Control Switch
ECT Sensor
ACP Sensor
J3B11F14

DIAGNOSTIC TROUBLE CODE (DTC) P0480

LOW SPEED COOLING FAN RELAY CIRCUIT FAULT (1.4L DOHC)

Circuit Description

Ignition voltage is supplied directly to the cooling fan relay coil. The engine control module(ECM) controls the relay by grounding the control circuit via an internal switch called a driver. The primary function of the driver is supply the ground for the component being controlled. Each driver has a fault line which is monitored by the ECM. When the ECM is commanding a component ON, the voltage of the control circuit should be low (near 0volts). When the ECM is commanding the control circuit to a component OFF, the voltage potential of the circuit should be high(near battery voltage). If the fault detection circuit senses a voltage other than what is expected, the fault line status will change causing the DTC to set.

The relay is used to control the high current flow to the cooling fan motors. This allows the ECM driver to only have to handle the relatively low current used by the relay.

Conditions for Setting the DTC

- The low speed cooling fan control circuit is an open or a short to battery to ground condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions ant the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

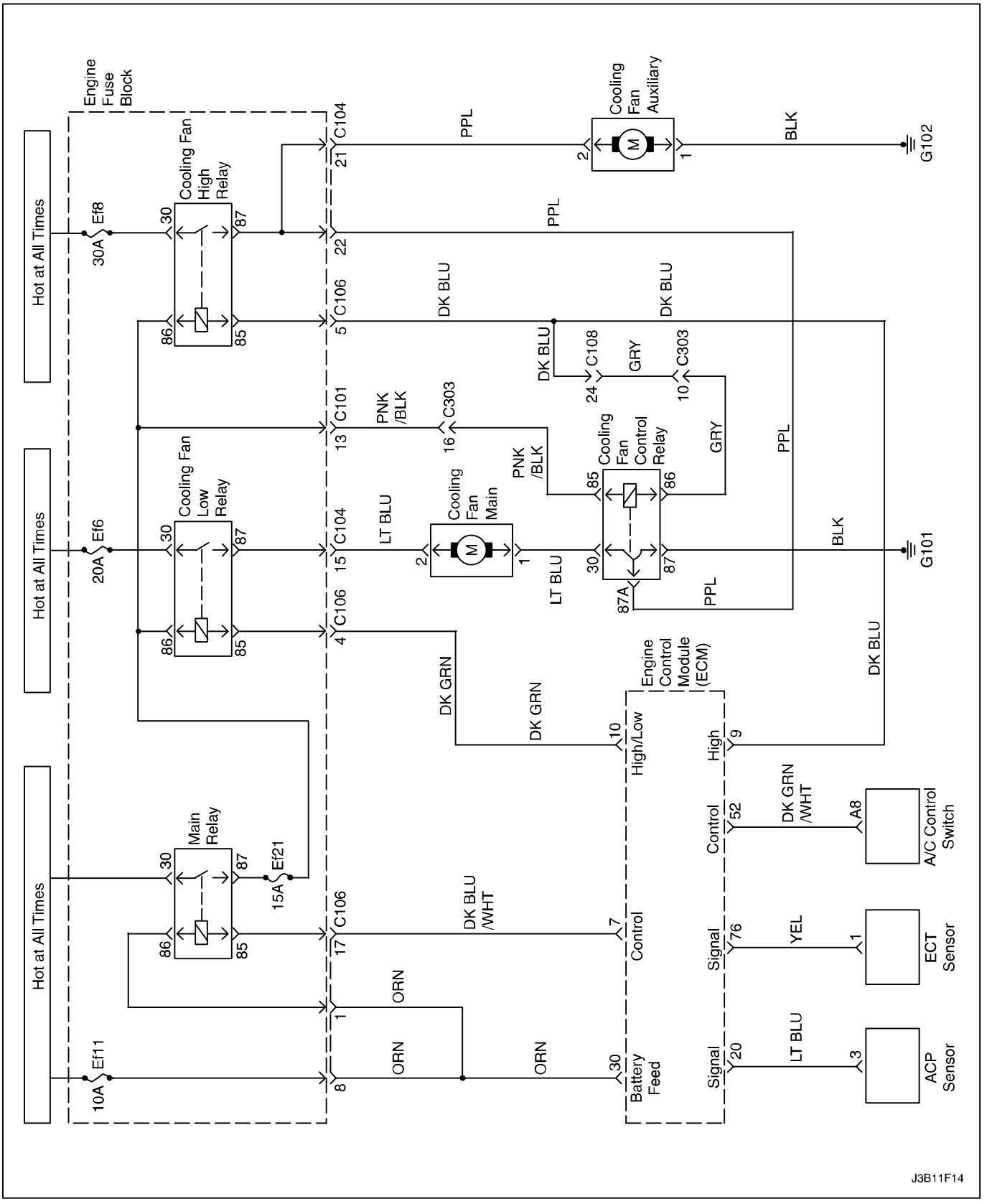
Diagnostic Aids

Using Freeze Frame and/or failure records data may aid in locating an intermittent condition. If the DTC cannot be duplicated, the information included in the Freeze Frame and/or failure records data can be useful in determining how many miles since the DTC set. The fail counter and Pass Counter can also be used to determine how many ignition cycles the diagnostics reported a Freeze Frame conditions (rpm, load, vehicle speed, temperature, etc.) that .are noted. This will isolate when the DTC failed.

DTC P0480 – Low Speed Cooling Fan Relay Circuit Fault (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON with the engine OFF. 2. Install a scan tool. 3. Command the relay ON and OFF. Does the relay turn ON and OFF when commanded?	–	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module (ECM) connector. 3. Turn the ignition switch to ON. 4. Using a digital voltmeter(DVM), measure the current in low speed relay control circuit, at terminal 10 to ground for 2 minutes. Does the amperage measure less than the specified value?	0.75 amps	Go to ”Diagnostic Aids”	Go to *Step 6*

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Using a DVM, measure the resistance between terminals 85 and 10 in the relay control circuit in the ECM harness connector to ground. Does the DVM display infinite resistance?	–	Go to *Step 12*	Go to *Step 10*
5	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Connect a test light between the relay coil terminals 86 and 85 in the relay harness connector. 4. Turn the Turn the ignition switch to ON. 5. Using the scan tool, command the relay ON and OFF. Does the test light turn ON and OFF with each commanded?	–	Go to *Step 8*	Go to *Step 6*
6	With the test light connected to ground, probe the ignition feed circuit in the relay harness connector. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Reconnect the relay. 3. Disconnect the ECM connector containing the relay control circuit. 4. Turn the Turn the ignition switch to ON. 5. With a fused jumper wire connected to ground, probe the relay control circuit at terminal 10 in the ECM harness connector. Does the relay operate?	–	Go to *Step 9*	Go to *Step 10*
8	Check the connections at the relay. Is a problem found and corrected?	–	Go to *Step 14*	Go to *Step 12*
9	Check the connection at the ECM. Is a problem found and corrected?	–	Go to *Step 11*	Go to *Step 13*
10	Repair the faulty relay control circuit. Is the repair complete?	–	Go to *Step 14*	–
11	Repair the faulty relay ignition feed circuit. Is the repair complete?	–	Go to *Step 14*	–
12	Replace the relay. Is the replacement complete?	–	Go to *Step 14*	–
13	Replace the ECM. Is the replacement complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK


Engine Fuse Block
Hot at All Times
Hot at All Times
Hot at All Times
Ef8
30A
Ef6
20A
Ef11
10A
Ef21
15A
Cooling Fan High Relay
Cooling Fan Low Relay
Main Relay
Cooling Fan Auxiliary
Cooling Fan Main
Cooling Fan Control Relay
C104
C106
C101
C303
C108
PPL
DK BLU
PNK /BLK
LT BLU
GRY
BLK
DK GRN
ORN
DK BLU /WHT
DK GRN /WHT
YEL
G102
G101
Engine Control Module (ECM)
High/Low
High
Control
Signal
Battery Feed
A/C Control Switch
ECT Sensor
ACP Sensor
J3B11F14

DIAGNOSTIC TROUBLE CODE (DTC) P0480

LOW SPEED COOLING FAN RELAY CIRCUIT FAULT (1.6L DOHC)

Circuit Description

Ignition voltage is supplied directly to the cooling fan relay coil. The engine control module(ECM) controls the relay by grounding the control circuit via an internal switch called a driver. The primary function of the driver is supply the ground for the component being controlled. Each driver has a fault line which is monitored by the ECM. When the ECM is commanding a component ON, the voltage of the control circuit should be low (near 0volts). When the ECM is commanding the control circuit to a component OFF, the voltage potential of the circuit should be high(near battery voltage). If the fault detection circuit senses a voltage other than what is expected, the fault line status will change causing the DTC to set.

The relay is used to control the high current flow to the cooling fan motors. This allows the ECM driver to only have to handle the relatively low current used by the relay.

Conditions for Setting the DTC

- The low speed cooling fan control circuit is an open or a short to battery or a short to ground condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

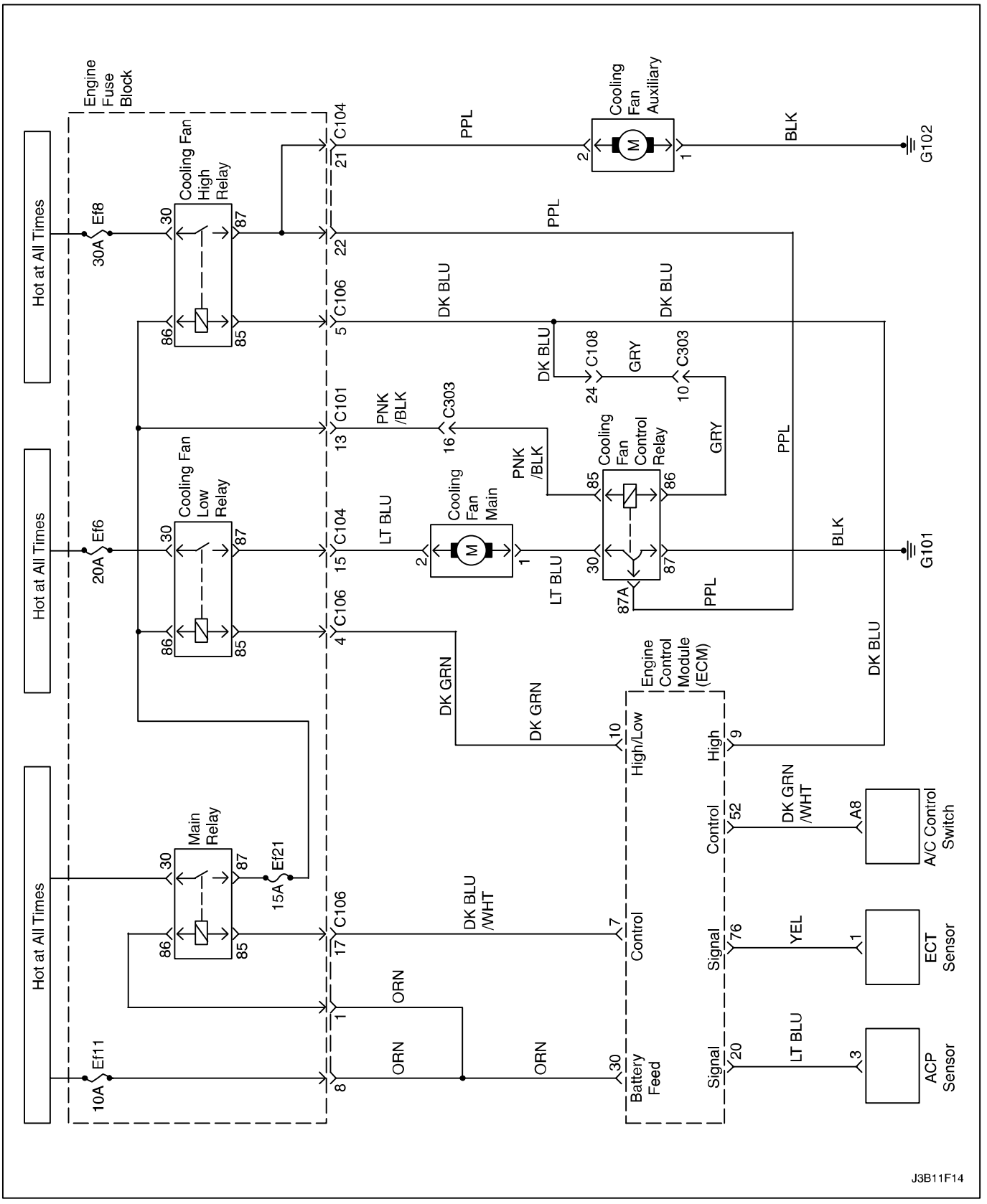
Diagnostic Aids

Using Freeze Frame and/or failure records data may aid in locating an intermittent condition. If the DTC cannot be duplicated, the information included in the Freeze Frame and/or failure records data can be useful in determining how many miles since the DTC set. The fail counter and Pass Counter can also be used to determine how many ignition cycles the diagnostics reported a Freeze Frame conditions (rpm, load, vehicle speed, temperature, etc.) that .are noted. This will isolate when the DTC failed.

DTC P0480 – Low Speed Cooling Fan Relay Circuit Fault (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON with the engine OFF. 2. Install a scan tool. 3. Command the relay ON and OFF. Does the relay turn ON and OFF when commanded?	–	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module (ECM) connector. 3. Turn the ignition switch to ON. 4. Using a digital voltmeter(DVM), measure the current in low speed relay control circuit, at terminal 10 to ground for 2 minutes. Does the amperage measure less than the specified value?	0.75 amps	Go to ”Diagnostic Aids”	Go to *Step 6*

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Using a DVM, measure the resistance between terminals 85 and 10 in the relay control circuit in the ECM harness connector to ground. Does the DVM display infinite resistance?	–	Go to *Step 12*	Go to *Step 10*
5	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Connect a test light between the relay coil terminals 86 and 85 in the relay harness connector. 4. Turn the Turn the ignition switch to ON. 5. Using the scan tool, command the relay ON and OFF. Does the test light turn ON and OFF with each commanded?	–	Go to *Step 8*	Go to *Step 6*
6	With the test light connected to ground, probe the ignition feed circuit in the relay harness connector. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Reconnect the relay. 3. Disconnect the ECM connector containing the relay control circuit. 4. Turn the Turn the ignition switch to ON. 5. With a fused jumper wire connected to ground, probe the relay control circuit at terminal 10 in the ECM harness connector. Does the relay operate?	–	Go to *Step 9*	Go to *Step 10*
8	Check the connections at the relay. Is a problem found and corrected?	–	Go to *Step 14*	Go to *Step 12*
9	Check the connection at the ECM. Is a problem found and corrected?	–	Go to *Step 11*	Go to *Step 13*
10	Repair the faulty relay control circuit. Is the repair complete?	–	Go to *Step 14*	–
11	Repair the faulty relay ignition feed circuit. Is the repair complete?	–	Go to *Step 14*	–
12	Replace the relay. Is the replacement complete?	–	Go to *Step 14*	–
13	Replace the ECM. Is the replacement complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK


Engine Fuse Block
Hot at All Times
Hot at All Times
Hot at All Times
Ef8
30A
Ef6
20A
Ef11
10A
Ef21
15A
Cooling Fan High Relay
Cooling Fan Low Relay
Main Relay
Cooling Fan Auxiliary
Cooling Fan Main
Cooling Fan Control Relay
C104
C106
C101
C303
C108
PPL
DK BLU
PNK /BLK
LT BLU
DK GRN
ORN
DK BLU /WHT
GRY
BLK
G102
G101
Engine Control Module (ECM)
High/Low
High
Control
Battery Feed
Signal
DK GRN /WHT
YEL
LT BLU
A/C Control Switch
ECT Sensor
ACP Sensor
J3B11F14

DIAGNOSTIC TROUBLE CODE (DTC) P0481

HIGH SPEED COOLING FAN RELAY CIRCUIT FAULT (1.4L DOHC)

Circuit Description

Ignition voltage is supplied directly to the cooling fan relay coil. The engine control module(ECM) controls the relay by grounding the control circuit via an internal switch called a driver. The primary function of the driver is supply the ground for the component being controlled. Each driver has a fault line which is monitored by the ECM. When the ECM is commanding a component ON, the voltage of the control circuit should be low (near 0volts). When the ECM is commanding the control circuit to a component OFF, the voltage potential of the circuit should be high(near battery voltage). If the fault detection circuit senses a voltage other than what is expected, the fault line status will change causing the DTC to set.

The relay is used to control the high current flow to the cooling fan motors. This allows the ECM driver to only have to handle the relatively low current used by the relay.

Conditions for Setting the DTC

- The high speed cooling fan control circuit is an open or a short to battery or a short to ground condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions ant the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

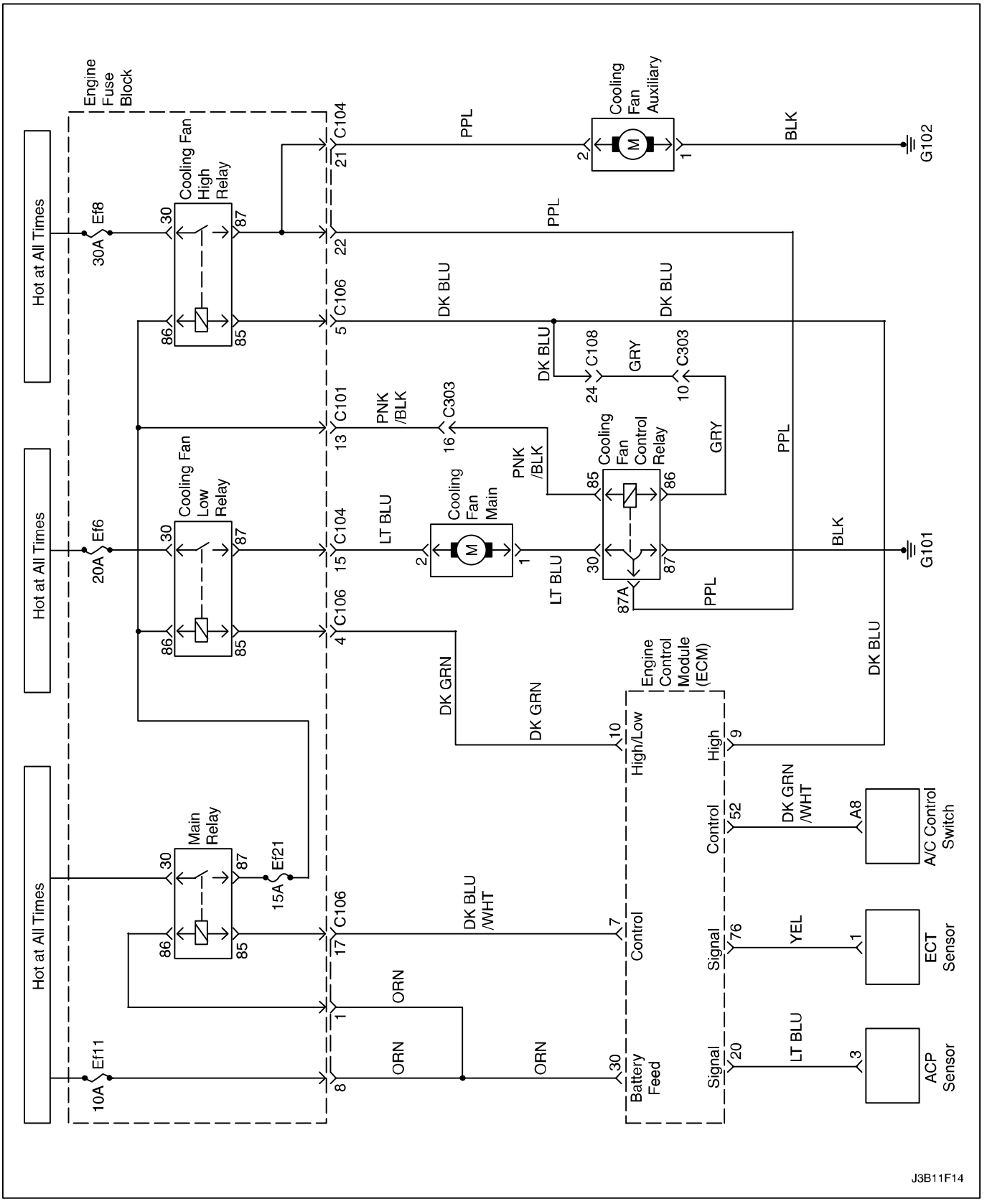
Diagnostic Aids

Using Freeze Frame and/or failure records data may aid in locating an intermittent condition. If the DTC cannot be duplicated, the information included in the Freeze Frame and/or failure records data can be useful in determining how many miles since the DTC set. The fail counter and Pass Counter can also be used to determine how many ignition cycles the diagnostics reported a Freeze Frame conditions (rpm, load, vehicle speed, temperature, etc.) that .are noted. This will isolate when the DTC failed.

DTC P0481 – High Speed Cooling Fan Relay Circuit Fault (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON with the engine OFF. 2. Install a scan tool. 3. Command the relay ON and OFF. Does the relay turn ON and OFF when commanded?	–	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module (ECM) connector. 3. Turn the ignition switch to ON. 4. Using a digital voltmeter(DVM), measure the current in high speed relay control circuit, at terminal 9 to ground for 2 minutes. Does the amperage measure less than the specified value?	0.75 amps	Go to ”Diagnostic Aids”	Go to *Step 6*

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Using a DVM, measure the resistance between terminals 85 and 9 in the relay control circuit in the ECM harness connector to ground. Does the DVM display infinite resistance?	–	Go to *Step 12*	Go to *Step 10*
5	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Connect a test light between the relay coil terminals 86 and 85 in the relay harness connector. 4. Turn the Turn the ignition switch to ON. 5. Using the scan tool, command the relay ON and OFF. Does the test light turn ON and OFF with each commanded?	–	Go to *Step 8*	Go to *Step 6*
6	With the test light connected to ground, probe the ignition feed circuit in the relay harness connector. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Reconnect the relay. 3. Disconnect the ECM connector containing the relay control circuit. 4. Turn the Turn the ignition switch to ON. 5. With a fused jumper wire connected to ground, probe the relay control circuit at terminal 9 in the ECM harness connector. Does the relay operate?	–	Go to *Step 9*	Go to *Step 10*
8	Check the connections at the relay. Is a problem found and corrected?	–	Go to *Step 14*	Go to *Step 12*
9	Check the connection at the ECM. Is a problem found and corrected?	–	Go to *Step 11*	Go to *Step 13*
10	Repair the faulty relay control circuit. Is the repair complete?	–	Go to *Step 14*	–
11	Repair the faulty relay ignition feed circuit. Is the repair complete?	–	Go to *Step 14*	–
12	Replace the relay. Is the replacement complete?	–	Go to *Step 14*	–
13	Replace the ECM. Is the replacement complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK


Engine Fuse Block
Hot at All Times
Hot at All Times
Hot at All Times
Ef8
30A
Ef6
20A
Ef11
10A
Ef21
15A
Cooling Fan High Relay
Cooling Fan Low Relay
Main Relay
Cooling Fan Auxiliary
Cooling Fan Main
Cooling Fan Control Relay
C104
C106
C101
C303
C108
PPL
DK BLU
PNK /BLK
LT BLU
GRY
BLK
DK GRN
ORN
DK BLU /WHT
DK GRN /WHT
YEL
G102
G101
Engine Control Module (ECM)
High/Low
High
Control
Signal
Battery Feed
A/C Control Switch
ECT Sensor
ACP Sensor
J3B11F14

DIAGNOSTIC TROUBLE CODE (DTC) P0481

HIGH SPEED COOLING FAN RELAY CIRCUIT FAULT (1.6L DOHC)

Circuit Description

Ignition voltage is supplied directly to the cooling fan relay coil. The engine control module(ECM) controls the relay by grounding the control circuit via an internal switch called a driver. The primary function of the driver is supply the ground for the component being controlled. Each driver has a fault line which is monitored by the ECM. When the ECM is commanding a component ON, the voltage of the control circuit should be low (near 0volts). When the ECM is commanding the control circuit to a component OFF, the voltage potential of the circuit should be high(near battery voltage). If the fault detection circuit senses a voltage other than what is expected, the fault line status will change causing the DTC to set.

The relay is used to control the high current flow to the cooling fan motors. This allows the ECM driver to only have to handle the relatively low current used by the relay.

Conditions for Setting the DTC

- The high speed cooling fan control circuit is an open or a short to battery or a short to ground condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

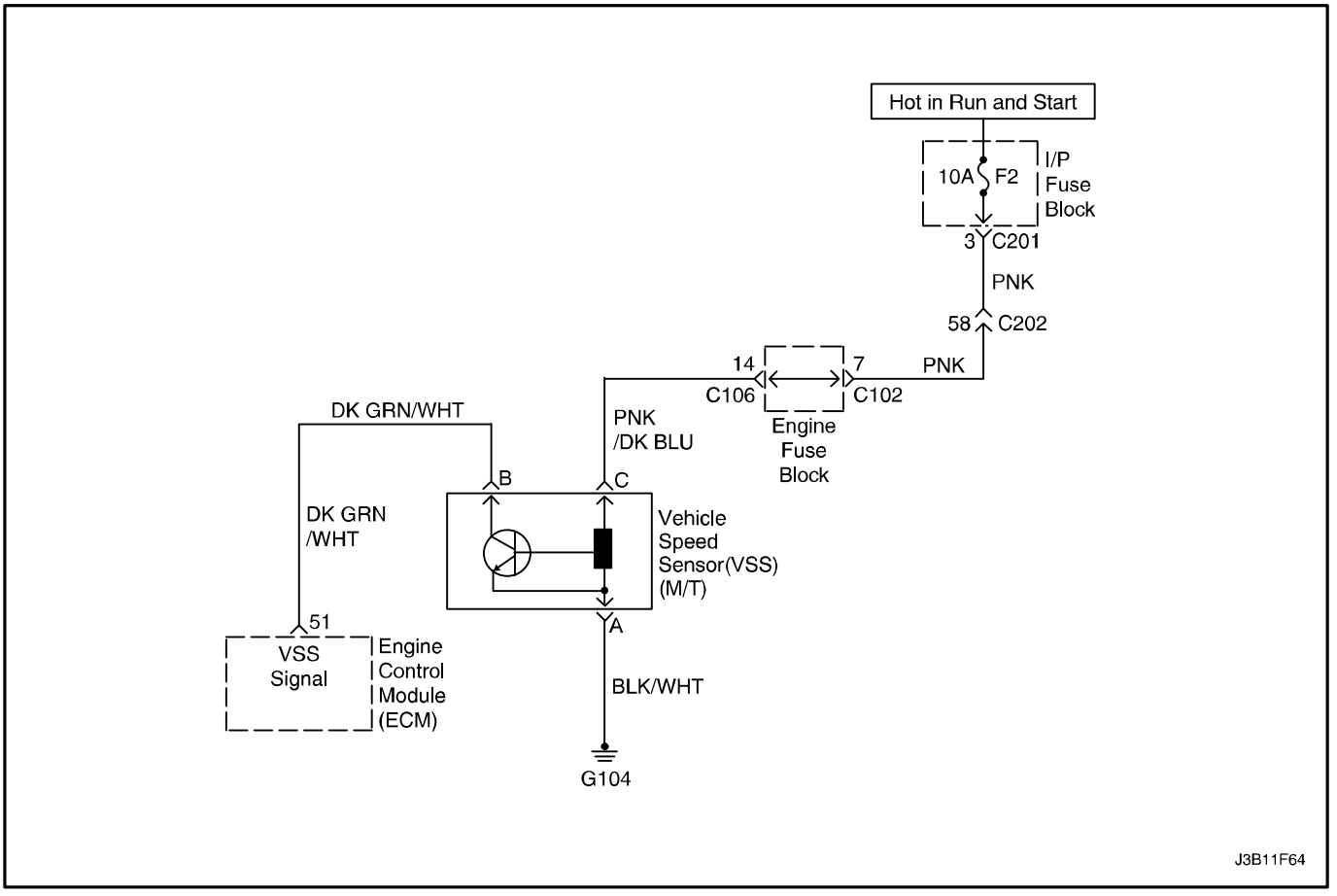
Using Freeze Frame and/or failure records data may aid in locating an intermittent condition. If the DTC cannot be duplicated, the information included in the Freeze Frame and/or failure records data can be useful in determining how many miles since the DTC set. The fail counter and Pass Counter can also be used to determine how many ignition cycles the diagnostics reported a Freeze Frame conditions (rpm, load, vehicle speed, temperature, etc.) that .are noted. This will isolate when the DTC failed.

DTC P0481 – High Speed Cooling Fan Relay Circuit Fault (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to ON with the engine OFF. 2. Install a scan tool. 3. Command the relay ON and OFF. Does the relay turn ON and OFF when commanded?	–	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module (ECM) connector. 3. Turn the ignition switch to ON. 4. Using a digital voltmeter(DVM), measure the current in high speed relay control circuit, at terminal 9 to ground for 2 minutes. Does the amperage measure less than the specified value?	0.75 amps	Go to ”Diagnostic Aids”	Go to *Step 6*

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Using a DVM, measure the resistance between terminals 85 and 9 in the high speed cooling fan relay control circuit in the ECM harness connector to ground. Does the DVM display infinite resistance?	–	Go to *Step 12*	Go to *Step 10*
5	1. Turn the ignition switch to LOCK. 2. Disconnect the relay. 3. Connect a test light between the relay coil terminals 86 and 85 in the relay harness connector. 4. Turn the Turn the ignition switch to ON. 5. Using the scan tool, command the relay ON and OFF. Does the test light turn ON and OFF with each commanded?	–	Go to *Step 8*	Go to *Step 6*
6	With the test light connected to ground, probe the ignition feed circuit in the relay harness connector. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 11*
7	1. Turn the ignition switch to LOCK. 2. Reconnect the relay. 3. Disconnect the ECM connector containing the relay control circuit. 4. Turn the Turn the ignition switch to ON. 5. With a fused jumper wire connected to ground, probe the relay control circuit at terminal 9 in the ECM harness connector. Does the relay operate?	–	Go to *Step 9*	Go to *Step 10*
8	Check the connections at the relay. Is a problem found and corrected?	–	Go to *Step 14*	Go to *Step 12*
9	Check the connection at the ECM. Is a problem found and corrected?	–	Go to *Step 11*	Go to *Step 13*
10	Repair the faulty relay control circuit. Is the repair complete?	–	Go to *Step 14*	–
11	Repair the faulty relay ignition feed circuit. Is the repair complete?	–	Go to *Step 14*	–
12	Replace the relay. Is the replacement complete?	–	Go to *Step 14*	–
13	Replace the ECM. Is the replacement complete?	–	Go to *Step 14*	–

Step	Action	Value(s)	Yes	No
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0501

VEHICLE SPEED NO SIGNAL (M/T ONLY)

Circuit Description

Vehicle speed information is provided to the engine control module (ECM) by the voltage speed sensor (VSS) is a permanent magnet generator that is mounted in the transaxle and produces a pulsing voltage whenever vehicle speed is over 3 mph (5km/h). The A/C voltage level and the number of pulses increase with vehicle speed. The ECM converts the pulsing voltage into mph (km/h) and than supplies the necessary signal to the instrument panel for speedometer/ odometer operation and to the cruise control module and multi–function alarm module operation. The Diagnostic Trouble Code (DTC) will detect if vehicle speed is reasonable according to engine rpm and load.

Conditions for Setting the DTC

- Vehicle speed is not change at least 25 seconds.
- Engine speed is greater than 2,500rpm.
- MAF is greater than 180mg/tdc.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- Coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- Using the scan tool can clear DTC(s).
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

VSS signal circuit should be thoroughly checked for the following conditions

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed

- Damaged terminals
- Poor terminal to wire connection
- Physical damage to the wiring harness

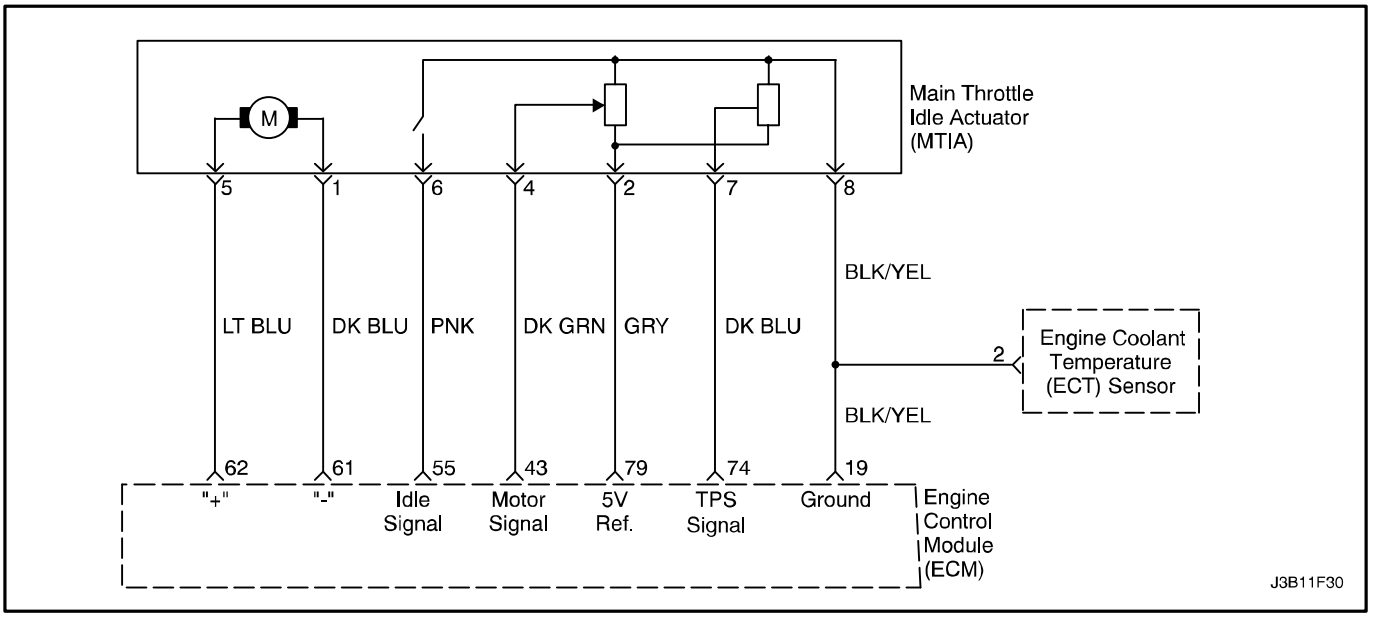
Ensure the VSS is correctly torqued to the trnasaxle housing.

Refer to ”Intermittents” in this section.

DTC P0501 – Vehicle Speed No Signal (M/T Only)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	**Notice :** Running the vehicle in gear with the wheels hanging down at full travel will damage the drive axles. 1. Turn the ignition ON, with the engine OFF. 2. Install a scan tool. 3. Raise the drive wheels. 4. Support the lower control arms so that the drive axles are in a horizontal (straight) position. 5. Allow the engine to idle in gear. Does the scan tool display vehicle speed above the specified value?	0 mph	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting this DTC. Does the scan tool display the vehicle speed above the specified value?	0 mph	Go to *Step 12*	Go to *Step 4*
4	1. Turn the ignition OFF. 2. Disconnect the engine control module(ECM) connector 51. 3. Using a digital voltmeter(DVM) connected to ground, measure the voltage in the Vehicle Speed Sensor (VSS) signal circuit, at terminal C while rotating the wheels. Is the voltage greater than or eqaul to specified value?	0.5V	Go to *Step 12*	Go to *Step 5*
5	Measure the resistant in the VSS signal circuit while rotating the wheels. Is the resistance greater than the specified value?	1950Ω	Go to *Step 6*	Go to *Step 7*
6	Check the VSS signal circuit for an open and repair as necessary. Is the repair complete?	–	Go to *Step 12*	Go to *Step 9*
7	Is the resistance value within or equal to the specified value?	1300–1950Ω	Go to *Step 8*	Go to *Step 9*
8	Check the VSS signal circuit for a short to ground or for being shorted together and repair as necessary. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 12*
9	1. Remove the VSS. 2. Measure the resistance between terminals A and C. Is the resistance value within the specified value?	1300–1950Ω	Go to *Step 11*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	Replace the VSS. Is the action complete?	–	Go to *Step 12*	–
11	Replace the ECM. Is the action complete?	–	Go to *Step 12*	–
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0510

THROTTLE POSITION SWITCH CIRCUIT FAULT (1.4L DOHC)

Circuit Description

The aim of the MTIA(Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (05, 195). The characteristics of the air flow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TP sensor is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical bowdencable.

This switch indicates throttle plate in idle position when contact closed. This switch is fixed at the DC–motor drive and the throttle plate closes the contact in dependence to the actual motor drive position.

Conditions for Setting the DTC

- The engine stopped and ignition switch turned ON.
- DTCs P0122, P0123, P0222 and P0223 are not set.
- MTIA output signal is highter than throttle position + 2.5˚ and throttle position is open at least 0.2 seconds.

Or

- DTCs P0122, P0123, P0222, and P0223 are not set.
- The throttle position output signal is greater than 30˚ and throttle position is closed at least 2 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

VSS signal circuit should be thoroughly checked for the following conditions

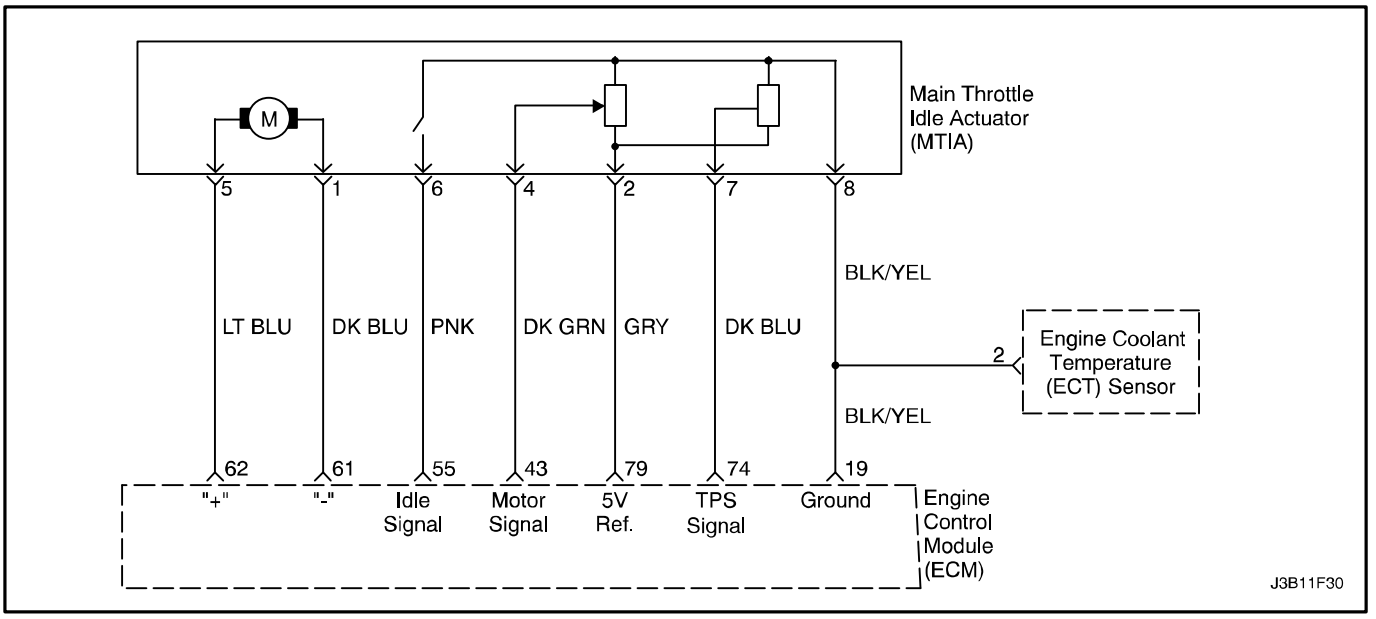
- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal to wire connection
- Physical damage to the wiring harness

Ensure the VSS is correctly torqued to the trnasaxle housing.

Refer to ”Intermittents” in this section.

DTC P0510 – Throttle Position Switch Circuit Fault (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the MTIA connector. 3. Disconnect the ECM connector. 4. Check for a short to ground or open in the wire between the MTIA connector terminal 6 and ECM connector terminal 55. Is the problem found?	–	Go to *Step 4*	Go to *Step 3*
3	Check for a high voltage or open in the wire between the MTIA connector terminal 6 and ECM connector terminal 55. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch to LOCK. 2. Repair the wire or the connector terminal as needed. 3. Clear any DTCs from ECM. 4. Perform the diagnostic system check.(start engine and turn LOCK). Is the repair complete?	–	System OK	–
5	1. Repair the short to battery voltage or ground in the wire between the EVAP canister purge valve connector terminal 2 and the ECM connector terminal 79. 2. Clear any Diagnostic Trouble Codes (DTCs) from the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0510

THROTTLE POSITION SWITCH CIRCUIT FAULT (1.6L DOHC)

Circuit Description

The aim of the MTIA(Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (05, 195). The characteristics of the air flow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TP sensor is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical bowdencable.

This switch indicates throttle plate in idle position when contact closed. This switch is fixed at the DC–motor drive and the throttle plate closes the contact in dependence to the actual motor drive position.

Conditions for Setting the DTC

- The engine stopped and ignition switch turned ON.
- DTCs P0122, P0123, P0222 and P0223 are not set.
- MTIA output signal is highter than throttle position + 2.5˚ and throttle position is open at least 0.2 seconds.

Or

- DTCs P0122, P0123, P0222, and P0223 are not set.
- The throttle position output signal is greater than 30˚ and throttle position is closed at least 2 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- Coolant fan turns on.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- Using the scan tool can clear DTC(s).
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

VSS signal circuit should be thoroughly checked for the following conditions

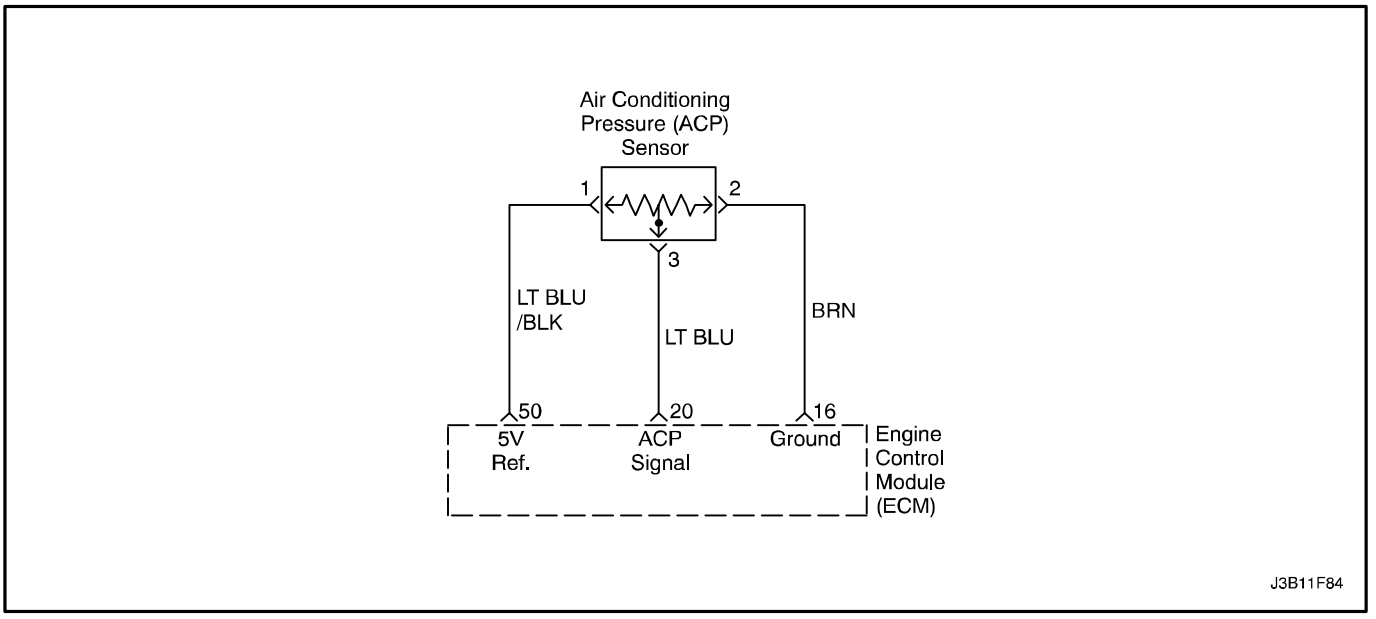
- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal to wire connection
- Physical damage to the wiring harness

Ensure the VSS is correctly torqued to the trnasaxle housing.

Refer to ”Intermittents” in this section.

DTC P0510 – Throttle Position Switch Circuit Fault (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the MTIA connector. 3. Disconnect the ECM connector. 4. Check for a short to ground or open in the wire between the MTIA connector terminal 6 and ECM connector terminal 55. Is the problem found?	–	Go to *Step 4*	Go to *Step 3*
3	Check for a high voltage or open in the wire between the MTIA connector terminal 6 and ECM connector terminal 55. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch to LOCK. 2. Repair the wire or the connector terminal as needed. 3. Clear any DTCs from ECM. 4. Perform the diagnostic system check.(start engine and turn LOCK). Is the repair complete?	–	System OK	–
5	1. Repair the short to battery voltage or ground in the wire between the EVAP canister purge valve connector terminal 2 and the ECM connector terminal 79. 2. Clear any Diagnostic Trouble Codes (DTCs) from the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0532

A/C PRESSURE SENSOR LOW VOLTAGE

Circuit Description

The Air Conditioning (A/C) system uses an A/C refrigerant pressure sensor mounted in the high pressure side of the A/C refrigerant system to monitor A/C refrigerant pressure. The Engine Control Module (ECM) uses this information to turn ON the engine coolant fans when the A/C refrigerant pressure is high and to keep the compressor disengaged when A/C refrigerant pressure is excessively high or low.

The Air Conditioning Pressure (ACP) sensor operates like other 3–wire sensors. The ECM applies a 5.0 volt reference and a sensor ground to the sensor. Changes in the A/C refrigerant pressure will cause the ACP sensor input to the ECM to vary. The ECM monitors the ACP sensor signal circuit and can determine when the signal is outside of the possible range of the sensor. When the signal is out of range for a prolonged period of time, the ECM will not allow the A/C compressor clutch to engage. This is done to protect the compressor.

Conditions for Setting the DTC

- A/C pressure is less than 12.16 kpa.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.
- The A/C compressor operation will be disabled while the low voltage indication exists.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

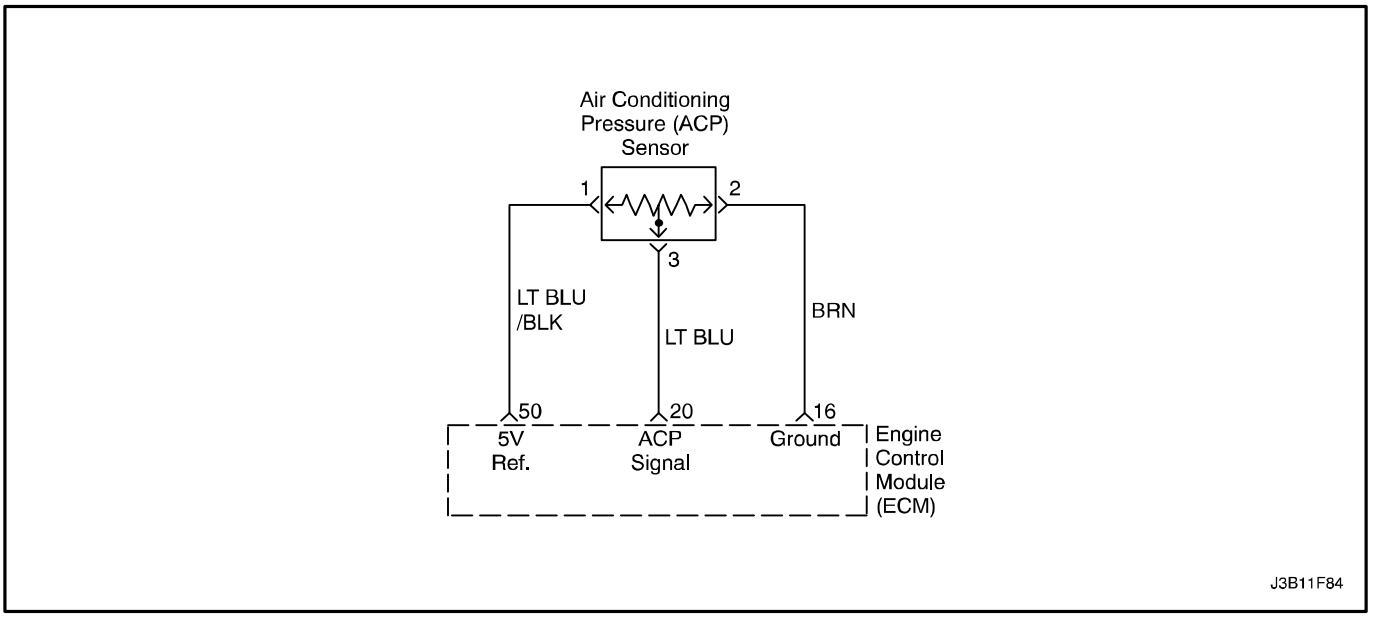
Inspect the wiring harness for damage. If the harness appears to be OK, observe the A/C pressure display on the scan tool while moving the connectors and wiring harnesses related to the A/C Pressure sensor. A change in the A/C pressure display will indicate the location of the fault.

If DTC P0532 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P0532 – A/C Pressure Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Idle the engine. Does the scan tool display Air Conditioning Pressure (ACP) sensor voltage below the specified value?	0.06 V	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition OFF. 2. Disconnect the ACP sensor connector. 3. Jumper the ACP signal circuit, terminal 2 to the 5 volt reference circuit, terminal 1. 4. Turn the ignition switch on. Does the ACP voltage read more than the specified value?	4.9 V	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition ON, with the engine OFF. 2. Operate the vehicle within the Failure Record conditions and Conditions For Setting the DTC as noted. Does the scan tool display ACP voltage below the specified value?	0.06 V	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Inspect the ACP sensor harness connector terminals for the following conditions: • Poor connections • Proper contact tension • Poor terminal–to–wire connection Is a problem found?	–	Go to *Step 8*	Go to *Step 9*
6	1. Turn the ignition OFF. 2. Remove the jumper wire. 3. Probe the ACP sensor signal circuit terminal 2 with a test light to B+. 4. Turn the ignition ON. Does the scan tool read over the specified value?	4 V	Go to *Step 7*	Go to *Step 11*
7	Check the ACP sensor 5 volt reference circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 13*	Go to *Step 10*
8	Repair the connection terminals as necessary. Is the repair complete?	–	Go to *Step 13*	–
9	1. Turn the ignition OFF. 2. Replace the ACP sensor. Is the repair complete?	–	Go to *Step 13*	–
10	1. Turn the ignition OFF. 2. Replace the engine control module (ECM). Is the repair complete?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
11	Check the ACP sensor signal circuit for the following conditions: • Open • Short to ground • Short to sensor ground Is a problem found?	–	Go to *Step 12*	Go to *Step 10*
12	Repair the A/C Pressure sensor signal circuit. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0533

A/C PRESSURE SENSOR HIGH VOLTAGE

Circuit Description

The Air Conditioning (A/C) system uses an A/C refrigerant pressure sensor mounted in the high pressure side of the A/C refrigerant system to monitor A/C refrigerant pressure. The Engine Control Module (ECM) uses this information to turn ON the engine coolant fans when the A/C refrigerant pressure is high and to keep the compressor disengaged when A/C refrigerant pressure is excessively high or low.

The Air Conditioning Pressure (ACP) sensor operates like other 3–wire sensors. The ECM applies a 5.0 volt reference and a sensor ground to the sensor. Changes in the A/C refrigerant pressure will cause the ACP sensor input to the ECM to vary. The ECM monitors the ACP sensor signal circuit and can determine when the signal is outside of the possible range of the sensor. When the signal is out of range for a prolonged period of time, the ECM will not allow the A/C compressor clutch to engage. This is done to protect the compressor.

Conditions for Setting the DTC

- A/C pressure is greater than 293 kpa.
- Engine is running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.
- The A/C compressor operation will be disabled while the high voltage indication exists.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

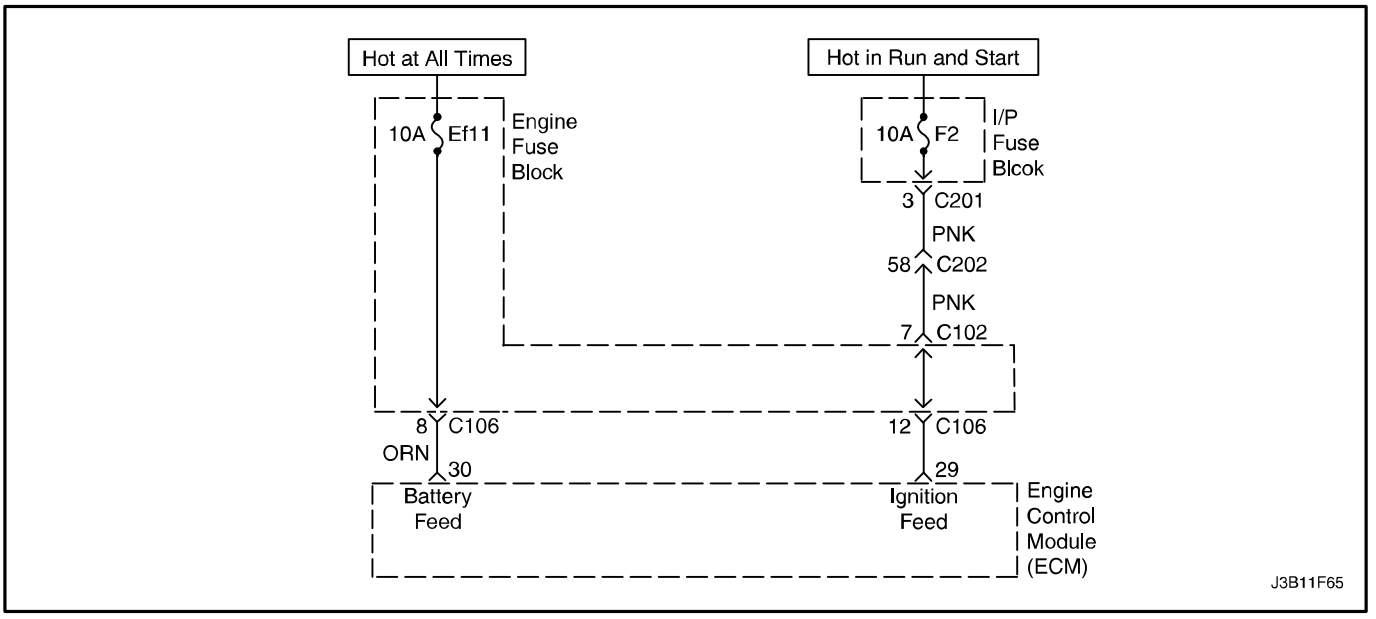
Inspect the wiring harness for damage. If the harness appears to be OK, observe the A/C pressure display on the scan tool while moving the connectors and wiring harnesses related to the ACP sensor. A change in the A/C pressure display will indicate the location of the fault.

If DTC P0533 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P0533 – A/C Pressure Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Idle the engine. Does the scan tool display Air Conditioning Pressure (ACP) sensor voltage below the specified value?	0.06 V	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition OFF. 2. Disconnect the ACP sensor connector. 3. Jumper the ACP signal circuit, terminal 2 to the 5 volt reference circuit, terminal 1. 4. Turn the ignition switch on. Does the ACP voltage read more than the specified value?	4.9 V	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition ON, with the engine OFF. 2. Operate the vehicle within the Failure Record conditions and Conditions For Setting the DTC as noted. Does the scan tool display ACP voltage below the specified value?	0.06 V	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Inspect the ACP sensor harness connector terminals for the following conditions: • Poor connections • Proper contact tension • Poor terminal–to–wire connection Is a problem found?	–	Go to *Step 8*	Go to *Step 9*
6	1. Turn the ignition OFF. 2. Remove the jumper wire. 3. Probe the ACP sensor signal circuit terminal 2 with a test light to B+. 4. Turn the ignition ON. Does the scan tool read over the specified value?	4 V	Go to *Step 7*	Go to *Step 11*
7	Check the ACP sensor 5 volt reference circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 13*	Go to *Step 10*
8	Repair the connection terminals as necessary. Is the repair complete?	–	Go to *Step 13*	–
9	1. Turn the ignition OFF. 2. Replace the ACP sensor. Is the repair complete?	–	Go to *Step 13*	–
10	1. Turn the ignition OFF. 2. Replace the engine control module (ECM). Is the repair complete?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
11	Check the ACP sensor signal circuit for the following conditions: • Open • Short to ground • Short to sensor ground Is a problem found?	–	Go to *Step 12*	Go to *Step 10*
12	Repair the A/C Pressure sensor signal circuit. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0562
SYSTEM VOLTAGE(ENGINE SIDE) TOO LOW

Circuit Description

The engine control module (ECM) monitors the ignition voltage on the ignition feed circuit to terminal 29 at the ECM. A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is below a calibrated value.

Conditions for Setting the DTC

- The main relay voltage is less than 5.0v or higher than 16.6v during 7.65 seconds. (1.4L DOHC)
- The main relay voltage is less than 5.0v or higher than 26v during 7.6 seconds. (1.6L DOHC)

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

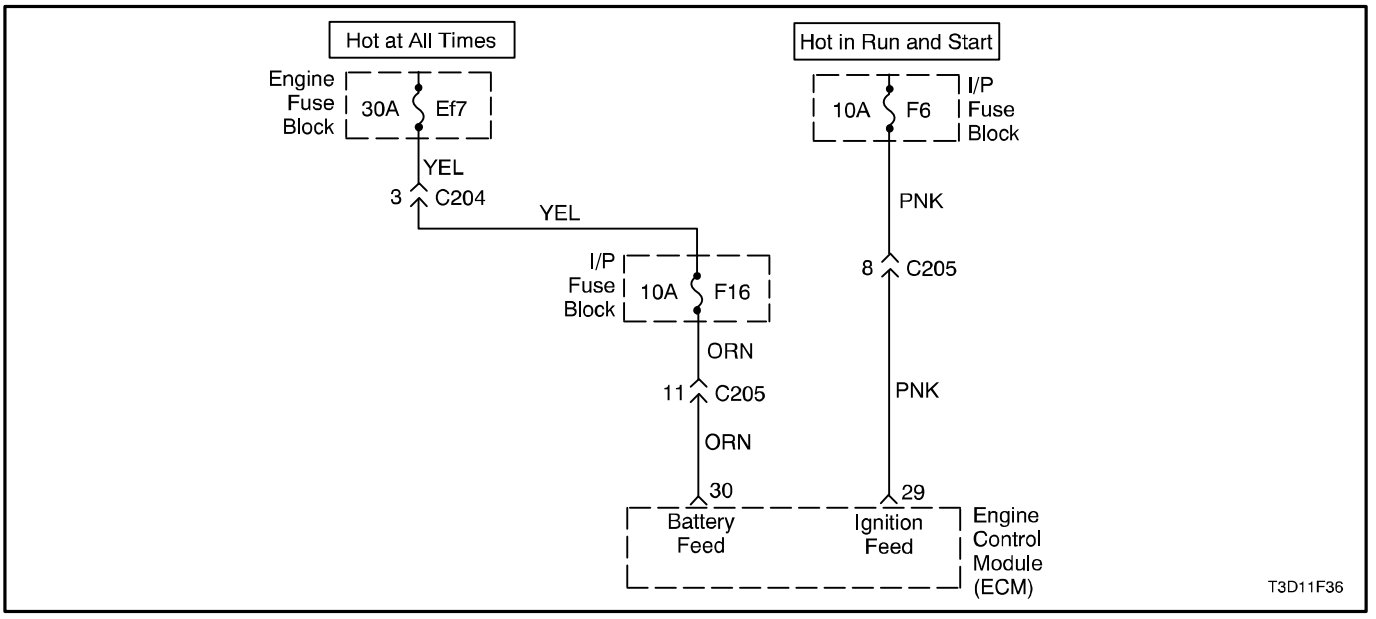
An Intermittent problem may be caused by a poor connection, rubbed through wire insulation, or wire that is broken inside the insulation.

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

DTC P0562 – System Voltage(Engine Side) Too Low

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and raise the engine speed to the specified value. 3. Load the electrical system by turning on the headlights, high blower motor, etc. Is the ignition voltage less than the specified value?	1,400rpm 10V	Go to *Step 3*	Go to *Step 8*
3	1. With the engine still running at the specified value. 2. Using a digital voltmeter(DVM), measure the battery voltage at the battery. Is the battery voltage greater than the specified value?	1,400rpm 12V	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module(ECM) connector at the ECM. 3. Turn the Turn the ignition switch to ON with the engine OFF. 4. Using a DVM, measure the ignition voltage at the ignition feed circuit, terminal 29. Is the ignition voltage greater than the specified value?	10V	Go to *Step 5*	Go to *Step 6*
5	Check for a malfunctioning connection at the ECM harness terminals and repair as necessary. Is a repair necessary?	–	Go to *Step 8*	Go to *Step 7*
6	Repair the poor connection (high resistance) in the ignition feed circuit. Is the repair complete?	–	Go to *Step 8*	–
7	Replace the ECM. Is the replacement complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0563

SYSTEM VOLTAGE(ENGINE SIDE) TOO HIGH

Circuit Description

The engine control module (ECM) monitors the ignition voltage on the ignition feed circuit to terminal 29 at the ECM. A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is below a calibrated value.

Conditions for Setting the DTC

- The main relay voltage is greater than 7.9V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal to wiring connections
- Physical damage to the wiring harness

DTC P0563 – System Voltage(Engine Side) Too High

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool and clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and raise the engine speed to the specified value. 3. Load the electrical system by turning on the headlights, high blower motor, etc. Is the ignition voltage less than the specified value?	1,400rpm 10V	Go to *Step 3*	Go to *Step 8*
3	1. With the engine still running at the specified value. 2. Using a digital voltmeter(DVM), measure the battery voltage at the battery. Is the battery voltage greater than the specified value?	1,400rpm 12V	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch to LOCK. 2. Disconnect the engine control module(ECM) connector at the ECM. 3. Turn the Turn the ignition switch to ON with the engine OFF. 4. Using a DVM, measure the ignition voltage at the ignition feed circuit, terminal 29. Is the ignition voltage greater than the specified value?	10V	Go to *Step 5*	Go to *Step 6*
5	Check for a malfunctioning connection at the ECM harness terminals and repair as necessary. Is a repair necessary?	–	Go to *Step 8*	Go to *Step 7*
6	Repair the poor connection (high resistance) in the ignition feed circuit. Is the repair complete?	–	Go to *Step 8*	–
7	Replace the ECM. Is the replacement complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0601
ENGINE CONTROL MODULE CHECKSUM ERROR

Circuit Description

The engine control module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that after vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An electrically erasable programmable read only memory (EEPROM) is used to house the program information and the calibrations required for engine, transaxle, transaxle diagnostics operation. The ECM uses a value called a checksum for error detection of the software. The checksum is a value that is equal to all the numbers in the software added together. The ECM adds all the values in the software and if that value does not equal the checksum value, a checksum error is indicated.

Conditions for Setting the DTC

- The ECM detects incorrect checksum.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycle in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P0601 – Engine Control Module Checksum Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Replace the engine control module(ECM). Is the replacement complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC ad specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0604

ENGINE CONTROL MODULE INTERNAL/EXTERNAL RAM ERROR

Circuit Description

The engine control module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that after vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An electrically erasable programmable read only memory (EEPROM) is used to house the program information and the calibrations required for engine, transaxle, transaxle diagnostics operation. The ECM uses a value called a checksum for error detection of the software. The checksum is a value that is equal to all the numbers in the software added together. The ECM adds all the values in the software and if that value does not equal the checksum value, a checksum error is indicated.

Conditions for Setting the DTC

- The ECM detects an internal or external Random Acess Memory (RAM) error.

Action Taken When the DTCs Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P0604 – Engine Control Module Internal/External RAM Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Replace the engine control module(ECM). Is the replacement complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC ad specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0605
ENGINE CONTROL MODULE INMVY WRITE ERROR

Circuit Description

The engine control module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that after vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An electrically erasable programmable read only memory (EEPROM) is used to house the program information and the calibrations required for engine, transaxle, transaxle diagnostics operation. The ECM uses a value called a checksum for error detection of the software. The checksum is a value that is equal to all the numbers in the software added together. The ECM adds all the values in the software and if that value does not equal the checksum value, a checksum error is indicated.

Conditions for Setting the DTC

- The ECM detects a INMVY write error.

Action Taken When the DTCs Sets

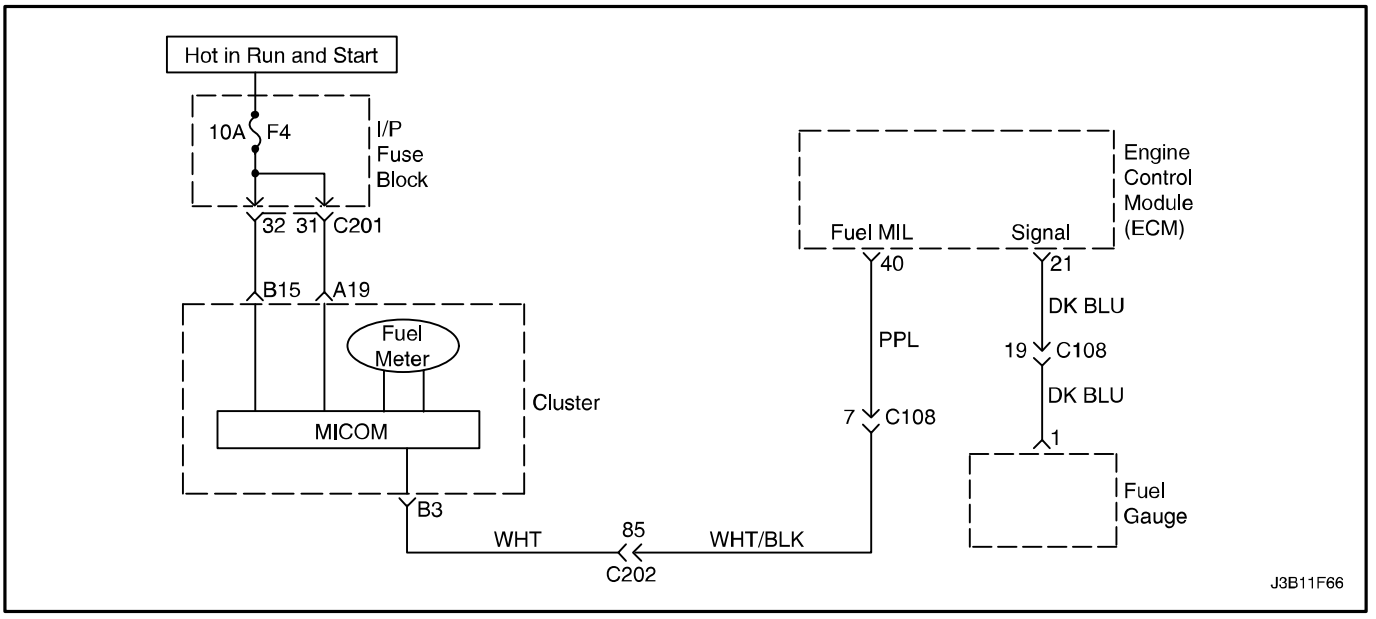
- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P0605 – Engine Control Module INMVY Write Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Replace the engine control module(ECM). Is the replacement complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC ad specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0656

FUEL LEVEL GAUGE CIRCUIT FAULT

Circuit Description

The engine control module(ECM) uses the fuel level input from the Fuel Level Sensor to calculate expected vapor pressures within the fuel system. Vapor pressure vary as the fuel level changes. Vapor pressure is critical in determining if the evaporative emission (EVAP) system is operating properly. Fuel Level is also used to determine if the Fuel level is too high or too low to be able to accurately detect EVAP system faults. This Diagnostic Trouble Code(DTC) detects a stuck fuel level sender.

Conditions for Setting the DTC

- The fuel tank level output circuit is a short to ground or a short to battery or an open condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connectors for backed–out terminal, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

Inspect the wiring harness for damage.

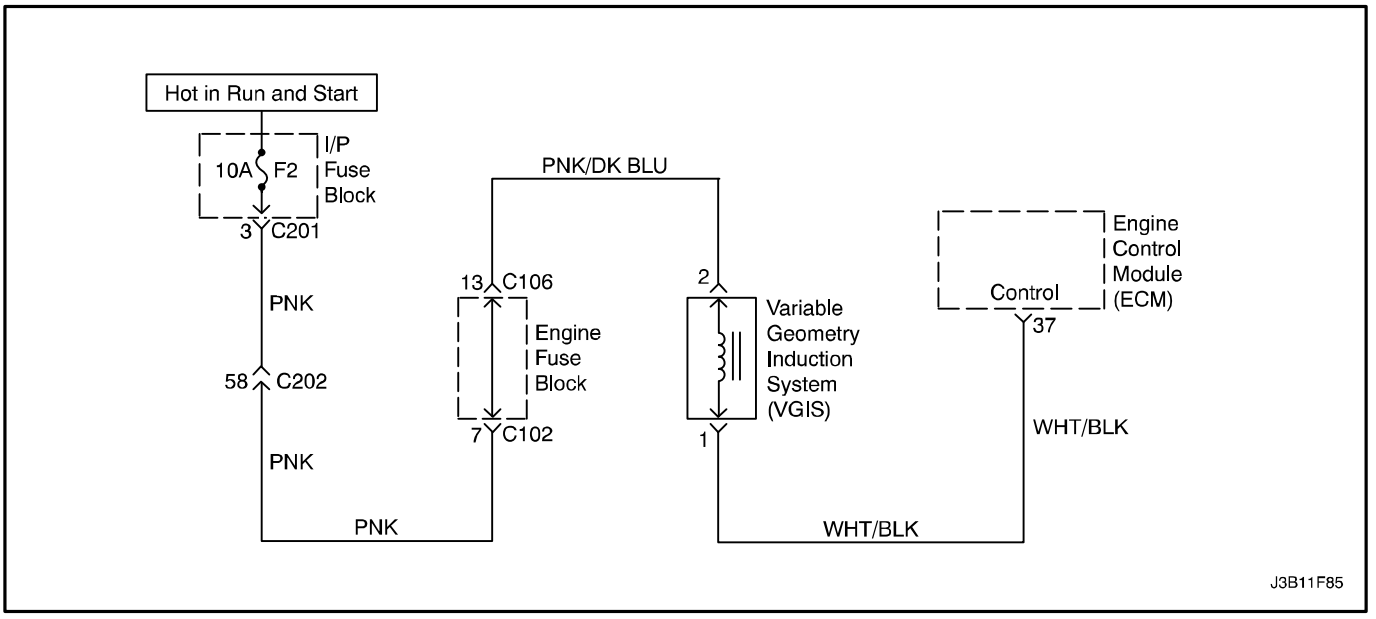
A stuck Fuel Level Sensor may cause the DTC to set. If DTC P0656 cannot be duplicated, the information included in the Freeze Frame data can be useful in determining vehicle operating conditions when the DTC was first set.

Resistance check for the Fuel Level Sensor.

- Empty = 100 ohms or over.
- Half full = about 32.5 ohms.
- Full = 10 ohms or less.

DTC P0656 – Fuel Level Gauge Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Connect the scan tool to the DLC. 3. Turn the Turn the ignition switch to ON. Are any Diagnostic Trouble Codes (DTCs) displayed?	–	Go to *Step 3*	Try with another scan tool
3	Refer to the applicable DTC table. Start with the DTC with the lowest numerical value and move up. Is the DTC identified as valid trouble code P0656?	–	Go to *Step 4*	Go to applicable DTC table
4	1. Disconnect the cluster connector. 2. Turn the ignition switch to LOCK. 3. Check for an open or short to ground in the wire between the ECM connector 40 and cluster connector terminal B3. Is the problem found?	–	Go to *Step 6*	Go to *Step 5*
5	1. Turn the ignition switch to LOCK. 2. Check for short to battery in the wire between the the ECM connector 40 and cluster connector terminal B3. Is the problem found?	–	Go to *Step 6*	Go to *Step 7*
6	1. Change the between cluster and ECM or repair the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	–
7	1. Replace the cluster. 2. Clear any DTCs from ECM. 3. Perform the diagnostic system check. Are any Diagnostic Trouble Codes (DTCs) displayed?	–	Go to *Step 8*	System OK
8	Replace the ECM. Is the replcement complete?	–	Go to *Step 9*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1181

VARIABLE INTAKE MANIFOLD SOLENOID LOW VOLTAGE

Circuit Description

The Engine Control Module(ECM) operates a solenoid to control the Variable Intake Manifold(VIM) solenoid electrical. The solenoid is normally closed. By providing a ground path, the ECM energizes the solenoid.

Conditions for Setting the DTC

- The VIM solenoid circuit is an open or a short to ground condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. The information will be stored in the freeze frame and failure records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

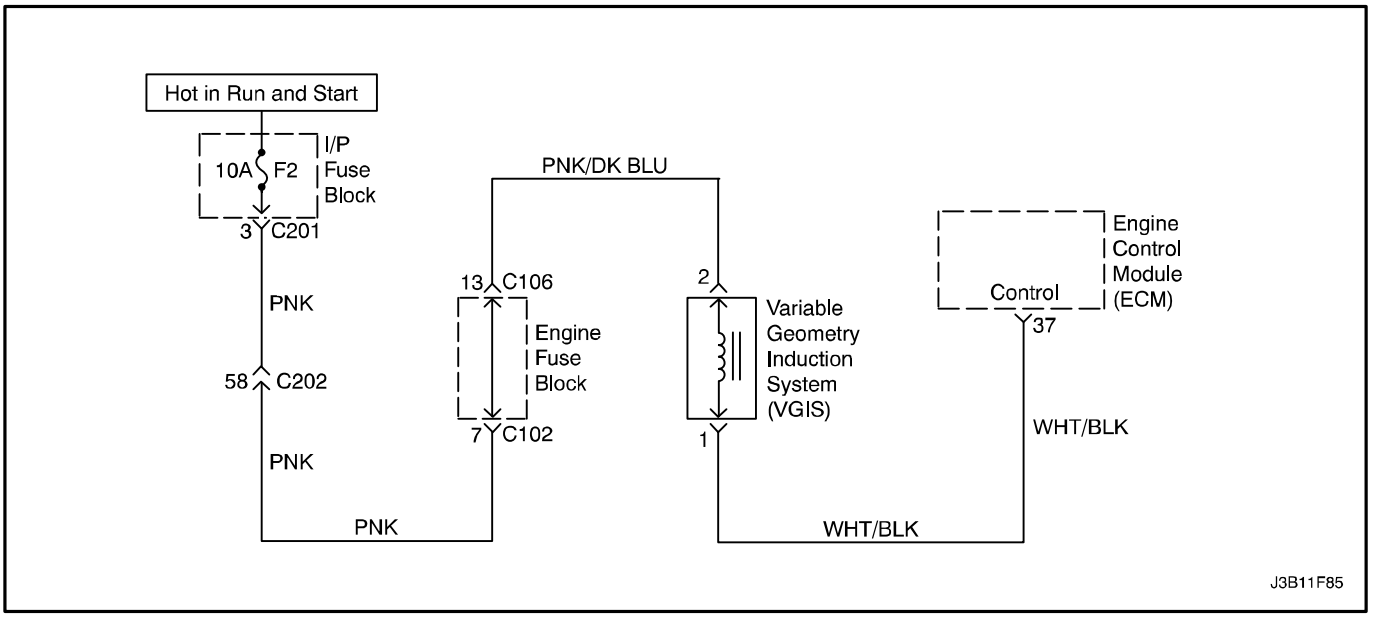
- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

DTC P1181 – Variable Intake Manifold Solenoid Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the Variable Intake Manifold(VIM) solenoid connector. 3. Measure the resistance of the VIM solenoid. Does the resistance near the specified value?	0 Ω	Go to *Step 3*	Go to *Step 6*
3	1. Disconnect the ignition relay connector. 2. Check for an open or a short to ground in the wire between the VIM solenoid connector terminal 2 and the engine connector terminal 13. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	Repair the wire and the connector terminal. Is the repair complete?	–	Go to *Step 8*	–
5	1. Turn the ignition switch to LOCK. 2. Disconnect the Engine Control Module(ECM) connector. 3. Check for an open or a short to ground in the wire between the VIM solenoid connector terminal 1 and the ECM connector terminal 37. Is the problem found?	–	Go to *Step 4*	Go to *Step 7*
6	Replace the VIM solenoid. Is the replacement complete?	–	Go to *Step 8*	–
7	Replace the ECM. Is the replacement complete?	–	Go to *Step 9*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine. 3. Run the engine until it reaches normal operating temperature at idle. 4. Operating the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1182

VARIABLE INTAKE MANIFOLD SOLENOID HIGH VOLTAGE

Circuit Description

The Engine Control Module(ECM) operates a solenoid to control the Variable Intake Manifold(VIM) solenoid electrical. The solenoid is normally closed. By providing a ground path, the ECM energizes the solenoid.

Conditions for Setting the DTC

- The VIM solenoid circuit is a short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. The information will be stored in the freeze frame and failure records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

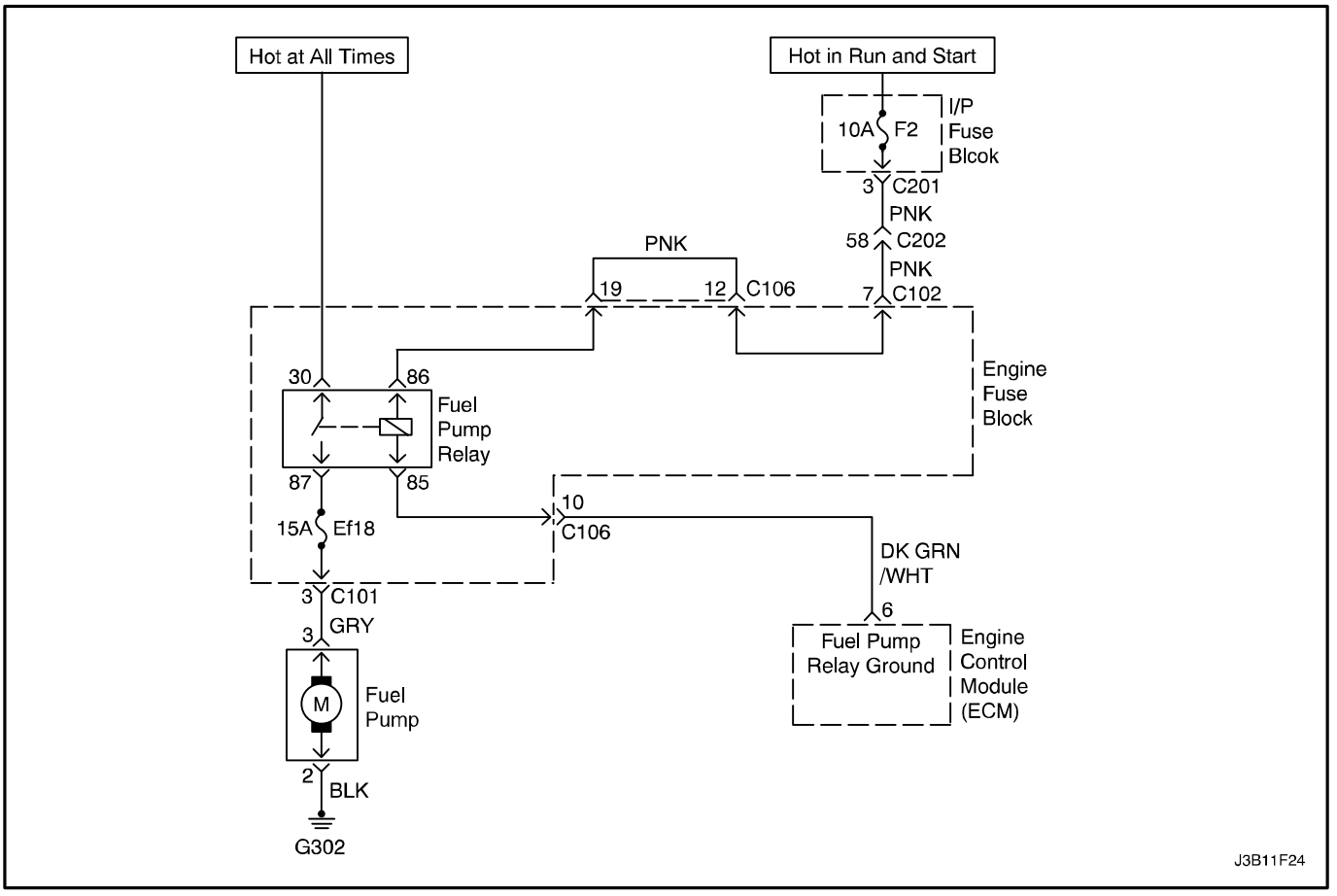
- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

DTC P1182 – Variable Intake Manifold Solenoid High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the Variable Intake Manifold(VIM) solenoid connector. 3. Measure the resistance of the VIM solenoid. Does the resistance near the specified value?	0 Ω	Go to *Step 3*	Go to *Step 6*
3	1. Disconnect the ignition relay connector. 2. Check for a short to battery in the wire between the VIM solenoid connector terminal 2 and the engine connector terminal 13. Is the problem found?	–	Go to *Step 4*	Go to *Step 5*
4	Repair the wire and the connector terminal. Is the repair complete?	–	Go to *Step 8*	–
5	1. Turn the ignition switch to LOCK. 2. Disconnect the Engine Control Module(ECM) connector. 3. Check for a short to battery voltage in the wire between the VIM solenoid connector terminal 1 and the ECM connector terminal 37. Is the problem found?	–	Go to *Step 4*	Go to *Step 7*
6	Replace the VIM solenoid. Is the replacement complete?	–	Go to *Step 8*	–
7	Replace the ECM. Is the replacement complete?	–	Go to *Step 9*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine. 3. Run the engine until it reaches normal operating temperature at idle. 4. Operating the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1230

FUEL PUMP RELAY LOW VOLTAGE (1.4L DOHC)

Circuit Description

When the ignition switch is turned ON, the 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.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.
- An open or low voltage condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

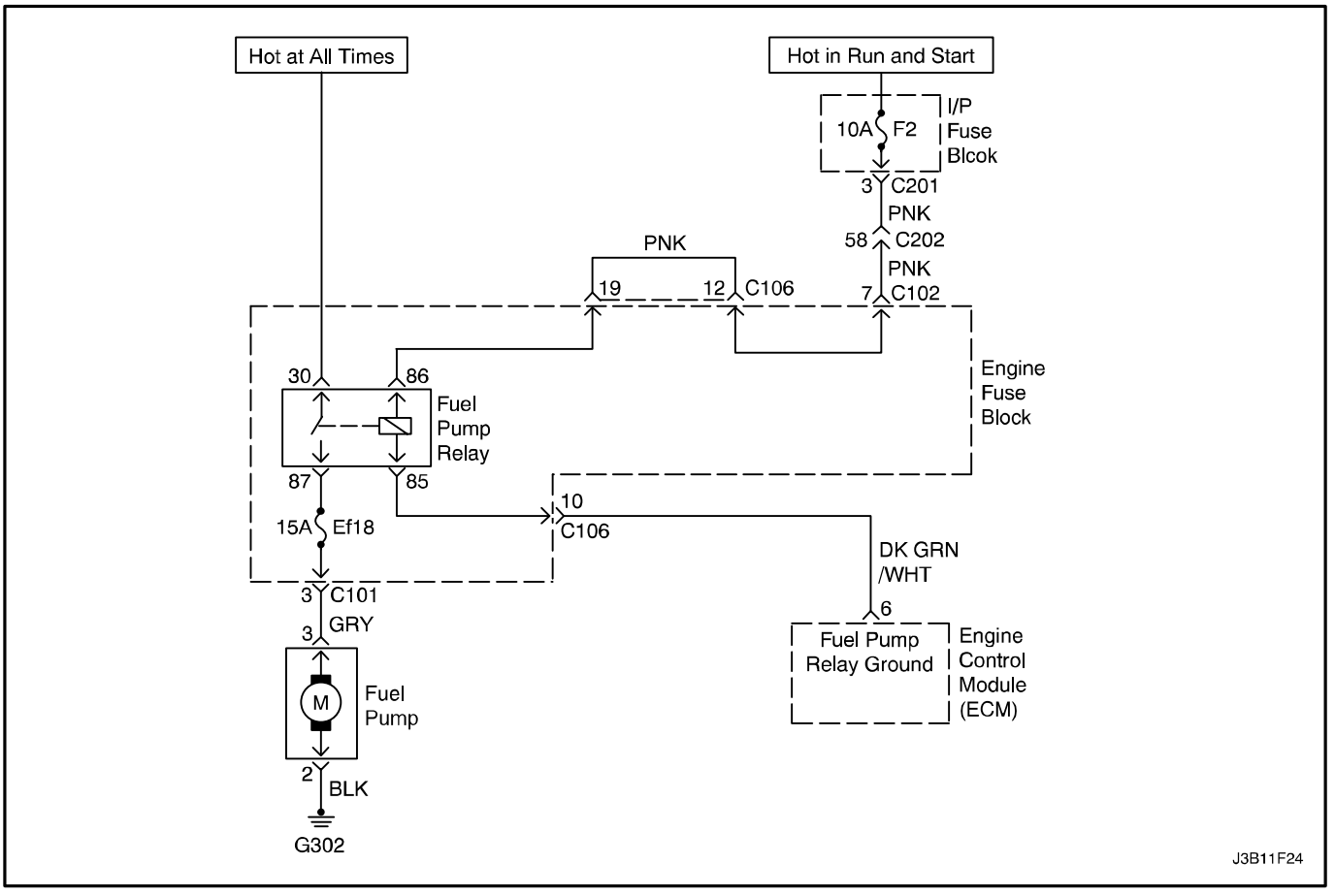
Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P1230 – Fuel Pump Relay Low Voltage (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK for 10 seconds. 2. Turn the Turn the ignition switch to ON. 3. Listen for in–tank fuel pump operation. Does the fuel pump operate?	2.55 seconds	Go to ”Diagnostic Aids”	Go to *Step 3*
3	1. Turn the ignition switch to ON. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 85 and ground. 4. Turn the Turn the ignition switch to ON. Is the test light ON?	–	Go to *Step 4*	Go to *Step 10*
4	1. Turn the ignition switch to ON. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 86 and B+. 4. Turn the Turn the ignition switch to ON. Is the test light ON?	–	Go to *Step 5*	Go to *Step 9*
5	1. Turn the ignition switch to LOCK. 2. Connect a test light between the fuel pump relay connector terminal 30 and ground. Is the test light ON?	–	Go to *Step 6*	Go to *Step 8*
6	Check for short to ground in the wire between the fuel pump relay connector terminal 87 and fuel pump connector. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire between the fuel pump relay connector terminal 87 and fuel pump connector terminal 3. 2. Install the fuel pump relay. 3. Turn the engine OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 14*	–
8	1. Replace the fuel pump relay. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 14*	Go to *Step 9*
9	Check for a short to ground wire between the fuel pump relay connector terminal 86 and the ignition after key ON(IGN 1). Is the problem found?	–	Go to *Step 11*	Go to *Step 10*
10	Check for a short to ground wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. Is the problem found?	–	Go to *Step 12*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
11	1. Repair the wire between the fuel pump relay connector terminal 86 and the ignition key ON (IGN1). 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 13*
12	1. Repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 13*
13	1. Replace the ECM. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 14*
14	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC ad specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1230

FUEL PUMP RELAY LOW VOLTAGE (1.6L DOHC)

Circuit Description

When the ignition switch is turned ON, the 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.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.
- An open or low voltage condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.
- Coolant fan turns ON.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

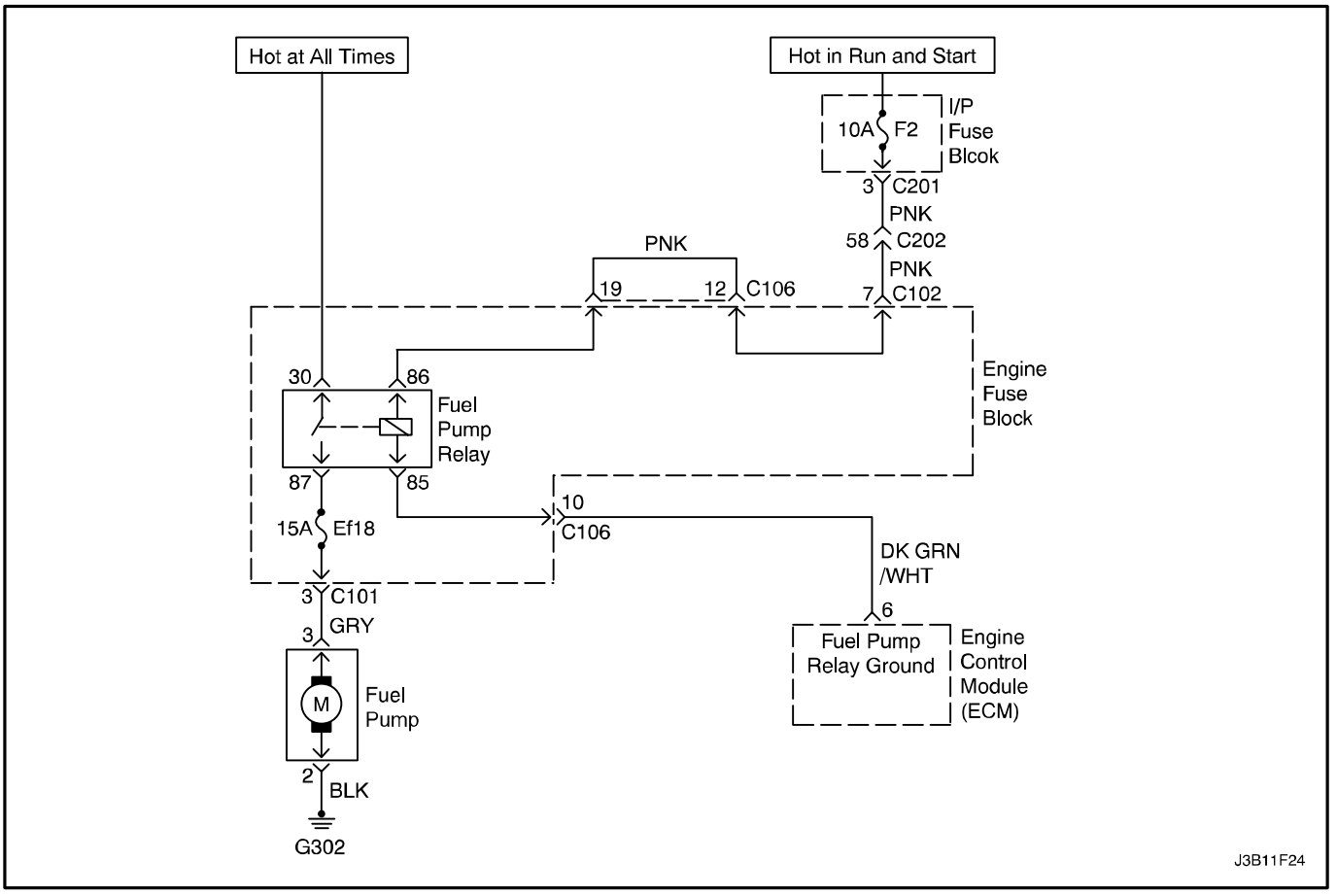
Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P1230 – Fuel Pump Relay Low Voltage (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK for 10 seconds. 2. Turn the Turn the ignition switch to ON. 3. Listen for in–tank fuel pump operation. Does the fuel pump operate?	2.55 seconds	Go to ”Diagnostic Aids”	Go to *Step 3*
3	1. Turn the ignition switch to ON. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 85 and ground. 4. Turn the Turn the ignition switch to ON. Is the test light ON?	–	Go to *Step 4*	Go to *Step 10*
4	1. Turn the ignition switch to ON. 2. Disconnect the fuel pump relay. 3. Connect a test light between the fuel pump relay connector terminal 86 and B+. 4. Turn the Turn the ignition switch to ON. Is the test light ON?	–	Go to *Step 5*	Go to *Step 9*
5	1. Turn the ignition switch to LOCK. 2. Connect a test light between the fuel pump relay connector terminal 30 and ground. Is the test light ON?	–	Go to *Step 6*	Go to *Step 8*
6	Check for short to ground in the wire between the fuel pump relay connector terminal 87 and fuel pump connector. Is the problem found?	–	Go to *Step 7*	Go to *Step 8*
7	1. Repair the wire between the fuel pump relay connector terminal 87 and fuel pump connector terminal 3. 2. Install the fuel pump relay. 3. Turn the engine OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 14*	–
8	1. Replace the fuel pump relay. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 14*	Go to *Step 9*
9	Check for a short to ground wire between the fuel pump relay connector terminal 86 and the ignition after key ON(IGN 1). Is the problem found?	–	Go to *Step 11*	Go to *Step 10*
10	Check for a short to ground wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. Is the problem found?	–	Go to *Step 12*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
11	1. Repair the wire between the fuel pump relay connector terminal 86 and the ignition key ON (IGN1). 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 13*
12	1. Repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 13*
13	1. Replace the ECM. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 14*
14	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC ad specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1231

FUEL PUMP RELAY HIGH VOLTAGE (1.4L DOHC)

Circuit Description

When the ignition switch is turned ON, the 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.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.
- A high voltage condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

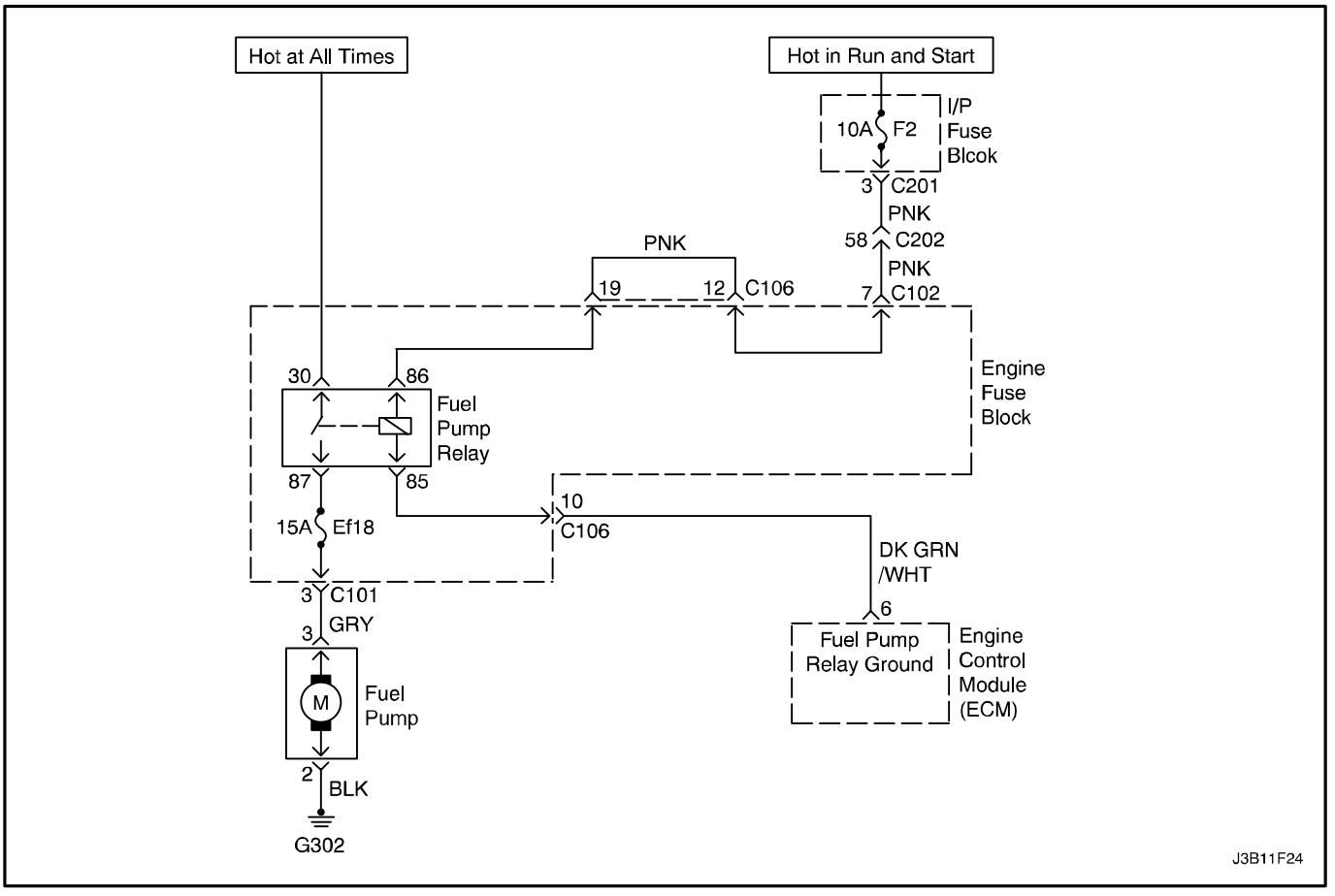
Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P1231 – Fuel Pump Relay High Voltage (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK for 10 seconds. 2. Turn the Turn the ignition switch to ON. 3. Listen for in–tank fuel pump operation. Does the fuel pump operate?	2.55 seconds	Go to ”Diagnostic Aids”	Go to *Step 3*
3	Check for short to battery voltage or low voltage in the wire between the fuel pump relay connector terminal 87 and fuel pump connector 3. Is the problem found?	–	Go to *Step 7*	Go to *Step 5*
4	1. Repair the wire between the fuel pump relay connector terminal 87 and fuel pump connector terminal 3. 2. Install the fuel pump relay. 3. Turn the engine OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 11*	–
5	1. Replace the fuel pump relay. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 11*	Go to *Step 6*
6	Check for short to battery voltage wire between the fuel pump relay connector terminal 86 and the ignition after key ON(IGN 1). Is the problem found?	–	Go to *Step 8*	Go to *Step 7*
7	Check for an open wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. Is the problem found?	–	Go to *Step 9*	Go to *Step 10*
8	1. Repair the wire between the fuel pump relay connector terminal 86 and the ignition key ON (IGN1). 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 10*
9	1. Repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	1. Replace the ECM. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 11*
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC ad specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1231

FUEL PUMP RELAY HIGH VOLTAGE (1.6L DOHC)

Circuit Description

When the ignition switch is turned ON, the 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.

Conditions for Setting the DTC

- This DTC can be stored in ”key–on” status.
- A high voltage condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Records buffers.
- A history DTC is stored.
- Coolant fan turns ON.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

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

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P1231 – Fuel Pump Relay High Voltage (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK for 10 seconds. 2. Turn the Turn the ignition switch to ON. 3. Listen for in–tank fuel pump operation. Does the fuel pump operate?	2.55 seconds	Go to ”Diagnostic Aids”	Go to *Step 3*
3	Check for short to battery voltage or low voltage in the wire between the fuel pump relay connector terminal 87 and fuel pump connector 3. Is the problem found?	–	Go to *Step 7*	Go to *Step 5*
4	1. Repair the wire between the fuel pump relay connector terminal 87 and fuel pump connector terminal 3. 2. Install the fuel pump relay. 3. Turn the engine OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 11*	–
5	1. Replace the fuel pump relay. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	Go to *Step 11*	Go to *Step 6*
6	Check for short to battery voltage wire between the fuel pump relay connector terminal 86 and the ignition after key ON(IGN 1). Is the problem found?	–	Go to *Step 8*	Go to *Step 7*
7	Check for an open wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. Is the problem found?	–	Go to *Step 9*	Go to *Step 10*
8	1. Repair the wire between the fuel pump relay connector terminal 86 and the ignition key ON (IGN1). 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 10*
9	1. Repair the wire between the fuel pump relay connector terminal 85 and the ECM connector terminal 6. 2. Install the fuel pump relay. 3. Turn the ignition OFF for 10 seconds. 4. Clear any DTCs from ECM. 5. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	1. Replace the ECM. 2. Turn the ignition OFF for 10 seconds. 3. Clear any DTCs from ECM. 4. Turn the ignition switch to ON. Does the fuel pump operate?	2.55 seconds	System OK	Go to *Step 11*
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC ad specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1320

CRANKSHAFT SEGMENT PERIOD SEGMENT ADAPTATION AT LIMIT

Circuit Description

The 58X reference signal is produced by the Crankshaft Position (CKP) sensor. During one crankshaft revolution, 58 crankshaft pulses will be produced. The Engine Control Module (ECM) uses the 58X reference signal to calculate engine rpm and CKP. The ECM constantly monitors the number of pulses on the 58X reference circuit and compares them to the number of Camshaft Position (CMP) signal pulses being received. If the ECM receives and incorrect number of pulses on the 58X reference circuit, Diagnostic Trouble Code (DTC) P1320 will set.

Conditions for Setting the DTC

- Segment adaptation valve at the limit.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for:

- Poor connection – Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connections.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition ON and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving the connectors and the wiring harnesses related to the ECM. A change in voltage will indicate the location of the fault.
- Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P1320 – Crankshaft Segment Period Segment Adaptation at Limit

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Attempt to start the engine. Does the engine start?	–	Go to *Step 3*	Refer to ”Engine Cranks But Will Not Run”
3	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Turn the ignition ON, with the engine OFF. 4. Review and record Failure Records information. 5. Clear the Diagnostic Trouble Codes (DTCs). 6. Start the engine and idle for 1 minute. Is DTC P1320 set?	–	Go to *Step 4*	Go to ”Diagnostic Aids”

Step	Action	Value(s)	Yes	No
4	1. Remove the crankshaft. 2. Check for a problem with the crahkshaft's visual defection and tooth. Is a problem found?	–	Go to *Step 5*	Go to *Step 6*
5	Replace the crankshaft. Is the replacement complete?	–	System OK	–
6	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1321

CRANKSHAFT SEGMENT PERIOD TOOTH ERROR

Circuit Description

The 58X reference signal is produced by the Crankshaft Position (CKP) sensor. During one crankshaft revolution, 58 crankshaft pulses will be produced. The Engine Control Module (ECM) uses the 58X reference signal to calculate engine rpm and CKP. The ECM constantly monitors the number of pulses on the 58X reference circuit and compares them to the number of Camshaft Position (CMP) signal pulses being received. If the ECM receives and incorrect number of pulses on the 58X reference circuit, Diagnostic Trouble Code (DTC) P1321 will set.

Conditions for Setting the DTC

- Missing or additional teeth detected.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

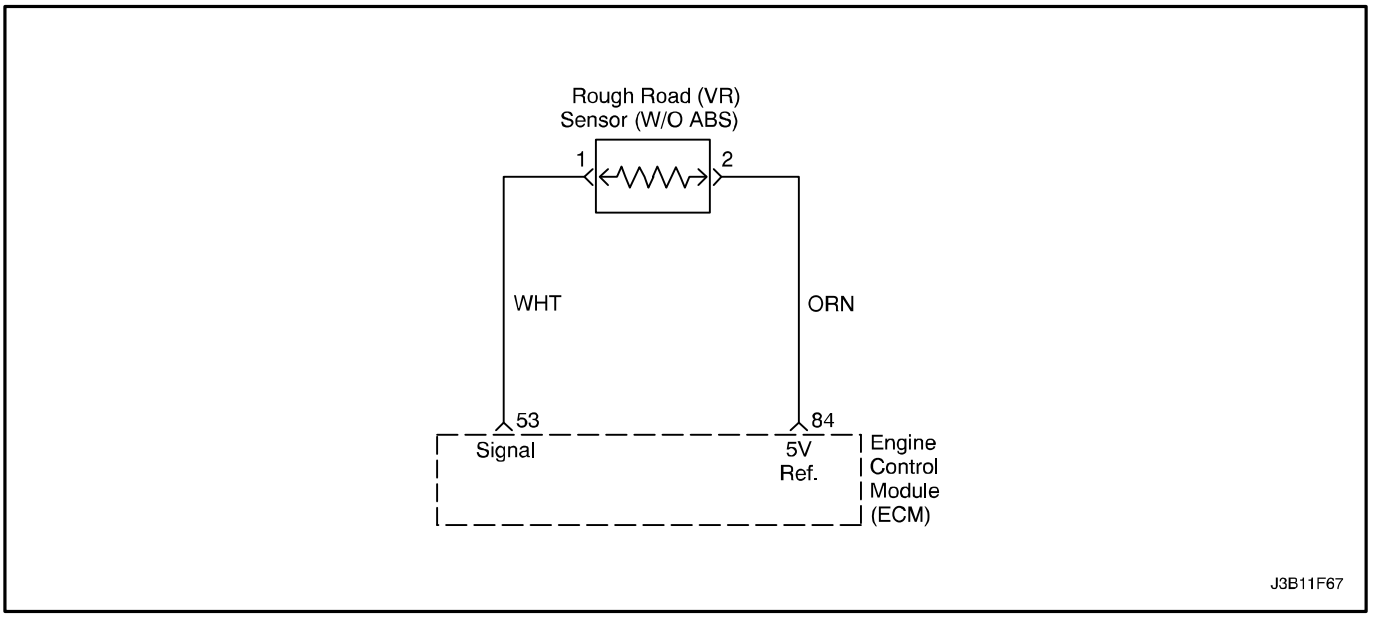
An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for:

- Poor connection – Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connections.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition ON and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving the connectors and the wiring harnesses related to the ECM. A change in voltage will indicate the location of the fault.
- Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P1321 – Crankshaft Segment Period Tooth Error

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Attempt to start the engine. Does the engine start?	–	Go to *Step 3*	Refer to ”Engine Cranks But Will Not Run”
3	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Turn the ignition ON, with the engine OFF. 4. Review and record Failure Records information. 5. Clear the Diagnostic Trouble Codes (DTCs). 6. Start the engine and idle for 1 minute. Is DTC P1321 set?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Remove the crankshaft. 2. Check for a problem with the crahkshaft’s visual defection and tooth. Is a problem found?	–	Go to *Step 5*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
5	Replace the crankshaft. Is the replacement complete?	–	System OK	–
6	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1382

ROUGH ROAD DATA INVALID (NON ABS)

Circuit Description

The VR sensor is used to detecting the road situation.

