Rio Fuel System

GENERAL

SPECIFICATIONS EE5F11B82

Item \ Engine				A3 SOHC	A5 DOHC
Idle speed			rpm	750 ± 50	
Ignition timing			BTDC	8˚± 5˚	8˚± 5˚ (6˚± 5˚ for Europe)
Throttle body	Type			Horizontal drift	
	Throat diameter		in (mm)	2(50)	
Idle air control valve	Type			Rotary	
	Resistance (at 68˚F [20˚C])Ω	Opening		17~18.2	
		Closing		15~16	
Air cleaner element				Dry, paper type	
EVAP canister purge valve	Resistance (at 68˚F[20˚C])		Ω	24 ~ 28	
Engine coolant Temperature sensor	Resistance (KΩ)	-4˚F(-20˚C)		14.6~17.8	
		68˚F (20˚C)		2.2~2.7	
		176˚F (80˚C)		0.29 ~ 0.35	
Fuel injector	Type of drive			Electromechanical	
	Number of spray ports			2	
	Resistance (at 68˚F [20˚C])		Ω	13.5 ~ 15.5	
Heated oxygen sensor	Resistance (at 68˚F [20˚C])		Ω	3 ~ 7	
Main relay	Resistance (at 68˚F [20˚C])		Ω	80 ~ 90	
Fuel pump maximum pressure			kg/cm²	4.5 ~ 6.5	
Fuel filter	Low pressure side			Nylon element (in fuel pump)	
	High pressure side			paper element	
Pressure regulator	Pressure		kg/cm²	3.25 ~ 3.35	
Fuel tank	Capacity		Liter	45	

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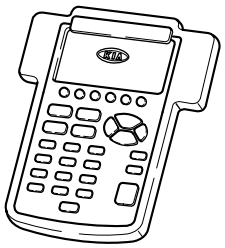
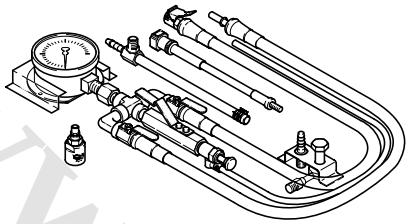
SPECIAL SERVICE TOOLS EE258C705

Tool (Number and Name)	Illustration	Use
0K2CA 089 HSP Hi-scan pro	 BF2C010A	Used for diagnosis and DTC retrieval and erasing.
0K2A1 131 AA1 Fuel pressure gauge	 BF2C010B	Used for measuring fuel pressure.

COMPONENT DESCRIPTION

TABLE EECDDD2BA

Component	Function	Remark
A/C relay	Controls battery power to compressor magnetic clutch and condenser fan relay according to vehicle conditions	Control condenser fan relay and compressor magnetic clutch
A/C switch	Controls battery power to A/C DEF switch and grounds A/C DEF switch	Normal open type
Air cleaner	Filters air entering throttle body	
Camshaft positin(CMP) sensor	Detects number 1 cylinder TDC and sends the signal to ECM	Installed at rear of cylinder head (bank 1)
Crankshaft position (CKP) sensor	Detects crankshaft angle from flywheel rotation and sends signal to ECM	SGT signal
Data link connector (DLC)	Centalized service connector for on-board diagnosis	For on-board diagnosis and service/inspection
EGI main relay	Supplies battery power to electrical devices	Normal open type Controlled by ECM
Engine control module (ECM)	Detects the following: 1. A/C operation 2. Air/fuel ratio (oxygen concentration) 3. Ignition ON signal 4. Engine coolant temperature 5. Engine speed 6. In-gear condition (A/T only) 7. Intake air amount 8. Intake air temperature 9. No. 1 piston TDC(compression stroke) 10. Throttle valve opening angle 11. Vehicle speed 12. Engine knocking Controls operation of following: 1. A/C 2. Self-diagnosis function 3. Fuel injection system 4. Ignition control system 5. Idle speed control 6. Purge control system 7. Fuel pump control 8. Cooling fan control	1. A/C switch 2. Oxygen sensor 3. Ignition switch 4. Engine coolant temperature sensor 5. Crankshaft position (CKP) sensor (SGT signal) 6. Transaxle range switch (A/T) 7. Mass air flow sensor 8. Intake air temperature sensor 9. Camshaft position (CMP) sensor (SGC signal) 10. Throttle position sensor 11. Vehicle speed sensor 12. Knock sensor 1. A/C relay 2. Hi-scan pro & MIL 3. Injector 4. Ignition coil 5. Idle air control valve 6. Evaporative canister purge valve 7. Fuel pump relay 8. Cooling fan control relay
Engine coolant temperature (ECT) sensor	Detects engine coolant temperature and sends signal to ECM	-
Fuel filter (high pressure side)	Filters fine dirt particles in fuel discharged from the fuel pump	-
Fuel filter (low pressure side)	Filters fuel in fuel tank	-
Fuel injector	Injects fuel into intake port	Controlled by signals from ECM