By sensing difference of wheel rotation duration caused by bumps or potholes in the road, the Engine Control Module (ECM) can determine if the changes in crankshaft speed are due to engine misfire or are driveline induced. If the VR sensor detects a rough road condition, the ECM misfire detection diagnostic will be de–activated.

Conditions for Setting the DTC

- Vehicle speed is higher than 5km/h(3.1mph).
- No Vehicle Speed Sensor error not set.
- VR sensor output signal is higher than 0.26.
- VR sensor output signal is not change for 30seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

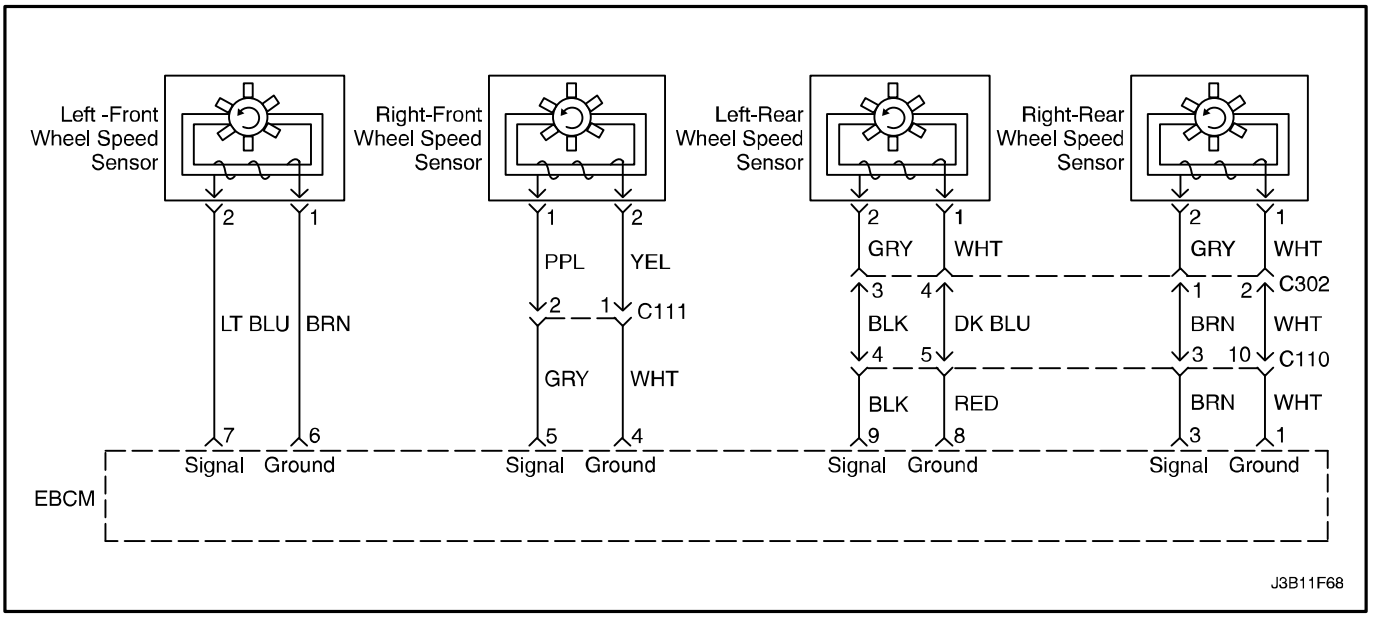
Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1382 – Rough Road Data Invalid (NON ABS)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with engine OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Review and record the scan tool Failure Records data. 4. Operate the vehicle within Failure Records conditions as noted. 5. Using the scan tool, monitor specific Diagnostic Trouble Code (DTC) info for DTC P1382. Does the scan tool indicate that DTC P1382 failed?	–	Go to *Step 4*	Go to *Step 3*
3	1. Check for the following conditions and repair as needed: 2. VR sensor seal missing or damaged. 3. VR sensor mounting flanges cracked, missing, or incorrectly installed. Is the repair complete?	–	Go to *Step 14*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the VR sensor electrical connector. 3. Turn the ignition ON, with the engine OFF. 4. Observe the VR sensor value displayed on the scan tool. Is the VR sensor value near the specified value?	0V	Go to *Step 5*	Go to *Step 12*
5	1. Jumper the 5 volt reference circuit, terminal 2 and the VR sensor signal circuit, terminal 1 together at the VR sensor harness connector. 2. Observe the VR sensor value displayed on the scan tool. Is the VR sensor value near the specified value?	4.95V	Go to *Step 14*	Go to *Step 10*
6	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) and check the sensor ground circuit for high resistance, an open between the ECM and the VR sensor, or for a poor connection at the terminal 53 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 10*
7	Check the 5 volt reference circuit for high resistance, an open between the ECM and the VR sensor, or a poor connection at the terminal 84 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 8*
8	1. Turn the ignition OFF. 2. Disconnect the ECM and check the VR sensor signal circuit for high resistance, an open, a low voltage, or a short to the sensor ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
9	Check the VR sensor signal circuit for a poor connection at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
10	Check for a poor connection at terminal 1 of the VR sensor and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 11*
11	Replace the VR sensor. Is the repair complete?	–	Go to *Step 14*	–
12	1. Turn the ignition OFF. 2. Disconnect the ECM. 3. Turn the ignition ON. 4. Check the VR sensor signal circuit for a short to battery voltage or a short to the 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
13	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1382

ROUGH ROAD DATA INVALID (ABS)

Circuit Description

The wheel speed sensor is used to detecting the road situation.

As the wheel is rotated, the wheel speed sensor produces an AC voltage that increase with wheel speed. The EBCM uses the frequency of the AC signal to calculate wheel speed. The wheel speed sensor is connected to EBCM by a ”twisted pair” of wires. Twisting reduces noise susceptibility than may cause a DTC to set. If the wheel speed sensor detects a rough road condition, the ECM misfire detection diagnostic will be de–activated.

Conditions for Setting the DTC

- Vehicle speed is higher than 5km/h(3.1mph).
- No Vehicle Speed Sensor error not set.
- VR sensor output signal is higher than 0.26.
- VR sensor output signal is not change for 30seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

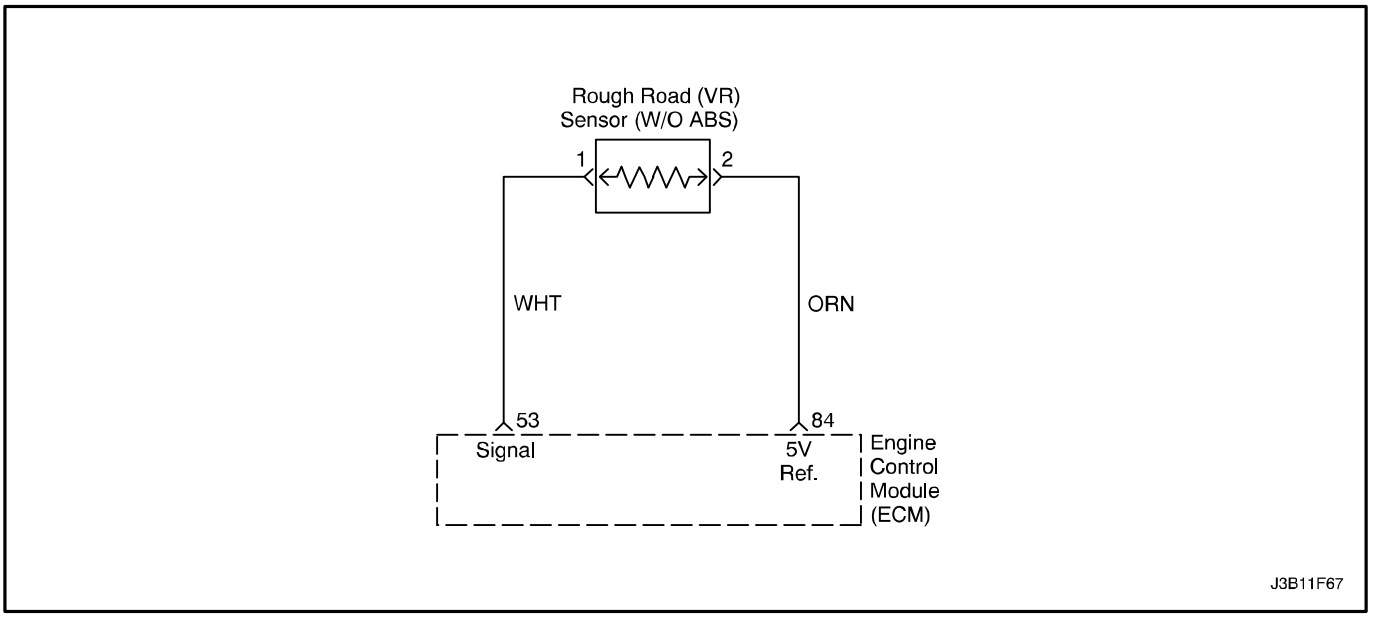
Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1382 – Rough Road Data Invalid (ABS)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with engine OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Review and record the scan tool Failure Records data. 4. Operate the vehicle within Failure Records conditions as noted. 5. Using the scan tool, monitor specific Diagnostic Trouble Code (DTC) info for DTC P1382. Does the scan tool indicate that DTC P1382 failed?	–	Go to *Step 4*	Go to *Step 3*
3	1. Check for the following conditions and repair as needed: 2. Wheel speed sensor seal missing or damaged. 3. Wheel speed sensor mounting flanges cracked, missing, or incorrectly installed. Is the repair complete?	–	Go to *Step 14*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the defected Wheel speed sensor electrical connector. 3. Turn the ignition ON, with the engine OFF. 4. Observe the Wheel speed sensor value displayed on the scan tool. Is the Wheel speed sensor value near the specified value?	0V	Go to *Step 5*	Go to *Step 12*
5	1. Jumper the 5 volt reference circuit, the Wheel speed sensor signal circuit, together at the defected Wheel speed sensor harness connector. 2. Observe the defected Wheel speed sensor value displayed on the scan tool. Is the VR sensor value near the specified value?	4.95V	Go to *Step 14*	Go to *Step 10*
6	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) and check the sensor ground circuit for high resistance, an open between the ECM and the Wheel speed sensor, or for a poor connection of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 10*
7	Check the 5 volt reference circuit for high resistance, an open between the ECM and the Wheel speed sensor, or a poor connection of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	1. Turn the ignition OFF. 2. Disconnect the ECM and check the Wheel speed sensor signal circuit for high resistance, an open, a low voltage, or a short to the sensor ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 9*
9	Check the Wheel speed sensor signal circuit for a poor connection at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
10	Check for a poor connection at the Wheel speed sensor and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 11*
11	Replace the Wheel speed sensor. Is the repair complete?	–	Go to *Step 14*	–
12	1. Turn the ignition OFF. 2. Disconnect the ECM. 3. Turn the ignition ON. 4. Check the Wheel speed sensor signal circuit for a short to voltage or a short to the 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
13	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1385

ROUGH ROAD SENSOR CIRCUIT FAULT (NON ABS)

Circuit Description

The VR sensor is used to detecting the road situation.

By sensing difference of wheel rotation duration caused by bumps or potholes in the road, the Engine Control Module (ECM) can determine if the changes in crankshaft speed are due to engine misfire or are driveline induced. If the VR sensor detects a rough road condition, the ECM misfire detection diagnostic will be de–activated.

Conditions for Setting the DTC

- The VR sensor is greater than 0.06V.

Or

- The minimum value of the VR sensor is less than 1.5V.

Or

- The maximum value of the VR sensor is greater than 2.2V.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

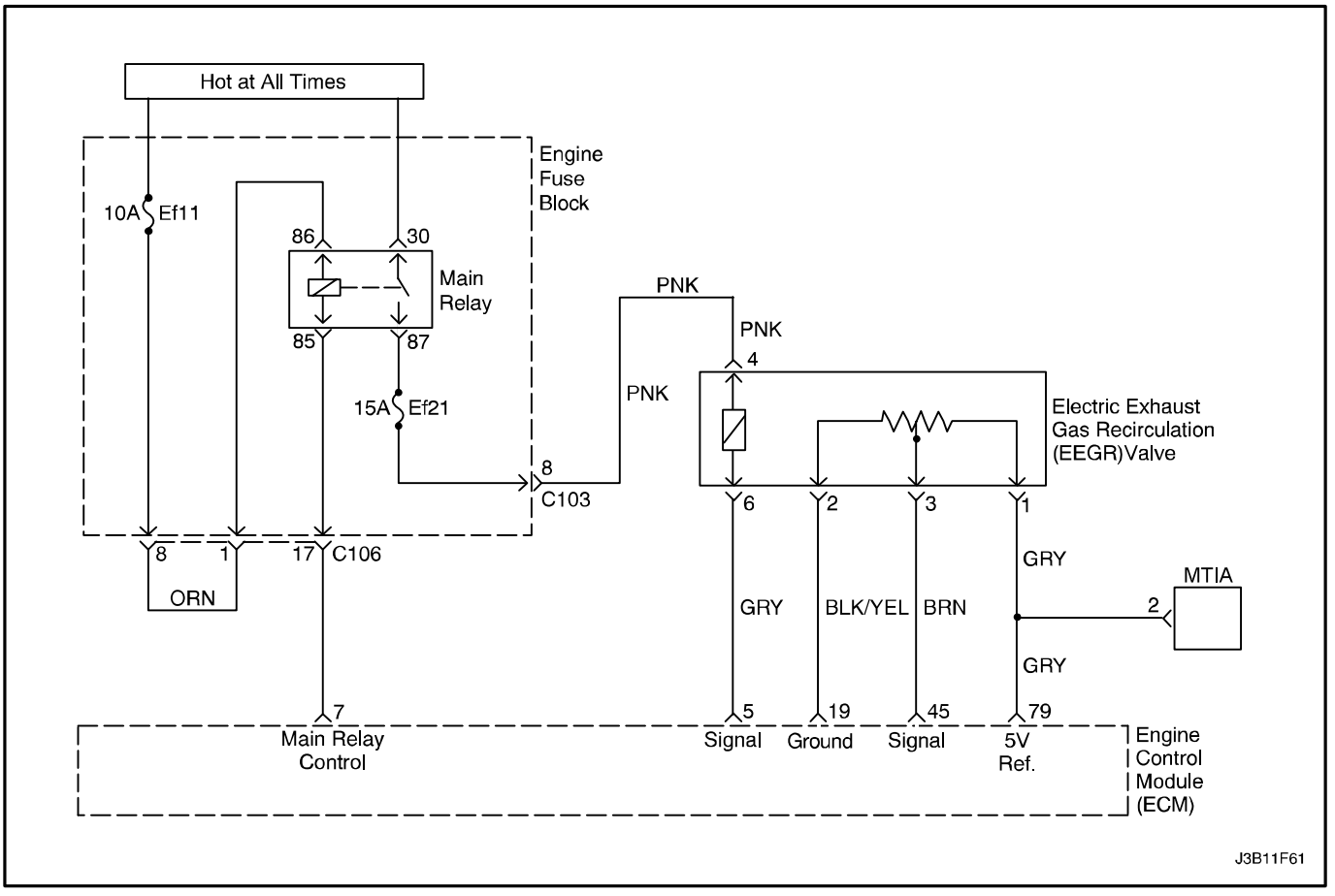
Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1385 – Rough Road Sensor Circuit Fault (NON ABS)

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with engine OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Review and record the scan tool Failure Records data. 4. Operate the vehicle within Failure Records conditions as noted. 5. Using the scan tool, monitor specific Diagnostic Trouble Code (DTC) info for DTC P1385. Does the scan tool indicate that DTC P1385 failed?	–	Go to *Step 4*	Go to *Step 3*
3	1. Check for the following conditions and repair as needed: 2. VR sensor seal missing or damaged. 3. VR sensor mounting flanges cracked, missing, or incorrectly installed. Is the repair complete?	–	Go to *Step 14*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the VR sensor electrical connector. 3. Turn the ignition ON, with the engine OFF. 4. Observe the VR sensor value displayed on the scan tool. Is the VR sensor value near the specified value?	0V	Go to *Step 5*	Go to *Step 12*
5	1. Jumper the 5 volt reference circuit, terminal C and the VR sensor signal circuit, terminal 1 together at the VR sensor harness connector. 2. Observe the VR sensor value displayed on the scan tool. Is the VR sensor value near the specified value?	4.95V	Go to *Step 14*	Go to *Step 10*
6	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) and check the sensor ground circuit for high resistance, an open between the ECM and the VR sensor, or for a poor connection at the terminal 53 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 10*
7	Check the 5 volt reference circuit for high resistance, an open between the ECM and the VR sensor, or a poor connection at the terminal 84 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 8*
8	1. Turn the ignition OFF. 2. Disconnect the ECM and check the VR sensor signal circuit for high resistance, an open, a low voltage, or a short to the sensor ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 9*

Step	Action	Value(s)	Yes	No
9	Check the VR sensor signal circuit for a poor connection at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
10	Check for a poor connection at terminal 1 of the VR sensor and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 11*
11	Replace the VR sensor. Is the repair complete?	–	Go to *Step 14*	–
12	1. Turn the ignition OFF. 2. Disconnect the ECM. 3. Turn the ignition ON. 4. Check the VR sensor signal circuit for a short to battery voltage or a short to the 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
13	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1402

EXHAUST GAS RECIRCULATION BLOCKED

Circuit Description

An Exhaust Gas Re–circulation (EGR) system is used to lower oxides of nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with a engine control module(ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and the Manifold Absolute Pressure (MAP) sensor. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The actual EGR position should always be near the commanded or Desired EGR position.

This Diagnostic Trouble Code(DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- The vehicle is part load.
- The engine controls system is in closed loop.
- Engine Coolant Temperature(ECT) is greater than 60˚C(140˚F).
- Intake Air Temperature(IAT) is greater than 15˚C(59˚F).
- Manifold Absolute Pressure is greater than 75kPA.
- The EGR is greater than 10%.
- Mass Air Flow is between 71~174mg/tdc.
- Engine Speed Is Between 1,950~2,600rpm.
- DTCs P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0300, P0335, P0336, P0341, P0342, P1671, P1672, P1673 are NOT SET.
- EGR is disabled.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.

- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

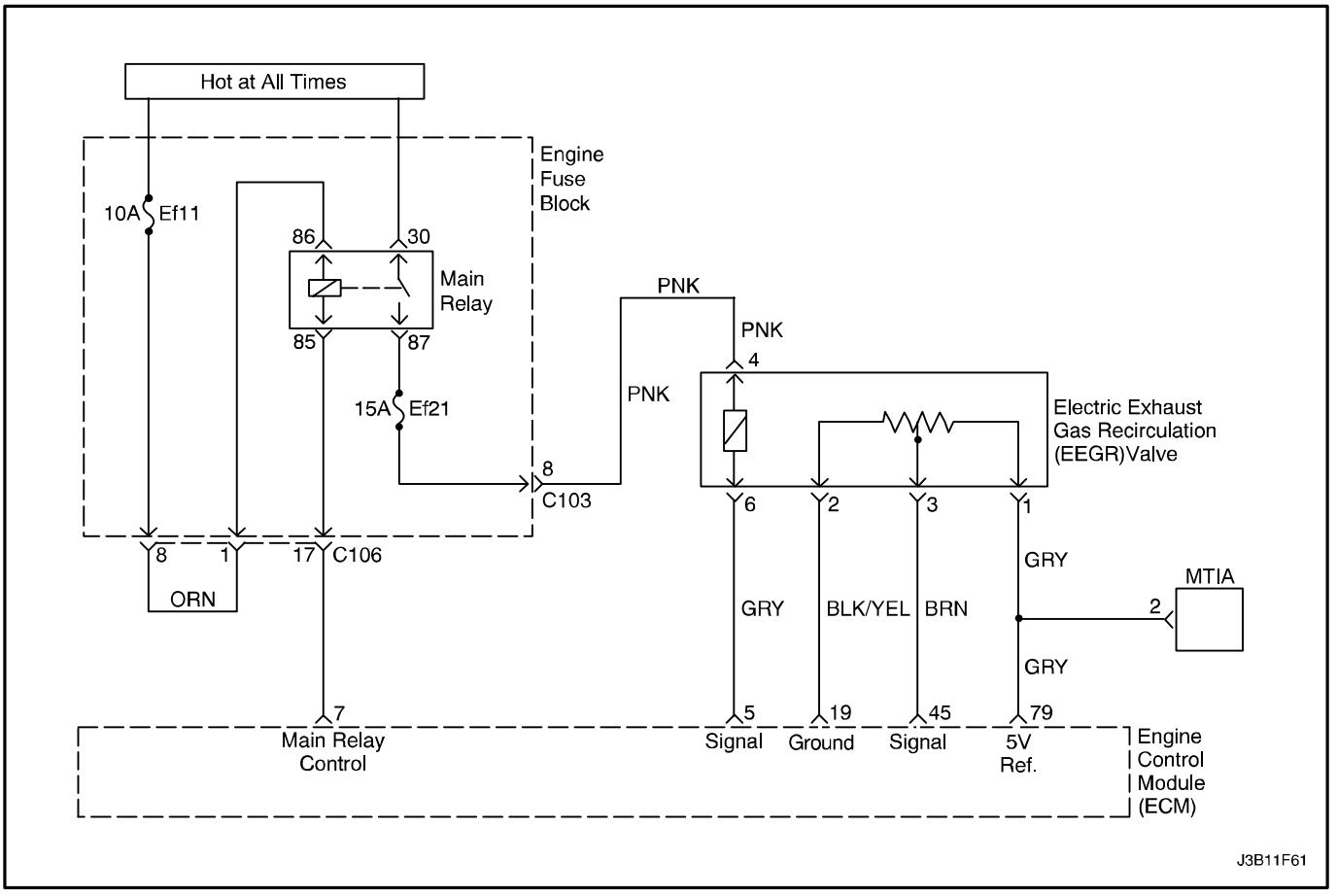
Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears.

By watching the Actual EGR and desired EGR positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the Freeze Frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

DTC P1402 – Exhaust Gas Recirculation Blocked

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Start the engine and allow the engine to idle. 2. Install the scan tool. 3. Command the exhaust gas recirculation (EGR) valve to the specified values. Does the engine stall or attempt to stall?	50%	Go to *Step 5*	Go to *Step 3*
3	1. Turn the ignition switch to LOCK. 2. Remove the EGR valve assembly. 3. Inspect the EGR valve, passages and pipe for a restriction or damage and repair as necessary. Is a repair necessary?	–	Go to *Step 5*	Go to *Step 4*
4	Replace the EGR valve. Is the replacement complete?	–	Go to *Step 5*	–
5	1. Start the engine. 2. Disconnect the battery for the specified time. 3. Drive the vehicle to the specified value. 4. Release the throttle and allow the vehicle to decelerate to the specified value. Is the EGR Decel Filter Values less than the specified value?	10 secnds 60mph (27km/h) 20mph (32km/h) 0mph	Go to *Step 3*	Go to *Step 6*
6	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 7*	Go to *Step 2*



DIAGNOSTIC TROUBLE CODE (DTC) P1403

EXHAUST GAS RECIRCULATION VALVE FAILURE

Circuit Description

An Exhaust Gas Re–circulation (EGR) system is used to lower oxides of nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with a engine control module(ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and the Manifold Absolute Pressure (MAP) sensor. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The actual EGR position should always be near the commanded or Desired EGR position.

This Diagnostic Trouble Code(DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- The vehicle is part load.
- The engine controls system is in closed loop.
- Engine Coolant Temperature(ECT) is greater than 60˚C(140˚F).
- Intake Air Temperature(IAT) is greater than 15˚C(59˚F).
- Manifold Absolute Pressure is greater than 75kPA.
- The open EGR value is higher than 10%.
- Mass Air Flow is between 71~174mg/tdc.
- Engine Speed Is Between 1,950~2,600rpm.
- EGR potentiometer voltage is less than 0.4V.
- EGR potentiometer voltage is higher than 1.75V or integral term of EGR controller blocked in high or low limit.
- DTCs P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0300, P0335, P0336, P0341, P0342, P1671, P1672, P1673 are NOT SET.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

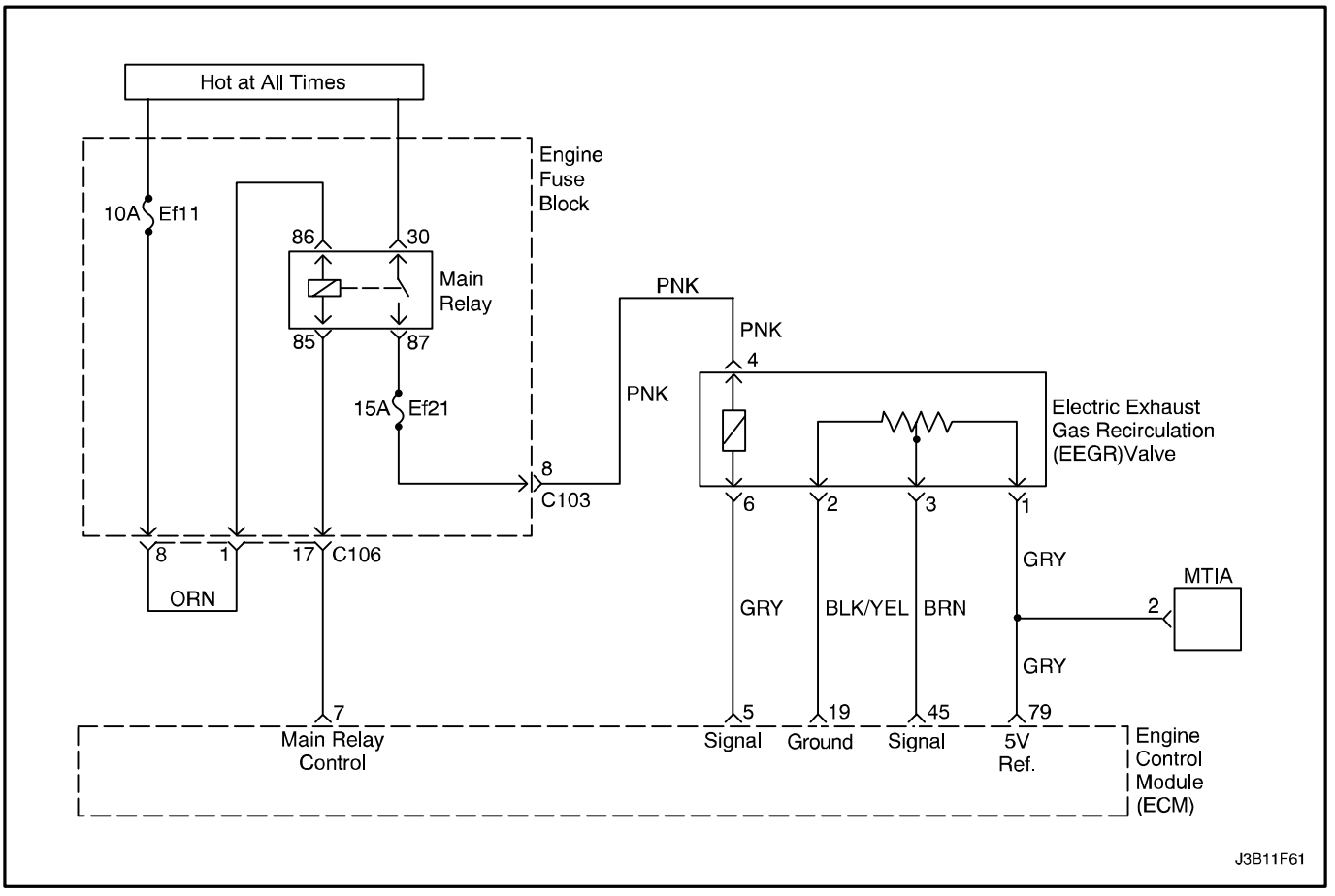
Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears.

By watching the Actual EGR and desired EGR positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the Freeze Frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

DTC P1403 – Exhaust Gas Recirculation Valve Failure

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition switch to with the engine OFF. 2. Install the scan tool. 3. Command the exhaust gas recirculation (EGR) valve to the specified values. Does the Actual EGR Position follow the desired EGR position?	25%, 50% 75%, 100%	Go to *Step 19*	Go to *Step 3*
3	1. Turn the ignition switch to ON. 2. Disconnect the EGR valve electrical connector. 3. With a test light connected to B+, probe the ground circuit to the EGR valve. Does the test light illuminate?	–	Go to *Step 4*	Go to *Step 5*
4	1. Connect the test light to ground. 2. Probe the EGR control circuit at terminal 3 to the EGR valve. 3. Command the EGR valve to the specified values using a scan tool. After the command is raised, does the test light glow brighter, flash or maintain a steady glow?	25%, 50% 75%, 100%	Go to *Step 6*	Go to *Step 7*
5	Repair the open or poor connection in the EGR ground circuit. Is the repair complete?	–	Go to *Step 19*	–
6	With a test light still connected to ground, probe the signal circuit at terminal 3. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
7	With a test light still connected to ground, again probe the signal circuit without commanding the EGR valve with the scan tool. Does the test light illuminate?	–	Go to *Step 10*	Go to *Step 11*
8	Check the signal circuit for a short to voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
9	With a digital voltmeter (DVM) connected to ground, probe the 5V reference circuit at terminal 1. Is the voltage measured near the specified value?	5V	Go to *Step 13*	Go to *Step 14*
10	Check the control circuit for a short to battery voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
11	Connect the test light to B+ and again probe the control circuit at terminal 4. Does the test light illuminate?	–	Go to *Step 15*	Go to *Step 16*
12	Replace the engine control module (ECM). Is the replacement complete?	–	Go to *Step 19*	–
13	Check the EGR ground circuit for a poor connection or proper terminal tension at the ECM and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 17*
14	Check the 5V reference circuit for a shortage to battery voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
15	Check the control circuit for a shortage to ground and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
16	Check the control circuit for an open or poor connection at the EGR valve electrical connector and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 18*
17	Replace the EGR valve. Is the replacement complete?	–	Go to *Step 19*	–
18	Check the ECM electrical connector for a poor connection and repair as necessary. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
19	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 20*	Go to *Step 2*
20	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1404
EXHAUST GAS RECIRCULATION CLOSED

Circuit Description

An Exhaust Gas Re–circulation (EGR) system is used to lower oxides of nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with a engine control module(ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and the Manifold Absolute Pressure (MAP) sensor. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The actual EGR position should always be near the commanded or Desired EGR position.

This Diagnostic Trouble Code(DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- EGR circuit is a short to battery condition exist.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

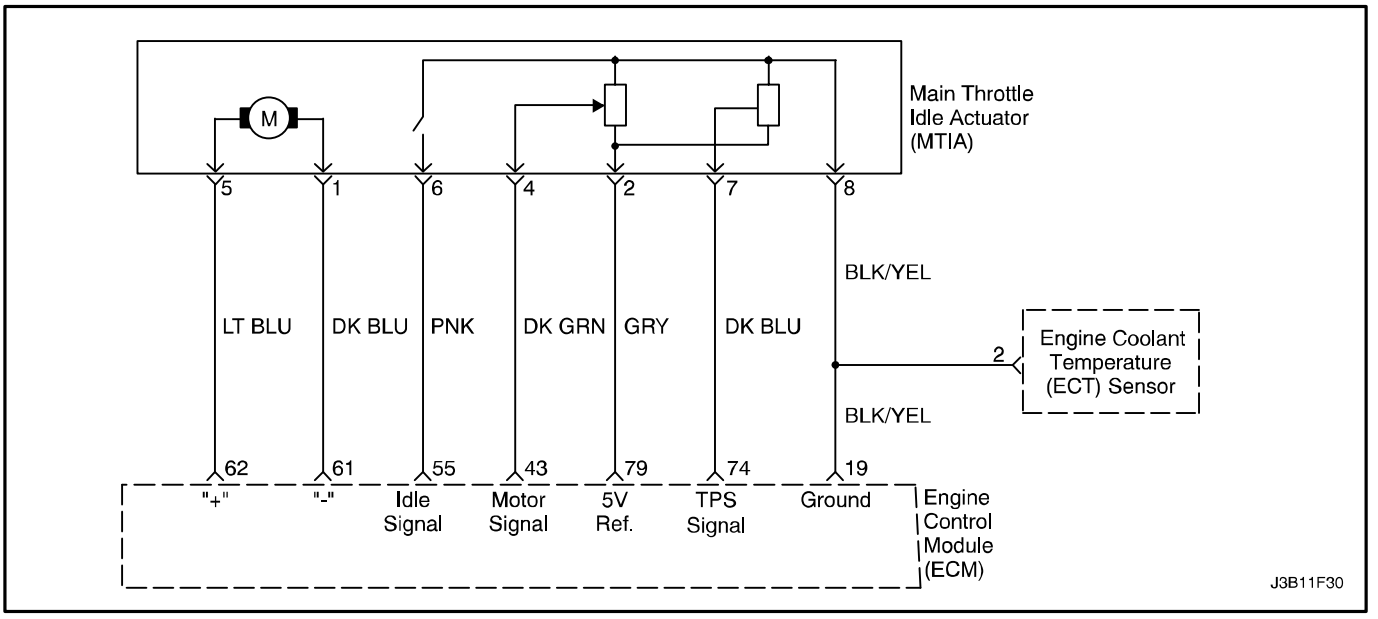
Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and desired EGR positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the Freeze Frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

DTC P1404 – Exhaust Gas Recirculation Closed

Step	Action	Value(s)	Yes	No
1	Perform an Euro On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition switch ON with the engine OFF. 2. Install the scan tool. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specified values. Does the Actual EGR Position follow the Desired EGR Position?	25%, 50% 75%, 100%	Go to *Step 13*	Go to *Step 3*
3	Disconnect the EGR valve electrical connector. Is the Actual EGR Position near the specified value?	100%	Go to *Step 4*	Go to *Step 5*
4	Check the signal circuit terminal 3 for a short to voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 6*
5	With a Digital Voltmeter (DVM) connected to ground, probe the 5 volt reference circuit terminal 1 to the EGR valve. Does the DVM read near the specified valve?	5V	Go to *Step 7*	Go to *Step 8*
6	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 13*	–
7	1. Connect a test light to ground. 2. Probe the EGR control circuit to the EGR valve. Does the test light illuminate?	–	Go to *Step 9*	Go to *Step 10*
8	Check the 5 volt reference circuit for a short to voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 6*
9	Check the control circuit for a short to voltage and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 6*
10	Check the EGR valve ground circuit for an open or poor connection at the EGR valve electrical connector and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 12*
11	Replace the EGR valve. Is a action complete?	–	Go to *Step 13*	–
12	Check the EGR electrical connector for a poor connection and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting the DTC as specifiec in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1511

IDLE CHARGE ACTUATOR CIRCUIT FAULT

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (0˚, 19˚). The characteristics of the air flow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical accelcable.

The DC–motor commands the actuator for idle

Conditions for Setting the DTC

- The engine is running.
- The throttle position is set between 0.25 and 5.65.
- DTCs P0222 and P0223 are not set.
- The reference range of MTIA higher than 59.5% or less than –70% for longer than 5 seconds. (1.4L DOHC)
- The reference range of MTIA higher than 35% or less than –35% at least 5 seconds. (1.6L DOHC)

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

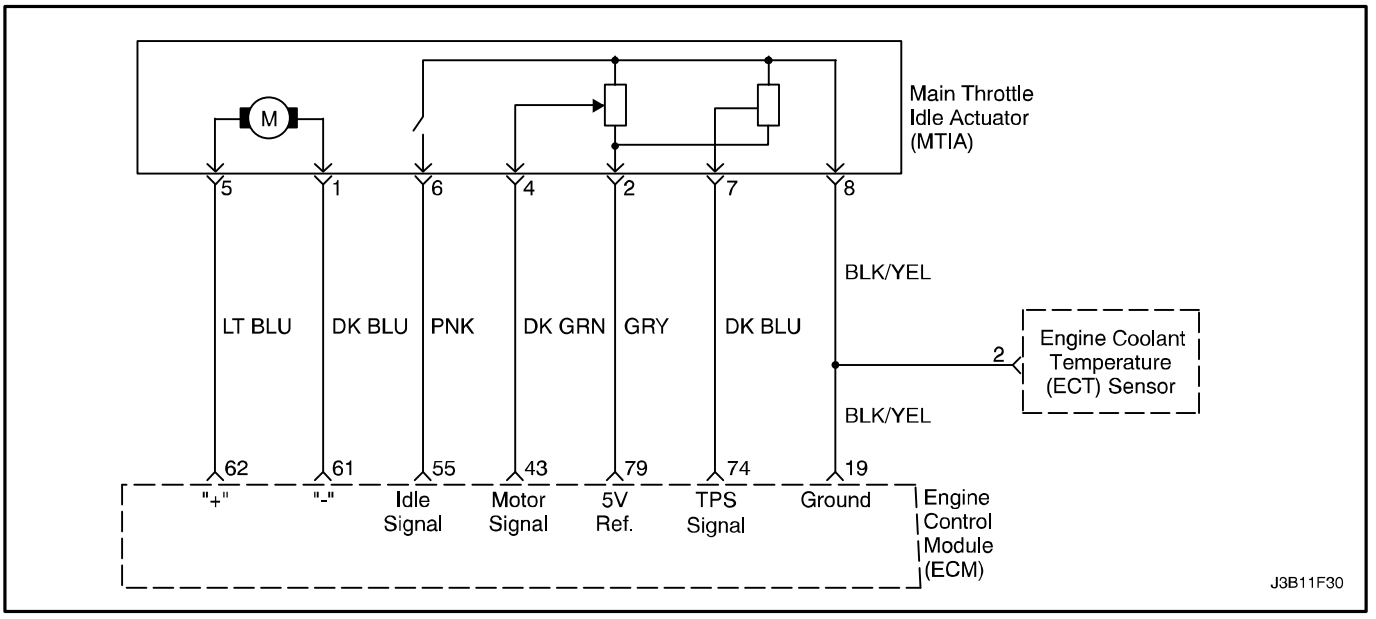
Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal to wire connection
- Physical damage to the wiring harness

DTC P1511 – Idle Charge Actuator Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Turn the Turn the ignition switch to ON. Is the Malfunction Indicator Lamp(MIL) on steady?	–	Go to *Step 4*	Go to *Step 3*
3	1. Connect the scan tool the DLC. 2. Turn the Turn the ignition switch to ON. Does the scan tool display serial data?	–	Go to *Step 4*	Try with another scan tool
4	Start the engine. Does the engine start?	–	Go to *Step 5*	Go to ”Engine Cranks But Will Not Run”
5	1. Turn the ignition switch to LOCK. 2. Connect the scan tool to the DLC. 3. Turn the Turn the ignition switch to ON. Are any Diagnostic Trouble Codes (DTCs) displayed?	–	Go to *Step 6*	Try with another scan tool
6	Refer to the applicable DTC table. Is only one DTC identified as valid trouble code P1511?	–	Go to *Step 7*	Go to Applicable DTC Table and Go to ”Multiple DTC”
7	1. Turn the ignition switch to LOCK. 2. Disconnect the MTIA connector. 3. Disconnect the ECM connector. 4. Measure resistance between MTIA connector terminal 4 and ECM connector terminal 43. Does the resistance measure with the value specified?	0Ω	Go to *Step 8*	Go to *Step 9*
8	Measure resistance between MTIA connector terminal 8 and ECM connector terminal 19. Does the resistance measure within the value specified?	0Ω	Go to *Step 10*	Go to *Step 11*
9	1. Repair the wire or the connector terminal as needed. • Clear any DTCs from ECM. • Perform the diagnostic system check. Is the repair complete?	–	System OK	Go to *Step 8*
10	1. Repair the wire or the connector terminal as needed. • Clear any DTCs from ECM. • Perform the diagnostic system check. Is the repair complete?	–	System OK	Go to *Step 11*
11	1. Turn the ignition switch to LOCK. 2. Replace the throttle body assembly. • Clear any DTCs from ECM. • Perform the diagnostic system check. Is the repair complete?	–	System OK	Go to *Step 12*

Step	Action	Value(s)	Yes	No
12	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1512

IDLE CHARGE ACTUATOR MECHANICAL ERROR

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (0˚, 19˚). The characteristics of the air flow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical accelcable.

The DC–motor commands the actuator for idle

Conditions for Setting the DTC

- The engine is running.
- The MTIA set point is between 0.25 and 5.65.
- DTCs P0222 and P0223 are not set.
- The reference range of MTIA higher than 59.5% or less than –70% for longer than 10 seconds. (1.4L DOHC)
- The reference range of MTIA higher than 35% or less than –35% at least 10seconds. (1.6L DOHC)
- Mechanical problems exists.

  – problem of accel cable hose
  – problem inside MTIA : seizing by friction, snooted, fouling.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

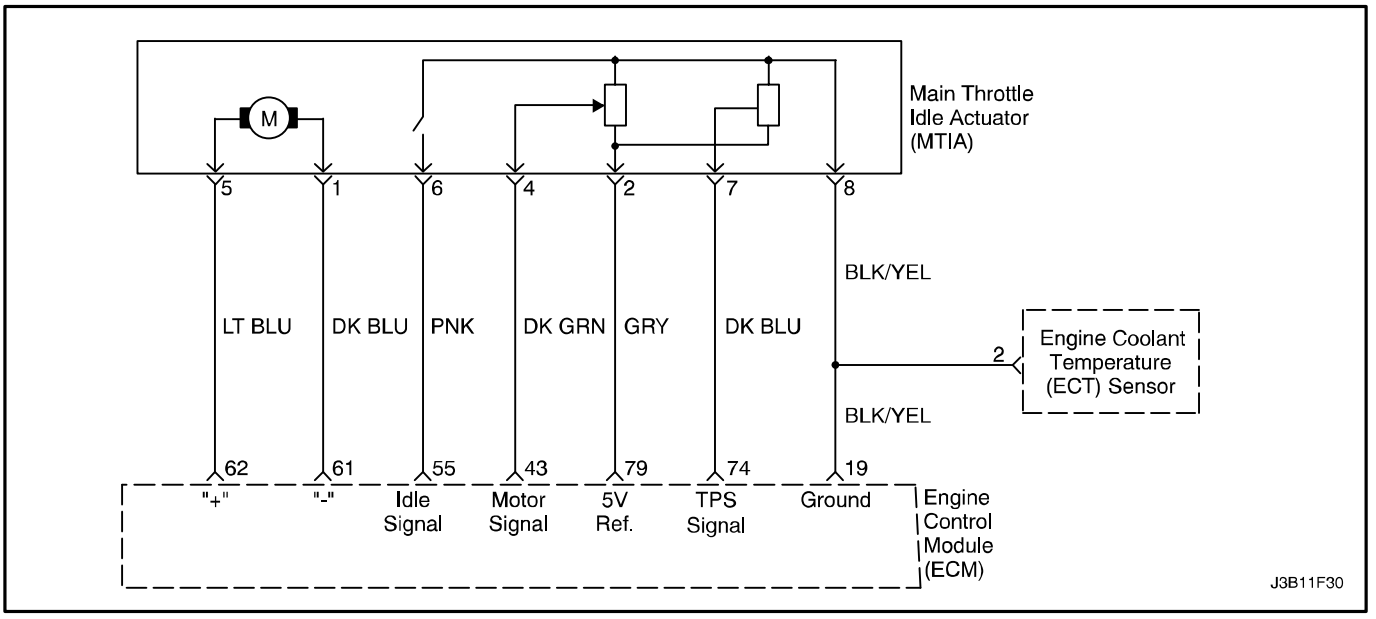
An Intermittent problem may be caused by a poor connection, rubbed through wire insulation, or wire that is broken inside the insulation.

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal to wire connection
- Physical damage to the wiring harness

DTC P1512 – Idle Charge Actuator Mechanical Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Turn the Turn the ignition switch to ON. Is the Malfunction Indicator Lamp(MIL) on steady?	–	Go to *Step 4*	Go to *Step 3*
3	1. Connect the scan tool the DLC. 2. Turn the Turn the ignition switch to ON. Does the scan tool display serial data?	–	Go to *Step 4*	Try with another scan tool
4	Start the engine. Does the engine start?	–	Go to *Step 5*	Go to ”Engine Cranks But Will Not Run”
5	1. Turn the ignition switch to LOCK. 2. Connect the scan tool to the DLC. 3. Turn the Turn the ignition switch to ON. Are any Diagnostic Trouble Codes (DTCs) displayed?	–	Go to *Step 6*	Try with another scan tool
6	Refer to the applicable DTC table. Is only one DTC identified as valid trouble code P1512?	–	Go to *Step 7*	Go to Applicable DTC Table and Go to ”Multiple DTC”
7	Check if the accel cable of MTIA is not on accel cable stop repair the accel cable as necessary. Is it necessary?	–	Go to *Step 9*	Go to *Step 8*
8	1. Turn the ignition switch to LOCK. 2. Replace the throttle body assembly. 3. Clear any DTCs from ECM. 4. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 10*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1513

IDLE CHARGE ACTUATOR FUNCTIONAL ERROR

Circuit Description

The aim of the MTIA (Main Throttle Idle Actuator) is to control the idle speed with the throttle body itself. The throttle is motorized for low opening angle (0˚, 19˚). The characteristics of the air flow are not the same for low and high opening angles. As a matter of fact, the gradient of the mass air flow function of TPS is lower for small angles that permits to be more precise during the idle speed control. Out of idle speed the throttle is actuated mechanically by a classical accelcable.

The DC–motor commands the actuator for idle

Conditions for Setting the DTC

- Mechanical problems exists.
  - – problem of accel cable hose
  - – problem inside MTIA : seizing by friction, snooted, fouling.
- Absolute adaptation or relative is not correct after 16 attemps.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

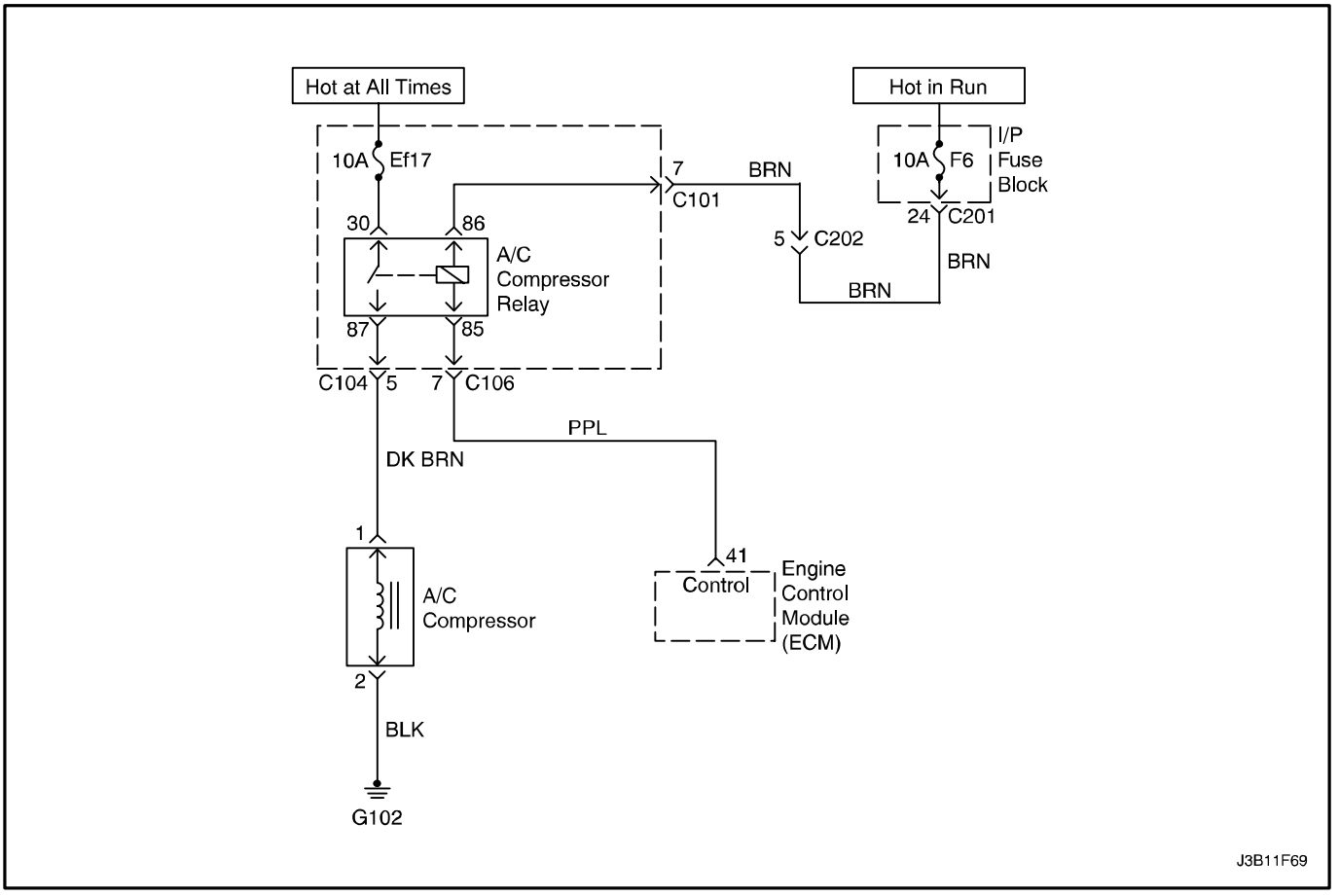
Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal to wire connection
- Physical damage to the wiring harness

DTC P1513 – Idle Charge Actuator Functional Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Turn the Turn the ignition switch to ON. Is the Malfunction Indicator Lamp(MIL) on steady?	–	Go to *Step 4*	Go to *Step 3*
3	1. Connect the scan tool the DLC. 2. Turn the Turn the ignition switch to ON. Does the scan tool display serial data?	–	Go to *Step 4*	Try with another scan tool
4	Start the engine. Does the engine start?	–	Go to *Step 5*	Go to ”Engine Cranks But Will Not Run”
5	1. Turn the ignition switch to LOCK. 2. Connect the scan tool to the DLC. Turn the Turn the ignition switch to ON. Are any Diagnostic Trouble Codes (DTCs) displayed?	–	Go to *Step 6*	Try with another scan tool
6	Refer to the applicable DTC table. Is only one DTC identified as valid trouble code P1513?	–	Go to *Step 7*	Go to Applicable DTC Table and Go to ”Multiple DTC”
7	1. Turn the ignition switch to LOCK. 2. Disconnect the MTIA connector. 3. Disconnect the ECM connector. 4. Measure resistance between MTIA connector terminal 4 and ECM connector terminal 43. Does the resistance measure with the value specified?	0Ω	Go to *Step 8*	Go to *Step 9*
8	Measure resistance between MTIA connector terminal 8 and ECM connector terminal 19. Does the resistance measure within the value specified?	0Ω	Go to *Step 10*	Go to *Step 11*
9	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	Go to *Step 8*
10	1. Repair the wire or the connector terminal as needed. 2. Clear any DTCs from ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	System OK	Go to *Step 11*
11	1. Turn the ignition switch to LOCK. 2. Replace the throttle body assembly. • Clear any DTCs from ECM. • Perform the diagnostic system check. Is the repair complete?	–	System OK	Go to *Step 12*

Step	Action	Value(s)	Yes	No
12	1. Turn the ignition switch to LOCK. 2. Replace the ECM. 3. Perform the diagnostic system check. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1537

A/C COMPRESSOR RELAY HIGH VOLTAGE

Circuit Description

The A/C system uses an A/C refrigerant pressure sensor mounted in the high pressure side of the A/C refrigerant system to monitor A/C refrigerant pressure. The engine control module (ECM) uses this information to turn ON the engine coolant fans when the A/C refrigerant pressure is high and to keep the compressor disengaged when A/C refrigerant pressure is excessively high or low.

The air conditioning pressure (ACP) sensor operates like other 3–wire sensors. The ECM applies a 5.0 volt reference and a sensor ground to the sensor. Changes in the A/C refrigerant pressure will causes the ACP sensor input to the ECM to vary. The ECM monitors the ACP sensor signal circuit and can determine when the signal is out of the possible range of the sensor. When the signal is out of range for a prolonged period of time, the ECM will not allow the A/C compressor clutch to engage. This is done to protect the compressor.

Conditions for Setting the DTC

- The air conditioning compressor relay circuit is a short to battery condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

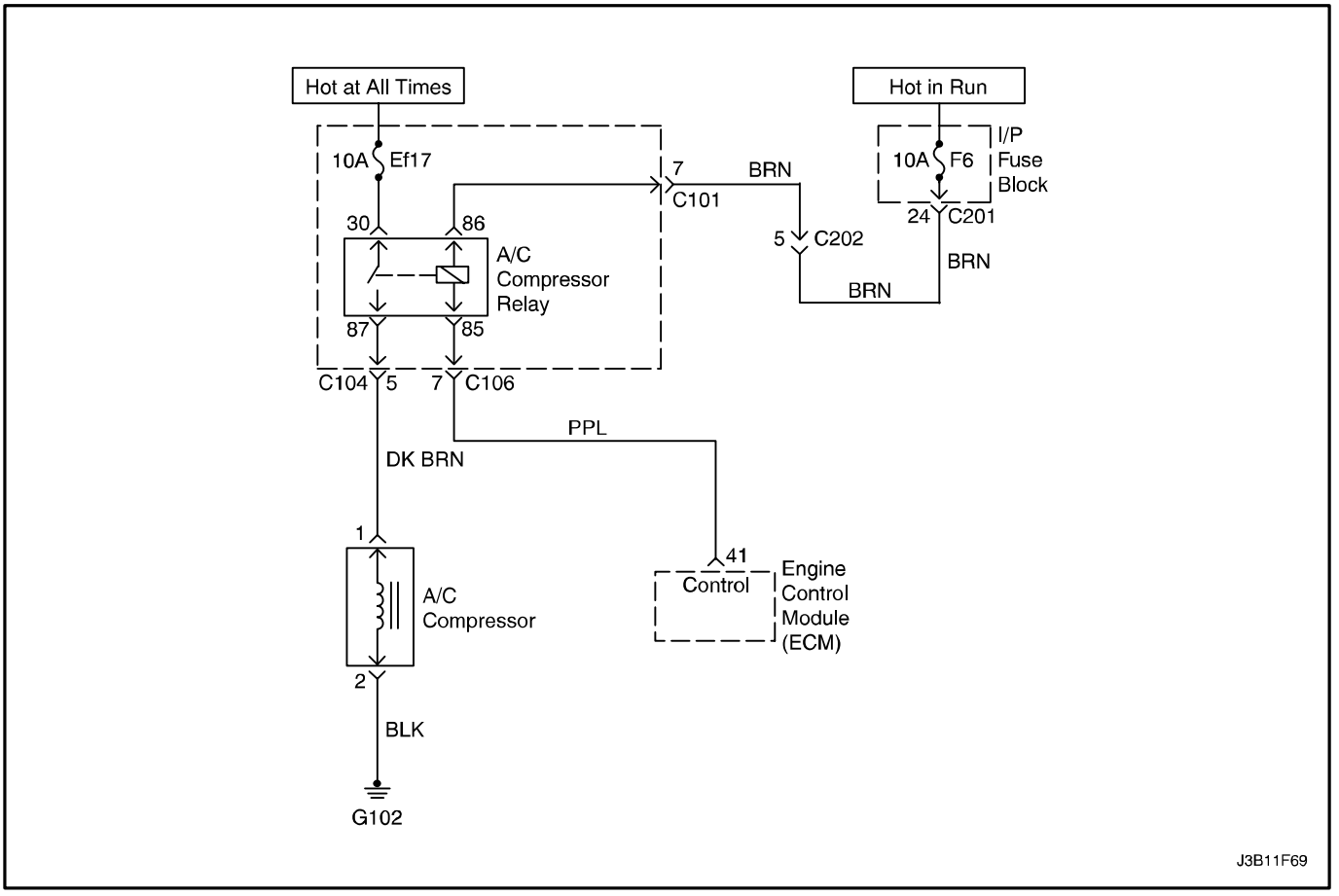
Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

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

If DTC P1537 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P1537 – A/C Compressor Relay High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition switch to LOCK. 2. Disconnect the A/C compressor relay. 3. Measure the resistance between A/C compressor relay terminals 85 and 86. Does the resistance within the specified value?	0Ω	Go to *Step 3*	Go to *Step 7*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at terminal 86 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 5*	Go to *Step 4*
4	Repair a short to battery voltage between the ignition switch terminal and A/C compressor relay terminal 86. Is the repair complete?	–	Go to *Step 9*	–
5	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 6*
6	Repair a short to battery voltage between the ECM wiring connector terminal 41 and A/C compressor relay terminal 86. Is the repair complete?	–	Go to *Step 9*	–
7	Replace the A/C compressor relay. Is the replacement complete?	–	Go to *Step 9*	–
8	1. Turn the ignition switch to LOCK. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 9*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1538

A/C COMPRESSOR RELAY LOW VOLTAGE

Circuit Description

The A/C system uses an A/C refrigerant pressure sensor mounted in the high pressure side of the A/C refrigerant system to monitor A/C refrigerant pressure. The engine control module (ECM) uses this information to turn ON the engine coolant fans when the A/C refrigerant pressure is high and to keep the compressor disengaged when A/C refrigerant pressure is excessively high or low.

The air conditioning pressure (ACP) sensor operates like other 3–wire sensors. The ECM applies a 5.0 volt reference and a sensor ground to the sensor. Changes in the A/C refrigerant pressure will causes the ACP sensor input to the ECM to vary. The ECM monitors the ACP sensor signal circuit and can determine when the signal is out of the possible range of the sensor. When the signal is out of range for a prolonged period of time, the ECM will not allow the A/C compressor clutch to engage. This is done to protect the compressor.

Conditions for Setting the DTC

- The air conditioning compressor relay circuit is a short to ground an open condition exists.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

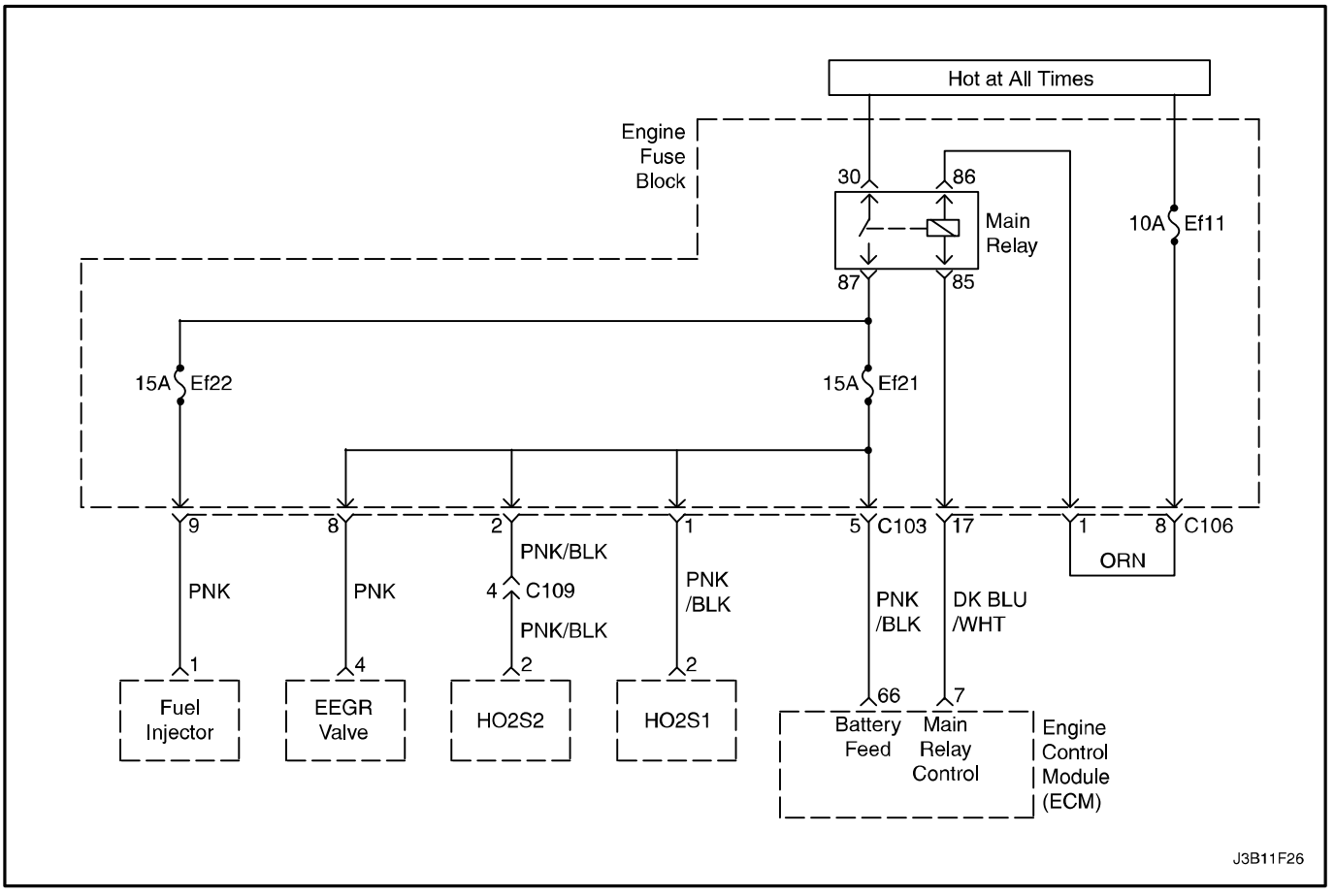
Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

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

If DTC P1538 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P1538 – A/C Compressor Relay Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the A/C compressor relay. 3. Measure the resistance between A/C compressor relay terminals 85 and 86. Does the resistance within the specified value?	0Ω	Go to *Step 3*	Go to *Step 7*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at terminal 86 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 5*	Go to *Step 4*
4	Repair a short to ground between the ignition switch and A/C compressor relay terminal 86. Is the repair complete?	–	Go to *Step 9*	–
5	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal 86 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 6*
6	Repair a short to ground between the ECM wiring connector terminal 41 and A/C compressor relay terminal 86. Is the repair complete?	–	Go to *Step 9*	–
7	Replace the A/C compressor relay. Is the replacement complete?	–	Go to *Step 9*	–
8	1. Turn the ignition switch to LOCK. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 9*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1610

MAIN RELAY HIGH VOLTAGE (1.4L DOHC)

Circuit Description

When the ignition switch to ON, main relay will grounded to ECM internal ground by ECM controlling.

A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is below a calibrated value.

Conditions for Setting the DTC

- The main relay circuit is a short to battery condition exists.

Action Taken When the DTCs Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

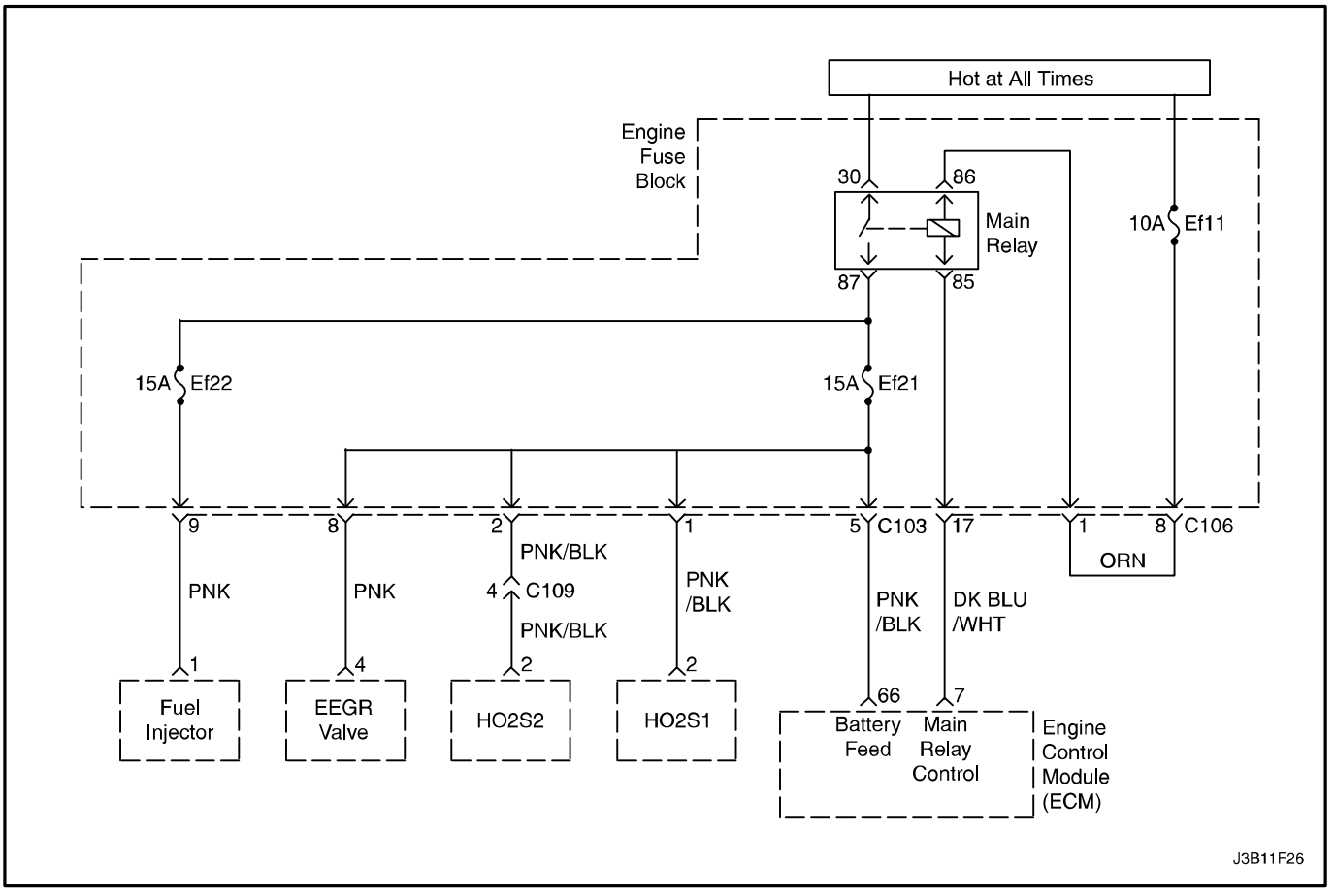
Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

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

If DTC P1610 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P1610 – Main Relay High Voltage (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Disconnect the main relay. 2. Measure the resistance between main relay terminals 85 and 86. Does the resistance within the specified value?	75~85Ω	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM wiring harness connector. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 5*	Go to *Step 7*
5	Repair a high voltage between the ECM wiring connector terminal 7 and main relay terminal 85. Is the repair complete?	–	Go to *Step 7*	–
6	Replace the main relay. Is the replacement complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1610

MAIN RELAY HIGH VOLTAGE (1.6L DOHC)

Circuit Description

When the ignition switch to ON, main relay will grounded to ECM internal ground by ECM controlling.

A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is below a calibrated value.

Conditions for Setting the DTC

- The main relay circuit is a short to battery condition exists.

Action Taken When the DTCs Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- Using the scan tool can clear DTC(s).
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

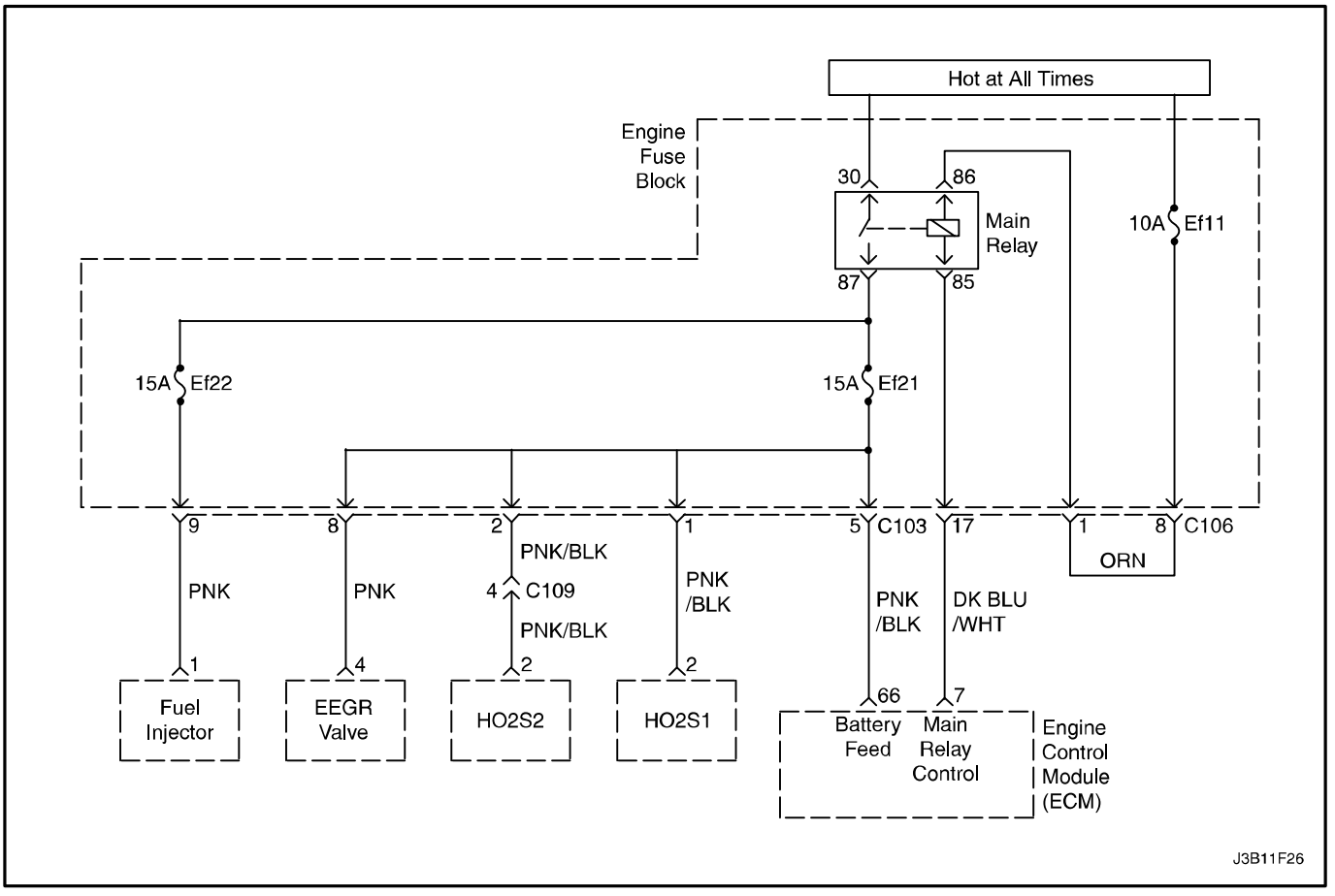
Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

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

If DTC P1610 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P1610 – Main Relay High Voltage (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Disconnect the main relay. 2. Measure the resistance between main relay terminals 85 and 86. Does the resistance within the specified value?	75~85Ω	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM wiring harness connector. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 5*	Go to *Step 7*
5	Repair a high voltage between the ECM wiring connector terminal 7 and main relay terminal 85. Is the repair complete?	–	Go to *Step 7*	–
6	Replace the main relay. Is the replacement complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1611

MAIN RELAY LOW VOLTAGE (1.4L DOHC)

Circuit Description

When the ignition switch to ON, main relay will grounded to ECM internal ground by ECM controlling.

A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is below a calibrated value.

Conditions for Setting the DTC

- The main relay circuit is a short to ground or an open condition exists.

Action Taken When the DTCs Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

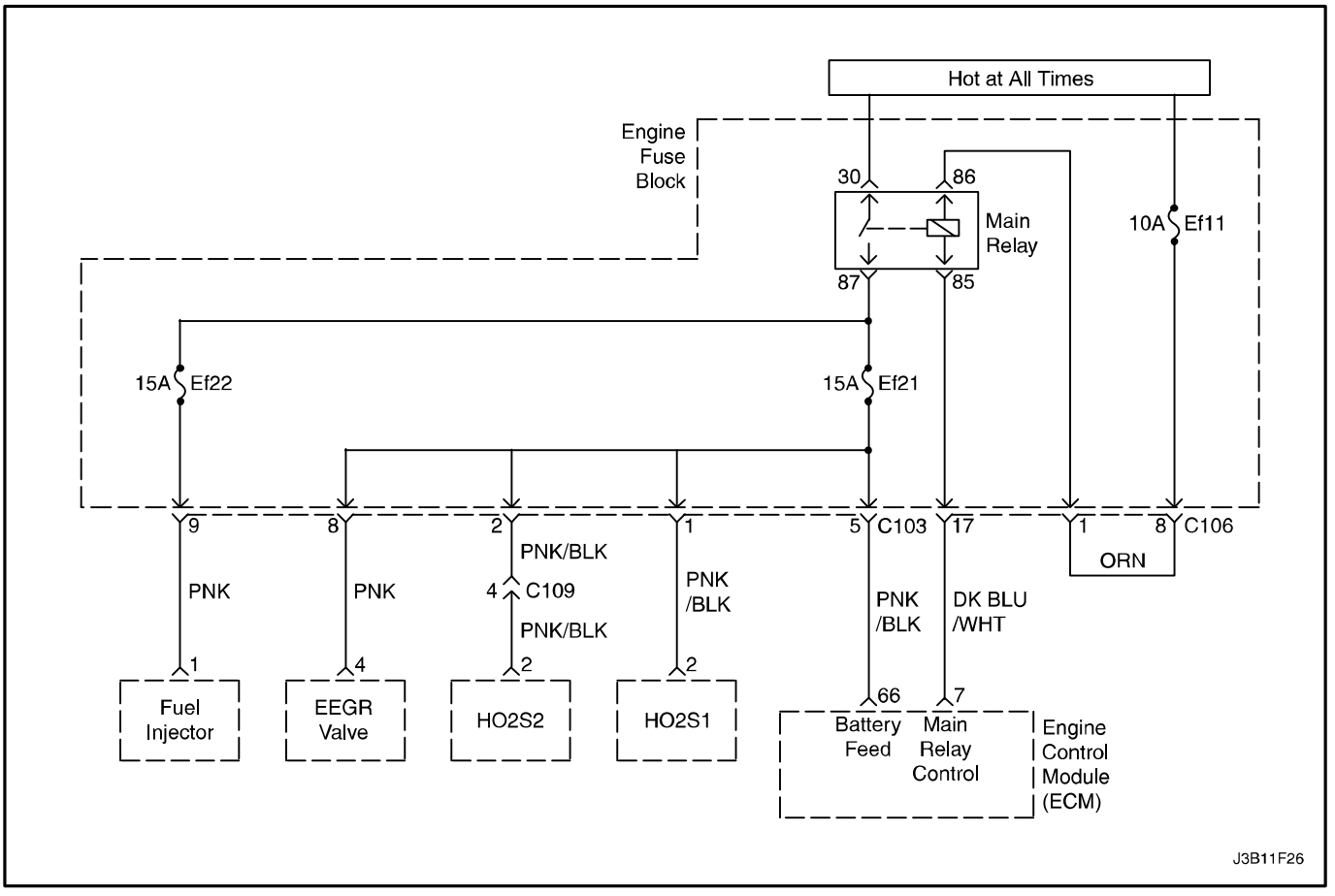
Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

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

If DTC P1611 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P1611 – Main Relay Low Voltage (1.4L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Disconnect the main relay. 2. Measure the resistance between main relay terminals 85 and 86. Does the resistance within the specified value?	75~85Ω	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM wiring harness connector. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 5*	Go to *Step 7*
5	Repair a high voltage between the ECM wiring connector terminal 7 and main relay terminal 85. Is the repair complete?	–	Go to *Step 7*	–
6	Replace the main relay. Is the replacement complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1611

MAIN RELAY LOW VOLTAGE (1.6L DOHC)

Circuit Description

When the ignition switch to ON, main relay will grounded to ECM internal ground by ECM controlling.

A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is below a calibrated value.

Conditions for Setting the DTC

- The main relay circuit is a short to ground or an open condition exists.

Action Taken When the DTCs Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- Using the scan tool can clear DTC(s).
- Disconnecting the ECM battery feed for 10 seconds.

Diagnostic Aids

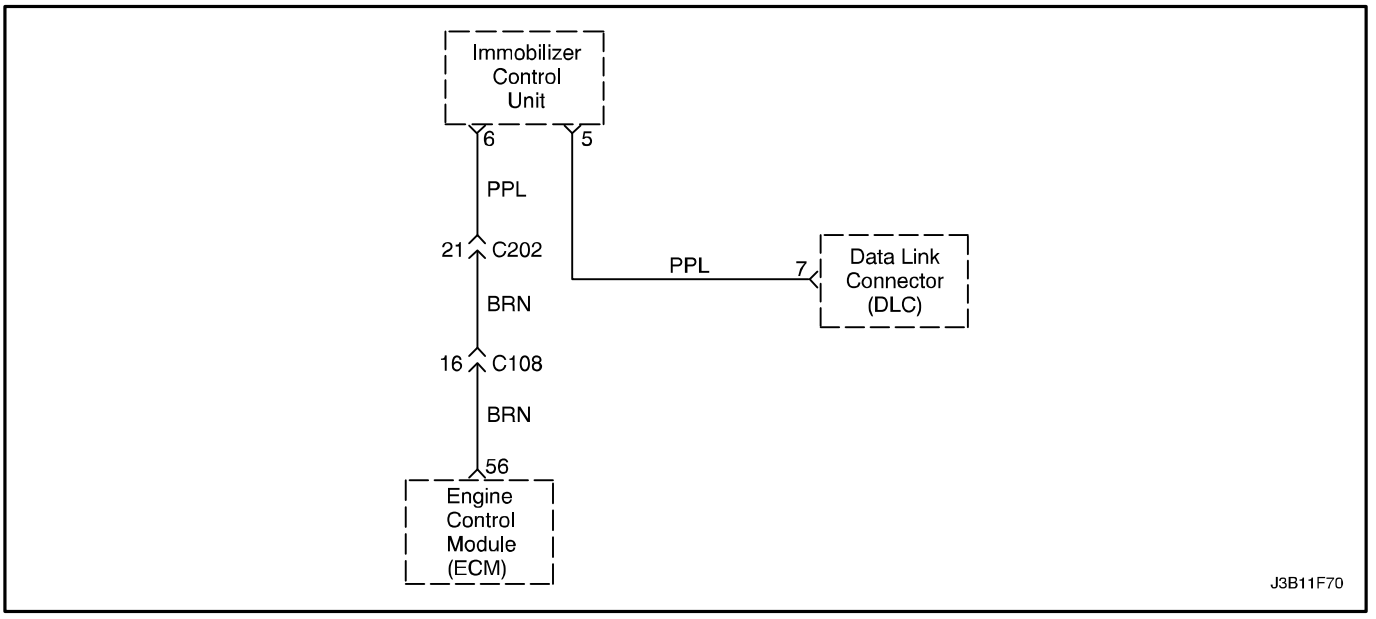
Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

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

If DTC P1611 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P1611 – Main Relay Low Voltage (1.6L DOHC)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Disconnect the main relay. 2. Measure the resistance between main relay terminals 85 and 86. Does the resistance within the specified value?	75~85Ω	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch to LOCK. 2. Disconnect the ECM wiring harness connector. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal 85 in the relay harness connector. Does the test light illuminate?	–	Go to *Step 5*	Go to *Step 7*
5	Repair a high voltage between the ECM wiring connector terminal 7 and main relay terminal 85. Is the repair complete?	–	Go to *Step 7*	–
6	Replace the main relay. Is the replacement complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1628

IMMOBILIZER NO SUCCESSFUL COMMUNICATION

Circuit Description

When the ignition switch is turned to ON, the key tested by immobilizer anti–theft system. While the key code is being read by immobilizer control unit or integrated anti–theft control unit, the engine can start 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 Engine 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 action:

- Disable the fuel injector circuit.
- Disable the fuel pump circuit.
- Disable the ignition coil.
- A Diagnostic Trouble Code (DTC) will stored if detect communication link failure between the ECM and immobilizer control unit.

Conditions for Setting the DTC

- No safety security strategy allowed.
- Time–out delay has elapsed without successful communication or a transmission key ON/OFF occurred before a successful communication.

Action Taken When the DTC Sets

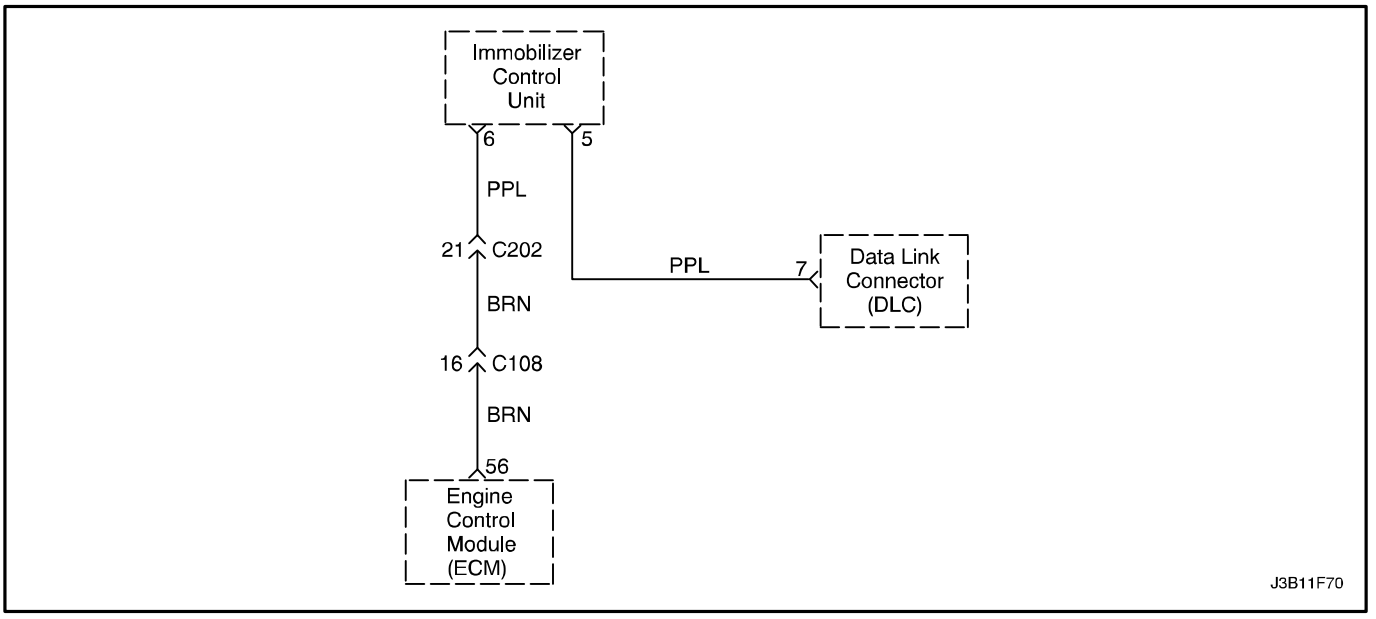
- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1628 – Immobilizer No Successful Communication

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Install a scan too to the Data Link Connector (DLC). 3. Turn the ignition ON. 4. Select IMMOBILIZER DIAGNOSIS STATUS from the scan tool menu. Is the communication established between the scan tool and the immobilizer control unit?	–	Go to *Step 3*	Go to Section 9T, Immobillzer Anti–Theft System
3	1. Turn the ignition OFF. 2. Disconnect the Immobilizer Control Unit and Engine Control Module (ECM) connectors. 3. Measure the resistance between terminal 7 of immoblizer control unit and terminal 56 of the ECM. Is the resistance within the specified value?	0Ω	Go to *Step 5*	Go to *Step 4*
4	Repair an open circuit between terminal 7 of immobilizer control unit and terminal 56 of the ECM. Is the repair complete?	–	Go to *Step 8*	–
5	Check the terminals in immobilizer control unit and the ECM for damages and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 6*
6	Replace the immobilizer control unit. Is the repair complete?	–	Go to *Step 8*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1629

IMMOBILIZER WRONG COMPUTATION

A Diagnostic Trouble Code (DTC) will stored if detect communication link failure between the ECM and immobilizer control unit.

Circuit Description

When the ignition switch is turned to ON, the key tested by immobilizer anti–theft system. While the key code is being read by immobilizer control unit or integrated anti–theft control unit, the engine can start 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 Engine 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 action:

- Disable the fuel injector circuit.
- Disable the fuel pump circuit.
- Disable the ignition coil.

Conditions for Setting the DTC

- Wrong coded value from ICU.

Action Taken When the DTC Sets

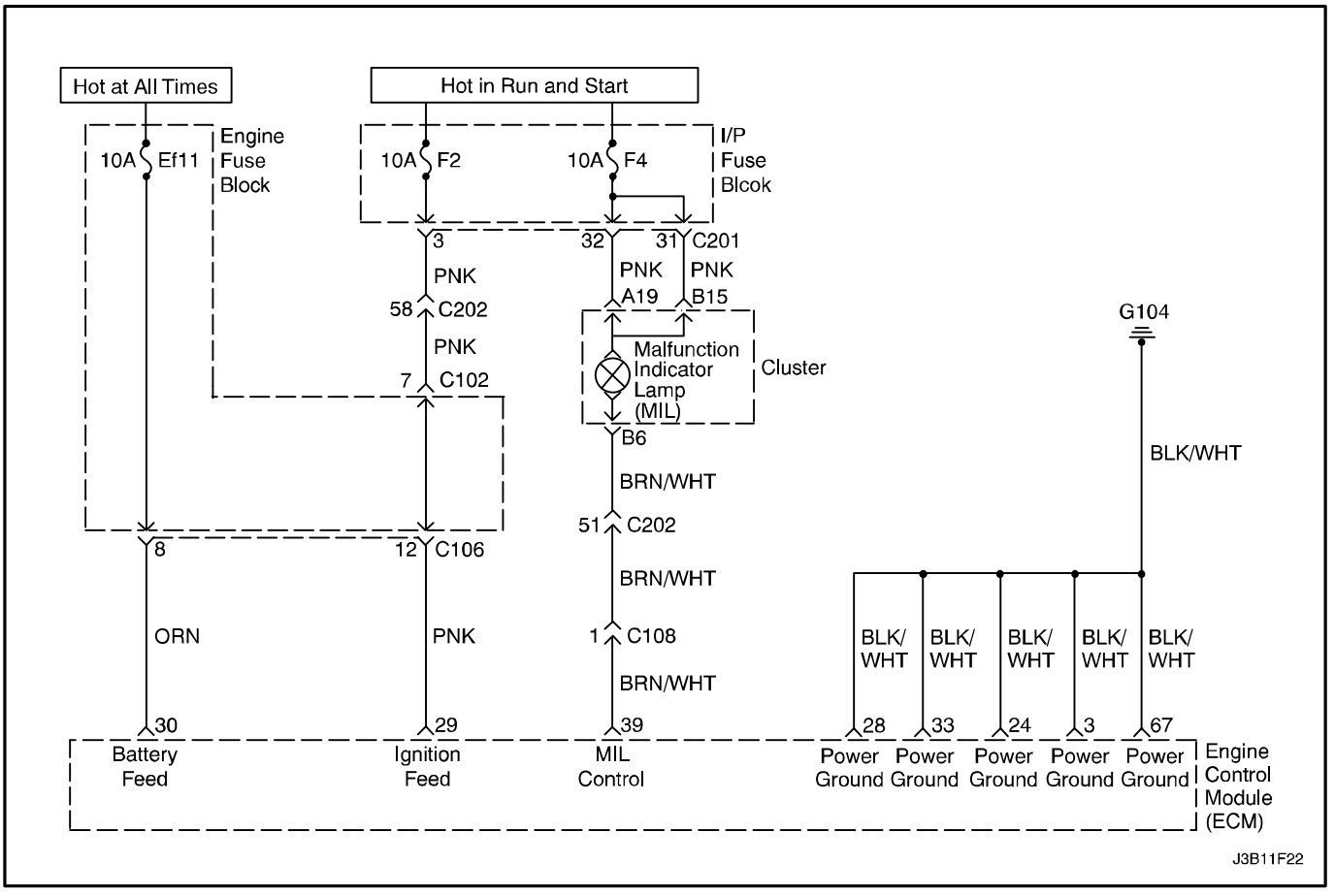
- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1629 – Immobilizer Wrong Computation

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Install a scan too to the Data Link Connector (DLC). 3. Turn the ignition ON. 4. Select IMMOBILIZER DIAGNOSIS STATUS from the scan tool menu. Is the communication established between the scan tool and the immobilizer control unit?	–	Go to *Step 3*	Go to Section 9T, Immobillzer Anti–Theft System
3	1. Turn the ignition OFF. 2. Disconnect the Immobilizer Control Unit and Engine Control Module (ECM) connectors. 3. Measure the resistance between terminal 7 of immoblizer control unit and terminal 56 of the ECM. Is the resistance within the specified value?	0Ω	Go to *Step 5*	Go to *Step 4*
4	Repair an open circuit between terminal 7 of immobilizer control unit and terminal 56 of the ECM. Is the repair complete?	–	Go to *Step 8*	–
5	Check the terminals in immobilizer control unit and the ECM for damages and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 6*
6	Replace the immobilizer control unit. Is the repair complete?	–	Go to *Step 8*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1660

MALFUNCTION INDICATOR LAMP (MIL) HIGH VOLTAGE

Circuit Description

When the ignition switch to ON, the Malfunction Indicator Lamp (MIL) is ON steady.

When the engine cranking, the Malfunction Indicator Lamp (MIL) is OFF after one flashing time.

If a system have some difficulties, the Malfunction Indicator Lamp (MIL) is ON.

Conditions for Setting the DTC

- The Malfunction Indicator Lamp (MIL) wiring harness high voltage.

Action Taken When the DTCs Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

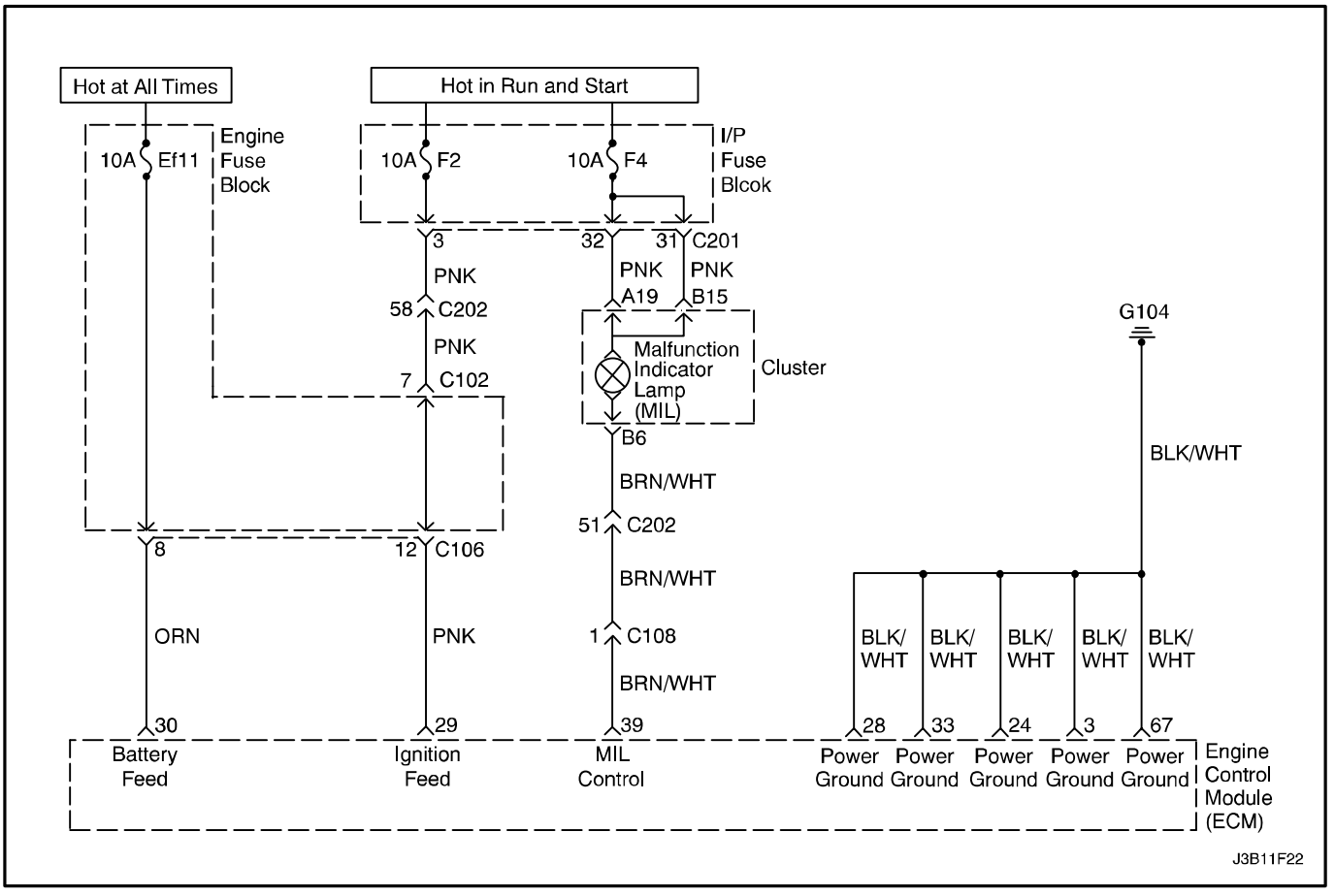
An Intermittent problem may be caused by a poor connection, rubbed through wire insulation, or wire that is broken inside the insulation.

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P1660 – Malfunction Indicator Lamp (MIL) High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the cluster wiring connector. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal B6 in the harness connector. Does the resistance within the specified value?	0Ω	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at ECM wiring connector terminal 39. Does the test light illuminate?	–	Go to *Step 4*	–
4	1. Turn the ignition switch to LOCK. 2. Replace the cluster. Is the replacement complete?	–	Go to *Step 6*	–
5	Repair a short to battery between the ECM wiring connector terminal 39 and cluster wiring connector terminal B6. Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1661

MALFUNCTION INDICATOR LAMP (MIL) LOW VOLTAGE

Circuit Description

When the ignition switch to ON, the Malfunction Indicator Lamp (MIL) is ON steady.

When the engine cranking, the Malfunction Indicator Lamp (MIL) is OFF after one flashing time.

If a system have some difficulties, the Malfunction Indicator Lamp (MIL) is ON.

Conditions for Setting the DTC

- The Malfunction Indicator Lamp (MIL) wiring harness low voltage.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fail. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions.

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminals to wire connection
- Physical damage to the wiring harness

DTC P1661 – Malfunction Indicator Lamp (MIL) Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition switch to LOCK. 2. Disconnect the cluster wiring connector. 3. With the test light, connected to ground, probe the ignition feed circuit, at terminal B6 in the harness connector. Does the resistance within the specified value?	0Ω	Go to *Step 3*	Go to *Step 6*
3	1. Turn the ignition switch to LOCK. 2. With the test light, connected to ground, probe the ignition feed circuit, at ECM wiring connector terminal 39. Does the test light illuminate?	–	Go to *Step 4*	–
4	1. Turn the ignition switch to LOCK. 2. Replace the cluster. Is the replacement complete?	–	Go to *Step 6*	–
5	Repair a short to ground or open between the ECM wiring connector terminal 39 and cluster wiring connector terminal B6. Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

TROUBLE CODE DIAGNOSIS (1.8L DOHC)

CLEARING TROUBLE CODES

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

When the ECM sets a Diagnostic Trouble Code (DTC), the Malfunction Indicator Lamp (MIL) lamp will be turned on only for type A, B and E but a DTC will be stored in the ECM's memory for all types of DTC. If the problem is intermittent, the MIL will go out after 10 seconds if the fault is no longer present. The DTC will stay in the ECM's memory until cleared by scan tool. Removing battery voltage for 10 seconds will clear some 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.

DIAGNOSTIC TROUBLE CODES (1.8L DOHC)

DTC	Description	Type	Illuminate MIL
P0106	Manifold Absolute Pressure Rationality	E	Yes
P0107	Manifold Absolute Pressure Low Voltage	A	Yes
P0108	Manifold Absolute Pressure High Voltage	A	Yes
P0112	Intake Air Temperature Low Voltage	E	Yes
P0113	Intake Air Temperature High Voltage	E	Yes
P0117	Engine Coolant Temperature Low Voltage	A	Yes
P0118	Engine Coolant Temperature High Voltage	A	Yes
P0122	Throttle Position Sensor Low Voltage	A	Yes
P0123	Throttle Position Sensor High Voltage	A	Yes
P0131	Front Heated Oxygen Sensor (HO2S1) Low Voltage	A	Yes
P0132	Front Heated Oxygen Sensor (HO2S1) High Voltage	A	Yes
P0133	Front Heated Oxygen Sensor (HO2S1) Slow Response	E	Yes
P0134	Front Heated Oxygen Sensor (HO2S1) No Activity or Open	A	Yes
P0135	Front Heated Oxygen Sensor (HO2S1) Heater Circuit Not Functioning	E	Yes
P0137	Rear Heated Oxygen Sensor (HO2S2) Low Voltage	E	Yes
P0138	Rear Heated Oxygen Sensor (HO2S2) High Voltage	E	Yes
P0140	Rear Heated Oxygen Sensor (HO2S2) No Activity or Open	E	Yes
P0141	Rear Heated Oxygen Sensor (HO2S2) Heater Circuit Not Functioning	E	Yes
P0171	Fuel Trim System Too Lean	B	Yes
P0172	Fuel Trim System Too Rich	B	Yes
P0201	Injector 1 Circuit Fault	A	Yes
P0202	Injector 2 Circuit Fault	A	Yes
P0203	Injector 3 Circuit Fault	A	Yes
P0204	Injector 4 Circuit Fault	A	Yes
P0300	Multiple Cylinder Misfire Detected	B	Yes
P0301	Cylinder 1 Misfire	A	Yes
P0302	Cylinder 2 Misfire	A	Yes
P0303	Cylinder 3 Misfire	A	Yes
P0304	Cylinder 4 Misfire	A	Yes
P0317	Rough Road Sensor Source Not Detected	Cnl	No
P0325	Knock Sensor Internal Malfunction	Cnl	No

DTC	Description	Type	Illuminate MIL
P0327	Knock Sensor Circuit Fault	Cnl	No
P0336	58X Crank Position Sensor Extra/Missing Pulses	E	Yes
P0337	58X Crank Position Sensor No Signal	A	Yes
P0341	Camshaft Position Sensor Rationality	E	Yes
P0342	Camshaft Position Sensor No Signal	A	Yes
P0351	Ignition Control Circuit A Fault (Cylinder 1 and 4)	A	Yes
P0352	Ignition Control Circuit B Fault (Cylinder 2 and 3)	A	Yes
P0401	Exhaust Gas Recirculation Insufficient Flow	Cnl	No
P0402	Exhaust Gas Recirculation Excessive Flow	E	Yes
P0404	Exhaust Gas Recirculation Open Valve Position Error	E	Yes
P0405	Exhaust Gas Recirculation Pintle Position Low Voltage	E	Yes
P0406	Exhaust Gas Recirculation Pintle Position High Voltage	E	Yes
P0420	Catalyst Oxygen Sensor Low Efficiency	A	Yes
P0443	Evaporative Emission System Purge Solenoid Control Circuit	E	Yes
P0461	Fuel Level Stuck	Cnl	No
P0462	Fuel Level Low Voltage	Cnl	No
P0463	Fuel Level High Voltage	Cnl	No
P0502	Vehicle Speed Sensor No Signal (Engine Side)	E	Yes
P0506	Idle Speed rpm Lower Than Desired Idle Speed	E	Yes
P0507	Idle Speed rpm Higher Than Desired Idle Speed	E	Yes
P0532	A/C Pressure Sensor Low Voltage	Cnl	No
P0533	A/C Pressure Sensor High Voltage	Cnl	No
P0562	System Voltage Too Low (Engine Side)	Cnl	No
P0563	System Voltage Too High (Engine Side)	Cnl	No
P0601	ECM Checksum Error (Engine Side)	A	Yes
P0602	ECM Reprogram Error	A	Yes
P0607	Lower Power Counter Error	Cnl	No
P0700	Transaxle Control Module Malfunction	A	Yes
P1106	Manifold Absolute Pressure Intermittent High Voltage	Cnl	No
P1107	Manifold Absolute Pressure Intermittent Low Voltage	Cnl	No
P1111	Intake Air Temperature Intermittent High Voltage	Cnl	No
P1112	Intake Air Temperature Intermittent Low Voltage	Cnl	No
P1114	Engine Coolant Temperature Intermittent Low Voltage	Cnl	No
P1115	Engine Coolant Temperature Intermittent High Voltage	Cnl	No
P1121	Throttle Position Sensor Intermittent High Voltage	Cnl	No
P1122	Throttle Position Sensor Intermittent Low Voltage	Cnl	No
P1133	Front Heated Oxygen Sensor (HO2S1) Too Few Transitions	E	Yes
P1134	Front Heated Oxygen Sensor (HO2S1) Transition Ratio	E	Yes
P1167	Front Heated Oxygen Sensor (HO2S1) Rich in Decel Fuel Cut–off (DFCO)	A	Yes
P1171	Fuel Trim System Lean During Power Enrichment	B	Yes
P1336	58X Crank Position Tooth Error Not Learned	A	Yes
P1391	G Sensor Rough Road Rationality	Cnl	No

DTC	Description	Type	Illuminate MIL
P1392	G Sensor Rough Road Low Voltage	Cnl	No
P1393	G Sensor Rough Road High Voltage	Cnl	No
P1396	ABS WSS Signal Variation	Cnl	No
P1397	ABS WSS No Signal	Cnl	No
P1404	Exhaust Gas Recirculation Closed Valve Pintle Error	E	Yes
P1601	SPI Communications Between ECM and TCM	A	Yes
P1607	Lower Power Counter Reset	Cnl	No
P1626	Immobilizer No Response	Cnl	No
P1631	Immobilizer Incorrect Response	Cnl	No
P1650	SPI Communications Between Error with SIDM Chip	Cnl	No
P1655	SPI Communications Between Error with PSVI Chip	E	Yes

DIAGNOSTIC TROUBLE CODE (DTC) P0106
MANIFOLD ABSOLUTE PRESSURE RATIONALITY

Circuit Description

The Engine Control Module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure which results from engine load (intake manifold vacuum) and the rpm changes, and it converts these into voltage outputs. The ECM can detect if the MAP sensor is not responding to the Throttle Position (TP) changes by comparing the actual MAP change to a predicted MAP change based on the amount of TP change that occurs. If the ECM does not see the expected MAP change or more, DTC P0106 will set.

Conditions for Setting the DTC

- Altitude compensated MAP reading is higher than high threshold or lower than low threshold table based on rpm and TP signal.
- DTCs P0107, P0108, P0117, P0118, P0122, P0123, P0201, P0202, P0203, P0204, P0300, P0351, P0352, P0402, P0404, P1404, P0405, P0406, P0506, P0507 are not set.
- Engine running.
- Valid Barometric Pressure (BARO) update.
- Torque Converter Clutch (TCC) steady (A/T).
- A/C steady state.
- No TP sensor fail conditions present.
- No MAP fail conditions present.
- Change in Idle Air Control (IAC) is less than 5%.
- Coolant temperature is greater than –10˚C (14˚F).
- Change in rpm is less than 200.
- Change in TP sensor is less than 3%.
- Change in Exhaust Gas Recirculation (EGR) value is less than 6%.
- The rpm is between 1300 and 4500.
- All of the above are stabilized for 1.5 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will substitute a fixed MAP value and use TP sensor to control the fuel delivery. (The scan tool will not show defaulted value.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same +0.4 volt.

The MAP sensor vacuum source should be thoroughly checked for restrictions at the intake manifold.

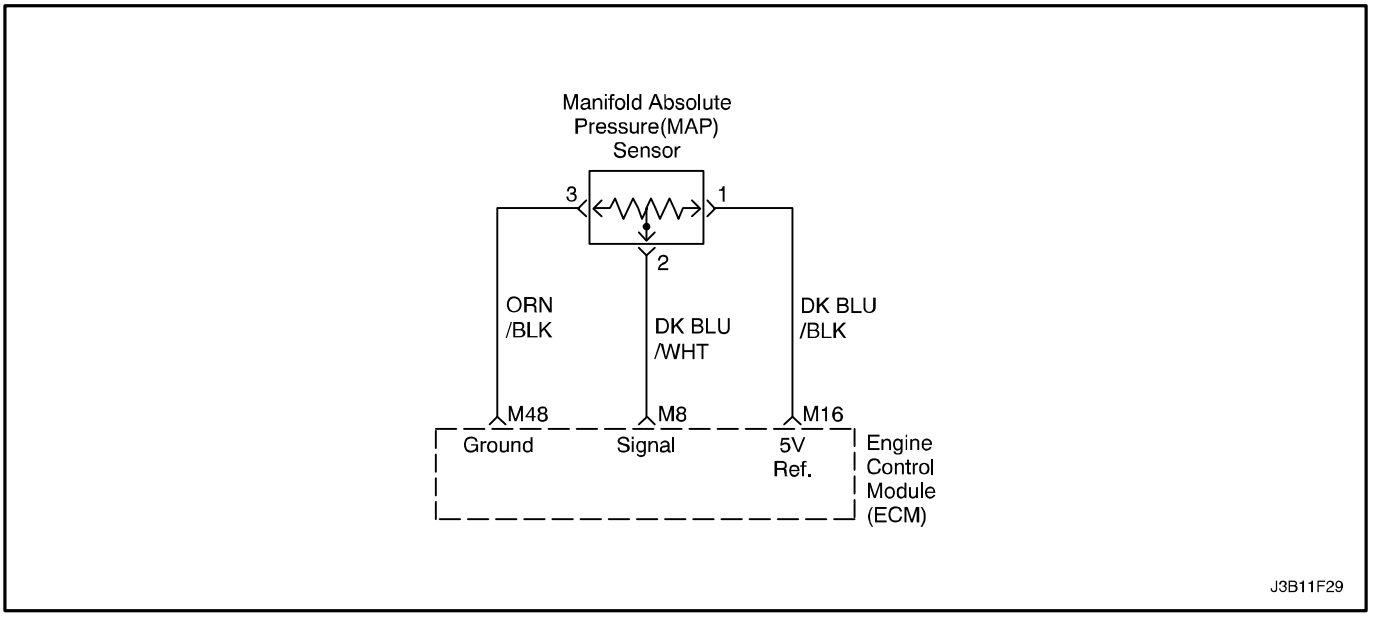
Test Description

Numbers below refer to the step numbers on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the occurred. The information is then stored on the scan tool for later reference.
2. A sensor that displays an ignition ON, engine OFF BARO value that does not appear normal for the altitude the vehicle is in should be considered to be malfunctioning.
3. While starting the engine, the MAP sensor should detect any changes in the manifold pressure. This test is to determine if the sensor is stuck at a value.
4. A normal MAP sensor will react as quickly to the throttle changes as they can be made. A sensor should not appear to be lazy or catch up with the throttle movements.
5. This step checks if the reason for no MAP change was due to a faulty sensor or vacuum source to the sensor.
6. The MAP sensor vacuum source should be thoroughly checked for restrictions. A drill bit can be used to clean out any casting flash that may exist in the vacuum port.
7. The MAP sensor vacuum source should be thoroughly checked for restrictions. A drill bit can be used to clean out any casting flash that may exist in the vacuum port.
9. The MAP Sensor System Performance diagnostic may have to complete several tests before determining if the diagnostic has passed or failed the last test. Operate the vehicle in the Conditions for Setting the DTC several times to ensure that the diagnostic runs enough tests to pass or fail.
10. If no faults have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids”in this section for additional checks and information.

DTC P0106 – Manifold Absolute Pressure Rationality

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition switch to ON, with the engine not running. 3. Compare the Barometric Pressure (BARO) reading with a known good vehicle. Is the BARO reading similar?	–	Go to *Step 3*	Go to *Step 8*
3	Start the engine while watching the Manifold Absolute Pressure (MAP) sensor value. Does the MAP sensor value change while starting the engine?	–	Go to *Step 4*	Go to *Step 5*
4	With the engine still running, snap the throttle while watching the MAP sensor display on the scan tool. Does the MAP sensor value change rapidly with the throttle position changes?	–	Go to *Step 9*	Go to *Step 6*
5	1. Turn the ignition switch OFF. 2. Remove the MAP sensor and install a vacuum pump to the MAP sensor. 3. Turn the ignition switch ON, with the engine OFF. 4. Apply 380 mm Hg (15 in Hg) to the MAP sensor. Does the MAP sensor value on the scan tool change?	–	Go to *Step 7*	Go to *Step 8*
6	1. Remove the MAP sensor from the manifold port. 2. Inspect the port and MAP sensor for restrictions and repair as necessary. Is the repair complete?	–	Go to *Step 9*	Go to *Step 8*
7	Repair the restriction in the MAP sensor or vacuum port as necessary. Is the action complete?	–	Go to *Step 9*	–
8	Replace the MAP sensor. Is the action complete?	–	Go to *Step 9*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0107

MANIFOLD ABSOLUTE PRESSURE LOW VOLTAGE

Circuit Description

The Engine Control Module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure which results from engine load (intake manifold vacuum) and the rpm changes, and it converts these into voltage outputs. The ECM sends a 5 volt reference voltage to the MAP sensor. As the manifold pressure changes, the output of MAP sensor also changes. By monitoring the Map sensor output voltage, the ECM knows the manifold pressure. A low pressure (low voltage) output voltage will be about 1.0 to 1.5 volts while the higher pressure (high voltage) output voltage will be about 4.5 to 4.8 volts at Wide Open Throttle(WOT). The MAP sensor is also used, under certain conditions to measure Barometric Pressure (BARO), allowing the ECM to make adjustments for different altitude.

Conditions for Setting the DTC

- MAP is less than 12 kPa (1.7 psi)
- No TP sensor fail conditions present.
- TP sensor is greater than 0% if the rpm is less than 1000.
- TP sensor is greater than 5% if the rpm is greater than 1000.
- System voltage is between 11.0 and 11.5 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will substitute a fixed MAP value and use TP sensor to control the fuel delivery. (The scan tool will not show defaulted value.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same 12 kPa.

If a DTC P0107 is intermittent, refer to ”Manifold Absolute Pressure Check” in this section for further diagnosis.

Important : After repairs, use the scan tool FUEL TRIM RESET function to reset long–term fuel trim to 128 (0%).

Test Description

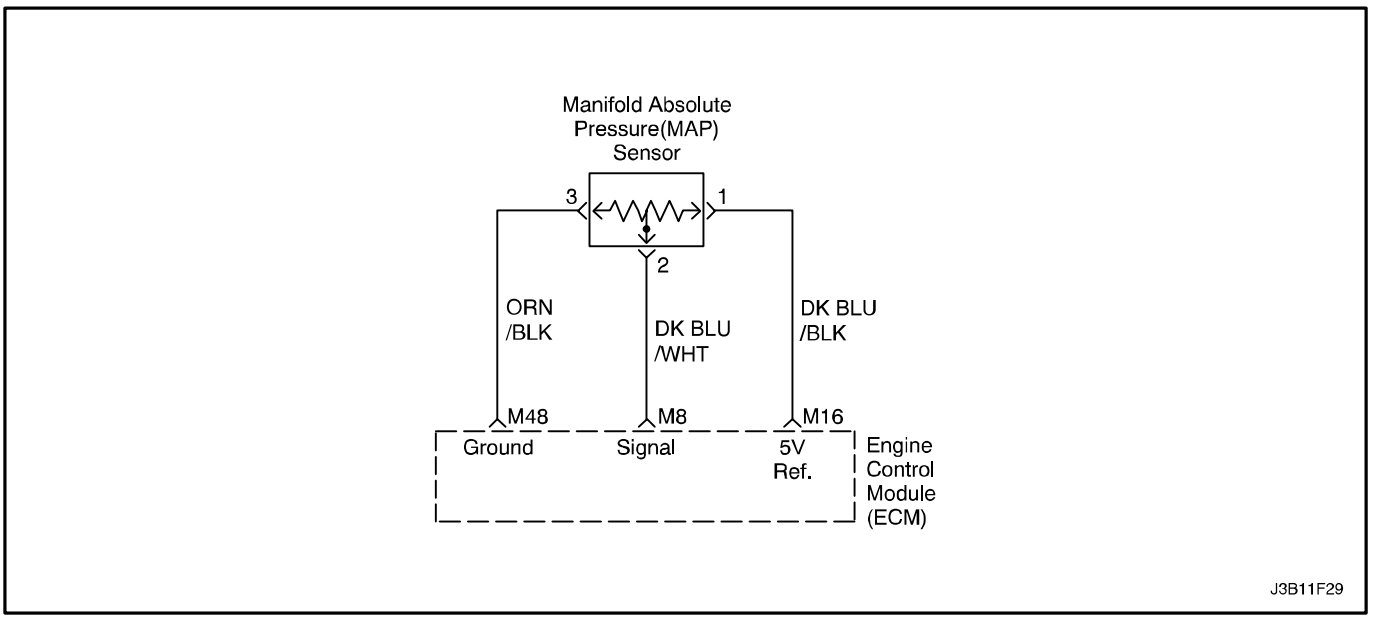
Numbers below refer to the step numbers on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step will determine if DTC P0107 is the result of a hard failure or an intermittent condition.
3. Jumpering harness terminals 2 to 1 (signal circuit to 5 volts) will determine if the sensor is malfunctioning or if there is a problem with the ECM or wiring.
6. The scan tool may not display 5 volts. The Important thing is that the ECM recognizes the voltage as more than 4 volts, indicating that the ECM and the signal circuit are OK. A test light that illuminates indicates a short to ground in the signal circuit.
7. A short to ground in the 5 volt reference circuit could also set additional DTCs.
11. The replacement ECM must be programmed. Refer to the latest Techline procedure for the ECM reprogramming.

DTC P0107 Manifold Absolute Pressure Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine. 3. Read the Manifold Absolute Pressure (MAP). Does the scan tool display a MAP below the specified value?	12 kPa	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition switch OFF. 2. Disconnect the MAP sensor electrical connector. 3. Jumper the MAP signal circuit at terminal 2 to the 5 volt reference circuit at terminal 1. 4. Turn the ignition switch ON. Does the MAP read more than the specified value?	96 kPa	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition switch ON with the engine OFF, review the Freeze Frame data, and note the parameters. 2. Operate the vehicle within the freeze frame conditions and Conditions For Setting the DTC as noted. Does the scan tool display MAP below the specified value?	12 kPa	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Inspect the MAP sensor harness electrical connector terminals for the following conditions: • Poor connections. • Proper contact tension. • Poor terminal to wire connection. Is a problem found?	–	Go to *Step 8*	Go to *Step 9*
6	1. Turn the ignition switch OFF. 2. Remove the jumper wire. 3. Probe the MAP sensor signal circuit terminal 2 with a test light to B+. 4. Turn the ignition switch ON. Does the scan tool read over the specified value?	90 kPa	Go to *Step 7*	Go to *Step 12*
7	Check the MAP sensor 5 volt reference circuit at terminal 1 for an open or short to ground. Is a problem found?	–	Go to *Step 10*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
8	Repair the connection terminals as necessary. Is the action complete?	–	Go to *Step 14*	–
9	Replace the MAP sensor. Is the action complete?	–	Go to *Step 14*	–
10	Repair the MAP sensor 5 volt reference circuit. Is the action complete?	–	Go to *Step 14*	–
11	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the action complete?	–	Go to *Step 14*	–
12	Check the MAP sensor signal circuit for the following conditions: • Open. • Short to ground. • Short to sensor ground. Is a problem found?	–	Go to *Step 13*	Go to *Step 11*
13	Repair the MAP sensor signal circuit. Is the action complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0108

MANIFOLD ABSOLUTE PRESSURE HIGH VOLTAGE

Circuit Description

The Engine Control Module (ECM) uses the Manifold Absolute Pressure (MAP) sensor to control the fuel delivery and the ignition timing. The MAP sensor measures the changes in the intake manifold pressure which results from engine load (intake manifold vacuum) and the rpm changes, and it converts these into voltage outputs. The ECM sends a 5 volt reference voltage to the MAP sensor. As the manifold pressure changes, the output of MAP sensor also changes. By monitoring the Map sensor output voltage, the ECM knows the manifold pressure. A low pressure (low voltage) output voltage will be about 1.0 to 1.5 volts while the higher pressure (high voltage) output voltage will be about 4.5 to 4.8 volts at Wide Open Throttle(WOT). The MAP sensor is also used, under certain conditions to measure Barometric Pressure (BARO), allowing the ECM to make adjustments for different altitude.

Conditions for Setting the DTC

- MAP is greater than 103 kPa (15 psi)
- No Throttle Position (TP) sensor fail conditions present.
- Engine is running more than 10 seconds.
- TP sensor is less than 10% if the rpm is less than 2500.
- TP sensor is less than 35 % if the rpm is great than 2500.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will substitute a fixed MAP value and use TP sensor to control the fuel delivery. (The scan tool will not show defaulted value.)

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

With the ignition ON and the engine stopped, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the ECM as an indication of vehicle altitude. Comparison of this reading with a known good vehicle with the same sensor is a good way to check the accuracy of a suspect sensor. Readings should be the same 12 kPa.

If a DTC P0108 is intermittent, refer to ”Manifold Absolute Pressure Check” in this section for further diagnosis.

DTC P0108 may set as result of a misfire. If misfire is present, repair the cause of misfire before using this table. The misfire counters may be used to determine which cylinder(s) is misfiring.

Note : After repairs, use the scan tool FUEL TRIM RESET function to reset long–term fuel trim to 128 (0%).

If DTC P0172 is also set, check 5 volt reference circuit for short to voltage.

Test Description

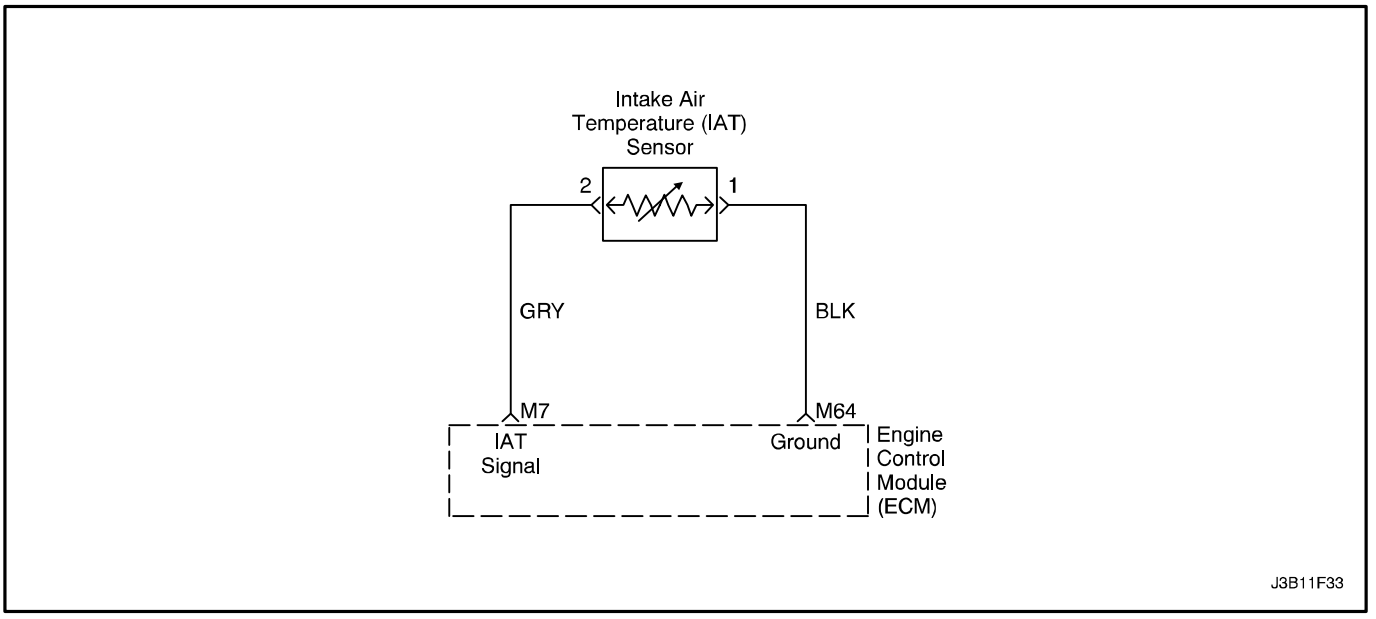
Numbers below refer to the step numbers on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step will determine if DTC P0108 is the result of a hard failure or an intermittent condition.
3. This step simulates conditions for a DTC P0107. If the ECM recognizes the change, the ECM, the 5 volt reference and the sensor signal circuits are OK.
5. This step also looks for an open in the sensor ground circuit. If the circuit was open, additional DTCs will also be set. If no other DTCs are set and the circuit is found to be open, then the open must be between the MAP sensor and the electrical connector ground splice.
6. When the sensor signal circuit is shorted to battery voltage, the TP will be displayed above 0% at all times and A/C High Side will be displayed high. The vehicle will also remain in Open Loop.
8. The MAP sensor vacuum source should only supply vacuum to the MAP sensor. Check the vacuum port for a restriction caused by casting flash.
9. Disconnect all sensors that use a 5 volt reference one at a time while monitoring the short on the 5 volt reference circuit. Replace any sensor that may have caused the short on the 5 volt reference circuit.
11. The replacement ECM must be programmed to the latest Techline procedure for the ECM reprogramming.

DTC P0108 – Manifold Absolute Pressure High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine. 3. Read the Manifold Absolute Pressure (MAP). Does the scan tool display a MAP of the specified value or over?	85 kPa	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition switch OFF. 2. Disconnect the MAP sensor electrical connector. 3. Turn the ignition switch ON. Does the MAP read less than the specified value?	28 kPa	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition switch ON with the engine OFF, review the Freeze Frame data, and note the parameters. 2. Operate the vehicle within the freeze frame conditions and Conditions For Setting the DTC as noted. Does the scan tool display MAP equal to or greter than the specified value?	85 kPa	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Probe the MAP sensor signal ground circuit at terminal 3 with a test light connected to battery +. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 11*
6	Check the MAP sensor signal circuit at terminal M8 of ECM for a short to voltage and repair as needed. Is a repair necessary?	–	Go to *Step 14*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
7	With a ohmmeter connected to the ground, probe the 5 volt reference circuit terminal M16. Is the resistance within near the specified value.	5 v	Go to *Step 8*	Go to *Step 9*
8	Check the MAP sensor vacuum source for being plugged or leaking. Is a problem found?	–	Go to *Step 10*	Go to *Step 13*
9	Check the 5 volt reference circuit at terminal M16 for a short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 12*
10	Repair the vacuum source as needed. Is the action complete?	–	Go to *Step 14*	–
11	Check for an open in the MAP sensor ground circuit at terminal 1 and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 12*
12	1. Turn the ignition switch OFF. 2. Replace the Engine Control Module (ECM). Is the action complete?	–	Go to *Step 14*	–
13	Replace the MAP sensor. Is the action complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0112

INTAKE AIR TEMPERATURE LOW VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) sensor uses a thermistor to control the signal voltage to the Engine Control Module (ECM). The ECM supplies a 5 volt reference and a ground to the sensor. When the air is cold, the resistance is high; therefore the IAT signal voltage will be high. If the intake air is warm, resistance is low; therefore the IAT signal voltage will be low.

Conditions for Setting the DTC

- IAT is less than 149˚C (300˚F).
- Engine run time is greater than 120 seconds.
- Vehicles speed is greater than or equal to 50 km/h (31 mph).
- DTC P0502 is not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will substitute a default value for intake air temperature. The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

If the vehicle is at ambient temperature, compare the IAT sensor to the Engine Coolant Temperature (ECT) sensor. The IAT sensor and the ECT sensor should be relatively close to each other.

Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

Test Description

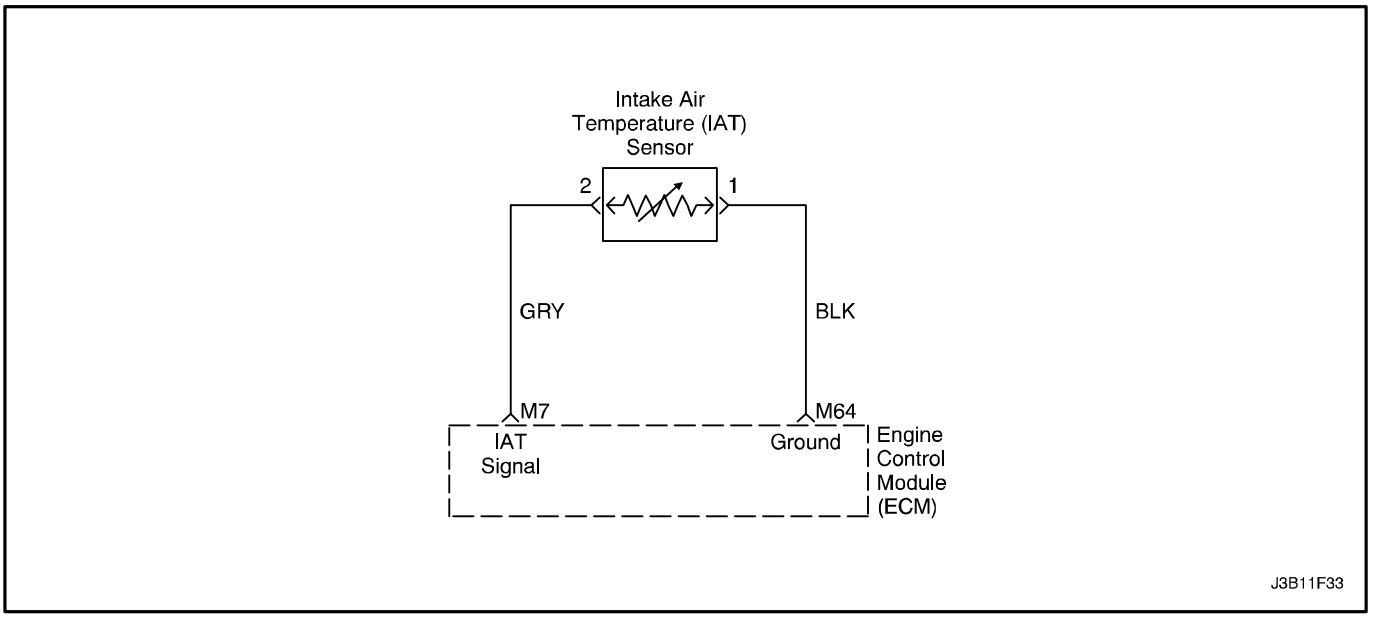
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
4. This step simulates a DTC P0113 condition. If the scan tool displays the specified value, the IAT signal circuit, the ECM are OK.
8. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0112 – Intake Air Temperature Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is the Intake Air Temperature (IAT) value greater than the specified value?	128˚C (262 ˚F)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF, review Freeze Frame data, and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the IAT sensor value greater than the specified value?	128˚C (262 ˚F)	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch OFF. 2. Disconnect the IAT sensor electrical connector. 3. Turn the ignition switch ON. Is the IAT sensor value below the specified value?	–30 ˚C (–22 ˚F)	Go to *Step 5*	Go to *Step 6*
5	Replace IAT sensor. Is the repair complete?	–	Go to *Step 10*	–
6	With a test light connected to battery +, probe the IAT sensor signal circuit, terminal 2 at the IAT sensor connector. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 9*
7	1. Turn the ignition switch OFF. 2. Disconnect the Engine Control Module (ECM) connector. 3. With a test light connected to B+, probe the IAT sensor signal circuit, terminal 2 at the IAT sensor electrical connector. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
8	Repair the short to ground circuit in the IAT sensor signal circuit as needed. Is the repair complete?	–	Go to *Step 10*	–
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the action complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
10	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 11*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to the applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0113

INTAKE AIR TEMPERATURE HIGH VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) sensor uses a thermistor to control the signal voltage to the Engine Control Module (ECM). The ECM supplies a 5 volt reference and a ground to the sensor. When the air is cold, the resistance is high; therefore the IAT signal voltage will be high. If the intake air is warm, resistance is low; therefore the IAT signal voltage will be low.

Conditions for Setting the DTC

- IAT is less than –38˚C (–36˚F).
- Vehicles speed is less than 25 km/h (16 mph).
- Engine run time is greater than 120 seconds.
- Engine Coolant Temperature (ECT) is above 70 ˚C 158 ˚F).
- Calculated air are flow is less than 15 g/second.
- DTC P0502, P0117, P0118 not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The ECM will substitute a default value for intake air temperature. The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

- If the vehicle is at ambient temperature, compare the IAT sensor to the Engine Coolant Temperature (ECT) sensor. The IAT sensor and the ECT sensor should be relatively close to each other.
- Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

Test Description

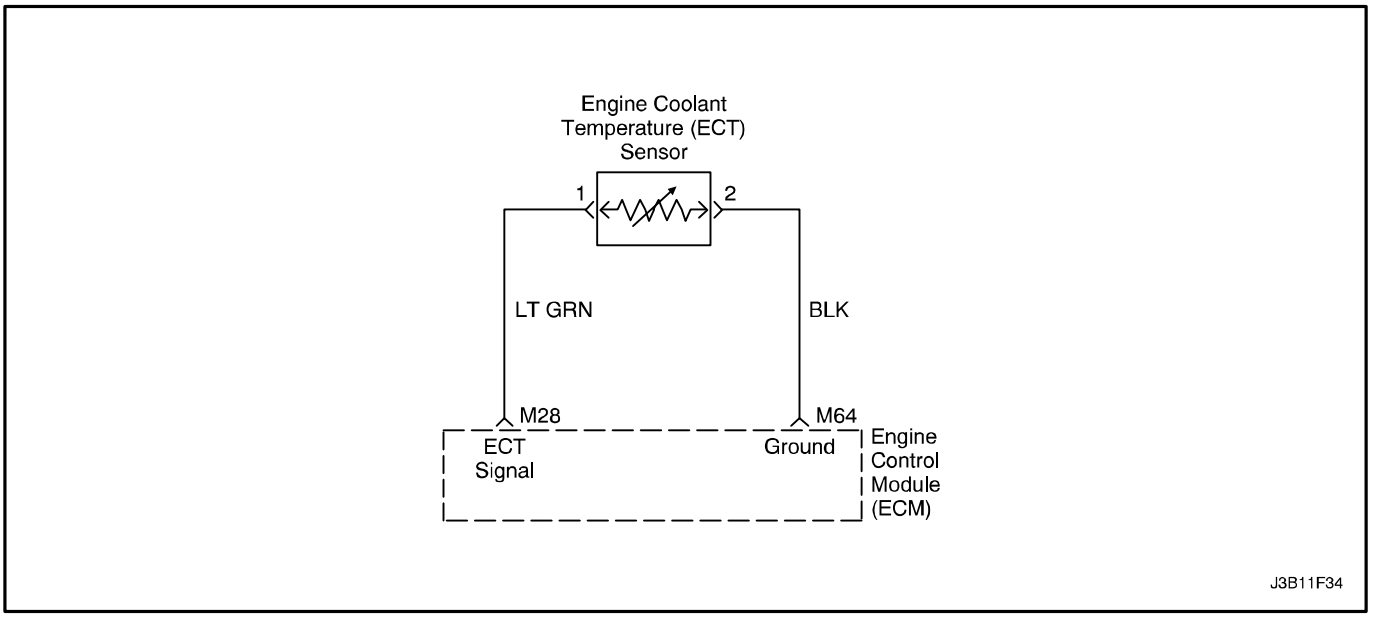
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
4. This step simulates a DTC P0112. If the ECM senses the change, the ECM and wiring are OK.
5. This step will determine if the reason the ECM did not sense the change was due to a open ground or signal circuit or malfunctioning ECM.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0113 Intake Air Temperature High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is the Intake Air Temperature (IAT) value less than the specified value?	–30 ˚C (–22 ˚F)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF, review Freeze Frame data, and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the IAT sensor value less than the specified value?	–30 ˚C (–22 ˚F)	Go to *Step 4*	Go to "Diagnostic Aids"
4	1. Turn the ignition switch OFF. 2. Disconnect the IAT sensor electrical connector. 3. Turn the ignition switch ON. 4. Jumper the IAT sensor signal circuit terminal 2 and ground circuit terminal 1. Is the IAT sensor value greater than the specified value?	130 ˚C (266 ˚F)	Go to *Step 6*	Go to *Step 5*
5	Jumper the IAT sensor signal circuit at terminal 1 to ground. Is the IAT sensor value greater than the specified value?	130 ˚C (266 ˚F)	Go to *Step 7*	Go to *Step 8*
6	Check for a poor connection at the IAT sensor connector and repair or replace any malfunctioning terminal as needed. Is the repair necessary?	–	Go to *Step 12*	Go to *Step 10*
7	Check the IAT sensor ground circuit for an open and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 9*
8	Check the IAT sensor signal circuit for an open and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 9*
9	Check for a poor IAT sensor ground circuit at terminal M64 or a poor IAT sensor signal circuit terminal M7 connection at Engine Control Module (ECM) and repair as needed. Is the repair necessary?	–	Go to *Step 12*	Go to *Step 11*
10	Replace the IAT sensor. Is the action complete?	–	Go to *Step 12*	
11	1. Turn the ignition OFF. 2. Replace the ECM. Is the action complete?	–	Go to *Step 12*	–

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0117
ENGINE COOLANT TEMPERATURE LOW VOLTAGE

Circuit Description

The Engine Coolant Temperature (ECT) sensor uses a thermistor to control the signal voltage to the Engine Control Module (ECM). The ECM supplies a 5 volt reference and a ground to the sensor. When the engine coolant is cold, the resistance is high; therefore the ECT signal voltage will be high. If the engine coolant is warm, sensor resistance becomes less; therefore the IAT signal voltage drops. At normal engine operating temperature, the voltage will be between 1.5 to 2.0 volts at the ECT signal terminal.

The ECT sensor is used to control following items:

- Fuel delivery.
- Ignition.
- Evaporative (EVAP) Emission canister purge valve.
- Idle Air Control (IAC) valve.
- Electric cooling fan.

Conditions for Setting the DTC

- Engine run time is greater than 60 seconds.
- ECT is less tan 149˚C (300˚F)

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- Both cooling fans turns on.
- The ECM will default to 20˚C (68˚F) for engine coolant temperature for the first 60 seconds of engine run time and then 92˚C (198˚F). The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

After engine start the ECT should rise steadily to 90˚C (194˚F) then stabilize when the thermostat opens.

Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to”Temperature vs. Resistance” in this section.

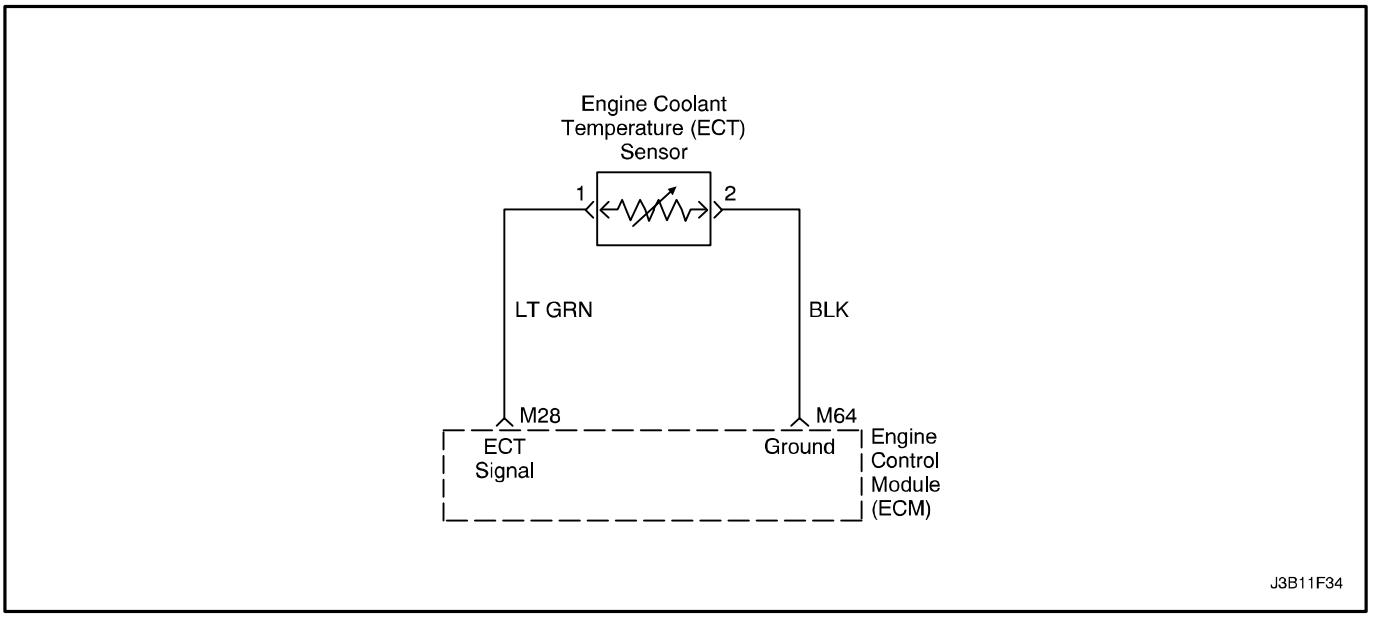
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
4. This step simulates a DTC P0118 condition. If the ECM senses the change, then the ECM and the ECT wiring are OK.
7. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0117 – Engine Coolant Temperature Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is the Engine Coolant Temperature (ECT) sensor value greater than the specified value?	130 ˚C (266 ˚F)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF, review Freeze Frame data, and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the ECT sensor value greater than the specified value?	130 ˚C (266 ˚F)	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch OFF. 2. Disconnect the ECT sensor connector. 3. Turn the ignition switch ON. Is the ECT sensor value below the specified value?	–30 ˚C (–22 ˚F)	Go to *Step 6*	Go to *Step 5*
5	Check the ECT sensor signal circuit at terminal 1 for a short to ground and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 7*
6	Replace ECT sensor. Is the repair complete?	–	Go to *Step 8*	–
7	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the action complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0118
ENGINE COOLANT TEMPERATURE HIGH VOLTAGE

Circuit Description

The Engine Coolant Temperature (ECT) sensor uses a thermistor to control the signal voltage to the Engine Control Module (ECM). The ECM supplies a 5 volt reference and a ground to the sensor. When the engine coolant is cold, the resistance is high; therefore the ECT signal voltage will be high. If the engine coolant is warm, sensor resistance becomes less; therefore the IAT signal voltage drops. At normal engine operating temperature, the voltage will be between 1.5 to 2.0 volts at the ECT signal terminal.

The ECT sensor is used to control following items:

- Fuel delivery.
- Ignition.
- Evaporative Emission (EVAP) canister purge valve.
- Idle Air Control (IAC) valve.
- Electric cooling fan.

Conditions for Setting the DTC

- ECT is less than –38˚C (–36˚F).
- Engine run time is greater than 90 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- Both cooling fans turns on.
- The ECM will default to 20 ˚C (68 ˚F) for engine coolant temperature for the first 60 seconds of engine run time and then 92 ˚C (198 ˚F). The scan tool will not show the defaulted value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Normal operating temperature for the engine cooling system is between 90˚C(194˚F) and 95˚C(203˚F).

Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to"Temperature vs. Resistance" in this section.

Test Description

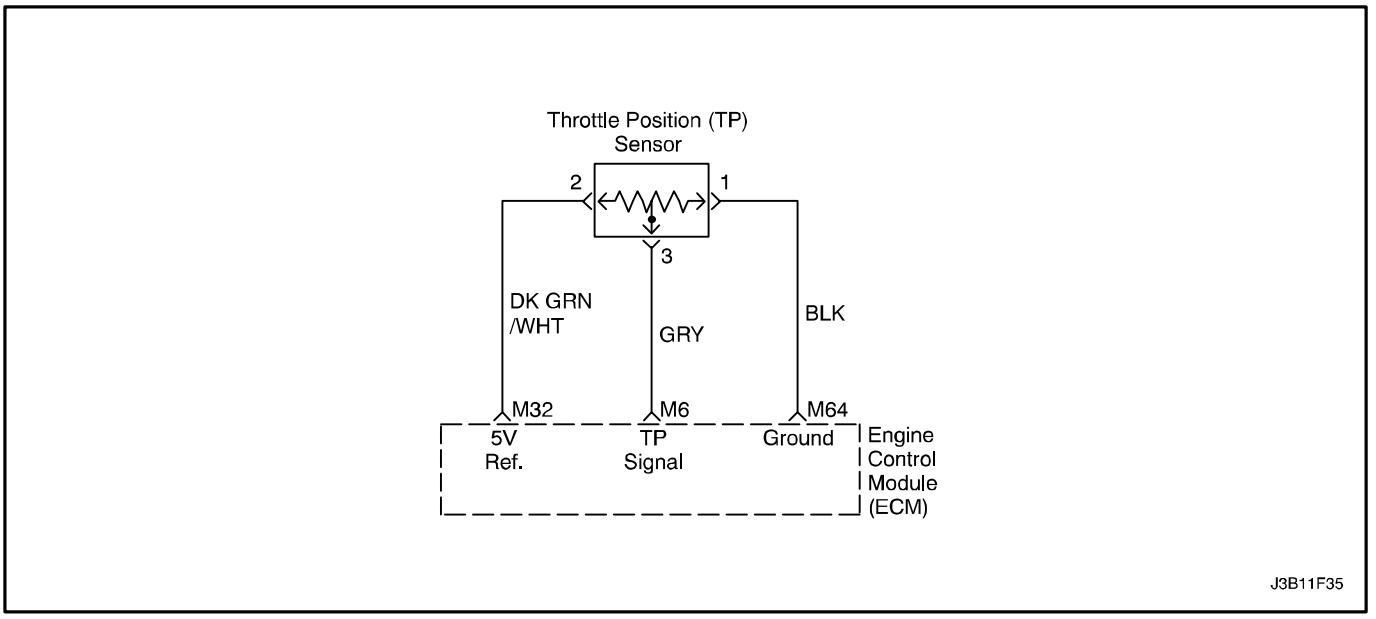
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
4. This step simulates a DTC P0117 condition. If the ECM senses the change, then the ECM and the ECT wiring are OK.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0118 – Engine Coolant Temperature High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is the engine Coolant Temperature (ECT) value less than the specified value?	–30 ˚C (–22 ˚F)	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition switch ON with the engine OFF, review Freeze Frame data, and note the parameters. 2. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Is the ECT sensor value less than the specified value?	–30 ˚C (–22 ˚F)	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition switch OFF. 2. Disconnect the ECT sensor connector. 3. Turn the ignition switch ON. 4. Jumper the ECT sensor signal circuit terminal 1 and ground circuit terminal 2. Is the ECT sensor value greater than the specified value?	130 ˚C (266 ˚F)	Go to *Step 6*	Go to *Step 5*
5	Jumper the ECT sensor signal circuit at terminal 1 to ground. Is the ECT sensor value greater than the specified value?	130 ˚C (266 ˚F)	Go to *Step 7*	Go to *Step 8*
6	Check for a poor connection at the ECT sensor connector and repair or replace any malfunctioning terminal as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 10*
7	Check the ECT sensor ground circuit for an open and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 9*
8	Check the ECT sensor signal circuit for an open and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 9*
9	Check for a poor ECT sensor ground circuit at terminal M64 or a poor ECT sensor signal circuit terminal M28 connection at Engine Control Module (ECM) and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 11*
10	Replace the ECT sensor. Is the repair complete?	–	Go to *Step 12*	–
11	1. Turn the ignition OFF. 2. Replace the ECM. Is the action complete?	–	Go to *Step 12*	–

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes(DTVCs.) 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scantool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?		Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0122

THROTTLE POSITION SENSOR LOW VOLTAGE

Circuit Description

The Engine Control Module (ECM) supplies a 5 volt reference voltage signal and a ground to the Throttle Position (TP) sensor. The TP sensor sends a voltage signal back to the ECM relative to the throttle plate opening. The voltage signal will vary from approximately 0.33 volts at closed throttle, to over 4.3 volts at Wide Open Throttle (WOT).

The TP signal is used by the ECM for fuel control and for most of the ECM controlled outputs. The TP signal is one of the most important inputs used by the ECM for fuel control and most of the ECM controlled outputs.

Conditions for Setting the DTC

- TP sensor voltage indicates a throttle voltage less than 0.14 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The TP angle will default to 0% when the vehicle speed is less than 3 km/h (2 mph) and 10% when the vehicle speed is greater than 3 km/h (2 mph). The scan tool will not display the default value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

If the DTC P0122 cannot be duplicated, the information included in the Freeze Frame data can be useful. Use a scan tool information data to determine the status of the DTC. If the dc occurs intermittently, using the Diagnostic table may help isolate the problem.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

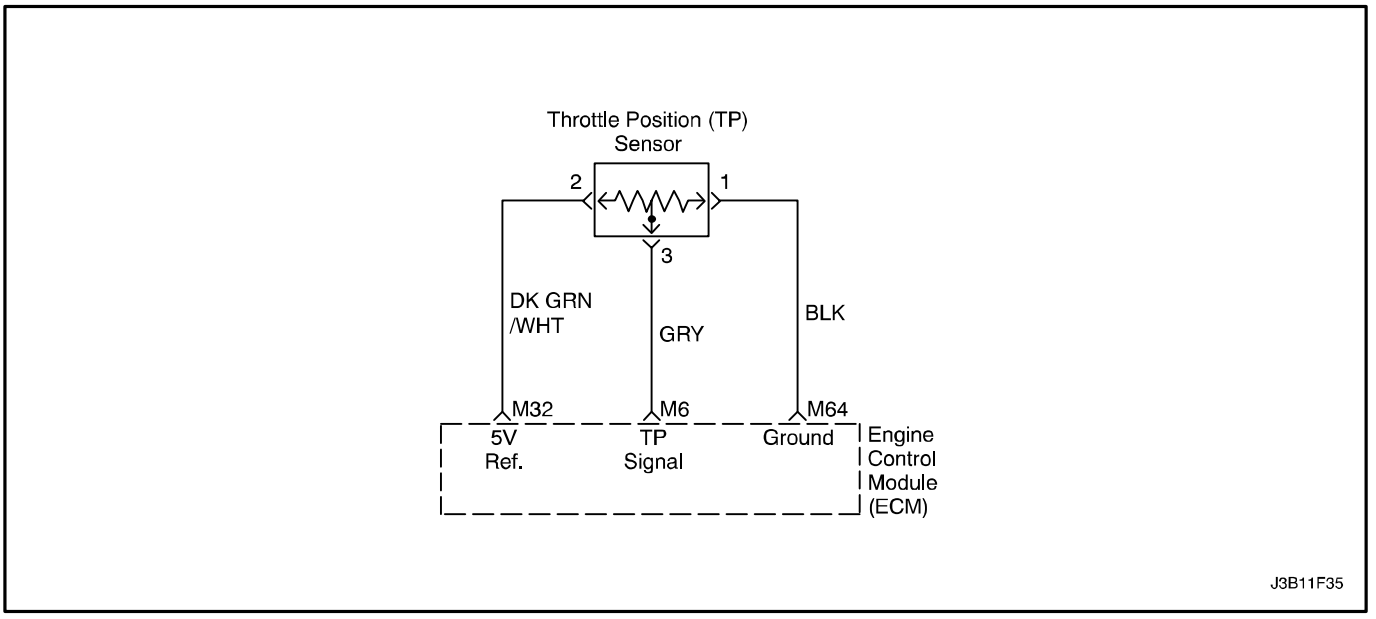
1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. The TP sensor has an auto zeroing feature. If the voltage reading is between 0.2 to 0.9 volts, the ECM will assume the TP sensor is at a closed throttle position (0%).
5. Simulates a high voltage signal which will identify an open in the signal circuit.
6. If additional DTCs are set, check the 5v reference circuits for a short to ground.
8. If the test light illuminates while probing the TP signal circuit, then the TP signal circuit is shorted to ground.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

13. If no faults have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids”for additional checks and information.

DTC P0122 – Throttle Position Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector DLC). 2. Turn the ignition ON. Is the Throttle Position (TP) sensor voltage below the specified value?	0.20 V	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition ON. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting the DTC as noted. Is the TP sensor voltage below the specified value?	0.20 V	Go to *Step 4*	Go to *Step 12*
4	1. Turn the ignition OFF. 2. Disconnect the TP sensor connector. 3. Turn the ignition ON. 4. Jump the 5 volt reference circuit terminal 2 and the TP signal circuit terminal 3 at the TP sensor connector. Is the TP sensor voltage over the specified value?	4.0 V	Go to *Step 10*	Go to *Step 5*
5	Connect a test light between B+ and the TP sensor signal circuit terminal 3. Is the TP sensor voltage greater than the specified value?	4.0 V	Go to *Step 6*	Go to *Step 8*
6	Check the TP sensor 5 volt reference circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 7*
7	Check the 5 volt reference circuit for a poor connection at terminal M32 of the Engine Control Module (ECM) and repair as needed. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 11*
8	Check the TP sensor signal circuit between terminal C of the TP sensor and terminal M6 of the ECM for an open or a short to ground and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 9*
9	Check the TP sensor signal circuit, terminal M6 of the ECM for a poor connection and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 11*
10	Replace the TP sensor. Is the action complete?	–	Go to *Step 12*	–
11	1. Turn the ignition OFF. 2. Replace the ECM. Is the action complete?	–	Go to *Step 12*	–

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0123

THROTTLE POSITION SENSOR HIGH VOLTAGE

Circuit Description

The Engine Control Module (ECM) supplies a 5 volt reference voltage signal and a ground to the Throttle Position (TP) sensor. The TP sensor sends a voltage signal back to the ECM relative to the throttle plate opening. The voltage signal will vary from approximately 0.33 volts at closed throttle, to over 4.3 volts at Wide Open Throttle (WOT).

The TP signal is used by the ECM for fuel control and for most of the ECM controlled outputs. The TP signal is one of the most important inputs used by the ECM for fuel control and most of the ECM controlled outputs.

Conditions for Setting the DTC

- TP sensor voltage indicates a throttle voltage greater than 4.9 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The TP angle will default to 0% when the vehicle speed is less than 3 km/h (2 mph) and 10% when the vehicle speed is greater than 3 km/h (2 mph). The scan tool will not display the default value.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

If the DTC P0123 cannot be duplicated, the information included in the Freeze Frame data can be useful. Use a scan tool information data to determine the status of the DTC. If the dc occurs intermittently, using the Diagnostic table may help isolate the problem.

With ignition ON and the throttle at closed position, the voltage should read between 0.2 and 0.90 volts and increase steadily to over 4.3 volts at WOT.

DTCs P0123 and P0113 stored at the same time could be result of an open sensor ground circuit.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

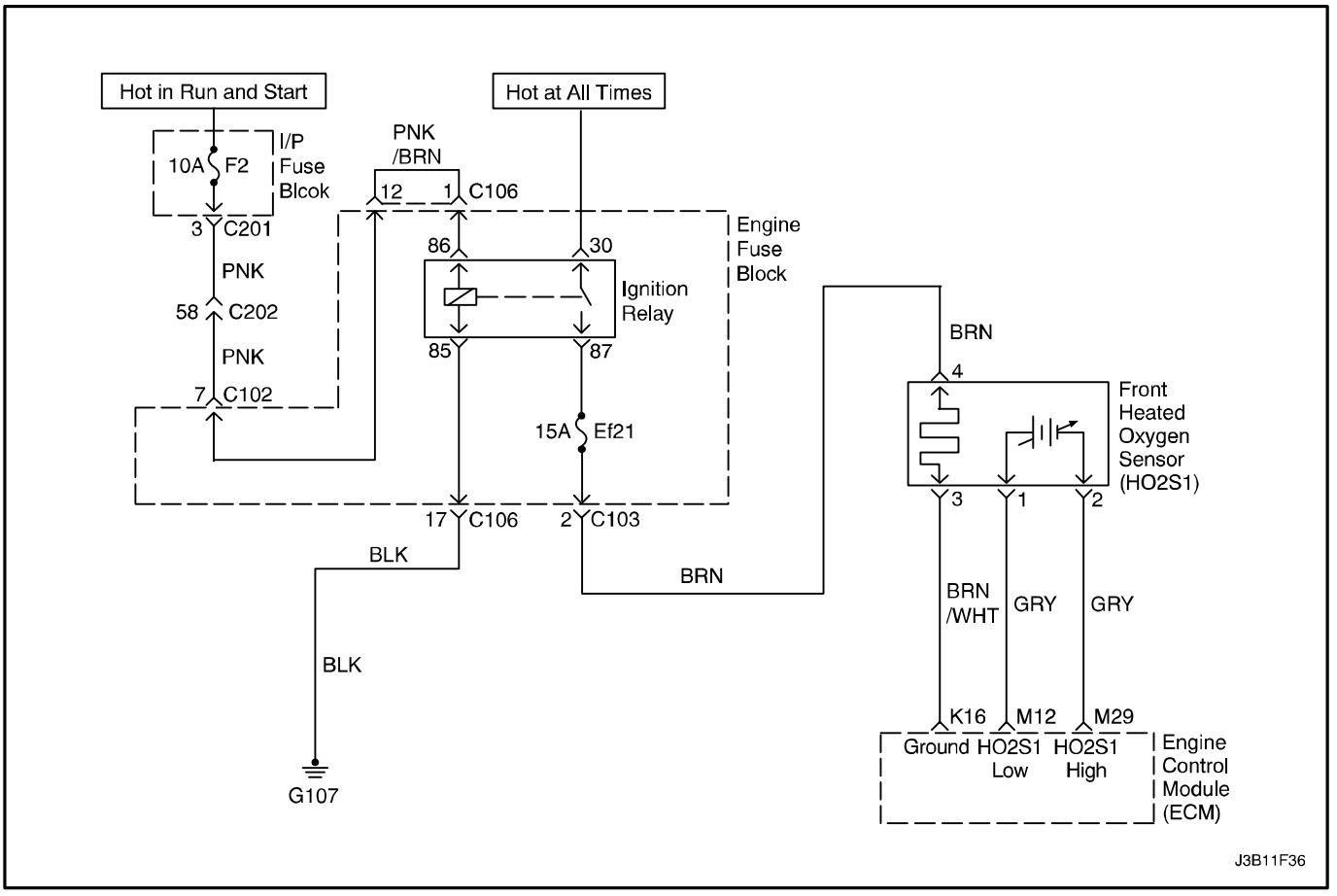
1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. With the throttle closed, the TP sensor voltage should read less than 0.90 volts. If the TP sensor voltage does not read less than 0.90 volts check for a binding or sticking throttle cable.
4. With the TP sensor disconnected, the TP sensor voltage should be less than 0.2 volts if the ECM and wiring are OK.
5. Probing the ground circuit with a test light checks the circuit for high resistance which will cause a DTC P0123 to set.

7. A shorted 5 volt reference circuit will also set additional DTCs.
11. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0123 – Throttle Position Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is the Throttle Position (TP) sensor voltage greater than the specified value?	1.0 V	Go to *Step 4*	Go to *Step 3*
3	1. Turn the ignition ON. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting the DTC as noted. Is the TP sensor voltage greater than the specified value?	3.9 V	Go to *Step 4*	Go to *Step 12*
4	1. Turn the ignition OFF. 2. Disconnect the TP sensor connector. 3. Turn the ignition ON. Is the TP sensor voltage less than the specified value?	0.2 V	Go to *Step 5*	Go to *Step 6*
5	Probe the TP sensor ground circuit, terminal 1 at the TP sensor connector with a test light connected to B+. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 9*
6	Check the TP sensor signal circuit for an short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 11*
7	Check the 5 volt reference circuit for a short to B+ and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 8*
8	Check the TP sensor electric connector for a poor connection and repair as needed. Is a repair necessary?	–	Go to *Step 12*	Go to *Step 10*
9	Check the TP sensor ground circuit for an open and repair as needed. Is the repair necessary?	–	Go to *Step 12*	Go to *Step 11*
10	Replace the TP sensor. Is the action complete?	–	Go to *Step 12*	–
11	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the action complete?	–	Go to *Step 12*	–

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0131

FRONT HEATED OXYGEN SENSOR (HO2S1) LOW VOLTAGE

Circuit Description

The Engine Control Module (ECM) supplies a voltage of about 0.45 volts between terminals M12 and M29 (if measured with a 10 megohm digital voltmeter, this may read as low as 0.32 volts). The Front Heated Oxygen sensor 1 (HO2S1) varies the voltage within a range of about 1 volt if the exhaust is rich, down through about 0.10 volts if the exhaust is lean.

The sensor is like an open circuit and produces no voltage when it is below 315˚C(600˚F). An open sensor circuit or cold sensor causes Open Loop operation.

If the HO2S1 pigtail wiring, connector, or terminal is damaged, the entire HO2S1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S1 wire(s). Any attempt to repair the wires, connector or terminals could result in the obstruction of the air reference and degrade the HO2S1 performance. Refer to ”Front Heated Oxygen Sensor” in this section.

Conditions for Setting the DTC

- HO2S1 voltage is less than 0.05 volts.
- Closed loop stoichiometry.
- Engine Coolant Temperature (ECT) is greater than 60˚C(140˚F).
- System voltage is greater than 10 volts.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.
- 3 second delay after conditions are met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

- Fuel pressure – The system will be lean if the fuel pressure is too low. It may be necessary to monitor the fuel pressure while driving the vehicle at various road speeds and/or loads to confirm. Refer to ”Fuel System Diagnosis” in this section.
- Manifold Absolute Pressure (MAP) sensor – An output that causes the ECM to sense a lower than normal manifold pressure (high vacuum) can cause the system to go lean. Disconnecting the MAP sensor will allow the ECM to substitute a fixed (default) value for the MAP sensor. If the lean condition is gone when the sensor is disconnected, substitute a known good sensor and recheck.
- Fuel contamination – Water, in even small amounts near the in–tank fuel pump inlet can be delivered to the injector. The water causes a lean exhaust and can set DTC P0131.
- Sensor harness – The HO2S1 sensor pigtail may be mis–positioned and contacting the exhaust manifold.
- Engine misfire – A misfiring cylinder will result in unburned oxygen in the exhaust, which could cause DTC P0131 to set. Refer to DTC P0300 Engine Misfire in this section.
- Cracked Front Heated Oxygen Sensor – A cracked HO2S1 or poor ground at the sensor could cause DTC P0131. Refer to”Symptoms Diagnosis” in this section.
- Plugged fuel filter – A plugged fuel filter can cause a lean condition and cause a DTC P0131 to set.
- Plugged Front Heated Oxygen Sensor – A plugged reference port on the HO2S1 will indicate a lower–than–normal voltage output from the HO2S1.

Test Description

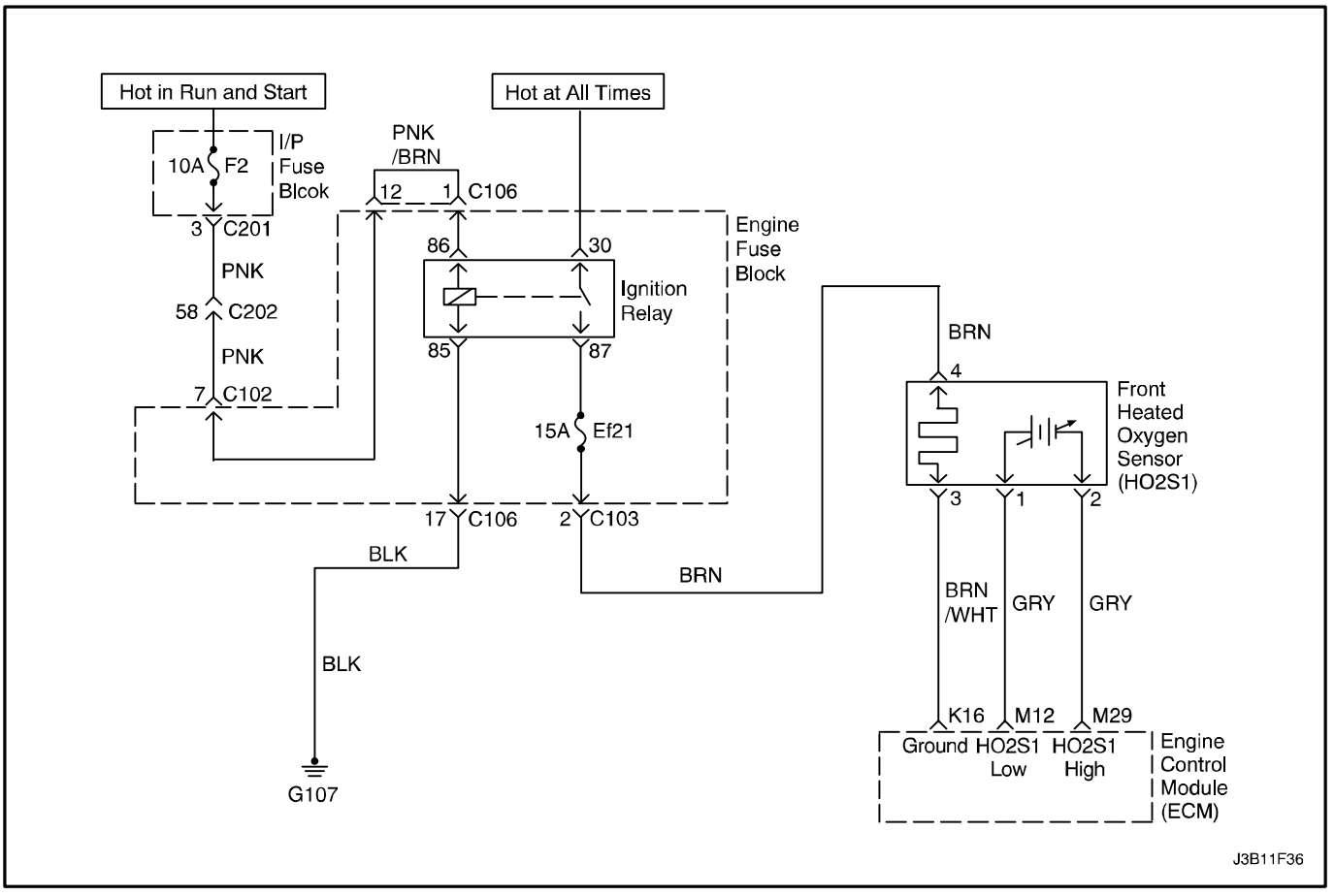
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0131 is the result of a hard failure or an intermittent condition. It may be necessary to operate the vehicle within the Freeze Frame conditions and Conditions for Setting the DTC in order to duplicate the malfunction detected by the ECM.
4. This step simulates DTC P0134. If the ECM senses the change, the ECM and the wiring are OK.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
8. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” for additional checks and information.

DTC P0131 – Front Heated Oxygen Sensor (HO2S1) Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the check completed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and idle at normal operating temperature. Does the Front Heated Oxygen Sensor (HO2S1) voltage remain below the value specified?	0.1 V	Go to *Step 4*	Go to *Step 3*
3	1. Review the Freeze Frame data and note the parameters. 2. Operate the vehicle within the Freeze frame conditions and Conditions For Setting the DTC as noted. Does the HO2S1 voltage stay below the specified value?	0.1 V	Go to *Step 4*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition OFF. 2. Disconnect HO2S1 connector. 3. Turn the ignition ON. Does the scan tool indicate the HO2S1 voltage within the specified value?	407–509 mV	Go to "Diagnostic Aids"	Go to *Step 5*
5	Check the HO2S1 signal circuit, terminal 4 for a short to ground and repair as needed. Is the repair necessary.	–	Go to *Step 7*	Go to *Step 6*
6	• Turn the ignition OFF. • Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 7*	–
7	1. If disconnected, reconnect HO2S1 connector. 2. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 3. Start the engine and idle at normal operating temperature. 4. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0132

FRONT HEATED OXYGEN SENSOR (HO2S1) HIGH VOLTAGE

Circuit Description

The Engine Control Module (ECM) supplies a voltage of about 0.45 volts between terminals M12 and M29 (if measured with a 10 megohm digital voltmeter, this may read as low as 0.32 volts). The Front Heated Oxygen Sensor (HO2S1) varies the voltage within a range of about 1 volt if the exhaust is rich, down through about 0.10 volts if the exhaust is lean.

The sensor is like and open circuit and produces no voltage when it is below 315˚C (600˚F). An open sensor circuit or cold sensor causes Open Loop operation.

If the HO2S1 pigtail wiring, connector, or terminal is damaged, the entire HO2S1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S1 wire(s). Any attempt to repair the wires, connector or terminals could result in the obstruction of the air reference and degrade the HO2S1 performance. Refer to"Front Heated Oxygen Sensor" in this section.

Conditions for Setting the DTC

- HO2S1 voltage is greater than 0.952 volts.
- Closed loop stoichiometry.
- Engine Coolant Temperature (ECT) is greater than 60˚C(140˚F).
- System voltage is greater than 10 volts.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.
- 3 second delay after conditions are met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

The DTC P0132 or rich exhaust is most likely caused by one of the following items:

- Fuel pressure – The system will go rich if the fuel pressure is too high. The ECM can compensate for some increase, but if it gets too high, a DTC P0132 will be set
- Leaking injector – A leaking or malfunctioning injector can cause the system to go rich causing a DTC P0132.
- Manifold Absolute Pressure (MAP) sensor – An output that causes the ECM to sense a higher than normal manifold pressure (low vacuum) can cause the system to go rich. Disconnecting the MAP sensor will allow the ECM to substitute a fixed value for the MAP sensor. Substitute a different a MAP sensor, if the rich condition is gone while the sensor is disconnected.
- Pressure regulator – Check for a leaking fuel pressure regulator diaphragm by checking for the presence of liquid fuel in the vacuum line to the regulator.
- TP sensor – An intermittent TP sensor output will cause the system to go rich due to a false indication of the engine accelerating.
- HO2S1 contamination – Inspect the HO2S1 for silicone contamination from fuel or the use of improper Room Temperature Vulcanizing sealant. The sensor may have a white powdery coating which may result in a high but false voltage signal (rich exhaust indication). The ECM will then reduce the amount of fuel delivered to the engine, causing a severe surge or driveability problem.

Test Description

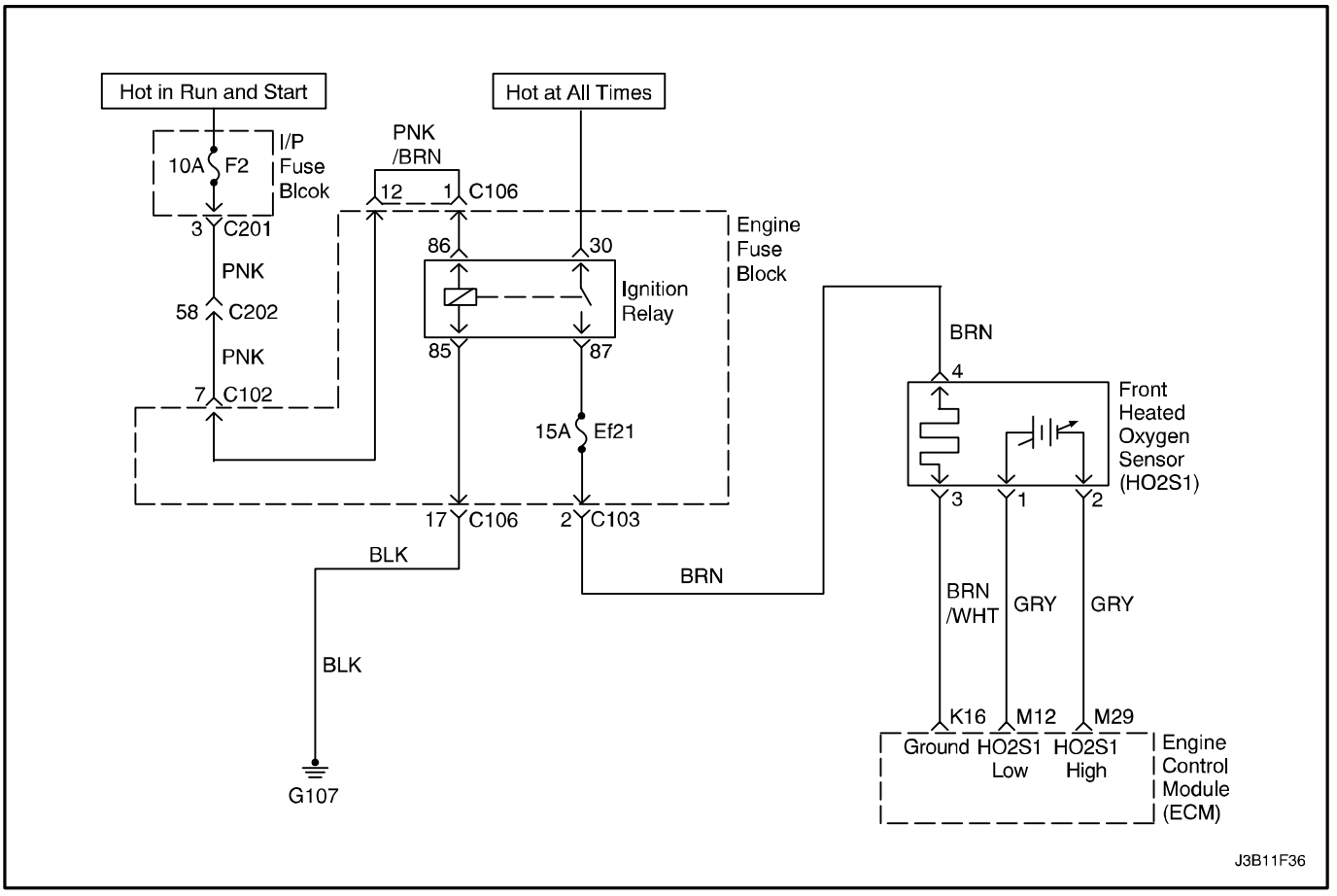
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0132 is the result of a hard failure or an intermittent condition. It may be necessary to operate the vehicle within the Freeze Frame conditions and Conditions for Setting the DTC in order to duplicate the malfunction detected by the ECM.
4. This step simulates a DTC P0131. If the ECM senses the change, the ECM and the wiring are OK.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
8. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0132 – Front Heated Oxygen Sensor (HO2S1) High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and idle at normal operating temperature. Does the Front Heated Oxygen Sensor (HO2S1) voltage remain below the value specified?	952 mV	Go to *Step 4*	Go to *Step 3*
3	1. Review the Freeze Frame data and note the parameters. 2. Operate the vehicle within the Freeze frame conditions and Conditions For Setting the DTC as noted. Does the HO2S1 voltage stay below the specified value?	952 mV	Go to *Step 4*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition OFF. 2. Disconnect HO2S1 connector. 3. Turn the ignition ON. 4. Jumper the Engine Control Module (ECM) side HO2S1 signal circuit to ground. Does the scan tool indicate the HO2S1 voltage below the specified value?	500 mV	Go to "Diagnostic Aids"	Go to *Step 5*
5	Check the HO2S1 signal circuit, terminal 4 for a short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 7*	Go to *Step 6*
6	• Turn the ignition OFF. • Replace the ECM. Is the repair complete?	–	Go to *Step 7*	–
7	1. If disconnected, reconnect HO2S1 connector. 2. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 3. Start the engine and idle at normal operating temperature. 4. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0133

FRONT HEATED OXYGEN SENSOR (HO2S1) SLOW RESPONSE

Circuit Description

The Engine Control Module (ECM) continuously monitors the Front Heated Oxygen Sensor (HO2S1) activity for 100 seconds. During the monitor period, the ECM counts the number of times that the HO2S1 switches from rich to lean and from lean to rich and adds the amount of time it took to complete all switches. With this information, an average time for all switches can be determined. If the average time to switch is too out of specification, a DTC P0133 will set.

If the HO2S1 pigtail wiring, connector, or terminal is damaged, the entire HO2S1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S1 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade HO2S1 performance.

Conditions for Setting the DTC

- HO2S1 average transition time between 0.3–0.6 volts, lean to rich is greater than 156 milliseconds(A/T) or rich to lean is greater than 140 milliseconds (M/T).
- Closed loop stoichiometry.
- Engine Coolant Temperature (ECT) is greater than 70˚C (158˚F).
- System voltage is greater than 10 volts.
- Engine run time is greater than 60 seconds.
- Purge Duty Cycle (DC) is less than 20%.
- The rpm is between 1600 and 4300.
- Airflow is between 9 and 40 g/sec.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0131, P0132, P0134, P0135, P1167, P0171, P1171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.
- 2 second delay after conditions are met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.

- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

DTC P0133 or slow response is most likely caused by one of the following items:

- Fuel pressure – The system will go rich if fuel pressure is too high. The ECM can compensate for some increase, but if it gets too high, a DTC P0133 may set. Refer to"Fuel System Diagnosis" in this section.
- Leaking injector – A leaking or malfunctioning injector can cause the system to go rich.
- Manifold Absolute Pressure (MAP) sensor – An output that causes the ECM to sense a higher than normal manifold pressure (low vacuum) can cause the system to go rich. Disconnecting the MAP sensor will allow the ECM to set a fixed value for the MAP sensor. Substitute a different MAP sensor if the rich condition is gone while the sensor is disconnected.
- Pressure regulator – Check for a leaking fuel pressure regulator diaphragm by checking for the presence of liquid fuel in the vacuum line to the pressure regulator.
- Throttle Position (TP) sensor – An intermittent TP sensor output can cause the system to go rich due to a false indication of the engine accelerating.
- HO2S1 contamination – Inspect HO2S1 for silicone contamination from fuel or use of improper room temperature vulcanizing (RTV) sealant. The sensor may have a white powdery coating, resulting in a high but false voltage signal (rich exhaust indication). The ECM will then reduce the amount of fuel delivered to the engine causing a severe surge or driveability problem.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

14. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

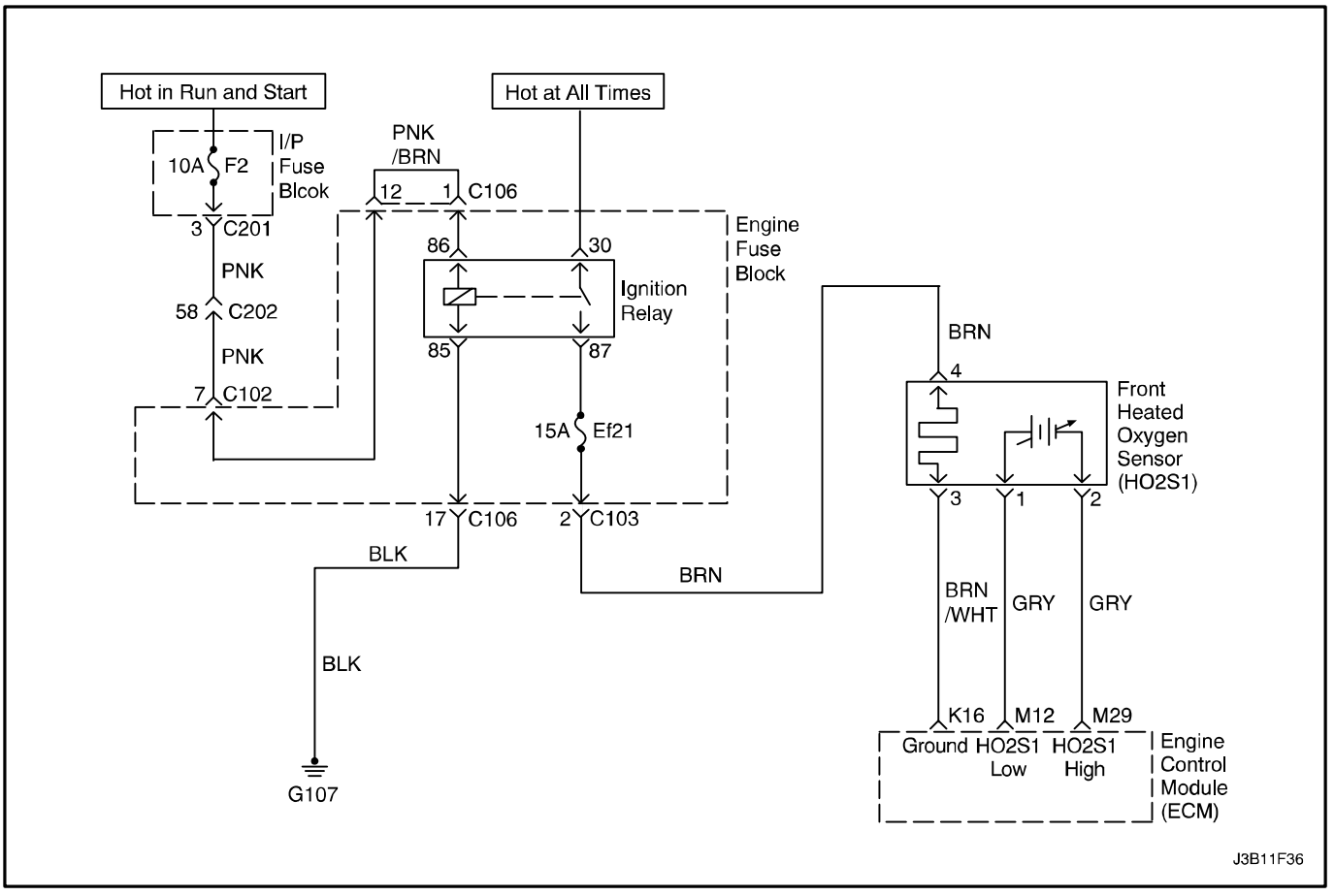
17. If no malfunctions have been found at this point and no additional DTCs were set, refer to "Diagnostic Aids" for additional checks and information.

DTC P0133 – Front Heated Oxygen Sensor (HO2S1) Slow Response

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Install a scan tool to the Data Link Connector DLC). 2. Turn the ignition ON. Are any additional Diagnostic Trouble Codes (DTCs) set?	–	Go to "Applicable DTC table"	Go to *Step 3*
3	1. Start the engine and idle at normal operating temperature. 2. Operate the vehicle within the specified parameter under the Conditions For Setting the DTC. 3. Using the scan tool monitor the specific DTC information for DTC P0133 until DTC P0133 test run. Does the scan tool indicate DTC P0133 failed this ignition cycle?	–	Go to *Step 4*	Go to "Diagnostic Aids"

Step	Action	Value(s)	Yes	No
4	Did the scan tool indicate that DTC P1133 or P1134 failed this ignition cycle.	–	Go to ”Applicable DTC table”	Go to *Step 5*
5	Check the exhaust manifold/catalytic converter for a leak and repair as needed. Is the repair complete?	–	Go to *Step 16*	Go to *Step 6*
6	Visually/physically inspect for the following items: • Front Heated Oxygen Sensor (HO2S1) is securely installed. • Corrosion on the terminals. • Terminal tension. • HO2S1 wiring harness for poor terminal connection or damaged wiring. Is a problem found in any of the above areas?	–	Go to *Step 9*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Disconnect the HO2S1 connector. 3. Jumper the HO2S1 low circuit, terminal 3 to ground. 4. Turn the ignition ON. Does the scan tool indicate the voltage between the specified value?	400 – 500 mV	Go to *Step 8*	Go to *Step 10*
8	Jumper the HO2S1 signal and low circuit terminal 4 to ground. Does the scan tool indicate the voltage below the specified value?	200 mV	Go to *Step 15*	Go to *Step 13*
9	Repair the condition as necessary. Is the repair complete?	–	Go to *Step 16*	–
10	• Turn the ignition OFF. • Disconnect the ECM connector. • Check the HO2S1 low circuit for an open or poor connection and repair as needed. Is the repair complete?	–	Go to *Step 16*	Go to *Step 11*
11	Check the terminal M29 of the ECM for poor connection and repair as needed. Is the repair complete?	–	Go to *Step 16*	Go to *Step 14*
12	Check the HO2S1 signal circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 16*	Go to *Step 13*
13	Check the terminal M12 of the ECM for poor connection and repair as needed. Is the repair complete?	–	Go to *Step 16*	Go to *Step 14*
14	• Turn the ignition OFF. • Replace the ECM. Is the repair complete?	–	Go to *Step 16*	–
15	Replace the HO2S1. Is the repair complete?	–	Go to *Step 16*	–

Step	Action	Value(s)	Yes	No
16	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 17*	Go to *Step 2*
17	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0134

FRONT HEATED OXYGEN SENSOR (HO2S1) NO ACTIVITY OR OPEN

Circuit Description

The Engine Control Module (ECM) supplies a voltage of about 0.45 volts between terminals M12 and M29 (if measured with a 10 megohm digital voltmeter, this may read as low as 0.32 volts). The Front Heated Oxygen Sensor (HO2S1) varies the voltage within a range of about 1 volt if the exhaust is rich, down through about 0.10 volts if the exhaust is lean.

The sensor is like and open circuit and produces no voltage when it is below 315 ˚C (600 ˚F). An open sensor circuit or cold sensor causes Open Loop operation.

If the HO2S1 pigtail wiring, connector, or terminal is damaged, the entire HO2S1 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S1 wire(s). Any attempt to repair the wires, connector or terminals could result in the obstruction of the air reference and degrade the HO2S1 performance. Refer to”Front Heated Oxygen Sensor (HO2S1)” in this section.

Conditions for Setting the DTC

- HO2S1 voltage is between 420 and 480 mV.
- Engine Coolant Temperature (ECT) is greater than 60 ˚C (140 ˚F)
- System voltage is greater than 10 volts.
- Engine run time is greater than 60 seconds.
- Airflow is greater than 8 g/sec.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.
- 3 second delay after exiting Decel Fuel Cut–off (DFCO) mode.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

- Normal scan tool voltage varies from 150 mV to 850 mV while in Closed Loop. If DTC P0134 is intermittent, refer to ”Intermittents” in this section.

Test Description

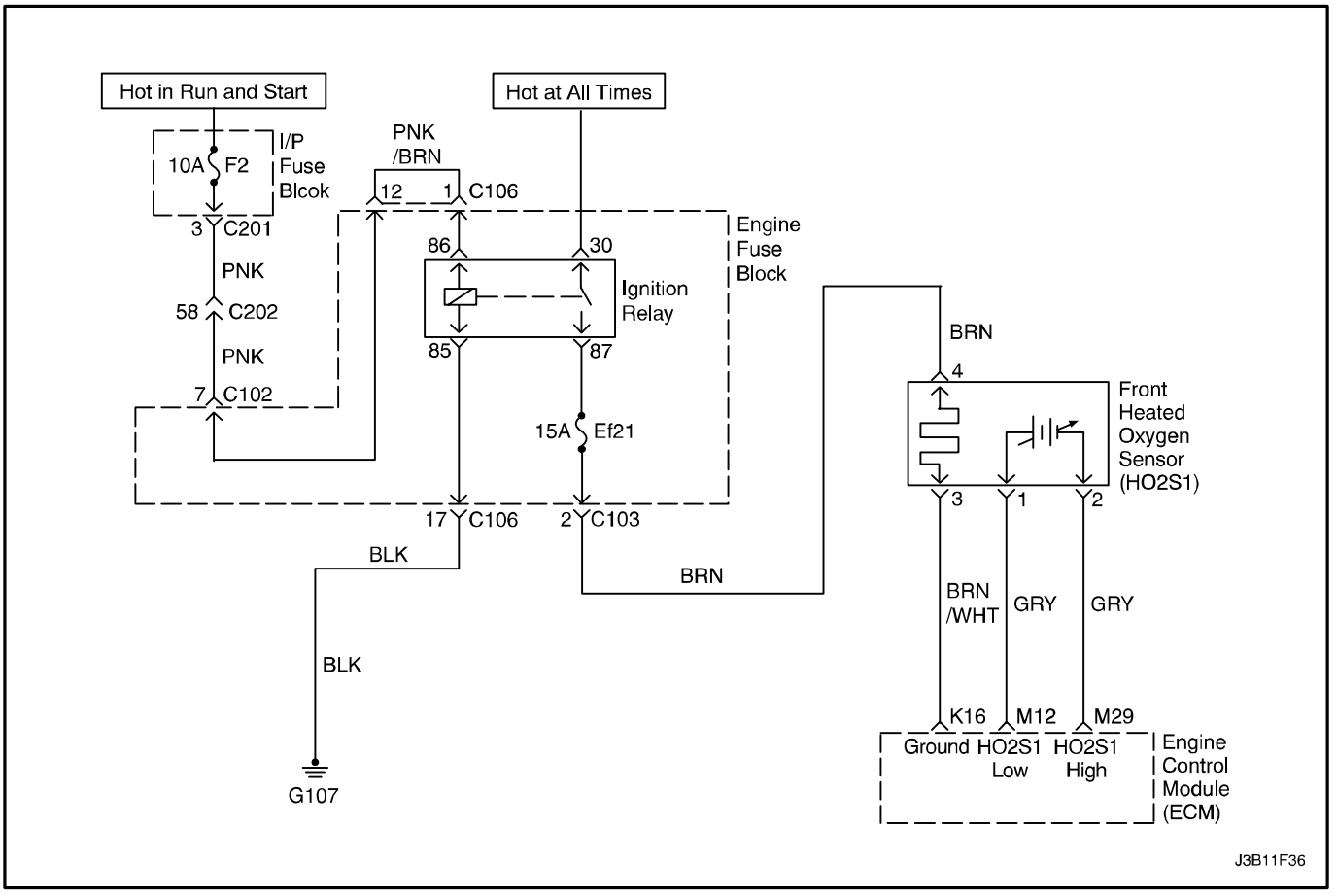
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. During engine warm–up, the HO2S1 should warm up, and its voltage output should vary between 150 mv and 850 mv. When the HO2S1 voltage varies, the engine will go into Closed Loop. This determines if the HO2S1 1 is operating properly.
4. This will determine if the sensor is malfunctioning or if the wiring or the ECM is the cause of the DTC P0134.
6. Use only a high impedance digital voltmeter (DVM) for this test. The test checks the continuity of the HO2S1 signal and the ground circuits; if the ground circuit is open, the ECM voltage on the circuit will be over 0.6 volts (600 mv).
10. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0134 – Front Heated Oxygen Sensor (HO2S1)No Activity or Open

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and idle at normal operating temperature. 3. Operate the engine above the specified rpm for 2 minutes. Does the scan tool indicate Closed Loop?	80˚C(176˚F) 1200 rpm	Go to *Step 3*	Go to *Step 4*
3	1. Review the Freeze Frame data and note the parameters. 2. Operate the vehicle within the Freeze frame conditions and Conditions For Setting the DTC as noted. Does the scan tool indicate CLOSED LOOP?	–	Go to *Step 12*	Go to *Step 4*
4	1. Turn the ignition OFF. 2. Disconnect HO2S1 connector. 3. Jumper the terminal 3 of HO2S1 connector and ground. 4. Turn the ignition ON. Does the scan tool indicate the HO2S1 voltage within the specified value?	400 – 500 mV	Go to *Step 5*	Go to *Step 8*
5	Check the HO2S1 harness connector for malfunction or poor connection and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	1. Idle the engine. 2. Remove the jumper wire. 3. Using a voltmeter, measure the voltage between terminal 4 of HO2S1 and ground Is the voltage above the specified value?	600 mV	Go to *Step 7*	Go to *Step 11*
7	1. Turn the engine OFF. 2. Using a voltmeter, measure the voltage between terminal 4 of the HO2S1 and ground. Is the voltage below the specified value?	300 mV	Go to *Step 9*	Go to *Step 11*
8	Check the HO2S1 low circuit for an open or short to ground between terminal 3 of the HO2S1 and terminal M29 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 10*
9	Check the HO2S1 signal circuit for an open or short to ground between terminal 4 of the HO2S1 and terminal M12 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 10*
10	• Turn the ignition OFF. • Replace the ECM. Is the repair complete?	–	Go to *Step 12*	–
11	Replace the HO2S1. Is the repair complete?	–	Go to *Step 12*	–
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0135

FRONT HEATED OXYGEN SENSOR (HO2S1) HEATER CIRCUIT NOT FUNCTIONING

Circuit Description

Heated oxygen sensors (HO2S) are used for fuel control and post catalyst monitoring. Each HO2S compares the oxygen content of the surrounding air with the oxygen content in the exhaust stream. The HO2S must reach operating temperature to provide an accurate voltage signal. A heating element inside the HO2S minmizes the time required for the sensor to reach operating temperature. Voltage is provided to the heater by the ignition 1 voltage circuit through a fuse. With the engine running, ground is provided to the heater by the HO2S heater low control circuit, through a low side driver within the engine control module (ECM). The ECM monitors the current flow through the heater for diagnosis.

If the ECM detects that the HO2S heater current is above or blelow a specified range, DTC P0135 seats.

Conditions for Setting the DTC

- DTCs P0106, P0117, P0118, P1017 are not set.
- Engine run time is greater than 200 seconds.
- Filtered O2 heater current is less than 0.025 amps.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history Diagnostic Trouble Code (DTC) is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

An intermittent may be caused by rubbed through wire insulation or a wire contacting the exhaust.

Check for poor connection or damaged harness – inspect harness connectors for the following conditions:

- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection

- Damaged harness

Test Description

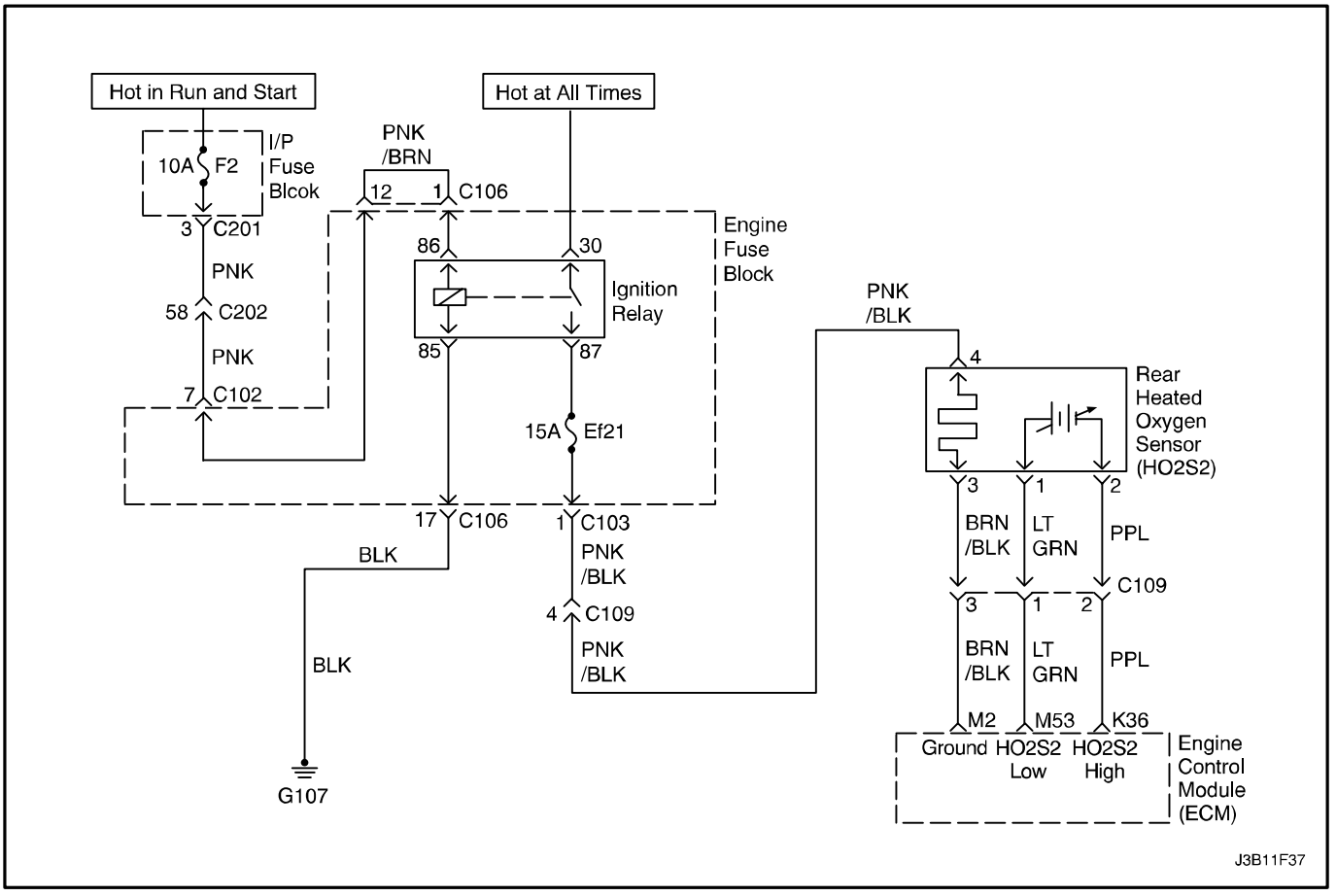
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0135 is the result of a hard failure or an intermittent condition. With the ignition ON, engine OFF, the HO2S1 voltage displayed on the scan tool should change within several minutes toward 0 or 1 volt, indicating that the heater is working properly.
3. Probing terminal 2 of the HO2S1 connector verifies if voltage is available to the HO2S1 heater.
4. If voltage is available at the connector, than it becomes a good voltage source to check for a ground at terminal 3.
5. Determines if voltage is not available at the HO2S1 due to an open in the HO2S1 fuse or open ignition feed circuit. If the fuse is open, determine if it was due to a short in the ignition feed circuit before replacing the fuse.

DTC P0135 – Front Heated Oxygen Sensor (HO2S1) Heater Circuit Not Functioning

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	**Notice :** If the engine has just been operating, allow the engine to cool for about one–half hour before proceeding. 1. Turn the ignition switch ON, with the engine OFF. 2. Install a scan tool. Does the Front Heated Oxygen Sensor (HO2S1) voltage gradually change toward the specified voltage?	0 v or 1 v	Go to *Step 13*	Go to *Step 3*
3	1. Disconnect the HO2S1 electrical connector. 2. With a test light connected to ground, probe the ignition feed circuit, terminal 4 of the connector. Does the test light illuminate?	–	Go to *Step 4*	Go to *Step 5*
4	Connect a test light between the ignition feed and ground circuits, terminal 4 and 3 of the connector. Does the test light illuminate?	–	Go to *Step 6*	Go to *Step 7*
5	Inspect the fuse in the engine fuse block. Is the fuse open?	–	Go to *Step 8*	Go to *Step 9*
6	Check the connections terminal 4 and 1 at the HO2S1 connector and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 10*
7	Check the connections terminal 3 at the HO2S1 connector and repair as necessary. Is a repair necessary?	–	Go to *Step 13*	Go to *Step 11*
8	1. Check for a short to ground in the HO2S1 ignition feed circuit and repair as necessary? 2. Replace open fuse. Is the action complete?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
9	Check the connections terminal 4 at the HO2S1 connector and repair as necessary. Is the repair complete?	–	Go to *Step 13*	Go to *Step 12*
10	Replace the HO2S1 sensor. Is the action complete?	–	Go to *Step 13*	–
11	Repair the open in the ground circuit. Is the action complete?	–	Go to *Step 13*	–
12	Repair the open in the ignition feed circuit. Is the action complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0137

REAR HEATED OXYGEN SENSOR (HO2S2) LOW VOLTAGE

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The Engine Control Module (ECM) has the ability to monitor this process by using a Rear Heated Oxygen Sensor (HO2S2). The HO2S2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst. This in turn indicates the catalyst's ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S2 signal will be far less active than the signal produced by the Front Heated Oxygen Sensor (HO2S1).

If the HO2S2 pigtail wiring, connector, or terminal is damaged, the entire HO2S2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S2 performance.

Conditions for Setting the DTC

- HO2S2 voltage is less than 0.05 volt in Closed Loop control or less than 0.35 volt in Power Enrichment (PE) mode.
- Engine Coolant Temperature (ECT) is greater than 60˚C (140˚F).
- System voltage is greater than 10 volts.
- Closed Loop test: 3 seconds delay after in Closed Loop and air flow is greater than 9 g/sec.
- Power Enrichment test: Air/Fuel ration is less than or equal to 13.5 and 3 seconds delay after in Power Enrichment mode.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0141, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.

- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by rubbed–through wire insulation or a wire contacting the exhaust.

Check for the following conditions:

- Exhaust system – Inspect the exhaust system for leaks. Check the exhaust between the three–way catalytic converter and the flange for leaks, corrosion, or for loose or missing hardware and repair as necessary.
- Poor connection or damaged harness – Ensure that the HO2S2 pigtail is not contacting the exhaust. Check for the following conditions:
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Damaged harness
- Intermittent test – Observe the HO2S2 on the scan tool while moving related connections and the wiring harness with the ignition ON. If the failure is induced, the HO2S2 display will change. This may help isolate the location of the malfunction.

Test Description

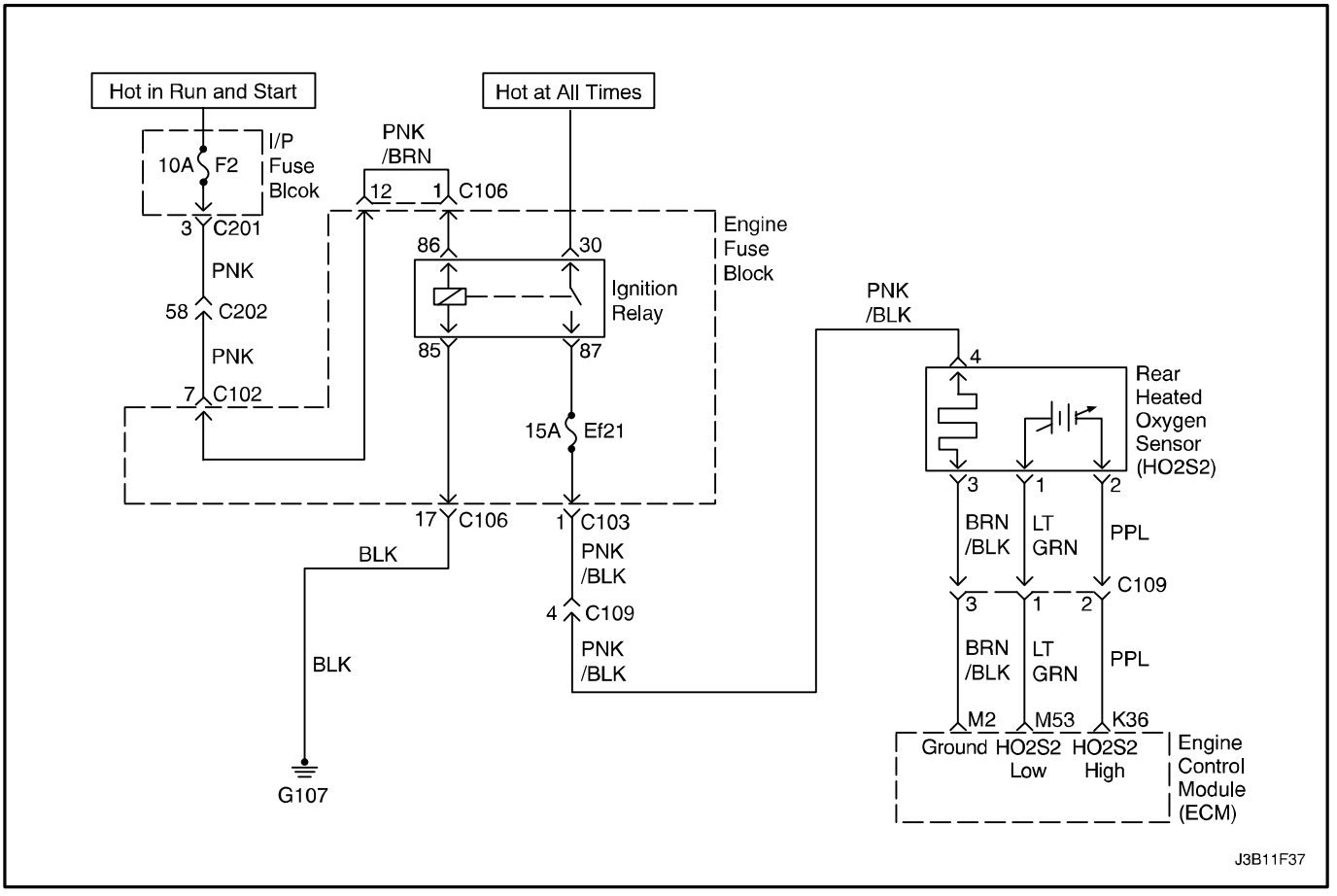
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0137 is the result of a hard failure or an intermittent condition.
4. Jumping the HO2S2 low circuit, terminal 4 to ground is necessary to allow the ECM to display the supplied bias voltage. If the voltage is between 0.35 and 0.55 volt, then the wiring and ECM are OK.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0137 – Rear Heated Oxygen Sensor (HO2S2) Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is the Rear Heated Oxygen Sensor (HO2S2) voltage less than the value specified?	0.1 V	Go to *Step 4*	Go to *Step 3*
3	1. Start the engine. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze frame conditions and Conditions For Setting the DTC as noted. Is the HO2S2 voltage less than the specified value?	0.4 V	Go to *Step 4*	Go to *Step 8*
4	1. Turn the ignition OFF. 2. Disconnect HO2S2 connector. 3. Connect a jumper wire between terminal 1 of HO2S2 connector and ground. 4. Turn the ignition ON. Does the scan tool indicate that the HO2S2 voltage is within the specified value?	350–550 mV	Go to *Step 7*	Go to *Step 5*

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector and check the HO2S2 high circuit, terminal K36 for short to ground or short to the HO2S2 low circuit terminal M53 and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 6*
6	• Turn the ignition OFF. • Replace the ECM. Is the repair complete?	–	Go to *Step 8*	–
7	• Turn the ignition OFF. • Replace the HO2S2. Is the repair complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0138

REAR HEATED OXYGEN SENSOR (HO2S2) HIGH VOLTAGE

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The Engine Control Module (ECM) has the ability to monitor this process by using a Rear Heated Oxygen Sensor (HO2S2). The HO2S2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst. This in turn indicates the catalyst¡¯s ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S2 signal will be far less active than the signal produced by the Front Heated Oxygen Sensor (HO2S1).

If the HO2S2 pigtail wiring, connector, or terminal is damaged, the entire HO2S2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S2 performance.

Conditions for Setting the DTC

- HO2S2 voltage is greater than 0.952 volt in Closed Loop control or greater than 0.55 volt in Decel Fuel Cutoff (DFCO) mode.
- Engine Coolant Temperature (ECT) is greater than 60˚C (140˚F).
- System voltage is greater than 10 volts.
- Closed Loop test: 3 seconds delay after in Closed Loop and airflow is greater than 9 g/sec.
- DFCO test: 2 seconds delay after in DFCO.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0141, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Rich exhaust – An overly rich exhaust may load the catalyst, causing high HO2S2 signal voltages.
- Silicone contamination – A false rich condition may be caused by silicone contamination of the HO2S2. This will be indicated by a powdery white deposit on the sensor.
- Faulty HO2S2 – If HO2S2 is internally shorted, the HO2S2 voltage displayed on a scan tool will be over 1 volt. Disconnect the HO2S2 and jumper the sensor low circuit to engine ground; if the displayed voltage goes from over 1000 millivolt to around 450 millivolt, replace the HO2S2.
- Intermittent test – Observe HO2S2 on the scan tool while moving related connectors and the wiring harness with the key in the ON position. If the failure is induced, the HO2S2 display will change. This may help isolate the location of the malfunction.

Test Description

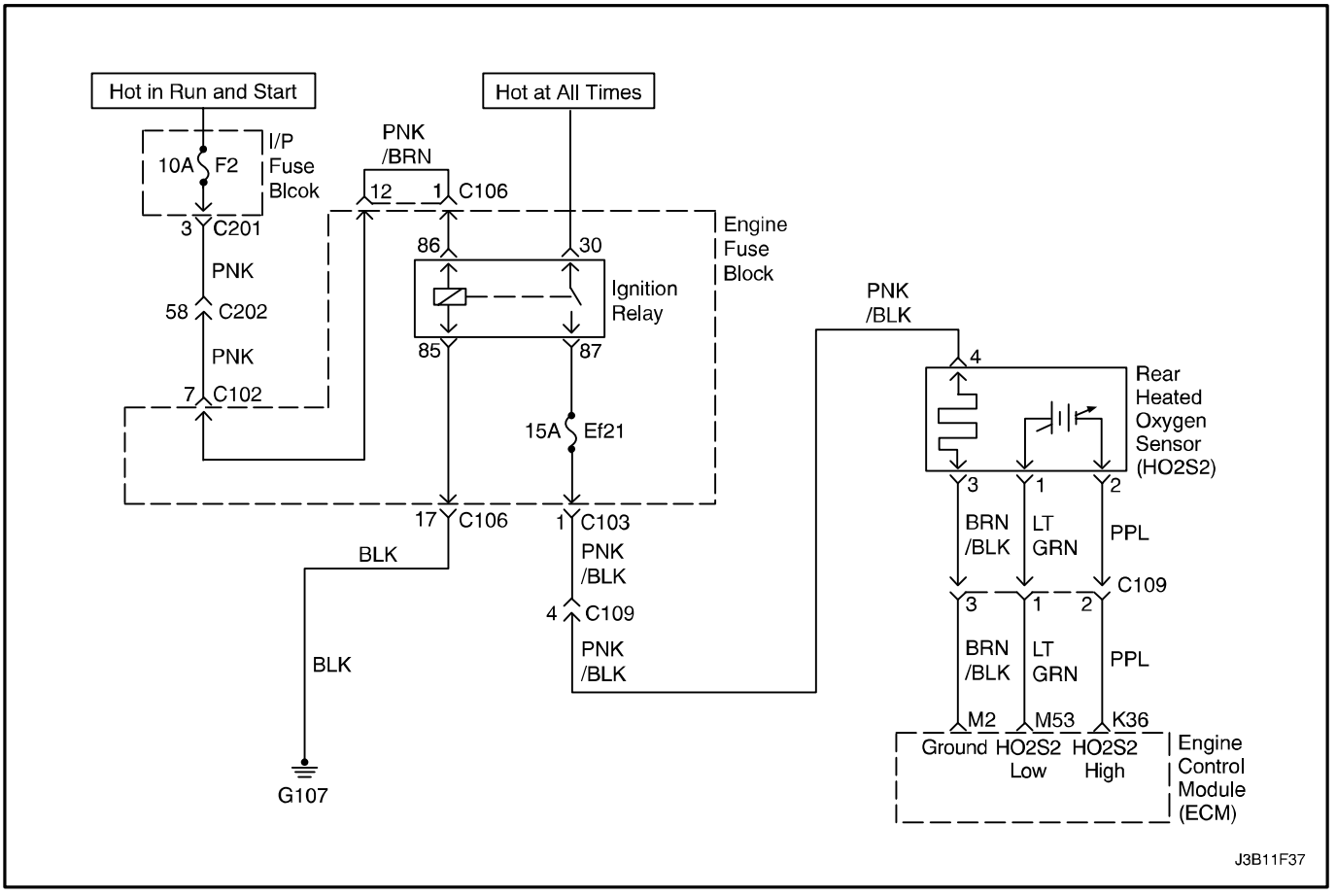
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0138 is the result of a hard failure or an intermittent condition.
5. Disconnecting the HO2S2 and jumpering the sensor signal circuit and the sensor low circuit to ground should cause the scan tool to display HO2S2 voltage below 100 mv (0.1 v). If the signal voltage is still high, the ECM is malfunctioning.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0138 – Rear Heated Oxygen Sensor (HO2S2) High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is the Rear Heated Oxygen Sensor (HO2S2) voltage above the value specified?	0.9 V	Go to *Step 4*	Go to *Step 3*
3	1. Review the Freeze Frame data and note the parameters. 2. Operate the vehicle within the Freeze frame conditions and Conditions For Setting the DTC as noted. Is the HO2S2 voltage above the specified value?	0.9 V	Go to *Step 4*	Go to *Step 9*
4	1. Turn the ignition OFF. 2. Disconnect HO2S2 connector. 3. Disconnect the Engine Control Module (ECM) connector. 4. With voltmeter connected to ground, probe the HO2S2 high signal circuit, terminal K36. Is the voltage within the specified value?	±0 V	Go to *Step 5*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
5	1. Reconnect the ECM connector. 2. Turn the ignition ON. 3. Jumper the high and low circuits at the HO2S2 connector, terminals 1 and 2 to ground. Does the scan tool indicate the HO2S2 voltage below the specified value?	0.1 V	Go to *Step 7*	Go to *Step 8*
6	Repair the short to voltage in the HO2S2 high circuit. Is the repair complete?	–	Go to *Step 9*	–
7	• Turn the ignition OFF. • Replace the HO2S2. Is the repair complete?	–	Go to *Step 9*	–
8	• Turn the ignition OFF. • Replace the ECM. Is the repair complete?	–	Go to *Step 9*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0140

REAR HEATED OXYGEN SENSOR (HO2S2) NO ACTIVITY OR OPEN

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The Engine Control Module (ECM) has the ability to monitor this process by using a Rear Heated Oxygen Sensor (HO2S2). The HO2S2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst. This in turn indicates the catalyst is ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S2 signal will be far less active than the signal produced by the Front Heated Oxygen Sensor (HO2S1).

If the HO2S2 pigtail wiring, connector, or terminal is damaged, the entire HO2S2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S2 performance.

Conditions for Setting the DTC

- HO2S2 voltage is between 0.422 and 0.478 volts.
- Engine Coolant Temperature (ECT) is greater than 60˚C (140˚F).
- Engine rum time is greater than 60 seconds.
- System voltage is greater than 10 volts.
- Closed Loop stoichiometry.
- 3 second delay after exiting Decel Fuel Cutoff (DFCO) mode.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0141, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a rubbed–through wire insulation or a wire contacting the exhaust.

Check for the following conditions:

- A poor connection or a damaged harness – Inspect the harness for a short to ground in the sensor signal circuit. Ensure that the HO2S2 pigtail is not contacting the exhaust. Check for the following conditions:
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Damaged harness
- Intermittent test – Observe HO2S2 on the scan tool while moving the related connections and the wiring harness with the ignition ON. If the failure is induced, the HO2S2 display will change. This may help isolate the location of the malfunction.