Component	Function	Remark
Fuel pressure regulator	Adjusts fuel pressure supply to injectors	Controlled by intake manifold vacuum
Fuel pump	Supplies fuel from fuel tank to fuel under pressure	Actuated by fuel pump relay installed
Fuel pump relay	Controls battery power to fuel pump Actuated by ECM fuel pump control signal or by jumping data link connector terminal 1 to battery	Normal open type
Heated oxygen sensor(front)	Detects oxygen density in exhaust gas and sends signal to ECM for air/fuel mixture adjustment	Located in exhaust manifold
Heated oxygen sensor (rear)	Detects oxygen density in exhaust gas and sends signal to ECM	TWC converter verification
Idle air control(ISC) valve	Supplies intake air to engine, bypassing throttle valve	For idle speed control Actuated by ECM idle speed control signal
Ignition coils	Supplies secondary voltage to spark plugs	Mounted directly above spark plugs
Ignition control module	Controls operation of ignition coils	Incorporated into ECM
Ignition switch	Starts engine and controls battery power to electrical devices	-
Intake manifld	Supplies intake air to all cylinders	-
Knock sensor	Detects detonation in the combustion (chambers) and sends signal to ECM	The ECM will retard ignition timing hased on input signal
Main relay	Supplies current to output devices and ECM	-
Mass air flow (MAF) sensor	Detects amount of intake air and sends signal to ECM	MAP Sensor (Except for Europe)
Starter	Starts engine by rotating flywheel ring gear	-
Throttle body	Controls intake air amount	-
Throttle position sensor	Detects throttle valve opening angle and sends signal to ECM	Installed on throttle body
Transaxle control module	Controls functions of transaxle for better performance and shift quality	Located below instrument panel behind left lower trim panel
Transaxle range switch	Detects shift lever position and sends to ECM	For idle speed control load/no load determination
Check valve	Maintains pressure in the fuel tank and regulates vapor flow to the evaporative emissions canister	Located in the evaporative system lines next to the fuel tank
Evaporative emission canister	Stores fuel tank vapors (engine stopped)	-
Positive crankcase ventilation (PCV) valve	Sends blow-by gas in crankcase into intake manifold (dynamic chamber) for blow-by gas re-circulation	Actuated by intake manifold vacuum
Evaporative canister purge solenoid valve	Controls fuel vapor from evaporative emission canister to intake manifold (dynamic chamber)	For purge control Actuated by ECM purge control signal
Resonance chamber	Reduces intake air suction noise and increases engine torque	-

Component	Function	Remark
Rollover valve	Restricts fuel from entering the evaporative system in a vehicle rollover	Located on the fuel tank
Three way catalytic convert	Reduce HC, CO and NOx in exhaust through chemical reaction	For exhaust gas emissions reduction

IGNITION TIMING AND IDLE SPEED EEC94F7D7

IGNITION TIMING

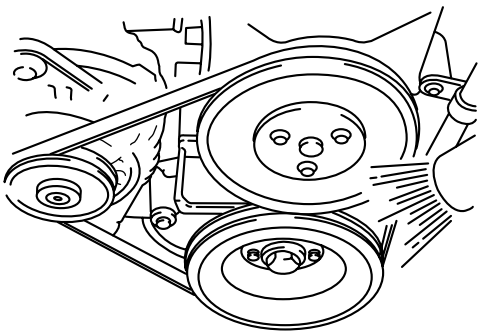
1. Apply parking brake.
2. Warm up engine to normal operating temperature.
3. Turn OFF all electrical loads.
4. Connect timing light to number one spark plug wire.

NOTE

A rubber inspection plug has been provided in the plastic coil cover(center of the cylinder head cover) directly over the number one (1) spark plug wire. Remove the inspection plug and connect the inductive pick-up of your tachometer or timing light to the number one (1) spark plug wire. If your tachometer/timing light inductive pick-up is too large, the coil cover will have to be removed.