Test Description

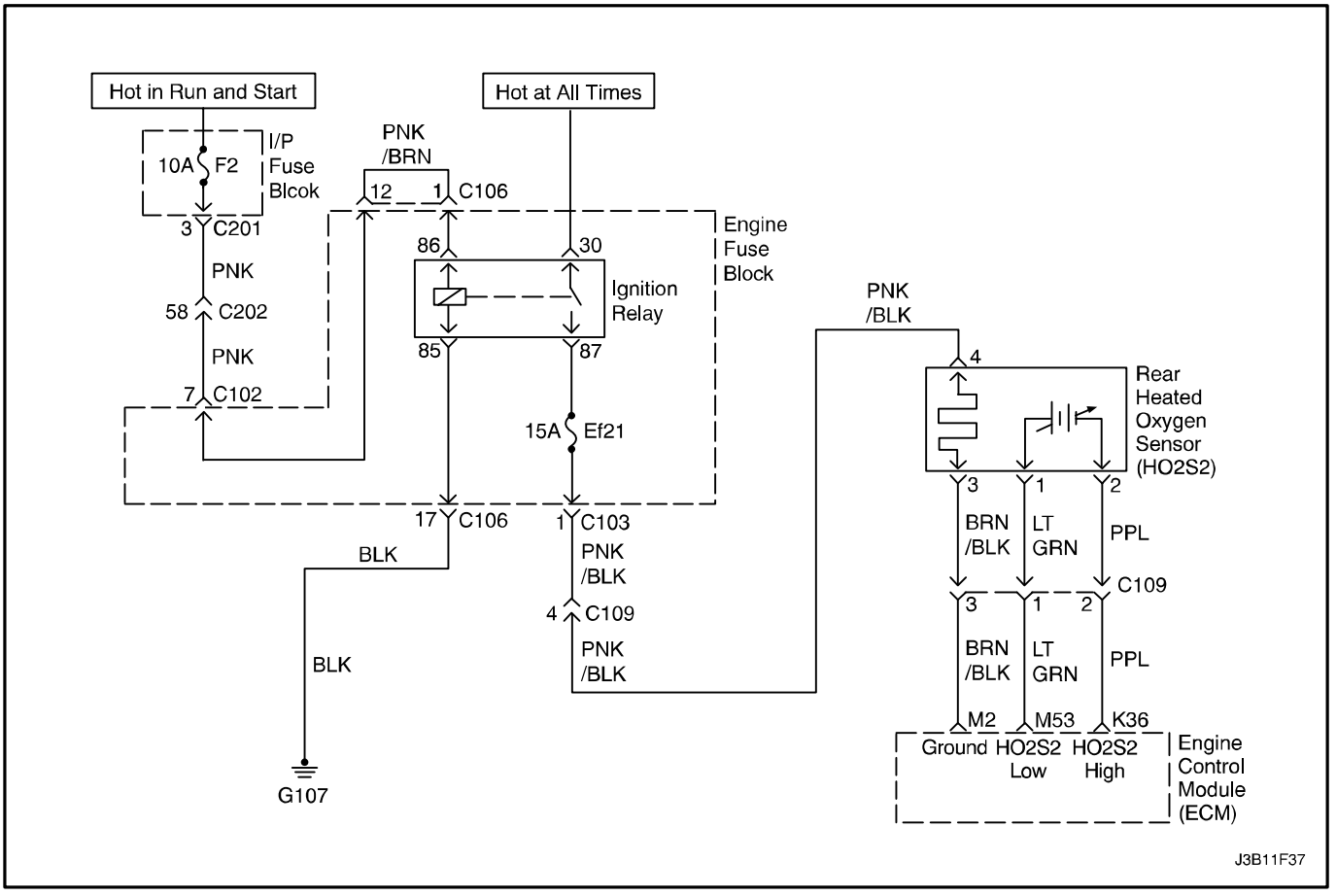
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0140 is the result of a hard failure or an intermittent condition.
4. Disconnecting the HO2S2 and jumpering the sensor signal circuit and the sensor low circuit to ground will determine if the ECM or wiring or HO2S2 is malfunctioning.
6. Determines which circuit the malfunction is in. If the sensor signal circuit and the sensor low circuit are OK, then the ECM connection or ECM is malfunctioning.
10. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0140 – Rear Heated Oxygen Sensor (HO2S2) No Activity or Open

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and operate to normal operating temperature. 3. Run the engine above the specified rpm for two minutes. Does the scan tool display a Rear Heated Oxygen Sensor (HO2S2) voltage between the value specified?	80˚C(176˚F) 1200 rpm 422–478 mV	Go to *Step 4*	Go to *Step 3*
3	1. Allow the engine to idle. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze frame conditions and Conditions For Setting the DTC as noted. Does the scan tool display the HO2S2 voltage steady around the value specified?	422–478 mV	Go to *Step 11*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
4	1. Turn the ignition OFF. 2. Disconnect HO2S2 connector. 3. Turn the ignition ON. 4. Jumper the high and low circuits at the HO2S2 connector, terminals 1 and 2 to ground. Does the scan tool indicate the HO2S2 voltage below the specified value?	0.1 V	Go to *Step 5*	Go to *Step 6*
5	1. Turn the ignition OFF. 2. Check for a malfunctioning connection at the HO2S2 Engine Control Module (ECM) side and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 7*
6	1. Remove the jumper wire. 2. With a voltmeter connected to ground, probe the terminal 2 of the HO2S2. Does the voltage within the specified value?	4.5 V	Go to *Step 8*	Go to *Step 9*
7	1. Turn the ignition OFF. 2. Replace the HO2S2. Is the repair complete?	–	Go to *Step 11*	–
8	Check the HO2S2 low circuit for an open or poor connection and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 10*
9	1. Turn the ignition OFF. 2. Disconnect the ECM connector. 3. Check the HO2S2 high circuit for continuity and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 5*
10	1. Turn the ignition OFF. 2. Replace the HO2S2. Is the repair complete?	–	Go to *Step 11*	–
11	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0141

REAR HEATED OXYGEN SENSOR (HO2S2) HEATER CIRCUIT NOT FUNCTIONING

Circuit Description

In order to control emissions, a catalytic converter is used to convert harmful emissions into harmless water vapor and carbon dioxide.

The Engine Control Module (ECM) has the ability to monitor this process by using a Rear Heated Oxygen Sensor (HO2S2). The HO2S2, located in the exhaust stream past the catalytic converter, produces an output signal which indicates the storage capacity of the catalyst. This in turn indicates the catalyst is ability to convert exhaust emissions effectively. If the catalyst is functioning properly, the HO2S2 signal will be far less active than the signal produced by the Front Heated Oxygen Sensor (HO2S1).

If the HO2S2 pigtail wiring, connector, or terminal is damaged, the entire HO2S2 assembly must be replaced. Do not attempt to repair the wiring, connector, or terminals. In order for the sensor to function properly, it must have a clean air reference provided to it. This clean air reference is obtained by way of the HO2S2 wire(s). Any attempt to repair the wires, connector, or terminals could result in the obstruction of the air reference and degrade the HO2S2 performance.

The ECM will check if HO2S2 is functioning properly by monitoring the current to HO2S2 heater. If the current is less than 0.1 ampere, DTC P0141 will set.

Conditions for Setting the DTC

- HO2S2 heater current is less than 0.1 amperes.
- Engine rum time is greater than 60 seconds.
- System voltage is greater than 10 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a rubbed–through wire insulation or a wire contacting the exhaust.

Check for a poor connection or a damaged harness – inspect the harness connectors for the following conditions:

- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Damaged harness

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0141 is the result of a hard failure or an intermittent condition. With the ignition ON, engine OFF, the HO2S2 voltage displayed on the scan tool should change within several minutes toward 0 or 1 volt, indicating that the heater is working properly.
3. Probing terminal D of the HO2S2 connector verifies if voltage is available to the HO2S2 heater.
4. If voltage is available at the connector, than it becomes a good voltage source to check for a ground at terminal 3.
5. Determines if voltage is not available at the HO2S2 due to an open in the HO2S2 fuse or open ignition feed circuit. If the fuse is open, determine if it was due to a short in the ignition feed circuit before replacing the fuse.

DTC P0141 – Rear Heated Oxygen Sensor (HO2S2) Heater Circuit Not Functioning

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Disconnect the Rear Heated Oxygen Sensor (HO2S2) connector. 3. Turn the ignition ON. 4. Using a voltmeter, measure the voltage at terminal 4 of HO2S2 and ground. Is the voltage within the specified value?	11–14 V	Go to *Step 3*	Go to ”Main Relay Circuit Check”
3	1. Turn the ignition OFF. 2. Disconnect the HO2S2 connector. 3. Check the connections at HO2S2 connector, terminal 3 and 4 and repair as needed. Is the repair complete?	–	Go to *Step 10*	Go to *Step 4*
4	Disconnect the Engine control Module (ECM) connector. Check the connection at the ECM connector, terminal M2 and repair as needed.	–	Go to *Step 10*	Go to *Step 5*
5	1. Using ohmmeter, measure the resistance between terminal 3 of the HO2S2 and terminal M2 of the ECM. Is the resistance equal to the specified value? 1. Using a voltmeter, measure the voltage between terminal M2 of the ECM and ground. Is the voltage within the specified value?	0 Ω ≈ 0 V	Go to *Step 7*	Go to *Step 6*
6	Repair an open or short to voltage circuit. Is the repair complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
7	Check he continuity between terminal 3 and 4 of the HO2S2. Is a problem found?	–	Go to *Step 8*	Go to *Step 9*
8	1. Turn the ignition OFF. 2. Replace the HO2S2. Is the repair complete?	–	Go to *Step 10*	–
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 10*	–
10	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 11*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC Table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0171

FUEL TRIM SYSTEM TOO LEAN

System Description

To provide the best possible combination of driveability, fuel economy, and emission control, a Closed Loop air/fuel metering system is used. While in Closed Loop, the Engine Control Module (ECM) monitors the Front Heated Oxygen Sensor (HO2S1) signal voltage and adjusts fuel delivery based on signal voltage. A change made to fuel delivery will be indicated by the long and short term fuel trim values which can be monitored with the scan tool. Ideal fuel trim values are around 128 (0%). If the HO2S1 signal is indicating a lean condition, the ECM will add fuel resulting in fuel trim values above 128 (0% to 100%). If a rich condition is detected, the fuel trim values will be below 128 (0% to –100%), indicating that the ECM is reducing the amount of fuel delivered. If exhaust emissions reach an excessive level due to a lean or rich condition, a fuel trim Diagnostic Trouble Code (DTC) is set.

Conditions for Setting the DTC

- The average of adaptive index multiplier value is greater than 1.28.
- No intrusive tests active.
- DTCs P0106, P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0132, P0133, P0134, P0135, P1167, P1171, P0300, P0336, P0337, P0341, P0342, P0402, P0404, P1404, P0405, P0406, P0443, P0506, and P0507 are not set.
- Throttle Position (TP) is less than 95%.
- Engine speed is between 700 and 6000 rpm.
- Barometric Pressure (BARO) is greater than 72.0 kPa (10.4 psi).
- Coolant temperature is between 70˚C (158˚F) and 115˚C (239˚F).
- Manifold Absolute Pressure (MAP) is between 25 kPa (3.6 psi) and 99.7 kPa (14.5 psi).
- Intake Air Temperature (IAT) is between –40˚C (–40˚F) and 120˚C (248˚F).
- Airflow is between 1.5 and 45 g/sec.
- Vehicle speed is less than 140 km/h (87 mph).
- System is in closed loop.
- Adaptive index is ready.
- System voltage is greater than 11 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after two consecutive ignitions cycle in which the diagnostic runs with the fault active.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after two consecutive ignition cycles in which the diagnostic runs without a fault within the freeze frame conditions that the DTC failed.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Important : After repairs, use the scan tool Fuel Trim Reset function to reset the long–term fuel trim to 128 (0%).

- Fuel pressure – The system will be lean if the pressure is too low. It may be necessary to monitor fuel pressure while driving the vehicle at various road speeds and/or loads to confirm.
- Map sensor – An output that causes the ECM to sense a lower than normal manifold pressure (high vacuum) can cause the system to go lean. Disconnecting the MAP sensor will allow the ECM to substitute a fixed (default) value for the MAP sensor. If the lean condition is gone when the sensor is disconnected, substitute a known good sensor and recheck.
- Fuel contamination – Water, in even small amounts, near the in–tank fuel pump inlet can be delivered to the injector. The water causes a lean exhaust and can set DTC P0171.

Check for poor HO2S1 or MAP sensor connection at the ECM. Inspect the harness connectors for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection

Inspect the wiring harness for damage. If the harness appears to be OK, observe the HO2S1 display on the scan tool while moving the connectors and the wiring harness related to the engine harness. A change in the display will indicate the location of the fault.

Check the brake power booster check valve for possible leaks.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure re-

cords data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

5. Visually/physically checking items which may cause a lean condition may determine the cause of the DTC being set and save diagnosis time.
9. A vacuum leak can change the Fuel Trim Index and set DTC P0171. This step checks the intake manifold for vacuum leaks.
11. Contaminants in fuel, such as alcohol or water, can create a lean condition setting DTC P0171. Checking for these contaminants could identify the malfunction.
17. If no faults have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” for additional checks and information.

DTC P0171 – Fuel Trim System Too Lean

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install the scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Are any component related Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	With the engine running, operate the vehicle until the LOOP STATUS indicates closed. Is the Long Term Fuel Trim value below the specified value?	25%	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Does the Long Term Fuel Trim value go below the specified value while operating under the specified conditions?	25%	Go to *Step 16*	Go to *Step 5*
5	Visually/physically check the following items: • Vacuum hoses for splits, kinks and improper connections. • Crankcase ventilation oil/air separator for proper installation. • Exhaust system for corrosion, leaks, loose or missing hardware. • Front Heated Oxygen Sensor (HO2S1) is installed securely and the pigtail harness is not contacting exhaust manifold or engine. • Fuel for excessive water, alcohol, or other contaminants. • Engine Control Module (ECM) and sensor grounds are clean, tight, and in their proper locations. Do any of the above checks isolate a condition requiring repair?	–	Go to *Step 7*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
6	1. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector. 2. Operate the vehicle in Closed Loop while monitoring the Long Term Fuel Trim value. Is the Long Term Fuel Trim value below the specified value?	25%	Go to *Step 15*	Go to *Step 9*
7	1. Repair the malfunction found in Step 5. 2. Recheck the Long Term Fuel Trim value while operating the engine. Is the Long Term Fuel Trim value below the specified value?	25%	Go to *Step 8*	Go to *Step 9*
8	Lean condition is not present. Does a driveability problem exist?	–	Go to ”Symptom Diagnosis”	Go to *Step 16*
9	1. Visually/physically inspect the following items for vacuum leaks: • Intake manifold. • Throttle body. • Injector O–rings. 2. Repair any leaks found as necessary. Is the repair complete?	–	Go to *Step 16*	Go to *Step 10*
10	Allow the engine to idle. Are the Idle Air Control (IAC) counts above the specified value?	5	Go to *Step 11*	Go to *Step 12*
11	Check the fuel for excessive water, alcohol, or other contaminants and correct the contaminated fuel condition if present. Is the repair complete?	–	Go to *Step 16*	Go to *Step 13*
12	Check the IAC valve performance. Refer to ”DTC P0506 Idle Speed RPM Lower Than Desired Idle Speed” or ”DTC P0507 Idle Speed RPM Higher Than Desired Idle Speed” in this section and repair as necessary. Is the repair complete?	–	Go to *Step 16*	Go to *Step 13*
13	1. Connect a fuel pressure gauge to the fuel system. 2. Turn the ignition OFF for at least 10 seconds. 3. Turn the ignition ON, with the engine OFF. The fuel pump will run for approximately 2–3 seconds. It may be necessary to cycle the ignition switch ON more than once to obtain maximum fuel pressure. 4. Note the fuel pressure with the fuel pump running. The pressure should be within the specified value. When the fuel pump stops, the pressure may vary slightly then hold steady. Is the fuel pressure steady and does the fuel pressure hold?	241–276 kPa (35–40 psi)	Go to *Step 14*	Go to ”Fuel System Diagnosis”

Step	Action	Value(s)	Yes	No
14	1. Start and idle the engine at normal operating temperature. 2. The fuel pressure noted in the above step should drop by the indicated value. Does the fuel pressure drop by the indicated value?	21–69 kPa (3–10 psi)	Go to "Fuel Injector Balance Test"	Go to "Fuel System Diagnosis"
15	Replace the MAP sensor. Is the action complete?	–	Go to *Step 16*	–
16	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 17*	Go to *Step 2*
17	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0172
FUEL TRIM SYSTEM TOO RICH

System Description

To provide the best possible combination of driveability, fuel economy, and emission control, a Closed Loop air/fuel metering system is used. While in Closed Loop, the Engine Control Module (ECM) monitors the Front Heated Oxygen Sensor (HO2S1) signal voltage and adjusts fuel delivery based on signal voltage. A change made to fuel delivery will be indicated by the long and short term fuel trim values which can be monitored with the scan tool. Ideal fuel trim values are around 128 (0%). If the HO2S1 signal is indicating a lean condition, the ECM will add fuel resulting in fuel trim values above 128 (0% to 100%). If a rich condition is detected, the fuel trim values will be below 128 (0% to –100%), indicating that the ECM is reducing the amount of fuel delivered. If exhaust emissions reach an excessive level due to a lean or rich condition, a fuel trim Diagnostic Trouble Code (DTC) is set.

Conditions for Setting the DTC

- The average of adaptive index multiplier value is less than 0.75.
- No intrusive tests active.
- DTCs P0106, P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0132, P0133, P0134, P0135, P1167, P1171, P0336, P0337, P0341, P0342, P0402, P0404, P1404, P0405, P0406, P0443, P0506, and P0507 are not set.
- Throttle Position (TP) is less than 95%.
- Engine speed is between 700 and 6000 rpm.
- Barometric Pressure (BARO) is greater than 72.0 kPa (10.4 psi).
- Coolant temperature is between 70˚C (158˚F) and 115˚C (239˚F).
- Manifold Absolute Pressure (MAP) is between 25 kPa (3.6 psi) and 99.7 kPa (14.5 psi).
- Intake Air Temperature (IAT) is between –40˚C (–40˚F) and 120˚C (248˚F).
- Airflow is between 1.5 and 45 g/sec.
- Vehicle speed is less than 140 km/h (87 mph).
- System is in closed loop.
- Adaptive index is ready.
- System voltage is greater than 11 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after two consecutive ignitions cycle in which the diagnostic runs with the fault active (SOHC).
- The Malfunction Indicator Lamp (MIL) will illuminate after first consecutive ignitions cycle (DOHC).
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after two consecutive ignition cycles in which the diagnostic runs without a fault within the freeze frame conditions that the DTC failed.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Important : After repairs, use the scan tool Fuel Trim Reset function to reset the long–term fuel trim to 128 (0%).

Check for poor connection at the ECM. Inspect the harness connectors for the following conditions:

- Backed–out terminals.
- Improper mating.
- Broken locks.
- Improperly formed.
- Damaged terminals.
- Poor terminal–to–wire connection.

Inspect the wiring harness for damage. If the harness appears to be OK, observe the HO2S1 display on the scan tool while moving the connectors and the wiring harness related to the engine harness. A change in the display will indicate the location of the fault.

If a DTC P1404 is also set, check the 5 volt reference circuits for a short to voltage.

Check for a restricted exhaust system.

A shorted 5 volt reference circuit may cause a DTC P0172 to set. Check the 5 volt reference sensors for abnormal readings.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

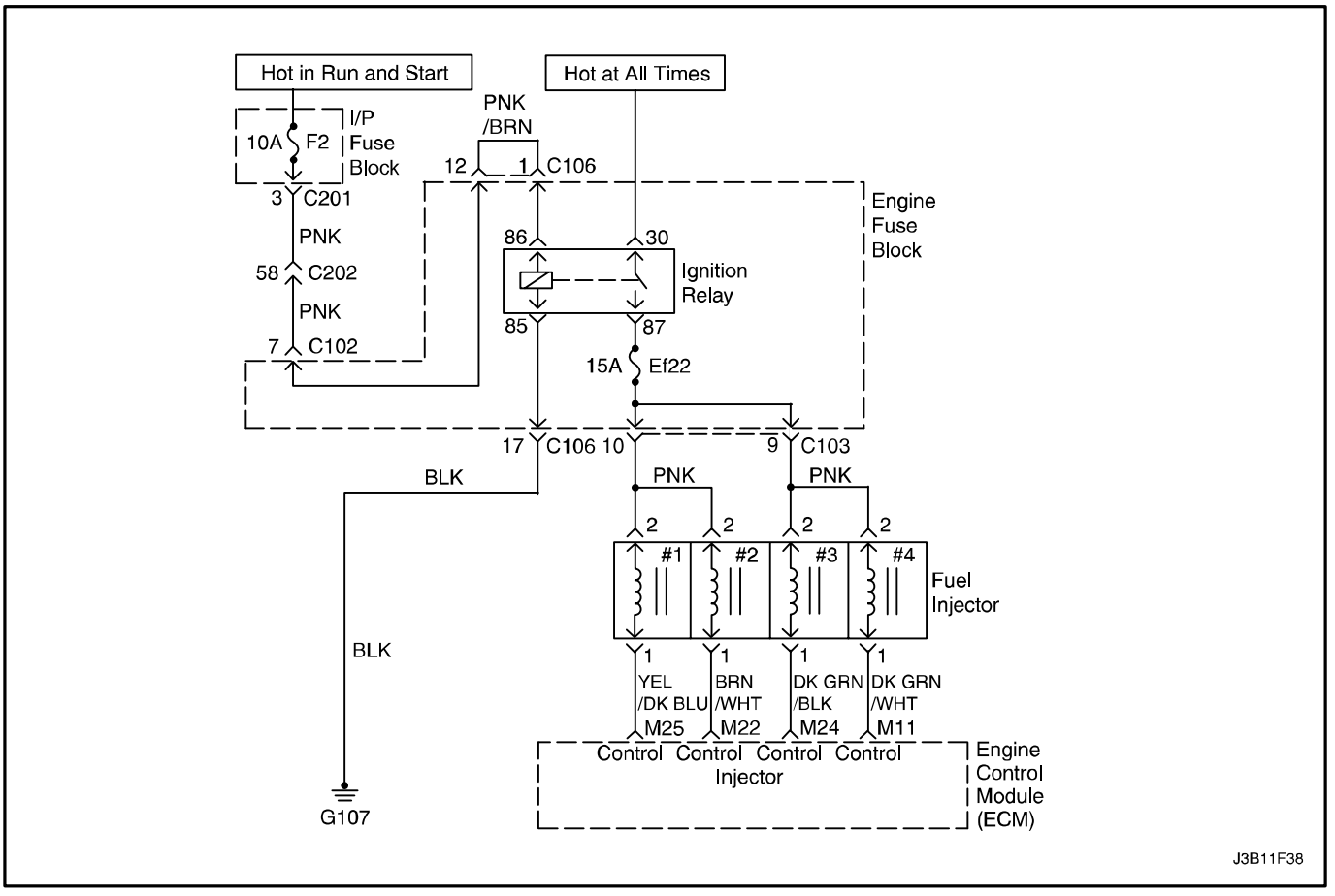
1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
5. A clogged air cleaner filter element restricts the airflow coming into the engine. This step checks the condition of the air cleaner filter.
17. A leaky injector can cause a rich condition and set DTC P0172. Refer to ”Fuel Injector Balance Test” in this section.
19. A loose TP sensor may not set a TP sensor related DTC, but may cause the system to become rich by a higher–than–actual TP reading.

DTC P0172 – Fuel Trim System Too Rich

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Install the scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Are any component related Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	With the engine running, operate the vehicle until the LOOP STATUS indicates closed. Is the Long Term Fuel Trim value above the specified value?	–20%	Go to *Step 4*	Go to *Step 5*
4	1. Turn the ignition switch ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting The DTC as noted. Does the Long Term Fuel Trim value above the specified value while operating under the specified conditions?	–20%	Go to *Step 21*	Go to *Step 5*
5	Visually/physically check the air cleaner filter for excessive dirt or being plugged and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 6*
6	Visually/physically check the air intake system for collapsed or restricted and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 7*
7	Inspect the throttle body inlet for damaged or foreign objects which may partially block the airflow and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 8*
8	1. Turn the ignition OFF. 2. Inspect the throttle bore, throttle plate and Idle Air Control (IAC) passages for clocking and foreign objects and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 9*
9	Start the engine with the vehicle in park or neutral and A/C off and note the idle quality. Is a low or unsteady idle being experienced?	–	Go to *Step 10*	Go to *Step 12*
10	Idle the engine. Are the IAC counts below the specified value?	100	Go to *Step 12*	Go to *Step 11*

Step	Action	Value(s)	Yes	No
11	1. Turn the ignition OFF. 2. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector. 3. Start the engine. 4. Operate the vehicle in Closed Loop while monitoring the Long Term Fuel Trim value. Does the Long Term Fuel Trim value increase above the specified value?	–20%	Go to *Step 20*	Go to *Step 12*
12	Check the IAC valve performance. Refer to ”DTC P0506 Idle Speed RPM Lower Than Desired Idle Speed” or ”DTC P0507 Idle Speed RPM Higher Than Desired Idle Speed”in this section and repair as necessary. Is the repair complete?	–	Go to *Step 21*	Go to *Step 13*
13	1. Disconnect the vacuum hose from the fuel pressure regulator and inspect the hose for the presence of fuel. 2. If fuel is presence in the vacuum hose, replace the fuel pressure regulator. Is the repair complete?	–	Go to *Step 21*	Go to *Step 14*
14	1. Turn the ignition ON. 2. Slowly press the acceleration pedal. Does the Throttle Position (TP) sensor display increase steady and evenly from its minimum voltage at closed throttle to its maximum voltage at Wide–Open Throttle (WOT).	–	Go to *Step 15*	Go to *Step 19*
15	1. Perform the Fuel System Diagnosis. 2. If the table isolate a problem, repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 16*
16	1. Perform the Evaporative Emission (EVAP) Control System Diagnosis. 2. If the table isolate a problem, repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 17*
17	1. Perform the Fuel Injector Balance Test. 2. If the table isolate a problem, repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to *Step 18*
18	1. Remove the Front Heated Oxygen Sensor (HO2S1). 2. Visually/physically inspect the HO2S1 for silicone contamination. **Note :** this will be indicated by a powdery white deposit on the portion of the HO2S1 exposed to the exhaust stream. 1. If contamination is present on the HO2S1, find the source and repair as needed. Is the repair complete?	–	Go to *Step 21*	Go to ”Diagnostic Aids”
19	1. Check the TP sensor mounting screws. 2. If they are too loose or missing tighten or replace them as needed. 3. If the screws are OK, replace the TP sensor. Is the repair complete?	–	Go to *Step 21*	–

Step	Action	Value(s)	Yes	No
20	1. Turn the ignition OFF. 2. Replace the MAP sensor. Is the repair complete?	–	Go to *Step 21*	–
21	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 22*	Go to *Step 2*
22	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0201

INJECTOR 1 CIRCUIT FAULT

Circuit Description

The Engine Control Module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a short to ground and/or an open circuit and short to battery conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- Monitor fault feedback signal from FETS.
- Engine is in run mode.
- Battery voltage is greater than 9 volts.
- Engine speed is greater than 700 rpm.
- Fault is present for more than 5 seconds.

Action Taken When the DTC Sets

- The ECM will illuminate the Malfunction Indicator Lamp (MIL) the first time the fault is Detected.
- The ECM will store conditions which were present when the DTC was set as Freeze Frame and in the Failure Records data.

Conditions for Clearing the MIL/DTC

- The ECM will turn off the MIL on the third consecutive trip cycle in which the diagnostic has been run and the fault is no longer present.
- A history will clear after 40 consecutive warm–up cycles without a fault.
- DTC can be cleared by using the scan tool Clear Info function.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An injector 1 driver circuit that is open or shorted to voltage will cause a DTC P0201 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–term fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel Injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than if tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5 Ω

Test Description

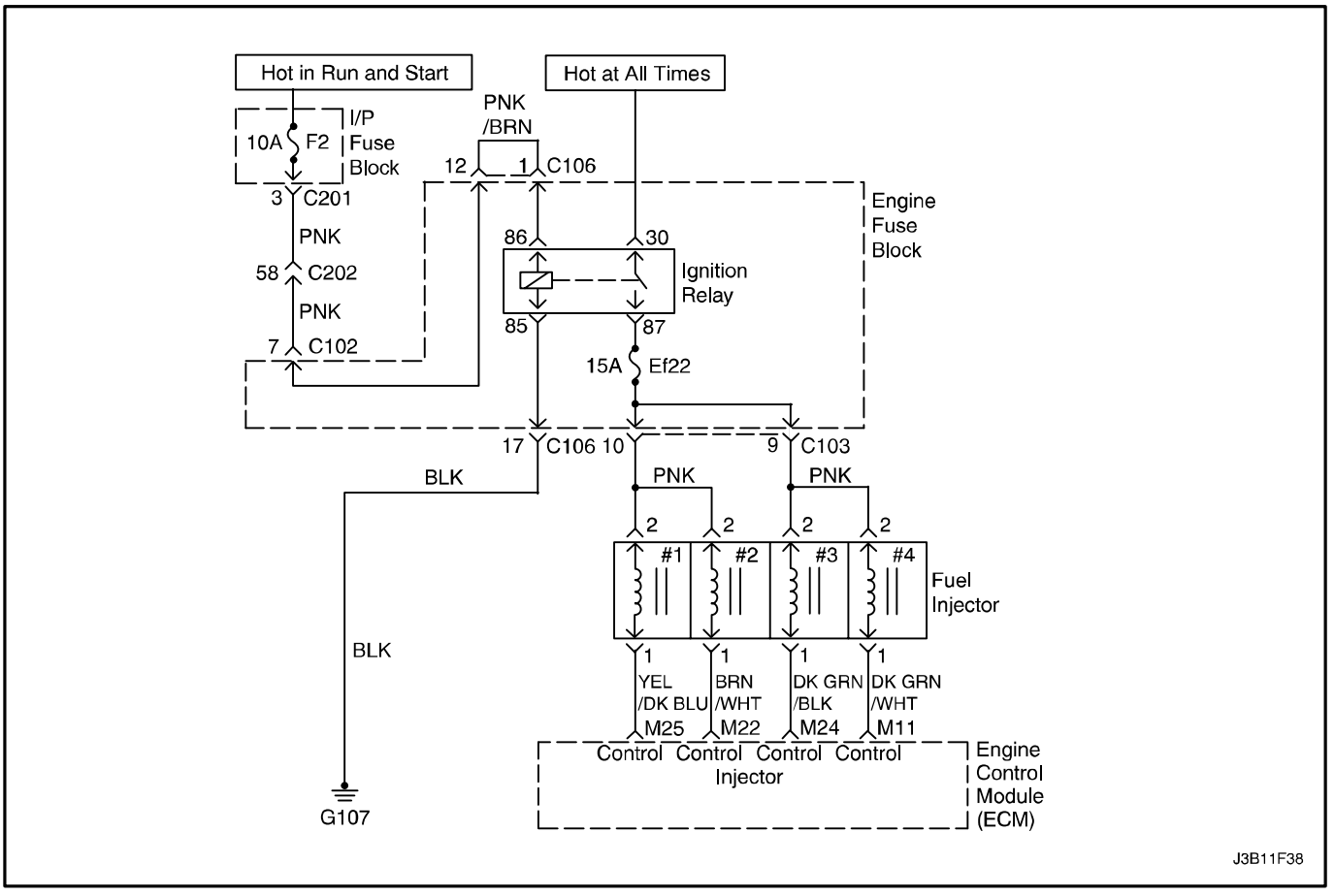
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. This step determines if DTC P0201 is the result of a hard failure or an intermittent condition.
5. This step tests the wiring harness and the ECM control of the injectors using a test light.
7. This step determines if the circuitry is shorted to voltage or the ECM is faulty.
9. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0201 – Injector 1 Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Will the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Clear the Diagnostic Trouble Codes (DTCs) using a scan tool. 4. Start the engine and idle for one minute. Does DTC P0201 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions as noted. Does DTC P0201 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector for injector 1. 3. Turn the ignition ON, with the engine OFF. 4. With a test light connected to ground, probe the driver circuit, terminal M25. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 6*
6	Repair the short to ground or open in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	–
7	1. Disconnect the injector 1 wiring connection. 2. With a test light connected to ground, probe the driver circuit, terminal 1. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
8	Repair the short to voltage in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 10*	–
10	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0202

INJECTOR 2 CIRCUIT FAULT

Circuit Description

The Engine Control Module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a short to ground and/or an open circuit and short to battery conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- Monitor fault feedback signal from FETS.
- Engine is in run mode.
- Battery voltage is greater than 9 volts.
- Engine speed is greater than 700 rpm.
- Fault is present for more than 5 seconds.

Action Taken When the DTC Sets

- The ECM will illuminate the Malfunction Indicator Lamp (MIL) the first time the fault is Detected.
- The ECM will store conditions which were present when the DTC was set as Freeze Frame and in the Failure Records data.

Conditions for Clearing the MIL/DTC

- The ECM will turn off the MIL on the third consecutive trip cycle in which the diagnostic has been run and the fault is no longer present.
- A history will clear after 40 consecutive warm–up cycles without a fault.
- DTC can be cleared by using the scan tool Clear Info function.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An injector 2 driver circuit that is open or shorted to voltage will cause a DTC P0202 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–term fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than if tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5 Ω

Test Description

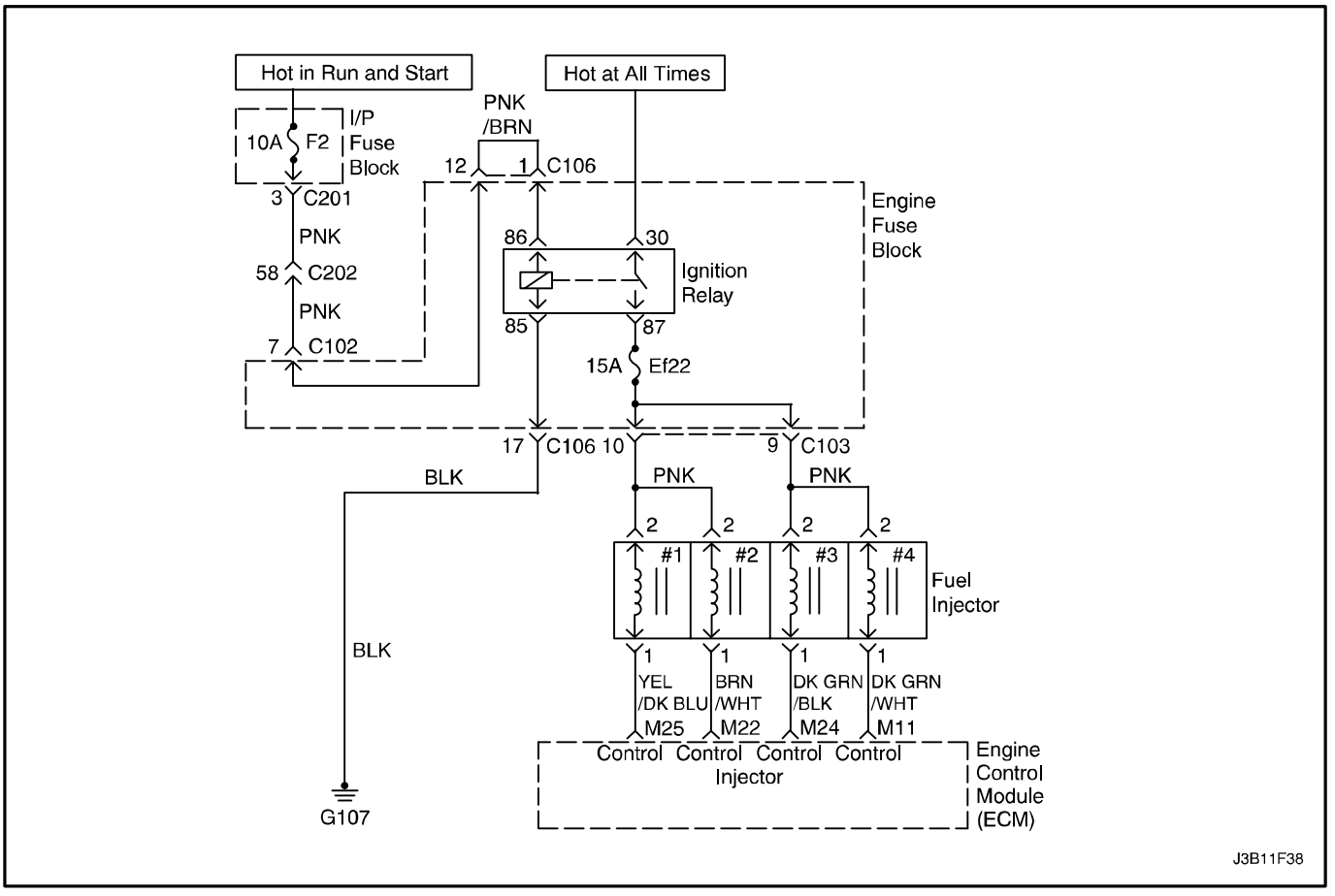
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. This step determines if DTC P0201 is the result of a hard failure or an intermittent condition.
5. This step tests the wiring harness and the ECM control of the injectors using a test light.
7. This step determines if the circuitry is shorted to voltage or the ECM is faulty.
9. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0202 – Injector 2 Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Will the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Clear the Diagnostic Trouble Codes (DTCs) using a scan tool. 4. Start the engine and idle for one minute. Does DTC P0202 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions as noted. Does DTC P0202 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector for injector 2. 3. Turn the ignition ON, with the engine OFF. 4. With a test light connected to ground, probe the driver circuit, terminal M22. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 6*
6	Repair the short to ground or open in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	
7	1. Disconnect the injector 2 wiring connection. 2. With a test light connected to ground, probe the driver circuit, terminal 1. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
8	Repair the short to voltage in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 10*	–
10	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0203

INJECTOR 3 CIRCUIT FAULT

Circuit Description

The Engine Control Module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a short to ground and/or an open circuit and short to battery conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- Monitor fault feedback signal from FETS.
- Engine is in run mode.
- Battery voltage is greater than 9 volts.
- Engine speed is greater than 700 rpm.
- Fault is present for more than 5 seconds.

Action Taken When the DTC Sets

- The ECM will illuminate the Malfunction Indicator Lamp (MIL) the first time the fault is Detected.
- The ECM will store conditions which were present when the DTC was set as Freeze Frame and in the Failure Records data.

Conditions for Clearing the MIL/DTC

- The ECM will turn off the MIL on the third consecutive trip cycle in which the diagnostic has been run and the fault is no longer present.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC can be cleared by using the scan tool Clear Info function.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An injector 3 driver circuit that is open or shorted to voltage will cause a DTC P0203 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–term fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than if tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5 Ω.

Test Description

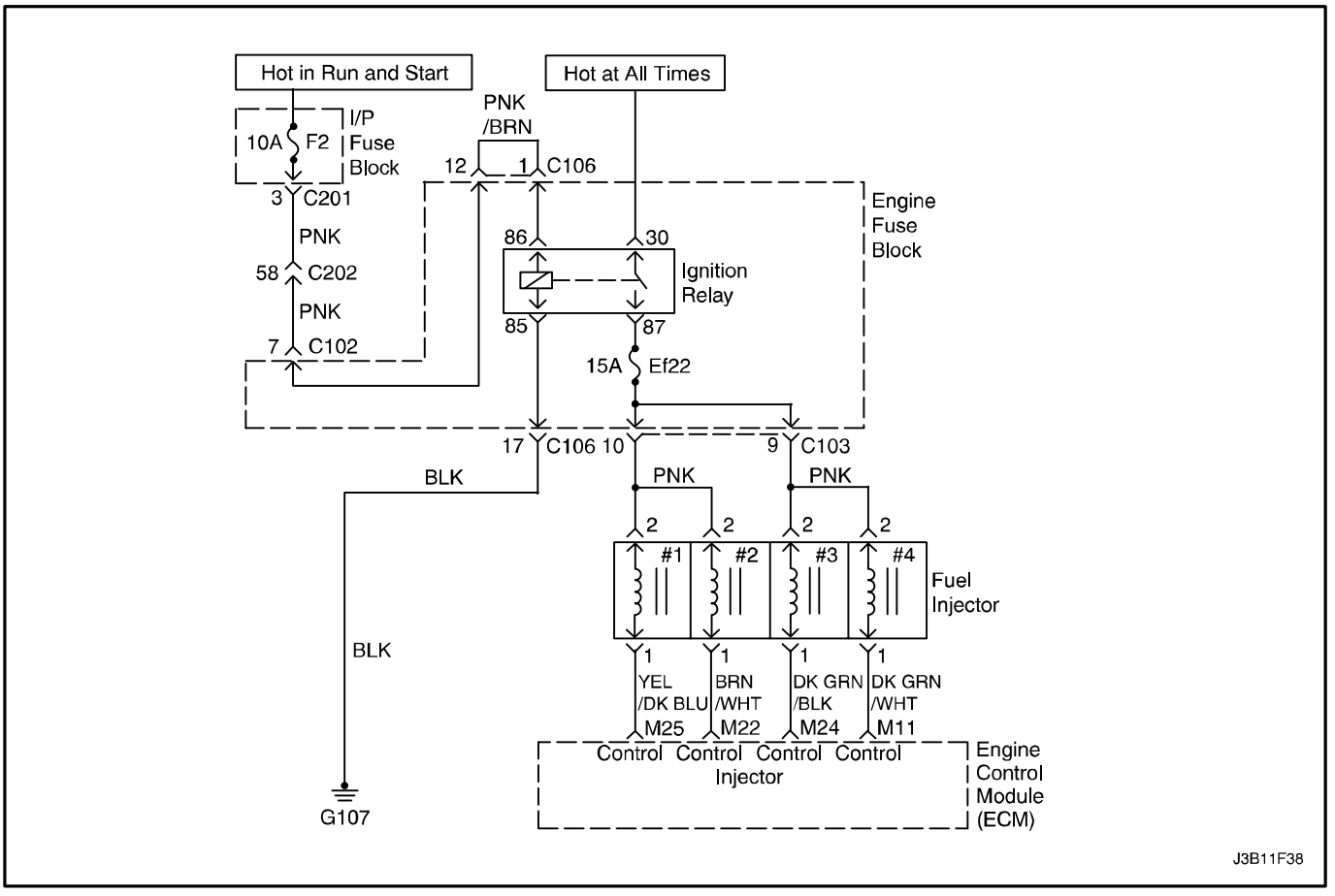
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. This step determines if DTC P0203 is the result of a hard failure or an intermittent condition.
5. This step tests the wiring harness and ECM control of the injectors using a test light.
7. This step determines if the circuitry is shorted to voltage or the ECM is faulty.
9. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0203 – Injector 3 Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Will the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool to the Data Link Connector DLC). 2. Turn the ignition ON, with the engine OFF. 3. Clear the Diagnostic Trouble Codes (DTCs) using a scan tool. 4. Start the engine and idle for one minute. Does DTC P0203 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions as noted. Does DTC P0203 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector for injector 3. 3. Turn the ignition ON, with the engine OFF. 4. With a test light connected to ground, probe the driver circuit, terminal M24. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 6*
6	Repair the short to ground or open in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	–
7	1. Disconnect the injector 3 wiring connection. 2. With a test light connected to ground, probe the driver circuit, terminal 1. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
8	Repair the short to voltage in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 10*	–
10	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0204

INJECTOR 4 CIRCUIT FAULT

Circuit Description

The Engine Control Module (ECM) has four individual injector driver circuits, each of which controls an injector. When a driver circuit is grounded by the ECM, the injector is activated. The ECM monitors the current in each driver circuit. The ECM measures a voltage drop through a fixed resistor and controls it. The voltage on each driver is monitored to detect a fault. If the voltage is not what the ECM expects to monitor on the circuit, a Diagnostic Trouble Code (DTC) is set. This DTC detects a short to ground and/or an open circuit and short to battery conditions for low–side drive injector outputs.

Conditions for Setting the DTC

- Monitor fault feedback signal from FETS.
- Engine is in run mode.
- Battery voltage is greater than 9 volts.
- Engine speed is greater than 700 rpm.
- Fault is present for more than 5 seconds.

Action Taken When the DTC Sets

- The ECM will illuminate the Malfunction Indicator Lamp (MIL) the first time the fault is Detected.
- The ECM will store conditions which were present when the DTC was set as Freeze Frame and in the Failure Records data.

Conditions for Clearing the MIL/DTC

- The ECM will turn off the MIL on the third consecutive trip cycle in which the diagnostic has been run and the fault is no longer present.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC can be cleared by using the scan tool Clear Info function.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An injector 4 driver circuit that is open or shorted to voltage will cause a DTC P0204 to set. It will also cause a misfire due to an inoperative injector. A misfire DTC should also be set indicating which injector is inoperative.

Long–term and short–term fuel trims that are excessively high or low are a good indication that an injector is malfunctioning. Refer to ”Fuel injector Balance Test” in this section to check for malfunctioning injectors.

The injector resistance tested at the ECM connection is slightly more than if tested directly at the injector because it includes resistance of the harness wires. The normal value is about 13.5 Ω.

Test Description

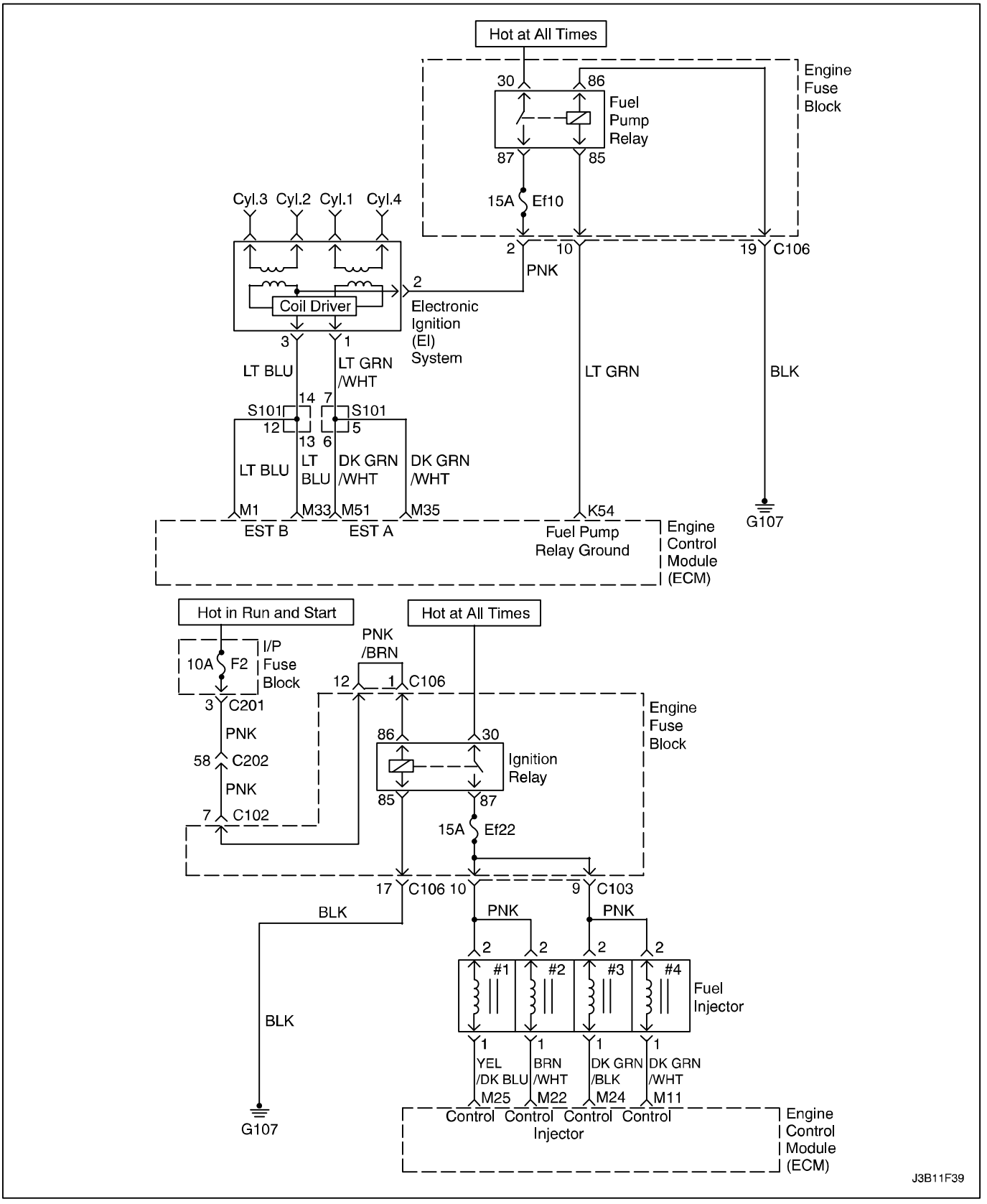
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. This step determines if DTC P0204 is the result of a hard failure or an intermittent condition.
5. This step tests the wiring harness and ECM control of the injectors using a test light.
7. This step determines if the circuitry is shorted to voltage or the ECM is faulty.
9. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0204 – Injector 4 Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Will the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Clear the Diagnostic Trouble Codes (DTCs) using a scan tool. 4. Start the engine and idle for one minute. Does DTC P0204 reset?	–	Go to *Step 5*	Go to *Step 4*
4	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions as noted. Does DTC P0204 reset?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
5	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector for injector 4. 3. Turn the ignition ON, with the engine OFF. 4. With a test light connected to ground, probe the driver circuit, terminal M11. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 6*
6	Repair the short to ground or open in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	–
7	1. Disconnect the injector 4 wiring connection. 2. With a test light connected to ground, probe the driver circuit, terminal 1. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
8	Repair the short to voltage in the injector driver circuit. Is the repair complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 10*	–
10	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK


Hot at All Times
Engine Fuse Block
30
86
Fuel Pump Relay
87
85
15A Ef10
Cyl.3 Cyl.2 Cyl.1 Cyl.4
2
10
19 C106
PNK
2
Coil Driver
Electronic Ignition (EI) System
3
1
LT BLU
LT GRN /WHT
LT GRN
BLK
14 7
S101
12
S101
5
13 6
LT BLU
LT BLU
DK GRN /WHT
DK GRN /WHT
M1
M33
M51
M35
K54
G107
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
Hot in Run and Start
Hot at All Times
PNK /BRN
I/P Fuse Block
10A F2
12
1 C106
3 C201
Engine Fuse Block
PNK
86
30
58 C202
Ignition Relay
PNK
85
87
7 C102
15A Ef22
17 C106 10
9 C103
BLK
PNK
PNK
2
2
2
2
#1
#2
#3
#4
Fuel Injector
BLK
1
1
1
1
YEL /DK BLU
BRN /WHT
DK GRN /BLK
DK GRN /WHT
M25
M22
M24
M11
G107
Control Injector
Control
Control
Control
Engine Control Module (ECM)
J3B11F39

DIAGNOSTIC TROUBLE CODE (DTC) P0300
MULTIPLE CYLINDER MISFIRE DETECTED

System Description

The Engine Control Module (ECM) monitors the crankshaft and camshaft positions to detect if the engine is misfiring. The ECM looks for a quick drop in crankshaft speed. This test is executed in blocks of 100 engine revolution tests. It may take between one to several tests to store a Diagnostic Trouble Code (DTC) and illuminate the Malfunction Indicator Lamp (MIL). Under light misfire conditions, it may also take more than one trip to set a DTC. Severe misfire will flash the MIL, indicating that catalyst damage is possible.

Conditions for Setting the DTC

- Emission threshold is 3%.
- 20 engine cycles have occurred since cranking has started.
- A/C compressor clutch has not just engaged or disengaged.
- Engine load and engine speed is in a detectable region and is at or above zero torque.
- Camshaft Position (CMP) sensor is in synchronization.
- Exhaust Gas Recirculation (EGR) flow diagnostic is not in progress.
- Fuel level is greater than 12% of rated tank capacity.
- Decel Fuel Cutoff (DFCO) not active.
- Throttle position change is less than 3% per 125 ms.
- Vehicle has not encountered an abusive engine speed of 7000 rpm.
- Crankshaft speed patters are normal.
- Throttle position is less than 3% when vehicle speed is greater than 10 km/h (6 mph).
- Vehicle voltage is between 11 and 16 volts.
- Engine Coolant Temperature (ECT) is between –7˚C (19˚F) and 120˚C (248˚F).
- There is the correct ratio between Crankshaft Position (CKP) sensor pulses and CMP sensor pulses.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0336, P0337, P0341, P0342 and P0502 are not set.

Action Taken When the DTC Sets

- The MIL will illuminate after two consecutive ignition cycles in which the diagnostic runs with the fault active.

Or

- The MIL will illuminate immediately and flash if misfire is present.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault within the freeze frame conditions that the DTC failed.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent can also be the result of a defective reluctor wheel. Remove the CKP sensor and inspect the reluctor wheel through the sensor mount hole. Check for porosity and the condition of wheel. If the DTC is intermittent refer to ”Symptoms Diagnosis” in this section.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. A visual/physical inspection should include checking the following components:
   - The wiring for proper connections, pinches or cuts.
   - The ECM grounds for being clean and tight.
   - The vacuum hoses for splits, kinks, and proper connections as shown on the Vehicle Emission Information label. Check thoroughly for any type of leak or restriction.
   - For air leaks at the throttle body mounting area and intake manifold sealing surfaces.
5. When all the accumulators are relatively equal, then the misfire is being caused by something that affects the entire engine. When they are not then the misfire is being caused by something that is specific to two or more cylinders.
6. Whenever the misfire is not present operating the vehicle may be necessary to duplicate the conditions in the Freeze Frame Data in order to detect misfire. Depending on the engine load, the conditions may have to be maintained for up to 20 seconds. Whenever the misfire accumulators start to increment, then misfire is present. A history misfire counter will store the number of misfires that have occurred until the DTC is cleared.

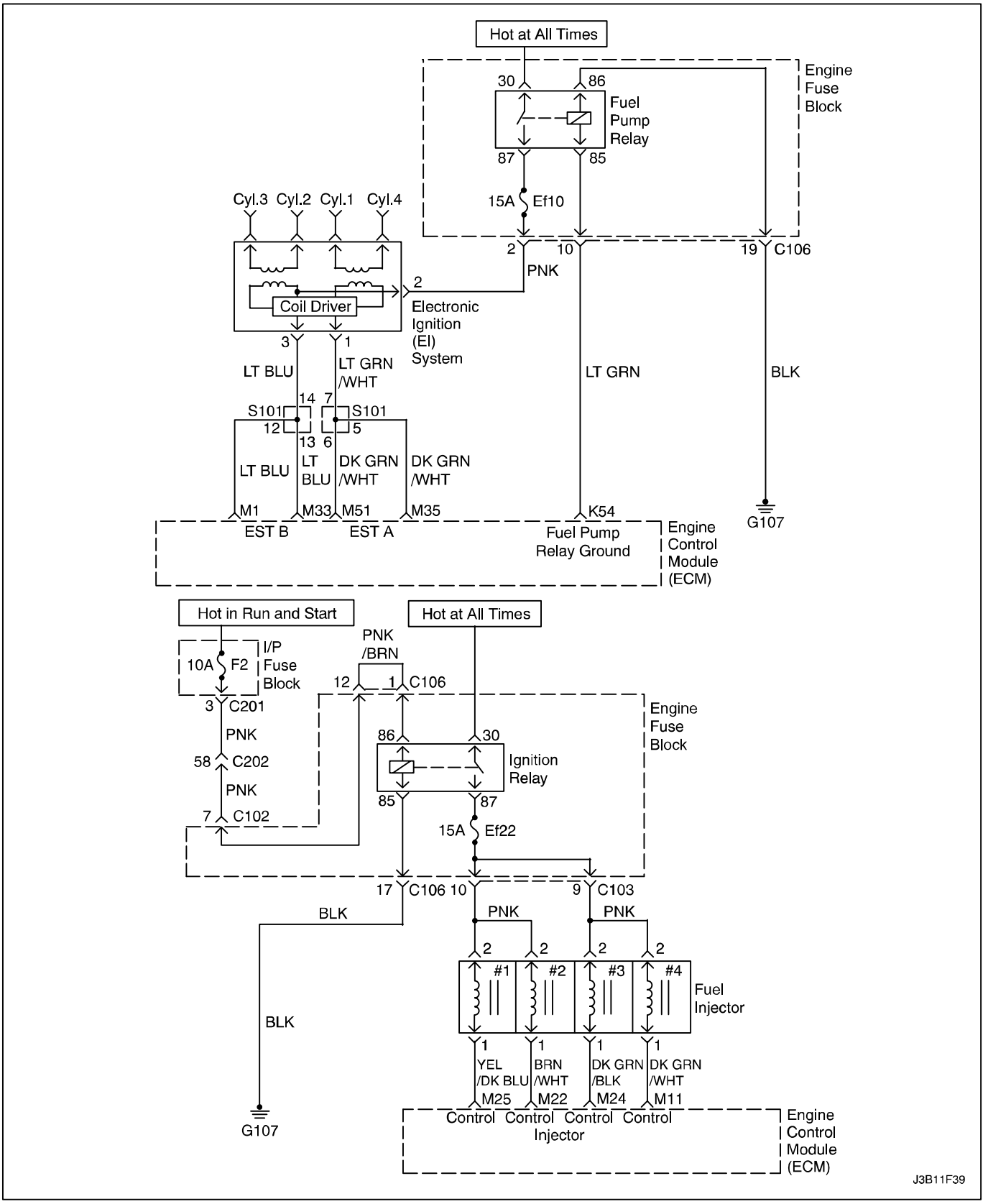
8. Check fuel for water, alcohol, etc.
9. A basic engine problem that affects all cylinders is the only possibility at this point. (Cam timing, throttle body leak, restricted air flow, etc.)
11. Tests the ignition system voltage output using a spark tester.
12. Replace any spark plugs that are worn, cracked or fouled.
13. Checks for voltage at the ignition feed circuit.
18. Whenever the driver circuit is shorted to ground, the light will be on steady. When the driver circuit is shorted to voltage or open, the light will be off.
19. Since voltage is supplied to the fuel injector on a single circuit, the malfunction could only be a poor connection or open in the fuel injector harness. An open before the harness would result in an ”Engine Cranks But Will Not Run” complaint.
28. Before replacing the ECM, check terminals for improper mating, broken locks, or physical damage to the wiring harness. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0300 – Multiple Cylinder Misfire Detected

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs) Are DTCs P0201, P0202, P0203, P0204 set?	–	Go to applicable DTC	Go to *Step 3*
3	1. Perform a visual/physical inspection. 2. Make any repairs that are necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 4*
4	Start the engine and allow it to idle. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to *Step 6*
5	Are all counters equal (within a percentage of each other)?	–	Go to *Step 7*	Go to *Step 11*
6	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data, and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for setting this DTC as noted. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
7	1. Turn the engine OFF. 2. Install a fuel pressure gauge to the fuel rail. 3. Observe the fuel pressure with the engine running. Is the fuel pressure within the specified value?	284–325 kPa (41–47 psi)	Go to *Step 8*	Go to ”Fuel System Diagnosis”
8	Check the fuel for contamination. Is the fuel OK?	–	Go to *Step 9*	Go to *Step 10*
9	Check for a basic engine problem and repair as necessary. Is the repair complete?	–	Go to *Step 27*	–
10	Replace the contaminated fuel. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
11	1. Turn the engine OFF. 2. Disconnect the fuel injector harness connector. 3. Install a spark tester on cylinder #1 spark plug cable. 4. Crank the engine and check for spark. 5. Repeat the above procedure on cylinders #2, #3 and #4. Is a spark observed on all four spark plug cables?	–	Go to *Step 12*	Go to *Step 20*
12	Replace any malfunctioning spark plugs if necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 13*
13	1. Turn the engine OFF. 2. Disconnect the fuel injector connectors from the injectors. 3. Install an injector test light on the injector harness connector for the cylinders that had misfired. 4. Crank the engine and note the test light. Does the injector test light blink?	–	Go to *Step 14*	Go to *Step 15*
14	Perform the Fuel Injector Balance Test. Are the fuel injectors OK?	–	Go to *Step 9*	Go to *Step 16*
15	1. Disconnect the injector test light. 2. With a test light connected to ground, probe the ignition feed terminal 2 of the injector harness connector for each cylinder that had misfire. 3. Crank the engine. Does the test light illuminate?	–	Go to *Step 17*	Go to *Step 19*
16	Replace any malfunctioning fuel injectors. Is the repair complete?		Go to *Step 27*	–
17	Check the affected fuel injector driver circuit at terminals M25, M22, M24, and M11 for an open, short, or short to voltage. Is a problem found?	–	Go to *Step 18*	Go to *Step 24*
18	Repair the open or the shorted fuel injector driver circuit. Is the repair complete?	–	Go to *Step 26*	–
19	Repair the open ignition feed circuit between the fuel injector harness connector and the fuel injector connector. Is the repair complete?	–	Go to *Step 27*	–
20	Measure the resistance of the spark plug cable that the spark plug tester did not spark. Is the resistance of the spark plug cable less than the specified value?	30,000 Ω	Go to *Step 21*	Go to *Step 25*
21	Inspect the Engine Control Module (ECM) connector and connections. Are the connections OK?	–	Go to *Step 22*	Go to *Step 23*
22	Check the affected cylinders ignition control circuit for an open or short and repair as necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 26*

Step	Action	Value(s)	Yes	No
23	Repair the connector or connections. Is the repair complete?	–	Go to *Step 27*	–
24	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 27*	–
25	Replace the spark plug cable. Is the repair complete?	–	Go to *Step 27*	–
26	Replace the faulty ignition coil. Is the repair complete?	–	Go to *Step 27*	Go to *Step 24*
27	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 28*	Go to *Step 2*
28	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK


Hot at All Times
Engine Fuse Block
30
86
Fuel Pump Relay
87
85
15A Ef10
2
10
19 C106
PNK
Cyl.3 Cyl.2 Cyl.1 Cyl.4
Coil Driver
2
Electronic Ignition (EI) System
3
1
LT BLU
LT GRN /WHT
LT GRN
BLK
14 7
S101
12
S101
5
13 6
LT BLU
LT BLU
DK GRN /WHT
DK GRN /WHT
M1
M33
M51
M35
K54
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
G107
Hot in Run and Start
Hot at All Times
PNK /BRN
10A F2
I/P Fuse Block
12
1
C106
3 C201
PNK
58 C202
PNK
7 C102
Engine Fuse Block
86
30
Ignition Relay
85
87
15A Ef22
17 C106 10
9 C103
BLK
PNK
PNK
2
2
2
2
#1
#2
#3
#4
Fuel Injector
1
1
1
1
YEL /DK BLU
BRN /WHT
DK GRN /BLK
DK GRN /WHT
M25
M22
M24
M11
Control
Control
Control
Control
Injector
Engine Control Module (ECM)
BLK
G107
J3B11F39

DIAGNOSTIC TROUBLE CODE (DTC) P0301

CYLINDER 1 MISFURE

System Description

The Engine Control Module (ECM) monitors the crankshaft and camshaft positions to detect if the engine is misfiring. The ECM looks for a quick drop in crankshaft speed. This test is executed in blocks of 100 engine revolution tests. It may take between one to several tests to store a Diagnostic Trouble Code (DTC) and illuminate the Malfunction Indicator Lamp (MIL). Under light misfire conditions, it may also take more than one trip to set a DTC. Severe misfire will flash the MIL, indicating that catalyst damage is possible.

Conditions for Setting the DTC

- Emission threshold is 3%.
- 20 engine cycles have occurred since cranking has started.
- A/C compressor clutch has not just engaged or disengaged.
- Engine load and engine speed is in a detectable region and is at or above zero torque.
- Camshaft Position (CMP) sensor is in synchronization.
- Exhaust Gas Recirculation (EGR) flow diagnostic is not in progress.
- Fuel level is greater than 12% of rated tank capacity.
- Decel Fuel Cutoff (DFCO) not active.
- Throttle position change is less than 3% per 125 ms.
- Vehicle has not encountered an abusive engine speed of 7000 rpm.
- Crankshaft speed patters are normal.
- Throttle position is less than 3% when vehicle speed is greater than 10 km/h (6 mph).
- Vehicle voltage is between 11 and 16 volts.
- Engine Coolant Temperature (ECT) is between –7˚C (19˚F) and 120˚C (248˚F).
- There is the correct ratio between Crankshaft Position (CKP) sensor pulses and CMP sensor pulses.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0336, P0337, P0341, P0342 and P0502 are not set.

Action Taken When the DTC Sets

- The MIL will illuminate after two consecutive ignition cycles in which the diagnostic runs with the fault active.

Or

- The MIL will illuminate immediately and flash if misfire is present.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault within the freeze frame conditions that the DTC failed.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent can also be the result of a defective reluctor wheel. Remove the CKP sensor and inspect the reluctor wheel through the sensor mount hole. Check for porosity and the condition of wheel. If the DTC is intermittent refer to ”Symptoms Diagnosis” in this section.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. A visual/physical inspection should include checking the following components:
   - The wiring for proper connections, pinches or cuts.
   - The ECM grounds for being clean and tight.
   - The vacuum hoses for splits, kinks, and proper connections as shown on the Vehicle Emission Information label.
   - Check thoroughly for any type of leak or restriction.
   - For air leaks at the throttle body mounting area and intake manifold sealing surfaces.
5. When all the accumulators are relatively equal, then the misfire is being caused by something that affects the entire engine. When they are not then the misfire is being caused by something that is specific to two or more cylinders.
6. Whenever the misfire is not present operating the vehicle may be necessary to duplicate the conditions in the Freeze Frame Data in order to detect

misfire. Depending on the engine load, the conditions may have to be maintained for up to 20 seconds. Whenever the misfire accumulators start to increment, then misfire is present. A history misfire counter will store the number of misfires that have occurred until the DTC is cleared.

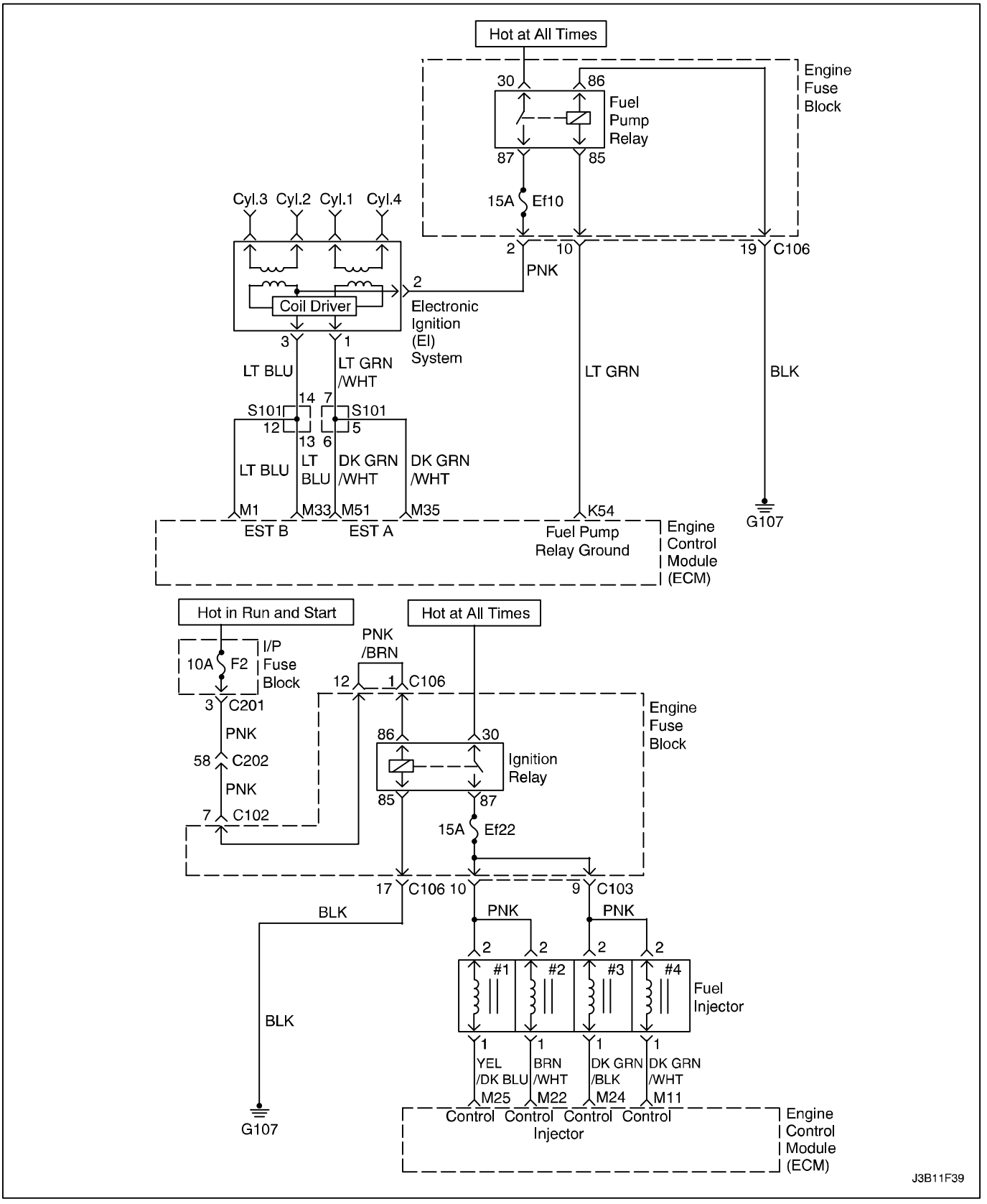
8. Check the fuel for water, alcohol, etc.
9. A basic engine problem that affects all cylinders is the only possibility at this point. (Cam timing, throttle body leak, restricted air flow, etc.)
11. Tests the ignition system voltage output using a spark tester.
12. Replace any spark plugs that are worn, cracked or fouled.
13. Checks for voltage at the ignition feed circuit.
18. Whenever the driver circuit is shorted to ground, the light will be on steady. When the driver circuit is shorted to voltage or open, the light will be off.
19. Since voltage is supplied to the fuel injector on a single circuit, the malfunction could only be a poor connection or open in the fuel injector harness. An open before the harness would result in an ”Engine Cranks But Will Not Run” complaint.
28. Before replacing the ECM, check terminals for improper mating, broken locks, or physical damage to the wiring harness. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0301 – Cylinder 1 Misfire

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC) 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs) Are DTCs P0201 or P300 set?	–	Go to applicable DTC	Go to *Step 3*
3	1. Perform a visual/physical inspection. 2. Make any repairs that are necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 4*
4	Start the engine and allow it to idle. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to *Step 6*
5	Are all counters equal (within a percentage of each other)?	–	Go to *Step 7*	Go to *Step 11*
6	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data, and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for setting this DTC as noted. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
7	1. Turn the engine OFF. 2. Install a fuel pressure gauge to the fuel rail. 3. Observe the fuel pressure with the engine running. Is the fuel pressure within the specified value?	284–325 kPa (41–47 psi)	Go to *Step 8*	Go to ”Fuel System Diagnosis”
8	Check the fuel for contamination. Is the fuel OK?	–	Go to *Step 9*	Go to *Step 10*
9	Check for a basic engine problem and repair as necessary. Is the repair complete?	–	Go to *Step 27*	–
10	Replace the contaminated fuel. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
11	1. Turn the engine OFF. 2. Disconnect the fuel injector harness connector. 3. Install a spark tester on cylinder #1 spark plug cable. 4. Crank the engine and check for spark. Is a spark observed on all four spark plug cables?	–	Go to *Step 12*	Go to *Step 20*
12	Replace the malfunctioning spark plug. Is the repair complete?	–	Go to *Step 27*	Go to *Step 13*
13	1. Turn the engine OFF. 2. Disconnect the cylinder #1 fuel injector connectors from the injector. 3. Install an injector test light on the injector harness connector, terminal 1. 4. Crank the engine and note the test light. Does the injector test light blink?	–	Go to *Step 14*	Go to *Step 15*
14	Perform the Fuel Injector Balance Test. Are the fuel injectors OK?	–	Go to *Step 9*	Go to *Step 16*
15	1. Disconnect the injector test light. 2. With a test light connected to ground, probe the ignition feed terminal 2 of the injector harness connector. 3. Crank the engine. Does the test light illuminate?	–	Go to *Step 17*	Go to *Step 19*
16	Replace the malfunctioning fuel injector. Is the repair complete?	–	Go to *Step 26*	–
17	Check the affected fuel injector driver circuit for an open, short, or short to voltage. Is a problem found?	–	Go to *Step 18*	Go to *Step 24*
18	Repair the open or the shorted fuel injector driver circuit. Is the repair complete?	–	Go to *Step 27*	–
19	Repair the open ignition feed circuit between the fuel injector harness connector and the fuel injector connector. Is the repair complete?	–	Go to *Step 27*	–
20	Measure the resistance of the spark plug cable. Is the resistance of the spark plug cable less than the specified value?	30,000 Ω	Go to *Step 21*	Go to *Step 25*
21	Inspect the Engine Control Module (ECM) connector and connections. Are the connections OK?	–	Go to *Step 22*	Go to *Step 23*
22	Check the affected cylinders ignition control circuit for an open or short and repair as needed. Is the repair complete?	–	Go to *Step 27*	Go to *Step 26*
23	Repair the connector or connections. Is the repair complete?	–	Go to *Step 27*	–
24	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 27*	–
25	Replace the spark plug cable. Is the action complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
26	Replace the faulty ignition coil. Is the repair complete?	–	Go to *Step 27*	Go to *Step 24*
27	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 28*	Go to *Step 2*
28	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK


Hot at All Times
Engine Fuse Block
30
86
Fuel Pump Relay
87
85
15A Ef10
Cyl.3 Cyl.2 Cyl.1 Cyl.4
2
10
19 C106
PNK
Coil Driver
2
Electronic Ignition (EI) System
3
1
LT BLU
LT GRN /WHT
LT GRN
BLK
14 7
S101
12
S101
5
13 6
LT BLU
LT BLU
DK GRN /WHT
DK GRN /WHT
M1
M33
M51
M35
K54
G107
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
Hot in Run and Start
Hot at All Times
PNK /BRN
I/P Fuse Block
10A F2
12
1 C106
3 C201
PNK
58 C202
PNK
7 C102
Engine Fuse Block
86
30
Ignition Relay
85
87
15A Ef22
17 C106 10
9 C103
BLK
PNK
PNK
2
2
2
2
#1
#2
#3
#4
Fuel Injector
BLK
1
1
1
1
YEL /DK BLU
BRN /WHT
DK GRN /BLK
DK GRN /WHT
M25
M22
M24
M11
G107
Control
Control
Control
Control
Injector
Engine Control Module (ECM)
J3B11F39

DIAGNOSTIC TROUBLE CODE (DTC) P0302

CYLINDER 2 MISFIRE

System Description

The Engine Control Module (ECM) monitors the crankshaft and camshaft positions to detect if the engine is misfiring. The ECM looks for a quick drop in crankshaft speed. This test is executed in blocks of 100 engine revolution tests. It may take between one to several tests to store a Diagnostic Trouble Code (DTC) and illuminate the Malfunction Indicator Lamp (MIL). Under light misfire conditions, it may also take more than one trip to set a DTC. Severe misfire will flash the MIL, indicating that catalyst damage is possible.

Conditions for Setting the DTC

- Emission threshold is 3%.
- 20 engine cycles have occurred since cranking has started.
- A/C compressor clutch has not just engaged or disengaged.
- Engine load and engine speed is in a detectable region and is at or above zero torque.
- Camshaft Position (CMP) sensor is in synchronization.
- Exhaust Gas Recirculation (EGR) flow diagnostic is not in progress.
- Fuel level is greater than 12% of rated tank capacity.
- Decel Fuel Cutoff (DFCO) not active.
- Throttle position change is less than 3% per 125 ms.
- Vehicle has not encountered an abusive engine speed of 7000 rpm.
- Crankshaft speed patters are normal.
- Throttle position is less than 3% when vehicle speed is greater than 10 km/h (6 mph).
- Vehicle voltage is between 11 and 16 volts.
- Engine Coolant Temperature (ECT) is between –7˚C (19˚F) and 120˚C (248˚F).
- There is the correct ratio between Crankshaft Position (CKP) sensor pulses and CMP sensor pulses.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0336, P0337, P0341, P0342 and P0502 are not set.

Action Taken When the DTC Sets

- The MIL will illuminate after two consecutive ignition cycles in which the diagnostic runs with the fault active.

Or

- The MIL will illuminate immediately and flash if misfire is present.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault within the freeze frame conditions that the DTC failed.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent can also be the result of a defective reluctor wheel. Remove the CKP sensor and inspect the reluctor wheel through the sensor mount hole. Check for porosity and the condition of wheel. If the DTC is intermittent refer to”Symptoms Diagnosis” in this section.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. A visual/physical inspection should include checking the following components:
   - The wiring for proper connections, pinches or cuts.
   - The ECM grounds for being clean and tight.
   - The vacuum hoses for splits, kinks, and proper connections as shown on the Vehicle Emission Information label. Check thoroughly for any type of leak or restriction.
   - For air leaks at the throttle body mounting area and intake manifold sealing surfaces.
5. When all the accumulators are relatively equal, then the misfire is being caused by something that affects the entire engine. When they are not then the misfire is being caused by something that is specific to two or more cylinders.
6. Whenever the misfire is not present operating the vehicle may be necessary to duplicate the conditions in the Freeze Frame Data in order to detect misfire. Depending on the engine load, the conditions may have to be maintained for up to 20 seconds. Whenever the misfire accumulators start to increment, then misfire is present. A history misfire counter will store the number of misfires that have occurred until the DTC is cleared.

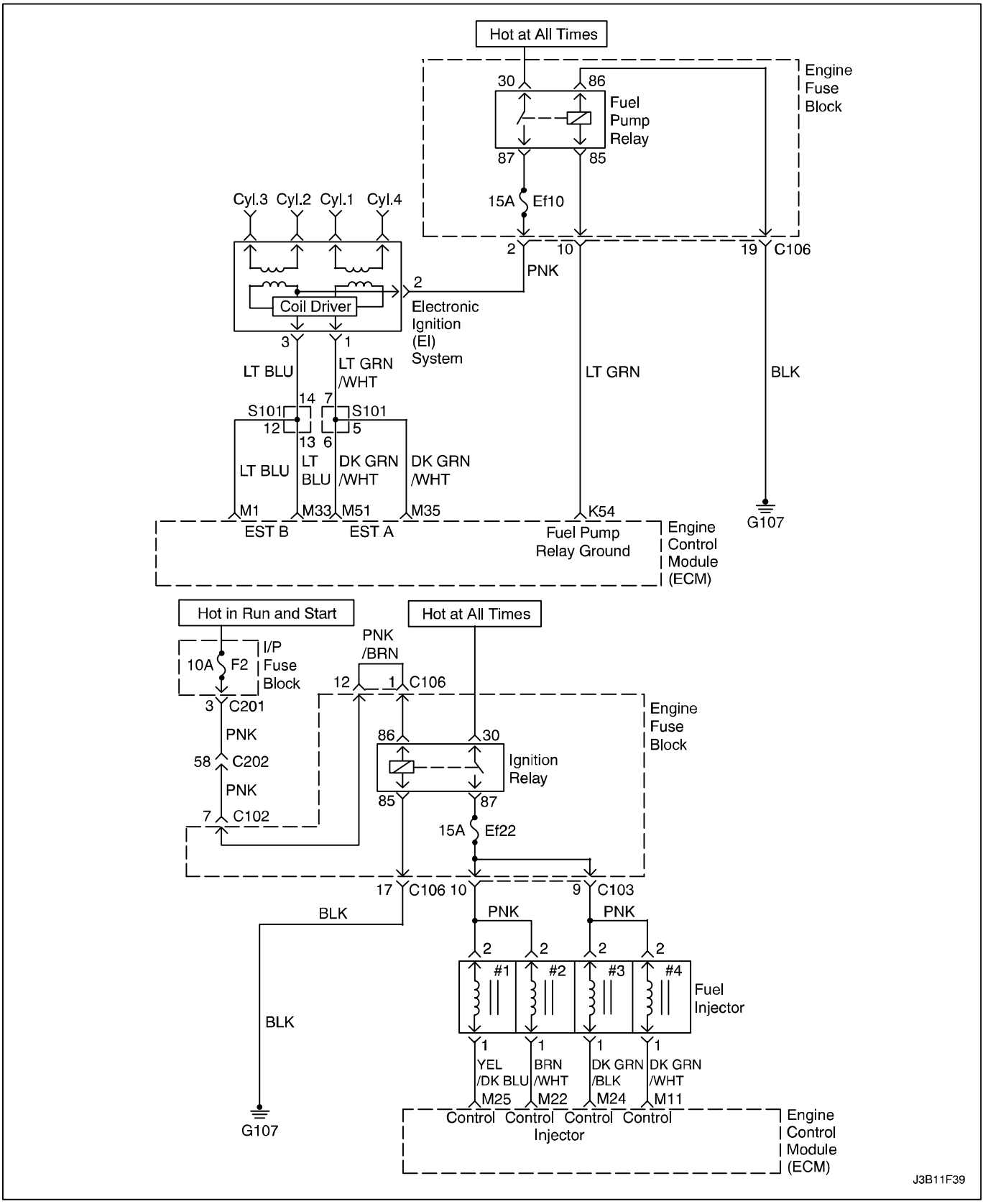
8. Check the fuel for water, alcohol, etc.
9. A basic engine problem that affects all cylinders is the only possibility at this point. (Cam timing, throttle body leak, restricted air flow, etc.)
11. Tests the ignition system voltage output using a spark tester.
12. Replace any spark plugs that are worn, cracked or fouled.
13. Checks for voltage at the ignition feed circuit.
18. Whenever the driver circuit is shorted to ground, the light will be on steady. When the driver circuit is shorted to voltage or open, the light will be off.
19. Since voltage is supplied to the fuel injector on a single circuit, the malfunction could only be a poor connection or open in the fuel injector harness. An open before the harness would result in an ”Engine Cranks But Will Not Run” complaint.
28. Before replacing the ECM, check terminals for improper mating, broken locks, or physical damage to the wiring harness. The replacement ECM must be programmed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0302 – Cylinder 2 Misfire

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs) Are DTCs P0202 or P300 set?	–	Go to applicable DTC	Go to *Step 3*
3	1. Perform a visual/physical inspection. 2. Make any repairs that are necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 4*
4	Start the engine and allow it to idle. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to *Step 6*
5	Are all counters equal (within a percentage of each other)?	–	Go to *Step 7*	Go to *Step 11*
6	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data, and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for setting this DTC as noted. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
7	1. Turn the engine OFF. 2. Install a fuel pressure gauge to the fuel rail. 3. Observe the fuel pressure with the engine running. Is the fuel pressure within the specified value?	284–325 kPa (41–47 psi)	Go to *Step 8*	Go to ”Fuel System Diagnosis”
8	Check the fuel for contamination. Is the fuel OK?	–	Go to *Step 9*	Go to *Step 10*
9	Check for a basic engine problem and repair as necessary. Is the repair complete?	–	Go to *Step 27*	–
10	Replace the contaminated fuel. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
11	1. Turn the engine OFF. 2. Disconnect the fuel injector harness connector. 3. Install a spark tester on cylinder #2 spark plug cable. 4. Crank the engine and check for spark. Is a spark observed on all four spark plug cables?	–	Go to *Step 12*	Go to *Step 20*
12	Replace the malfunctioning spark plug. Is the repair complete?	–	Go to *Step 27*	Go to *Step 13*
13	1. Turn the engine OFF. 2. Disconnect the cylinder #2 fuel injector connectors from the injector. 3. Install an injector test light on the injector harness connector, terminal 1. 4. Crank the engine and note the test light. Does the injector test light blink?	–	Go to *Step 14*	Go to *Step 15*
14	Perform the Fuel Injector Balance Test. Are the fuel injectors OK?	–	Go to *Step 9*	Go to *Step 16*
15	1. Disconnect the injector test light. 2. With a test light connected to ground, probe the ignition feed terminal 2 of the injector harness connector. 3. Crank the engine. Does the test light illuminate?	–	Go to *Step 17*	Go to *Step 19*
16	Replace the malfunctioning fuel injector. Is the repair complete?	–	Go to *Step 27*	–
17	Check the affected fuel injector driver circuit for an open, short, or short to voltage. Is a problem found?	–	Go to *Step 18*	Go to *Step 24*
18	Repair the open or the shorted fuel injector driver circuit. Is the repair complete?	–	Go to *Step 27*	–
19	Repair the open ignition feed circuit between the fuel injector harness connector and the fuel injector connector. Is the repair complete?	–	Go to *Step 27*	
20	Measure the resistance of the spark plug cable. Is the resistance of the spark plug cable less than the specified value?	30,000 Ω	Go to *Step 21*	Go to *Step 25*
21	Inspect the Engine Control Module (ECM) connector and connections. Are the connections OK?	–	Go to *Step 22*	Go to *Step 23*
22	Check the affected cylinders ignition control circuit for an open or short and repair as needed. Is the repair complete?	–	Go to *Step 27*	Go to *Step 26*
23	Repair the connector or connections. Is the repair complete?	–	Go to *Step 27*	–
24	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 27*	–
25	Replace the spark plug cable. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
26	Replace the faulty ignition coil. Is the repair complete?	–	Go to *Step 27*	Go to *Step 24*
27	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 28*	Go to *Step 2*
28	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK


Hot at All Times
Engine Fuse Block
30
86
Fuel Pump Relay
87
85
15A Ef10
Cyl.3 Cyl.2 Cyl.1 Cyl.4
2
10
19 C106
PNK
Coil Driver
2
Electronic Ignition (EI) System
3
1
LT BLU
LT GRN /WHT
LT GRN
BLK
14 7
S101
12
S101
5
13 6
LT BLU
LT BLU
DK GRN /WHT
DK GRN /WHT
M1
M33
M51
M35
K54
G107
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
Hot in Run and Start
Hot at All Times
PNK /BRN
I/P Fuse Block
10A F2
12
1 C106
3 C201
PNK
58 C202
PNK
7 C102
Engine Fuse Block
86
30
Ignition Relay
85
87
15A Ef22
17 C106 10
9 C103
BLK
PNK
PNK
2
2
2
2
#1
#2
#3
#4
Fuel Injector
BLK
1
1
1
1
YEL /DK BLU
BRN /WHT
DK GRN /BLK
DK GRN /WHT
M25
M22
M24
M11
G107
Control
Control
Control
Control
Injector
Engine Control Module (ECM)
J3B11F39

DIAGNOSTIC TROUBLE CODE (DTC) P0303

CYLINDER 3 MISFIRE

System Description

The Engine Control Module (ECM) monitors the crankshaft and camshaft positions to detect if the engine is misfiring. The ECM looks for a quick drop in crankshaft speed. This test is executed in blocks of 100 engine revolution tests. It may take between one to several tests to store a Diagnostic Trouble Code (DTC) and illuminate the Malfunction Indicator Lamp (MIL). Under light misfire conditions, it may also take more than one trip to set a DTC. Severe misfire will flash the MIL, indicating that catalyst damage is possible.

Conditions for Setting the DTC

- Emission threshold is 3%.
- 20 engine cycles have occurred since cranking has started.
- A/C compressor clutch has not just engaged or disengaged.
- Engine load and engine speed is in a detectable region and is at or above zero torque.
- Camshaft Position (CMP) sensor is in synchronization.
- Exhaust Gas Recirculation (EGR) flow diagnostic is not in progress.
- Fuel level is greater than 12% of rated tank capacity.
- Decel Fuel Cutoff (DFCO) not active.
- Throttle position change is less than 3% per 125 ms.
- Vehicle has not encountered an abusive engine speed of 7000 rpm.
- Crankshaft speed patters are normal.
- Throttle position is less than 3% when vehicle speed is greater than 10 km/h (6 mph).
- Vehicle voltage is between 11 and 16 volts.
- Engine Coolant Temperature (ECT) is between –7˚C (19˚F) and 120˚C (248˚F).
- There is the correct ratio between Crankshaft Position (CKP) sensor pulses and CMP sensor pulses.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0336, P0337, P0341, P0342 and P0502 are not set.

Action Taken When the DTC Sets

- The MIL will illuminate after two consecutive ignition cycles in which the diagnostic runs with the fault active.

Or

- The MIL will illuminate immediately and flash if misfire is present.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault within the freeze frame conditions that the DTC failed.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent can also be the result of a defective reluctor wheel. Remove the CKP sensor and inspect the reluctor wheel through the sensor mount hole. Check for porosity and the condition of wheel. If the DTC is intermittent refer to”Symptoms Diagnosis” in this section.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. A visual/physical inspection should include checking the following components:
   - The wiring for proper connections, pinches or cuts.
   - The ECM grounds for being clean and tight.
   - The vacuum hoses for splits, kinks, and proper connections as shown on the Vehicle Emission Information label. Check thoroughly for any type of leak or restriction.
   - For air leaks at the throttle body mounting area and intake manifold sealing surfaces.
5. When all the accumulators are relatively equal, then the misfire is being caused by something that affects the entire engine. When they are not then the misfire is being caused by something that is specific to two or more cylinders.
6. Whenever the misfire is not present operating the vehicle may be necessary to duplicate the conditions in the Freeze Frame Data in order to detect misfire. Depending on the engine load, the conditions may have to be maintained for up to 20 seconds. Whenever the misfire accumulators start to increment, then misfire is present. A history misfire counter will store the number of misfires that have occurred until the DTC is cleared.

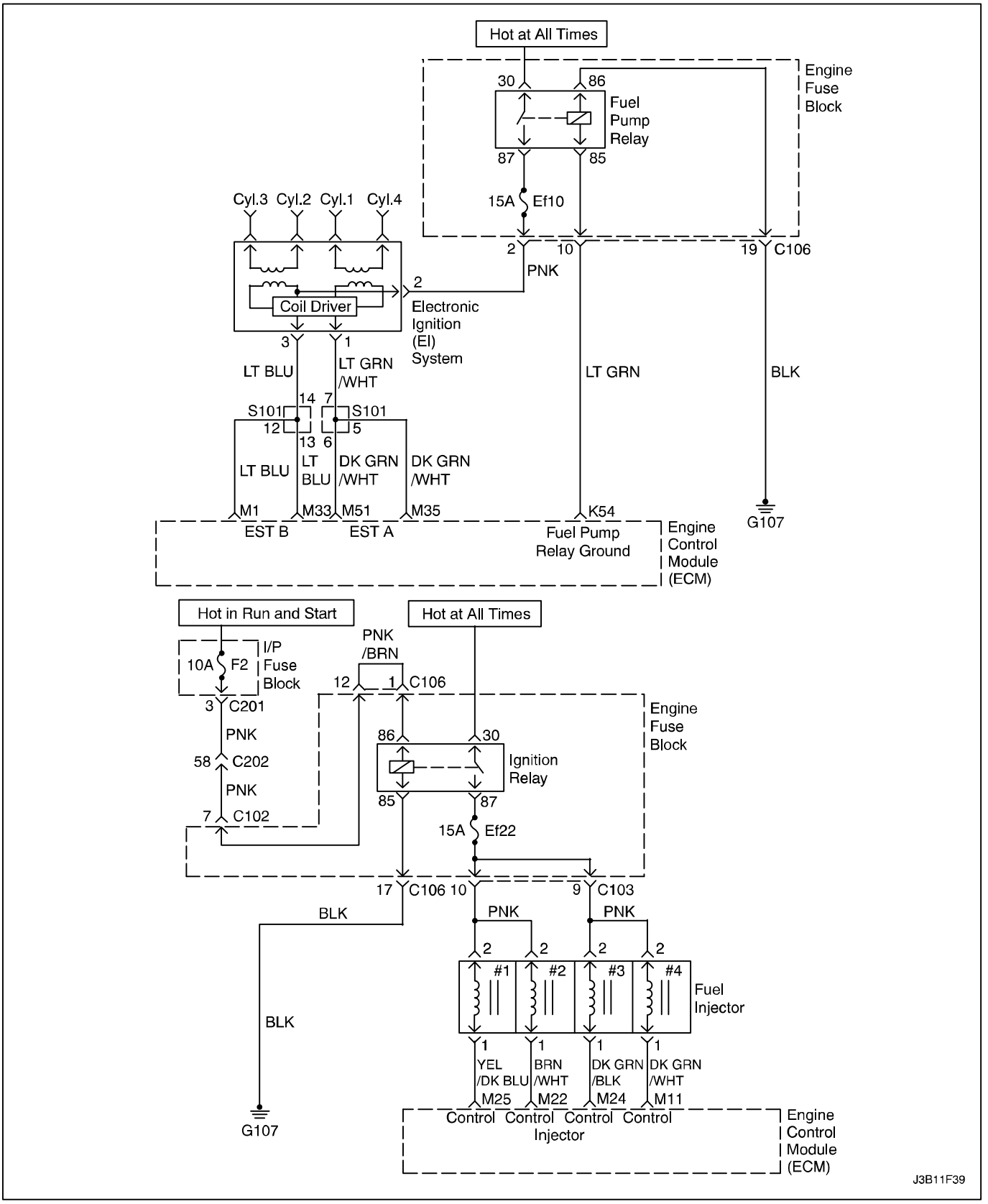
8. Check the fuel for water, alcohol, etc.
9. A basic engine problem that affects all cylinders is the only possibility at this point. (Cam timing, throttle body leak, restricted air flow, etc.)
11. Tests the ignition system voltage output using a spark tester.
12. Replace any spark plugs that are worn, cracked or fouled.
13. Checks for voltage at the ignition feed circuit.
18. Whenever the driver circuit is shorted to ground, the light will be on steady. When the driver circuit is shorted to voltage or open, the light will be off.
19. Since voltage is supplied to the fuel injector on a single circuit, the malfunction could only be a poor connection or open in the fuel injector harness. An open before the harness would result in an ”Engine Cranks But Will Not Run” complaint.
28. Before replacing the ECM, check terminals for improper mating, broken locks, or physical damage to the wiring harness. The replacement ECM must be programmed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0303 – Cylinder 3 Misfire

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs) Are DTCs P0203 or P300 set?	–	Go to applicable DTC	Go to *Step 3*
3	1. Perform a visual/physical inspection. 2. Make any repairs that are necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 4*
4	Start the engine and allow it to idle. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to *Step 6*
5	Are all counters equal (within a percentage of each other)?	–	Go to *Step 7*	Go to *Step 11*
6	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data, and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for setting this DTC as noted. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
7	1. Turn the engine OFF. 2. Install a fuel pressure gauge to the fuel rail. 3. Observe the fuel pressure with the engine running. Is the fuel pressure within the specified value?	284–325 kPa (41–47 psi)	Go to *Step 8*	Go to ”Fuel System Diagnosis”
8	Check the fuel for contamination. Is the fuel OK?	–	Go to *Step 9*	Go to *Step 10*
9	Check for a basic engine problem and repair as necessary. Is the repair complete?	–	Go to *Step 27*	–
10	Replace the contaminated fuel. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
11	1. Turn the engine OFF. 2. Disconnect the fuel injector harness connector. 3. Install a spark tester on cylinder #3 spark plug cable. 4. Crank the engine and check for spark. Is a spark observed on all four spark plug cables?	–	Go to *Step 12*	Go to *Step 20*
12	Replace the malfunctioning spark plug. Is the repair complete?	–	Go to *Step 27*	Go to *Step 13*
13	1. Turn the engine OFF. 2. Disconnect the cylinder #3 fuel injector connectors from the injector. 3. Install an injector test light on the injector harness connector, terminal 1. 4. Crank the engine and note the test light. Does the injector test light blink?	–	Go to *Step 14*	Go to *Step 15*
14	Perform the Fuel Injector Balance Test. Are the fuel injectors OK?	–	Go to *Step 9*	Go to *Step 16*
15	1. Disconnect the injector test light. 2. With a test light connected to ground, probe the ignition feed terminal 2 of the injector harness connector. 3. Crank the engine. Does the test light illuminate?	–	Go to *Step 17*	Go to *Step 19*
16	Replace the malfunctioning fuel injector. Is the repair complete?	–	Go to *Step 27*	–
17	Check the affected fuel injector driver circuit for an open, short, or short to voltage. Is a problem found?	–	Go to *Step 18*	Go to *Step 24*
18	Repair the open or the shorted fuel injector driver circuit. Is the repair complete?	–	Go to *Step 27*	–
19	Repair the open ignition feed circuit between the fuel injector harness connector and the fuel injector connector. Is the repair complete?	–	Go to *Step 27*	–
20	Measure the resistance of the spark plug cable. Is the resistance of the spark plug cable less than the specified value?	30,000 Ω	Go to *Step 21*	Go to *Step 25*
21	Inspect the Engine Control Module (ECM) connector and connections. Are the connections OK?	–	Go to *Step 22*	Go to *Step 23*
22	Check the affected cylinders ignition control circuit for an open or short and repair as needed. Is the repair complete?	–	Go to *Step 27*	Go to *Step 26*
23	Repair the connector or connections. Is the repair complete?	–	Go to *Step 27*	–
24	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 27*	–
25	Replace the spark plug cable. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
26	Replace the faulty ignition coil. Is the repair complete?	–	Go to *Step 27*	Go to *Step 24*
27	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 28*	Go to *Step 2*
28	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK


Hot at All Times
Engine Fuse Block
30
86
Fuel Pump Relay
87
85
15A Ef10
Cyl.3 Cyl.2 Cyl.1 Cyl.4
2
10
19 C106
PNK
2
Coil Driver
Electronic Ignition (EI) System
3
1
LT BLU
LT GRN /WHT
LT GRN
BLK
14 7
S101
12
S101
5
13 6
LT BLU
LT BLU
LT GRN /WHT
DK GRN /WHT
M1
M33
M51
M35
K54
G107
EST B
EST A
Fuel Pump Relay Ground
Engine Control Module (ECM)
Hot in Run and Start
Hot at All Times
PNK /BRN
I/P Fuse Block
10A F2
12
1 C106
3 C201
PNK
58 C202
PNK
7 C102
Engine Fuse Block
86
30
Ignition Relay
85
87
15A Ef22
17 C106 10
9 C103
BLK
PNK
PNK
2
2
2
2
#1
#2
#3
#4
Fuel Injector
BLK
1
1
1
1
YEL /DK BLU
BRN /WHT
DK GRN /BLK
DK GRN /WHT
M25
M22
M24
M11
G107
Control
Control
Control
Control
Injector
Engine Control Module (ECM)
J3B11F39

DIAGNOSTIC TROUBLE CODE (DTC) P0304

CYLINDER 4 MISFIRE

System Description

The Engine Control Module (ECM) monitors the crankshaft and camshaft positions to detect if the engine is misfiring. The ECM looks for a quick drop in crankshaft speed. This test is executed in blocks of 100 engine revolution tests. It may take between one to several tests to store a Diagnostic Trouble Code (DTC) and illuminate the Malfunction Indicator Lamp (MIL). Under light misfire conditions, it may also take more than one trip to set a DTC. Severe misfire will flash the MIL, indicating that catalyst damage is possible.

Conditions for Setting the DTC

- Emission threshold is 3%.
- 20 engine cycles have occurred since cranking has started.
- A/C compressor clutch has not just engaged or disengaged.
- Engine load and engine speed is in a detectable region and is at or above zero torque.
- Camshaft Position (CMP) sensor is in synchronization.
- Exhaust Gas Recirculation (EGR) flow diagnostic is not in progress.
- Fuel level is greater than 12% of rated tank capacity.
- Decel Fuel Cutoff (DFCO) not active.
- Throttle position change is less than 3% per 125 ms.
- Vehicle has not encountered an abusive engine speed of 7000 rpm.
- Crankshaft speed patters are normal.
- Throttle position is less than 3% when vehicle speed is greater than 10 km/h (6 mph).
- Vehicle voltage is between 11 and 16 volts.
- Engine Coolant Temperature (ECT) is between –7˚C (19˚F) and 120˚C (248˚F).
- There is the correct ratio between Crankshaft Position (CKP) sensor pulses and CMP sensor pulses.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0336, P0337, P0341, P0342 and P0502 are not set.

Action Taken When the DTC Sets

- The MIL will illuminate after two consecutive ignition cycles in which the diagnostic runs with the fault active.

Or

- The MIL will illuminate immediately and flash if misfire is present.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault within the freeze frame conditions that the DTC failed.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent can also be the result of a defective reluctor wheel. Remove the CKP sensor and inspect the reluctor wheel through the sensor mount hole. Check for porosity and the condition of wheel. If the DTC is intermittent refer to”Symptoms Diagnosis” in this section.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
3. A visual/physical inspection should include checking the following components:
   - The wiring for proper connections, pinches or cuts.
   - The ECM grounds for being clean and tight.
   - The vacuum hoses for splits, kinks, and proper connections as shown on the Vehicle Emission Information label. Check thoroughly for any type of leak or restriction.
   - For air leaks at the throttle body mounting area and intake manifold sealing surfaces.
5. When all the accumulators are relatively equal, then the misfire is being caused by something that affects the entire engine. When they are not then the misfire is being caused by something that is specific to two or more cylinders.
6. Whenever the misfire is not present operating the vehicle may be necessary to duplicate the conditions in the Freeze Frame Data in order to detect misfire. Depending on the engine load, the conditions may have to be maintained for up to 20 seconds. Whenever the misfire accumulators start to increment, then misfire is present. A history misfire counter will store the number of misfires that have occurred until the DTC is cleared.

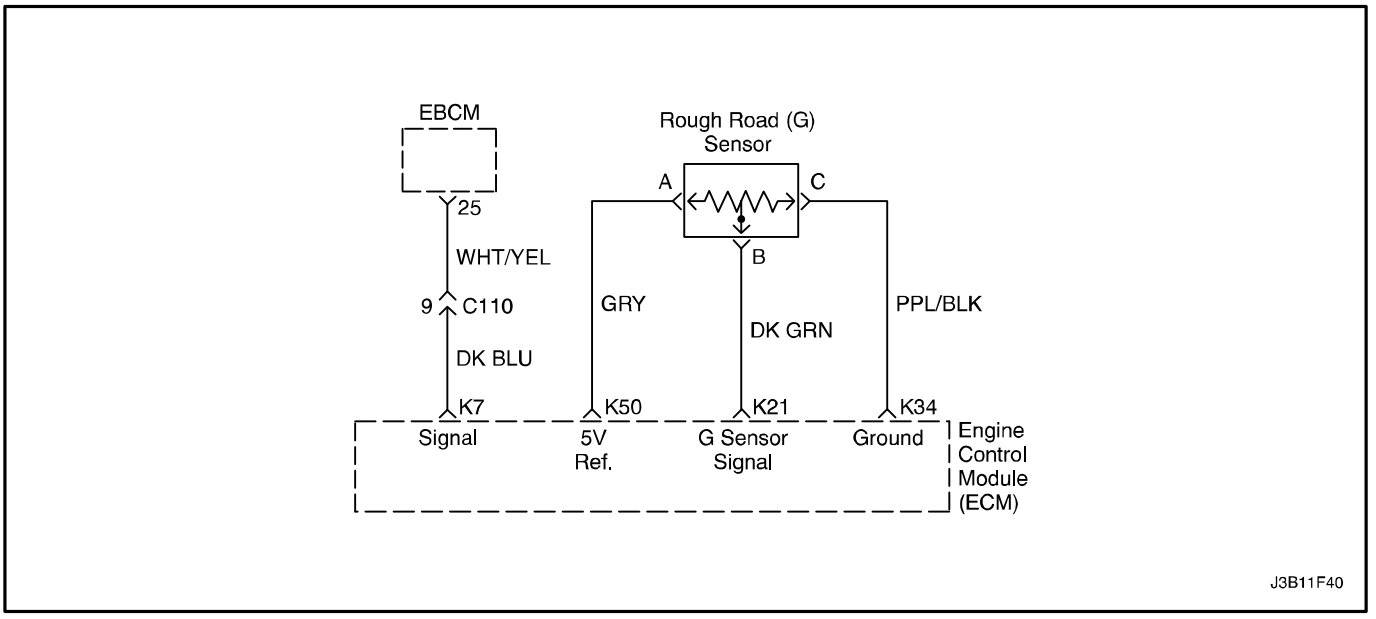
8. Check the fuel for water, alcohol, etc.
9. A basic engine problem that affects all cylinders is the only possibility at this point. (Cam timing, throttle body leak, restricted air flow, etc.)
11. Tests the ignition system voltage output using a spark tester.
12. Replace any spark plugs that are worn, cracked or fouled.
13. Checks for voltage at the ignition feed circuit.
18. Whenever the driver circuit is shorted to ground, the light will be on steady. When the driver circuit is shorted to voltage or open, the light will be off.
19. Since voltage is supplied to the fuel injector on a single circuit, the malfunction could only be a poor connection or open in the fuel injector harness. An open before the harness would result in an ”Engine Cranks But Will Not Run” complaint.
28. Before replacing the ECM, check terminals for improper mating, broken locks, or physical damage to the wiring harness. The replacement ECM must be programmed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0304 – Cylinder 4 Misfire

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs) Are DTCs P0201 or P300 set?	–	Go to applicable DTC	Go to *Step 3*
3	1. Perform a visual/physical inspection. 2. Make any repairs that are necessary. Is the repair complete?	–	Go to *Step 27*	Go to *Step 4*
4	Start the engine and allow it to idle. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to *Step 6*
5	Are all counters equal (within a percentage of each other)?	–	Go to *Step 7*	Go to *Step 11*
6	1. Turn the ignition ON, with the engine OFF. 2. Review the Freeze Frame data, and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and conditions for setting this DTC as noted. Are any Misfire Current counters incrementing?	–	Go to *Step 5*	Go to ”Diagnostic Aids”
7	1. Turn the engine OFF. 2. Install a fuel pressure gauge to the fuel rail. 3. Observe the fuel pressure with the engine running. Is the fuel pressure within the specified value?	284–325 kPa (41–47 psi)	Go to *Step 8*	Go to ”Fuel System Diagnosis”
8	Check the fuel for contamination. Is the fuel OK?		Go to *Step 9*	Go to *Step 10*
9	Check for a basic engine problem and repair as necessary. Is the repair complete?	–	Go to *Step 27*	–
10	Replace the contaminated fuel. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
11	1. Turn the engine OFF. 2. Disconnect the fuel injector harness connector. 3. Install a spark tester on cylinder #4 spark plug cable. 4. Crank the engine and check for spark. Is a spark observed on all four spark plug cables?	–	Go to *Step 12*	Go to *Step 20*
12	Replace the malfunctioning spark plug. Is the repair complete?	–	Go to *Step 27*	Go to *Step 13*
13	1. Turn the engine OFF. 2. Disconnect the cylinder #4 fuel injector connectors from the injector. 3. Install an injector test light on the injector harness connector, terminal 1. 4. Crank the engine and note the test light. Does the injector test light blink?	–	Go to *Step 14*	Go to *Step 15*
14	Perform the Fuel Injector Balance Test. Are the fuel injectors OK?	–	Go to *Step 9*	Go to *Step 16*
15	1. Disconnect the injector test light. 2. With a test light connected to ground, probe the ignition feed terminal 2 of the injector harness connector. 3. Crank the engine. Does the test light illuminate?	–	Go to *Step 17*	Go to *Step 19*
16	Replace the malfunctioning fuel injector. Is the repair complete?	–	Go to *Step 27*	–
17	Check the affected fuel injector driver circuit for an open, short, or short to voltage. Is a problem found?	–	Go to *Step 18*	Go to *Step 24*
18	Repair the open or the shorted fuel injector driver circuit. Is the repair complete?	–	Go to *Step 27*	–
19	Repair the open ignition feed circuit between the fuel injector harness connector and the fuel injector connector. Is the repair complete?	–	Go to *Step 27*	–
20	Measure the resistance of the spark plug cable. Is the resistance of the spark plug cable less than the specified value?	30,000 Ω	Go to *Step 21*	Go to *Step 25*
21	Inspect the Engine Control Module (ECM) connector and connections. Are the connections OK?	–	Go to *Step 22*	Go to *Step 23*
22	Check the affected cylinders ignition control circuit for an open or short and repair as needed. Is the repair complete?	–	Go to *Step 27*	Go to *Step 26*
23	Repair the connector or connections. Is the repair complete?	–	Go to *Step 27*	–
24	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 27*	–
25	Replace the spark plug cable. Is the repair complete?	–	Go to *Step 27*	–

Step	Action	Value(s)	Yes	No
26	Replace the faulty ignition coil. Is the repair complete?	–	Go to *Step 27*	Go to *Step 24*
27	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 28*	Go to *Step 2*
28	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0317

ROUGH ROAD SENSOR SOURCE NOT DETECTED

System Description

The Engine Control Module (ECM) identifies engine misfire by detecting variations in crankshaft speed. Crankshaft speed variations can also occur when a vehicle is operating over a rough road. The ECM receives rough road signal by gravity sensing rough road (G) sensor or Electronic Brake Control Module (EBCM) if equipped with the Anti–Lock Brake System (ABS). The ABS can detect if the vehicle is on the rough surface based on wheel acceleration/deceleration data supplied by each wheel speed sensor. This information sent to the ECM by EBCM through serial data line. The G sensor is vertical low g–acceleration sensor. By sensing vertical acceleration caused by bumps or portholes in the road, the ECM determine if the changes in crankshaft speed are due to engine misfire or are driveline induced. If the ECM can not receive any of those signal, a historic Diagnostic Trouble Code (DTC) will be stored.

Conditions for Setting the DTC

- ECM can not detect any rough road source.
- Vehicle speed is greater than 5km/h (3.1 mph).

Action Taken When the DTC Sets

- The MIL will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An open signal circuit of G sensor or open serial data line between the ECM and the EBCM will be the cause of this DTC.

DTC P0317 – Rough Road Sensor Source Not Detected

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON, with the engine OFF. 3. Request Diagnostic Trouble Codes (DTCs) Are DTCs P1380, P1381, P1391, P1392 or P1393 set?	–	Go to Applicable DTC	Go to *Step 3*
3	Is the vehicle equipped with the Anti–lock Brake System (ABS)?	–	Go to *Step 8*	Go to *Step 4*
4	1. Disconnect the gravity sensing rough road (G) sensor connector. 2. Disconnect the Engine control Module (ECM) connector. 3. Measure resistance between terminal B of the G sensor and terminal K21 of the ECM. Is the resistance within the specified value?	0 Ω	Go to *Step 6*	Go to *Step 5*
5	Repair open circuit. Is the repair complete?	–	Go to *Step 11*	Go to *Step 6*
6	1. Reconnect the ECM and G sensor connectors. 2. Turn the ignition ON. 3. Probe the voltage at terminal B of G sensor. Is the voltage within the specified value?	2.35–2.65 V	Go to *Step 10*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the G sensor. Is the repair complete?	–	Go to *Step 11*	–
8	1. Turn the ignition OFF. 2. Disconnect the Electronic Brake Control Module EBCM) connector and the ECM connector. 3. Measure the resistance between terminal 25 of the EBCM and terminal K7 of the ECM. Is the resistance within the specified value?	0 Ω	Go to *Step 10*	Go to *Step 9*
9	Repair open circuit. Is the repair complete?	–	Go to *Step 11*	Go to *Step 10*
10	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0325

KNOCK SENSOR INTERNAL MALFUNCTION

System Description

The Knock Sensor (KS) system is used to detect engine detonation, allowing the Engine Control Module (ECM) to retard the ignition control spark timing based on the KS signal being received. The KS produces an AC signal so that under a no–knock condition the signal on the KS circuit measures about 0.007 volts AC. The KS signal's amplitude and frequency depend upon the amount of knock being experienced. The ECM contains a nonreplaceable knock filter module called a Digitally Controlled Signal–to–Noise Enhancement Filter (DSNEF) module. This filter module in the ECM determines whether or not knock is occurring by comparing the signal level on the KS 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) P0325 will set.

Conditions for Setting the DTC

- DSNEF A/D reading is less than 1.0% or greater than 80% any of the 4 cylinders.
- Vacuum is less than the predetermined value (10 to 50 kPa, based on rpm).
- The rpm is greater than 1600.
- DTC(s) P0106, P0107, P0108 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check and correct any abnormal engine noise before using the diagnostic table.

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

Test Description

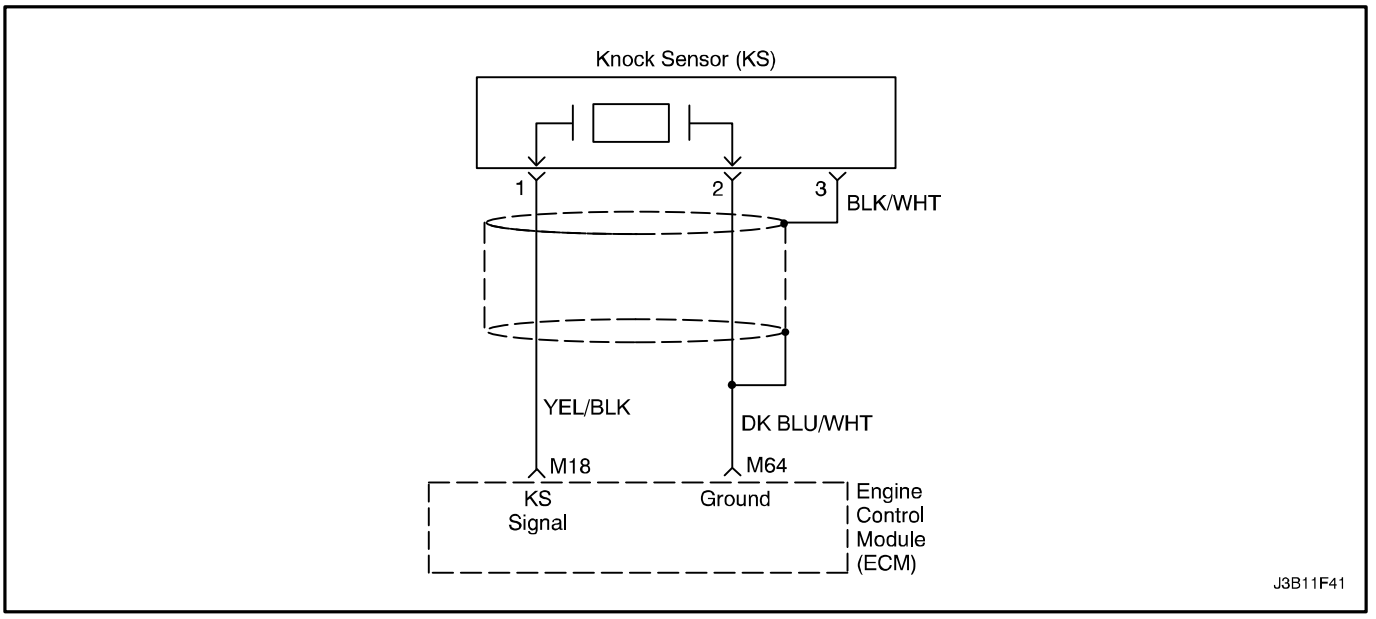
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. If the conditions for the test as described above are met, a DTC P0325 will set and MIL will illuminate.
4. If the engine has an internal knock or audible noise that causes a knocking type noise on the engine block, the knock sensor may be responding to the noise.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0325 – Knock Sensor Internal Malfunction

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Clear the Diagnostic Trouble Codes (DTCs). 3. Start the engine. 4. Operate the vehicle within the Conditions for Setting the DTC as noted. Is the DTC set again.	–	Go to *Step 3*	Go to *Step 6*

Step	Action	Value(s)	Yes	No
3	Listen to the engine while rising and lowing the engine speed. Is a knock or audible noise present?	–	Go to *Step 4*	Go to *Step 5*
4	Repair mechanical engine problem or a loose bracket or components as needed. Is the repair complete?	–	Go to *Step 6*	–
5	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0327

KNOCK SENSOR CIRCUIT FAULT

System Description

The Knock Sensor (KS) system is used to detect engine detonation, allowing the Engine Control Module (ECM) to retard the ignition control spark timing based on the KS signal being received. The KS produces an AC signal so that under a no–knock condition the signal on the KS circuit measures about 0.007 volts AC. The KS signal's amplitude and frequency depend upon the amount of knock being experienced. The ECM monitors the KS signal and can diagnose the KS and circuitry.

Conditions for Setting the DTC

- Minimum difference between cylinders is greater than 0.4%.
- Vacuum is less than the predetermined value (10 to 50 kPa, based on rpm).
- The rpm is greater than 1600.
- DTC(s) P0106, P0107, P0108 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check and correct any abnormal engine noise before using the diagnostic table.

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. If the conditions for the test as described above are met, a DTC P0327 will set and MIL will illuminate.
3. If the engine has an internal knock or audible noise that causes a knocking type noise on the engine block, the KS may be responding to the noise.
5. Checking the internal resistance of the KS or the wiring to the KS is OK.
6. Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for backed–out terminals, improper mating, broken locks, im-

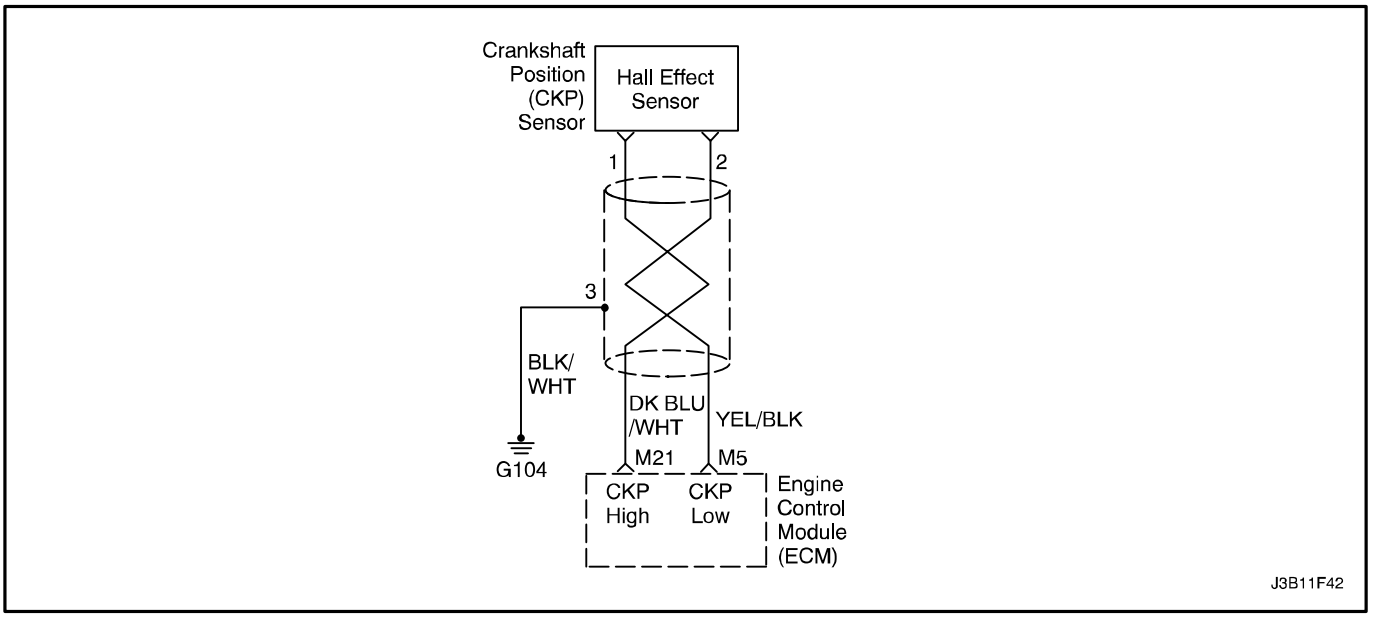
properly formed or damaged terminals, poor terminal–to–wiring connections or physical damage to the wiring harness.

7. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0327 – Knock Sensor Circuit Fault

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Clear the Diagnostic Trouble Codes (DTCs). 3. Start the engine. 4. Operate the vehicle within the Conditions for Setting the DTC as noted. Is the DTC set again.	–	Go to *Step 3*	Go to *Step 6*
3	Listen to the engine while rising and lowing the engine speed. Is a knock or audible noise present?	–	Go to *Step 4*	Go to *Step 5*
4	Repair mechanical engine problem or a loose bracket or components as needed. Is the repair complete?	–	Go to *Step 11*	–
5	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector. 3. With a ohmmeter connected ground, measure the resistance of the Knock Sensor (KS) through the KS signal circuit, terminal M18. Is the resistance between the specified value?	90–110 kΩ	Go to *Step 6*	Go to *Step 8*
6	Check for a poor connection at the ECM connector KS signal circuit and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–
8	Check the KS connector for a poor connection and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 9*
9	Check the KS signal circuit for an open or a short to ground or voltage and repair as needed. Is the repair complete?	–	Go to *Step 11*	–
10	1. Turn the ignition OFF. 2. Replace the KS. Is the repair complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0336

58X CRANK POSITION SENSOR EXTRA/MISSING PULSES

Circuit Description

The 58X reference signal is produced by the Crankshaft Position (CKP) sensor. During one crankshaft revolution, 58 crankshaft pulses will be produced. The Engine Control Module (ECM) uses the 58X reference signal to calculate engine rpm and CKP. The ECM constantly monitors the number of pulses on the 58X reference circuit and compares them to the number of Camshaft Position (CMP) signal pulses being received. If the ECM receives and incorrect number of pulses on the 58X reference circuit, Diagnostic Trouble Code (DTC) P0336 will set.

Conditions for Setting the DTC

- Engine is running.
- Extra or missing pulses detected between consecutive 58X reference pulses.
- Number of extra or missing teeth is greater than or equal to 2 per revolution.
- Above condition is detected in 10 of 100 crankshaft rotations.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffer.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn OFF after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles have occurred without a fault.
- The DTC(s) can be cleared using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

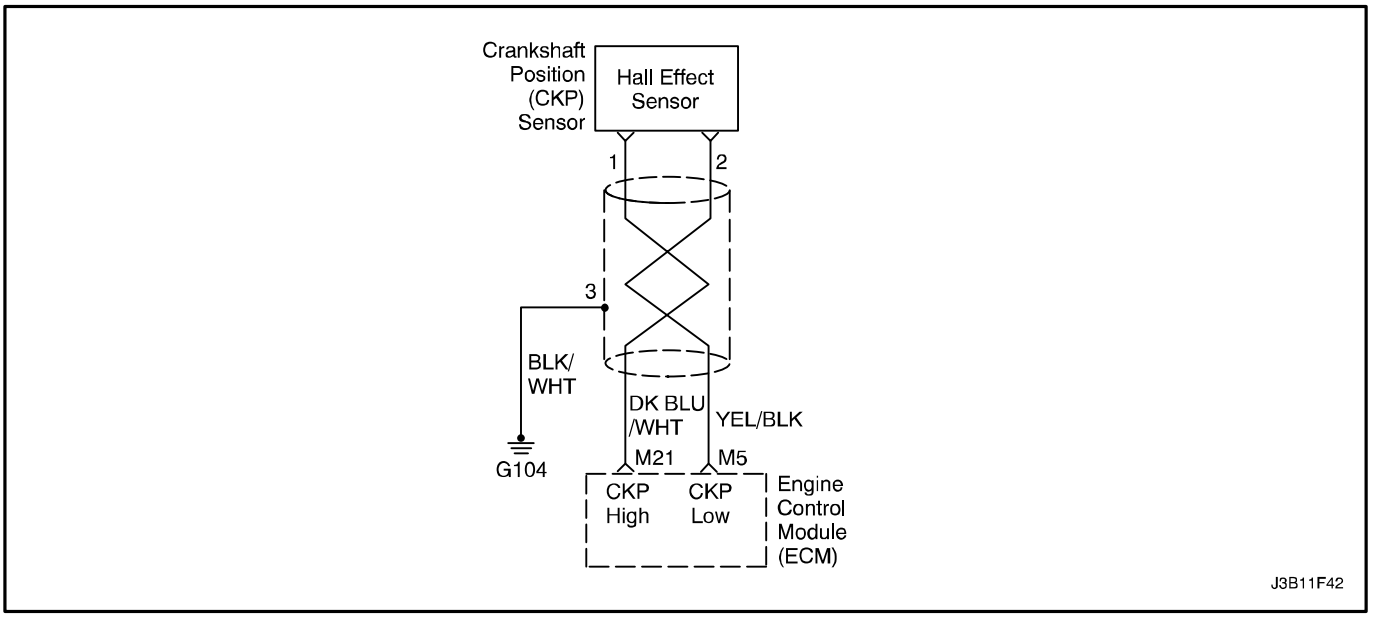
An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for:

- Poor connection – Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–towire connections.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition ON and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving the connectors and the wiring harnesses related to the ECM. A change in voltage will indicate the location of the fault.
- Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0336 – 58X Crank Position Sensor Extra/Missing Pulses

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Attempt to start the engine. Does the engine start?	–	Go to *Step 3*	Go to ”Engine Cranks But Will Not Run”
3	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Turn the ignition ON, with the engine OFF. 4. Review and record Failure Records information. 5. Clear the Diagnostic Trouble Codes (DTCs). 6. Start the engine and idle for 1 minute. Is DTC P0336 set?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector and Crankshaft Position (CKP) sensor. 3. Check for an open or short to ground in the 58X reference circuit between CKP sensor connector and the ECM harness connector. Is a problem found?	–	Go to *Step 5*	Go to *Step 6*
5	Repair an open or short to ground in the 58X reference circuit between the CKP sensor connector and the ECM harness connector. Is the repair complete?	–	Go to *Step 11*	–
6	Reconnect the ECM and CKP sensor. Connect a voltmeter to measure the voltage at terminal M21 of the ECM connector. Observe the voltage while cranking the engine. Is the voltage near the specified value?	1.6 v	Go to *Step 9*	Go to *Step 7*
7	Check the connections at CKP sensor and repair or replace the terminals. Is the repair complete?	–	Go to *Step 11*	Go to *Step 8*
8	1. Turn the ignition OFF. 2. Replace the CKP sensor. Is the repair complete?	–	Go to *Step 11*	–
9	Check the connections at ECM and repair or replace the terminals. Is the repair complete?	–	Go to *Step 11*	Go to *Step 10*
10	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0337

58X CRANK POSITION SENSOR NO SIGNAL

Circuit Description

The 58X reference signal is produced by the Crankshaft Position (CKP) sensor. During one crankshaft revolution, 58 crankshaft pulses will be produced. The Engine Control Module (ECM) uses the 58X reference signal to calculate engine rpm and CKP. The ECM constantly monitors the number of pulses on the 58X reference circuit and compares them to the number of Camshaft Position (CMP) signal pulses being received. If the ECM does not receive any 58X reference pulses on the 58X reference circuit while cranking, Diagnostic Trouble Code (DTC) P0337 will set.

Conditions for Setting the DTC

- 58X reference pulse not seen during cranking.
- DTCs P0341 and P0342 are not set.
- Change in voltage drop is greater than 0.5 volts and change in Manifold Absolute Pressure (MAP) is greater than 0.05kPa (0.07 psi).
- 58X reference pulse not seen for 0.078 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffer.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn OFF after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles have occurred without a fault.
- The DTC(s) can be cleared using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

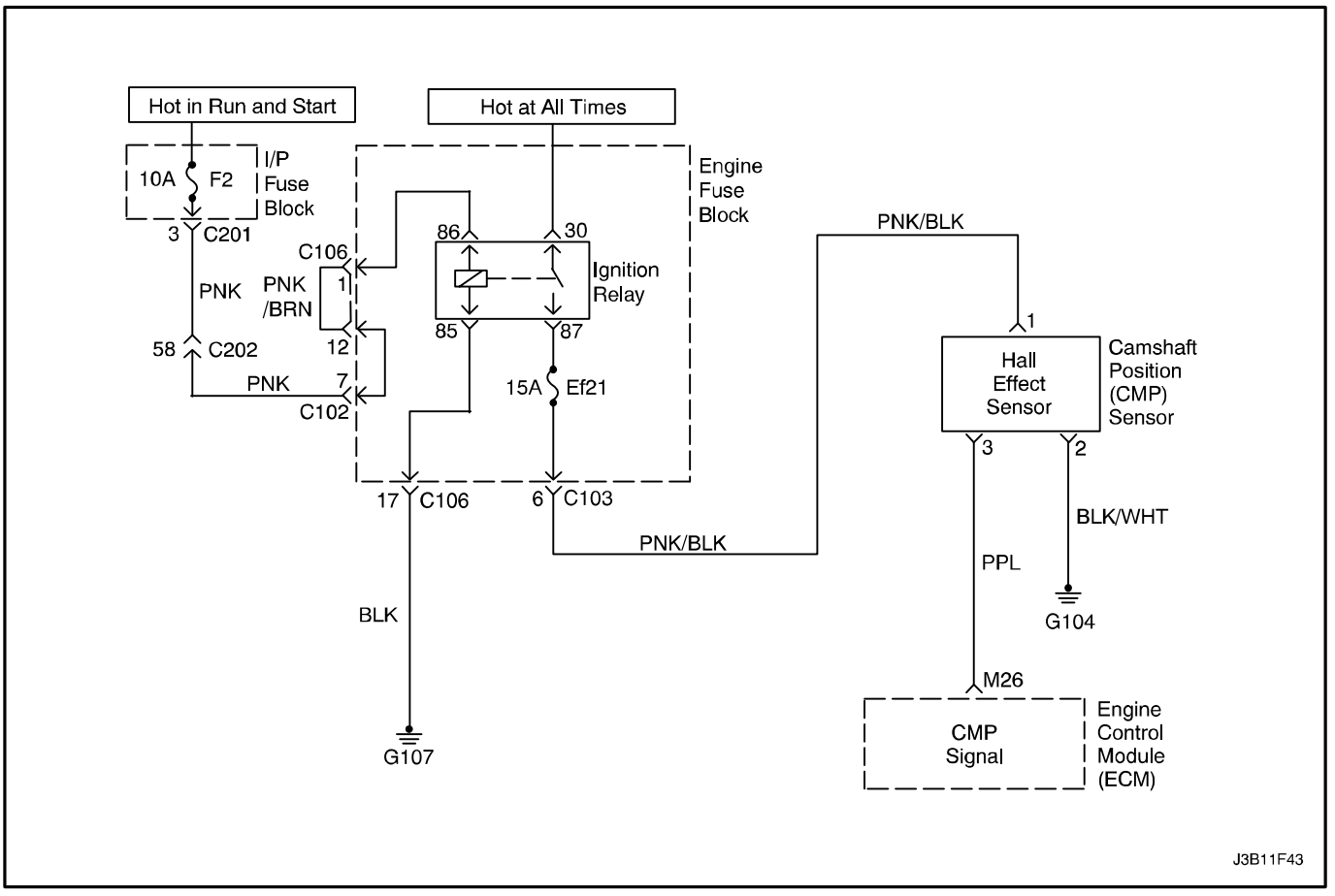
An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for:

- Poor connection – Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–towire connections.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition ON and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving the connectors and the wiring harnesses related to the ECM. A change in voltage will indicate the location of the fault.
- Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0337 – 58X Crank Position Sensor No Signal

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Start the engine. 4. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting the DTC as noted. Is Diagnostic Trouble Code (DTC) P0337 set?	–	Go to *Step 3*	Go to *Step 10*
3	1. Turn the ignition OFF. 2. Disconnect the Crankshaft Position (CKP) sensor connector. 3. Turn the ignition ON. 4. Using a voltmeter, check the voltage between the CKP sensor wiring harness connector (Engine Control Module [ECM] side) terminal 1 and ground. Does the voltage within the value specified?	1.4 volts	Go to *Step 4*	Go to *Step 5*
4	Using a voltmeter, check the voltage between the CKP sensor wiring harness connector (ECM side) terminal 2 and ground. Does the voltage within the value specified?	1.4 volts	Go to *Step 6*	Go to *Step 5*
5	1. Turn the ignition OFF. 2. Disconnect the ECM connector. 3. Turn the ignition ON. 4. Using a voltmeter, check the out put voltage of the ECM terminal M21 and M5. Does the voltage within the value specified?	11–14 volts	Go to *Step 8*	Go to *Step 9*
6	1. Reconnect the CKP sensor. 2. Using a voltmeter, back probe the ECM connector terminal M21 and M5. 3. Observe the voltage while cranking the engine. Does the voltage fluctuate between the specified value?	1.3–1.6 volts	Go to ”Diagnostic Aids”	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the CKP sensor. Is the repair complete?	–	Go to *Step 10*	–
8	Check the CKP sensor high and low circuits for an open, short to ground or voltage and repair as needed. Is the repair complete?	–	Go to *Step 10*	–
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
10	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 11*	Go to *Step 2*
11	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0341

CAMSHAFT POSITION SENSOR RATIONALITY

System Description

The Camshaft Position (CMP) Sensor is used to correlate crankshaft to camshaft position so that the Engine Control Module (ECM) can determine which cylinder is ready to be fueled by the injector. The CMP is also used to determine which cylinder is misfiring when a misfire is present. When the ECM cannot use the information from the CMP sensor, a Diagnostic Trouble Code (DTC) is set, and the ECM will fuel the engine using the Alternating Synchronous Double Fire (ASDF) method.

Conditions for Setting the DTC

- CMP Sensor reference pulse is not detected at the correct interval every 4 cylinders.
- Engine is running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

Anytime a poor connection is present, the CMP Reference Activity counter will stop incrementing.

Test Description

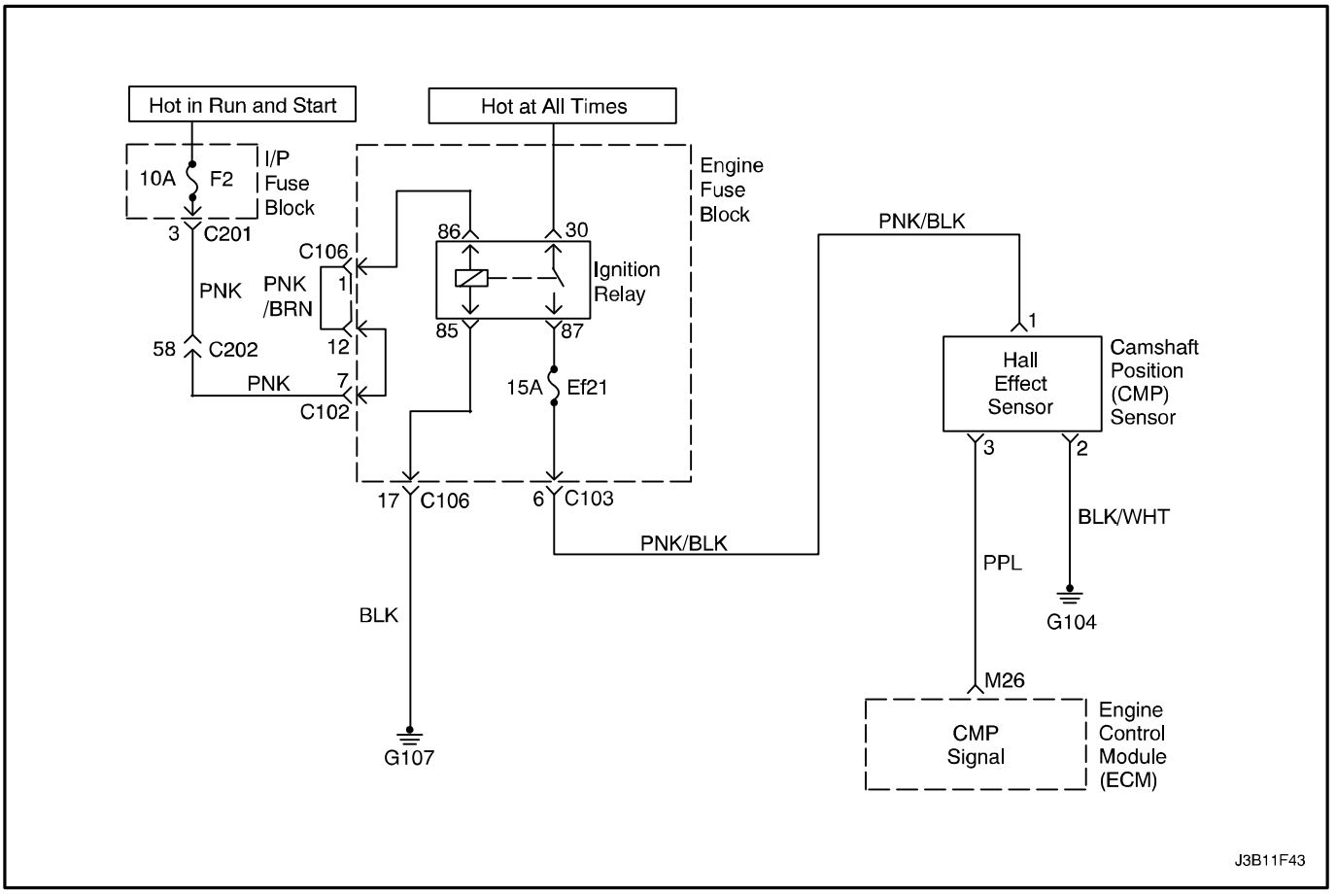
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0341 is the result of a hard failure or an intermittent condition.
3. The counter should stop incrementing with the sensor electrical connector disconnected and set a DTC P0342 with the sensor disconnected. If it still increments the ECM is malfunctioning.
4. By moving the CMP sensor electrical connector, the connections at the sensor are checked. Make sure the electrical connector remains securely fastened.
5. A poor connection in any of the circuits at the CMP will cause the CMP Resync Counter to increment. Anytime a poor connection is present, the CMP Reference Activity counter will stop incrementing and the CMP Resync Counter will increment.
8. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0341 – Camshaft Position Sensor Rationality

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Start the engine and operate the vehicle within the Freeze Frame Conditions and Conditions for Setting the DTC as noted. Is Diagnostic Trouble Code (DTC) P0341 set?	–	Go to *Step 3*	Go to ”Diagnostic Aids”
3	1. Turn the ignition OFF. 2. Disconnect the Camshaft Position (CMP) sensor connector. 3. Turn the ignition ON. 4. Using a voltmeter, check the voltage between the CMP sensor harness connector (Engine Control Module [ECM] side) terminal 3 and ground. Does the voltage near the specified value?	5 V	Go to *Step 4*	Go to *Step 5*
4	Using a voltmeter, check the voltage between the CMP sensor wiring harness connector terminal 1 and ground. Is the voltage over the specified value?	10 volts	Go to *Step 6*	Go to *Step 10*
5	With a test light connected to ground, probe the CMP harness connector terminal 3. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
6	With a test light connected to B+, probe the CMP sensor harness connector terminal 2. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 11*
7	Check for poor connections at the CMP sensor electrical connectors and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
8	1. Turn the ignition OFF. 2. Disconnect the ECM connector. 3. Repair the short to voltage on the CMP signal circuit. Is the repair complete?	–	Go to *Step 15*	Go to *Step 14*
9	Check the CMP signal circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 12*
10	Check for a poor connection or open in the CMP B+ feed circuit and repair as needed. Is the repair complete?	–	Go to *Step 15*	–
11	Check for a poor connection or open in the CMP ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 15*	–
12	Check for a poor connection in the CMP signal circuit terminal and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 14*
13	1. Turn the ignition OFF. 2. Replace the CMP sensor. Is the repair complete?	–	Go to *Step 15*	
14	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 15*	–
15	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 16*	Go to *Step 2*
16	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0342

CAMSHAFT POSITION SENSOR NO SIGNAL

System Description

The Camshaft Position (CMP) Sensor is used to correlate crankshaft to camshaft position so that the Engine Control Module (ECM) can determine which cylinder is ready to be fueled by the injector. The CMP is also used to determine which cylinder is misfiring when a misfire is present. When the ECM cannot use the information from the CMP sensor, a Diagnostic Trouble Code (DTC) is set, and the ECM will fuel the engine using the Alternating Synchronous Double Fire (ASDF) method.

Conditions for Setting the DTC

- CMP Sensor pulse is not detected at the correct interval every 4 cylinders.
- Engine is running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

Any circuitry, that is suspected as causing the complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

Test Description

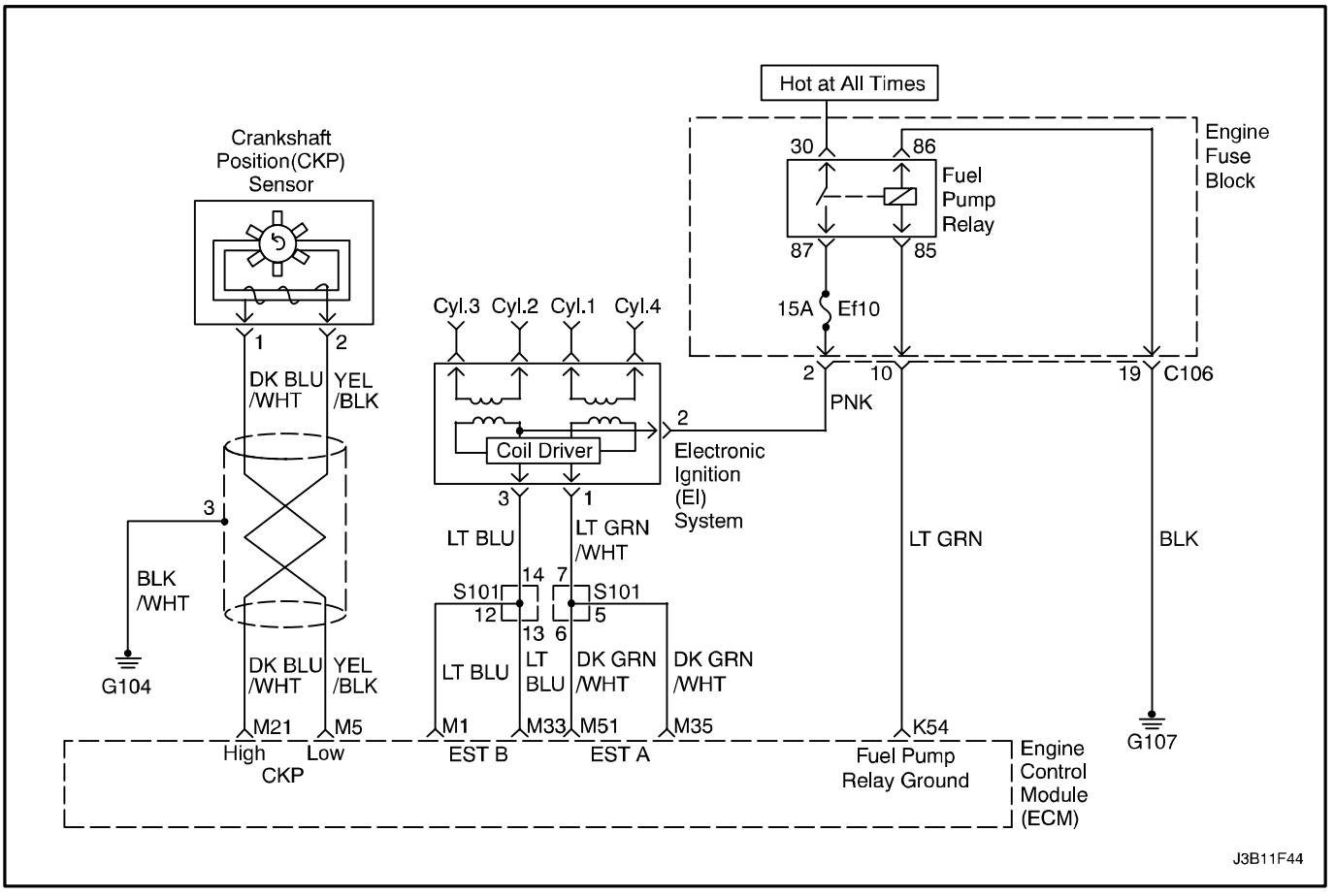
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and to store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This step determines if DTC P0342 is the result of a hard failure or an intermittent condition.
4. Determines if voltage is available to the CMP.
7. This step checks for a voltage supplied by the ECM to the CMP.
12. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM re-programming.

DTC P0342 – Camshaft Position Sensor No Signal

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Idle the engine. Is the Camshaft Position (CMP) Active Count incrementing?	–	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition ON. 2. Review the Freeze Frame data and note the parameters. 3. Start the engine and operate the vehicle within the Freeze Frame Conditions and Conditions for Setting the DTC as noted. Is the CMP Active Counter incrementing?	–	Go to *Step 13*	Go to *Step 4*
4	1. Turn the ignition OFF. 2. Disconnect the CMP sensor connector. 3. Turn the ignition ON. 4. With a test light connected to ground, probe the CMP sensor harness connector, terminal 1. Does the test light illuminate?	–	Go to *Step 5*	Go to *Step 6*
5	With a test light connected to B+, probe the CMP sensor harness connector, terminal 2. Does the test light illuminate?	–	Go to *Step 7*	Go to *Step 8*
6	Check for a poor connection or open in the CMP sensor B+ feed circuit and repair as necessary. Is the repair complete?	–	Go to *Step 13*	Go to ”Diagnostic Aids”
7	Using a Digital Voltmeter (DVM), check the voltage between the CMP sensor harness connector, terminal 3 and ground. Does the DVM display near the specified values?	5 V	Go to *Step 11*	Go to *Step 9*
8	Check for a poor connection or open in the CMP sensor ground circuit and repair as necessary. Is the repair complete?	–	Go to *Step 13*	–
9	1. Turn the ignition OFF. 2. Disconnect the engine Control Module (ECM) connector. 3. Check for the CMP signal circuit for an open or short to round or short to B+, and repair as needed. Is the repair complete?	–	Go to *Step 13*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
10	Check the CMP signal circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 13*	Go to *Step 12*
11	1. Turn the ignition OFF. 2. Replace the CMP sensor. Is the repair complete?	–	Go to *Step 13*	–
12	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to ”Applicable DTC table”	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0351

IGNITION CONTROL CIRCUIT A FAULT (CYLINDER 1 & 4)

Circuit Description

The Engine Control Module (ECM) provides a ground for the electronic spark timing A circuit. When the ECM removes the ground path of the ignition primary coil, the magnetic field produced by the coil collapses. The collapsing magnetic field produces a voltage in the secondary coil which fires the spark plug.

The circuit between the ECM and the electronic ignition system ignition coil is monitored for an open circuit, short to voltage, and short to ground. When the ECM detects a problem in the electronic spark timing A circuit, it will set Diagnostic Trouble Code (DTC) P0351.

Conditions for Setting the DTC

- Monitor fault feedback signal.
- Ignition ON.
- Fault flag increments fail count.
- Must receive more than 200 failures within 255 test cycles.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- Low speed coolant fan turns on.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for:

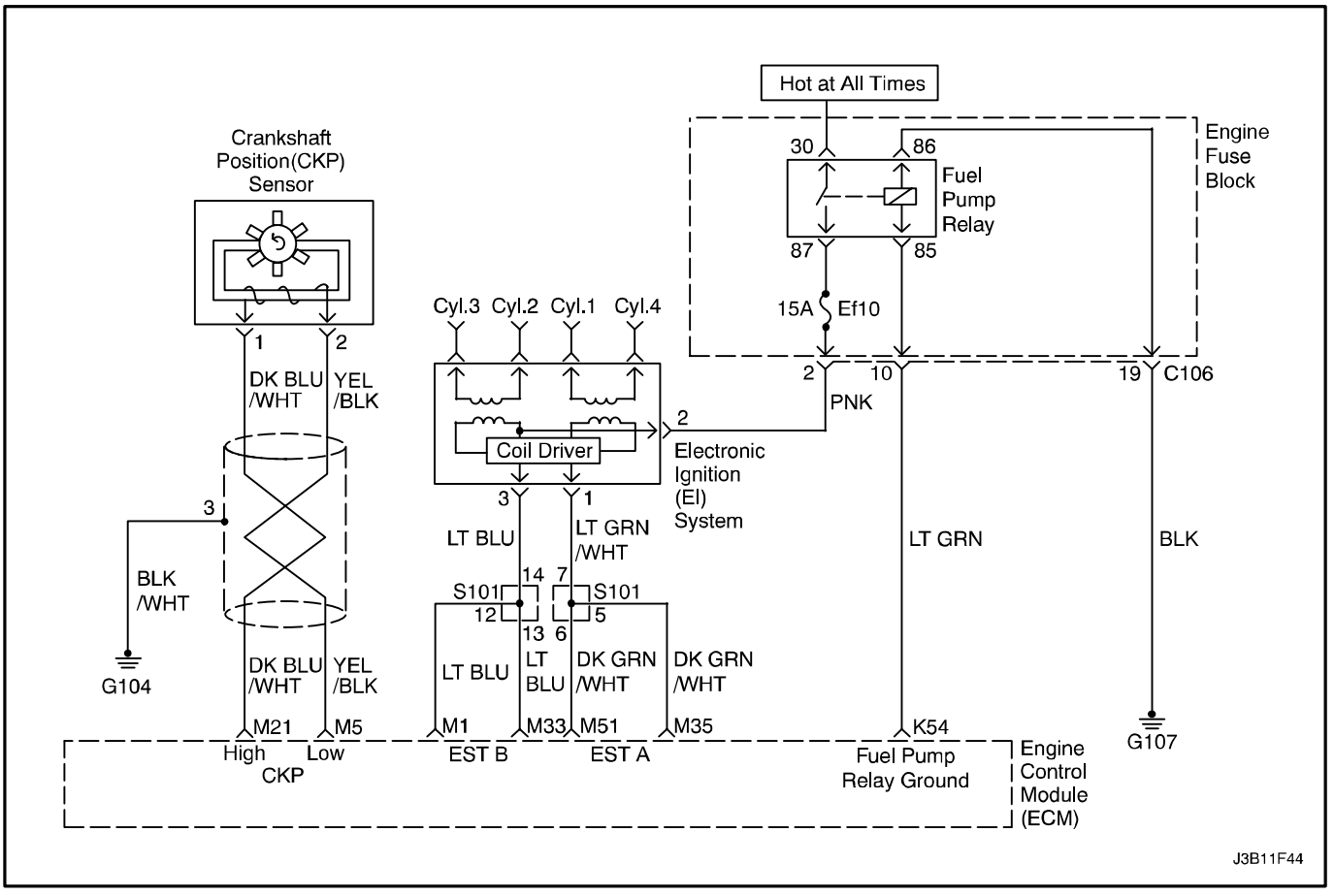
- Poor connection – Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–towire connection.

- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition on, and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving connectors and wiring harnesses related to the ECM. A change in voltage will indicate the location of the fault.

Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0351 – Ignition Control Circuit A Fault (Cylinder 1 and 4)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Check for a faulty connection or damaged terminal C at the Electronic Ignition (EI) system ignition coil and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 3*
3	Check for a faulty connection or damaged terminal M51/M35 at the Engine Control Module (ECM) and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 4*
4	1. Ignition OFF. 2. Disconnect the ECM connector. 3. Check the ignition control circuit for a short to ground and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 5*
5	Check the ignition control circuit for a short to voltage and repair as necessary. Is the repair complete?	–	Go to *Step 8*	Go to *Step 6*
6	Check an open ignition control circuit and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0352

IGNITION CONTROL CIRCUIT B FAULT (CYLINDER 2 & 3)

Circuit Description

The Engine Control Module (ECM) provides a ground for the electronic spark timing A circuit. When the ECM removes the ground path of the ignition primary coil, the magnetic field produced by the coil collapses. The collapsing magnetic field produces a voltage in the secondary coil which fires the spark plug.

The circuit between the ECM and the electronic ignition system ignition coil is monitored for an open circuit, short to voltage, and short to ground. When the ECM detects a problem in the electronic spark timing A circuit, it will set Diagnostic Trouble Code (DTC) P0351.

Conditions for Setting the DTC

- Monitor fault feedback signal.
- Ignition ON.
- Fault flag increments fail count.
- Must receive more than 200 failures within 255 test cycles.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- Low speed coolant fan turns on.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

An intermittent may be caused by a poor connection, rubbed–through wire insulation or a wire broken inside the insulation. Check for:

- Poor connection – Inspect the ECM harness and connectors for improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–towire connection.

- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, disconnect the ECM, turn the ignition on, and observe a voltmeter connected to the 58X reference circuit at the ECM harness connector while moving connectors and wiring harnesses related to the ECM. A change in voltage will indicate the location of the fault.

Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P0352 – Ignition Control Circuit B Fault (Cylinder 2 and 3)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	Check for a faulty connection or damaged terminal A at the Electronic Ignition (EI) system ignition coil and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 3*
3	Check for a faulty connection or damaged terminal M33/M1 at the Engine Control Module (ECM) and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 4*
4	1. Turn the ignition OFF. 2. Disconnect the ECM connector. 3. Check the ignition control circuit for a short to ground and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 5*
5	Check the ignition control circuit for a short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 6*
6	Check for an open in the ignition control circuit and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 8*	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 9*	Go to *Step 2*
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0401

EXHAUST GAS RECIRCULATION INSUFFICIENT FLOW

Circuit Description

An Exhaust Gas Recirculation (EGR) system is used to lower Nitrogen Oxide (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with an Engine Control Module (ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and Manifold Absolute Pressure (MAP) sensors. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR Position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The Actual EGR Position should always be near the commanded or Desired EGR Position.

This diagnostic will determine if there is a reduction in EGR flow.

Conditions for Setting the DTC

- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0201, P0202, P0203, P0204, P0351, P0352, P0402, P0404, P1404, P0405, P0406 and P0502 are not set.
- Test in Decel Fuel Cutoff (DFCO) mode.
  - Barometric Pressure (BARO) is greater than 72 kPa (10.4 psi).
  - Vehicle speed is greater than 18 km/h (11.2 mph).
  - A/C clutch/transmission clutch are unchanged.
  - Rpm is between 1400 and 3000 for manual transaxle.
  - Rpm is between 1300 and 2900 for automatic transaxle.
  - Compensated MAP is with 10.3 to 32 kpa (1.5 to 4.6 psi) range.
- Start test
  - Throttle position (TP) sensor is less then 1%.
  - EGR is less than 1%.
  - Change in MAP is less than 1.0 kpa (0.15 psi)

Note : Test will be aborted when:

- Change in vehicle speed is greater than 5km/h (3.1 mph).
- Rpm is increased more than 75.
- EGR opened less than 90% commanded position.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored in the Freeze Frame data.
- A history Diagnostic Trouble Code (DTC) is stored.
- EGR is disabled.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

The EGR Decel Filter value can be a great aid in determining if a problem exists and to verify repairs. The EGR Decel Filter is an average of the difference in the expected MAP change and the actual MAP change caused by opening the EGR valve during a deceleration, and is used to determine when the MIL is illuminated. By driving the vehicle up to approximately 97 km/h (60 mph) and decelerating to 32 km/h (20 mph), it can be determined if the EGR system is OK, partially restricted, or fully restricted.

A more negative number (less than –3) indicates that the system is working normally, whereas a positive number indicates that the system is being restricted and that the expected amount of EGR flow is was not seen. A number that falls between negative 3 and positive 2 indicates that the system is partially restricted but not restricted enough to cause an emissions impact.

The EGR Decel Filter value should always be at –3 or lower. If the EGR Decel Filter number becomes more positive (towards 0 or more), then the EGR system is becoming restricted. Look for possible damage to the EGR pipe or for a restriction caused by carbon deposits in the EGR passages or on the EGR valve.

Test Description

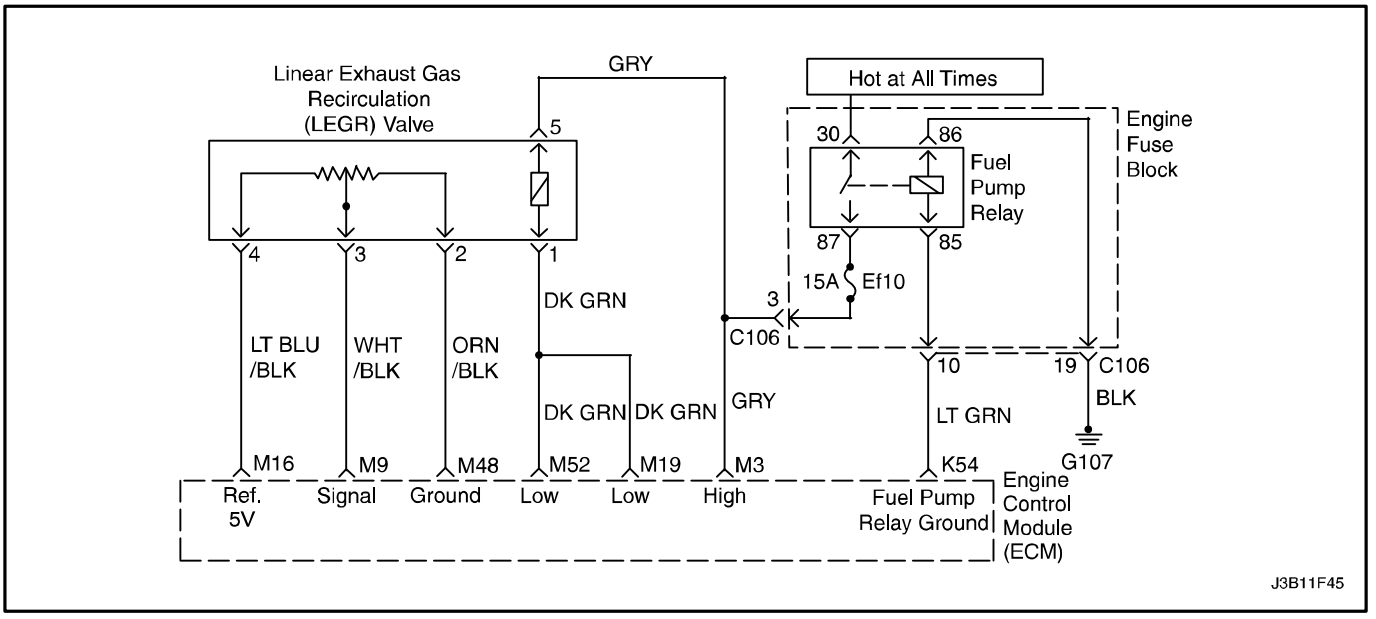
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This

creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Commanding the EGR valve open determines whether the EGR system is totally restricted or partially restricted.
3. Visually and physically inspect the EGR passages and valve for excessive carbon deposits or damage.
4. Be sure all gasket material is removed from the EGR mounting surface. Even a small amount of material may cause a DTC P0401 to set.
5. This step verifies if the fault is present and also verifies if a repair corrected the problem. If the EGR Deceleration Filter value stays near 0 or a positive number after several tests have been run, then a small restriction may still exist. Be sure to check the EGR pipe for damage or dents and the EGR valve for any excessive carbon build up. Only 1 test per ignition cycle will run unless a DTC P0401 has been cleared or the battery has been disconnected.
6. Clearing DTCs is a very important step for this diagnostic. The clearing function allows the EGR valve to relearn a new pintle position as the old pintle position was inaccurate due to the failure that caused the DTC. The DTC must be cleared with the ignition ON, engine OFF or when the engine is idling. If the ECM sees a EGR command, the new pintle will not be learned.

DTC P0401 – Exhaust Gas Recirculation Insufficient Flow

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and allow the engine to idle. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specific value. Does the engine stall or attempt to stall?	50%	Go to *Step 5*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the EGR valve connector and remove the EGR valve. 3. Inspect the EGR valve passages and pipe for a restriction or damages and repair as needed. Is the repair complete?	–	Go to *Step 5*	Go to *Step 4*
4	Replace the EGR valve. Is the repair complete?	–	Go to *Step 5*	–
5	1. Disconnect the battery for more than 10 seconds. 2. Drive the vehicle up to 97 km/h (60mph) 3. Release the throttle and allow the vehicle to decelerate to 32 km/h (20mph). Is the EGR Decel Filter value greater than specified value?	0	Go to *Step 3*	Go to *Step 6*
6	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0402

EXHAUST GAS RECIRCULATION EXCESSIVE FLOW

Circuit Description

An Exhaust Gas Recirculation (EGR) system is used to lower Nitrogen Oxide (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with an Engine Control Module (ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and Manifold Absolute Pressure (MAP) sensors. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR Position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The Actual EGR Position should always be near the commanded or Desired EGR Position.

This Diagnostic Trouble Code (DTC) will detect an EGR open to a large valve during crank. Crank time may be excessive with an open EGR valve.

Conditions for Setting the DTC

- EGR position is greater than 70% for more than 3 seconds during cranking.
- Engine cranking (not running).
- Ignition voltage is between 10 and 16 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history Diagnostic Trouble Code (DTC) is stored.
- EGR is disabled.

Conditions for Clearing the MIL/DTC

- The MIL will turns off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and Desired EGR Positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the freeze frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

The EGR Decel Filter value should always be at –3 or lower. If the EGR Decel Filter number becomes more positive (towards 0 or more), then the EGR system is becoming restricted. Look for possible damage to the EGR pipe or for a restriction caused by carbon deposits in the EGR passages or on the EGR valve.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

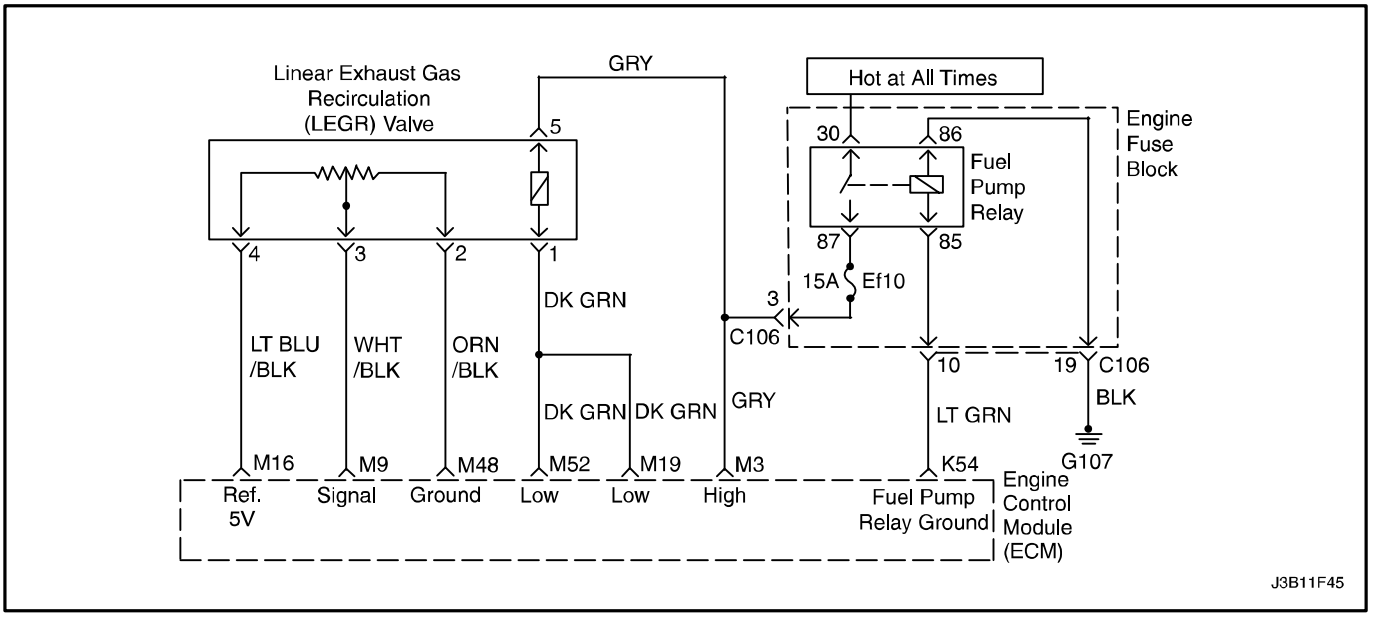
1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Commanding the EGR valve open determines whether the EGR system can control the EGR valve accurately and if the fault is present. The difference between the current and commanded position is greater than 15%.
3. When the EGR valve electrical connector is disconnected, the scan tool should display the Actual EGR Position as 0%. If it does not, the fault lies either in the EGR signal circuit or the ECM.
4. There may be a slight delay for the voltage displayed on the DVM to change after the scan tool commands the EGR valve to operate.
5. An open or poor connection condition may have caused this DTC to set. Be sure to check the terminals for being backed out, improperly formed or damaged, and for poor tension.
7. The test light will have glowed brightly in the previous step if the EGR control circuit was shorted to B+ and the Actual EGR Position on the scan tool will display 100%. A test light that did not illuminate, indicates that the circuit may be open or shorted to ground.
9. If the EGR valve 5 volt reference is shorted to voltage, the digital voltmeter (DVM) will read battery voltage and additional DTCs may be set and the engine performance will be poor.
12. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
13. Although the circuitry acted correctly when checked, a problem may still lie within the terminals which would not show up in probe type testing. Be sure to check the terminals for being backed out, improperly formed or damaged, and for poor tension.
17. All circuits to the EGR valve are OK at this point. The fault lies internally in the EGR valve and, therefore, must be replaced. Be sure all gasket material is removed from the EGR mounting surface. Even a small amount of material may cause a DTC P0401 to set.
18. Check the terminals for being backed out, improperly formed or damaged, and for poor tension.
19. Clearing DTCs is a very important step for this diagnostic. The clearing function allows the EGR valve to relearn a new pintle position as the old pintle position was inaccurate due to the failure that caused the DTC. The DTC must be cleared with the ignition ON, engine OFF or when the engine is idling. If the ECM sees a EGR command, the new pintle will not be learned.
20. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0402 – Exhaust Gas Recirculation Excessive Flow

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data link Connector (DLC). 2. Turn the ignition ON. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specific values. Does the Actual EGR Position follow the Desired EGR Position?	25%, 50%, 75%, 100%	Go to *Step 19*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the EGR valve. 3. Turn the ignition ON. 4. With a test light connected to B+, probe the EGR valve wiring harness connector terminal 2. Does the test light illuminate?	–	Go to *Step 4*	Go to *Step 5*

Step	Action	Value(s)	Yes	No
4	1. Using a voltmeter, measure the voltage at the EGR valve wiring harness connector terminal 1. 2. Command the EGR valve open with the scan tool. After command is raised, is the voltage displayed on the voltmeter vary between specified value?	0 to ≈ 5 V	Go to *Step 6*	Go to *Step 7*
5	Repair the open or poor connection in the EGR ground circuit as needed. Is the repair complete?	–	Go to *Step 19*	
6	With a test light connected to ground, probe the EGR valve wiring harness connector terminal 3. Does the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
7	With a test light connected to ground, probe the EGR valve wiring harness connector terminal 1, without commanding the EGR valve with scan tool. Dose the test light illuminate?	–	Go to *Step 10*	Go to *Step 11*
8	Check the signal circuit for a short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 19*	Go to *Step 12*
9	With a voltmeter connected to the ground, probe the 5 volt reference circuit at terminal 4 of the EGR valve wiring harness connector. Is the voltage near the specified value?	5 v	Go to *Step 13*	Go to *Step 14*
10	Check the control circuit for a short to voltage and repair as needed. Is a repair necessary.	–	Go to *Step 19*	Go to *Step 12*
11	With a test light connected to B+ and again probe the control circuit at terminal 1. Dose the test light illuminate?	–	Go to *Step 15*	Go to *Step 16*
12	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 19*	–
13	Check the EGR ground circuit for poor connection or proper terminal tension at the ECM and repair as needed. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 17*
14	Check the 5 volt reference circuit for a short to voltage and repair as needed. Is the repair necessary?	–	Go to *Step 19*	Go to *Step 12*
15	Check the control circuit 1 for short to ground and repair as needed. Is the repair necessary?	–	Go to *Step 19*	Go to *Step 12*
16	Check the control circuit at terminal 1 for an open or poor connection at EGR valve connector and repair as needed. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 18*
17	1. Turn the ignition OFF. 2. Replace the EGR valve. Is the repair complete?	–	Go to *Step 19*	–

Step	Action	Value(s)	Yes	No
18	Check the ECM connector for a poor connection and repair as needed. Is the repair complete?	–	Go to *Step 19*	–
19	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 20*	Go to *Step 2*
20	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0404

EXHAUST GAS RECIRCULATION OPEN VALVE POSITION ERROR

Circuit Description

An Exhaust Gas Recirculation (EGR) system is used to lower Nitrogen Oxide (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with an Engine Control Module (ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and Manifold Absolute Pressure (MAP) sensors. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR Position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The Actual EGR Position should always be near the commanded or Desired EGR Position.

This Diagnostic Trouble Code (DTC) will detect an open valve position.

Conditions for Setting the DTC

- Difference between current and commended position is greater than 15%.
- Desired EGR position is greater than 0.
- Change in Desired EGR is less than 3%.
- Engine is running.
- Ignition voltage is between 11.7 and 16 volts.
- Air temperature is greater than 3˚C.
- DTCs P0112, P0113 P0405, P0406, and P0502 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate, after three concecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history Diagnostic Trouble Code (DTC) is stored.
- EGR is disabled.

Conditions for Clearing the MIL/DTC

- The MIL will turns off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching

the Actual EGR and Desired EGR Positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the freeze frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

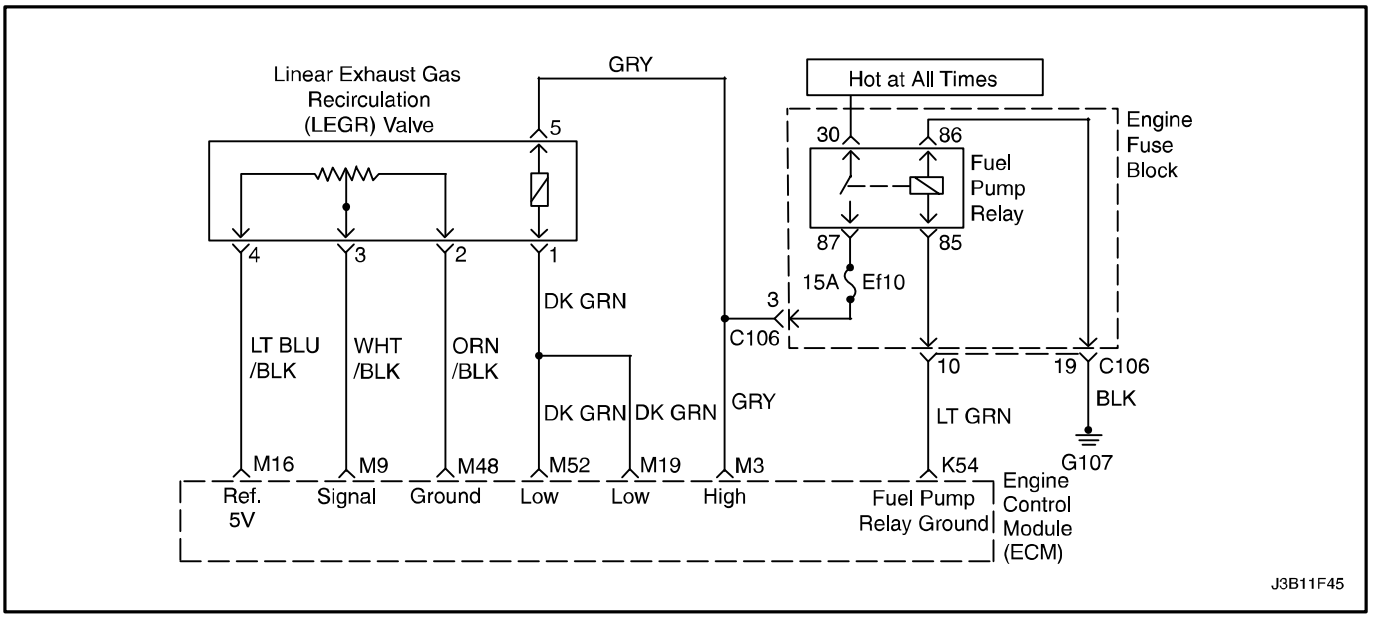
1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Commanding the EGR valve open determines whether the EGR system can control the EGR valve accurately and if the fault is present. The difference between the current and commanded position is greater than 15%.
3. When the EGR valve electrical connector is disconnected, the scan tool should display the Actual EGR Position as 0%. If it does not, the fault lies either in the EGR signal circuit or the ECM.
4. There may be a slight delay for the voltage displayed on the DVM to change after the scan tool commands the EGR valve to operate.
5. An open or poor connection condition may have caused this DTC to set. Be sure to check the terminals for being backed out, improperly formed or damaged, and for poor tension.
7. The test light will have glowed brightly in the previous step if the EGR control circuit was shorted to B+ and the Actual EGR Position on the scan tool will display 100%. A test light that did not illuminate, indicates that the circuit may be open or shorted to ground.
9. If the EGR valve 5 volt reference is shorted to voltage, the digital voltmeter (DVM) will read battery voltage and additional DTCs may be set and the engine performance will be poor.
12. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
13. Although the circuitry acted correctly when checked, a problem may still lie within the terminals which would not show up in probe type testing. Be sure to check the terminals for being backed out, improperly formed or damaged, and for poor tension.
17. All circuits to the EGR valve are OK at this point. The fault lies internally in the EGR valve and, therefore, must be replaced. Be sure all gasket material is removed from the EGR mounting surface. Even a small amount of material may cause a DTC P0401 to set.
18. Check the terminals for being backed out, improperly formed or damaged, and for poor tension.
19. Clearing DTCs is a very important step for this diagnostic. The clearing function allows the EGR valve to relearn a new pintle position as the old pintle position was inaccurate due to the failure that caused the DTC. The DTC must be cleared with the ignition ON, engine OFF or when the engine is idling. If the ECM sees a EGR command, the new pintle will not be learned.
20. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0404 – Exhaust Gas Recirculation Open Valve Position Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specific values. Does the Actual EGR Position follow the Desired EGR Position?	25%, 50%, 75%, 100%	Go to *Step 19*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the EGR valve. 3. Turn the ignition ON. 4. With a test light connected to B+, probe the EGR valve wiring harness connector terminal 2. Does the test light illuminate?	–	Go to *Step 4*	Go to *Step 5*

Step	Action	Value(s)	Yes	No
4	1. Using a voltmeter, measure the voltage at the EGR valve wiring harness connector terminal 1. 2. Command the EGR valve open with the scan tool. After command is raised, is the voltage displayed on the voltmeter vary between specified value?	0 to ≈ 5 V	Go to *Step 6*	Go to *Step 7*
5	Repair the open or poor connection in the EGR ground circuit as needed. Is the repair complete?	–	Go to *Step 19*	–
6	With a test light connected to ground, probe the EGR valve wiring harness connector terminal 3. Dose the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
7	With a test light connected to ground, probe the EGR valve wiring harness connector terminal 1, without commanding the EGR valve with scan tool. Dose the test light illuminate?	–	Go to *Step 10*	Go to *Step 11*
8	Check the signal circuit for a short to voltage and repair as needed. Is a repair necessary?	–	Go to *Step 19*	Go to *Step 12*
9	With a voltmeter connected to the ground, probe the 5 volt reference circuit at terminal 4 of the EGR valve wiring harness connector. Is the voltage near the specified value?	5 v	Go to *Step 13*	Go to *Step 14*
10	Check the control circuit for a short to voltage and repair as needed. Is a repair complete?	–	Go to *Step 19*	Go to *Step 12*
11	With a test light connected to B+ and again probe the control circuit at terminal 1. Dose the test light illuminate?	–	Go to *Step 15*	Go to *Step 16*
12	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 19*	–
13	Check the EGR ground circuit for poor connection or proper terminal tension at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 19*	Go to *Step 17*
14	Check the 5 volt reference circuit for a short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 19*	Go to *Step 12*
15	Check the control circuit at terminal 1 for short to ground and repair as needed. Is the repair complete?	–	Go to *Step 19*	Go to *Step 12*
16	Check the control circuit at terminal 1 for an open or poor connection at EGR valve connector and repair as needed. Is the repair complete?	–	Go to *Step 19*	Go to *Step 18*
17	1. Turn the ignition OFF. 2. Replace the EGR valve. Is the repair complete?	–	Go to *Step 19*	–

Step	Action	Value(s)	Yes	No
18	Check the ECM connector for a poor connection and repair as needed. Is the repair complete?	–	Go to *Step 19*	–
19	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 20*	Go to *Step 2*
20	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0405

EXHAUST GAS RECIRCULATION PINTLE POSITION LOW VOLTAGE

Circuit Description

An Exhaust Gas Recirculation (EGR) system is used to lower Nitrogen Oxide (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with an Engine Control Module (ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and Manifold Absolute Pressure (MAP) sensors. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR Position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The Actual EGR Position should always be near the commanded or Desired EGR Position. This diagnostic Trouble Code (DTC) will detect an open or short circuit.

Conditions for Setting the DTC

- EGR position signal is less than 2%.
- Ignition voltage is between 11.7 and 16 volts.
- Fail condition last more than 10 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history Diagnostic Trouble Code (DTC) is stored.
- EGR is disabled.

Conditions for Clearing the MIL/DTC

- The MIL will turns off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and Desired EGR Positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the freeze frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

Test Description

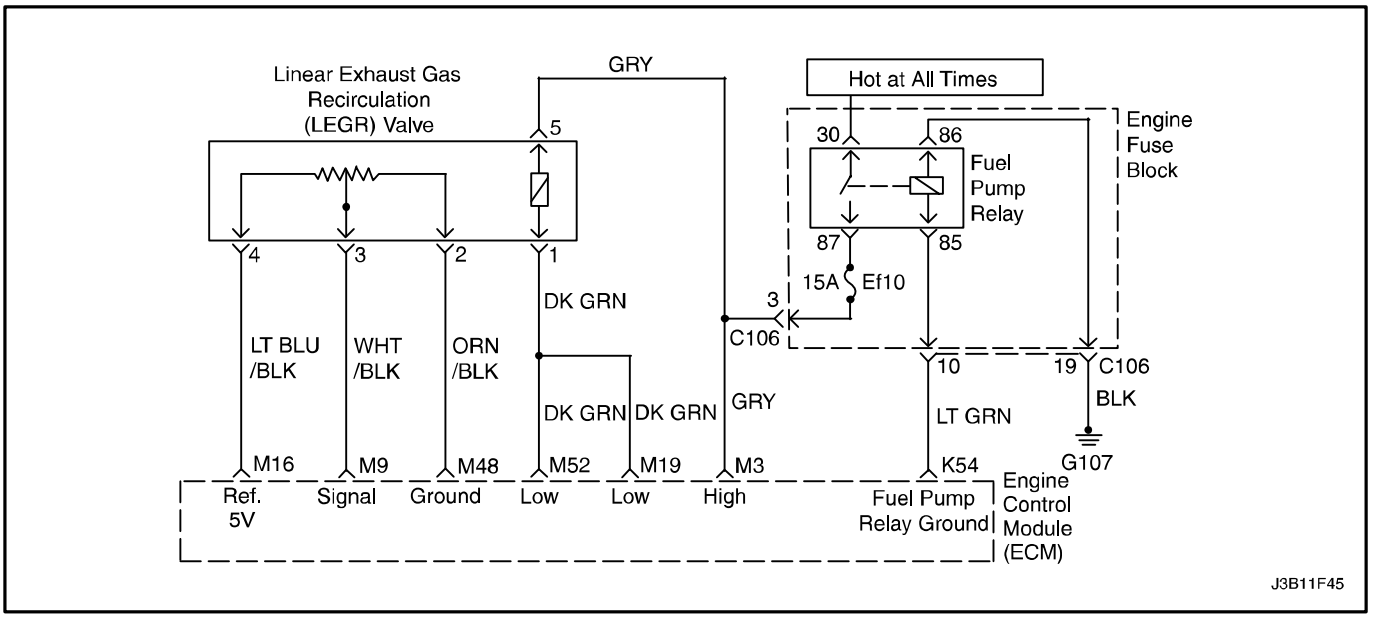
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Commanding the EGR valve open determines whether the EGR system can control the EGR valve accurately and if the fault is present.
3. If the EGR valve 5 volt reference is shorted to ground, the digital voltmeter (DVM) will read no voltage and additional DTCs may be set and the engine performance will be poor. When this circuit is open, only a DTC P0405 will be set.
4. Jumpering the 5 volt reference circuit to the signal circuit checks the signal circuit and the ECM. The scan tool should display the Actual EGR Position as 100% if the signal circuit and ECM are OK.
6. Although the ECM and circuitry acted correctly in the previous step, a problem may still lie within the terminals which would not show up in probe type testing. Be sure to check the terminals for being backed out, improperly formed or damaged, and for poor tension.
10. All circuits to the EGR valve are OK at this point. The fault lies internally in the EGR valve and therefore must be replaced. Be sure all gasket material is removed from the EGR mounting surface. Even a small amount of material may cause a DTC P0401 to set.
13. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
14. Check the terminals for being backed out, improperly formed or damaged, and for poor tension.
15. Clearing DTCs is a very important step for this diagnostic. The clearing function allows the EGR valve to relearn a new pintle position as the old pintle position was inaccurate due to the failure that caused the DTC. The DTC must be cleared with the ignition ON, engine OFF or when the engine is idling. If the ECM sees an EGR command, the new pintle will not be learned.
16. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0405 – Exhaust Gas Recirculation Pintle Position Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specific values. Does the Actual EGR Position follow the Desired EGR Position?	25%, 50%, 75%, 100%	Go to *Step 15*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the EGR valve. 3. Turn the ignition ON. 4. With a voltmeter connected to the ground, probe the 5 volt reference circuit at terminal 4 of the EGR valve wiring harness connector. Is the voltage near the specified value?	5 V	Go to *Step 4*	Go to *Step 5*
4	Jumper the 5 volt reference circuit to the signal circuit at terminal 4 and C at the EGR valve wiring harness connector. Does the Actual EGR Position display the specific value?	100%	Go to *Step 6*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
5	With a test light connected to B+, probe the 5 volt reference circuit at the EGR valve wiring harness connector terminal 4. Dose the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
6	Check the 5 volt reference and signal circuit for a poor connection or proper terminal tension and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 10*
7	With a test light connected to B+, probe the signal circuit at terminal 3 of the EGR valve wiring harness connector. Dose the test light illuminate?	–	Go to *Step 11*	Go to *Step 12*
8	Check for a short to ground in EGR valve 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 13*
9	Check for an open in EGR valve 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 14*
10	1. Turn the ignition OFF. 2. Replace the EGR valve. Is the repair complete?	–	Go to *Step 15*	–
11	Check for a short to ground in the EGR valve signal circuit and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 13*
12	Check for an open in the EGR valve signal circuit and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 14*
13	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 15*	–
14	Check the ECM connector for a poor connection and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 13*
15	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 16*	Go to *Step 2*
16	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0406

EXHAUST GAS RECIRCULATION PINTLE POSITION HIGH VOLTAGE

Circuit Description

An Exhaust Gas Recirculation (EGR) system is used to lower Nitrogen Oxide (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber. When the air/fuel mixture is diluted with the exhaust gases, combustion temperatures are reduced

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with an Engine Control Module (ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and Manifold Absolute Pressure (MAP) sensors. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR Position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The Actual EGR Position should always be near the commanded or Desired EGR Position. This diagnostic Trouble Code (DTC) will detect short circuit.

Conditions for Setting the DTC

- EGR position signal is greater than 98%.
- Ignition voltage is between 11.7 and 16 volts.
- Fail condition last more than 10 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history Diagnostic Trouble Code (DTC) is stored.
- EGR is disabled.

Conditions for Clearing the MIL/DTC

- The MIL will turns off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather at times. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and Desired EGR Positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the freeze frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Commanding the EGR valve open determines whether the EGR system can control the EGR valve accurately and if the fault is present.
3. If the EGR valve 5 volt reference is shorted to ground, the digital voltmeter (DVM) will read no voltage and additional DTCs may be set and the engine performance will be poor. When this circuit is open, only a DTC P0405 will be set.
4. Jumpering the 5 volt reference circuit to the signal circuit checks the signal circuit and the ECM. The scan tool should display the Actual EGR Position as 100% if the signal circuit and ECM are OK.
6. Although the ECM and circuitry acted correctly in the previous step, a problem may still lie within the terminals which would not show up in probe type testing. Be sure to check the terminals for being backed out, improperly formed or damaged, and for poor tension.
10. All circuits to the EGR valve are OK at this point. The fault lies internally in the EGR valve and, therefore, must be replaced. Be sure all gasket material is removed from the EGR mounting surface. Even a small amount of material may cause a DTC P0401 to set.
12. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
13. Check the terminals for being backed out, improperly formed or damaged, and for poor tension.
14. Clearing DTCs is a very important step for this diagnostic. The clearing function allows the EGR valve to relearn a new pintle position as the old pintle position was inaccurate due to the failure that caused the DTC. The DTC must be cleared with the ignition ON, engine OFF or when the engine is idling. If the ECM sees an EGR command, the new pintle will not be learned.
15. no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0406 – Exhaust Gas Recirculation Pintle Position High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Install a scan tool to the Data Link Connector (DLC). 3. Command the Exhaust Gas Recirculation (EGR) valve to the specific values. Does the Actual EGR Position follow the Desired EGR Position?	25%, 50%, 75%, 100%	Go to *Step 14*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the EGR valve. 3. Turn the ignition ON. 4. With a voltmeter connected to the ground, probe the 5 volt reference circuit at terminal 4 of the EGR valve wiring harness connector. Is the voltage near the specified value?	5 V	Go to *Step 4*	Go to *Step 5*
4	Jumper the 5 volt reference circuit to the signal circuit at terminal 4 and C at the EGR valve wiring harness connector. Does the Actual EGR Position display the specific value?	100%	Go to *Step 6*	Go to *Step 7*

Step	Action	Value(s)	Yes	No
5	With a test light connected to B+, probe the 5 volt reference circuit at the EGR valve wiring harness connector terminal 4. Dose the test light illuminate?	–	Go to *Step 8*	Go to *Step 9*
6	Check the 5 volt reference and signal circuit for a poor connection or proper terminal tension and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 10*
7	With a test light connected to B+, probe the signal circuit at terminal 3 of the EGR valve wiring harness connector. Dose the test light illuminate?	–	Go to *Step 11*	Go to *Step 13*
8	Check for a short to ground in EGR valve 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 12*
9	Check for an open in EGR valve 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
10	1. Turn the ignition OFF. 2. Replace the EGR valve. Is the repair complete?	–	Go to *Step 14*	–
11	Check for a short to ground in the EGR valve signal circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 12*
12	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 14*	–
13	Check the ECM connector for a poor connection and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 12*
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0420

CATALYST OXYGEN SENSOR LOW EFFICIENCY

Circuit Description

In order to control exhaust emissions of Hydrocarbons (HC), Carbon Monoxide (CO) and Nitrogen Oxide (NOx), a Three–Way Catalytic Converter (TWC) is used. The catalyst within the converter promotes a chemical reaction which oxidizes the HC and CO present in the exhaust gas, converting them into harmless water vapor and carbon dioxide, it also reduces NOx, converting it into nitrogen. The catalytic converter also has the ability to store oxygen. The Engine Control Module (ECM) has the capability to monitor this process using a Heated

Rear Heated Oxygen Sensor (HO2S2) located in the exhaust stream past the TWC. The HO2S2 produces an output signal which indicates the oxygen storage capacity of the catalyst; this in turn indicates the catalyst's ability to convert exhaust emissions effectively. The ECM monitors the catalyst efficiency by first allowing the catalyst to heat up, waiting for a stabilization period while the engine is idling, and then adding and removing fuel while monitoring the reaction of the HO2S2. When the catalyst is functioning properly, the HO2S2 response to the extra fuel is slow compared to the Front Heated Oxygen Sensor (HO2S1). When the HO2S2 response is close to that of the HO2S1, the Oxygen storage capability or efficiency of the catalyst is considered to be bad, and the Malfunction Indicator Lamp (MIL) will illuminate.

Conditions for Setting the DTC

- Oxygen storage capacity index time is less than 0.3 seconds.
- Before idle test, the vehicle needs to be driven for at least:
  - 15 seconds at airflow is greater than 9.2 g/sec. for manual transaxle.
  - 11 seconds at airflow is greater than 12 g/sec for automatic transaxle.
- Oxygen Sensor Capacity test condition:
- Closed loop stoichiometry.
- Purge concentration learned.
- Engine is running more than 330 seconds.
- Airflow is between 2.5 and 7.25 g/sec.
- Throttle Position (TP) sensor is less than 1.5%.
- Intake Air Temperature (IAT) is between –7˚C (19.4˚F) and 105˚C (221˚F).
- Barometric pressure (BARO) is greater than 72 kPa (10.4 psi).
- Catalyst temperature is between 500˚C (932˚F) and 850˚C (1562˚F) for automatic transaxle.
- Catalyst temperature is between 450˚C (842˚F) and 850˚C (1562˚F) for automatic transaxle.
- Closed Loop integrator change is less than 0.03.
- Idle time is less than 1 minute.
- Vehicle speed is less than 3 km/h (1.9 mph).
- Block Learn Mode is learned.
- Above condition is stabilized for 5 seconds.

Note : Test is aborted for this idle if:

  - Change in engine speed is greater than 80 rpm.
  - A/C status changed.
  - Cooling fan status changed.
  - Insufficient air/fuel shift.
- DTC(s) P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0131, P0132, P0133, P1133, P0134, P0135, P0137, P0138, P0140, P0141, P1167, P1171, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0341, P0342, P0351, P0352, P0402, P0404, P1404, P0405, P0406, P0443, P0502, P0506, P0507, and P0562 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

The catalyst test may abort due to a change in the engine load. Do not change the engine load (i.e. A/C, coolant fan, heater motor) while a catalyst test is in progress.

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

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection

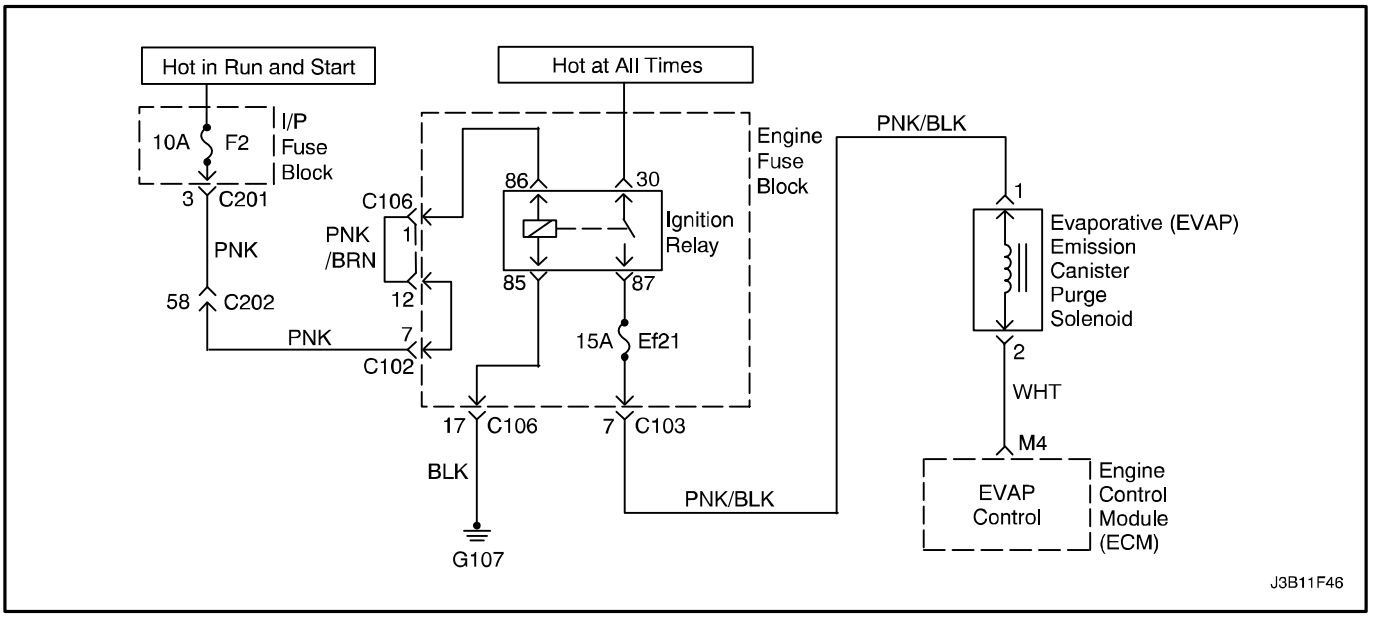
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. If any component DTCs are set, diagnose those DTCs first. A fault in a component can cause the converter to appear degraded or may have caused its failure.
3. This step includes checks for conditions that can cause the three–way catalytic converter to appear degraded. Repair any problems found before proceeding with this table.
5. If the three–way catalytic converter needs to be replaced, make sure that another condition is not present which would cause the converter to become damaged. These conditions may include the following: misfire, high engine oil or coolant consumption, and/or retarded spark timing or weak spark. To avoid damaging the replacement converter, correct any possible causes of converter damage before replacing the catalytic converter.
6. Clearing DTCs allows the catalyst test to be run up to 6 times this ignition cycle. Once the ignition is cycled, the test will run only once. Driving the vehicle heats the catalyst to a test temperature. The ECM must see predetermined amount of time at above idle before allowing the catalyst test to run at idle. Once at idle, the ECM will allow the system to stabilize and then test the catalyst in 2 stages.
7. If no faults have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0420 – Catalyst Oxygen Sensor Low Efficiency

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	• Install a scan tool to the Data Link Connector (DLC). • Turn the ignition ON. Are any component Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC tables	Go to *Step 3*
3	Visually/physically check the following: • Exhaust system for a leak. • Rear Heated Oxygen Sensor (HO2S2) Is a problem found?	–	Go to *Step 4*	Go to *Step 5*
4	Repair the exhaust system as needed. Is the repair complete?	–	Go to *Step 6*	–
5	Replace the Three Way Catalytic Converter (TWC). Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0443

EVAPORATIVE EMISSION SYSTEM PURGE SOLENOID CONTROL CIRCUIT

System Description

The Evaporative Emission (EVAP) system includes the following components:

- Fuel tank
- Fuel tank pressure sensor.
- Fuel pipes and hoses.
- Fuel vapor lines.
- Fuel cap
- EVAP canister.
- Purge lines.
- EVAP emission canister purge solenoid valve.
- EVAP service port.

The EVAP purge canister solenoid is controlled by the Engine Control Module (ECM). The ECM applies a ground to the EVAP purge canister solenoid. The ECM determines when to activate the EVAP canister purge solenoid depending on operating conditions, including Throttle Position (TP), engine speed, Engine Coolant Temperature (ECT) and ambient temperature.

The Diagnostic Trouble Code will detect an open or short circuit.

Conditions for Setting the DTC

- Ignition ON.
- Ignition voltage is greater than 11 v.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using a scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

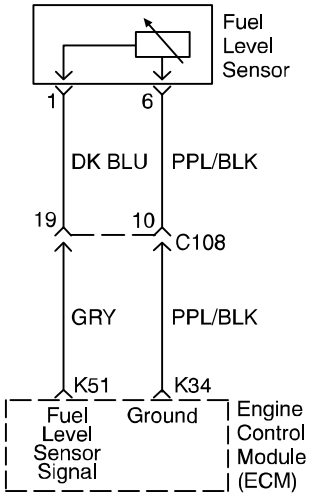
Diagnostic Aids

Using Freeze Frame and/or Failure Records data may aid in locating an intermittent condition. If the DTC cannot be duplicated, the information included in the Freeze Frame and/or Failure Records data can be useful in determining how many miles since the DTC set. The Fail Counter and the Pass Counter can also be used to determine how many ignition cycles the diagnostic reported a pass and/or a fail. Operate the vehicle within the same freeze frame conditions (rpm, load, vehicle speed, temperature, etc.) that were noted. This will isolate when the DTC failed.

DTC P0443 – Evaporative Emission System Purge Solenoid Control Circuit

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Command the Evaporative Emission (EVAP) Purge Solenoid ON and OFF. Does the solenoid turn ON and OFF with each command.	ON–99% OFF–0%	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector. 3. Turn the ignition ON. 4. Using a ammeter on a 10 ampere scale, measure the current between the solenoid control circuit, terminal M4 at the ECM connect and ground for 2 minutes. Does the current draw measure less than the specified value?	0.75 A	Go to ”Diagnostic Aids”	Go to *Step 4*
4	1. Disconnect the solenoid. 2. Using ohmmeter measure the resistance between the solenoid control circuit, terminal M4 of the ECM connector and ground. Does the ohmmeter display infinite resistance?	–	Go to *Step 12*	Go to *Step 10*
5	1. Turn the ignition OFF. 2. Disconnect the solenoid. 3. Connect a test light between the terminal 1 and 2 of the solenoid. 4. Turn the ignition ON. 5. Using the scan tool, command the solenoid ON and OFF. Does the test light turn ON and OFF with each command?	–	Go to *Step 8*	Go to *Step 6*
6	With a test light connected to ground, probe the ignition feed circuit, terminal 1 in the solenoid harness connector.	–	Go to *Step 7*	Go to *Step 11*
7	1. Turn the ignition OFF. 2. Reconnect the solenoid. 3. Disconnect the ECM connector. 4. Turn the ignition ON. 5. With a fused jumper wire connected to ground, probe the solenoid control circuit terminal M4 in the ECM connector. Does the solenoid operate?	–	Go to *Step 9*	Go to *Step 10*
8	Check the connections at the solenoid. Is a problem found and corrected?	–	Go to *Step 14*	Go to *Step 12*

Step	Action	Value(s)	Yes	No
9	Check the connections at the ECM. Is a problem found and corrected?	–	Go to *Step 14*	Go to *Step 13*
10	Repair the faulty solenoid control circuit. Is the repair complete?	–	Go to *Step 14*	–
11	Repair the faulty solenoid ignition feed circuit. Is the repair complete?	–	Go to *Step 14*	
12	1. Turn the ignition OFF. 2. Replace the solenoid. Is the repair complete?	–	Go to *Step 14*	–
13	1. Turn the ignition OFF. 2. Replace ECM. Is the repair complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



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DIAGNOSTIC TROUBLE CODE (DTC) P0461

FUEL LEVEL STUCK

Circuit Description

The Engine Control Module (ECM) uses the signal from the fuel level sensor to calculate expected vapor pressure within the fuel system. Vapor pressure varies as the fuel level changes. The fuel level signal also used to determine if the fuel level is too high or too low to be able to detect Evaporative Emission (EVAP) system faults. This Diagnostic Trouble Code (DTC) indicates the fuel level stuck.

Conditions for Setting the DTC

- Change in fuel level sensor output is less than 3.5% after 250 km (155 mile) driving.
- Ignition ON.
- DTCs P0462, P0463 and P0502 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

Check for a poor connection or damaged ECM harness. Inspect the fuel level circuit terminal for the following conditions:

- Improper mating.
- Broken locks.
- Improperly formed.
- Damaged terminals.
- Poor terminal–to–wire connection.
- Damaged harness.

Test Description

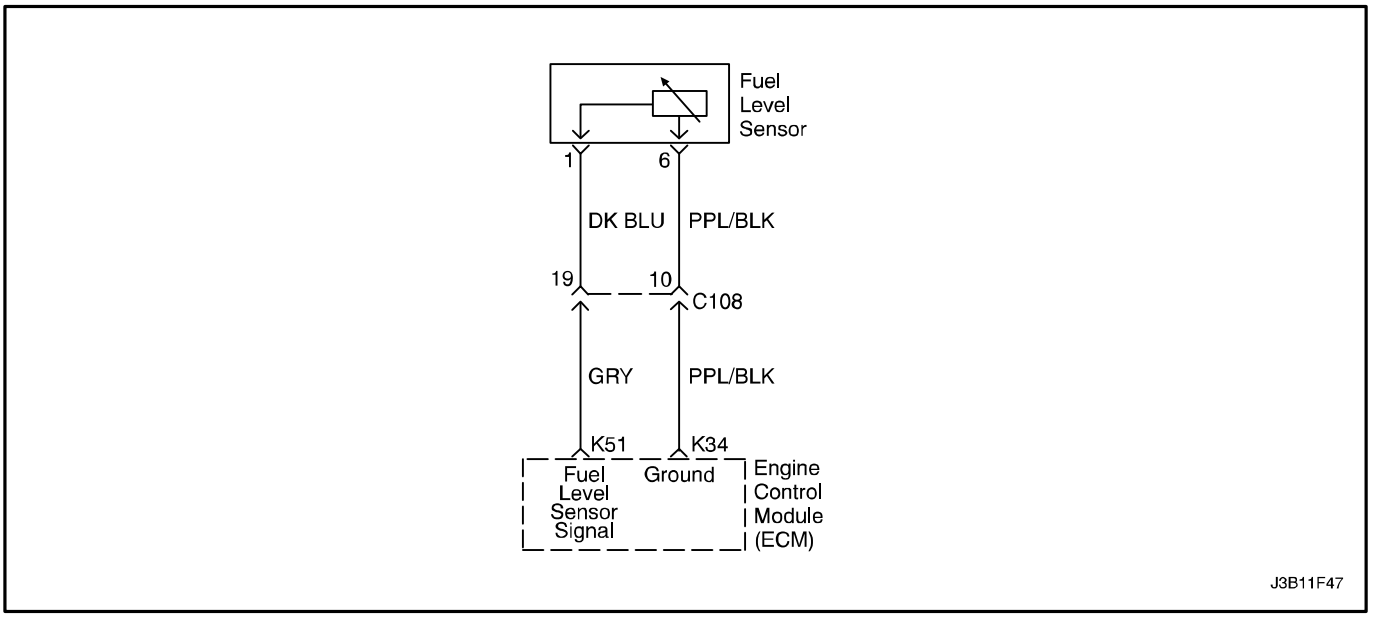
The number(s) below refer to step(s) on the diagnostic table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an
2. Determine if fault is present. Reviews Freeze Frame data to determine when the DTC set. Always record this information.

DTC P0461 – Fuel Level Stuck

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and operate the vehicle over the specified mileage. Is any of the Diagnostic trouble Codes (DTCs) P0462, P0463 or P0502 set?	250 km (155 mile)	Go to Applicable DTC table	Go to Step 3
3	1. Turn the ignition OFF. 2. Disconnect the fuel pump connector. 3. Turn the ignition ON. 4. Using a voltmeter, measure the fuel level signal voltage at the fuel level sensor connector terminal 1. Is the voltage within the specified value?	4–5 volts	Go to *Step 4*	Go to *Step 5*
4	1. Disconnect the Engine Control Module (ECM). 2. Check the fuel level sensor ground circuit for an open between terminal 6 of the fuel sensor connector and terminal K34 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 10*	Go to *Step 6*
5	Using a voltmeter, measure the voltage at the ECM connector terminal K34 by back–probing the ECM connector. Is the voltage within the specified value?	4–5 V	Go to *Step 8*	Go to *Step 9*
6	1. Remove the fuel pump from the fuel tank. 2. Reconnect the fuel pump connector. 3. Turn the ignition ON. 4. Monitor the fuel level sensor parameter on the scan tool while moving the fuel sensor float from empty position to full position. 5. Repeat procedure 4 several times. Does the fuel level sensor vale on the scan tool increase and then decrease steadily when the float is moved?	–	Go to ”Diagnostic Aids”	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Replace the fuel pump assembly.	–	Go to *Step 10*	–
8	1. Turn the ignition OFF. 2. Disconnect the ECM connector. 3. Check the fuel level signal circuit fir an open or short to ground between terminal K51 and fuel pump harness connector terminal 1 and repair as needed. Is the repair complete?	–	Go to *Step 10*	–
9	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 10*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 11*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0462

FUEL LEVEL LOW VOLTAGE

Circuit Description

The Engine Control Module (ECM) uses the signal from the fuel level sensor to calculate expected vapor pressure within the fuel system. Vapor pressure varies as the fuel level changes. The fuel level signal also used to determine if the fuel level is too high or too low to be able to detect Evaporative Emission (EVAP) system faults. This Diagnostic Trouble Code (DTC) detects a continuous short to low or open in either the signal circuit or the fuel level sensor.

Conditions for Setting the DTC

- Fuel level sensor output is less than 5% of sensor reading scale.
- Ignition ON.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connector for backed–out terminal, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

Inspect wiring harness for damage.

A stuck fuel level sensor may cause the DTC set.

If the DTC P0462 cannot be duplicate, the information included on the Failure record data can be useful in determine vehicle conditions when the DTC was first set.

Resistance checks for fuel level sensor:

- Empty = 280 ohms or over.
- Half Full = about 90 ohms.
- Full = 38 ohms or less

Test Description

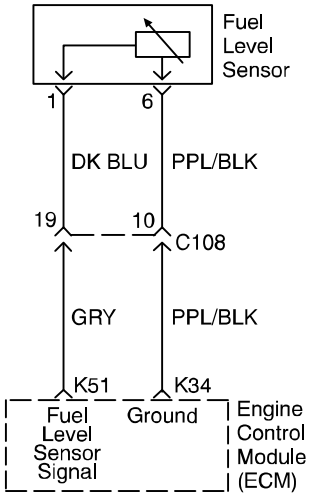
The number(s) below refer to step(s) on the diagnostic table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Determine if fault is present. Review Freeze Frame data to determine when the DTC set. Always record this information.

DTC P0462 – Fuel Level Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and operate the vehicle within Failure Record condition as noted. Is Diagnostic trouble Codes (DTCs) P0462 set?	–	Go to *Step 3*	Go to ”Diagnostic Aids”
3	1. Turn the ignition OFF. 2. Disconnect the fuel pump connector. 3. Turn the ignition ON. 4. Using a voltmeter, measure the fuel level signal voltage at the fuel level sensor connector terminal 1. Is the voltage within the specified value?	0.4 – 4.5 V	Go to *Step 4*	Go to *Step 6*
4	Check for a proper ground connection at the fuel tank and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 5*
5	1. Remove the fuel pump from the fuel tank. 2. Reconnect the fuel pump connector. 3. Turn the ignition ON. 4. Monitor the fuel level sensor parameter on the scan tool while moving the fuel sensor float from empty position to full position. 5. Repeat procedure 4 several times. Does the fuel level sensor vale on the scan tool increase and then decrease steadily when the float is moved?	–	Go to ”Diagnostic Aids”	Go to *Step 8*
6	Check for an open or short to ground in the fuel level sensor circuit and repair as needed. Is the repair necessary?	–	Go to *Step 11*	Go to *Step 9*
7	Repair the open or short to ground in the fuel level sensor circuit between the fuel level sensor harness connector and fuel level sensor. Is the repair complete?	–	Go to *Step 11*	–
8	1. Turn the ignition OFF. 2. Replace the fuel pump assembly. Is the repair complete?	–	Go to *Step 11*	–
9	1. Turn the ignition OFF. 2. Connect the fuel pump connector. 3. Disconnect the engine Control Module (ECM) connector. 4. Turn the ignition ON. 5. Using a digital voltmeter, measure the voltage in the signal circuit at terminal K51. Is the voltage within the specified value?	4–5 V	Go to *Step 10*	Go to *Section 9E, Instrumentation/ Driver Information*
10	• Turn the ignition OFF. • Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



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DIAGNOSTIC TROUBLE CODE (DTC) P0463

FUEL LEVEL HIGH VOLTAGE

Circuit Description

The Engine Control Module (ECM) uses the signal from the fuel level sensor to calculate expected vapor pressure within the fuel system. Vapor pressure varies as the fuel level changes. The fuel level signal also used to determine if the fuel level is too high or too low to be able to detect Evaporative Emission (EVAP) system faults. This Diagnostic Trouble Code (DTC) detects a continuous short to low or open in either the signal circuit or the fuel level sensor.

Conditions for Setting the DTC

- Fuel level sensor output is greater than 85% of sensor reading scale.
- Ignition ON.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connector for backed–out terminal, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.

Inspect wiring harness for damage.

A stuck fuel level sensor may cause the DTC set.

If the DTC P0462 cannot be duplicate, the information included on the Failure record data can be useful in determine vehicle conditions when the DTC was first set.

Resistance checks for fuel level sensor:

- Empty = 280 ohms or over.
- Half Full = about 90 ohms.
- Full = 38 ohms or less.

Test Description

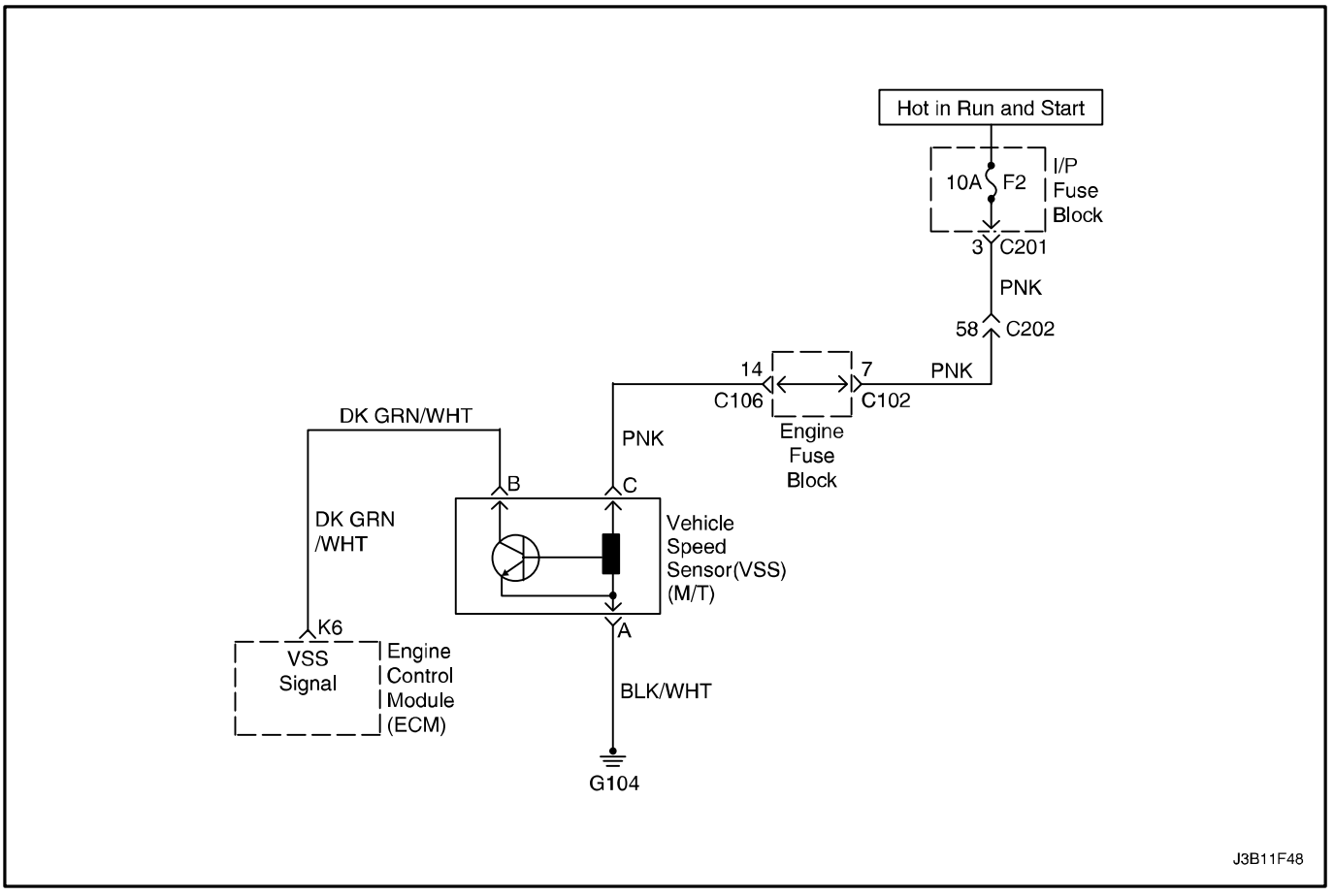
The number(s) below refer to step(s) on the diagnostic table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Determine if fault is present. Review Freeze Frame data to determine when the DTC set. Always record this information.

DTC P0463 – Fuel Level High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and operate the vehicle within Failure Record condition as noted. Is Diagnostic trouble Codes (DTCs) P0463 set?	–	Go to *Step 3*	Go to ”Diagnostic Aids”
3	1. Turn the ignition OFF. 2. Disconnect the fuel pump connector. 3. Turn the ignition ON. 4. Using a voltmeter, measure the fuel level signal voltage at the fuel level sensor connector terminal 1. Is the voltage within the specified value?	0.4 – 4.5 V	Go to *Step 4*	Go to *Step 6*
4	Check for a proper ground connection at the fuel tank and repair as needed. Is the repair necessary?	–	Go to *Step 11*	Go to *Step 5*
5	1. Remove the fuel pump from the fuel tank. 2. Reconnect the fuel pump connector. 3. Turn the ignition ON. 4. Monitor the fuel level sensor parameter on the scan tool while moving the fuel sensor float from empty position to full position. 5. Repeat procedure 4 several times. Does the fuel level sensor vale on the scan tool increase and then decrease steadily when the float is moved?	–	Go to ”Diagnostic Aids”	Go to *Step 8*
6	Check for short to voltage in the fuel level sensor circuit and repair as needed. Is the repair necessary?	–	Go to *Step 7*	Go to *Step 9*
7	Repair the short to voltage in the fuel level sensor circuit between the fuel level sensor harness connector and fuel level sensor. Is the repair necessary?	–	Go to *Step 11*	–
8	• Turn the ignition OFF. • Replace the fuel pump assembly. Is the repair complete?	–	Go to *Step 11*	–
9	1. Turn the ignition OFF. 2. Connect the fuel pump connector. 3. Disconnect the engine Control Module (ECM) connector. 4. Turn the ignition ON. 5. Using a digital voltmeter, measure the voltage in the signal circuit at terminal K51. Is the voltage within the specified value?	0.4 – 4.5 V	Go to *Step 10*	Go to *Section 9E, Instrumentation/ Driver Information*
10	• Turn the ignition OFF. • Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0502

VEHICLE SPEED SENSOR NO SIGNAL (ENGINE SIDE)

Circuit Description

Vehicle speed information is provided to the Engine Control Module (ECM) by the Vehicle Speed Sensor (VSS). The VSS is a permanent magnet generator that is mounted in the transaxle and produces a pulsing voltage whenever vehicle speed is over 3 mph (5 km/h). The Alternating Current (AC) voltage level and the number of pulses increases with vehicle speed. The ECM converts the pulsing voltage into mph (km/h) and then supplies the necessary signal to the instrument panel for speedometer/odometer operation and to the cruise control module and multi–function alarm module operation. This Diagnostic Trouble Code (DTC) will detect if vehicle speed is reasonable according to engine rpm and load.