5. Verify that ignition timing marks on crankshaft pulley and timing mark on timing belt cover are aligned.

Ignition timing: BTDC 8° ± 5° (at idle speed)
(BTDC 6° ± 5° : A5D for Europe)



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NOTE

Ignition timing is not adjustable.

6. If timing is not within the specified range, replace the ECM.

IDLE SPEED

1. Apply parking brake.
2. Warm up the engine to normal operating temperature.
3. Turn OFF all electrical loads.
4. Connect inductive tachometer to number one (1) spark plug wire or connect tachometer pick-up lead to terminal 'O' in the data link connector (DLC). In case of using scan tool connect Hi-scan pro to the DLC.

NOTE

The base idle speed is not adjustable. The idle speed is automatically controlled by the engine control module. Incorrect idle speed indicates a potential problem with the IAC system or an intake manifold leak.

5. Check that idle speed is within specified range.

Idle speed (transaxle in "NEUTRAL") : 750 ± 50 rpm

NOTE

This is a "wasted spark" ignition system, some tachometers will indicate twice the actual engine speed.

6. Disconnect tachometer from DLC or spark plug wire.
7. Turn off engine.

MFI CONTROL SYSTEM

ENGINE CONTROL COMPONENTS EEEA25DEC

The Engine Control Module (ECM) operates the fuel system. It regulates ignition timing, air fuel ration, emission control devices, charging system, idle speed control, air conditioning clutch engagement, etc. The ECM has the ability to adapt to changing operating conditions.
The ECM receives input signals from various switches and sensors. Based on these inputs, the ECM regulates various engine and vehicle operations through different system components also known as ECM Outputs. On the other hand, the sensors and switches that provide inputs to the ECM are ECM Inputs. For example, the ECM adjusts ignition timing based upon inputs it receives from sensors that react to: engine RPM, engine coolant temperature, throttle position, transaxle gear, vehicle speed, etc. The ECM adjusts idle speed based on inputs it receives from sensors that react to: throttle position, vehicle speed, transaxle gear, etc.

Mass air flow sensor
The Mass Air Flow (MAF) Sensor is the most direct method of measuring engine load because it measures the mass of air intake. This is also known as a "hot-wire" sensor because it depends on the measurement of current flowing through heated wires to measure air flow. The hot wire is heated to specific temperature differential above incoming air. Two wires inside the MAF Sensors are exposed to a portion of the airflow entering the engine:
The ambient temperature wire or "cold wire" isn't heated so this wire is the temperature of the surrounding air and serves as the reference temperature. The hot wire is heated by the MAF to be a certain amount above the ambient air. As soonas air flows over the wire, both wires are cooled. The control circuits then apply more voltage to keep the hot wire atthe original temperature differential. This creates a voltage signal monitored by the ECM. The greater the air flow andwire cooling, the greater the signal.

Engine coolant temperature sensor
The Engine Coolant Temperature (ECT) Sensor provides an input voltage to the ECM relating to coolant temperature. The ECM uses this input signal along with inputs from other sensors to determine injector pulse width and ignition timing. As coolant temperature varies the ECT Sensor's resistance changes. The change in resistance results in a different input voltage to the ECM. When the engine is cold, the ECM will operate in Open Loop cycle. It will demand slightly richer air/fuel mixtures and higher idle speeds until normal temperatures are reached.

Throttle position sensor
The Throttle Position (TP) Sensor is a variable resistor that provides the ECM with an input signal (voltage) that represents throttle blade position. The sensor is connected to the throttle blade shaft. As the position of the throttle blade changes, the resistance of the TP Sensor changes. The ECM supplies a 5V reference voltage to the TP Sensor. The TP Sensor output voltage (input signal to the ECM) represents the throttle blade position. This will usually vary from around 0.25V at minimum throttle opening, to around 4.7V at wide open throttle.

Crankshaft position sensor
The Crankshaft Position (CKP) Sensor is used to signal the ECM when a spark and/or fuel injection event required. The output from this sensor, in conjunction with the Camshaft Position Sensor signal, is used to determine whether spark or fuel is required in a particular cylinder. The engine will not start without a CKP Sensor signal to the ECM. Refer to section EE for more information.

Camshaft position sensor
The Camshaft Position (CMP) Sensor works with the CKP Sensor to provide inputs to the ECM to establish and maintain correct injector firing order. Refer to section EE for more information.