Conditions for Setting the DTC

- Vehicle speed is less than 5 km/h (3.1 mph) for Power and Decel test.
- Engine is running.
- Engine Coolant Temperature (ECT) is greater than 60 ˚C (140 ˚F).
- Ignition voltage is between 11–16 volts.
- Power Test
  - The rpm is between 1200 and 4000.
  - Throttle Position (TP) sensor is between 25% and 60%.
  - MAP is greater than 60 kPa (8.7 psi).
- Deceleration Test
  - Generator compensated Manifold Absolute Pressure (MAP) is less than 30 kPa (4.4 psi)
  - Change in rpm per cycle is less than 50 rpm/cycle.
  - Throttle Position (TP) sensor is less than 0.8%.
  - The rpm is between 1800 and 6000.
- DTC(s) P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0201, P0202, P0203, P0204, P0300, P0351, P0352, P0402, P0404, P1404, P0405, and P0406 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

VSS signal circuit should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wire connection
- Physical damage to the wiring harness

Ensure the VSS is correctly tightened with proper torque to the transmission housing.

Refer to ”Intermittents”in this section.

Test Description

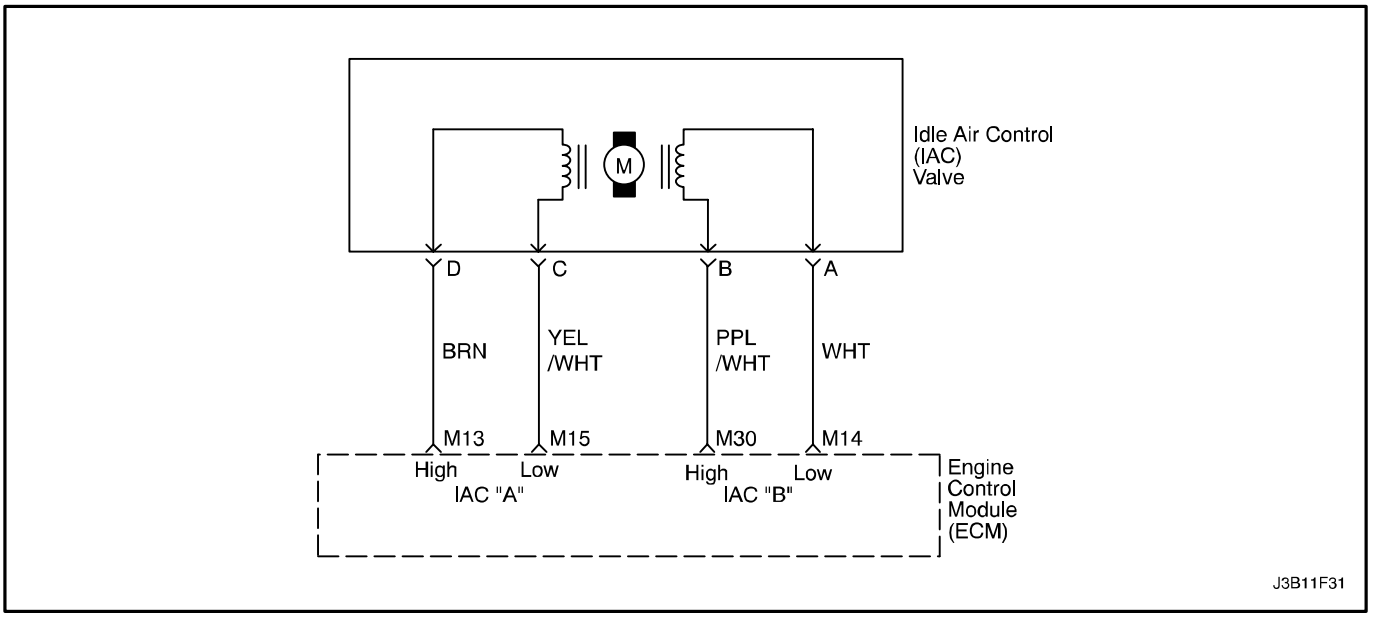
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. The permanent magnet generator only produces a signal if the drive wheels are turning greater than 5 mph (8 km/h). This step determines if DTC P0502 is the result of a hard failure or an intermittent condition.
3. Proper engine loads cannot be achieved in a shop environment to properly run the vehicle within the Freeze Frame Data conditions. It will be necessary to drive the vehicle on the road to obtain the proper engine loads.
4. This step verifies that the ECM is receiving a signal from the vehicle speed sensor.
5. Refer to service bulletin information for the latest calibration update.
6. Refer to the latest Techline information for programming procedures.
8. A resistance reading that is higher than the specified value indicates that the VSS circuitry is open.
10. If the displayed resistance is less than the 1300 ohms, the VSS high and low circuits are shorted together.
11. This checks the resistance of the VSS if no opens or shorts were found on the VSS high and low circuits.
13. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0502 – Vehicle Speed Sensor No Signal (Engine Side)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	**Notice :** Running the vehicle in gear with the wheels hanging down at full travel will damage the drive axles. 1. Install a scan tool to the Data Link Connector (DLC). 2. Raise the drive wheels. 3. Support the lower control arms so that the drive axles are in a horizontal (straight) position. 4. Start the engine and allow to idle in gear. Does the scan tool display vehicle speed above the specific value?	0 mph	Go to *Step 3*	Go to *Step 4*

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition ON. 2. Review the Freeze Frame data and note the parameters. 3. Operate the vehicle within the Freeze Frame conditions and Conditions for Setting this DTC. Does the scan tool display vehicle speed above the specific value?	0 mph	Go to *Step 12*	Go to *Step 4*
4	1. Turn the ignition OFF. 2. Disconnect the Vehicle Speed Sensor (VSS) connector. 3. Turn the ignition ON. 4. Using a voltmeter connected to ground, measure the voltage in VSS signal circuit, at terminal B. Is the voltage near the specified value?	10.1 v	Go to *Step 5*	Go to *Step 7*
5	Using a voltmeter connected to ground, measure the voltage at terminal C of the VSS connector. Is the voltage near the specified value?	11–14 V	Go to Step 6	Go to Step 8
6	Using a ohmmeter connected to ground, measure the voltage at terminal A of the VSS connector. Is the voltage near the specified value?	400 Ω	Go to *Step 10*	Go to *Step 9*
7	Check the VSS signal circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 11*
8	Check the ignition circuit for an open and repair as needed. Is the repair complete?	–	Go to *Step 12*	–
9	Check the VSS ground circuit for an open and repair as needed. Is the repair complete?	–	Go to *Step 12*	–
10	1. Turn the ignition OFF. 2. Replace the VSS. Is the repair complete?	–	Go to *Step 12*	–
11	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 12*	–
12	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0506

IDLE SPEED RPM LOWER THAN DESIRED IDLE SPEED

Circuit Description

The Engine Control Module (ECM) controls the air entering into the engine with an Idle Air Control (IAC) Valve. To increase the idle rpm, the ECM commands the pintle inside the IAC valve away from the throttle body seat. This allows more air to bypass through the throttle blade. To decrease the rpm the ECM commands the pintle towards the throttle body seat. This reduces the amount of air bypassing the throttle blade. A scan tool will read the IAC valve pintle position in counts. The higher the counts, the more air that is allowed to bypass the throttle blade. This Diagnostic Trouble Code (DTC) determines if a low idle condition exists as defined as 100 rpm below the desired idle rpm.

Conditions for Setting the DTC

- No intrusive tests are active.
- DTC(s) P0106, P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0132, P0133, P0135, P0141, P1133, P1134, P0171, P01167, P1171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0341, P0342, P0351, P0352, P0402, P0404, P1404, P0405, P0406, P0443, and P0502 are not set.
- Engine is running more than 60 seconds.
- Barometric Pressure (BARO) is greater than 72 kPa (10.4 psi).
- Engine Coolant Temperature (ECT) is greater than 60˚C (140˚F).
- Ignition voltage is between 11 and 16 volts.
- Manifold Absolute Pressure is less than 60 kPa (8.7 psi).
- IAC valve is controlled fully opened.
- All of the above must be met for greater than 5 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect the IAC valve electrical connection for proper mating.

Inspect the wiring harness for damage.

Inspect the throttle stop screw for signs of tampering.

Inspect the throttle linkage for signs of binding or excessive wear.

A slow or unstable idle may be caused by one of the following conditions:

- Fuel system too rich or too lean.
- Foreign material in the throttle body bore or in the air induction system.
- A leaking or restricted intake manifold.
- Excessive engine overloading. Check for seized pulleys, pumps, or motors on the accessory drive.
- Overweight engine oil.

Test Description

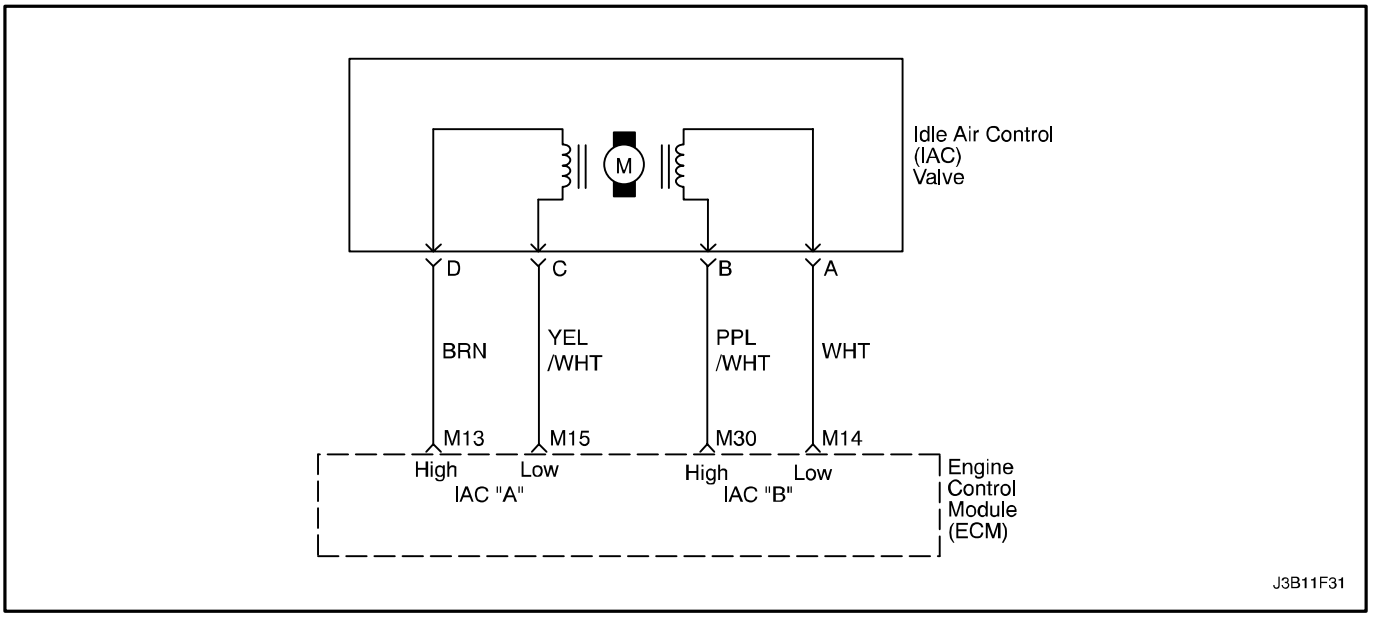
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. A normally operating IAC system will be able to be extended and retracted by a scan tool and change the engine idle rpm. Valve movement is verified by an engine rpm change.
3. If the scan tool was able to command the IAC valve smoothly, a malfunction may still exist internally within the IAC valve. This can be checked by checking the IAC valves internal resistance.
5. The IAC circuits always have ground or voltage signals on them in pairs. If the test light illuminates on more or less than 2 terminals, 1 of the circuits is shorted to voltage or open.
6. The IAC circuits always have ground or voltage signals on them in pairs. If the test light illuminates on more or less than 2 terminals, 1 of the circuits is shorted to ground or open
8. The IAC circuits are constantly switched between ground and voltage so the test light should blink on all circuits when connected to ground.
10. Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed–out terminals, improper mating, broke locks, improperly formed or damaged terminals, poor terminal– to–wiring connections or physical damage to the wiring harness.
12. A test light that remains ON constantly indicates that the circuit is shorted to voltage.
14. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
16. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P0506 – Idle Speed RPM Lower Than Desired Idle Speed

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Operate the engine to idle speed. 3. Transmission in park or neutral and the parking brake set. 4. A/C is off. 5. Using scan tool, command the Idle Air Control (IAC) valve up and down between the specified value. Does the rpm change smoothly when he commanded by the scan tool?	900–1200 rpm	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition OFF. 2. Disconnect the IAC valve connector. 3. Measure the resistance between terminal D and C of the IAC valve. 4. Measure the resistance between terminal B and A of the IAC valve. Is the resistance within the specified value?	40–80 Ω	Go to *Step 4*	Go to *Step 13*
4	1. Measure the resistance between terminal C and B of the IAC valve. 2. Measure the resistance between terminal D and A of the IAC valve. Is the resistance equal to the specified value?	∞	Go to *Step 15*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the IAC valve connector. 3. Turn the ignition ON. 4. With test light connected to ground, probe the IAC connector terminals. Does the test light illuminate on 2 terminals?	–	Go to *Step 6*	Go to *Step 7*
6	With test light connected to B+, probe the IAC connector terminals. Does the test light illuminate on 2 terminals?	–	Go to *Step 8*	Go to *Step 9*
7	Check for an open or short to ground in the IAC high and low circuits and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 10*
8	1. Idle the engine. 2. Connect a test light to ground, probe the IAC connector terminals. Does the test light flash On and OFF for all terminals?	–	Go to *Step 11*	Go to *Step 12*
9	Check for an open or a short to voltage in the IAC valve high and low circuits and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 10*
10	Check the Engine control Module (ECM) connector for poor connections and repair as needed. Is the repair necessary?	–	Go to *Step 15*	Go to *Step 14*
11	Inspect the IAC valve passages and repair as needed. Is the problem found?	–	Go to *Step 15*	Go to *Step 13*
12	Check the test light. Does the test light remain on constantly for the terminals that did not blink?	–	Go to *Step 9*	Go to *Step 7*
13	1. Turn the ignition OFF. 2. Replace the IAC valve. Is the repair complete?	–	Go to *Step 15*	–
14	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 15*	–
15	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to Step 16	Go to Step 2
16	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0507

IDLE SPEED RPM HIGHER THAN DESIRED IDLE SPEED

Circuit Description

The Engine Control Module (ECM) controls the air entering into the engine with an Idle Air Control (IAC) Valve. To increase the idle rpm, the ECM commands the pintle inside the IAC valve away from the throttle body seat. This allows more air to bypass through the throttle blade. To decrease the rpm the ECM commands the pintle towards the throttle body seat. This reduces the amount of air bypassing the throttle blade. A scan tool will read the IAC valve pintle position in counts. The higher the counts, the more air that is allowed to bypass the throttle blade. This Diagnostic Trouble Code (DTC) determines if a high idle condition exists as defined as 200 rpm above the desired idle rpm.

Conditions for Setting the DTC

- No intrusive tests are active.
- DTC(s) P0106, P0107, P0108, P0112, P0113, P0117, P0118, P0122, P0123, P0131, P0132, P0133, P0135, P0141, P1133, P1134, P0171, P1167, P1171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0341, P0342, P0351, P0352, P0402, P0404, P1404, P0405, P0406, P0441, P0443, and P0502 are not set.
- Engine is running more than 60 seconds.
- Barometric Pressure (BARO) is greater than 72 kPa (10.4 psi).
- Engine Coolant Temperature (ECT) is greater than 60˚C (140˚F).
- Ignition voltage is between 11 and 16 volts.
- The Intake Air Temperature (IAT) is greater than –20˚C (–4˚F).
- IAC valve is controlled fully closed.
- All of the above must be met for greater than 5 seconds.
- Idle engine speed error is greater than 200 rpm for 10 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect the IAC valve electrical connection for proper mating.

Inspect the wiring harness for damage.

Inspect the throttle stop screw for signs of tampering.

Inspect the throttle linkage for signs of binding or excessive wear.

Inspect the positive crankcase ventilation (PCV) valve and PCV hose.

A slow or unstable idle may be caused by one of the following conditions:

- Fuel system too rich or too lean.
- Foreign material in the throttle body bore or in the air induction system.
- A leaking or restricted intake manifold.
- Excessive engine overloading. Check for seized pulleys, pumps, or motors on the accessory drive.
- Overweight engine oil.

Test Description

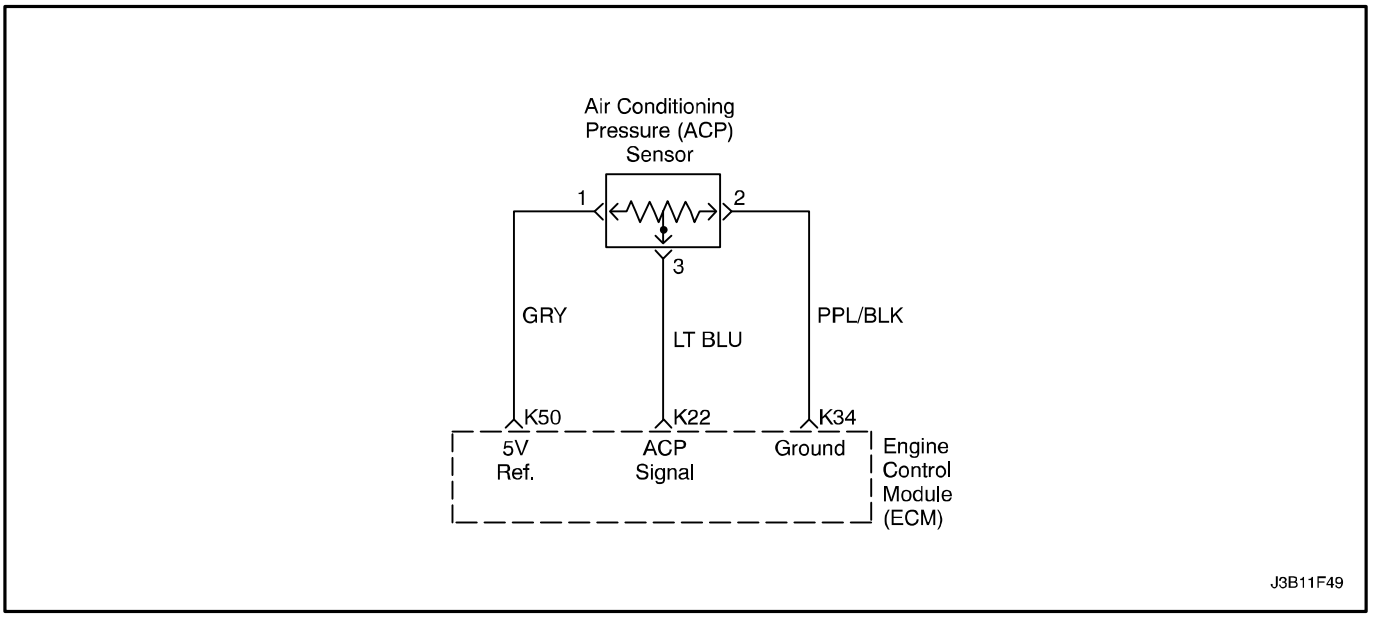
Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. A normally operating IAC system will be able to be extended and retracted by a scan tool and change the engine idle rpm. Valve movement is verified by an engine rpm change.
3. If the scan tool was able to command the IAC valve smoothly, a malfunction may still exist internally within the IAC valve. This can be checked by checking the IAC valves internal resistance.
5. The IAC circuits always have ground or voltage signals on them in pairs. If the test light illuminates on more or less than 2 terminals, 1 of the circuits is shorted to voltage or open.
6. The IAC circuits always have ground or voltage signals on them in pairs. If the test light illuminates on more or less than 2 terminals, 1 of the circuits is shorted to ground or open
8. The IAC circuits are constantly switched between ground and voltage so the test light should blink on all circuits when connected to ground.
10. Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal– to–wiring connections or physical damage to the wiring harness.
12. A test light that remains ON constantly indicates that the circuit is shorted to voltage.
14. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
16. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information for additional checks and information.

DTC P0507 – Idle Speed RPM Higher Than Desired Idle Speed

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Operate the engine to idle speed. 3. Transmission in park or neutral and the parking brake set. 4. A/C is Off. 5. Using scan tool, command the Idle Air Control (IAC) valve up and down between the specified value. Does the rpm change smoothly when he commanded by the scan tool?	900–1200 rpm	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition OFF. 2. Disconnect the IAC valve connector. 3. Measure the resistance between terminal D and C of the IAC valve. 4. Measure the resistance between terminal B and A of the IAC valve. Is the resistance within the specified value?	40–80 Ω	Go to *Step 4*	Go to *Step 13*
4	1. Measure the resistance between terminal C and B of the IAC valve. 2. Measure the resistance between terminal D and A of the IAC valve. Is the resistance equal to the specified value?	–	Go to *Step 15*	Go to *Step 13*

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the IAC valve connector. 3. Turn the ignition ON. 4. With test light connected to ground, probe the IAC connector terminals. Does the test light illuminate on 2 terminals?	–	Go to *Step 6*	Go to *Step 7*
6	With test light connected to B+, probe the IAC connector terminals. Does the test light illuminate on 2 terminals?	–	Go to *Step 8*	Go to *Step 9*
7	Check for an open or short to ground in the IAC high and low circuits and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 10*
8	1. Idle the engine. 2. Connect a test light to ground, probe the IAC connector terminals. Does the test light flash On and OFF for all terminals?	–	Go to *Step 11*	Go to *Step 12*
9	Check for an open or a short to voltage in the IAC valve high and low circuits and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 10*
10	Check the Engine control Module (ECM) connector for poor connections and repair as needed. Is the repair necessary?	–	Go to *Step 15*	Go to *Step 14*
11	Inspect the IAC valve passages and repair as needed. Is the repair complete?	–	Go to *Step 15*	Go to *Step 13*
12	Check the test light. Does the test light remain on constantly for the terminals that did not blink?	–	Go to *Step 9*	Go to *Step 7*
13	1. Turn the ignition OFF. 2. Replace the IAC valve. Is the repair complete?	–	Go to *Step 15*	–
14	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 15*	–
15	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 16*	Go to *Step 2*
16	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0532

A/C PRESSURE SENSOR LOW VOLTAGE

Circuit Description

The Air Conditioning (A/C) system uses an A/C refrigerant pressure sensor mounted in the high pressure side of the A/C refrigerant system to monitor A/C refrigerant pressure. The Engine Control Module (ECM) uses this information to turn ON the engine coolant fans when the A/C refrigerant pressure is high and to keep the compressor disengaged when A/C refrigerant pressure is excessively high or low.

The Air Conditioning Pressure (ACP) sensor operates like other 3–wire sensors. The ECM applies a 5.0 volt reference and a sensor ground to the sensor. Changes in the A/C refrigerant pressure will cause the ACP sensor input to the ECM to vary. The ECM monitors the ACP sensor signal circuit and can determine when the signal is outside of the possible range of the sensor. When the signal is out of range for a prolonged period of time, the ECM will not allow the A/C compressor clutch to engage. This is done to protect the compressor.

Conditions for Setting the DTC

- A/C pressure is less than 1 % of the sensor reading scale.
- Engine is running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.
- The A/C compressor operation will be disabled while the low voltage indication exists.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

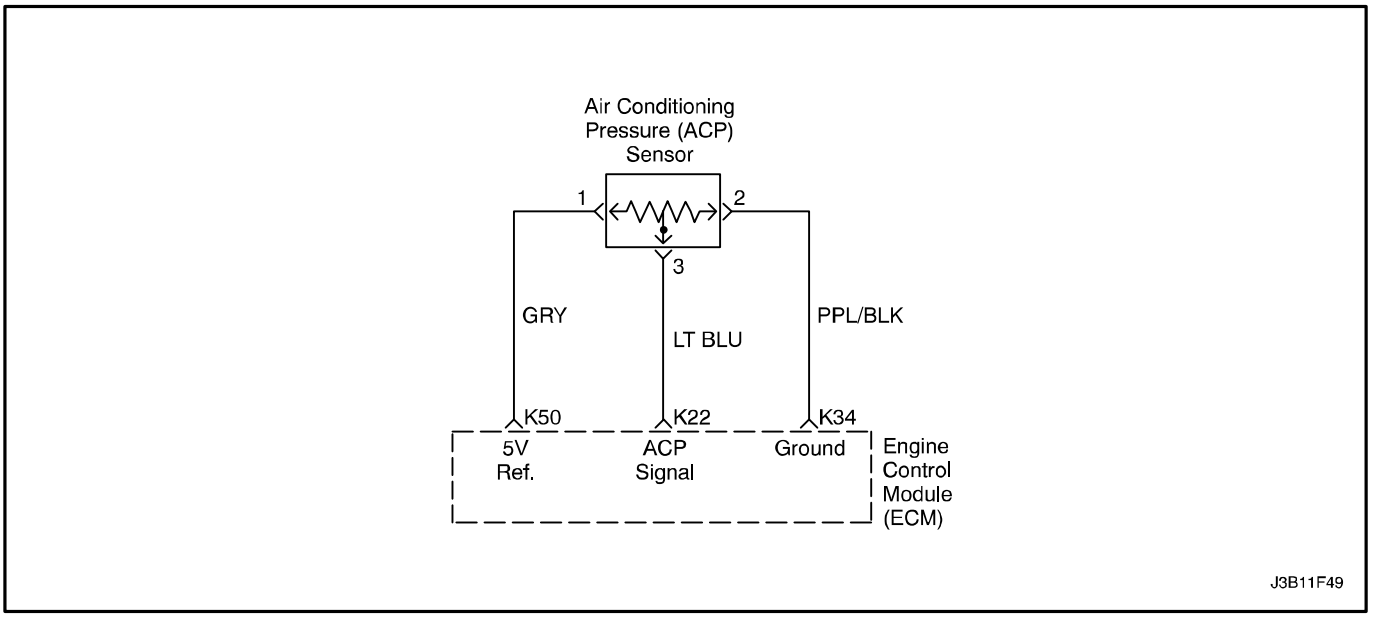
Inspect the wiring harness for damage. If the harness appears to be OK, observe the A/C pressure display on the scan tool while moving the connectors and wiring harnesses related to the A/C Pressure sensor. A change in the A/C pressure display will indicate the location of the fault.

If DTC P0532 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P0532 – A/C Pressure Sensor Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Idle the engine. Does the scan tool display Air Conditioning Pressure (ACP) sensor voltage below the specified value?	0.06 V	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition OFF. 2. Disconnect the ACP sensor connector. 3. Jumper the ACP signal circuit, terminal 2 to the 5 volt reference circuit, terminal 1. 4. Turn the ignition switch on. Does the ACP voltage read more than the specified value?	4.9 V	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition ON, with the engine OFF. 2. Operate the vehicle within the Failure Record conditions and Conditions For Setting the DTC as noted. Does the scan tool display ACP voltage below the specified value?	0.06 V	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Inspect the ACP sensor harness connector terminals for the following conditions: • Poor connections • Proper contact tension • Poor terminal–to–wire connection Is a problem found?	–	Go to *Step 8*	Go to *Step 9*
6	1. Turn the ignition OFF. 2. Remove the jumper wire. 3. Probe the ACP sensor signal circuit terminal 2 with a test light to B+. 4. Turn the ignition ON. Does the scan tool read over the specified value?	4 V	Go to *Step 7*	Go to *Step 11*
7	Check the ACP sensor 5 volt reference circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 13*	Go to *Step 10*
8	Repair the connection terminals as necessary. Is the repair complete?	–	Go to *Step 13*	–
9	1. Turn the ignition OFF. 2. Replace the ACP sensor. Is the repair complete?	–	Go to *Step 13*	–
10	1. Turn the ignition OFF. 2. Replace the engine control module (ECM). Is the repair complete?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
11	Check the ACP sensor signal circuit for the following conditions: • Open • Short to ground • Short to sensor ground Is a problem found?	–	Go to *Step 12*	Go to *Step 10*
12	Repair the A/C Pressure sensor signal circuit. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0533

A/C PRESSURE SENSOR HIGH VOLTAGE

Circuit Description

The Air Conditioning (A/C) system uses an A/C refrigerant pressure sensor mounted in the high pressure side of the A/C refrigerant system to monitor A/C refrigerant pressure. The Engine Control Module (ECM) uses this information to turn ON the engine coolant fans when the A/C refrigerant pressure is high and to keep the compressor disengaged when A/C refrigerant pressure is excessively high or low.

The Air Conditioning Pressure (ACP) sensor operates like other 3–wire sensors. The ECM applies a 5.0 volt reference and a sensor ground to the sensor. Changes in the A/C refrigerant pressure will cause the ACP sensor input to the ECM to vary. The ECM monitors the ACP sensor signal circuit and can determine when the signal is outside of the possible range of the sensor. When the signal is out of range for a prolonged period of time, the ECM will not allow the A/C compressor clutch to engage. This is done to protect the compressor.

Conditions for Setting the DTC

- A/C pressure is greater than 99% of the sensor reading scale.
- Engine is running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.
- The A/C compressor operation will be disabled while the high voltage indication exists.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection at the ECM.

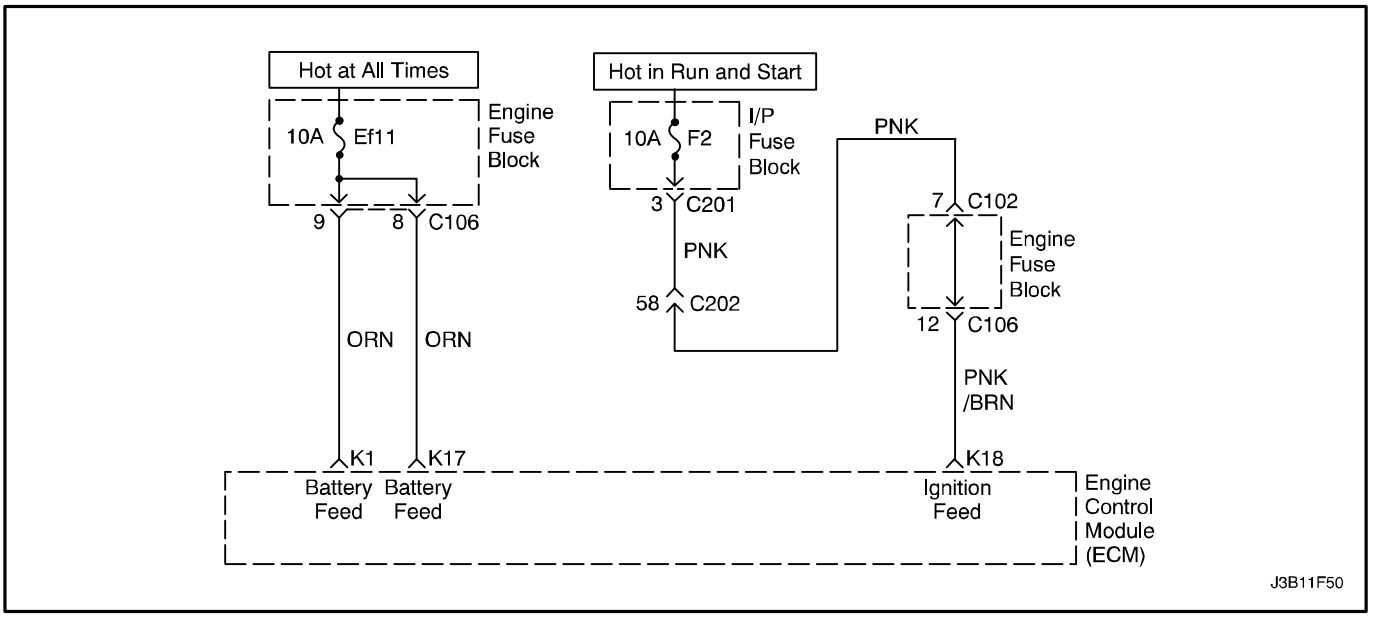
Inspect the wiring harness for damage. If the harness appears to be OK, observe the A/C pressure display on the scan tool while moving the connectors and wiring harnesses related to the ACP sensor. A change in the A/C pressure display will indicate the location of the fault.

If DTC P0533 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to set occurs. This may assist in diagnosing the condition.

DTC P0533 – A/C Pressure Sensor High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Idle the engine. Does the scan tool display Air Conditioning Pressure (ACP) sensor voltage below the specified value?	0.06 V	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition OFF. 2. Disconnect the ACP sensor connector. 3. Jumper the ACP signal circuit, terminal 2 to the 5 volt reference circuit, terminal 1. 4. Turn the ignition switch on. Does the ACP voltage read more than the specified value?	4.9 V	Go to *Step 5*	Go to *Step 6*
4	1. Turn the ignition ON, with the engine OFF. 2. Operate the vehicle within the Failure Record conditions and Conditions For Setting the DTC as noted. Does the scan tool display ACP voltage below the specified value?	0.06 V	Go to *Step 3*	Go to ”Diagnostic Aids”
5	Inspect the ACP sensor harness connector terminals for the following conditions: • Poor connections • Proper contact tension • Poor terminal–to–wire connection Is a problem found?	–	Go to *Step 8*	Go to *Step 9*
6	1. Turn the ignition OFF. 2. Remove the jumper wire. 3. Probe the ACP sensor signal circuit terminal 2 with a test light to B+. 4. Turn the ignition ON. Does the scan tool read over the specified value?	4 V	Go to *Step 7*	Go to *Step 11*
7	Check the ACP sensor 5 volt reference circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 13*	Go to *Step 10*
8	Repair the connection terminals as necessary. Is the repair complete?	–	Go to *Step 13*	–
9	1. Turn the ignition OFF. 2. Replace the ACP sensor. Is the repair complete?	–	Go to *Step 13*	–
10	1. Turn the ignition OFF. 2. Replace the engine control module (ECM). Is the repair complete?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
11	Check the ACP sensor signal circuit for the following conditions: • Open • Short to ground • Short to sensor ground Is a problem found?	–	Go to *Step 12*	Go to *Step 10*
12	Repair the A/C Pressure sensor signal circuit. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0562

SYSTEM VOLTAGE TOO LOW (ENGINE SIDE)

Circuit Description

The Engine Control Module (ECM) monitors the ignition voltage on the ignition feed circuit to terminal K18 at the ECM. A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is below a calibrated value.

Conditions for Setting the DTC

- System voltage is less than 11 volts.
- Engine is running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

If the DTC sets when an accessory is operated, check for a poor connection or excessive current draw.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wiring connections
- Physical damage to the wiring harness

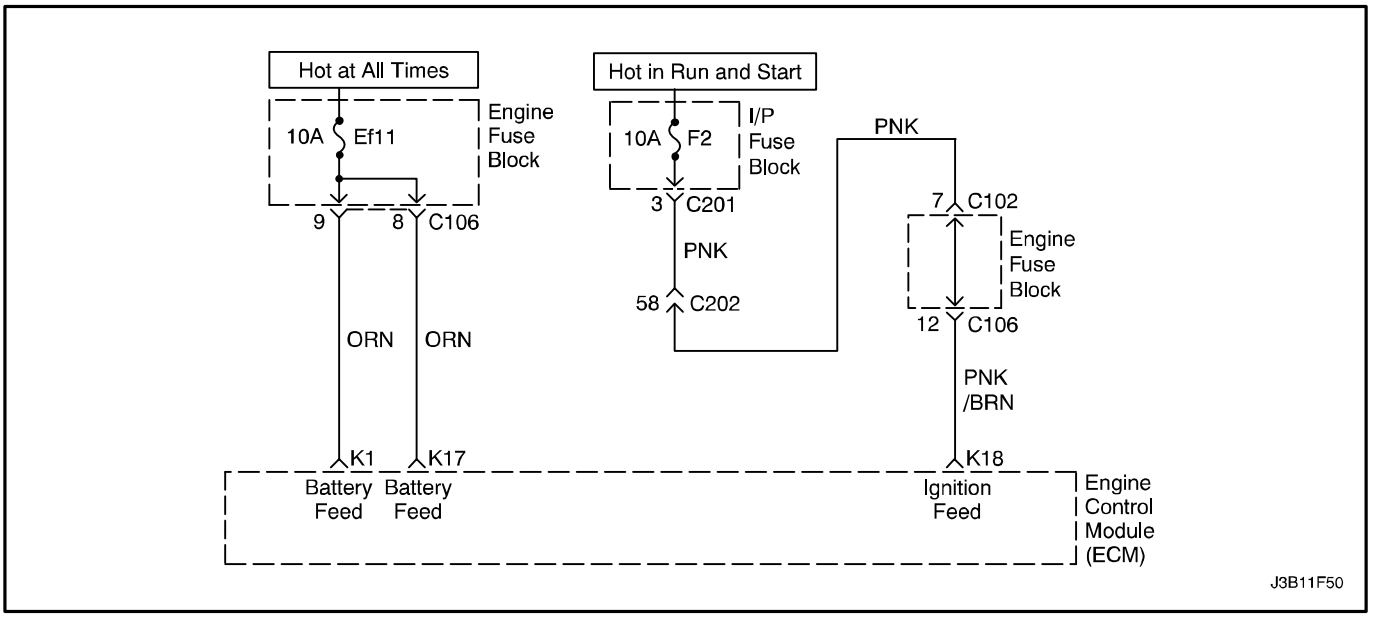
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This checks if the generator is malfunctioning under load conditions.
4. Checks the ignition feed circuit for excessive resistance. An open circuit will cause a no start condition.
7. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
9. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information for additional checks and information.

DTC P0562 – System Voltage Too Low (Engine Side)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	• Install a scan tool to the Data Link Connector (DLC) and clear the Diagnostic Trouble Codes (DTCs). • Start the engine and raise the engine speed over 1400 rpm. • Load the electrical system by turning on the headlamps, high blower motor, etc. Is the ignition voltage less than the specified value	10 V	Go to *Step 3*	Go to *Step 8*
3	• With the engine still running at 1400 rpm. • Using a voltmeter measure the battery voltage at the battery. Is the battery voltage greater than the specified value?	12 V	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) connector at the ECM. 3. Turn the ignition ON. 4. Using a voltmeter, measure the voltage at the ignition feed circuit, terminal K18. Is the ignition voltage greater than the specified value?	10 V	Go to *Step 5*	Go to *Step 6*
5	Check for a malfunctioning connector at the ECM harness terminals and repair as needed. Is the repair complete?	–	Go to *Step 8*	Go to *Step 7*
6	Repair the poor connection (high resistance) in the ignition feed circuit. Is the repair complete?	–	Go to *Step 8*	–
7	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to Step 8	–
8	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to Step 9	Go to Step 2
9	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P0563

SYSTEM VOLTAGE TOO HIGH (ENGINE SIDE)

Circuit Description

The Engine Control Module (ECM) monitors the ignition voltage on the ignition feed circuit to terminal K18 at the ECM. A system voltage Diagnostic Trouble Code (DTC) will set whenever the voltage is above a calibrated value.

Conditions for Setting the DTC

- System voltage is less than 16 volts.
- Engine is running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

If the DTC sets when an accessory is operated, check for a poor connection or excessive current draw.

Any circuitry, that is suspected as causing the intermittent complaint, should be thoroughly checked for the following conditions:

- Backed–out terminals
- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wiring connections
- Physical damage to the wiring harness

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. This checks if the generator is malfunctioning under load conditions.
7. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
9. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information for additional checks and information.

DTC P0563 – System Voltage Too High (Engine Side)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC) and clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and raise the engine speed over 1400 rpm. 3. Load the electrical system by turning on the headlamps, high blower motor, etc. Is the ignition voltage less than the specified value	16 V	Go to *Step 3*	Go to *Step 5*
3	1. With the engine still running at 1400 rpm. 2. Using a voltmeter measure the battery voltage at the battery. Is the battery voltage less than the specified value?	16 V	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 5*	–
5	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 6*	Go to *Step 2*
6	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0601

ECM CHECKSUM ERROR (ENGINE SIDE)

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An Electrically Erasable Programmable Read Only Memory (EEPROM) is used to house the program information and the calibrations required for engine, transmission, and powertrain diagnostics operation. The ECM uses a value called a checksum for error detection of the software. The checksum is a value that is equal to all the numbers in the software added together. The ECM adds all the values in the software, and if that value does not equal the checksum value, a checksum error is indicated.

Conditions for Setting the DTC

- Program ID is not equal to the value in the software.
- Ignition switch is turned to ON.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will attempt to record operating conditions at the time the failure is detected. However, since this is the internal ECM fault, this information may be or may not be reliable. This information will be stored in the freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P0601 – ECM Checksum Error (Engine Side)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0602

ECM REPROGRAM ERROR

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An Electrically Erasable Programmable Read Only Memory (EEPROM) is used to house the program information and the calibrations required for engine, transmission, and powertrain diagnostics operation. The ECM uses a value called a checksum for error detection of the software. The checksum is a value that is equal to all the numbers in the software added together. The ECM changes the checksum after reprogramming and adds all the values in the software, and if that value does not equal the checksum value, a ECM reprogramming error is indicated.

Conditions for Setting the DTC

- Calibration ID is not equal to the value in the software level.
- S/W major ID not equal to value in S/W.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will attempt to record operating conditions at the time the failure is detected. However, since this is the internal ECM fault, this information may be or may not be reliable. This information will be stored in the freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P0602 – ECM Reprogram Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC Table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0607

LOWER POWER COUNTER ERROR

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An Electrically Erasable Programmable Read Only Memory (EEPROM) is used to house the program information and the calibrations required for engine, transmission, and powertrain diagnostics operation. The ECM checks operation of Lower Power Counter Integrated Chip (I/C) and communication between main CPU and Lower Power Counter I/C.

Conditions for Setting the DTC

- Ignition switch is turned to ON.
- Ignition voltage is greater than 11 volts.
- Engine is running more than 10 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P0607 – Lower Power Counter Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to Step 2	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P0700

TRANSAXLE CONTROL MODULE MALFUNCTION

Circuit Description

The Transmission Control Module (TCM) and the Engine Control Module (ECM) are connected through the serial data link circuit. The TCM sends a Class–II P–code status message to the ECM every 100 milliseconds to confirm the transmission is functioning correctly.

If the TCM detects either an A– or B–type malfunction within the transmission, the TCM will send to the ECM a P–code status message to turn the Malfunction Indicator Lamp (MIL) ON and set DTC P0700.

Conditions for Setting the DTC

- Received message from the TCM indicating malfunction is detected in TCM.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and/or Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

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

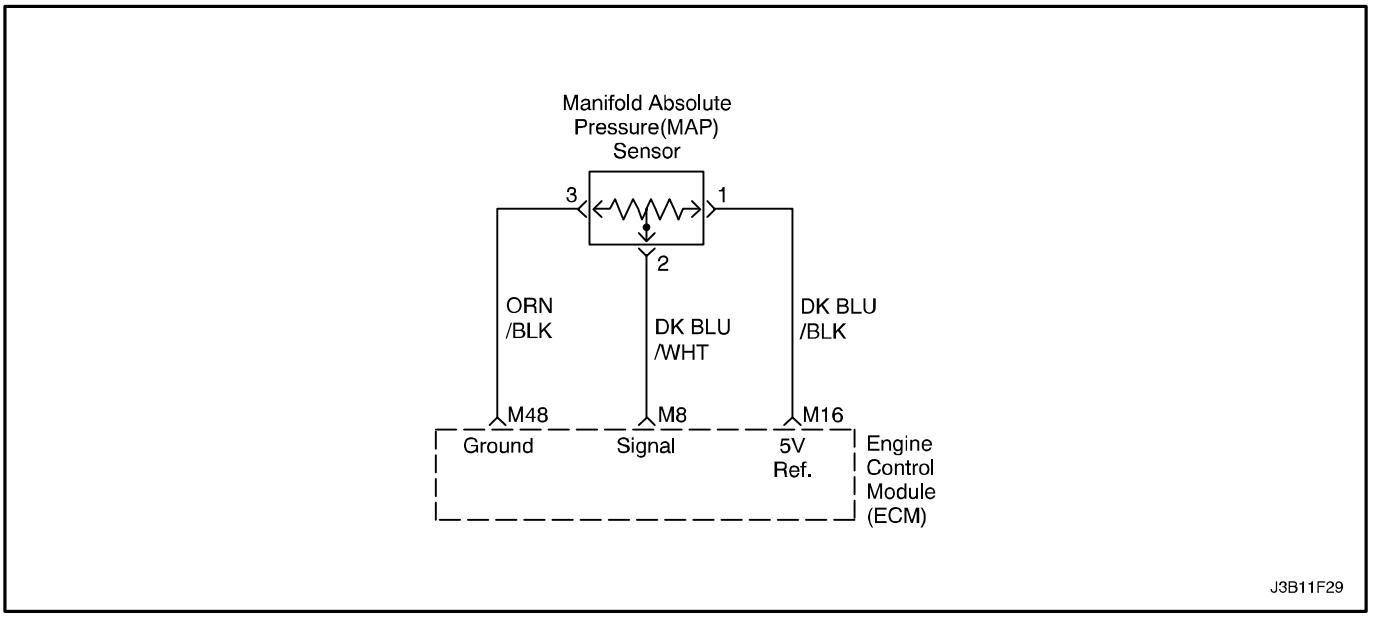
Check for a poor connection or damaged ECM/TCM harness. Inspect the serial data link circuit for the following conditions:

- Improper mating
- Broken locks
- Improperly formed
- Damaged terminals
- Poor terminal–to–wiring connections
- Damaged harness

DTC P0700 – Transaxle Control Module Malfunction

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Select Transmission Control Module (TCM) Diagnostic Trouble Code (DTC) with scan tool. Is a transmission DTC displayed?	–	Go to *Step 3*	Go to *Step 4*
3	1. Repair transmission malfunction. Refer to the applicable DTC table in the transmission repair section. 2. Using a scan tool, clear the TCM DTC. Is the repair complete?	–	Go to *Step 4*	–

Step	Action	Value(s)	Yes	No
4	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 5*	Go to *Step 2*
5	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC Table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1106

MANIFOLD ABSOLUTE PRESSURE INTERMITTENT HIGH VOLTAGE

Circuit Description

The Manifold Absolute Pressure (MAP) sensor responds to changes in intake manifold pressure (vacuum). The MAP signal voltage to the Engine Control Module (ECM) varies from below 2 volts at idle (high vacuum) to above 4 volts with the key in the ON position, engine not running or at Wide Open Throttle (WOT) (low vacuum).

A ”speed density” method of determining engine load is used. This is calculated using inputs from the MAP sensor, the rpm (58X), and the Intake Air Temperature (IAT) sensor. The MAP sensor is the main sensor used in this calculation, and measuring engine load is its main function.

The MAP sensor is also used to determine manifold pressure changes while the linear Exhaust Gas Recirculation (EGR) flow test diagnostic is being run (refer to DTC P0401). This determines the engine vacuum level for some other diagnostics and determines Barometric Pressure (BARO). The ECM compares the MAP sensor signal to calculated MAP based on Throttle Position (TP) and various other engine load factors. If the ECM detects a MAP signal voltage that is intermittently above the calculated value, DTC P1106 will set.

Conditions for Setting the DTC

- The MAP is greater than 103 kPa (15 psi).
- No TP sensor fail conditions present.
- Engine running more than 10 seconds
- TP sensor is less than 15 % if rpm is less than 2500.
- TP sensor less than 35% if rpm is greater than 2500.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

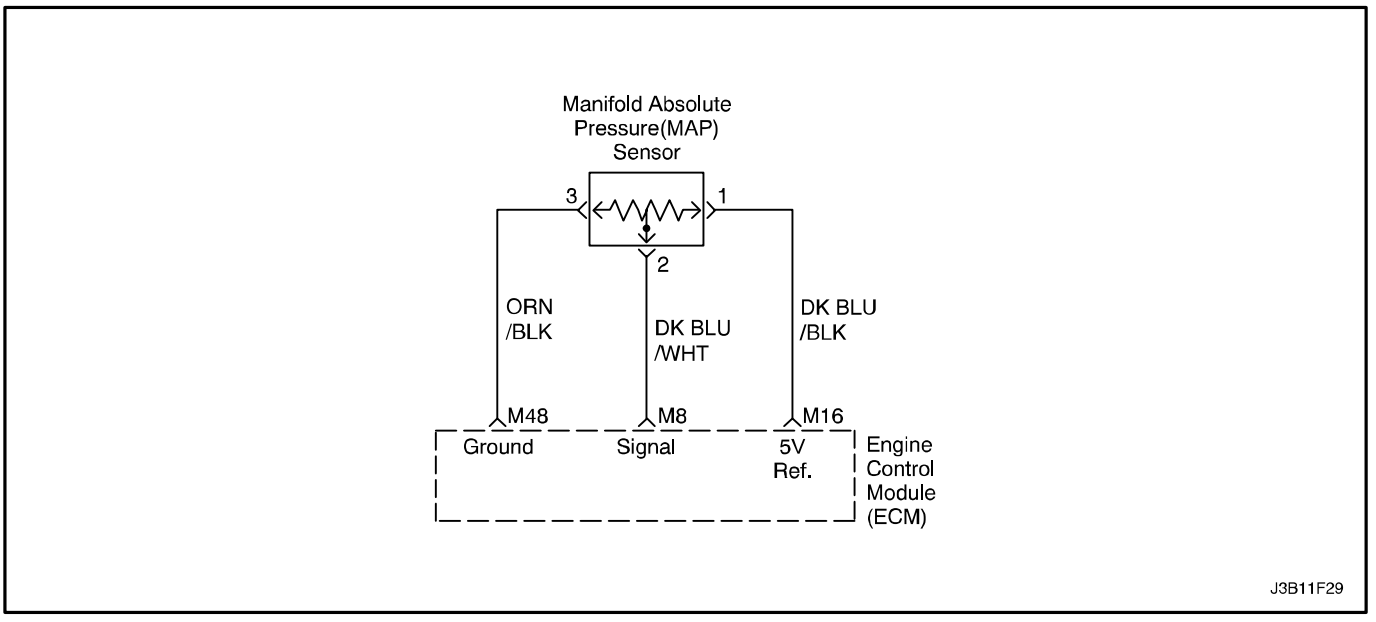
Check for the following conditions:

- Leaking or plugged vacuum supply line to the MAP sensor.
- Inspect ECM harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–towire connection.
- Inspect the wiring harness for damage. If the harness appears to be OK, observe the MAP display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.

Reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P1106 – Manifold Absolute Pressure Intermittent High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to*Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition switch to ON, with the engine not running. 3. Select diagnostic Trouble Code (DTC) information. 4. Check Last Test Fail and note any other DTCs set. Is DTC P0108 also set?	–	Go to applicable DTC table	Go to *Step 3*
3	Check for a poor sensor ground circuit terminal 3 connection at the Manifold Absolute Pressure (MAP) sensor. Is a repair necessary?	–	Go to *Step 7*	Go to *Step 4*
4	Check the MAP signal circuit between the MAP sensor connector and Engine Control Module (ECM) for an intermittent short to voltage. Is a problem found?	–	Go to *Step 7*	Go to *Step 5*
5	Check for an intermittent short to voltage on the 5 volt reference M16 circuit between the MAP sensor and ECM. Is a problem found?	–	Go to *Step 8*	Go to *Step 6*
6	Check for a poor sensor ground circuit terminal M48 connection at the ECM. Is a problem found?	–	Go to *Step 7*	Go to *Step 9*
7	Repair the faulty harness connector terminal for sensor ground circuit or replace it. Is the repair complete?	–	Go to *Step 9*	–
8	Locate and repair intermittent open or short circuit in the wiring harness as needed. Is the repair complete?	–	Go to *Step 9*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1107

MANIFOLD ABSOLUTE PRESSURE INTERMITTENT LOW VOLTAGE

Circuit Description

The Manifold Absolute Pressure (MAP) sensor responds to changes in intake manifold pressure (vacuum). The MAP signal voltage to the Engine Control Module (ECM) varies from below 2 volts at idle (high vacuum) to above 4 volts with the key in the ON position, engine not running or at Wide Open Throttle (WOT) (low vacuum).

A ”speed density” method of determining engine load is used. This is calculated using inputs from the MAP sensor, the rpm (58X), and the Intake Air Temperature (IAT) sensor. The MAP sensor is the main sensor used in this calculation, and measuring engine load is its main function.

The MAP sensor is also used to determine manifold pressure changes while the linear Exhaust Gas Recirculation (EGR) flow test diagnostic is being run (refer to DTC P0401). This determines the engine vacuum level for some other diagnostics and determines Barometric Pressure (BARO). The ECM compares the MAP sensor signal to calculated MAP based on Throttle Position (TP) and various other engine load factors. If the ECM detects a MAP signal voltage that is intermittently below the calculated value, DTC P1107 will set.

Conditions for Setting the DTC

- The MAP is less than 12 kPa (1.7 psi).
- No TP sensor fail conditions present.
- TP sensor is greater than 0% if rpm is less than 1000.
- TP sensor less than 5% if rpm is greater than 1000.
- System voltage is between 11–11.5 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC was set as Failure Records data only.
- This information will not be stored in the Freeze Frame data.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

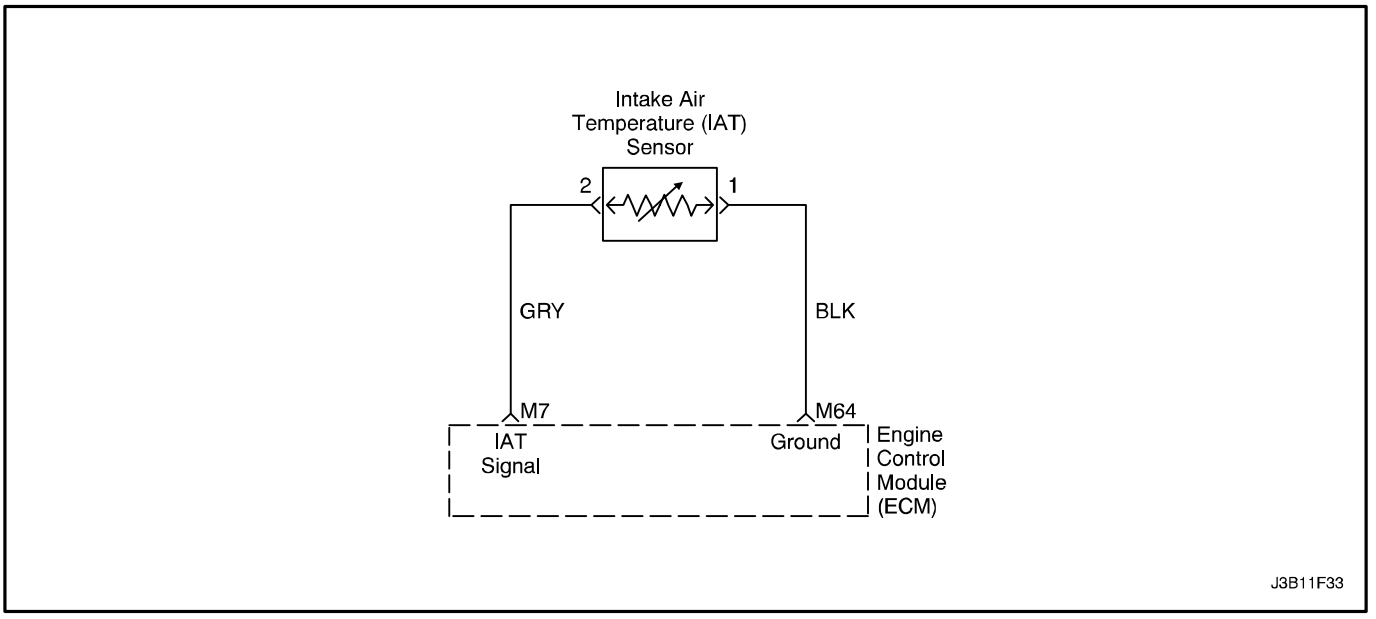
Check for the following conditions:

- Leaking or plugged vacuum supply line to the MAP sensor.
- Inspect ECM harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Inspect the wiring harness for damage. If the harness appears to be OK, observe the MAP display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.

Reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

DTC P1107 – Manifold Absolute Pressure Intermittent Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition switch to ON, with the engine not running. 3. Select diagnostic Trouble Code (DTC) information. 4. Check Last Test Fail and note any other DTCs set. Is DTC P0107 also set?	–	Go to applicable DTC table	Go to Step 3
3	1. Check for a poor 5 volt reference circuit or Manifold Absolute Pressure (MAP) signal circuit terminal connection at the MAP sensor. 2. Is a repair necessary?	–	Go to Step 5	Go to *Step 4*
4	Check the MAP signal circuit between the MAP sensor connector and Engine Control Module (ECM) for an intermittent short to ground. Is a problem found?	–	Go to *Step 6*	Go to *Step 7*
5	Replace the faulty harness connector terminal for the 5 volt reference circuit and/or the MAP signal circuit. Is the repair complete?	–	Go to *Step 7*	–
6	Repair intermittent open/short circuit in the wiring harness. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	*System OK*



DIAGNOSTIC TROUBLE CODE (DTC) P1111

INTAKE AIR TEMPERATURE INTERMITTENT HIGH VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) sensor is a thermistor which measures the temperature of the air entering the engine. The Engine Control Module (ECM) applies 5 volts through a pull–up resistor to the IAT sensor. When the intake air is cold, the resistance is high, and the ECM will monitor a high signal voltage on the IAT signal circuit. If the intake air is warm, the sensor resistance is lower causing the ECM to monitor a lower voltage. Diagnostic Trouble Code (DTC) P1111 will set when the ECM detects an intermittent high signal voltage in the intake air temperature sensor signal circuit or sensor.

Conditions for Setting the DTC

- IAT is less than –38˚C (–36˚F).
- DTCs P0502, P0117, P0118 are not set
- Engine has been running for over 120 seconds.
- Vehicles speed is less than 25 km/h (16 mph).
- Calculated air flow is less than 15 g/second.
- Engine Coolant Temperature (ECT) is above 70˚C (158˚F).

Action Taken When the DTC Sets

- The ECM will substitute a default value for IAT.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- The Malfunction Indicator Lamp (MIL) will not illuminate.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM. Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness for damage. If the harness appears to be OK, observe the IAT display on the scan tool while moving connectors and wiring harnesses related to the IAT sensor. A change in the IAT display will indicate the location of the fault.
- Reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.
- Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

Intake Air Temperature Sensor (Temperature Vs. Resistance Value)

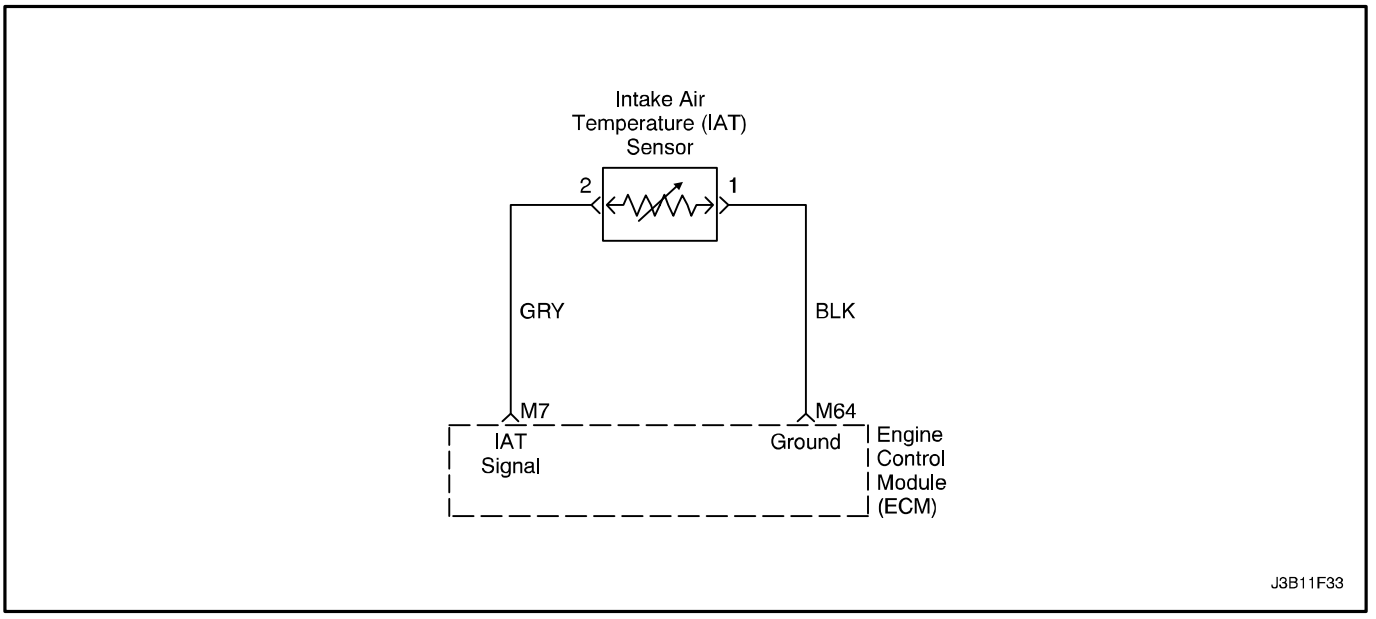
˚C	˚F	OHMS	˚C	˚F	OHMS
100	212	177	15	59	4450
80	176	332	5	41	7280
60	140	667	–5	23	12300
45	113	1188	–15	5	21450
35	95	1802	–30	–22	52700
25	77	2796	–40	–40	100700

Above resistance is approximate value

DTC P1111 – Intake Air Temperature Intermittent High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Request engine Diagnostic Trouble Code (DTC). Is DTC P0113 set?	–	Go to applicable DTC table	Go to *Step 3*
3	Is DTC P1115 also set.	–	Go to *Step 7*	Go to *Step 4*
4	Check for a poor sensor ground circuit terminal 1 at the Intake Air Temperature (IAT) sensor and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 5*
5	Check for a poor sensor signal circuit between terminal 2 of the IAT sensor and terminal M7 of the Engine Control Module (ECM) for an intermittent open and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 6*
6	Check for sensor signal circuit between terminal 2 of the IAT sensor and terminal M7 of the ECM for an intermittent short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 7*
7	Check for poor sensor ground circuit terminal M64 at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 8*
8	Check for an intermittent open or a faulty splice in the sensor ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 10*	Go to ”Diagnostic Aids”

Step	Action	Value(s)	Yes	No
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	*System OK*



DIAGNOSTIC TROUBLE CODE (DTC) P1112

INTAKE AIR TEMPERATURE INTERMITTENT LOW VOLTAGE

Circuit Description

The Intake Air Temperature (IAT) sensor is a thermistor which measures the temperature of the air entering the engine. The Engine Control Module (ECM) applies 5 volts through a pull–up resistor to the IAT sensor. When the intake air is cold, the resistance is high, and the ECM will monitor a high signal voltage on the IAT signal circuit. If the intake air is warm, the sensor resistance is lower causing the ECM to monitor a lower voltage. Diagnostic Trouble Code (DTC) P1111 will set when the ECM detects an intermittent high signal voltage in the intake air temperature sensor signal circuit or sensor.

Conditions for Setting the DTC

- IAT is greater than 149˚C (300˚F).
- DTC P0502 is not set
- Engine has been running for over two minutes.
- Vehicles speed is greater than 50 km/h (31 mph).

Action Taken When the DTC Sets

- The ECM will substitute a default value for IAT.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- The Malfunction Indicator Lamp (MIL) will not illuminate.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM. Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness for damage. If the harness appears to be OK, observe the IAT display on the scan tool while moving connectors and wiring harnesses related to the IAT sensor. A change in the IAT display will indicate the location of the fault.
- Reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.
- Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

Test Description

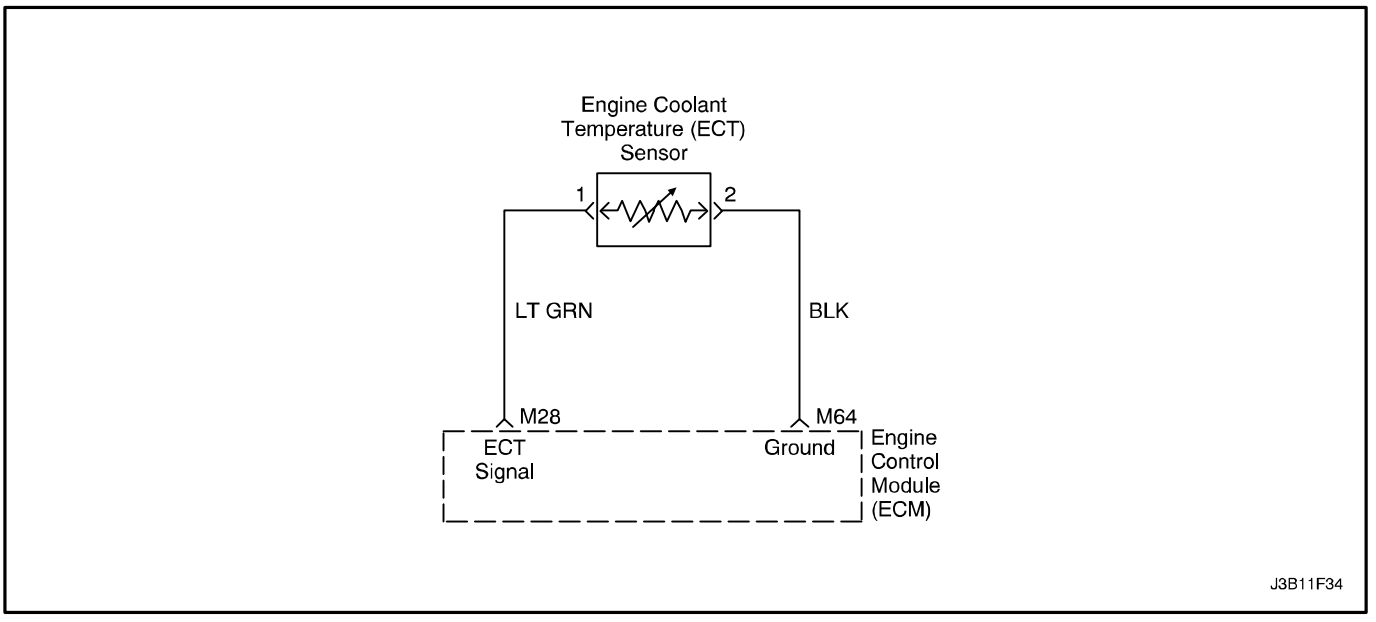
Number(s) below refer to the step number(s) on the Diagnostic Chart.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

2. Verifies the fault is present.
3. If DTC P1112 can be repeated only by duplicating the Fail Records conditions, refer to the Temperature Vs. Resistance Value Chart. The chart may be used to test the IAT sensor at various temperatures to evaluate the possibility of a ”shifted” sensor that may be shorted above or below a certain temperature. If this is the case, replace the IAT sensor.

DTC P1112 – Intake Air Temperature Intermittent Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Request engine Diagnostic Trouble Code (DTC). Is DTC P0112 also set?	–	Go to applicable DTC table	Go to Step 3
3	Check the Intake Air Temperature (IAT) signal circuit between terminal 2 of the IAT sensor and terminal M7 of the ECM for an intermittent short to ground and repair as needed. Is the repair complete?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 5*	Go to *Step 2*
5	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1114

ENGINE COOLANT TEMPERATURE INTERMITTENT LOW VOLTAGE

Circuit Description

The Engine Coolant Temperature sensor (ECT) is a thermistor mounted in the engine coolant stream. The Engine control Module (ECM) applies 5 volt reference voltage through a pull–up resistor to the ECT signal circuit. When the engine coolant is cold, the sensor resistance is high, and the ECM will monitor a high signal voltage. As the engine coolant warms, the sensor resistance is less, and the ECT signal voltage measured at the ECM drops. With a fully warmed engine, the ECT signal voltage should measure about 1.5 to 2.0 volts. If the ECM detects an ECT signal that is intermittently below the range of the ECT sensor, Diagnostic Trouble Code (DTC) P1114 will set.

Conditions for Setting the DTC

- ECT is less than 149˚C (300˚F).
- Engine has been running for over 60 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM. Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness for damage. If the harness appears to be OK, observe the ECT display on the scan tool while moving connectors and wiring harnesses related to the ECT sensor. A change in the ECT display will indicate the location of the fault.
- Reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.
- Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference

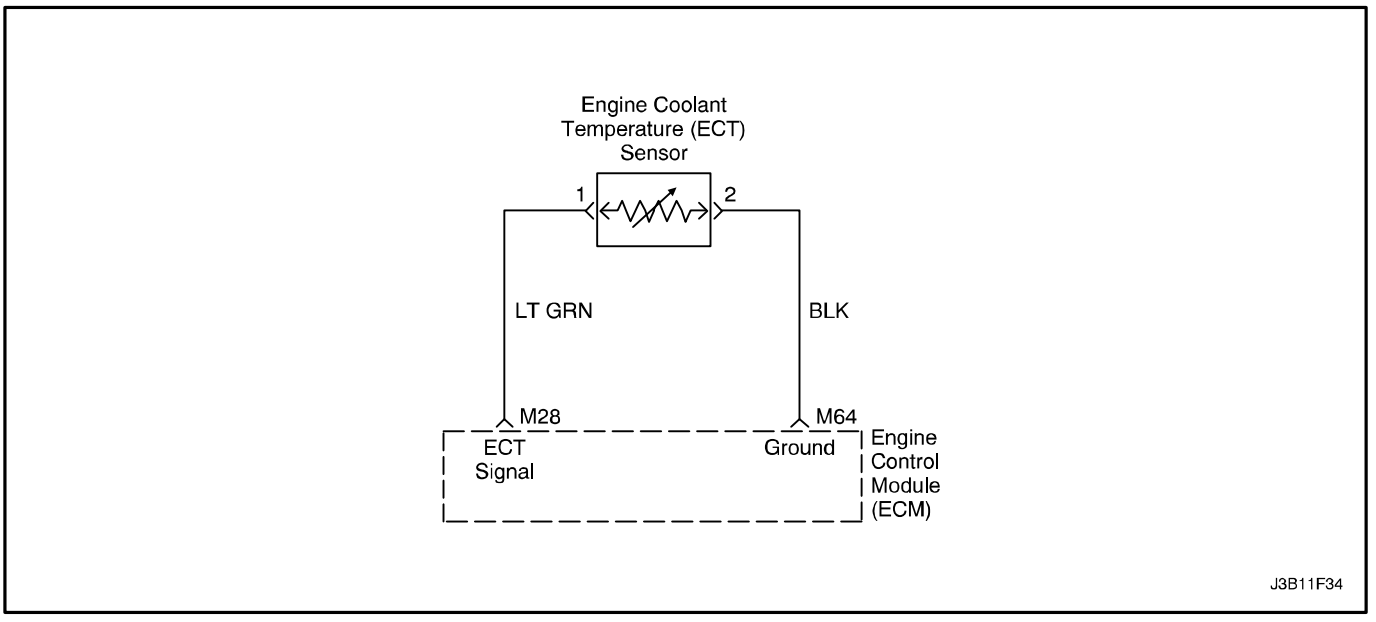
Engine Coolant Temperature Sensor (Temperature Vs. Resistance Value)

˚C	˚F	OHMS	˚C	˚F	OHMS
100	212	177	15	59	4450
80	176	332	5	41	7280
60	140	667	–5	23	12300
45	113	1188	–15	5	21450
35	95	1802	–30	–22	52700
25	77	2796	–40	–40	100700

Above resistance is approximate value

DTC P1114 – Engine Coolant Temperature Intermittent Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Request engine Diagnostic Trouble Code (DTC). Is Diagnostic Trouble Code (DTC) P0117 also set?	–	Go to applicable DTC table	Go to *Step 3*
3	Check the Engine Coolant Temperature (ECT) signal circuit between terminal 1 of the ECT sensor and terminal M28 of the ECM for an intermittent short to ground and repair as needed. Is the repair complete?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 5*	Go to *Step 2*
5	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	*System OK*



DIAGNOSTIC TROUBLE CODE (DTC) P1115

ENGINE COOLANT TEMPERATURE INTERMITTENT HIGH VOLTAGE

Circuit Description

The Engine Coolant Temperature sensor (ECT) is a thermistor mounted in the engine coolant stream. The Engine control Module (ECM) applies 5 volt reference voltage through a pull–up resistor to the ECT signal circuit. When the engine coolant is cold, the sensor resistance is high, and the ECM will monitor a high signal voltage. As the engine coolant warms, the sensor resistance is less, and the ECT signal voltage measured at the ECM drops. With a fully warmed engine, the ECT signal voltage should measure about 1.5 to 2.0 volts. If the ECM detects an ECT signal that is intermittently above the range of the ECT sensor, Diagnostic Trouble Code (DTC) P1115 will set.

Conditions for Setting the DTC

- ECT is less than –38˚C (–36˚F).
- Engine has been running for over 90 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM. Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness for damage. If the harness appears to be OK, observe the ECT display on the scan tool while moving connectors and wiring harnesses related to the ECT sensor. A change in the ECT display will indicate the location of the fault.
- Reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.
- Use the Temperature vs. Resistance Values table to evaluate the possibility of a skewed sensor. Refer to ”Temperature vs. Resistance” in this section.

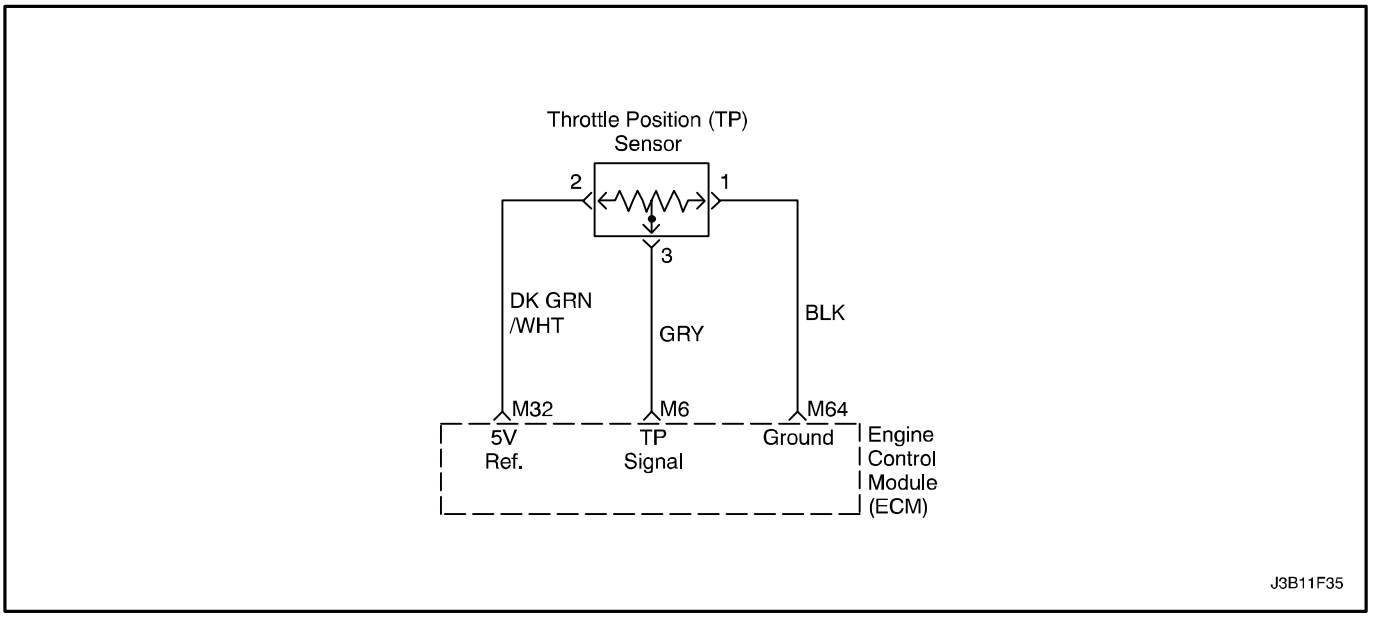
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

DTC P1115 – Engine Coolant Temperature Intermittent High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Request engine Diagnostic Trouble Code (DTC). Is Diagnostic Trouble Code (DTC) P0118 set?	–	Go to applicable DTC table	*Go to Step 3*
3	Is DTC P1111 also set?	–	Go to *Step 7*	Go to *Step 4*
4	Check for a poor sensor ground circuit terminal 2 at the Engine Coolant Temperature (ECT) sensor and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 5*
5	Check for a poor sensor signal circuit between terminal 1 of the ECT sensor and terminal M28 of the Engine Control Module (ECM) for an intermittent open and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 6*
6	Check for sensor signal circuit between terminal 1 of the ECT sensor and terminal M28 of the ECM for an intermittent short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 7*
7	Check for poor sensor ground circuit terminal M64 at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to *Step 8*
8	Check for an intermittent open or a faulty splice in the sensor ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 9*	Go to ”Diagnostic Aids”
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1121

THROTTLE POSITION SENSOR INTERMITTENT HIGH VOLTAGE

Circuit Description

The Throttle Position (TP) sensor circuit provides a voltage signal that changes relative to throttle blade angle. The TP sensor sends a voltage signal back to the Engine Control Module (ECM) relative to the throttle plate opening. The voltage signal will vary from approximately 0.33 volts at closed throttle, to over 4.3 volts at Wide Open Throttle (WOT).

The TP signal is used by the ECM for fuel control and for most of the ECM controlled outputs. The TP signal is one of the most important inputs used by the ECM for fuel control and most of the ECM controlled outputs. If the ECM detects a TP signal that is intermittently above the range of the TP sensor, Diagnostic Trouble Code (DTC) P1121 will be set.

Conditions for Setting the DTC

- TP sensor voltage indicates a throttle voltage intermittently greater than 4.9 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history will clear after 40 consecutive warm–up cycles in which the diagnostic runs without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM. Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness for damage. If the harness appears OK, observe the throttle position display on the scan tool while moving connectors and wiring harnesses related to the TP sensor. A change in the display will indicate the location of the fault.

If DTC P1121 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

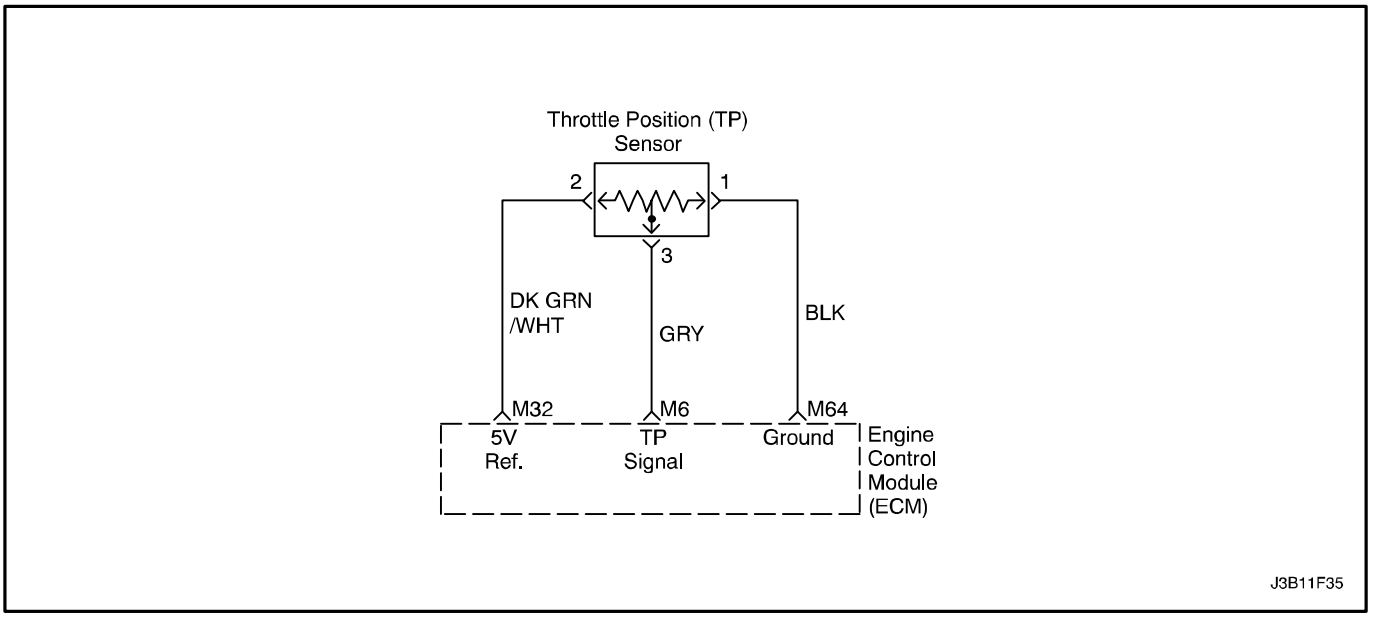
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

DTC P1121 – Throttle Position Sensor Intermittent High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is Diagnostic Trouble Code (DTC) P0123 also set?	–	Go to applicable DTC table	Go to *Step 3*
3	Check for poor sensor ground circuit terminal 1 connection at the Throttle Position (TP) sensor. Is a problem found?	–	Go to *Step 7*	Go to *Step 4*
4	Check the TP signal circuit between TP sensor connector and the Engine Control Module (ECM) for an intermittent short to voltage. Is a problem found?	–	Go to *Step 8*	Go to *Step 5*
5	Check for a poor sensor ground terminal M64 at the ECM. Is a problem found?	–	Go to *Step 7*	Go to *Step 6*
6	Check for an intermittent open or faulty spice in the sensor ground circuit. Is a problem found?	–	Go to *Step 8*	Go to ”Diagnostic Aids”
7	Repair or replace the faulty harness connector terminal for sensor ground circuit. Is the repair complete?	–	Go to *Step 9*	
8	Repair the intermittent open/short circuit in wiring harness as needed. Is the repair complete?	–	Go to *Step 9*	
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	*System OK*



DIAGNOSTIC TROUBLE CODE (DTC) P1122

THROTTLE POSITION SENSOR INTERMITTENT LOW VOLTAGE

Circuit Description

The Throttle Position (TP) sensor circuit provides a voltage signal that changes relative to throttle blade angle. The TP sensor sends a voltage signal back to the Engine Control Module (ECM) relative to the throttle plate opening. The voltage signal will vary from approximately 0.33 volts at closed throttle, to over 4.3 volts at Wide Open Throttle (WOT).

The TP signal is used by the ECM for fuel control and for most of the ECM controlled outputs. The TP signal is one of the most important inputs used by the ECM for fuel control and most of the ECM controlled outputs. If the ECM detects a TP signal that is intermittently above the range of the TP sensor, Diagnostic Trouble Code (DTC) P1122 will be set.

Conditions for Setting the DTC

- TP sensor voltage indicates a throttle voltage intermittently less than 0.14 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history will clear after 40 consecutive warm–up cycles in which the diagnostic runs without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM. Inspect harness connectors for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness. Inspect the wiring harness for damage. If the harness appears OK, observe the throttle position display on the scan tool while moving connectors and wiring harnesses related to the TP sensor. A change in the display will indicate the location of the fault.

If DTC P1122 cannot be duplicated, reviewing the Fail Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

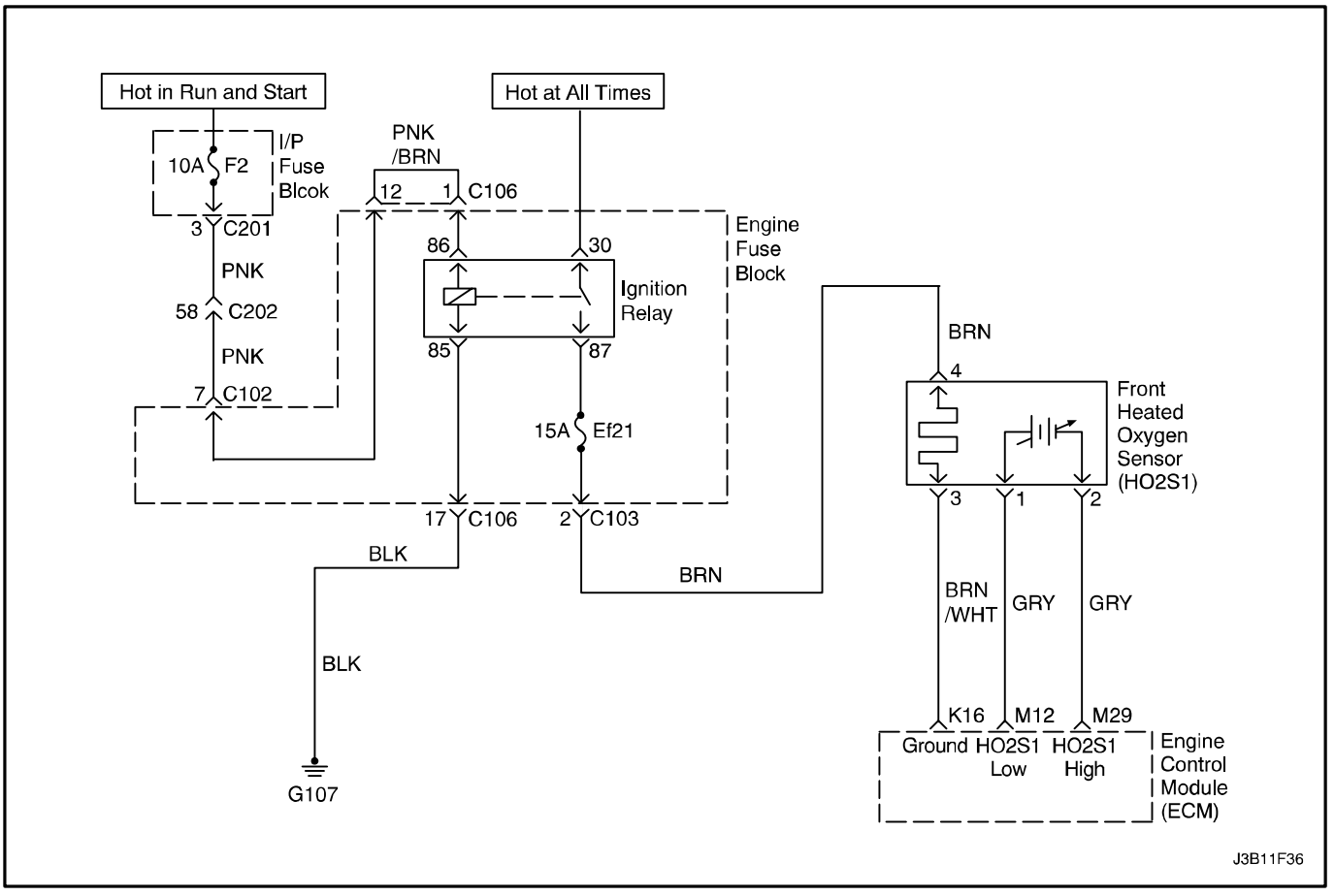
Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

DTC P1122 – Throttle Position Sensor Intermittent Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Is Diagnostic Trouble Code (DTC) P0123 also set?	–	Go to applicable DTC table	Go to *Step 3*
3	Check for poor 5 volt reference circuit terminal 2 connection at the Throttle Position (TP) sensor. Is a problem found?	–	*Step 7*	*Step 4*
4	Check the TP signal circuit between TP sensor connector and the Engine Control Module (ECM) for an intermittent open or short to ground. Is a problem found?	–	Go to *Step 8*	Go to *Step 5*
5	Check for a poor 5 volt reference circuit terminal M32 at the ECM. Is a problem found?	–	Go to *Step 7*	Go to*Step 6*
6	Check for an intermittent open in the 5 volt reference circuit. Is a problem found?	–	Go to *Step 8*	Go to Step 4
7	Repair or replace the faulty harness connector terminal for 5 volt reference circuit and/or the TP signal circuit as needed. Is the repair complete?	–	Go to *Step 9*	–
8	Repair the intermittent open/short circuit in wiring harness as needed. Is the repair complete?	–	Go to *Step 9*	–
9	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 10*	Go to *Step 2*
10	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1133

FRONT HEATED OXYGEN SENSOR (HO2S1) TOO FEW TRANSITION

Circuit Description

The Engine Control Module (ECM) continuously monitors the Front Heated Oxygen Sensor (HO2S1) activity for 100 seconds. During the monitor period, the ECM counts the number of times that the HO2S1 switches from rich to lean and from lean to rich. With this information, a total for all switches can be determined. If the number of switches is too low, a Diagnostic Trouble code (DTC) P1133 will set. The lean–to–rich and rich–to–lean are less than 15 switches.

Conditions for Setting the DTC

- HO2S1 signal switches from 0.3 to 0.6 volts and 0.6 to 0.3 volts is less than 15 times within 90seconds.
- Closed loop stoichiometry.
- Engine Coolant Temperature (ECT) is greater than 70 ˚C (158 ˚F).
- System voltage is greater than 10 volts.
- Engine run time is greater than 60 seconds.
- Purge Duty Cycle (DC) is less than 20%.
- The rpm is between 1600 and 4300.
- Airflow is between 9 and 40 g/sec.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0131, P0132, P0134, P0135, P1167, P0171, P1171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.
- 2 second delay after conditions are met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

DTC P1133 is most likely caused by one of the following items:

- Fuel Pressure – The system will go rich if the fuel pressure is too high. The ECM can compensate for some increase. However, if it gets too high, a DTC P1133 may set. Refer to ”Fuel System Diagnosis” in this section.
- Leaking injector – A leaking or malfunctioning injector can cause the system to go rich.
- Manifold Absolute Pressure (MAP) sensor – An output that causes the ECM to sense a higher than normal manifold pressure (low vacuum) can cause the system to go rich. Disconnecting the MAP sensor will allow the ECM to set a fixed value for the MAP sensor. Substitute a different MAP sensor if the rich condition is gone while the sensor is disconnected.
- Pressure regulator – Check for a leaking fuel pressure regulator diaphragm by checking for the presence of liquid fuel in the vacuum line to the pressure regulator.
- Throttle Position (TP) sensor – An intermittent TP sensor output can cause the system to go rich due to a false indication of the engine accelerating.
- HO2S1 contamination – Inspect the HO2S1 for silicone contamination from fuel or improper use of Room Temperature Vulcanizing (RTV) sealant. The sensor may have a white powdery coating and result in a high but false voltage signal (rich exhaust indication). The ECM will then reduce the amount of fuel delivered to the engine causing a severe surge or driveability problem.

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Chart.

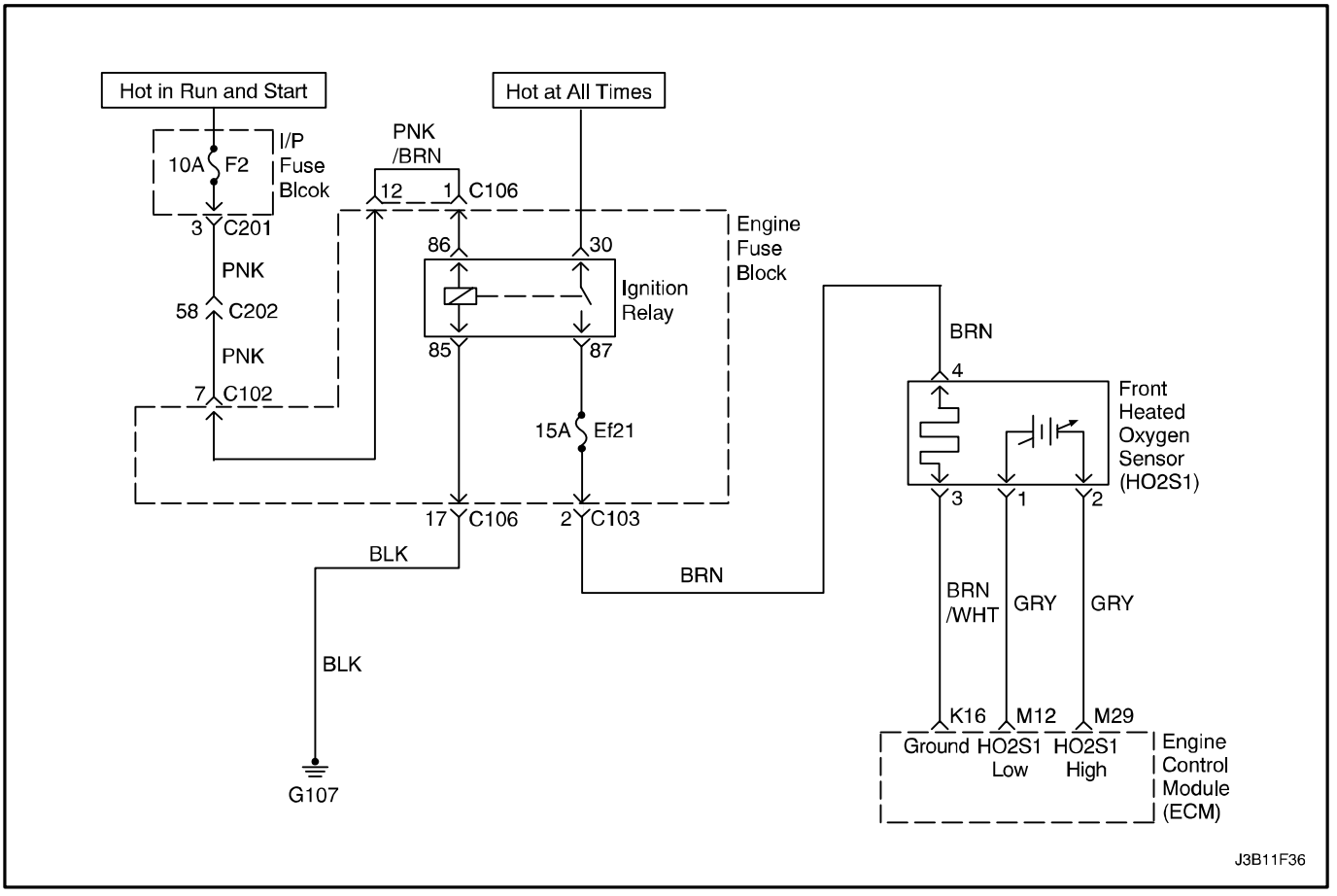
1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
14. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
16. If no malfunctions have been found at this point and no additional DTCs are set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P1133 – Front Heated Oxygen Sensor (HO2S1) Too Few Transition

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Are any additional Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	1. Start the engine and idle at normal operating temperature. 2. Operate the vehicle within the specified parameter under the Conditions For Setting the DTC. 3. Monitor the lean–to–rich transition and rich–to–lean transition and note the number of switches. Does the parameter show fewer transitions than the specified value within 90 seconds.	15	Go to *Step 4*	Go to *Step 18*

Step	Action	Value(s)	Yes	No
4	Visually/physically inspect for the following items: • Front Heated Oxygen Sensor (HO2S1) is securely installed. • Corrosion on the terminals. • Terminal tension. • HO2S1 wiring harness for poor terminal connection or damaged wiring. Is a problem found in any of the above areas?	–	Go to *Step 9*	Go to *Step 5*
5	Check the exhaust manifold for a leak near the engine and repair as needed. Is the repair complete?	–	Go to *Step 3*	Go to *Step 6*
6	1. Turn the ignition OFF. 2. Disconnect the HO2S1 connector. 3. Jumper the HO2S1 low circuit, terminal 3 to ground. 4. Turn the ignition ON. Does the scan tool indicate the voltage between the specified value?	400–500 mV	Go to *Step 7*	Go to *Step 10*
7	Jumper the HO2S1 signal and low circuit terminal 4 to ground. Does the scan tool indicate the voltage below the specified value?	200 mV	Go to *Step 8*	Go to *Step 11*
8	1. Turn the ignition OFF. 2. Replace the HO2S1. **Note :** before replacing the sensor, the cause of the contamination must be determined and corrected in order to prevent further damage to the sensor. Check for following: • Fuel contamination. • Use of improper Room Temperature Vulcanizing sealant. • Engine oil/coolant consumption. Is the repair complete?	–	Go to *Step 15*	–
9	Repair the condition as needed. Is the repair complete?	–	Go to *Step 15*	–
10	Repair the HO2S1 signal circuit for a short to ground. Is the repair complete?	–	Go to *Step 15*	–
11	1. Remove the jumper wire. 2. Using voltmeter measure the voltage between the HO2S1 signal circuit, terminal 4 and ground. Does the voltage above the specified value?	407 mV	Go to *Step 12*	Go to *Step 13*
12	1. Turn the ignition OFF. 2. Disconnect the ECM connectors and check the continuity between terminal 2 of HO2S1 and the terminal M29 of the ECM. 3. If the circuit measures over the specified value, repair open or poor connection as needed. Is the repair complete?	5 Ω	Go to *Step 15*	Go to *Step 14*

Step	Action	Value(s)	Yes	No
13	1. Turn the ignition OFF. 2. Check the continuity between terminal 4 of HO2S1 and the terminal M12 of the ECM. 3. If the circuit measures over the specified value, repair open or poor connection as needed. Is the repair complete?	5 Ω	Go to *Step 15*	Go to *Step 14*
14	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to Step 15	–
15	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 16*	Go to *Step 2*
16	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1134

FRONT HEATED OXYGEN SENSOR (HO2S1) TRANSITION RATIO

Circuit Description

The Engine Control Module (ECM) monitors the Front Heated Oxygen Sensor (HO2S1) activity for 100 seconds after closed loop and stoichiometric operation have been established. During the monitoring period the ECM counts the number of times that the HO2S1 responds from rich to lean and adds the amount of time it took to complete all transitions. With this information, an average time for all transitions can be determined. The ECM then divides the –to–lean average by the lean–to–rich average to obtain the ratio. If the HO2S1 transition time ratio is not within the range, Diagnostic Trouble Code (DTC) P1134 will be set, indicating that the HO2S1 is not responding as expected to changes in exhaust oxygen content.

Conditions for Setting the DTC

- HO2S1 rich–to–lean and lean–to rich transition ratio is out of specification(between 0.375 and 3.5).
- Closed Loop stoichiometry.
- Engine Coolant Temperature (ECT) is greater than 70˚C (158˚F).
- System voltage is greater than 10 volts.
- Engine run time is greater than 60 seconds.
- Purge Duty Cycle (DC) is less than 20%.
- Engine speed is between 1600 and 4300 rpm.
- Calculated airflow is between 9 and 40 g/sec.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0131, P0132, P0134, P0135, P1167, P0171, P1171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P1404, P0405, P0406, P0506, P0507, and P0443 are not set.
- 2 second delay after conditions are met.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.

- The DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

A malfunction in the HO2S1 ignition feed or ground circuit may cause a DTC P1134 to set. Check HO2S1 circuitry for intermittent faults or poor connections. If connections and wiring are OK and DTC P1134 continues to set, replace the HO2S1.

Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how open the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

Test Description

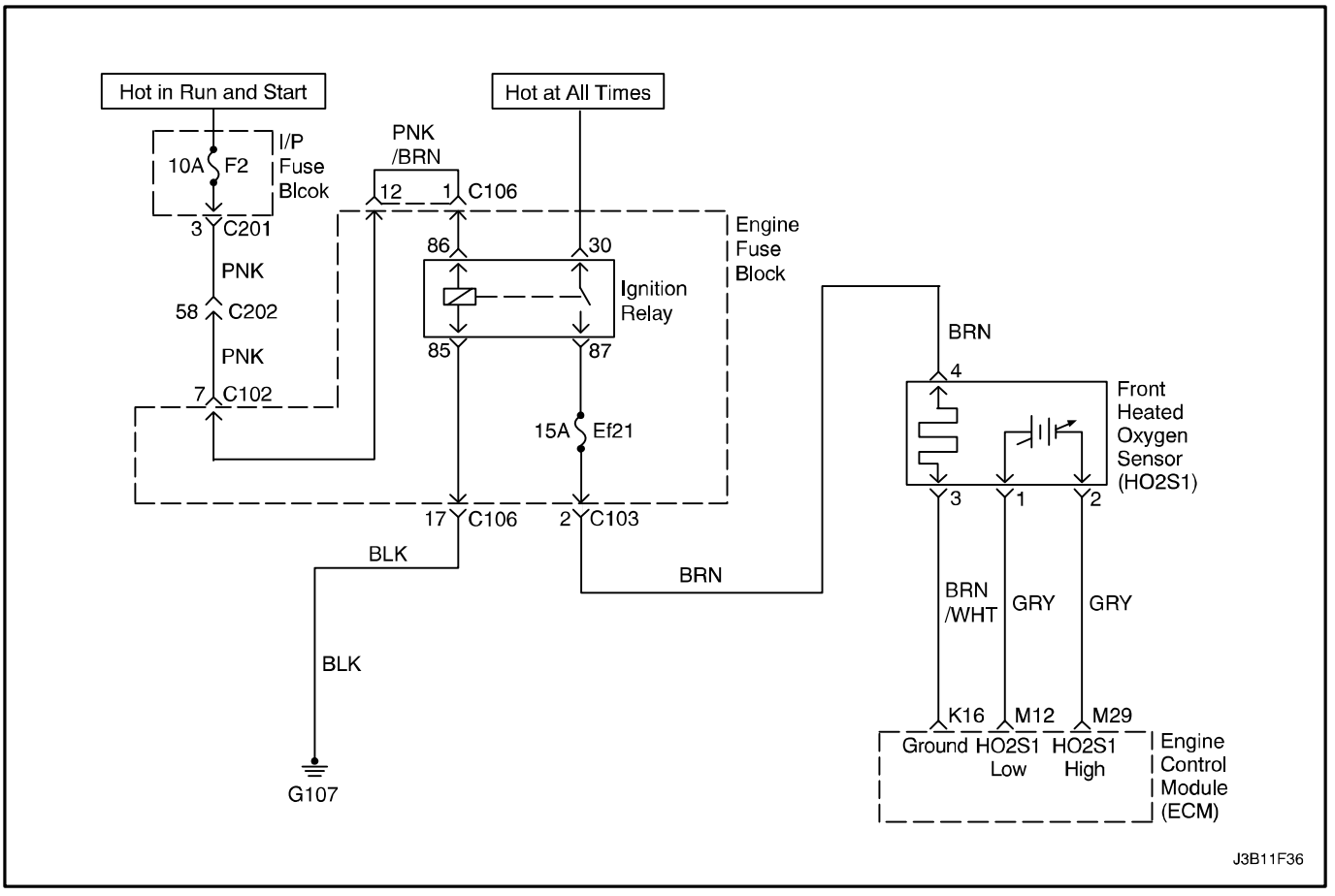
Number(s) below refer to the step number(s) on the Diagnostic Chart.

3. A condition that affects pre–converter and post–converter oxygen sensors indicates probable contamination. To avoid damaging replacement sensors, correct the condition which caused the contamination before replacing the affected sensors.
5. This step checks for conditions which may cause the oxygen sensor to appear faulty. Correct any of the described conditions if present.
8. To avoid damaging replacement sensors, correct the condition which caused the contamination before replacing the affected sensors

DTC P1134 – Front Heated Oxygen Sensor (HO2S1) Transition Ratio

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	**Important :** If any Diagnostic Trouble Codes (DTCs) are set, refer to those DTCs before processing with this diagnostic chart. 1. Install a scan tool to the Data Link Connector (DLC). 2. Start the engine and idle at normal operating temperature. 3. Operate the engine within parameters specified under Conditions for Setting the DTC. 4. Using a scan tool, monitor specific DTC info for DTC P1134 until the DTC P1134 test runs. 5. Note the test result. Does the scan tool indicate DTC P1134 failed this ignition?	–	Go to *Step 3*	Go to ”Diagnostic Aids”
3	Perform an exhaust system leak test. If an exhaust leak is found, repair as needed. The exhaust leak isolated?	–	Go to *Step 14*	Go to *Step 4*
4	Visually/physically inspect for the following items: • Front Heated Oxygen Sensor (HO2S1) is securely installed. • Corrosion on the terminals. • Terminal tension. • HO2S1 wiring harness for poor terminal connection or damaged wiring. Is a problem found in any of the above areas?	–	Go to *Step 7*	Go to *Step 5*

Step	Action	Value(s)	Yes	No
5	1. Turn the ignition OFF. 2. Disconnect the HO2S1 connector. 3. Turn the ignition ON. 4. Using a voltmeter, measure the voltage between following terminals. 5. Terminal 4 of Engine Control Module (ECM) side HO2S1 connector and ground. 6. Terminal 3 of ECM side HO2S1 connector and ground. Are both voltages in the specified value?	3–5 v	Go to *Step 6*	Go to *Step 8*
6	1. With the HO2S1 disconnected, jumper the ECM side HO2S1 connector terminals 4 and 3. 2. Turn the ignition ON. 3. Using a scan tool, monitor the HO2S1 voltage. Does the scan tool indicates less than 10 millivolts and immediately return to about 450 millivolts when the jumper is removed?	–	Go to *Step 10*	Go to *Step 9*
7	Repair conditions as needed. Is the action complete?	–	Go to *Step 14*	–
8	Check for faulty ECM connections or terminal damages and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 9*
9	Repair open, short, or grounded signal circuit. Is the repair complete?	–	Go to *Step 14*	*Step 11*
10	Remove the HO2S1 and examine it for sign of: • Fuel contamination. • Improper room temperature vulcanizing sealant (white powdery coating on the sensor) • Engine oil/coolant consumption. Are sign of contamination observed?	–	Go to *Step 12*	Go to *Step 13*
11	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
12	Determine and correct the cause of contamination. Is the repair complete?	–	Go to *Step 14*	
13	Replace the HO2S1. Is the repair complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1167

FRONT HEATED OXYGEN SENSOR (HO2S1) RICH IN DECEL FUEL CUTOFF (DFCO)

Circuit Description

The Engine Control Module (ECM) supplies a voltage of about 0.45 volts between terminals M12 and M29 (if measured with a 10 megohm digital voltmeter, this may read as low as 0.32 volts). The Front Heated Oxygen Sensor (HO2S1) varies the voltage within a range of about 1 volt if the exhaust is rich, down through about 0.10 volts if the exhaust is lean.

In internal circuitry of the Engine control Module (ECM) can identify if the vehicle fuel system is capable of cutoff amount of the fuel supply during deceleration. When a Decel Fuel Cutoff (DFCO) mode of operation is requested during Closed Loop operation, the ECM will cutoff the fuel supply to the engine. Under these conditions the ECM should detect a lean condition. If the ECM detect a rich condition at this time, Diagnostic Trouble Code (DTC) P1167 will set. Damaged fuel pressure regulator and faulty injector will be the cause of this DTC.

Conditions for Setting the DTC

- HO2S1 voltage is greater than 0.55 volts in Decel Fuel Cutoff (DFCO) mode.
- System voltage is greater than 10 volts.
- Engine Coolant Temperature (ECT) is greater than 60˚C (140˚F)
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.
- 3 second delay after in DFCO mode.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC can be cleared by using the scan tool.

- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

The DTC P1167 or rich exhaust is most likely caused by one of the following items:

- Leaking injector – A leaking or malfunctioning injector can cause the system to go rich causing a DTC P0132.
- Pressure regulator – Check for a leaking fuel pressure regulator diaphragm by checking for the presence of liquid fuel in the vacuum line to the regulator.

DTC P1167 – Front Heated Oxygen Sensor (HO2S1) Rich in Decel Fuel Cutoff (DFCO)

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Any other component related Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	1. Using a scan tool, observe the Front Heated Oxygen Sensor (HO2S1) voltage while decelerating the engine. 2. The HO2S1 voltage should vary from specified voltage (100–900 mV) and while decelerating occasionally toggle below the specified voltage. Is the HO2S1 voltage toggle?	550 mV	Go to *Step 4*	Go to ”DTC P0134 Oxygen Sensor No Activity”
4	Check the items in ”Diagnostic Aids” and repair or replace component as needed. Refer to ”Fuel System Diagnosis”. Is the repair complete?	–	Go to *Step 6*	Go to *Step 5*
5	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 6*	–
6	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 7*	Go to *Step 2*
7	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1171

FUEL TRIM SYSTEM LEAN DURING POWER ENRICHMENT

System Description

The internal circuitry of the Engine control Module (ECM) can identify if the vehicle fuel system is capable of supplying adequate amounts of fuel during heavy acceleration(power enrichment). When a Power Enrichment (PE) mode of operation is requested by heavy acceleration during Closed Loop operation, the ECM will provide more fuel to the engine. Under these conditions the ECM should detect a rich condition. If this reich condition is nor detected at this time, Diagnostic Trouble Code (DTC) P1171 will set. A plugged fuel filter or restricted fuel line can prevent adequate amount of fuel from being supplied during Power Enrichment mode.

Conditions for Setting the DTC

- HO2S1 voltage is less than 0.35 volts in Power Enrichment (PE) mode.
- Engine is operating in Closed Loop and in PE mode.
- Engine Coolant Temperature (ECT) is greater than 60˚C (140˚F).
- System voltage is greater than 10 volts.
- Air/Fuel ration is less than 13.5:1.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0171, P0172, P0201, P0202, P0203, P0204, P0300, P0336, P0337, P0351, P0352, P0402, P0404, P0405, P0406, P0506, P0507, P1404, and P0443 are not set.
- 3 second delay after in PE mode.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after two consecutive ignition cycle with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.
- The vehicle will operate in Open Loop.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.v

Diagnostic Aids

A restricted fuel filter can supply adequate amounts of fuel at idle, but may not be able to supply enough fuel during heavy acceleration.

Water or alcohol n fuel may cause low HO2S1 voltage during acceleration.

Check for adequate amount of fuel in the Tank.

When the engine is idling or at steady cruise, the HO2S1 voltage should vary from between approximately a00 to 900 millivolts. During power enrichment mode, more fuel is needed, and the HO2S1 should rise above 444 millivolts.

Check for faulty or plugged injector(s).

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
4. This step checks to see if the HO2S1 is operating properly.
6. If no faults have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P1171 – Fuel Trim Supply System Lean During Power Enrichment

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. Are any component related Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	1. Check the vehicle for an adequate amount of fuel. 2. Add fuel to the vehicles fuel tank if the tank is almost empty. Did the fuel tank require fuel?	–	Go to *Step 5*	Go to *Step 4*
4	1. Using a scan tool, observe the Front Heated Oxygen Sensor (HO2S1) voltage while accelerating the engine over 1200 rpm. 2. The HO2S1 voltage should vary from specified voltage (100—900 mV) and occasionally toggle above the specified voltage while accelerating. Is the HO2S1 voltage toggle?	3507 mV	Go to ”Fuel System Diagnosis”	Go to ”DTC P0134 Oxygen Sensor No Activity”
5	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 6*	Go to *Step 2*
6	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1336
58X CRANK POSITION TOOTH ERROR NOT LEARNED

Circuit Description

In order to detect engine misfire at higher engine speeds, the Engine Control Module (ECM) must know of any variation between the crankshaft sensor pulses. Most variations are due to the machining of the crankshaft reluctor wheel. However, other sources of variation are also possible. A Crankshaft Position (CKP) system variation learning procedure must be performed any time a change is made to the crankshaft sensor to crankshaft relationship of if the ECM is replaced or reprogrammed. The ECM measures the variations and then calculates compensation factors needed to enable the ECM to accurately detect engine misfire at all speeds and loads. A scan tool must be used to command the ECM to learn these variations. If for any reason the ECM is unable to learn these variations or they are out of an acceptable range, the ECM will set Diagnostic Trouble Code (DTC) P1336. An ECM that has not had the CKP system variation learning procedure performed due to replacement or reprogramming will also set DTC P1336.

Conditions for Setting the DTC

- Tooth error not learned if the manufacture enable counter is set to zero.
- DTCs P0106, P0107, P0108, P0117, P0118, P0122, P0123, P0132, P0201, P0202, P0203, P0204, P0325 , 0327, P0336, P0337, P0341, P0342, P0351, P0352, P0402, P1404, P0404, P0405, P0406 and P0502 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffer.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL will turn OFF after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm up cycles without a fault.
- Disconnecting the ECM battery feed for more than 10 seconds.
- DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

CAUTION : To avoid personal injury when performing the crankshaft position system variation learning procedure, always set the vehice parking brake and block the drive wheels. Release the throttle immediately when the engine starts to decelerate. Once the learn procedure is completed, engine control will be returned to the operator, and the engine will respond to throttle position.

DTC P1336 will only set if the ECM has not learned the CKP system variation. The ECM only needs to learn this variation once per life cycle of the vehicle unless the crank sensor to crankshaft relationship is disturbed. Removing a part is considered a disturbance. A fully warmed engine is critical to learning the variation correctly. If a valid learn occurs, no other learns can be completed that ignition cycle.

If the engine cuts out before the specified learn procedure engine speed or at normal fuel cutoff rpm, the ECM is not in the learn procedure mode.

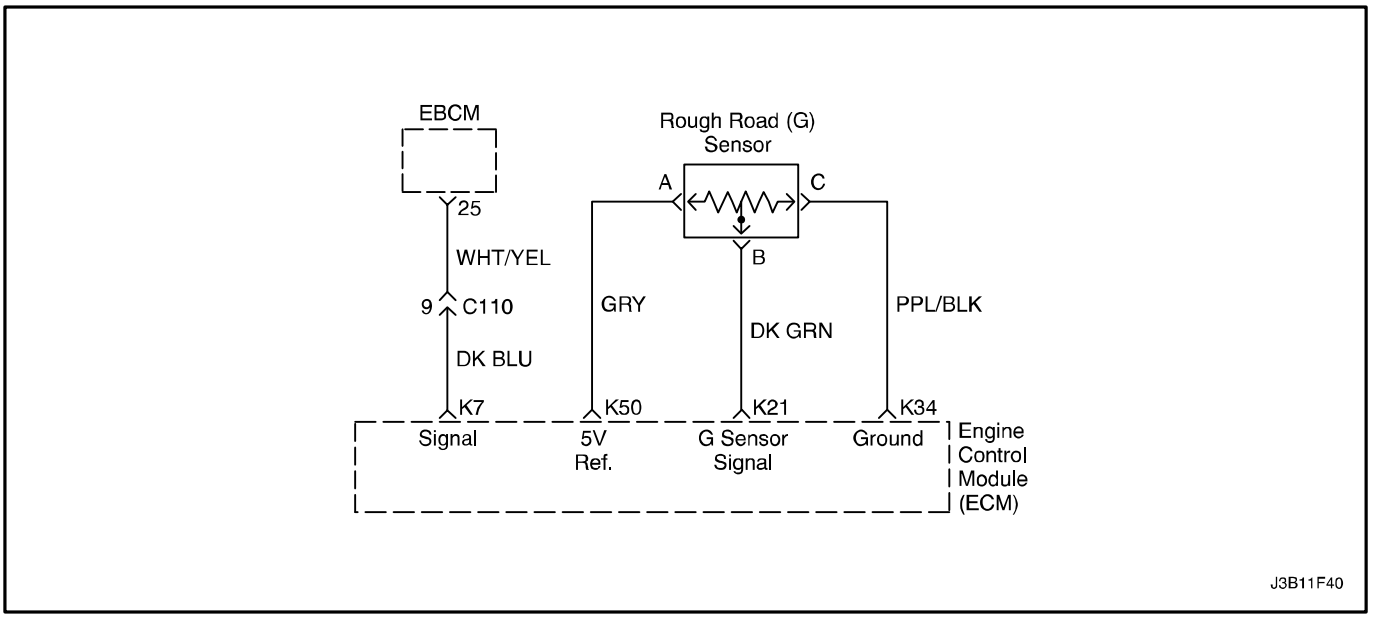
Test Description

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

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the fault occurred. The information is then stored on the scan tool for later reference.
2. Engine temperature is critical to properly learn the CKP system variation. Failure to properly warm the engine before performing this procedure will result in an inaccurate measurement of the CKP system variation. The ECM learns this variation as the engine is decelerating and then allows engine control to be returned to the operator. All accessories must be OFF when learning the CKP system angle variation. If the A/C is not disabled when the learn procedure is enabled, the ECM will disable the A/C.
3. If after the specified number attempts the ECM cannot learn the CKP system variation, then the variation is too large and no further attempts should be made until the variation problem is corrected.
4. Being unable to learn the procedure indicates that the variation is out of range.
5. After the CKP system variation has been learned, wait above 10 seconds with ignition switch OFF to prevent being cleared the learned value.

DTC P1336 – 58X Crank Position Tooth Error Not Learned

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Put the vehicle in PARK or NEUTRAL. 4. Start the engine and operate to normal operating temperature. 5. Turn all accessories OFF. 6. Enable the TEC (Tooth Error Correction) LEARN PROCEDURE with the scan tool. 7. Raise the engine rpm to the specified value, then release the throttle as soon as the engine cuts out. Does the scan tool indicate that the Crankshaft Position (CKP) system variation has been learned?	65˚C (149˚F) 4000 rpm	Go to *Step 5*	Go to *Step 3*
3	Attempt the CKP system variation procedure as many times as the specified value. Does the scan tool indicate that the CKP system variation has been learned?	10	Go to *Step 5*	Go to *Step 4*
4	Check for a problem with the CKP sensor to crankshaft relationship. Is the repair complete?	–	Go to *Step 5*	–
5	1. Turn the ignition OFF and wait above specified value. 2. Turn the ignition ON, with engine OFF. 3. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 4. Start the engine and idle at normal operating temperature. 5. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	10 sec	Go to *Step 6*	Go to *Step 2*
6	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1391

G SENSOR ROUGH ROAD RATIONALITY

Circuit Description

TThe Gravity Sensing Rough Road (G) sensor is a vertical low g–acceleration sensor. By sensing vertical acceleration caused by bumps or potholes in the road, the Engine Control Module (ECM) can determine if the changes in crankshaft speed are due to engine misfire or are driveline induced. If the G sensor detects a rough road condition, the ECM misfire detection diagnostic will be de–activated. The G sensor at rest output should be between 2.35–2.65 volts (+1G). During a rough road condition, the voltage output can vary between 0.5 (–1G) and 4.5 volts (+3G).

Conditions for Setting the DTC

- Engine is running.
- Vehicle speed is less than or equal to 5 km/h (3.1 mph).
- G sensor output at idle indicates below –0.39 volts or above 2.21 volts.

OR

- Engine is running more than 10 seconds and vehicle speed is between 30 mph (50 km/h) and 70 mph (112 km/h).
- G sensor signal changes less than 0.00024 volts while driving.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history Diagnostic Trouble Code (DTC) will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM – Inspect the harness connections for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness — Inspect the wiring harness for damage. If the harness appears to be OK, observe the G sensor display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.

Since the G sensor shares the ECM 5 volt reference and ground terminals with the A/C Pressure Sensor, a damaged A/C Pressure Sensor harness or sensor could cause a G sensor DTC to set. Refer to ”Multiple ECM Information Sensor DTCs Set” in this section. in this section.

The G sensor will give correct voltages only if it is level and mounted securely to its bracket.

Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the con

Test Description

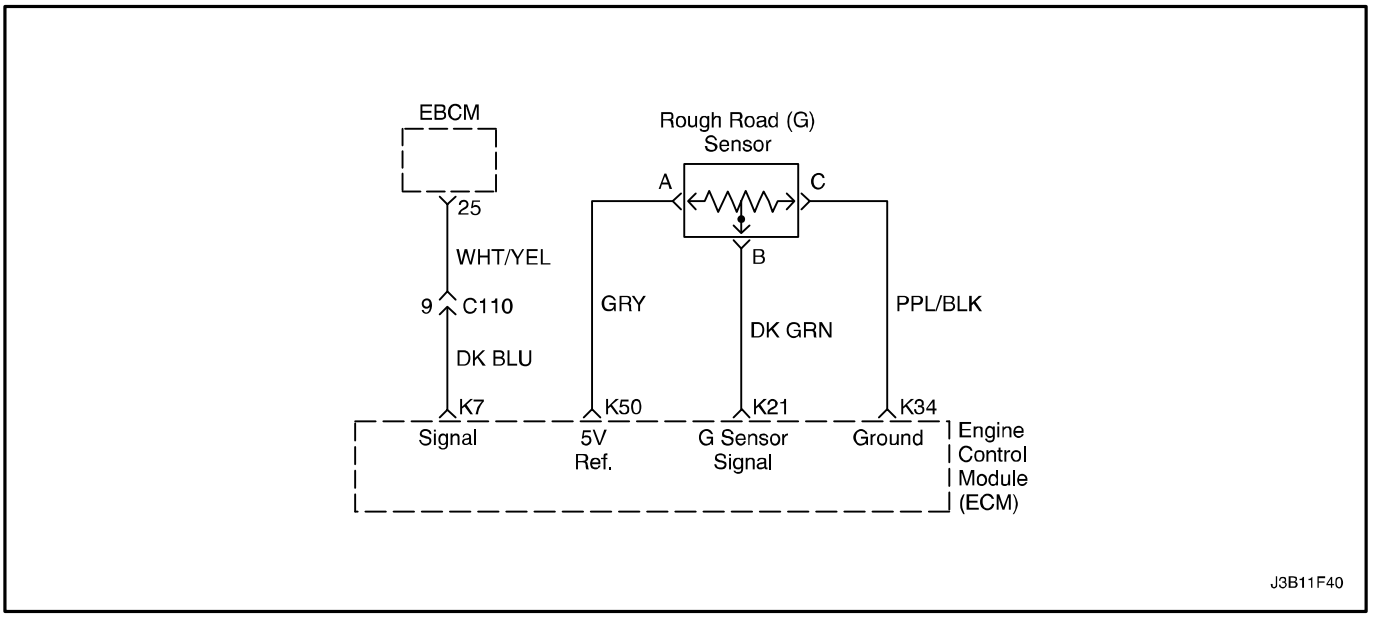
The number(s) below refer to step(s) on the diagnostic table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

DTC P1391 – G Sensor Rough Road Rationality

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with engine OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Review and record the scan tool Failure Records data. 4. Operate the vehicle within Failure Records conditions as noted. 5. Using the scan tool, monitor specific Diagnostic Trouble Code (DTC) info for DTC P1391. Does the scan tool indicate that DTC P1391 failed?	–	Go to *Step 4*	Go to *Step 3*
3	Check for the following conditions and repair as needed: • G sensor seal missing or damaged. • G sensor mounting flanges cracked, missing, or incorrectly installed. Is the repair complete?	–	Go to *Step 14*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the G sensor electrical connector. 3. Turn the ignition ON, with the engine OFF. 4. Observe the G sensor value displayed on the scan tool. Is the G sensor value near the specified value?	0 v	Go to *Step 5*	Go to *Step 12*
5	1. Jumper the 5 volt reference circuit, terminal A and the G sensor signal circuit, terminal B together at the G sensor harness connector. 2. Observe the G sensor value displayed on the scan tool. Is the G sensor value near the specified value?	4.95 v	Go to *Step 6*	Go to *Step 7*
6	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) and check the sensor ground circuit for high resistance, an open between the ECM and the G sensor, or for a poor connection at the terminal k34 of the ECM and repair as needed. 3. f the problem is found, repair as necessary. Is a problem found?	–	Go to *Step 14*	Go to *Step 10*
7	Check the 5 volt reference circuit for high resistance, an open between the ECM and the G sensor, or a poor connection at the terminal k50 of the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 8*

Step	Action	Value(s)	Yes	No
8	1. Turn the ignition OFF. 2. Disconnect the ECM and check the G sensor signal circuit for high resistance, an open, a short to ground, or a short to the sensor ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 9*
9	Check the G sensor signal circuit for a poor connection at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
10	Check for a poor connection at terminal C of the G sensor and repair as needed. Is the repair complete?		Go to *Step 14*	Go to *Step 11*
11	Replace the G sensor. Is the repair complete?	–	Go to *Step 14*	–
12	1. Turn the ignition OFF. 2. Disconnect the ECM. 3. Turn the ignition ON. 4. Check the G sensor signal circuit for a short to voltage or a short to the 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 14*	Go to *Step 13*
13	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 14*	–
14	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 15*	Go to *Step 2*
15	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1392
G SENSOR ROUGH ROAD LOW VOLTAGE

Circuit Description

The Gravity Sensing Rough Road (G) sensor is a vertical low g–acceleration sensor. By sensing vertical acceleration caused by bumps or potholes in the road, the Engine Control Module (ECM) can determine if the changes in crankshaft speed are due to engine misfire or are driveline induced. If the G sensor detects a rough road condition, the ECM misfire detection diagnostic will be de–activated. The G sensor at rest output should be between 2.35–2.65 volts (+1G). During a rough road condition, the voltage output can vary between 0.5 (–1G) and 4.5 volts (+3G).

Conditions for Setting the DTC

- G sensor output is less than 2%.
- Engine is running more than or equal to 10 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history Diagnostic Trouble Code (DTC) will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM – Inspect the harness connections for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, observe the G sensor display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.

Since the G sensor shares the ECM 5 volt reference and ground terminals with the A/C Pressure Sensor, a damaged A/C Pressure Sensor harness or sensor could cause a G sensor DTC to set. Refer to ”Multiple ECM Information Sensor DTCs Set” in this section.

The G sensor will give correct voltages only if it is level and mounted securely to its bracket.

Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

Test Description

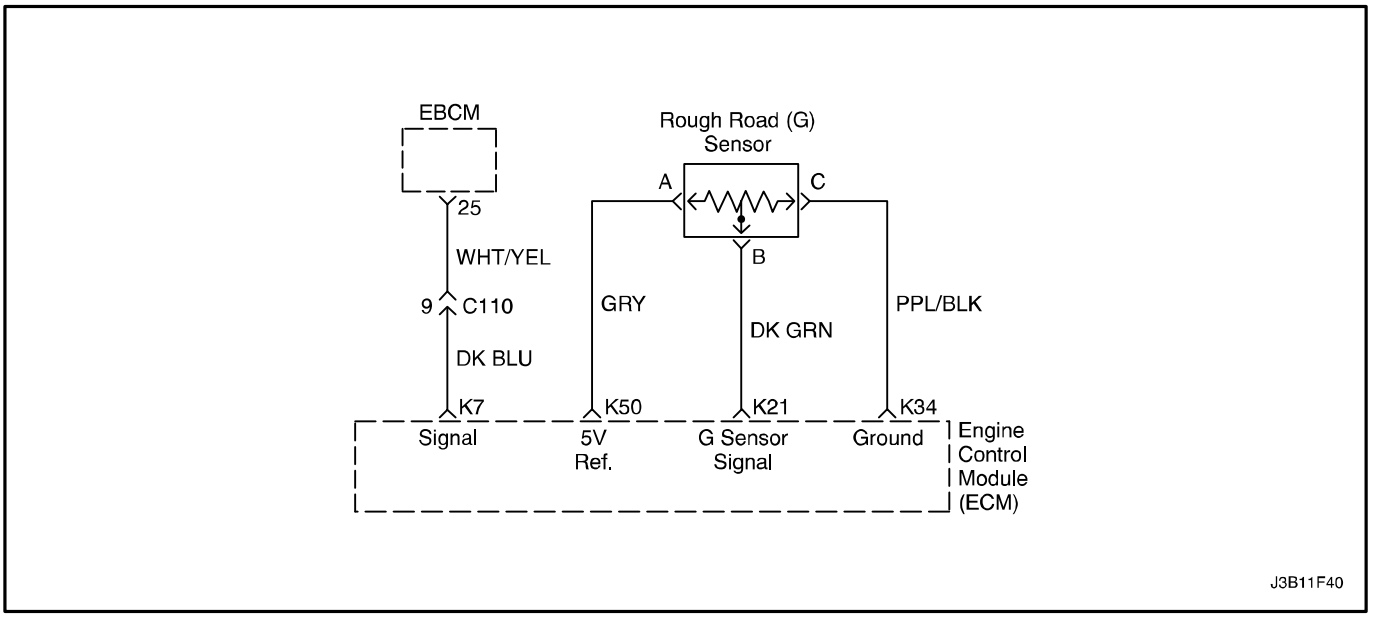
The number(s) below refer to step(s) on the diagnostic table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

DTC P1392 – G Sensor Rough Road Low Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Turn the ignition ON, with the engine OFF. 4. Observe the ROUGH ROAD value displayed on the scan tool. Is the ROUGH ROAD value near the specified value?	0 v	Go to *Step 4*	Go to *Step 3*
3	1. Review and record the scan tool Failure Records data. 2. Operate the vehicle within Failure Records conditions as noted. 3. Using the scan tool, monitor specific Diagnostic Trouble Code (DTC) info for DTC P1392. Does the scan tool indicate that DTC P1392 failed?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the G sensor electrical connector. 3. Turn the ignition ON, with the engine OFF. 4. Jumper the 5 volt reference circuit, terminal A and the G sensor signal circuit, terminal B together at the G sensor harness connector. 5. Observe the G sensor value displayed on the scan tool. Is the G sensor value near the specified value?	4.95 v	Go to *Step 9*	Go to *Step 5*
5	1. Turn the ignition OFF. 2. Disconnect the Engine Control Module (ECM) and check the 5 volt reference circuit for an open or short to ground and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 6*
6	Check the 5 volt reference circuit for poor connection at the ECM and repair or replace as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 7*
7	1. Turn the ignition OFF. 2. Disconnect the ECM and check the G sensor signal circuit for an open, a short to ground, or a short to the sensor ground circuit and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 8*
8	Check the G sensor signal circuit for a poor connection at the ECM and repair as needed. Is the repair complete?	–	Go to *Step 11*	Go to *Step 10*
9	Replace the G sensor. Is the repair complete?	–	Go to *Step 11*	–
10	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 11*	–

Step	Action	Value(s)	Yes	No
11	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 12*	Go to *Step 2*
12	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1393

G SENSOR ROUGH ROAD HIGH VOLTAGE

Circuit Description

The Rough Road (G) sensor is a vertical low g–acceleration sensor. By sensing vertical acceleration caused by bumps or potholes in the road, the Engine Control Module (ECM) can determine if the changes in crankshaft speed are due to engine misfire or are driveline induced. If the G sensor detects a rough road condition, the ECM misfire detection diagnostic will be de–activated. The G sensor at rest output should be between 2.35–2.65 volts (+1G). During a rough road condition, the voltage output can vary between 0.5 (–1G) and 4.5 volts (+3G).

Conditions for Setting the DTC

- G sensor output is greater than 98%.
- Engine is running more than or equal to 10 seconds.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history Diagnostic Trouble Code (DTC) will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM – Inspect the harness connections for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, observe the G sensor display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.

Since the G sensor shares the ECM 5 volt reference and ground terminals with the A/C Pressure Sensor, a damaged A/C Pressure Sensor harness or sensor could cause a G sensor DTC to set. Refer to"Multiple ECM Information Sensor DTCs Set" in this section.

The G sensor will give correct voltages only if it is level and mounted securely to its bracket.

Reviewing the Failure Records vehicle mileage since the diagnostic test last failed may help determine how often the condition that caused the DTC to be set occurs. This may assist in diagnosing the condition.

Test Description

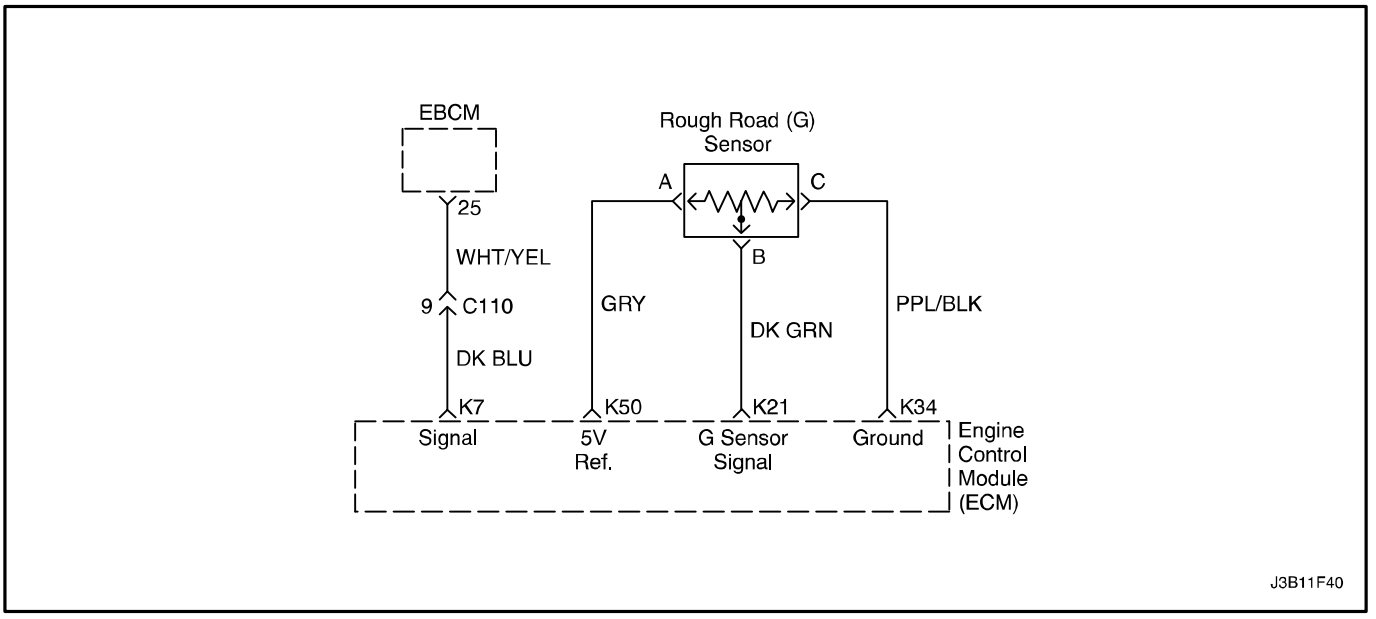
The number(s) below refer to step(s) on the diagnostic table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.

DTC P1393 – G Sensor Rough Road High Voltage

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Is the system check complete?	–	Go to *Step 2*	Go to "On–Board Diagnostic System Check"
2	1. Turn the ignition OFF. 2. Install a scan tool to the Data Link Connector (DLC). 3. Start and idle the engine. 4. Observe the ROUGH ROAD value displayed on the scan tool. Is the ROUGH ROAD value near the specified value?	4.5 v	Go to *Step 4*	Go to *Step 3*
3	1. Review and record the scan tool Failure Records data. 2. Operate the vehicle within Failure Records conditions as noted. 3. Using the scan tool, monitor specific Diagnostic Trouble Code (DTC) info for DTC P1393. Does the scan tool indicate that DTC P1393 failed?	–	Go to *Step 4*	Go to "Diagnostic Aids"
4	1. Turn the ignition OFF. 2. Disconnect the G sensor electrical connector. 3. Turn the ignition ON, with the engine OFF. 4. Note the G sensor voltage displayed on the scan tool. Is the G sensor value near the specified value?	0 v	Go to *Step 5*	Go to *Step 6*
5	Probe the sensor ground circuit terminal C with a test light to B+. Is the test light ON?	–	Go to *Step 7*	Go to *Step 9*
6	Check the G sensor signal circuit for a short to voltage or a short to the 5 volt reference circuit and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 11*
7	Check for a poor sensor ground terminal connection at the G sensor electrical connector. Is the repair complete?	–	Go to *Step 12*	Go to *Step 8*
8	Check for a poor sensor ground terminal connection at the Engine Control Module (ECM) and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 10*
9	Check the G sensor ground circuit for an open and repair as needed. Is the repair complete?	–	Go to *Step 12*	Go to *Step 10*
10	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 12*	–
11	Replace the G sensor. Is the repair complete?	–	Go to *Step 12*	Go to *Step 10*

Step	Action	Value(s)	Yes	No
12	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 13*	Go to *Step 2*
13	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1396

ABS WSS SIGNAL VARIATION

Circuit Description

The Engine Control Module (ECM) determines linear wheel speed excessive variation. The wheel speed variation test detects at least one missing edge from the wheel speed sensor signal.

Conditions for Setting the DTC

- WSS variation is greater than 18km/h (11.2 mph).
- Vehicle speed is greater than 10km/h (6.2 mph).

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM – Inspect the harness connections for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, observe the G sensor display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.

An open signal circuit of open PWM serial data line between the ECM and the EBCM will be the cause of this DTC.

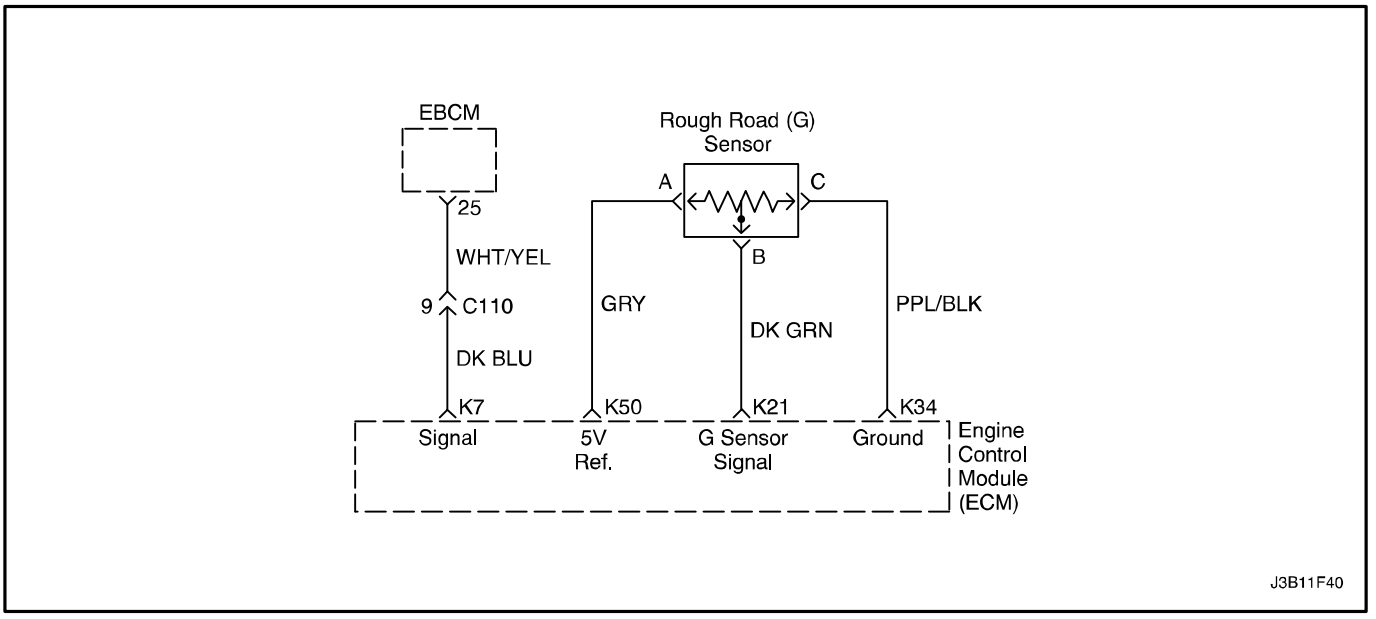
Test Description

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

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P1396 – ABS WSS Signal Variation

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan too. Are any additional Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	1. Review and record the scan tool Failure Records data. 2. Operate the vehicle within Failure Records conditions as noted. 3. Using the scan tool, monitor specific DTC info for DTC P1391. Does the scan tool indicate that DTC P1391 failed?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the engine control module (ECM) and check for an open or short in the wire between ECM connector terminal K7 and Electronic Brake Control Module (EBCM) connector terminal 25. Is the problem found?	–	Go to *Step 5*	Go to *Step 6*
5	Repair an open or short in the wire between ECM connector terminal K7 and EBCM connector terminal 25. Is the repair complete?	–	Go to *Step 7*	–
6	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1397

ABS WSS NO SIGNAL

Circuit Description

The Engine Control Module (ECM) determines linear wheel speed fail threshold. The ECM detects a good or failed wheel speed sensor under power conditions.

Conditions for Setting the DTC

- Vehicle speed is greater than 10km/h (6.2 mph).

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will store conditions which were present when the DTC set as Failure Records data only. This information will not be stored as Freeze Frame data.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- The DTC(s) can be cleared by using the scan tool.

Diagnostic Aids

Check for the following conditions:

- Poor connection at the ECM – Inspect the harness connections for backed–out terminals, improper mating, broken locks, improperly formed or damaged terminals, and poor terminal–to–wire connection.
- Damaged harness – Inspect the wiring harness for damage. If the harness appears to be OK, observe the G sensor display on the scan tool while moving connectors and wiring harnesses related to the sensor. A change in the display will indicate the location of the fault.

An open signal circuit of open PWM serial data line between the ECM and the EBCM will be the cause of this DTC.

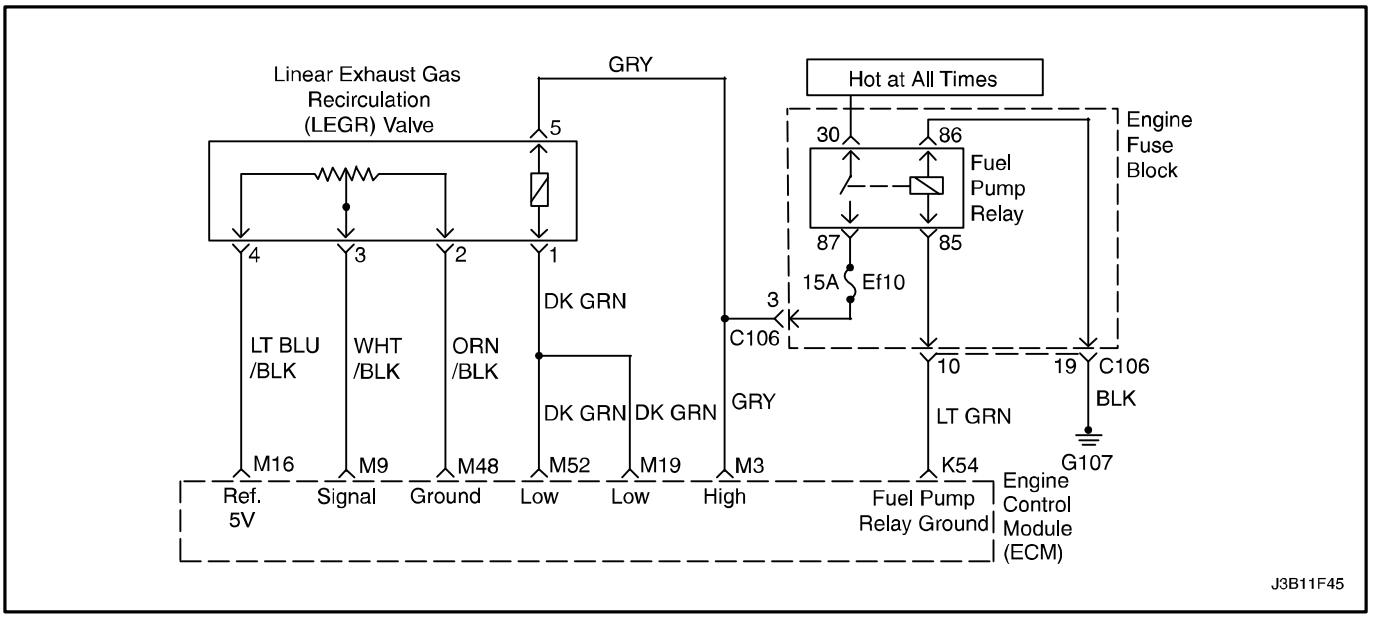
Test Description

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

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.

DTC P1397 – ABS WSS No Signal

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition ON, with the engine OFF. 2. Install a scan too. Are any additional Diagnostic Trouble Codes (DTCs) set?	–	Go to applicable DTC table	Go to *Step 3*
3	1. Review and record the scan tool Failure Records data. 2. Operate the vehicle within Failure Records conditions as noted. 3. Using the scan tool, monitor specific DTC info for DTC P1391. Does the scan tool indicate that DTC P1391 failed?	–	Go to *Step 4*	Go to ”Diagnostic Aids”
4	1. Turn the ignition OFF. 2. Disconnect the engine control module (ECM) and check for an open or short in the wire between ECM connector terminal K7 and Electronic Brake Control Module (EBCM) connector terminal 25. Is the problem found?	–	Go to *Step 5*	Go to *Step 6*
5	Repair an open or short in the wire between ECM connector terminal K7 and EBCM connector terminal 25. Is the repair complete?	–	Go to *Step 7*	–
6	1. Turn the ignition OFF. 2. Replace the ECM. Is the repair complete?	–	Go to *Step 7*	–
7	1. Using the scan tool, clear the DTCs. 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the conditions for setting this DTC as supported in the text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 8*	Go to *Step 2*
8	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK



DIAGNOSTIC TROUBLE CODE (DTC) P1404

EXHAUST GAS RECIRCULATION CLOSED VALVE PINTLE ERROR

Circuit Description

An Exhaust Gas Recirculation (EGR) system is used to lower Oxides of Nitrogen (NOx) emission levels caused by high combustion temperatures. It accomplishes this by feeding small amounts of exhaust gases back into the combustion chamber.When the air/fuelmixture is diluted with the exhaust gases, combustion temperatures are reduced.

A linear EGR valve is used on this system. The linear EGR valve is designed to accurately supply exhaust gases to the engine without the use of intake manifold vacuum. The valve controls exhaust flow going into the intake manifold from the exhaust manifold through an orifice with an Engine Control Module (ECM) controlled pintle. The ECM controls the pintle position using inputs from the Throttle Position (TP) and Manifold Absolute Pressure (MAP) sensors. The ECM then commands the EGR valve to operate when necessary by controlling an ignition signal through the ECM. This can be monitored on a scan tool as the Desired EGR Position.

The ECM monitors the results of its command through a feedback signal. By sending a 5 volt reference and a ground to the EGR valve, a voltage signal representing the EGR valve pintle position is sent to the ECM. This feedback signal can also be monitored on a scan tool and is the actual position of the EGR pintle. The Actual EGR Position should always be near the commanded or Desired EGR Position.

Conditions for Setting the DTC

- Difference between current and learned low position is greater than 10%.
- Desired EGR position is equal to 0.
- Engine is running.
- Ignition voltage is between 11.7 and 16 volts.
- Intake Air Temperature (IAT) is greater than 3˚C (37.4˚F).
- DTCs P0112, P0113, P0405, P0406, and P0502 are not set.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history Diagnostic Trouble Code (DTC) is stored.
- EGR is disabled.

Conditions for Clearing the MIL/DTC

- The MIL will turn off after three consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 80 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

Diagnostic Aids

Due to moisture associated with exhaust systems, the EGR valve may freeze and stick in cold weather. After the vehicle is brought into a warm shop for repairs, the valve warms and the problem disappears. By watching the Actual EGR and Desired EGR Positions on a cold vehicle with a scan tool, the fault can be easily verified. Check the

freeze frame data to determine if the DTC set when the vehicle was cold by viewing the Engine Coolant Temperature (ECT).

Test Description

Number(s) below refer to the step number(s) on the Diagnostic Table.

1. The On–Board Diagnostic (EOBD) System Check prompts the technician to complete some basic checks and store the freeze frame and failure records data on the scan tool if applicable. This creates an electronic copy of the data taken when the malfunction occurred. The information is then stored on the scan tool for later reference.
2. Commanding the EGR valve open determines whether the EGR system can control the EGR valve accurately and if the fault is present.
3. When the EGR valve electrical connector is disconnected, the scan tool should display the Actual EGR Position as 0%. If it does not, the fault lies either in the EGR signal circuit or the ECM.
5. If the ERG valve 5 volt reference is shorted to voltage, the Digital Voltmeter (DVM) will read battery voltage and additional DTCs may be set and engine performance will be poor.
6. The replacement ECM must be reprogrammed. Refer to the latest Techline procedure for ECM reprogramming.
10. An open or poor connection condition may have caused this DTC to set. Be sure to check the terminals for being backed out, improperly formed or damaged, and for poor tension.
11. All circuits to the EGR valve are OK at this point. The fault lies internally in the EGR valve and therefore must be replaced. Be sure all gasket material is removed from the EGR mounting surface. Even a small amount of material may cause a DTC P0401 to set.
12. Check the terminals for being backed out, improperly formed or damaged, and for poor tension.
13. Clearing DTCs is a very important step for this diagnostic. The clearing function allows the EGR valve to relearn a new pintle position as the old pintle position was inaccurate due to the failure that caused the DTC. The DTC must be cleared with the ignition ON, engine OFF or when the engine is idling. If the ECM sees a EGR command, the new pintle will not be learned.
14. If no malfunctions have been found at this point and no additional DTCs were set, refer to ”Diagnostic Aids” in this section for additional checks and information.

DTC P1404 – Exhaust Gas Recirculation Closed Valve Pintle Error

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was tht check Performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Install a scan tool to the Data Link Connector (DLC). 2. Turn the ignition ON. 3. Command the Exhaust Gas Recirculation (EGR) valve to the specific values. Does the Actual EGR Position follow the Desired EGR Position?	25%, 50%, 75%, 100%	Go to *Step 13*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the EGR valve. Is the Actual EGR Position near the specified value?	100%	Go to *Step 4*	Go to *Step 5*
4	Check the signal circuit terminal 3 at the EGR wiring harness connector for a short to voltage and repair as needed. Is a repair complete?	–	Go to *Step 13*	Go to *Step 6*
5	With a voltmeter connected to the ground, probe the 5 volt reference circuit at terminal 4 of the EGR valve wiring harness connector. Is the voltage near the specified value?	5 v	Go to *Step 7*	Go to *Step 8*
6	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 13*	–

Step	Action	Value(s)	Yes	No
7	With a teat light connected to ground, probe the EGR valve wiring harness connector terminal 1. Does the test light illuminate?	–	Go to *Step 9*	Go to *Step 10*
8	Check the 5 volt reference circuit for a short to voltage and repair as needed. Is a repair complete?	–	Go to *Step 13*	Go to *Step 6*
9	Check the control circuit for a short to voltage and repair as needed. Is the repair complete?	–	Go to *Step 13*	Go to *Step 6*
10	Check the EGR ground circuit for an open or poor connection at the EGR valve harness connector and repair as needed. Is a repair necessary.	–	Go to *Step 13*	Go to *Step 12*
11	1. Turn the ignition OFF. 2. Replace the EGR valve. Is the repair complete?	–	Go to *Step 13*	–
12	Check the ECM connector for a poor connection and repair as needed. Is the repair complete?	–	Go to *Step 13*	–
13	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic ran and passed?	–	Go to *Step 14*	Go to *Step 2*
14	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1601

SPI COMMUNICATIONS BETWEEN ECM AND TCM

Circuit Description

The Serial Peripheral Interface (SPI) communication is used internally by the Engine Control Module (ECM) to send message between the engine processor and the automatic transaxle processor. Included in each message sent between the two processor is a checksum of the message. Both the engine processor automatic transaxle processor will compare this checksum value with calculated checksum. If the checksum do not match, the processor will review the new data as being corrupted and ignore the value. The processor then use the previous message. The receiving processor will then send a message to the sending processor informing it that its last message was corrupted.

The ECM monitor periodic TCM status message and if message is not received fail counter incremented and Diagnostic trouble Code (DTC) will stored.

Conditions for Setting the DTC

- Ignition switch is turned to ON.
- Ignition voltage is greater than 11 volts.
- Engine is running more than 2 seconds.
- Device Control not active.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- The MIL turn off after four consecutive ignition cycles in which the diagnostic runs without a fault.
- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1601 SPI Communications Between ECM and TCM

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1607
LOWER POWER COUNTER RESET

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An Electrically Erasable Programmable Read Only Memory (EEPROM) is used to house the program information and the calibrations required for engine, transmission, and powertrain diagnostics operation. The ECM monitors EEPROM reset flag and Lower Power Counter I/C overflow bits. If the ECM detects if Lower Power Counter I/C has been reset due to battery disconnect or Lower Power Counter I/C malfunction, the Diagnostic Trouble Code (DTC) will stored.

Conditions for Setting the DTC

- Ignition switch is turned to ON.
- Engine is not running.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1607 – Lower Power Counter Reset

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1626

IMMOBILIZER NO RESPONSE

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. The ECM detects communication link failure with immobilizer control unit.

Conditions for Setting the DTC

- No immobilizer message identification for ECM release time window (1.5 or 2.0 seconds).
- Ignition switch is turned to ON.
- ECM release time window expired.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1626 – Immobilizer No Response

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1631

IMMOBILIZER INVALID RESPONSE

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. The ECM received incorrect message identification.

Conditions for Setting the DTC

- Wrong immobilizer message received.
- Ignition switch is turned to ON.
- Immobilizer option selected.
- ECM release time window expired.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1631 – Immobilizer Invalid Response

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1650

SPI COMMUNICATION BETWEEN ERROR WITH SIDM CHIP

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An Electrically Erasable Programmable Read Only Memory (EEPROM) is used to house the program information and the calibrations required for engine, transmission, and powertrain diagnostics operation. The Diagnostic Trouble Code (DTC) will stored, when the ECM detects SPI communication between main CPU and output driver I/C is corrupted.

Conditions for Setting the DTC

- Ignition switch is turned to ON.
- Battery voltage is greater than 11 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will not illuminate.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1650 – SPI Communication Between Error with SIDM Chip

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	System OK

DIAGNOSTIC TROUBLE CODE (DTC) P1655

SPI COMMUNICATION BETWEEN ERROR WITH PSVI CHIP

Circuit Description

The Engine Control Module (ECM) is the control center of the fuel injection system. It constantly looks at the information from various sensors, and controls the systems that affect vehicle performance. The ECM also performs the diagnostic function of the system. It can recognize operational problems, alert the driver through the Malfunction Indicator Lamp (MIL) (Check Engine), and store a Diagnostic Trouble Code (DTC) or DTCs which identify the problem areas to aid the technician in making repairs. An Electrically Erasable Programmable Read Only Memory (EEPROM) is used to house the program information and the calibrations required for engine, transmission, and powertrain diagnostics operation. The Diagnostic Trouble Code (DTC) will stored, when the ECM detects corrupted serial peripheral interface (SPI) comunication between main CPU and output driver I/C.

Conditions for Setting the DTC

- Ignition switch is turned to ON.
- Battery voltage is greater than 11 volts.

Action Taken When the DTC Sets

- The Malfunction Indicator Lamp (MIL) will illuminate after three consecutive trip with a fail.
- The ECM will record operating conditions at the time the diagnostic fails. This information will be stored in the Freeze Frame and Failure Records buffers.
- A history DTC is stored.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 40 consecutive warm–up cycles without a fault.
- DTC(s) can be cleared by using the scan tool.
- Disconnecting the ECM battery feed for more than 10 seconds.

DTC P1655 – SPI Communication Between Error with PSVI Chip

Step	Action	Value(s)	Yes	No
1	Perform an On–Board Diagnostic (EOBD) System Check. Was the check performed?	–	Go to *Step 2*	Go to ”On–Board Diagnostic System Check”
2	1. Turn the ignition OFF. 2. Replace the Engine Control Module (ECM). Is the repair complete?	–	Go to *Step 3*	–
3	1. Using the scan tool, clear the Diagnostic Trouble Codes (DTCs). 2. Start the engine and idle at normal operating temperature. 3. Operate the vehicle within the Conditions for setting this DTC as specified in the supporting text. Does the scan tool indicate that this diagnostic has run and passed?	–	Go to *Step 4*	Go to *Step 2*
4	Check if any additional DTCs are set. Are any DTCs displayed that have not been diagnosed?	–	Go to Applicable DTC table	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 an On–Board Diagnostic (EOBD) System Check. Is the check complete?	–	Go to*Step 2*	Go to"On–Board Diagnostic System Check"
2	1. Inspect all of the engine control module (ECM) ground connections. 2. Inspect all of the vacuum hoses for splits, kinks, and proper 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, and carbon tracking. 5. Inspect the wiring for proper connections, pinches, and cuts. Are all checks complete?	–	Go to Appropriate Symptom Table	–

INTERMITTENTS

Definition : The problem may or may not illuminate the Malfunction Indicator Lamp (MIL) 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 Data Link Connector (DLC). Did the voltmeter or the scan tool indicate an abnormal voltage or scan reading?	–	Go to*Step 5*	Go to*Step 6*

Step	Action	Value(s)	Yes	No
5	Replace the sensor in the affected circuit, if a Diagnostic Trouble Code (DTC) was stored for this circuit (except for the DTCs P0171 and P0172. Is the repair complete?	–	System OK	–
6	Does an intermittent Malfunction Indicator Lamp (MIL) or 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 MIL circuit or the DLC ”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. 2. Disconnect the Throttle Position Sensor. 3. Run the engine at idle until the MIL comes on. 4. Turn the ignition OFF. Is DTC P0122 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 Front Heated Oxygen Sensor (HO2S1) and the injector base pulse width with the scan tool. Does the scan tool display a steady low voltage (about 0 mv) for the HO2S1 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 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 Data Link Connector (DLC). 2. Check the Engine Coolant Temperature (ECT) sensor and the Intake Air Temperature (IAT) sensor using the scan tool. 3. Compare the coolant temperature and the IAT with the ambient temperature when the engine is cold. Do the ECT and the IAT readings differ from the ambient temperature by more than the value specified?	5˚F (3˚C)	Go to*Step 3*	Go to*Step 4*
3	1. Measure the resistance of the ECT and the IAT sensor. 2. Compare the resistance value to specifications using the Temperature Vs. Resistance tables for diagnostic trouble codes (DTCs) P0118 and P0113. 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 (TP) sensor voltage. Repair or replace as needed. 2. Check the TP sensor 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?	41–47 psi (284–325 kPa)	Go to*Step 8*	Go to*Step 29*
8	Check for water contamination in the fuel. Is fuel contaminated?	–	Go to*Step 9*	Go to*Step 10*
9	Replace the contaminated fuel. Is the repair complete?	–	System OK	–

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 at 68˚F (20˚C). The resistance will increase slightly at higher temperatures. Is the fuel injector resistance within the value specified?	11.6–12.4 Ω	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 powertrain control module (PCM)/engine 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 (CKP) sensor. 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	–

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 repair complete?	–	Go to*Step 27*	Go to*Step 28*
27	Check the Throttle Position (TP) sensor 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, making it feel 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 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 Data Link Connector (DLC). Does the Front Heated Oxygen Sensor (HO2S1) respond quickly to different throttle positions?	–	Go to*Step 4*	Go to*Step 3*
3	1. Check the HO2S1 sensor for silicone or other contaminants from fuel or use of improper Room Temperature Vulcanizing (RTV) sealant. 2. Replace the contaminated HO2S1 sensor. Is the repair complete?	–	System OK	–
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?	–20–25%	Go to*Step 7*	Go to*Step 5*
5	Is the long term fuel trim reading below the value specified?	–20%	Go to "Diagnostic Aids for DTC P0172"	Go to*Step 6*
6	Is the long term fuel trim reading above the value specified?	25%	Go to "Diagnostic Aids for DTC P0171"	–
7	Check the fuel system pressure while the condition exists. Is the fuel system pressure within specifications?	41–47 psi (284–325 kPa)	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 diagnosis. 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	–

Step	Action	Value(s)	Yes	No
12	1. Inspect the engine control module (ECM) grounds to make sure they are 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?	41–47 psi (284–325 kPa)	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 15*
13	Repair or replace any components as needed. Is the repair complete?	–	System OK	–

Step	Action	Value(s)	Yes	No
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*
15	Repair or replace any engine components as needed. Is the repair complete?	–	System OK	–
16	1. Check the engine control module (ECM) grounds for being clean, tight, and in their proper location. 2. Check the Exhaust Gas Recirculation (EGR) valve for being open or partially open all the time. 3. Check the Torque Converter Clutch (TCC) operation. 4. Check the 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	–

HESITATION, SAG, STUMBLE

Definition : Involves 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 (TP) sensor for binding or sticking. The TP sensor voltage should increase at a steady rate as the throttle is moved toward Wide Open Throttle (WOT). Is the problem found?	41–47 psi (284–325 kPa)	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 Evaporative (EVAP) Emission 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 engine 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 Ω	Go to*Step 10*	Go to*Step 9*
9	Replace any of the fuel injectors with 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*

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?	41–47 psi (284–325 kPa)	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 : This Involves 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?	3,000 Ω	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	–

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?	41–47 psi (284–325 kPa)	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 engine 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 Ω	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	–

Step	Action	Value(s)	Yes	No
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 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 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 LDLE, 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 Data Link Connector (DLC). 2. Monitor the Front Heated Oxygen Sensor (HO2S1) reading at different throttle positions. Does the HO2S sensor change quickly from rich to lean at the different throttle positions?	–	Go to*Step 5*	Go to*Step 3*
3	Check the HO2S1 sensor for contamination from fuel or improper use of Room Temperature Vulcanizing (RTV) sealant. Is the HO2S1 sensor contaminated?	–	Go to*Step 4*	Go to*Step 5*
4	Replace the contaminated HO2S 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 (TP) sensor voltage. 2. Check the TP sensor voltage reading with the throttle closed. Is the TP sensor voltage within the value specified?	0.4–0.8 v	Go to*Step 6*	Go to ”Diagnostic Aids for DTC P0123”
6	1. Check the Engine Coolant Temperature (ECT) sensor voltage reading using the scan tool. 2. Compare the ECT reading with the ambient temperature when the engine is cold. Does the ECT temperature reading differ from the ambient temperature by more than the value specified?	5˚F (3˚C)	Go to*Step 7*	Go to*Step 9*
7	Check for high resistance in the ECT sensor circuit or the sensor itself. Is the problem found?	–	Go to*Step 8*	Go to*Step 9*
8	Replace the ECT sensor 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	–

Step	Action	Value(s)	Yes	No
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?	–20–25%	Go to*Step 14*	Go to*Step 12*
12	Is the fuel trim reading below the value specified?	–20%	Go to ”Diagnostic Aids for DTC P0172”	Go to*Step 13*
13	Is the fuel trim reading above the value specified?	25%	Go to ”Diagnostic Aids for DTC P0171”	–
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 engine 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 Ω	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	–

Step	Action	Value(s)	Yes	No
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 ignitionwires for cracking, hardness, or improper connections. 4. Replace any ignition wires with a resistance over the value specified. Is the problem found?	3,000 Ω	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*
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 : A vehicle fails an emission test. The vehicle has an excessive rotten egg smell.

Important : 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 Data Link Connector (DLC). 2. Road test the vehicle. 3. Monitor the long term fuel trim memory. Is the long term fuel trim memory within the value specified?	–20–25%	Go to*Step 6*	Go to*Step 4*
4	Is the long term fuel trim memory below the value specified?	–20%	Go to ”Diagnostic Aids for DTC P0172”	Go to*Step 5*
5	Is the long term fuel trim memory above the value specified?	25%	Go to ”Diagnostic Aids for DTC P0171”	–
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*
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*

Step	Action	Value(s)	Yes	No
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 and the throttle plate and inside the engine. Remove with a top engine cleaner. 4. Check the Exhaust Gas Recirculation (EGR) valve to make sure it opens. 5. Check for proper Positive Crankcase Ventilation (PCV) operation. Are all checks and needed repairs complete?	–	System OK	–

DIESELING, RUN–ON

Definition : 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 : 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 diagnosis. 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 SYSTEM PRESSURE RELIEF

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.

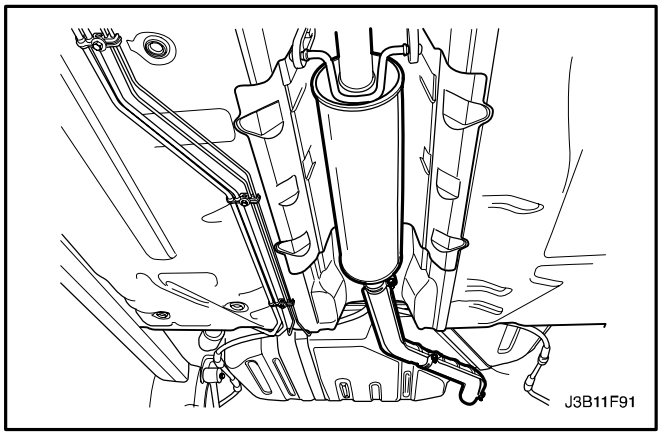
1. Remove the fuel cap.
2. Remove the fuel pump fuse Ef18 from the engine fuse block.
3. Start the engine and allow the engine to stall.
4. Crank the engine for an additional 10 seconds.

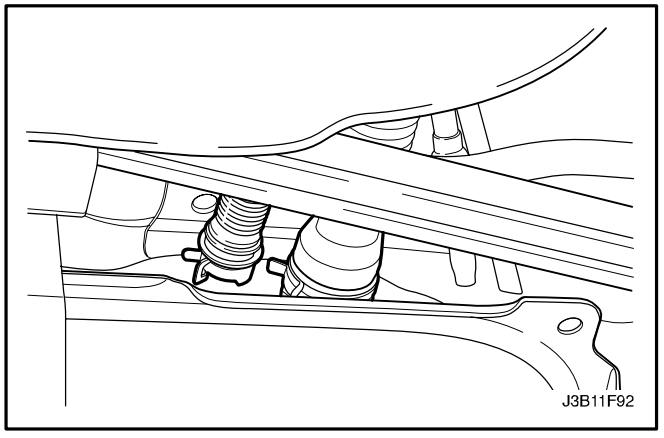
FUEL TANK

Removal Procedure

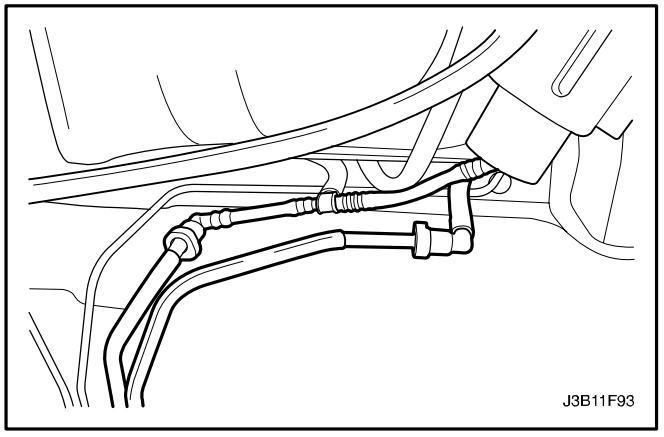
CAUTION : The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

1. Relieve the fuel pressure. Refer to ” Fuel System Pressure Relief ” in this section.
2. Disconnect the negative battery cable.
3. Drain the fuel tank.
4. Remove the front muffler. Refer to *Section 1G, Exhaust System*

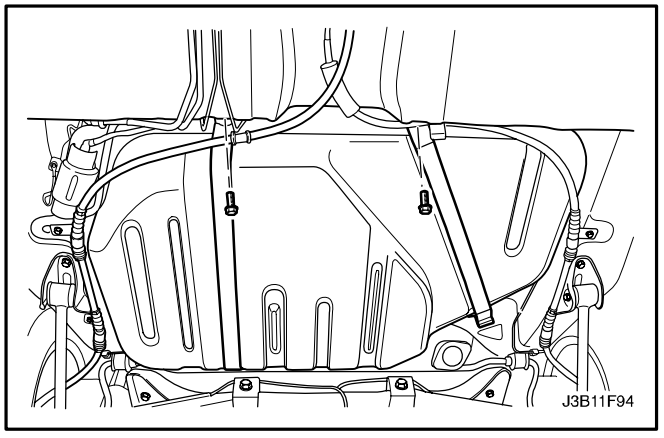




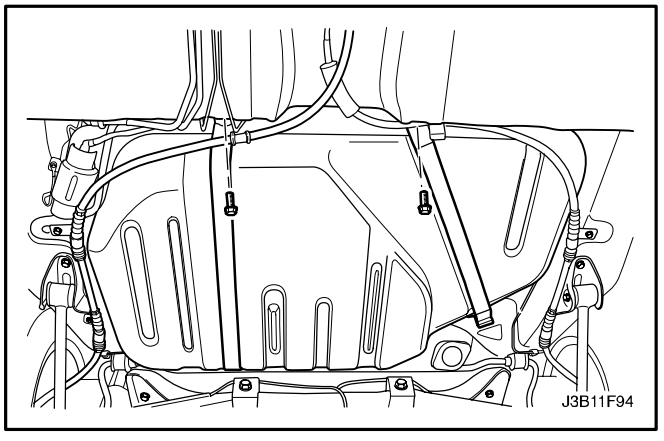
5. Remove the fuel tank filler tube clamp at the fuel tank.
6. Disconnect the fuel tank filler tube.
7. Disconnect the fuel vapor line near the fuel tank filler tube.
8. Disconnect the fuel pump harness connector.



9. Disconnect the fuel inlet line and the fuel return line near the right front of the fuel tank.
10. Remove the Fuel pump. Refer to ”Fuel Pump” in this section.



11. Remove the parking brake cables support brackets.
12. Support the fuel tank.
13. Remove the fuel tank strap retaining nuts.
14. Remove the fuel tank strap.
15. Carefully lower the fuel tank.
16. Remove the fuel tank.
17. Transfer any parts as needed.

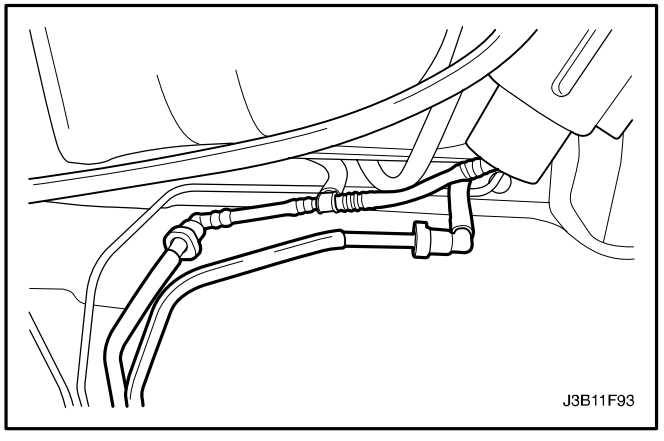


Installation Procedure

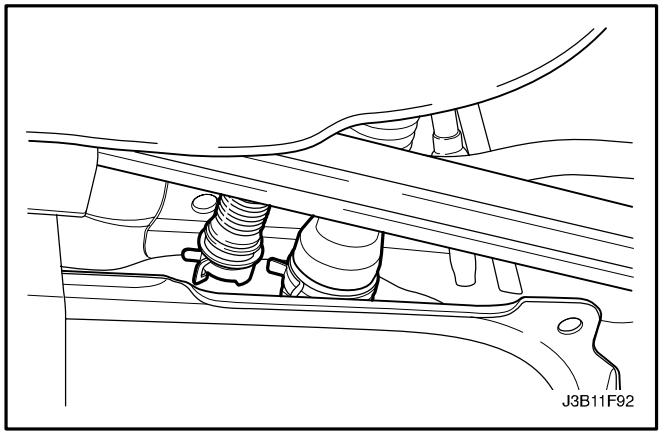
1. Raise the fuel tank into position.
2. Install the fuel tank straps.
3. Install the fuel tank strap retaining nuts.

   Tighten

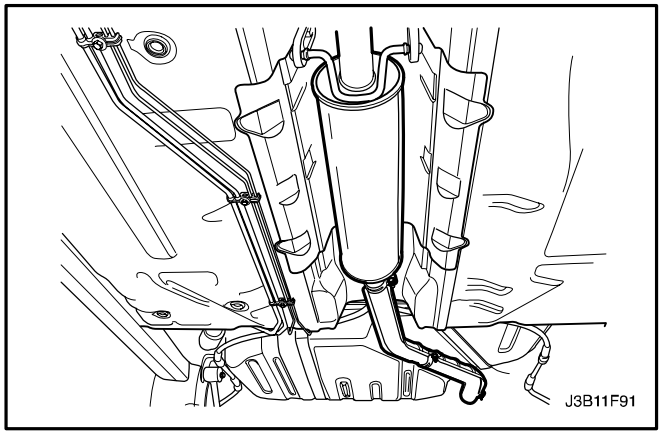
   Tighten the fuel tank strap retaining nuts to 20 N•m (15 lb–ft).
4. Install the parking brake cables support bracket.



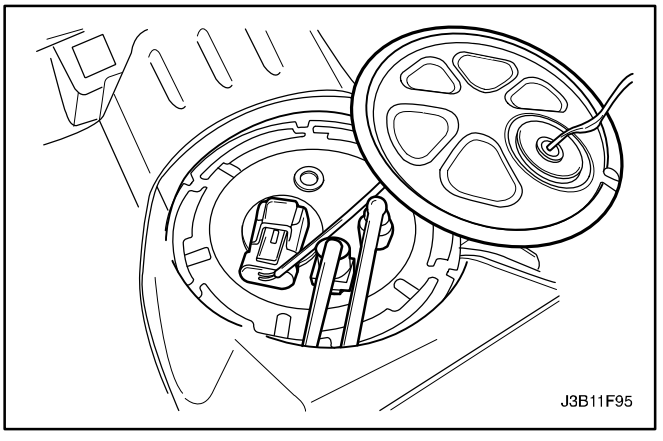
5. Install the fuel pump. Refer to ”Fuel Pump” in this section.
6. Connect the fuel outlet line and the fuel return line.



7. Connect the fuel pump harness connector.
8. Connect the fuel vapor line.
9. Connect the fuel tank filler tube.
10. Connect the fuel tank vent tube.
11. Install the fuel tank filler tube clamp at the fuel tank.



12. Install the front muffler. Refer to *Section 1G, Exhaust System*
13. Connect the negative battery cable.
14. Fill the fuel tank.
15. Perform a leak check of the fuel tank and the fuel line connections.

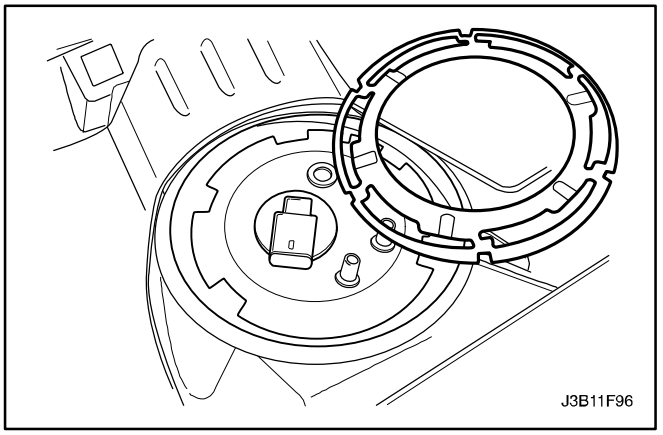


FUEL PUMP

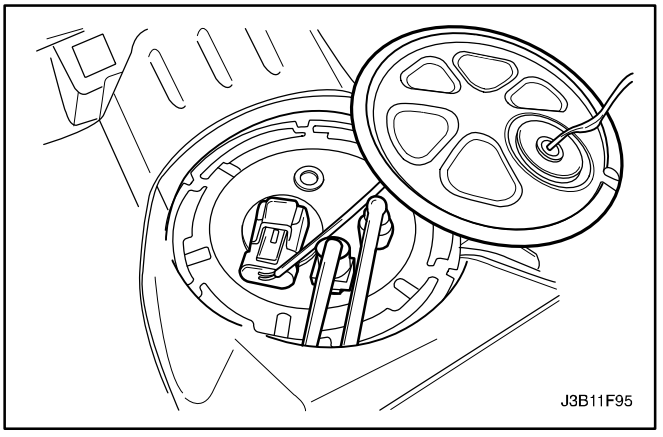
Removal Procedure

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.
   1) Remove the fuel cap.
   2) Remove 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.
2. Disconnect the negative battery cable.
3. Remove the rear seat. Refer to *Section 9H, Seats.*
4. Remove the fuel pump access cover.
5. Disconnect the electrical connector at the fuel pump assembly.
6. Disconnect the fuel outlet line.
7. Disconnect the fuel tank return line.

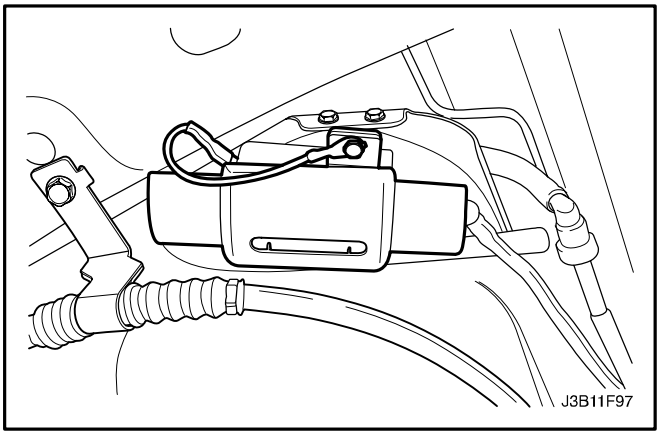


8. Turn the lock ring counterclockwise to clear the tank tabs.
9. Remove the fuel pump assembly from the tank.



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 fuel 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.*

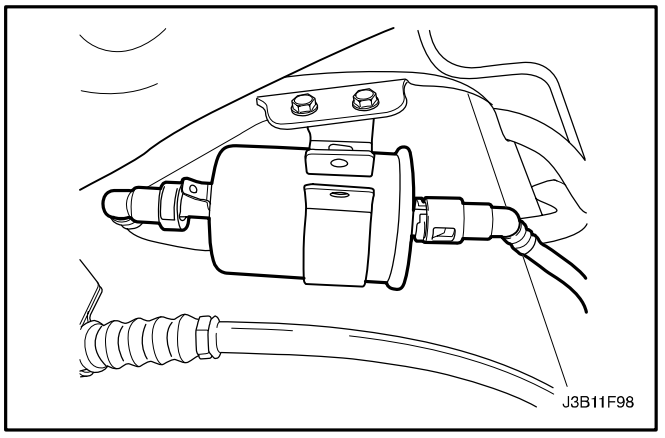


FUEL FILTER

Removal Procedure

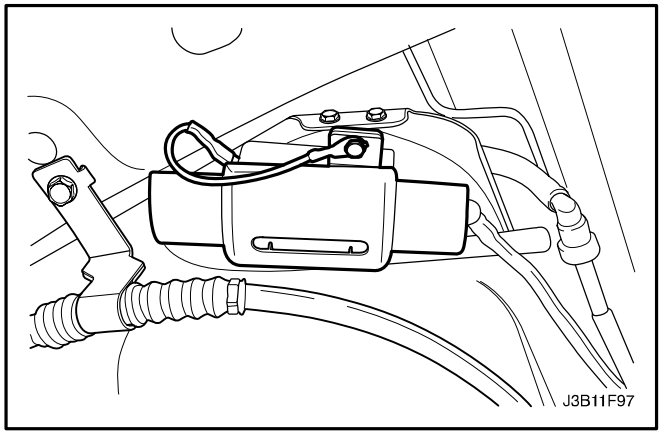
CAUTION : The fuel system is under pressure. To avoid fuel spillage and the risk of personal injury or fire, it is necessary to relieve the fuel system pressure before disconnecting the fuel lines.

1. Relieve the fuel system pressure. Refer to ” Fuel System Pressure Relief ” in this section.
2. Disconnect the negative battery cable.
3. Remove the fuel filter mounting bracket assembly bolt.
4. Remove the fuel filter cover.
5. Disconnect the inlet/outlet fuel lines by moving the line connector lock forward and pulling the hose off of the fuel filter tube.



Installation Procedure

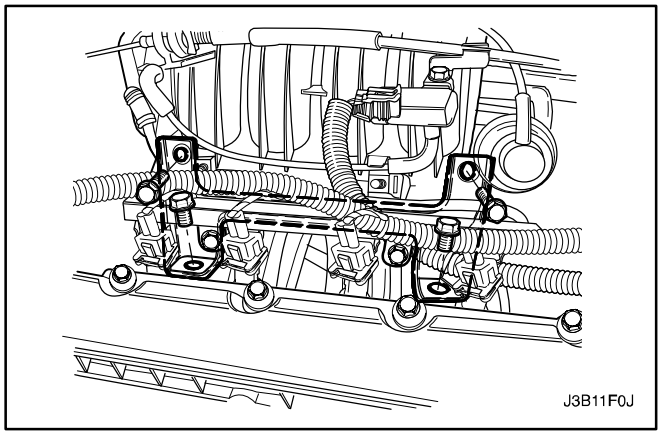
1. Install the new fuel filter into the retaining clamp. Note the flow direction.
2. Install the fuel filter.
3. Connect the inlet/outlet lines. Secure the lines with the connector lock.



4. Install the fuel filter cover.
5. Install the fuel filter mounting bracket assembly bolt with the fuel filter ground.

   Tighten

   Tighten the fuel filter mounting bracket assembly bolts to 4 N•m (35 lb–ft).
6. Connect the negative battery cable.
7. Perform a leak test of the fuel filter.

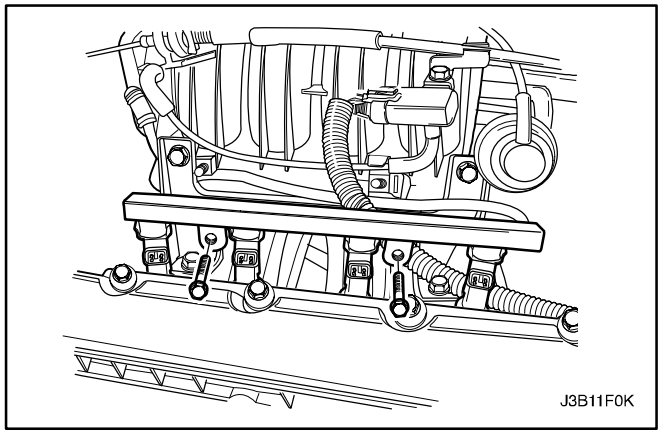


FUEL RAIL AND INJECTORS (1.4L/1.6L DOHC)

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. Remove the intake manifold bracket bolts.
4. Remove the intake manifold bracket.
5. Disconnect the fuel injector harness connectors.

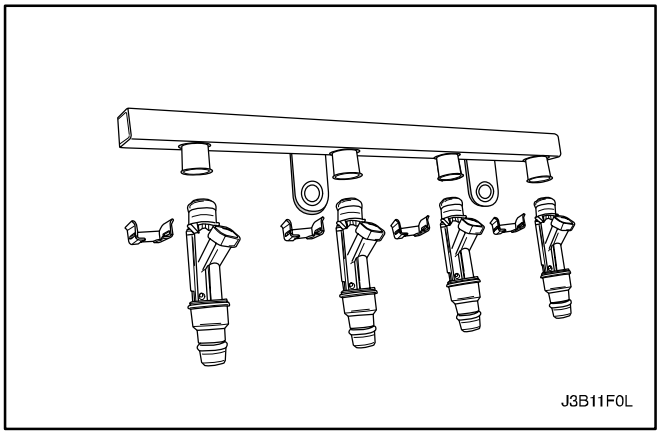


6. Remove the fuel feed line.
7. Remove the fuel rail mounting bolts.

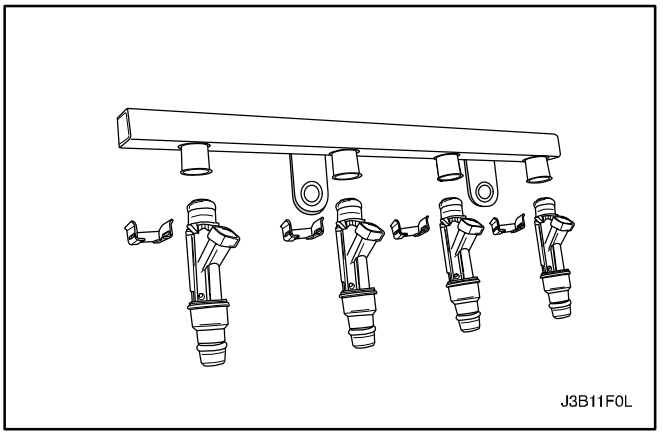
Notice : Before removal, the fuel rail assembly may be cleaned with a spray–type cleaner, following package instructions. Do not immerse the fuel rails in liquid cleaning solvent. Use care in removing the fuel rail assembly to prevent damage to the electrical connectors and the injector spray tips. Prevent dirt and other contaminants from entering open lines and passages. Fittings should be capped and holes plugged during service.

Important : If an injector becomes separated from the rail and remains in the cylinder head, replace the injector O–ring seals and the retaining clip.

8. Remove the fuel rail with the fuel injectors attached.



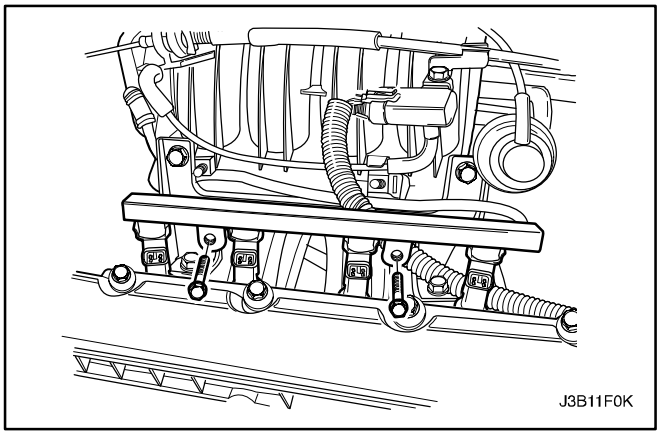
9. Remove the fuel injector retainer clips.
10. Remove the fuel injectors by pulling down and out.
11. Discard the fuel injector O–rings.



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.

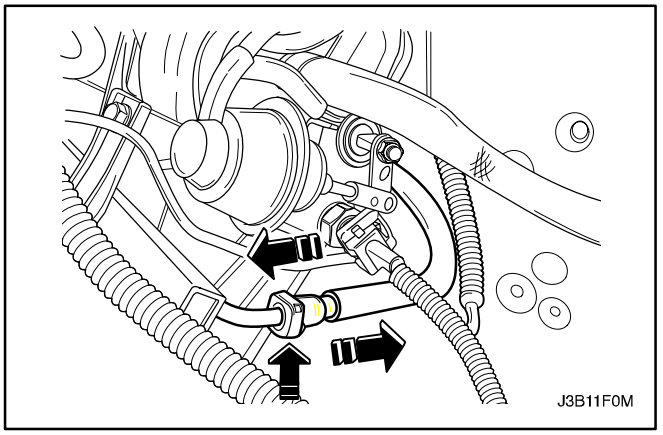
1. Lubricate the new fuel injector O–rings with engine oil. Install the new O–rings on the fuel injectors.
2. Install the fuel injectors into the fuel rail sockets with the fuel injector terminals facing outward.



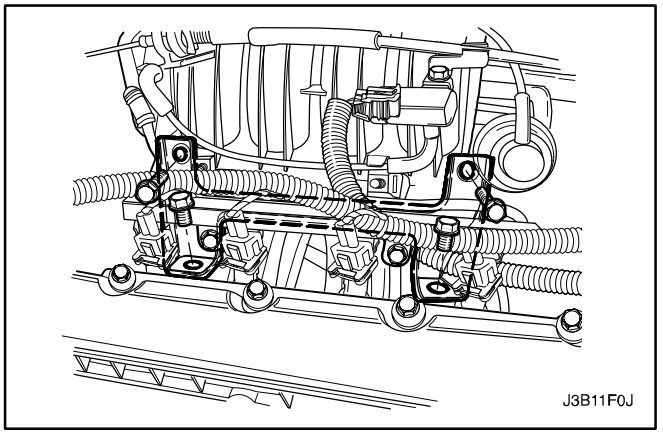
3. Install the fuel injector retainer clips onto the fuel injectors and the fuel rail ledge.
4. Make sure that the clip is parallel to the fuel injector harness connector.
5. Install the fuel rail assembly into the cylinder head.
6. Install the fuel rail mounting bolts.

Tighten

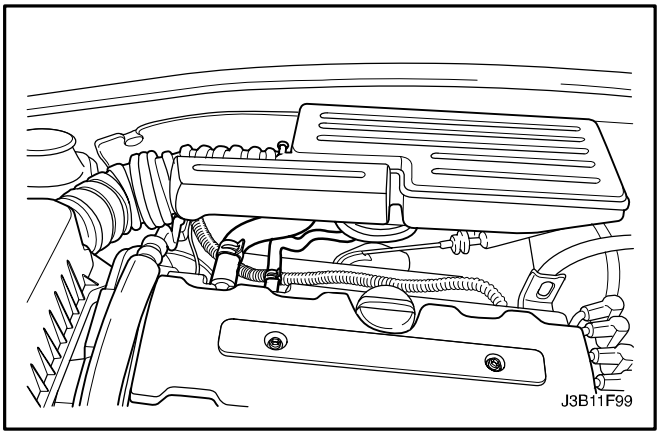
Tighten the fuel rail mounting bolts to 25 N•m (18 lb–ft).



7. Connect the fuel feed hose.



8. Connect the fuel injector harness connectors. Rotate each fuel injector as required to avoid stretching the wireing harness.
9. Install the intake manifold bracket with the bolts.
10. Connect the negative battery cable.
11. Perform a leak check of the fuel rail and fuel injectors.

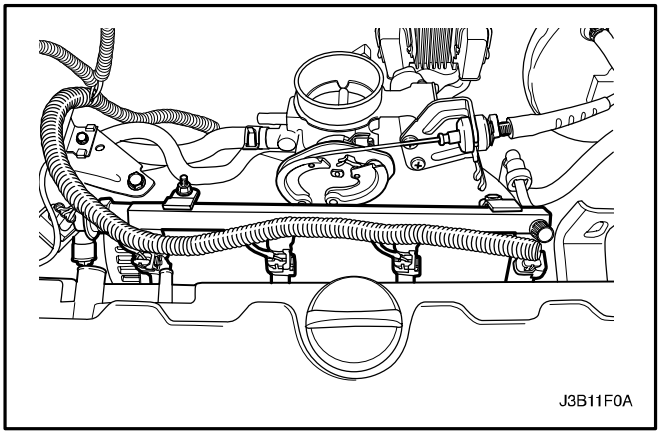


FUEL RAIL AND INJECTORS (1.8L DOHC)

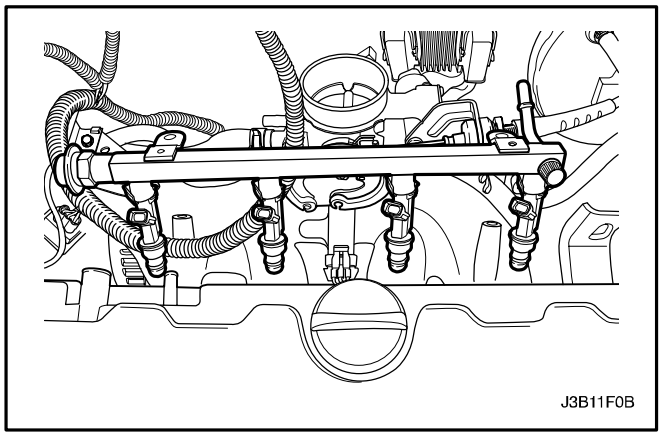
Removal Procedure

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 System Pressure Relief ” in this section.
2. Disconnect the negative battery cable.
3. Disconnect the intake air temperature (IAT) sensor connector.
4. Disconnect the breather hose from the valve cover.



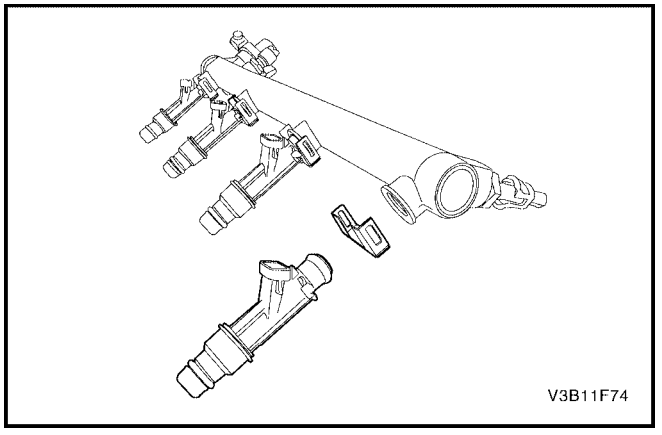
5. Disconnect the positive crankcase ventilation (PCV) hose from the valve cover.
6. Disconnect the throttle cables from the throttle body and the bracket.
7. Disconnect the fuel feed line at the fuel rail.
8. Remove the fuel rail retaining bolts.



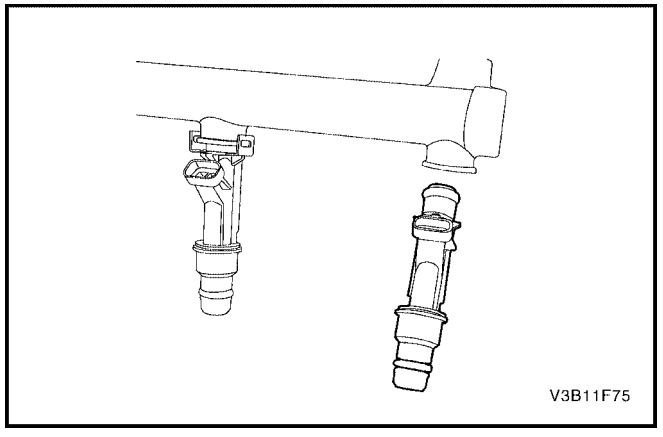
Notice : Before removal, the fuel rail assembly may be cleaned with a spray–type cleaner, following package instructions. Do not immerse the fuel rails in liquid cleaning solvent. Use care in removing the fuel rail assembly to prevent damage to the electrical connectors and the injector spray tips. Prevent 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.

9. Remove the fuel rail with the injectors attached.



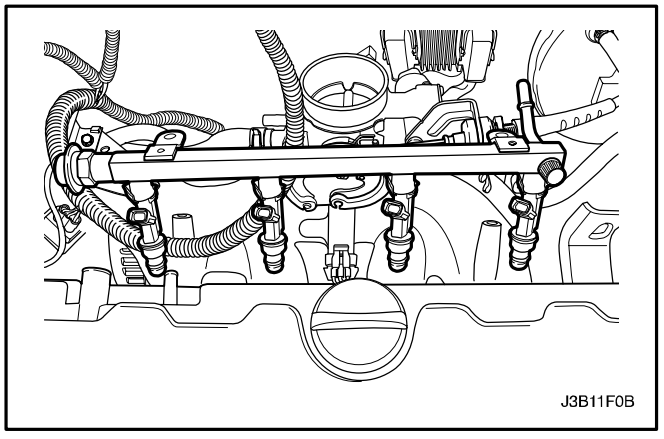
10. Remove the fuel injector retainer clips.
11. Remove the fuel injectors by pulling them down and out.
12. Discard the fuel injector O–rings.



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.

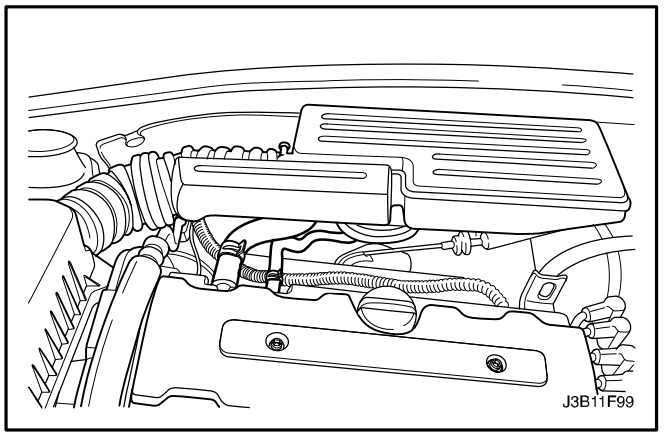
1. Lubricate the new fuel injector O–rings with engine oil. Install the new O–rings on the fuel injectors.
2. Install the fuel injectors into the fuel rail sockets with the fuel injector terminals facing outward.
3. Install the fuel injector retaining clips onto the fuel injector and the fuel rail ledge.
4. Make sure that the clips are parallel to the fuel injector harness connector.



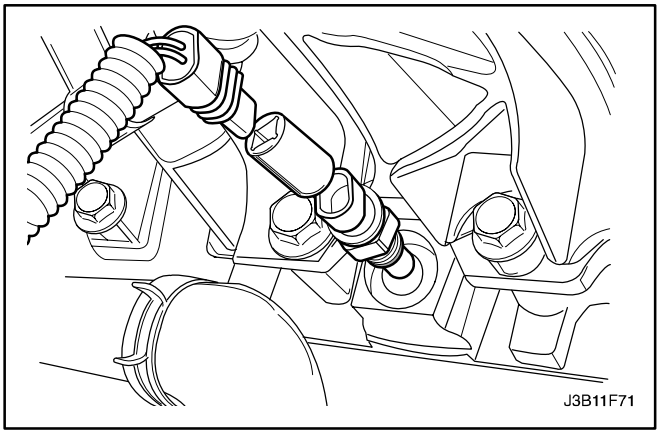
5. Install the fuel rail assembly into the cylinder head.
6. Install the fuel rail retaining bolts.

   Tighten

   Tighten the fuel rail retaining bolts to 25 N•m (18 lb–ft).
7. Connect the fuel feed line to the fuel rail.
8. Connect the fuel injector connectors. Rotate each fuel injector as required.



9. Connect the PCV hose to the valve cover.
10. Connect the breather hose to the valve cover.
11. Connect the IAT sensor connector.
12. Connect the negative battery cable.
13. Perform a leak check of the fuel rail and fuel injectors.



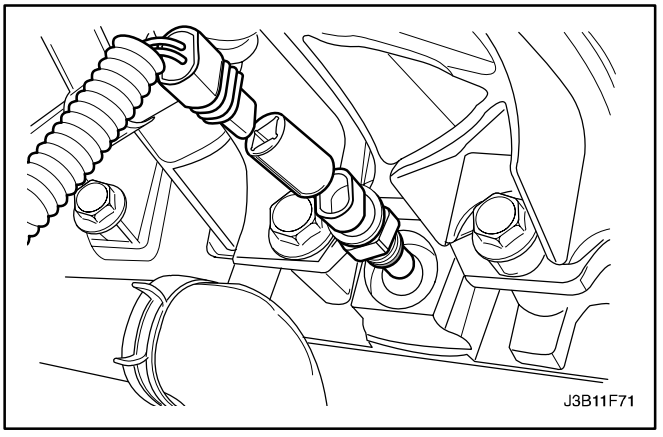
ENGINE COOLANT TEMPERATURE SENSOR (1.4L/1.6L DOHC)

Removal Procedure

1. Relieve the coolant system pressure.
2. Disconnect the negative battery cable.
3. Disconnect the engine coolant temperature (ECT) sensor connector.

Notice : Take care when handling the engine coolant temperature sensor. Damage to the sensor will affect the proper operation of the fuel injection system.

4. Remove the ECT sensor

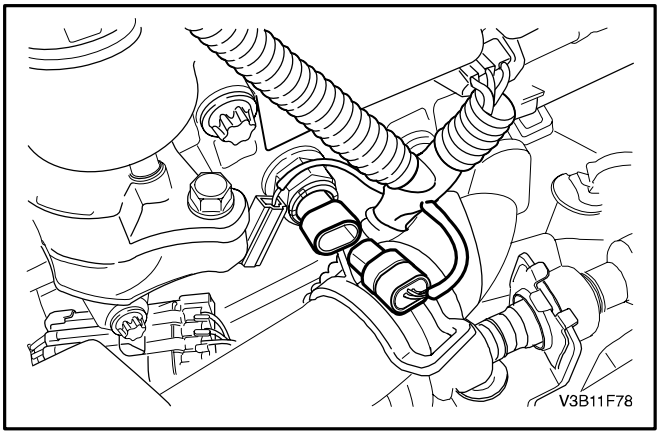


Installation Procedure

1. Install the engine coolant temperature (ECT) sensor.

   Tighten

   Tighten the engine coolant temperature (ECT) sensor to 17.5 N•m (13 lb–ft).
2. Connect the ECT sensor connector.
3. Connect the negative battery cable.



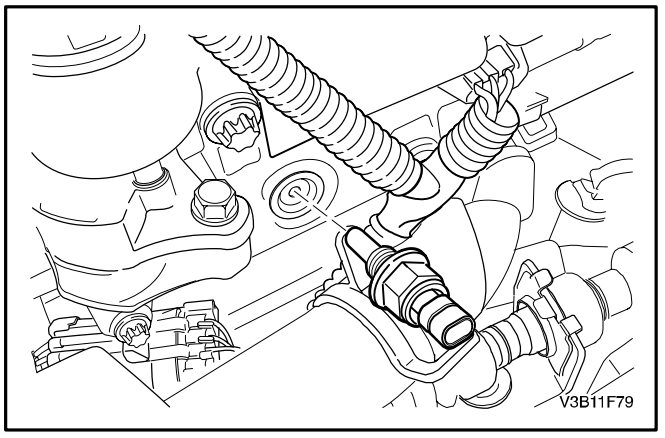
ENGINE COOLANT TEMPERATURE SENSOR (1.8L DOHC)

Removal Procedure

1. Relieve the coolant system pressure.
2. Disconnect the negative battery cable.
3. Disconnect the engine coolant temperature (ECT) sensor connector.

Notice : Take care when handling the engine coolant temperature sensor. Damage to the sensor will affect the proper operation of the fuel injection system.

4. Remove the ECT sensor from the electronic ignition (EI) system ignition coil adapter.

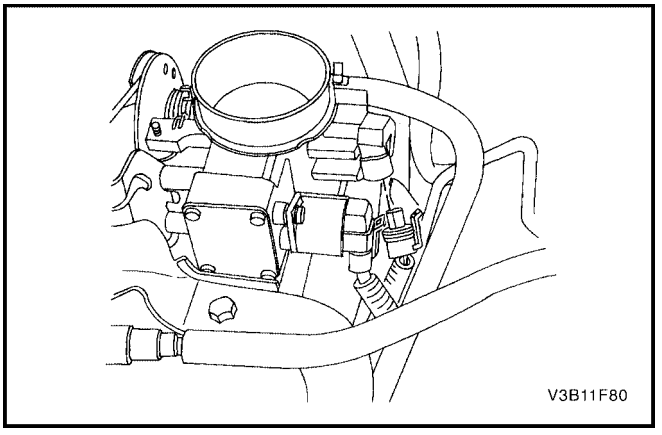


Installation Procedure

1. Coat the threads of the ECT sensor with sealer.
2. Install the ECT sensor into the EI system ignition coil adapter.

   Tighten

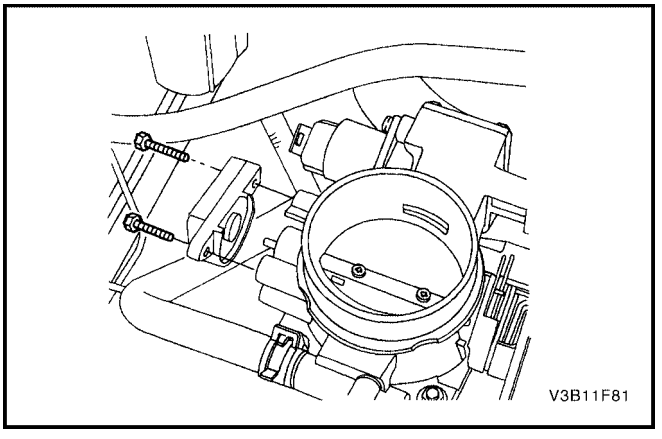
   Tighten the engine coolant temperature sensor to 20 N•m (15 lb–ft).
3. Connect the ECT sensor connector.
4. Fill the coolant system.
5. Connect the negative battery cable.



THROTTLE POSITION SENSOR (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the air intake tube and resonator.
3. Disconnect the throttle position (TP) sensor connector.
4. Remove the TP sensor retaining bolts and the TP sensor.

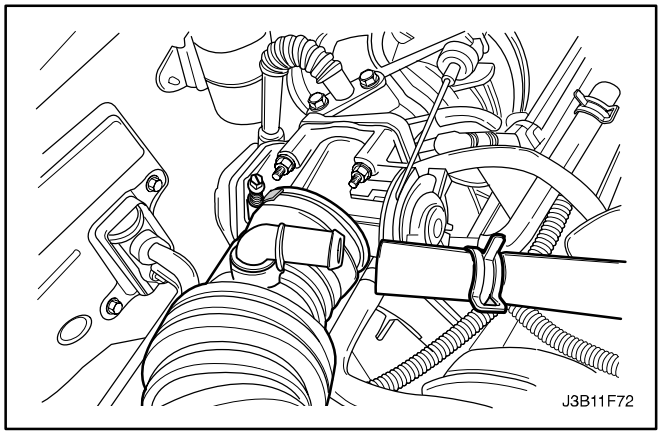


Installation Procedure

1. With the throttle valve closed, position the TP sensor on the throttle shaft. Align the TP sensor with the bolt holes.
2. Install the TP sensor retaining bolts.

   Tighten

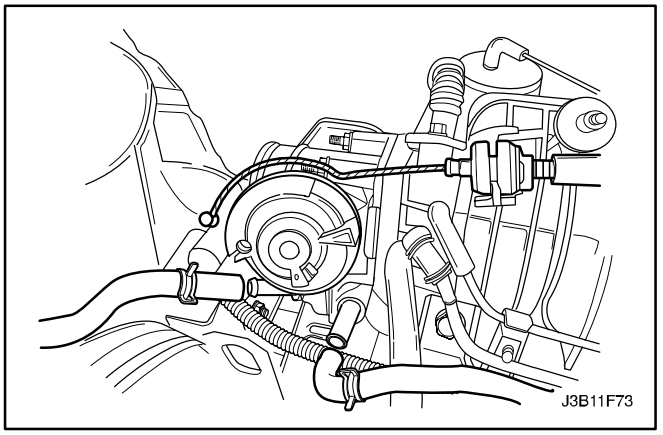
   Tighten the throttle position sensor retaining bolts to 2 N•m (18 lb–in).
3. Connect the TP sensor connector.
4. Install the air intake tube and resonator.
5. Connect the negative battery cable.



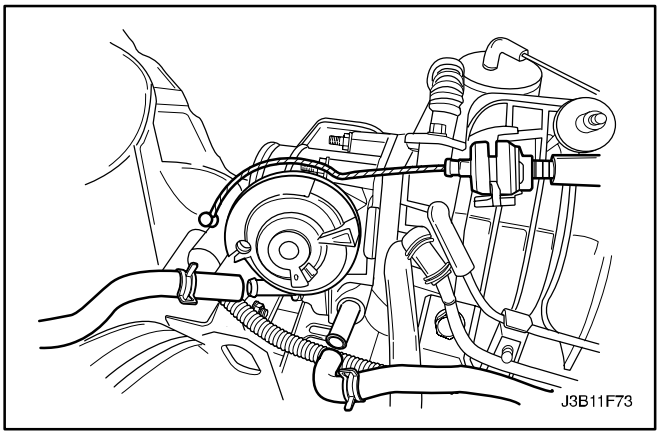
THROTTLE BODY (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the intake air tube.
3. Disconnect the breather hose.



4. Disconnect the coolant hose from the throttle body.
5. Disconnect the throttle cables by opening the release slot.
6. Disconnect the main throttle idle actuator (MTIA) electrical connector.
7. Remove the throttle body bolt and the nuts.
8. Remove the throttle body.

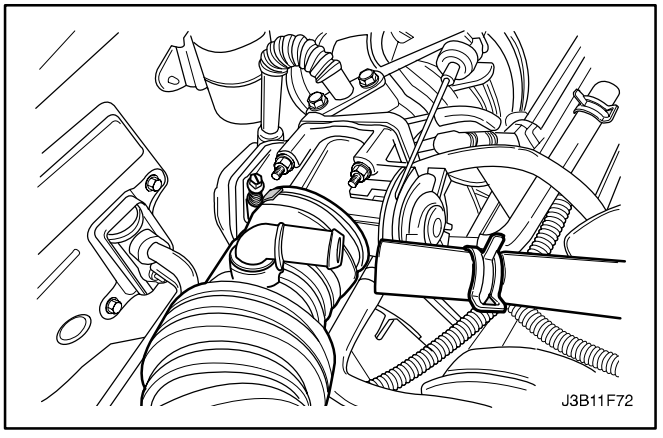


Installation Procedure

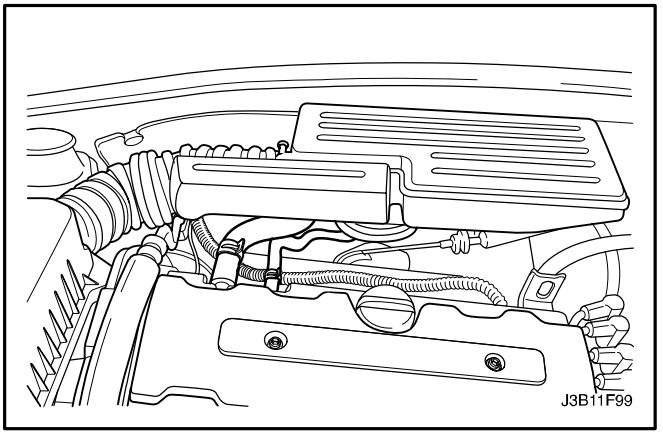
1. Install the throttle body assembly to the intake manifold.
2. Install the throttle body retaining nuts and the bolt.

   Tighten

   Tighten the throttle body retaining nuts and the bolt to 15 N•m (11 lb–ft).
3. Connect the throttle cable.
4. Connect the coolant hoses.



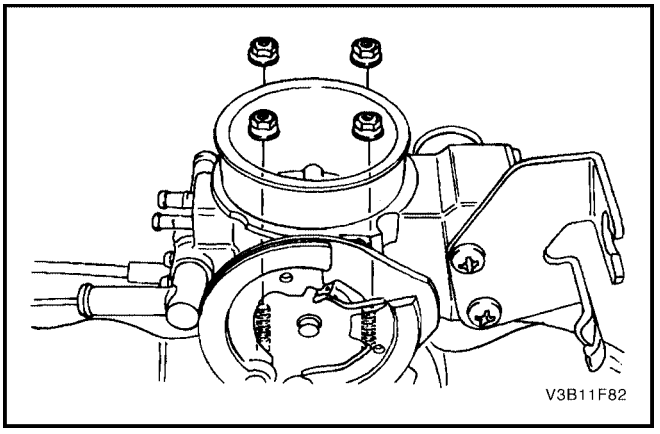
5. Connect the breather hose.
6. Install the intake air tube.
7. Connect the negative battery cable.



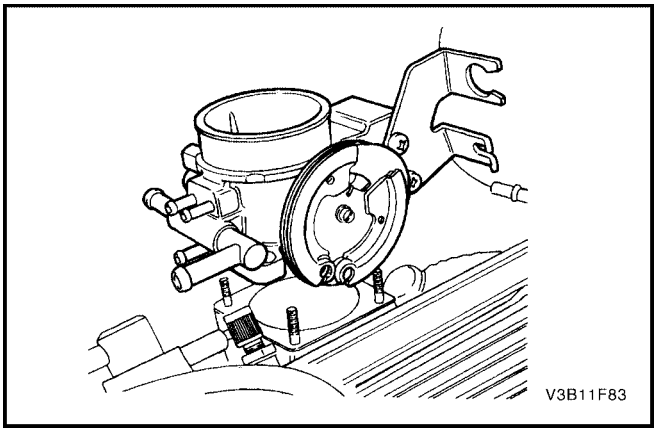
THROTTLE BODY (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature (IAT) sensor connector.
3. Disconnect the breather hose from the valve cover.
4. Remove the air intake tube.

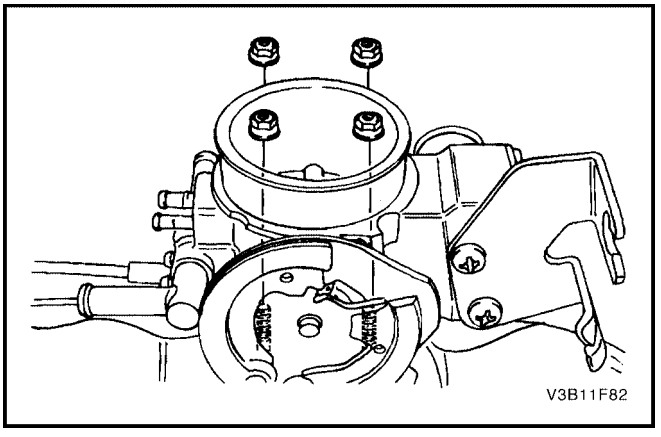


5. Disconnect the throttle cables by opening the throttle and moving the cable through the release slot.
6. Disconnect the vacuum hoses from the throttle body.
7. Disconnect the throttle position (TP) sensor and the idle air control valve connectors.
8. Disconnect the coolant hoses from the throttle body.
9. Remove the throttle body retaining nuts.



Notice : Cover the opening of the intake manifold after removing the throttle body assembly. This will prevent any objects or debris from entering the engine which may cause damage.

10. Remove the throttle body and discard the gasket.
11. Remove the TP sensor. Refer to ”Throttle Position Sensor ”in this section.
12. Remove the idle air control (IAC) valve. Refer to ”Idle Air Control Valve ”in this section.



Installation Procedure

Notice : Use care in cleaning old gasket material from machined aluminum surfaces. Sharp tools may damage sealing surfaces.

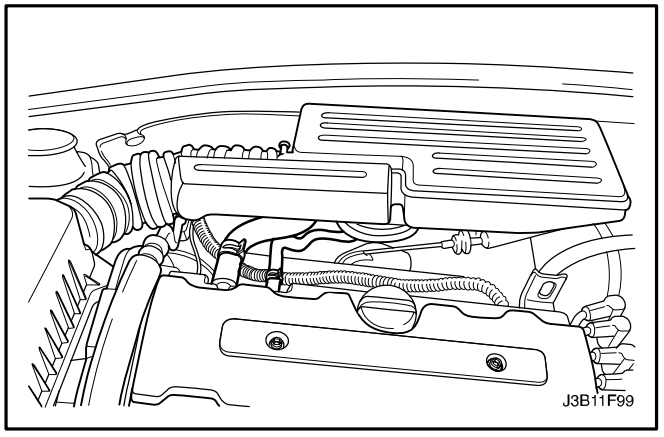
1. Clean the gasket mating surface on the intake manifold.

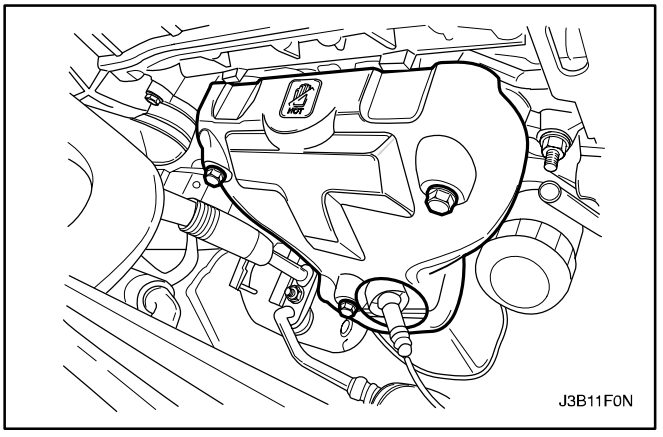
Notice : The throttle body may be cleaned in a cold immersion–type cleaner following disassembly. The TP sensor and the idle air control valve should not come in contact with any solvent or cleaner, as they may be damaged.

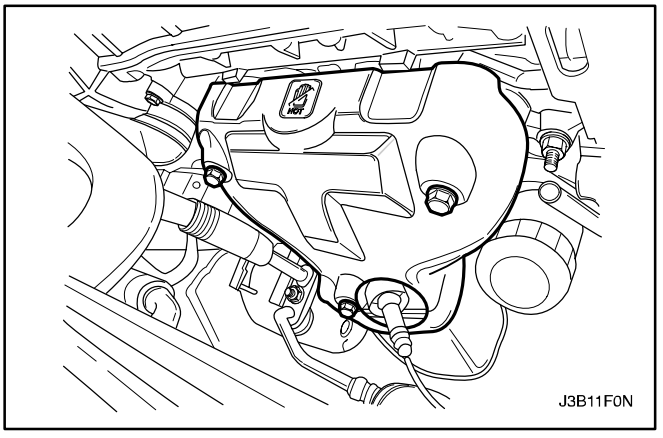
2. Clean the throttle body.
3. Install the TP sensor. Refer to ” Throttle Position Sensor ”in this section.
4. Install the IAC valve. Refer to ”Idle Air Control Valve ” in this section.
5. Install the throttle body assembly with a new gasket to the intake manifold.
6. Install the throttle body retaining nuts.

Tighten

Tighten the throttle body retaining nuts to 10 N•m (89 lb–in).







7. Connect the TP sensor connector and the IAC valve connector.
8. Connect the coolant hoses to the throttle body.
9. Connect the vacuum hoses to the throttle body.

Important : Make sure the throttle/cruise control cables do not hold the throttle open. With the engine off, check to see that the accelerator pedal is free.

10. Connect the throttle cable.
11. Install the air intake tube.
12. Connect the breather hose to the valve cover.
13. Connect the IAT sensor connector.
14. Connect the negative battery cable.
15. Fill the cooling system.

FRONT HEATED OXYGEN SENSOR (HO2S1) (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.

Notice : The oxygen sensor uses a permanently attached pigtail and connector. This pigtail should not be removed from the oxygen sensor. Damage or removal of the pigtail or the connector could affect proper operation of the oxygen sensor. Take care when handling the oxygen sensor. Do not drop the oxygen sensor.

2. Disconnect the front heated oxygen sensor (HO2S1) connector.

Notice : The oxygen sensor may be difficult to remove when engine temperature is below 48˚C (120˚F). Excessive force may damage threads in the exhaust manifold.

3. Carefully remove the HO2S1 from the exhaust manifold.

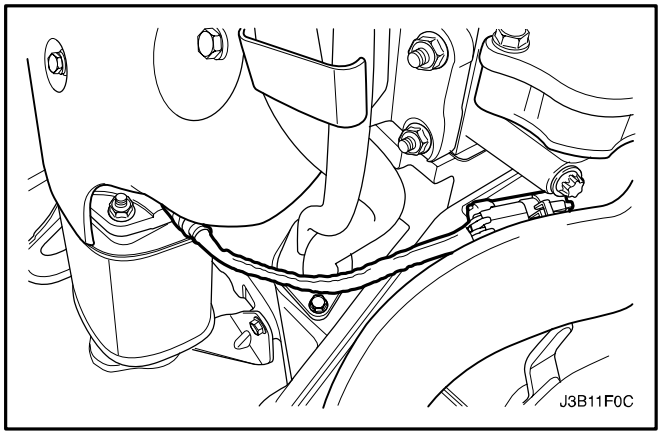
Installation Procedure

Important : A special anti–seize compound is used on the oxygen 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 HO2S1 with an anti–seize compound, if needed.
2. Install the HO2S1 into the exhaust manifold.

   ### Tighten

   Tighten the oxygen sensor to 42 N•m (31 lb–ft).
3. Connect the HO2S1 connector.
4. Connect the negative battery cable.



FRONT HEATED OXYGEN SENSOR (HO2S1) (1.8L DOHC)

Removal Procedure

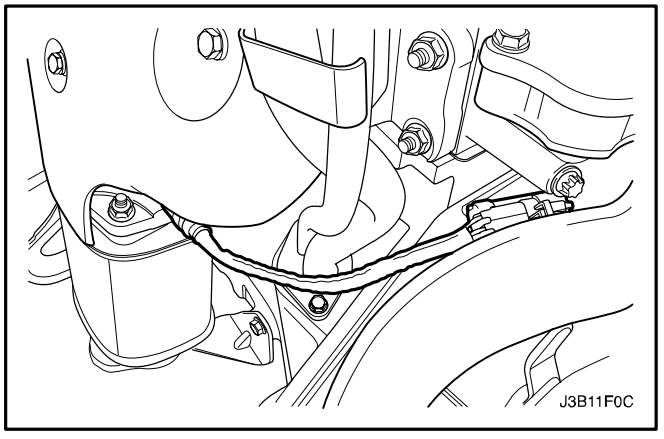
1. Disconnect the negative battery cable.

Notice : The oxygen sensor (O2S) uses a permanently attached pigtail and connector. This pigtail should not be removed from the O2S. Damage or removal of the pigtail or the connector could affect proper operation of the O2S. Take care when handling the O2S. Do not drop the O2S.

2. Disconnect the HO2S1 connector.

Notice : The oxygen sensor may be difficult to remove when engine temperature is below 118˚F (48˚C). Excessive force may damage threads in the exhaust manifold.

3. Carefully remove the HO2S1 from the exhaust manifold.



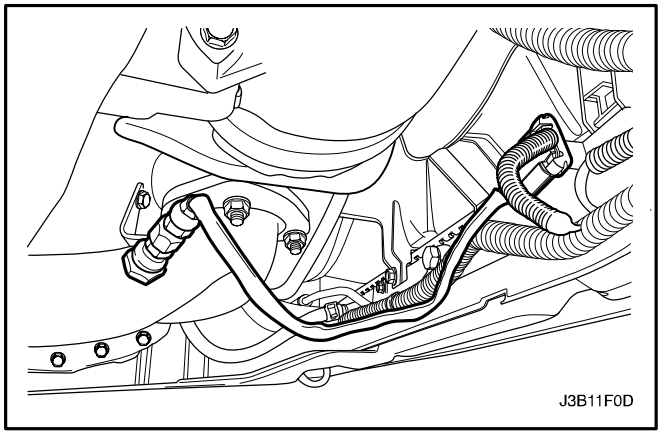
Installation Procedure

Important : A special anti–seize compound is used on the oxygen 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 serviced sensors will already have the compound applied to the threads. If a sensor is removed from any engine and is to be reinstalled, the threads must have an anti–seize compound applied before reinstallation.

1. Coat the threads of the HO2S1 with an anti–seize compound, if needed.
2. Install the HO2S1 into the exhaust manifold.

   ### Tighten

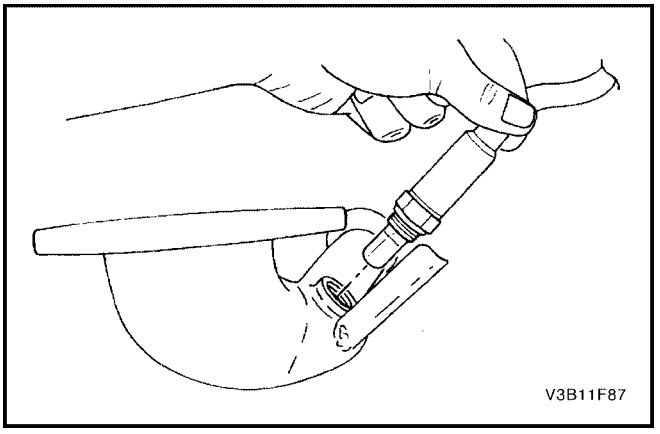
   Tighten the oxygen sensor to 42 N•m (31 lb–ft).
3. Connect the HO2S1 connector.
4. Connect the negative battery cable.



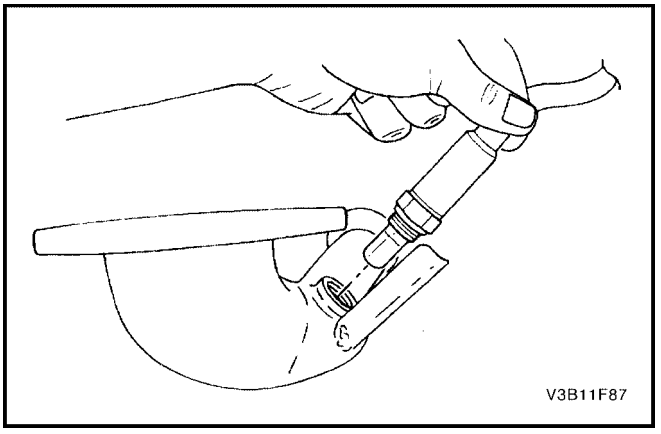
REAR HEATED OXYGEN SENSOR (HO2S2)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the electrical connector.

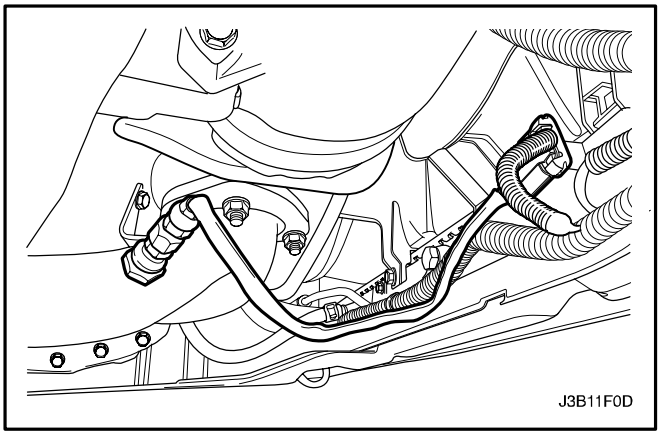


3. Remove the heated oxygen sensor.

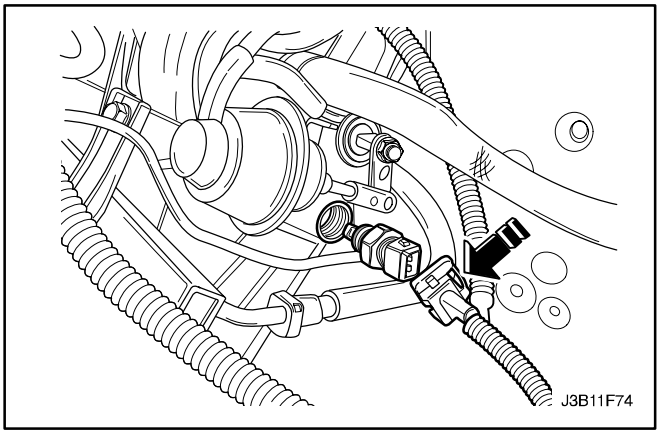


Installation Procedure

1. Install the rear heated oxygen sensor.
   Tighten
   Tighten the heated oxygen sensor to 42 N•m (31 lb–ft).



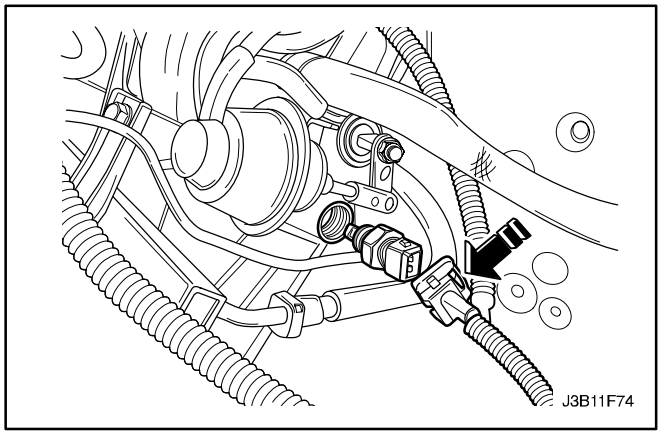
2. Connect the electrical connector.
3. Connect the negative battery cable.



INTAKE AIR TEMPERATURE SENSOR (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature (IAT) sensor connector.
3. Remove the IAT sensor.

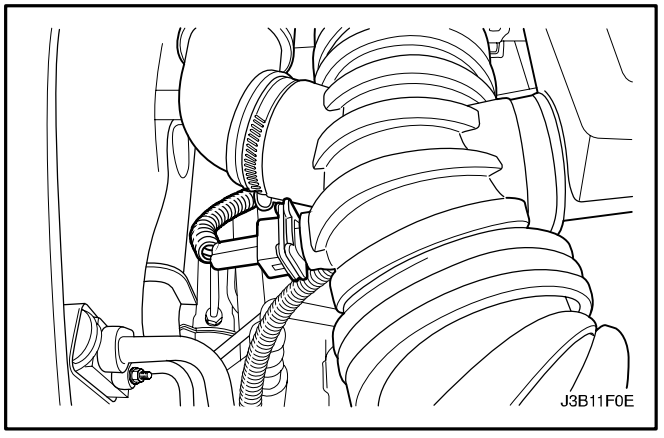


Installation Procedure

1. Install the IAT sensor.

   Tighten

   Tighten the IAT sensor to 22 N•m (16 lb–ft).
2. Connect the IAT sensor connector.
3. Connect the negative battery cable.



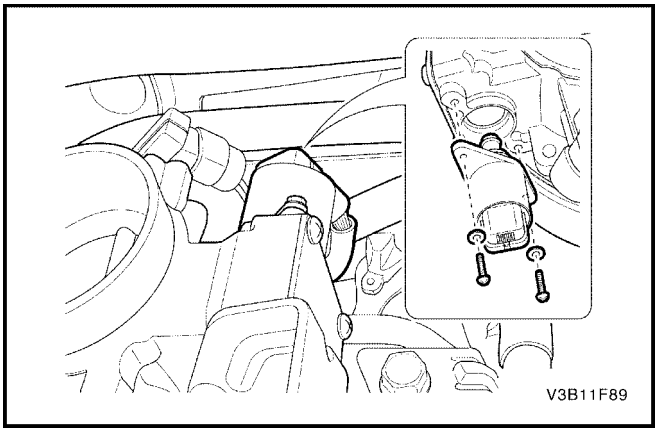
INTAKE AIR TEMPERATURE SENSOR (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the intake air temperature (IAT) sensor connector.
3. Remove the IAT sensor by pulling it out of the air intake tube.

Installation Procedure

1. Install the IAT sensor into the air intake tube.
2. Connect the IAT connector.
3. Connect the negative battery cable.



IDLE AIR CONTROL VALVE (1.8L DOHC)

Removal Procedure

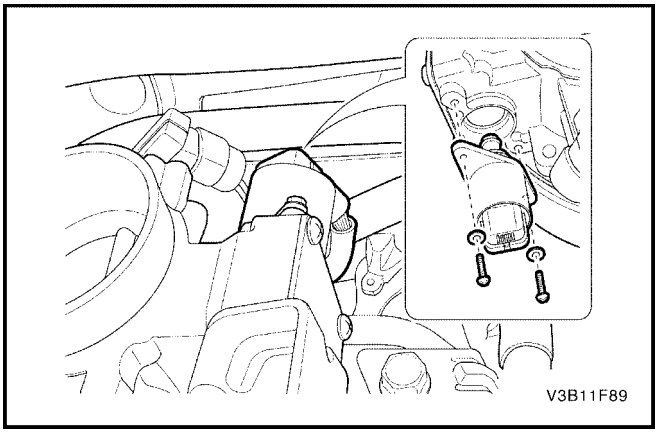
1. Disconnect the negative battery cable.
2. Remove the air intake resonator.
3. Disconnect the idle air control (IAC) valve connector.
4. Remove the IAC valve retaining bolts.

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.

5. Remove the IAC valve.

Notice : Do not use methyl ethyl ketone because it can damage the parts.

6. Clean the IAC valve O–ring seal area, the pintle valve seat, and the air passage with a suitable fuel system cleaner.



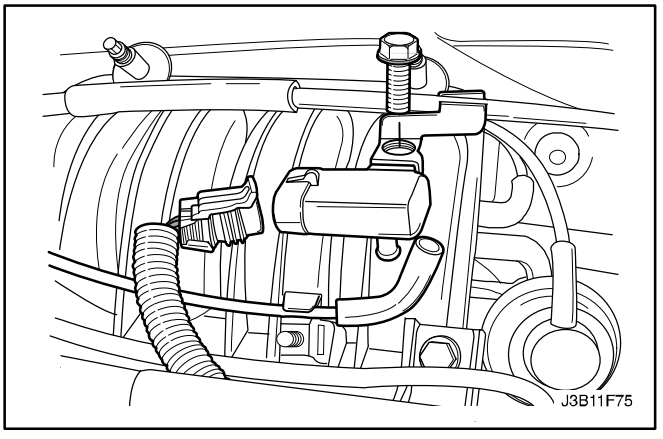
Installation Procedure

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 1.1 inches (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 1.1–inch (28–mm) setting is to prevent the IAC pintle from bottoming out on the pintle seat. This 1.1–inch (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.
3. Install the IAC valve retaining bolts.

   Tighten

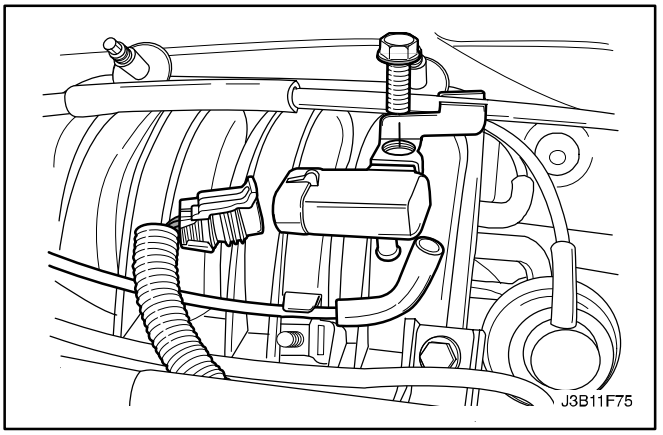
   Tighten the idle air control valve retaining bolts to 3 N•m (27 lb–in).
4. Connect the IAC valve connector.
5. Install the air intake resonator.
6. Connect the negative battery cable.
7. Start the engine and check for the proper idle speed.



MANIFOLD ABSOLUTE PRESSURE SENSOR (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the manifold Absolute pressure (MAP) sensor electrical connector.
3. Disconnect the MAP sensor vacuum hose.
4. Remove the MAP sensor bolt.
5. Remove the MAP sensor.

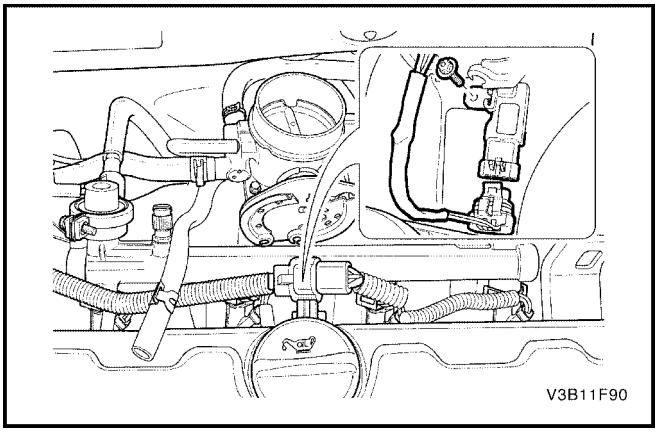


Installation Procedure

1. Install the manifold absolute pressure (MAP) sensor with the bolt.

   Tighten

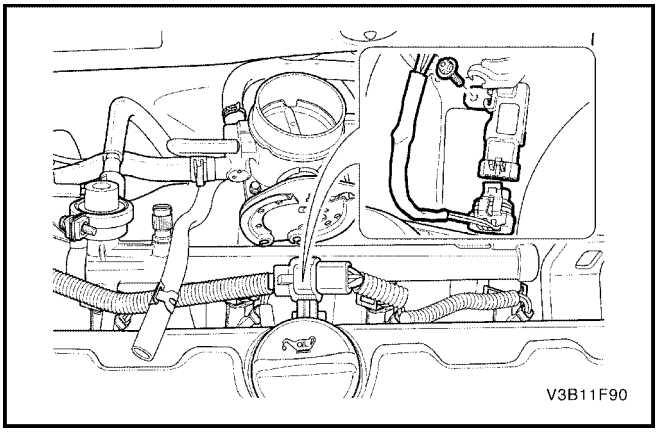
   Tighten the MAP sensor bolt to 8 N•m (71 lb–in).
2. Connect the MAP sensor vacuum hose.
3. Connect the MAP sensor electrical connector.
4. Connect the negative battery cable.



MANIFOLD ABSOLUTE PRESSURE SENSOR (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the fuel rail. Refer to"Fuel Rail and Injectors" in this section.
3. Disconnect the manifold absolute pressure (MAP) sensor connector from the MAP sensor.
4. Remove the MAP sensor retaining bolt.
5. Remove the MAP sensor from the intake manifold.

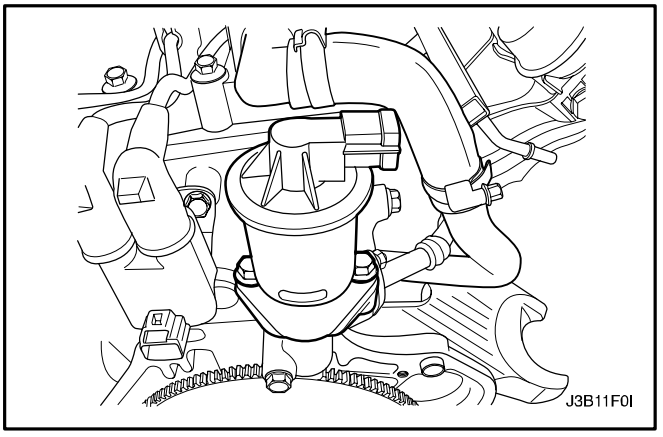


Installation Procedure

1. Connect the MAP sensor connector to the MAP sensor.
2. Install the MAP sensor into the intake manifold.
3. Install the MAP sensor retaining bolt.

   Tighten

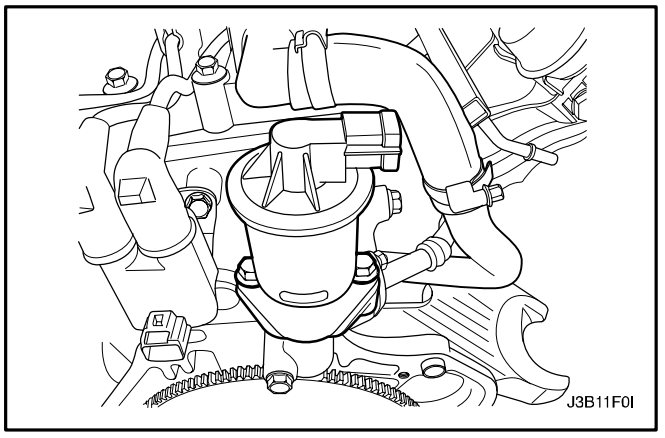
   Tighten the MAP sensor retaining bolt to 4 N•m (35 lb–in).
4. Connect the fuel rail. Refer to "Fuel Rail and Injectors" in this section.
5. Connect the negative battery cable.



EXHAUST GAS RECIRCULATION VALVE (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the electrical exhaust gas recirculation valve electrical connector.
3. Remove the EEGR valve retaining bolts.
4. Remove the EEGR valve.

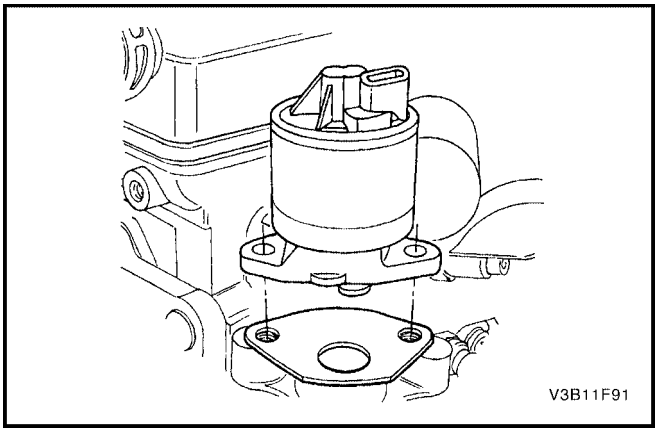


Installation Procedure

1. Install the EEGR valve with the bolts.

   Tighten

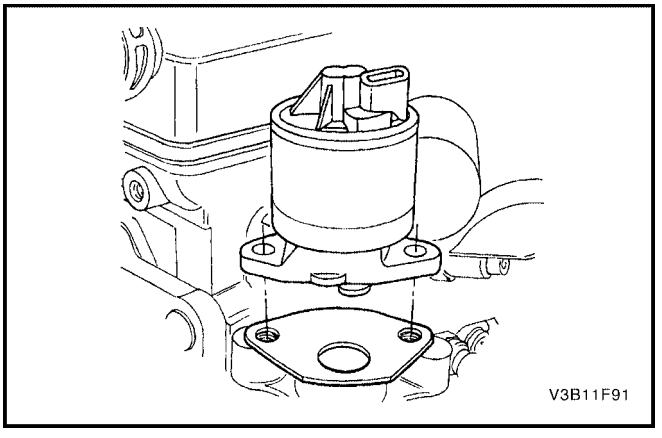
   Tighten the electrical exhaust gas recirculation valve retaining bolts to 30 N•m (22 lb–ft).
2. Connect the EEGR valve electrical connector.
3. Connect the negative battery cable.



EXHAUST GAS RECIRCULATION VALVE (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the vacuum hose from the exhaust gas recirculation (EGR) valve.
3. Remove the EGR valve retaining bolts.
4. Remove the EGR valve from the electronic ignition (EI) system ignition coil adapter.

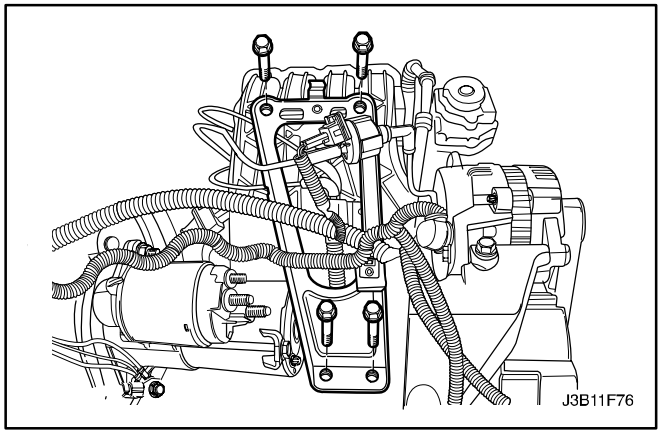


Installation Procedure

1. Clean the EI system ignition coil adapter mating surface.
2. Install a new EGR valve gasket.
3. Install the EGR valve with the bolts.

   Tighten

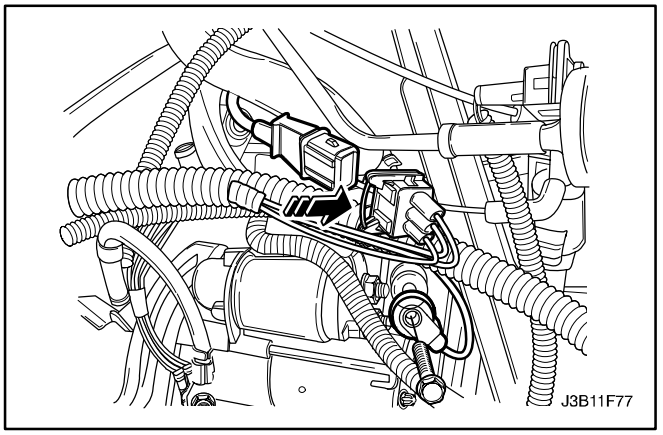
   Tighten the exhaust gas recirculation valve retaining bolts to 30 N•m (22 lb–ft).
4. Connect the vacuum hose to the EGR valve.
5. Connect the negative battery cable.



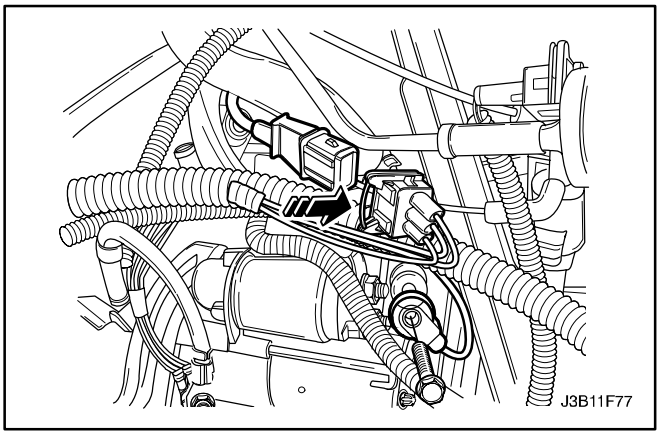
KNOCK SENSOR (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the intake manifold support bracket bolts.
3. Remove the intake manifold support bracket.

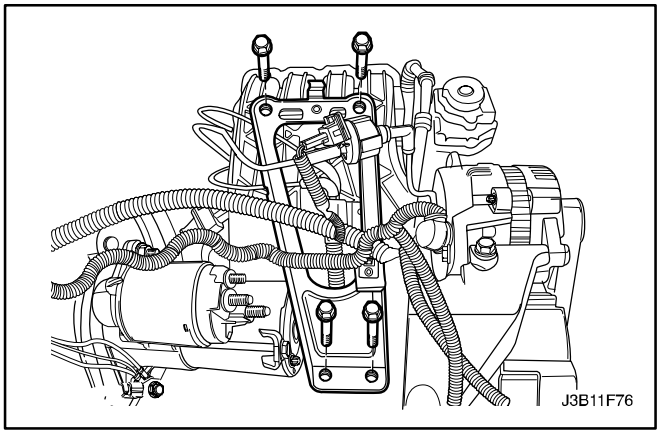


4. Disconnect the knock sensor electrical connector.
5. Remove the knock sensor bolt.
6. Remove the knock sensor.

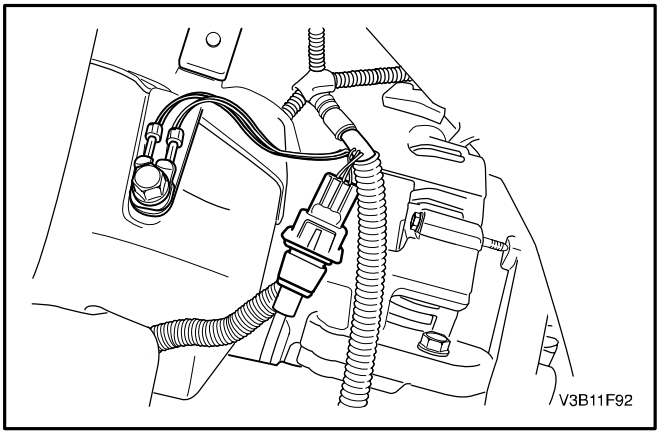


Installation Procedure

1. Install the knock sensor with the bolt.
   Tighten
   Tighten the knock sensor bolt to 20 N•m (15 lb–ft).
2. Connect the knock sensor electrical connector.



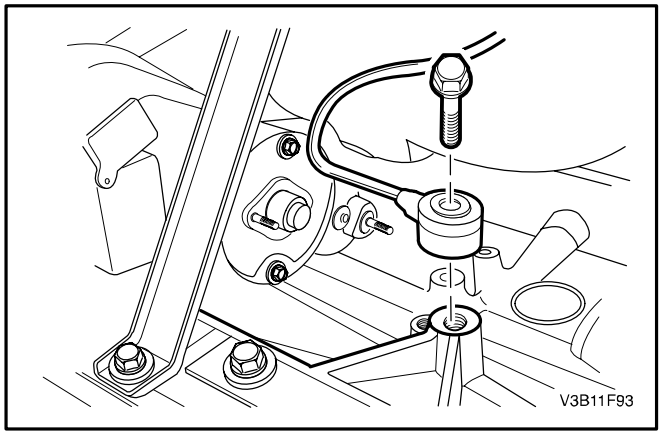
3. Install the intake manifold support bracket with the bolts.
   Tighten
   Tighten the intake manifold support bracket upper bolts to 25 N•m (18 lb–ft).
   Tighten the intake manifold support bracket lower bolts to 45 N•m (33 lb–ft).
4. Connect the negative battery cable.



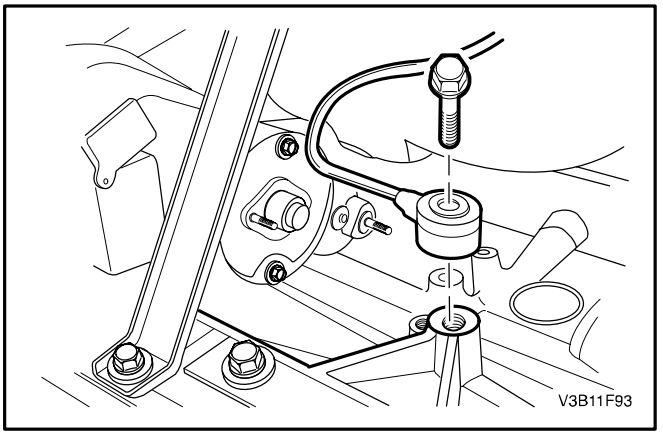
KNOCK SENSOR (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Raise and suitably support the vehicle.
3. Disconnect electrical connector at the knock sensor.

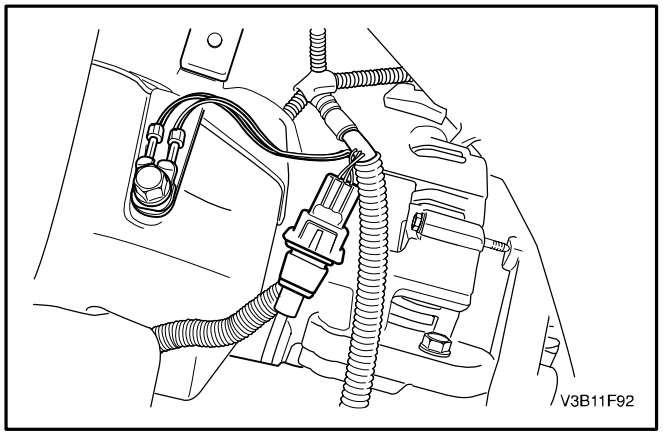


4. Remove the bolt and the knock sensor.

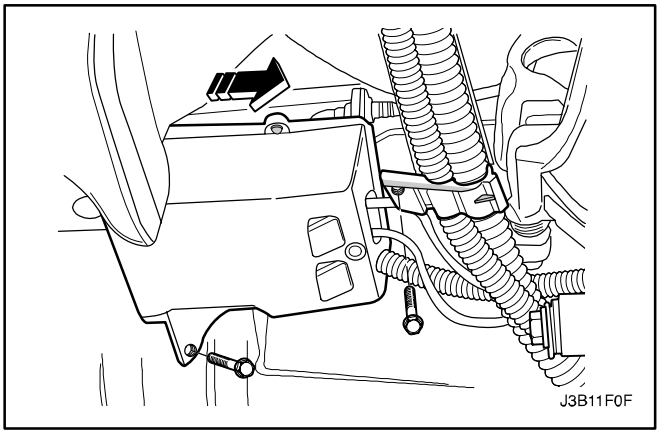


Installation Procedure

1. Install the knock sensor with the bolt.
   Tighten
   Tighten the knock sensor bolt to 20 N•m (15 lb–ft).



2. Connect the electrical connector at the knock sensor.
3. Lower the vehicle.
4. Connect the negative battery cable.

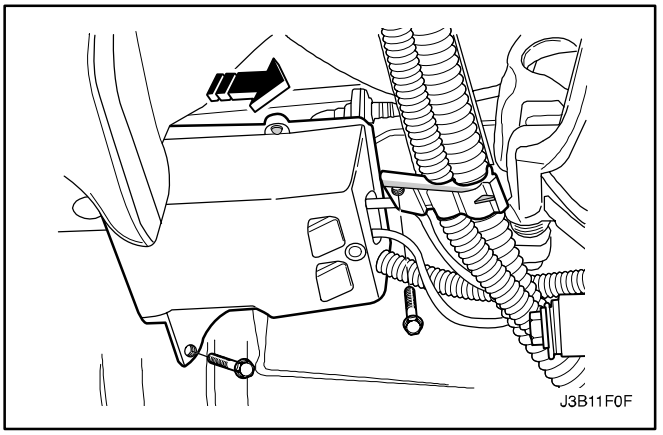


EVAPORATIVE EMISSION CANISTER

Removal Procedure

CAUTION : Canister and vacuum hoses contain fuel vapors. Do not smoke in the area or permit an open flame.

1. Remove the bolt that secures the canister flange to the vehicle.
2. Slide the canister out of the track holder.
3. Disconnect the canister fuel vapor hoses.
4. Remove the canister cover.
5. Remove the canister.

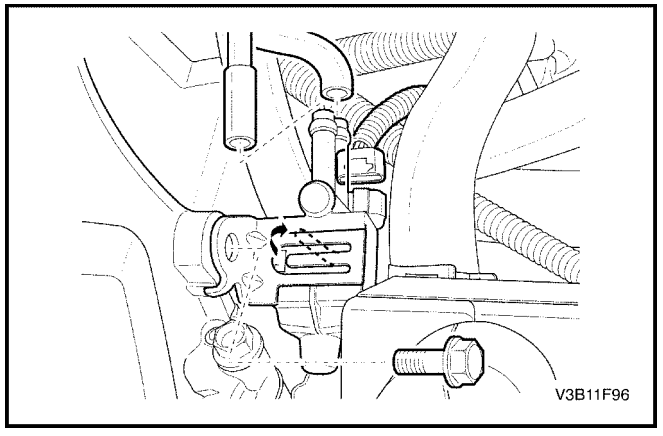


Installation Procedure

1. Insert the canister into the track and slide it into position.
2. Connect the canister fuel vapor hoses.

   Tighten

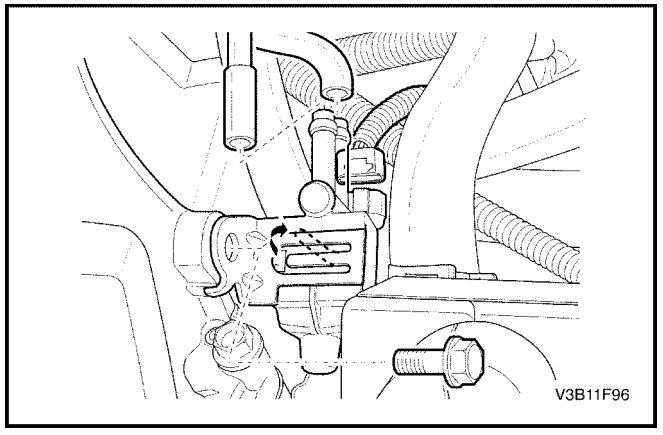
   Tighten the evaporative emission canister flange bolt to 4 N•m (35 lb–in).
3. Install the canister flange bolt.



EVAPORATIVE EMISSION CANISTER PURGE SOLENOID VALVE

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the evaporative (EVAP) emission canister purge solenoid connector.
3. Disconnect the vacuum hoses from the EVAP canister purge solenoid.
4. Remove the EVAP canister purge solenoid bracket bolt from the intake manifold.
5. Unclip the EVAP canister purge solenoid from the mounting bracket.

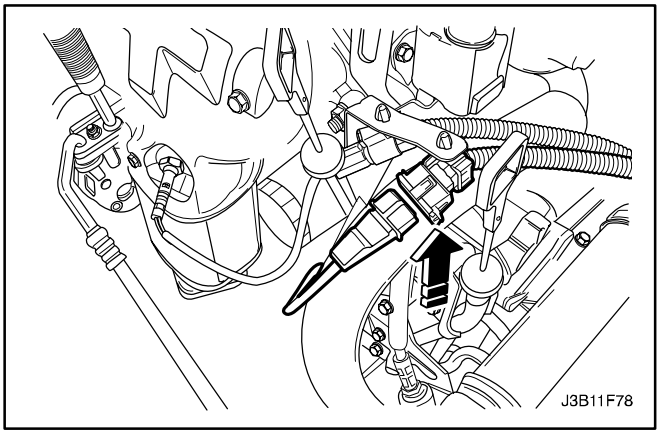


Installation Procedure

1. Attach the EVAP canister purge solenoid to the mounting bracket.
2. Install the EVAP canister purge solenoid and the mounting bracket to the intake manifold with the bracket bolt.

   Tighten

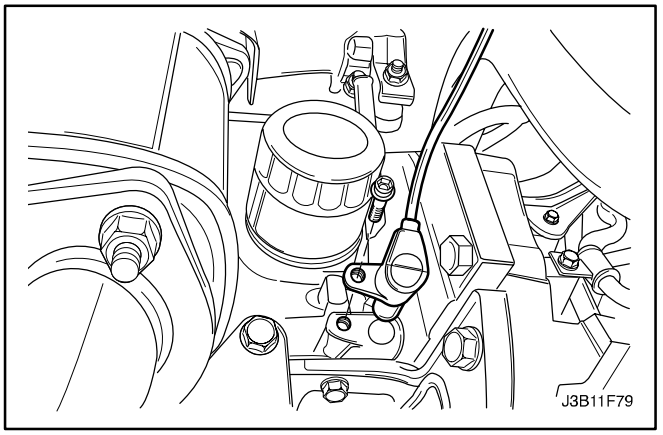
   Tighten the evaporative emission canister purge solenoid bracket bolt to 5 N•m (44 lb–in).
3. Connect the vacuum hoses to the EVAP canister purge solenoid.
4. Connect the EVAP canister purge solenoid connector.
5. Connect the negative battery cable.



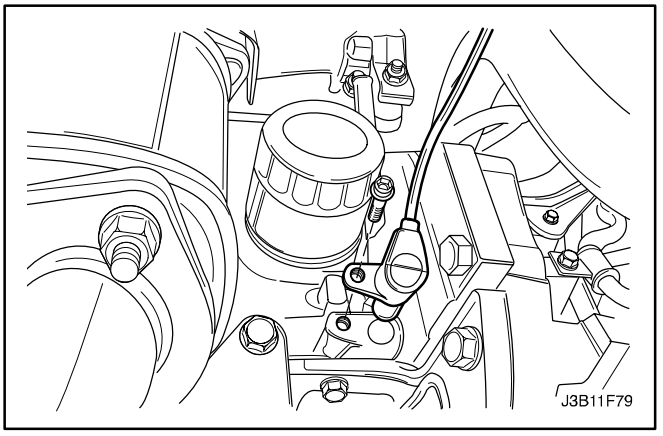
CRANKSHAFT POSITION (CKP) SENSOR (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the crankshaft position sensor (CKP) electrical connector.



3. Remove the crankshaft position sensor (CKP) bolt.
4. Remove the CKP sensor.

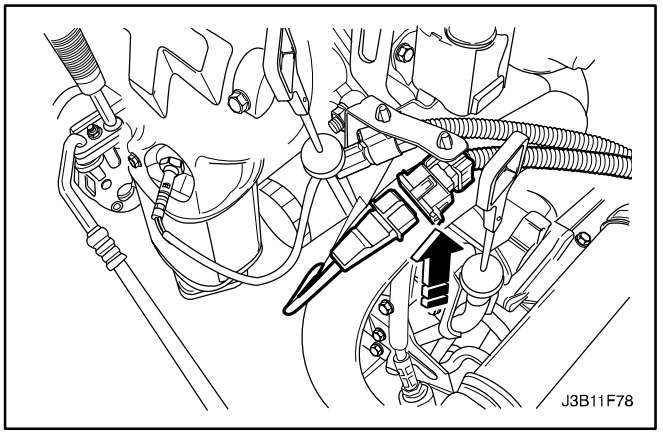


Installation Procedure

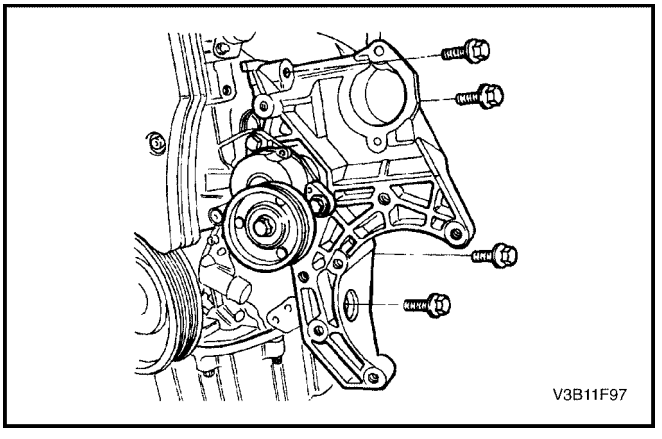
1. Install the CKP sensor with the bolt.

   Tighten

   Tighten the crankshaft position sensor (CKP) bolt to 6.5 N•m (57 lb–in).



2. Connect the CKP sensor electrical connector.
3. Connect the negative battery cable.

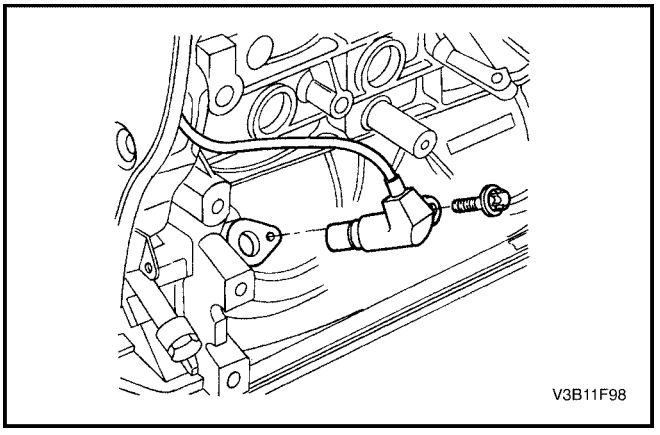


CRANKSHAFT POSITION (CKP) SENSOR (1.8L DOHC)

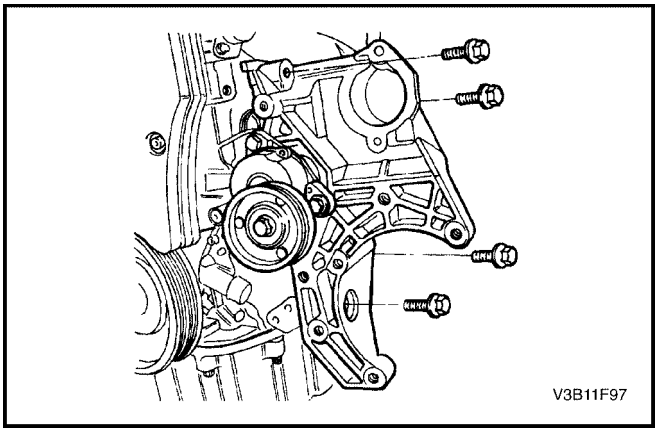
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the power steering pump, if equipped. Refer to *Section 6B, Power Steering Pump.*
3. Remove the A/C compressor. Refer to *Section 7D, Automatic Temperature Control Heating, Ventilation and Air Conditioning System.*
4. Remove the rear A/C compressor mounting bracket bolts and the rear A/C compressor mounting bracket.

5. Remove the accessory mounting bracket by removing the bolts.



6. Disconnect the crankshaft position (CKP) sensor connector.
7. Remove the CKP sensor retaining bolt.
8. Gently rotate and remove the CKP sensor from the engine block.



Installation Procedure

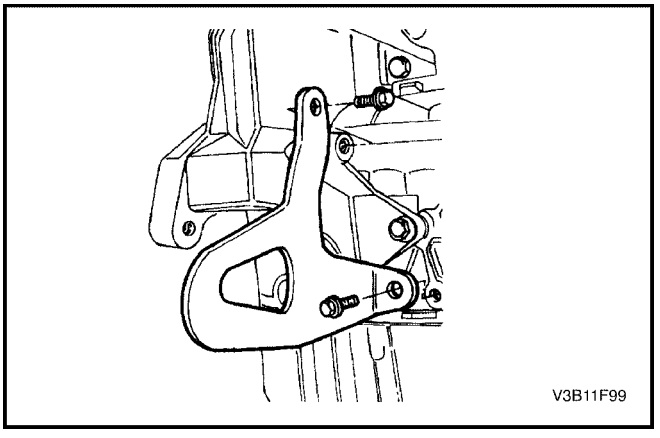
1. Insert the CKP sensor into the engine block.
2. Install the CKP sensor retaining bolt.

   Tighten

   Tighten the crankshaft position sensor retaining bolt to 8 N•m (71 lb–in).
3. Connect the CKP sensor connector.
4. Install the accessory mounting bracket with the bolts.

   Tighten

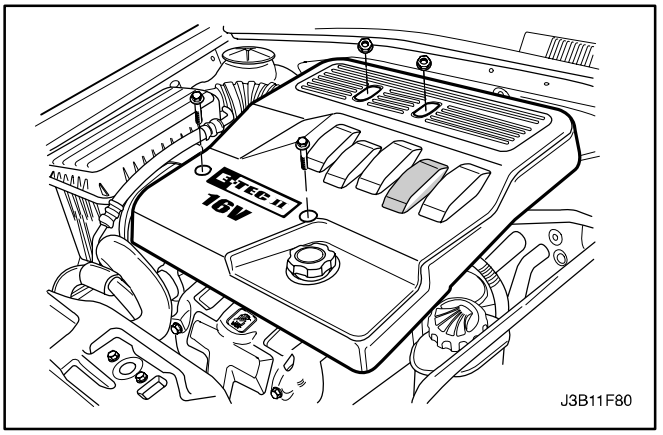
   Tighten the accessory mounting bracket bolts to 27 N•m (37 lb–ft).



5. Install the rear A/C mounting bracket.

   Tighten

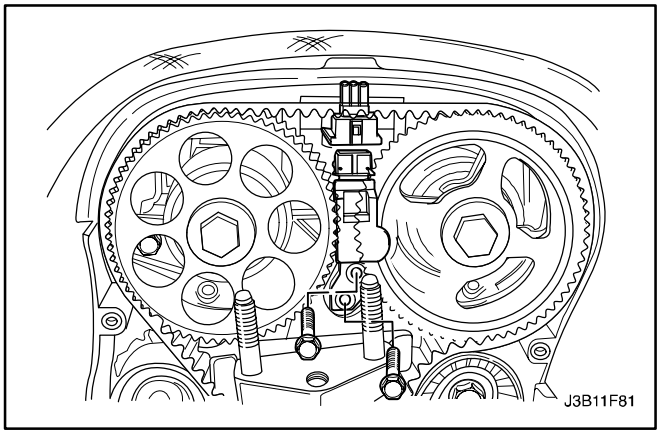
   Tighten the rear A/C mounting bracket bolts to 35 N•m (26 lb–ft).
6. Install the A/C compressor. Refer to *Section 7D, Automatic Temperature Control Heating, Ventilation and Air Conditioning System.*
7. Install the power steering pump. Refer to *Section 6B, Power Steering Pump.*
8. Connect the negative battery cable.



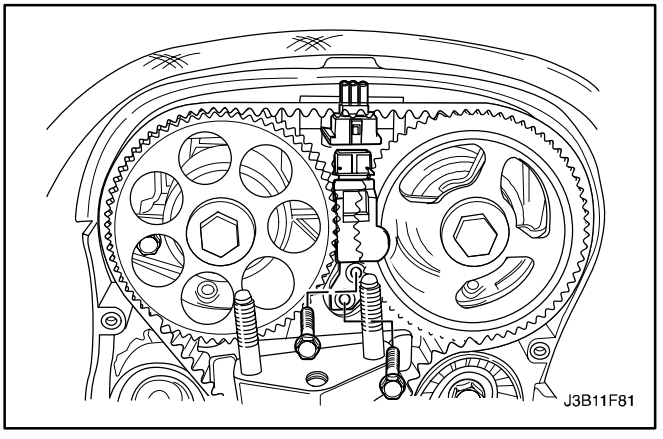
CAMSHAFT POSITION SENSOR (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the engine cover bolts and the nuts.
3. Remove the engine cover.



4. Disconnect the CMP sensor electrical connector.
5. Remove the timing belt front cover. Refer to *Section 1C, DOHC Engine Mechanical.*
6. Remvoe the CMP sensor bolts.
7. Remvoe the CMP sensor from the top.

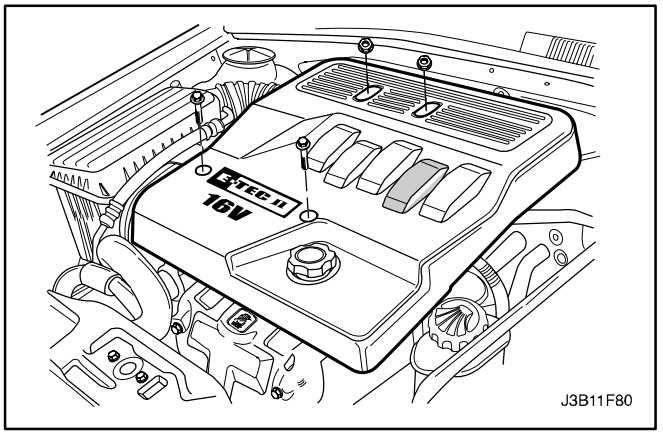


Installation Procedure

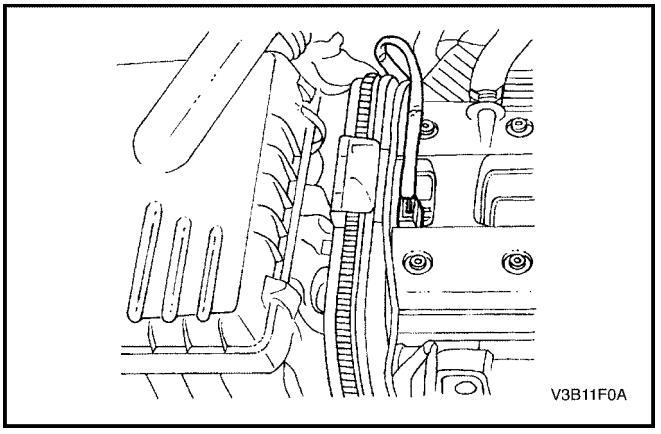
1. Install the camshaft position sensor and bolt.

   Tighten

   Tighten the camshaft position sensor bolts to 7 N•m (62 lb–in).



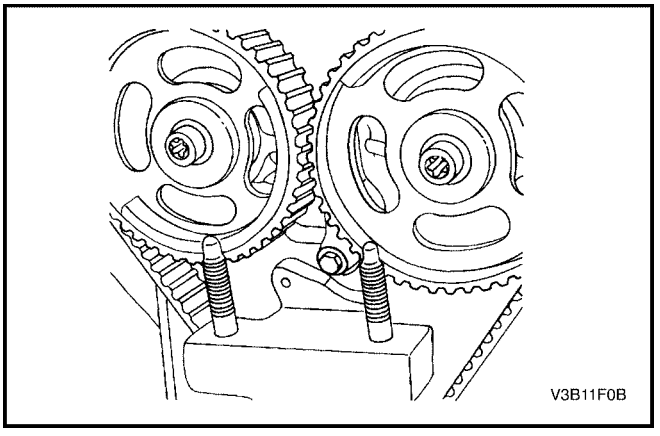
2. Install the timing bolt front cover. Refer to *Section 1C, DOHC Engine Mechanical.*
3. Connect the CMP sensor electrical connector.
4. Install the engine cover.
5. Connect the negative battery cable.



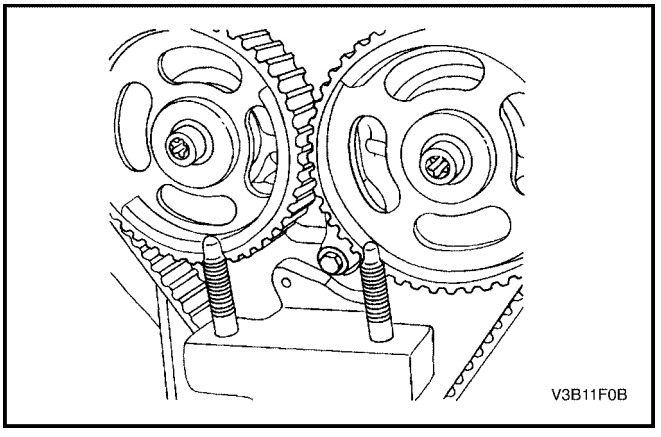
CAMSHAFT POSITION SENSOR (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the engine cover.
3. Disconnect the sensor electrical connector.



4. Remove the timing belt front cover. Refer to *Section 1C, DOHC Engine Mechanical.*
5. Remove the camshaft position sensor bolts.
6. Remove the camshaft position sensor from the top.

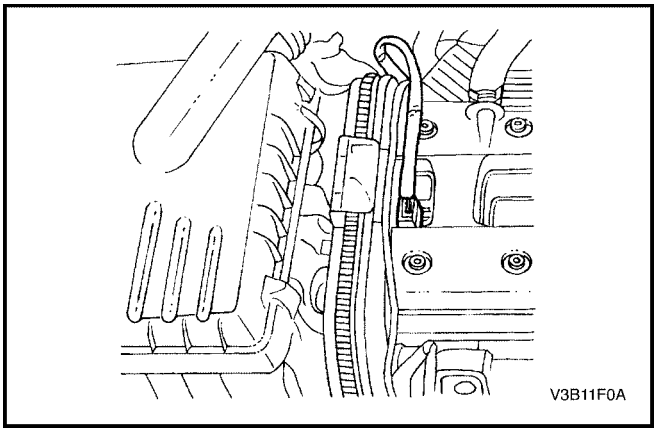


Installation Procedure

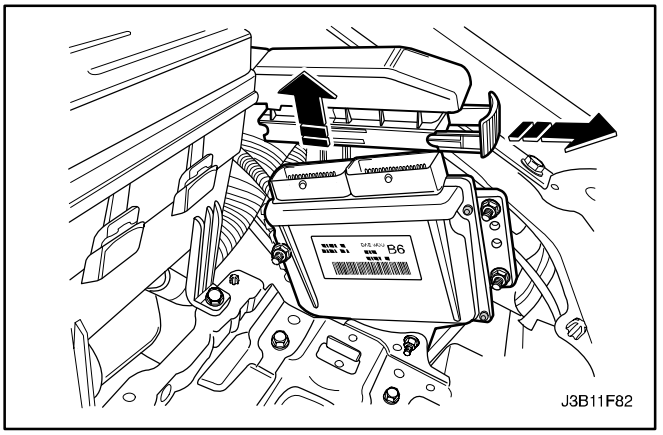
1. Install the camshaft position sensor and bolts.

   Tighten

   Tighten the camshaft position bolts to 8 N•m (71 lb–in).



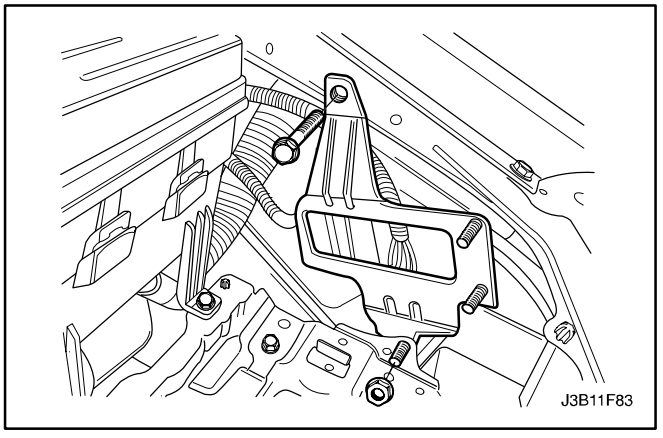
2. Install the timing belt front cover, the crankshaft pulley, the accessory drive belt, and the air filter. Refer to *Section 1C, DOHC Engine Mechanical.*
3. Connect the sensor electrical connector.
4. Install the engine cover.
5. Connect the negative battery cable.



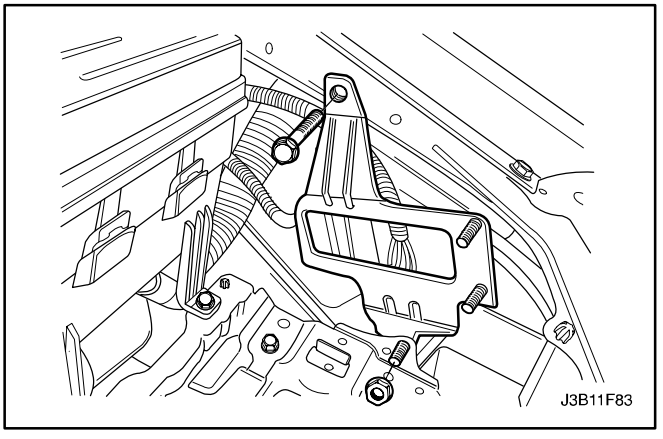
ENGINE CONTROL MODULE (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the engine control module (ECM) wiring harness connector.
3. Remove the nuts from the engine control module (ECM) mounting bracket.



4. Remove the engine control module (ECM) mounting bracket with the bolt and the nut.

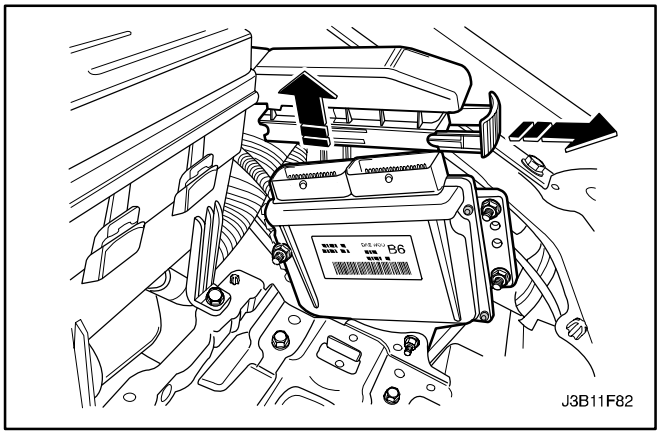


Installation Procedure

1. Install the engine control module (ECM) mounting bracket with the bolt and the nut.

   Tighten

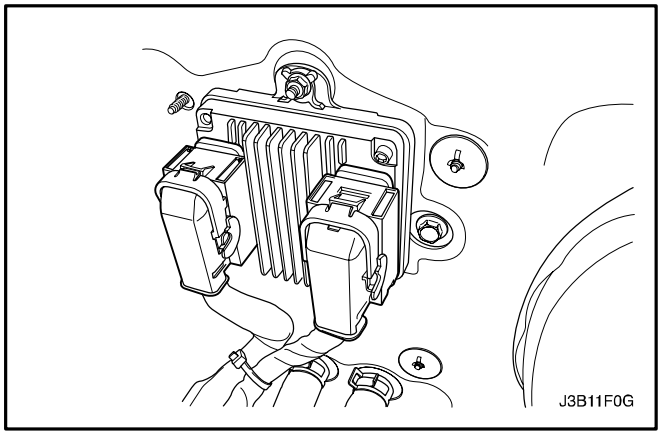
   Tighten the ECM mounting bracket bolt and the nut to 12 N•m (9 lb–ft).



2. Install the engine control module (ECM) with the nuts.

   Tighten

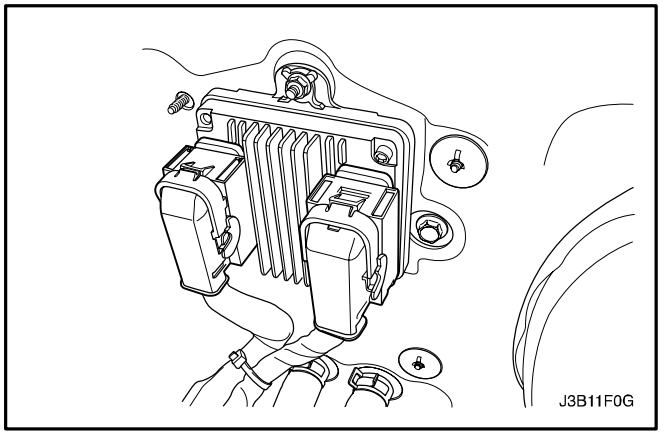
   Tighten the engine control module (ECM) nut to 12 N•m (9 lb–ft).



ENGINE CONTROL MODULE (1.8L DOHC)

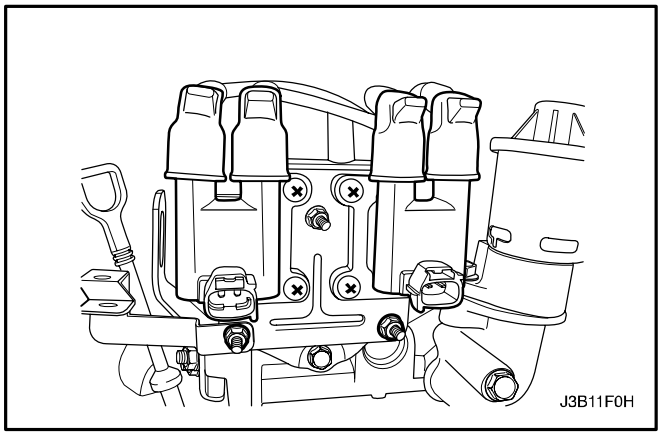
Removal Procedure

1. Disconnect the negative battery cable.
2. Remove the air intake tube and resonator.
3. Disconnect the ECM connectors from the ECM.
4. Remove the engine Control module.



Installation Procedure

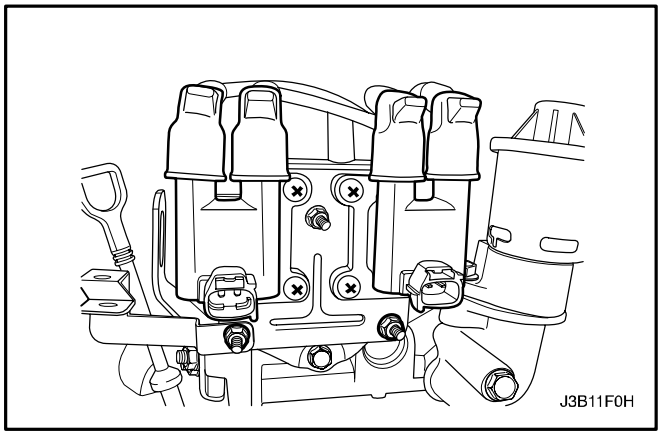
1. Connect the ECM connectors to the ECM.
2. Align the ECM into the mounting base.
3. Snap the ECM into its mounting base.
4. Install the ECM trim locks.
5. Install the passenger side kick panel. Refer to *Section 9G, Interior Trim.*
6. Connect the negative battery cable.
7. Perform a crankshaft position system variation learning procedure. Refer to ”DTC P1336” in this section.



ELECTRONIC IGNITION SYSTEM IGNITION COIL (1.4L/1.6L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the electronic ignition (EI) system ignition coil connector.
3. Note the ignition wire location and remove the ignition wire.
4. Remvoe the EI system ignition coil retaining nuts.
5. Remove the EI system ignition coil.

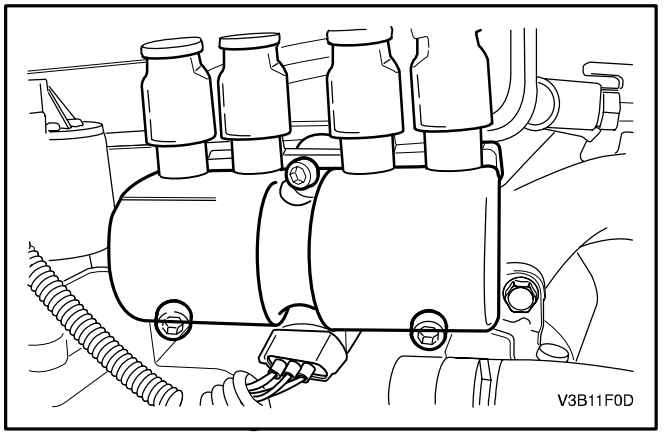


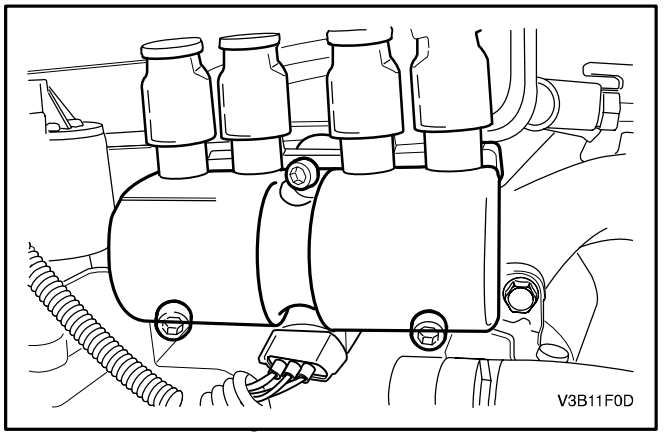
Installation Procedure

1. Install the EI system ignition coil into the mounting location and install the retaining nuts.

   Tighten

   Tighten the EI system ignition coil retaining nuts to 10 N•m (89 lb–in).
2. Connect the EI system ignition coil connector.
3. Connect the negative battery cable.





ELECTRONIC IGNITION SYSTEM IGNITION COIL (1.8L DOHC)

Removal Procedure

1. Disconnect the negative battery cable.
2. Disconnect the electronic ignition (EI) system ignition coil connector.
3. Note the ignition wire location and remove the ignition wires.
4. Remove the EI system ignition coil retaining bolts.
5. Remove the EI system ignition coil.

Installation Procedure

1. Install the EI system ignition coil into the mounting location and install the retaining bolts.

   ### Tighten

   Tighten the electronic ignition system ignition coil retaining bolts to 10 N•m (89 lb–in).
2. Connect the EI system 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 input to the engine control module (ECM). The ECM then determines Electronic Spark Timing (EST) and triggers the direct ignition system 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 electronic spark timing. 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).

ELECTRONIC IGNITION SYSTEM IGNITION COIL

The Electronic Ignition (EI) system ignition coil provides the spark for two spark plugs simultaneously. The EI system ignition coil is not serviceable and must be replaced as an assembly.

CRANKSHAFT POSITION SENSOR

This direct ignition system uses a magnetic crankshaft position sensor. This sensor protrudes through its mount to within approximately 0.05 inch (1.3 mm) of the crankshaft reluctor. The reluctor is a special wheel attached to the crankshaft or crankshaft pulley with 58 slots machined into it, 57 of which are equally spaced in 6 degree intervals. The last slot is wider 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 engine 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.

CAMAHAFT POSITION SENSOR

The Camshaft Position (CMP) sensor sends a CMP sensor signal to the engine control module (ECM). The ECM uses this signal as a ”sync pulse” to trigger the injectors in the proper sequence. The ECM uses the CMP sensor signal to indicate the position of the #1 piston during its power stroke. This allows the ECM to calculate true sequential fuel injection mode of operation. If the ECM detects an incorrect CMP sensor signal while the engine is running, DTC P0341 will set. If the CMP sensor signal is lost while the engine is running, the fuel injection system will shift to a calculated sequential fuel injection mode based on the last fuel injection pulse, and the engine will continue to run. As long as the fault is present, the engine can be restarted. It will run in the calculated sequential mode with a 1–in–6 chance of the injector sequence being correct.

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 engine 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, the Front Heated Oxygen Sensor (HO2S1) and the Rear Heated Oxygen Sensor (HO2S2).

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 engine 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.

HO2S Sensors

The HO2S sensor is located in the exhaust manifold. The HO2S 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 two seconds. The fuel pump then builds fuel pressure. The ECM also checks the Engine Coolant Temperature (ECT) sensor and the Throttle Position (TP) sensor and determines the proper air/fuel ratio for starting the engine. This ranges from 1.5 to 1 at –97 ˚F (–36 ˚C) coolant temperature to 14.7 to 1 at 201 ˚F (94 ˚C) 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. 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 HO2S and calculates the air/fuel ratio based on inputs from the ECT sensor and the MAP sensor. The sensor stays in ”open loop” until the following conditions are met:

- The HO2S sensor has a varying voltage output, showing that it is hot enough to operate properly.
- The ECT sensor 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 oxygen 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 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 Cut–Off 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 central power supply. This prevents flooding.

EVAPORATIVE EMISSION CONTROL SYSTEM OPERATION

The basic Evaporative (EVAP) Emission 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 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 the engine 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 EVAP emission canister purge solenoid valve. This valve is Pulse Width Modulated (PWM) or turned on and off several times a second. The EVAP emission canister purge 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 EVAP emission canister purge solenoid valve.
- A damaged canister.
- Hoses that are split, cracked, or not connected to the proper tubes.

EVAPORATIVE EMISSION CANISTER

The Evaporative (EVAP) Emission canister is an emission control device containing activated charcoal granules. The EVAP emission canister is used to store fuel vapors from the fuel tank. Once certain conditions are met, the engine control module (ECM) activates the EVAP canister purge solenoid, allowing the fuel vapors to be drawn into the engine cylinders and burned.

POSITIVE CRANKCASE VENTILATION 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 which are then passed 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

ENGINE COOLANT TEMPERATURE SENSOR

The Engine Coolant Temperature (ECT) sensor 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 ˚F [–40 ˚C]) while high temperature causes low resistance (70 ohms at 266 ˚F [130 ˚C]).

The engine control module (ECM) supplies 5 volts to the ECT 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 ECT sensor circuit should set a diagnostic trouble code P0117 or P0118. Remember, these diagnostic trouble codes indicate a failure in the ECT sensor 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 (TP) sensor is a potentiometer connected to the throttle shaft of the throttle body. The TP sensor electrical circuit consists of a 5 volt supply line and a ground line, both provided by the engine control module (ECM). The ECM calculates the throttle position by monitoring the voltage on this signal line. The TP sensor output changes as the accelerator pedal is moved, changing the throttle valve angle. At a closed throttle position, the output of the TP sensor 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 TP sensor 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 TP sensor circuits should set a diagnostic trouble code (DTC) P0121 or P0122. Once the DTC is set, the ECM will substitute a default value for the TP sensor and some vehicle performance will return. A DTC P0121 will cause a high idle speed.

CATALYST MONITOR OXYGEN SENSORS

Three–way catalytic converters are used to control emissions of hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx). The catalyst within the converters promotes a chemical reaction. This reaction oxidizes the HC and CO present in the exhaust gas and converts them into harmless water vapor and carbon dioxide. The catalyst also reduces NOx by converting it to nitrogen. The engine control module (ECM) can monitor this process using the HO2S1 and HO2S2 sensor. These sensors produce an output signal which indicates the amount of oxygen present in the exhaust gas entering and leaving the three–way converter. This indicates the catalyst's ability to efficiently convert exhaust gasses. If the catalyst is operating efficiently, the HO2S1 sensor signals will be more active than the signals produced by the HO2S2 sensor. The catalyst monitor sensors operate the same way as the fuel control sensors. The sensor's main function is catalyst monitoring, but they also have a limited role in fuel control. If a sensor output indicates a voltage either above or below the 450 mv bias voltage for an extended period of time, the ECM will make a slight adjustment to fuel trim to ensure that fuel delivery is correct for catalyst monitoring.

A problem with the HO2S1 sensor circuit will set DTC P0131, P0132, P0133 or P0134 depending, on the special condition. A problem with the HO2S2 sensor signal will set DTC P0137, P0138, P0140 or P0141, depending on the special condition.

A fault in the Rear Heated Oxygen Sensor (HO2S2) heater element or its ignition feed or ground will result in lower oxygen sensor response. This may cause incorrect catalyst monitor diagnostic results.

EXHAUST GAS RECIRCULATION VALVE

The Exhaust Gas Recirculation (EGR) system is used on engines equipped with an automatic transaxle to lower NOx (oxides of nitrogen) emission levels caused by high combustion temperature. The EGR valve is controlled by the engine control module (ECM). 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

INTAKE AIR TEMPERATURE SENSOR

The Intake Air Temperature (IAT) 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 (4,500 ohms at –40˚F [–40˚C]), while high temperature causes a low resistance (70 ohms at 266˚F [130˚C]).

The engine control module (ECM) provides 5 volts to the IAT sensor through a resistor in the ECM and measures the change in voltage to determine the IAT. The voltage will be high when the manifold air is cold and low when the air is hot. The ECM knows the intake IAT by measuring the voltage.

The IAT sensor is also used to control spark timing when the manifold air is cold.

A failure in the IAT sensor circuit sets a diagnostic trouble code P0112 or P0113.

IDLE AIR CONTROL VALVE

Notice : Do not attempt to remove the protective cap to 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 engine 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 position switch status, the vehicle speed, the battery voltage, and the 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 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. It 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 engine 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 P0107 or P0108.

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

ENGINE CONTROL MODULE

The engine control module (ECM), located inside the passenger kick–panel, 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 Malfunction Indicator Lamp (MIL), and store diagnostic trouble code(s) which identify 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 valve, the A/C clutch relay, etc., by controlling the ground circuit through transistors or a device called a "quad–driver."

FUEL INJECTOR

The Multiport Fuel Injection (MFI) assembly is a solenoid–operated device controlled by the engine control module (ECM). It meters pressurized fuel to a single engine cylinder. The ECM energizes the fuel injector or the 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 it to become further atomized and vaporized before entering the combustion chamber. A fuel injector which is stuck partially open will cause a loss of fuel pressure after the engine is shut down. Also, an extended crank time will be noticed on some engines. Dieseling can also occur because some fuel can 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 engine control module (ECM). The ECM then adjusts the ignition timing to reduce the spark knock.

ROUGH ROAD SENSOR

The engine control module (ECM) receives rough road information from the VR sensor. The ECM uses the rough road information to enable or disable the misfire diagnostic. The misfire diagnostic can be greatly affected by crankshaft speed variations caused by driving on rough road surfaces. The VR sensor generates rough road information by producing a signal which is proportional to the movement of a small metal bar inside the sensor.

If a fault occurs which causes the ECM to not receive rough road information between 30 and 80 mph (50 and 132 km/h), DTC P1391 will set.

STRATEGY – BASED DIAGNOSTICS

Strategy–Based Diagnostics

The strategy–based diagnostic is a uniform approach to repair all Electrical/Electronic (E/E) systems. The diagnostic flow can always be used to resolve an E/E system problem and is a starting point when repairs are necessary. The following steps will instruct the technician on how to proceed with a diagnosis:

- Verify the customer complaint. To verify the customer complaint, the technician should know the normal operation of the system.
- Perform preliminary checks as follows:
  - Conduct a thorough visual inspection.
  - Review the service history.
  - Detect unusual sounds or odors.
  - Gather Diagnostic Trouble Code (DTC) information to achieve an effective repair.
- Check bulletins and other service information. This includes videos, newsletters, etc.
- Refer to service information (manual) system check(s).
- Refer to service diagnostics.

No Trouble Found

This condition exists when the vehicle is found to operate normally. The condition described by the customer may be normal. Verify the customer complaint against another vehicle that is operating normally. The condition may be intermittent. Verify the complaint under the conditions described by the customer before releasing the vehicle.

Re–examine the complaint.

When the complaint cannot be successfully found or isolated, a re–evaluation is necessary. The complaint should be re–verified and could be intermittent as defined in ”Intermittents,” or could be normal.

After isolating the cause, the repairs should be made. Validate for proper operation and verify that the symptom has been corrected. This may involve road testing or other methods to verify that the complaint has been resolved under the following conditions:

- Conditions noted by the customer.
- If a DTC was diagnosed, verify a repair by duplicating conditions present when the DTC was set as noted in the Failure Records or Freeze Frame data.

Verifying Vehicle Repair

Verification of the vehicle repair will be more comprehensive for vehicles with On–Board Diagnostic (EOBD) system diagnostics. Following a repair, the technician should perform these steps:

Important : Follow the steps below when you verify repairs on EOBD systems. Failure to follow these steps could result in unnecessary repairs.

- Review and record the Failure Records and the Freeze Frame data for the DTC which has been diagnosed (Freeze Fame data will only be stored for an A or B type diagnostic and only if the MIL has been requested).
- Clear the DTC(s).
- Operate the vehicle within conditions noted in the Failure Records and Freeze Frame data.
- Monitor the DTC status information for the specific DTC which has been diagnosed until the diagnostic test associated with that DTC runs.

EOBD SERVICEABILITY ISSUES

Based on the knowledge gained from On–Board Diagnostic (EOBD) experience in the 1994 and 1995 model years, this list of non–vehicle faults that could affect the performance of the EOBD system has been compiled. These non–vehicle faults vary from environmental conditions to the quality of fuel used. With the introduction of EOBD diagnostics across the entire passenger car and light–duty truck market in 1996, illumination of the MIL due to a non–vehicle fault could lead to misdiagnosis of the vehicle, increased warranty expense and customer dissatisfaction. The following list of non–vehicle faults does not include every possible fault and may not apply equally to all product lines.

Fuel Quality

Fuel quality is not a new issue for the automotive industry, but its potential for turning on the Malfunction Indicator Lamp (MIL) with EOBD systems is new.

Fuel additives such as ”dry gas” and ”octane enhancers” may affect the performance of the fuel. If this results in an incomplete combustion or a partial burn, it will set DTC P0300. The Reed Vapor Pressure of the fuel can also create problems in the fuel system, especially during the spring and fall months when severe ambient temperature swings occur. A high Reed Vapor Pressure could show up as a Fuel Trim DTC due to excessive canister loading. High vapor pressures generated in the fuel tank can also affect the Evaporative Emission diagnostic as well.

Using fuel with the wrong octane rating for your vehicle may cause driveability problems. Many of the major fuel companies advertise that using ”premium” gasoline will improve the performance of your vehicle. Most premium fuels use alcohol to increase the octane rating of the fuel. Although alcohol–enhanced fuels may raise the octane rating, the fuel’s ability to turn into vapor in cold temperatures deteriorates. This may affect the starting ability and cold driveability of the engine.

Low fuel levels can lead to fuel starvation, lean engine operation, and eventually engine misfire.

Non–OEM Parts

All of the EOBD diagnostics have been calibrated to run with Original Equipment Manufacturer (OEM) parts. Something as simple as a high–performance exhaust system that affects exhaust system back pressure could po-

tentially interfere with the operation of the Exhaust Gas Recirculation (EGR) valve and thereby turn on the MIL. Small leaks in the exhaust system near the post catalyst oxygen sensor can also cause the MIL to turn on.

Aftermarket electronics, such as cellular phones, stereos, and anti–theft devices, may radiate electromagnetic interference (EMI) into the control system if they are improperly installed. This may cause a false sensor reading and turn on the MIL.

Environment

Temporary environmental conditions, such as localized flooding, will have an effect on the vehicle ignition system. If the ignition system is rain–soaked, it can temporarily cause engine misfire and turn on the MIL.

Refueling

A new EOBD diagnostic checks the integrity of the entire Evaporative (EVAP) Emission system. If the vehicle is restarted after refueling and the fuel cap is not secured correctly, the on–board diagnostic system will sense this as a system fault, turn on the MIL, and set DTC P0440.

Vehicle Marshaling

The transportation of new vehicles from the assembly plant to the dealership can involve as many as 60 key cycles within 2 to 3 miles of driving. This type of operation contributes to the fuel fouling of the spark plugs and will turn on the MIL with a set DTC P0300.

Poor Vehicle Maintenance

The sensitivity of EOBD diagnostics will cause the MIL to turn on if the vehicle is not maintained properly. Restricted air filters, fuel filters, and crankcase deposits due to lack of oil changes or improper oil viscosity can trigger actual vehicle faults that were not previously monitored prior to EOBD. Poor vehicle maintenance can not be classified as a ”non–vehicle fault,” but with the sensitivity of EOBD diagnostics, vehicle maintenance schedules must be more closely followed.

Severe Vibration

The Misfire diagnostic measures small changes in the rotational speed of the crankshaft. Severe driveline vibrations in the vehicle, such as caused by an excessive amount of mud on the wheels, can have the same effect on crankshaft speed as misfire and, therefore, may set DTC P0300.

Related System Faults

Many of the EOBD system diagnostics will not run if the engine controlmodule (ECM) detects a fault on a related system or component. One example would be that if the ECM detected a Misfire fault, the diagnostics on the catalytic converter would be suspended until the Misfire fault was repaired. If the Misfire fault is severe enough, the catalytic converter can be damaged due to overheating and will never set a Catalyst DTC until the Misfire fault is repaired and the Catalyst diagnostic is allowed to run to completion. If this happens, the customer may have to make two trips to the dealership in order to repair the vehicle.

SERIAL DATA COMMUNICATIONS

Class II Serial Data Communications

Government regulations require that all vehicle manufacturers establish a common communication system. This vehicle utilizes the ”Class II” communication system. Each bit of information can have one of two lengths: long or short. This allows vehicle wiring to be reduced by transmitting and receiving multiple signals over a single wire. The messages carried on Class II data streams are also prioritized. If two messages attempt to establish communications on the data line at the same time, only the message with higher priority will continue. The device with the lower priority message must wait. Themost significant result of this regulation is that it provides scan tool manufacturers with the capability to access data from any make or model vehicle that is sold.

The data displayed on the other scan tool will appear the same, with some exceptions. Some scan tools will only be able to display certain vehicle parameters as values that are a coded representation of the true or actual value. On this vehicle the scan tool displays the actual values for vehicle parameters. It will not be necessary to perform any conversions from coded values to actual values.

ON–BOARD DIAGNOSTIC (EOBD)

On–Board Diagnostic Tests

A diagnostic test is a series of steps, the result of which is a pass or fail reported to the diagnostic executive. When a diagnostic test reports a pass result, the diagnostic executive records the following data:

- The diagnostic test has been completed since the last ignition cycle.
- The diagnostic test has passed during the current ignition cycle.
- The fault identified by the diagnostic test is not currently active.

When a diagnostic test reports a fail result, the diagnostic executive records the following data:

- The diagnostic test has been completed since the last ignition cycle.
- The fault identified by the diagnostic test is currently active.
- The fault has been active during this ignition cycle.
- The operating conditions at the time of the failure.

Remember, a fuel trim Diagnostic Trouble Code (DTC) may be triggered by a list of vehicle faults. Make use of all information available (other DTCs stored, rich or lean condition, etc.) when diagnosing a fuel trim fault.

COMPREHENSIVE COMPONENT MONITOR DIAGNOSTIC OPERATION

Comprehensive component monitoring diagnostics are required to monitor emissions–related input and output powertrain components.

Input Components

Input components are monitored for circuit continuity and out–of–range values. This includes rationality checking. Rationality checking refers to indicating a fault when the signal from a sensor does not seem reasonable, i.e. Throttle Position (TP) sensor that indicates high throttle position at low engine loads or Manifold Absolute Pressure (MAP) voltage. Input components may include, but are not limited to, the following sensors:

- Vehicle Speed Sensor (VSS).
- Crankshaft Position (CKP) sensor.
- Throttle Position (TP) sensor.
- Engine Coolant Temperature (ECT) sensor.
- Camshaft Position (CMP) sensor.
- Manifold Absolute Pressure (MAP) sensor.

In addition to the circuit continuity and rationality check, the ECT sensor is monitored for its ability to achieve a steady state temperature to enable closed loop fuel control.

Output Components

Output components are diagnosed for proper response to control module commands. Components where functional monitoring is not feasible will be monitored for circuit continuity and out–of–range values if applicable. Output components to be monitored include, but are not limited to the following circuit:

- Idle Air Control (IAC) Motor.
- Control module controlled EVAP Canister Purge Valve.
- A/C relays.
- Cooling fan relay.
- VSS output.
- MIL control.

Refer to ”Engine Control Module” and Sensors in this section.

Passive and Active Diagnostic Tests

A passive test is a diagnostic test which simply monitors a vehicle system or component. Conversely, an active test, actually takes some sort of action when performing diagnostic functions, often in response to a failed passive test. For example, the Exhaust Gas Recirculation (EGR) diagnostic active test will force the EGR valve open during closed throttle deceleration and/or force the EGR valve closed during a steady state. Either action should result in a change in manifold pressure.

Intrusive Diagnostic Tests

This is any on–board test run by the Diagnostic Management System which may have an effect on vehicle performance or emission levels.

Warm–Up Cycle

A warm–up cycle means that engine temperature must reach aminimum of 160˚F (70˚C) and rise at least 72˚F (22˚C) over the course of a trip.

Freeze Frame

Freeze Frame is an element of the Diagnostic Management System which stores various vehicle information at the moment an emissions–related fault is stored in memory and when the Malfunction Indicator Lamp (MIL) is commanded on. These data can help to identify the cause of a fault.

Failure Records

Failure Records data is an enhancement of the EOBD Freeze Frame feature. Failure Records store the same vehicle information as does Freeze Frame, but it will store that information for any fault which is stored in onboard memory, while Freeze Frame stores information only for emission–related faults that command the MIL on.

COMMON EOBD TERMS

Diagnostic

When used as a noun, the word diagnostic refers to any on–board test run by the vehicle’s Diagnostic Management System. A diagnostic is simply a test run on a system or component to determine if the system or component is operating according to specification. There are many diagnostics, shown in the following list:

- Misfire
- Front Heated Oxygen Sensor (HO2S1)
- Rear Heated Oxygen Sensor (HO2S2)
- Exhaust Gas Recirculation (EGR)
- Catalyst monitoring

Enable Criteria

The term ”enable criteria” is engineering language for the conditions necessary for a given diagnostic test to run. Each diagnostic has a specific list of conditions which must be met before the diagnostic will run.

”Enable criteria” is another way of saying ”conditions required.”

The enable criteria for each diagnostic is listed on the first page of the Diagnostic Trouble Code (DTC) description under the heading ”Conditions for Setting the DTC.” Enable criteria varies with each diagnostic and typically includes, but is not limited to, the following items:

- Engine speed.
- Vehicle speed
- Engine Coolant Temperature (ECT)
- Manifold Absolute Pressure (MAP)

- Barometric Pressure (BARO)
- Intake Air Temperature (IAT)
- Throttle Position (TP)
- High canister purge
- Fuel trim
- A/C on

Trip

Technically, a trip is a key–on run key–off cycle in which all the enable criteria for a given diagnostic are met, allowing the diagnostic to run. Unfortunately, this concept is not quite that simple. A trip is official when all the enable criteria for a given diagnostic are met. But because the enable criteria vary from one diagnostic to another, the definition of trip varies as well. Some diagnostics are run when the vehicle is at operating temperature, some when the vehicle first starts up; some require that the vehicle be cruising at a steady highway speed, some run only when the vehicle is at idle; some diagnostics function with the Torque Converter Clutch (TCC) disabled. Some run only immediately following a cold engine startup.

A trip then, is defined as a key–on run key–off cycle in which the vehicle was operated in such a way as to satisfy the enables criteria for a given diagnostic, and this diagnostic will consider this cycle to be one trip. However, another diagnostic with a different set of enable criteria (which were not met) during this driving event, would not consider it a trip. No trip will occur for that particular diagnostic until the vehicle is driven in such a way as to meet all the enable criteria

Diagnostic Information

The diagnostic charts and functional checks are designed to locate a faulty circuit or component through a process of logical decisions. The charts are prepared with the requirement that the vehicle functioned correctly at the time of assembly and that there are not multiple faults present.

There is a continuous self–diagnosis on certain control functions. This diagnostic capability is complimented by the diagnostic procedures contained in this manual. The language of communicating the source of the malfunction is a system of diagnostic trouble codes. When a malfunction is detected by the control module, a diagnostic trouble code is set and the Malfunction Indicator Lamp (MIL) is illuminated.

Malfunction Indicator Lamp (MIL)

The Malfunction Indicator Lamp (MIL) is required by On–Board Diagnostics (EOBD) that it illuminates under a strict set of guide lines.

Basically, the MIL is turned on when the engine control module (ECM) detects a DTC that will impact the vehicle emissions.

The MIL is under the control of the Diagnostic Executive. The MIL will be turned on if an emissions–related diagnostic test indicates a malfunction has occurred. It will stay on until the system or component passes the same test, for three consecutive trips, with no emissions related faults.

Extinguishing the MIL

When the MIL is on, the Diagnostic Executive will turn off the MIL after three consecutive trips that a ”test passed” has been reported for the diagnostic test that originally caused the MIL to illuminate. Although the MIL has been turned off, the DTC will remain in the ECM memory (both Freeze Frame and Failure Records) until forty (40) warm–up cycles after no faults have been completed.

If the MIL was set by either a fuel trim or misfire–related DTC, additional requirements must be met. In addition to the requirements stated in the previous paragraph, these requirements are as follows:

- The diagnostic tests that are passed must occur with 375 rpm of the rpm data stored at the time the last test failed.
- Plus or minus ten percent of the engine load that was stored at the time the last test failed. Similar engine temperature conditions (warmed up or warming up) as those stored at the time the last test failed.

Meeting these requirements ensures that the fault which turned on the MIL has been corrected.

The MIL is on the instrument panel and has the following functions:

- It informs the driver that a fault that affects vehicle emission levels has occurred and that the vehicle should be taken for service as soon as possible.
- As a system check, the MIL will come on with the key ON and the engine not running. When the engine is started, the MIL will turn OFF.
- When the MIL remains ON while the engine is running, or when a malfunction is suspected due to a driveability or emissions problem, an EOBD System Check must be performed. The procedures for these checks are given in EOBD System Check. These checks will expose faults which may not be detected if other diagnostics are performed first.

Data Link Connector (DLC)

The provision for communicating with the control module is the Data Link Connector (DLC). The DLC is used to connect to a scan tool. Some common uses of the scan tool are listed below:

- Identifying stored DTCs.
- Clearing DTCs.
- Performing output control tests.
- Reading serial data.

READING DIAGNOSTIC TROUBLE CODES

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

DTC Modes

On On–Board Diagnostic (EOBD) passenger cars there are five options available in the scan tool DTC mode to display the enhanced information available. A description of the new modes, DTC Info and Specific DTC, follows. After selecting DTC, the following menu appears:

- DTC Info.
- Specific DTC.
- Freeze Frame.
- Fail Records (not all applications).
- Clear Info.

The following is a brief description of each of the sub menus in DTC Info and Specific DTC. The order in which they appear here is alphabetical and not necessarily the way they will appear on the scan tool.

DTC Information Mode

Use the DTC info mode to search for a specific type of stored DTC information. There are seven choices. The service manual may instruct the technician to test for DTCs in a certain manner. Always follow published service procedures.

To get a complete description of any status, press the ”Enter” key before pressing the desired F–key. For example, pressing ”Enter” then an F–key will display a definition of the abbreviated scan tool status.

DTC Status

This selection will display any DTCs that have not run during the current ignition cycle or have reported a test failure during this ignition up to a maximum of 33 DTCs. DTC tests which run and pass will cause that DTC number to be removed from the scan tool screen.

Fail This Ign. (Fail This Ignition)

This selection will display all DTCs that have failed during the present ignition cycle.

History

This selection will display only DTCs that are stored in the ECM’s history memory. It will not display type CNL DTCs that have not requested the Malfunction Indicator Lamp (MIL). It will display all type A, B and E DTCs that have requested the MIL and have failed within the last 40 warm–up cycles. In addition, it will display all type C and type D DTCs that have failed within the last 40 warm–up cycles.

Last Test Fail

This selection will display only DTCs that failed the last time the test ran. The last test may have run during a previous ignition cycle if a type A or type B DTC is displayed. For type C and type D DTCs, the last failure must have occurred during the current ignition cycle to appear as Last Test Fail.

MIL Request

This selection will display only DTCs that are requesting the MIL. Type C and type D DTCs cannot be displayed using this option. This selection will report type B DTCs only after the MIL has been requested.

Not Run SCC (Not Run Since Code Clear)

This option will display up to 33 DTCs that have not run since the DTCs were last cleared. Since any displayed DTCs have not run, their condition (passing or failing) is unknown.

Test Fail SCC (Test Failed Since Code Clear)

This selection will display all active and history DTCs that have reported a test failure since the last time DTCs were cleared. DTCs that last failed more than 40 warm–up cycles before this option is selected will not be displayed.

Specific DTC Mode

This mode is used to check the status of individual diagnostic tests by DTC number. This selection can be accessed if a DTC has passed, failed or both. Many EOBD DTC mode descriptions are possible because of the extensive amount of information that the diagnostic executive monitors regarding each test. Some of the many possible descriptions follow with a brief explanation.

The ”F2” key is used, in this mode, to display a description of the DTC. The ”Yes” and ”No” keys may also be used to display more DTC status information. This selection will only allow entry of DTC numbers that are supported by the vehicle being tested. If an attempt is made to enter DTC numbers for tests which the diagnostic executive does not recognize, the requested information will not be displayed correctly and the scan tool may display an error message. The same applies to using the DTC trigger option in the Snapshot mode. If an invalid DTC is entered, the scan tool will not trigger.

Failed Last Test

This message display indicates that the last diagnostic test failed for the selected DTC. For type A and type B DTCs, this message will be displayed during subsequent ignition cycles until the test passes or DTCs are cleared. For type C and type D DTCs, this message will clear when the ignition is cycled.

Failed Since Clear

This message display indicates that the DTC has failed at least once within the last 40 warm–up cycles since the last time DTCs were cleared.

Failed This Ig. (Failed This Ignition)

This message display indicates that the diagnostic test has failed at least once during the current ignition cycle. This message will clear when DTCs are cleared or the ignition is cycled.

History

This message display indicates that the DTC has been stored in memory as a valid fault. A DTC displayed as a History fault may not mean that the fault is no longer present. The history description means that all the conditions necessary for reporting a fault have been met (maybe even currently), and the information was stored in the control module memory.

MIL Requested

This message display indicates that the DTC is currently causing the MIL to be turned ON. Remember that only type A and type B DTCs can request the MIL. The MIL request cannot be used to determine if the DTC fault conditions are currently being experienced. This is because the diagnostic executive will require up to three trips during which the diagnostic test passes to turn OFF the MIL.

Not Run Since CI (Not Run Since Cleared)

This message display indicates that the selected diagnostic test has not run since the last time DTCs were cleared. Therefore, the diagnostic test status (passing or failing) is unknown. After DTCs are cleared, this message will continue to be displayed until the diagnostic test runs.

Not Run This Ig. (Not Run This Ignition)

This message display indicates that the selected diagnostic test has not run during this ignition cycle.

Test Ran and Passed

This message display indicates that the selected diagnostic test has done the following:

- Passed the last test.
- Run and passed during this ignition cycle.
- Run and passed since DTCs were last cleared.

If the indicated status of the vehicle is ”Test Ran and Passed” after a repair verification, the vehicle is ready to be released to the customer.

If the indicated status of the vehicle is ”Failed This Ignition” after a repair verification, then the repair is incomplete and further diagnosis is required.

Prior to repairing a vehicle, status information can be used to evaluate the state of the diagnostic test, and to help identify an intermittent problem. The technician can conclude that although the MIL is illuminated, the fault condition that caused the code to set is not present. An intermittent condition must be the cause.

PRIMARY SYSTEM – BASED DIAGNOSTICS

There are primary system–based diagnostics which evaluate system operation and its effect on vehicle emissions. The primary system–based diagnostics are listed below with a brief description of the diagnostic function:

Oxygen Sensor Diagnosis

The fuel control Front Heated Oxygen Sensor (HO2S1) is diagnosed for the following conditions:

- Slow response.
- Response time (time to switch R/L or L/R).
- Inactive signal (output steady at bias voltage approx. 450 mv).
- Signal fixed high.
- Signal fixed low.

The catalyst monitor Rear Heated Oxygen Sensor (HO2S2) is diagnosed for the following conditions:

- Heater performance (time to activity on cold start).
- Signal fixed low during steady state conditions or power enrichment (hard acceleration when a rich-mixture should be indicated).
- Signal fixed high during steady state conditions or deceleration mode (deceleration when a lean mixture should be indicated).
- Inactive sensor (output steady at approximately 438 mv).

If the oxygen sensor pigtail wiring, connector or terminal are damaged, the entire oxygen sensor assembly must be replaced. Do not attempt to repair the wiring, connector or terminals. In order for the sensor to function properly, it must have clean reference air provided to it. This clean air reference is obtained by way of the oxygen sensor wire(s). Any attempt to repair the wires, connector or terminals could result in the obstruction of the reference air and degrade oxygen sensor performance.

Misfire Monitor Diagnostic Operation

The misfire monitor diagnostic is based on crankshaft rotational velocity (reference period) variations. The engine control module (ECM) determines crankshaft rotational velocity using the Crankshaft Position (CKP) sensor and the Camshaft Position (CMP) sensor. When a cylinder misfires, the crankshaft slows down momentarily. By monitoring the CKP and CMP sensor signals, the ECM can calculate when a misfire occurs.

For a non–catalyst damaging misfire, the diagnostic will be required to monitor a misfire present for between 1000–3200 engine revolutions.

For catalyst–damaging misfire, the diagnostic will respond to misfire within 200 engine revolutions.

Rough roads may cause false misfire detection. A rough road will cause torque to be applied to the drive wheels and drive train. This torque can intermittently decrease the crankshaft rotational velocity. This may be falsely detected as a misfire.

A rough road sensor, or G sensor, works together with the misfire detection system. The G sensor produces a voltage that varies along with the intensity of road vibrations. When the ECM detects a rough road, the misfire detection system is temporarily disabled.

Misfire Counters

Whenever a cylinder misfires, the misfire diagnostic counts the misfire and notes the crankshaft position at the time the misfire occurred. These ”misfire counters” are basically a file on each engine cylinder. A current and a history misfire counter are maintained for each cylinder. The misfire current counters (Misfire Cur #1–4) indicate the number of firing events out of the last 200 cylinder firing events which were misfires. The misfire current counter will display real time data without a misfire Diagnostic Trouble Code (DTC) stored. The misfire history counters (Misfire Hist #1–4) indicate the total number of cylinder firing events which were misfires. The misfire history counters will display 0 until the misfire iagnostic has failed and a DTC P0300 is set. Once the misfire DTC P0300 is set, the misfire history counters will be updated every 200 cylinder firing events. A misfire counter is maintained for each cylinder.

If the misfire diagnostic reports a failure, the diagnostic executive reviews all of the misfire counters before reporting a DTC. This way, the diagnostic executive reports the most current information.

When crankshaft rotation is erratic, a misfire condition will be detected. Because of this erratic condition, the data that is collected by the diagnostic can sometimes incorrectly identify which cylinder is misfiring.

Use diagnostic equipment to monitor misfire counter data on On–Board Diagnostic (EOBD) compliant vehicles. Knowing which specific cylinder(s) misfired can lead to the root cause, even when dealing with amultiple cylinder misfire. Using the information in the misfire counters, identify which cylinders are misfiring. If the counters indicate cylinders numbers 1 and 4 misfired, look for a circuit or component common to both cylinders number 1 and 4.

The misfire diagnostic may indicate a fault due to a temporary fault not necessarily caused by a vehicle emission system malfunction. Examples include the following items:

- Contaminated fuel.
- Low fuel.
- Fuel–fouled spark plugs.
- Basic engine fault.

Fuel Trim System Monitor Diagnostic Operation

This system monitors the averages of short–term and long–term fuel trim values. If these fuel trim values stay at their limits for a calibrated period of time, a malfunction is indicated. The fuel trim diagnostic compares the averages of short–term fuel trim values and long–term fuel trim values to rich and lean thresholds. If either value is within the thresholds, a pass is recorded. If both values are outside their thresholds, a rich or lean DTC will be recorded.

The fuel trim system diagnostic also conducts an intrusive test. This test determines if a rich condition is being caused by excessive fuel vapor from the Evaporative (EVAP) Emission canister. In order to meet EOBD requirements, the control module uses weighted fuel trim cells to determine the need to set a fuel trim DTC. A fuel trim DTC can only be set if fuel trim counts in the weighted fuel trim cells exceed specifications. This means that the vehicle could have a fuel trim problem which is causing a problem under certain conditions (i.e., engine idle high due to a small vacuum leak or rough idle due to a large vacuum leak) while it operates fine at other times. No fuel trim DTC would set (although an engine idle speed DTC or HO2S2 DTC may set). Use a scan tool to observe fuel trim counts while the problem is occurring.

A fuel trim DTC may be triggered by a number of vehicle faults. Make use of all information available (other DTCs stored, rich or lean condition, etc.) when diagnosing a fuel trim fault.

Fuel Trim Cell Diagnostic Weights

No fuel trim DTC will set regardless of the fuel trim counts in cell 0 unless the fuel trim counts in the weighted cells are also outside specifications. This means that the vehicle could have a fuel trim problem which is causing a problem under certain conditions (i.e. engine idle high due to a small vacuum leak or rough due to a large vacuum leak) while it operates fine at other times. No fuel trim DTC would set (although an engine idle speed DTC or HO2S2 DTC may set). Use a scan tool to observe fuel trim counts while the problem is occurring.