Knock sensor
The Knock Sensor is a feedback signal used to control of ignition timing. When knocking occurs, the Knock Sensor sends the signal to the ECM. The ECM then retards the ignition timing to reduce or eliminate the knock.

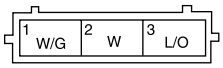
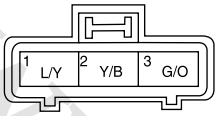
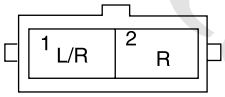
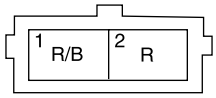
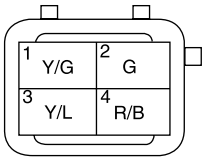
Intake air temperature sensor
This sensor measures the temperature of the intake air and converts its charge into a resistance through t a thermister similar to the ECT Sensor. By monitoring the IAT Sensor, the ECM detects the intake air temperature and use it as one ofthe signals to control fuel injectors and ignition timing.

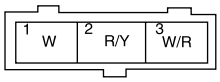
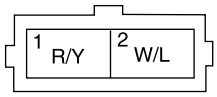
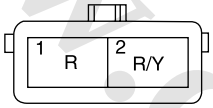
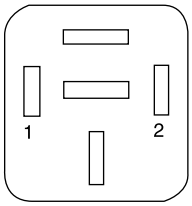
HO2 (Oxygen) sensor
Two heated O2 Sensors are used in the vehicle. The sensors produce voltages from 0 to 1 volt, depending upon the oxygen content of the exhaust has in the exhaust manifold. When a large amount of oxygen is present (caused by a lean air/fuel mixture), the sensors produce a low voltage. When there is a lesser amount (rich air/fuel mixture) the sensors produce ahigher voltage. By monitoring the oxygen content and converting it to electrical voltage, the sensors act as a rich-lean switch. Both HO2 Sensors are equipped with a heating element that keeps the sensors at proper operating temperature during all modes of operation. Maintaining correct sensor temperature at all times allows the system to enter into closed loop operation faster and allows the system to remain in closed loop during periods of extended idle.

Front HO2 sensor
The front (upstream) HO2 Sensor is located in the exhaust downpipe after the TWC and provides an input voltage to the ECM. The input tells the ECM the oxygen content of the exhaust gas. The ECM uses this information to fine tune the air/fuel ratio by adjusting injector pulse width.

ON-VEHICLE SERVICE EEC3BECE2

INSPECTION

Component	Connector	Terminal	Normal Ranges
TPS (Throttle Position Sensor)	 BF2C975A	1-2 1-3 1-3	1.6~2.4Ω 0.71~1.38kΩ at close throttle 2.2~3.4kΩ at wide open terminal 1 : ground terminal 2 : power terminal 3 : signal
ECT (Engine Coolant Temperature sensor)	 BF2C975B	1-3 1-3 1-3	14.6~17.8kΩ at -4°F(-20°C) 2.2~2.7kΩ at 68°F(20°C) 0.29~0.35kΩ at 176°F(80°C)
ATS (Air Temperature Sensor)	 BF2C975C	1-2 1-2 1-2	14.6~17.8kΩ at -4°F(-20°C) 2.2~2.7kΩ at 68°F(20°C) 0.29~0.35kΩ at 176°F(80°C)
INJECTOR	 BF2C975D	1-2	13.5~15.5Ω at 68°F (20°C)
O2 Sensor	 BF2C975E	2-4	Whole sensor is in a temperature chamber without heater power 3~7Ω at 68°F(20°C)

Component	Connector	Terminal	Normal Ranges
ISC (Idle Speed Control)	 BF2C975F	2-3 1-2	16.5~18.5kΩ at 68°F(20°C) 14.5~16.5kΩ at 68°F(20°C) terminal 1 : closing coil terminal 2 : power supply (12V) terminal 3 : opening coil
CPSV (Canister Purge control Valve)	 BF2C975G	1-2	24~28Ω at 68°F(20°C)
CCV (Canister Close valve)	 BF2C975H	1-2	23.0~26.0Ω at 68°F(20°C)
POWER RELAY	 BF2C975I	1-2	80~90Ω at 68°F(20°C)

MAF SENSOR

REMOVAL EE8AA7199

NOTE

Do not drop or subject the sensor to shock.
Do not put objects inside the sensor.

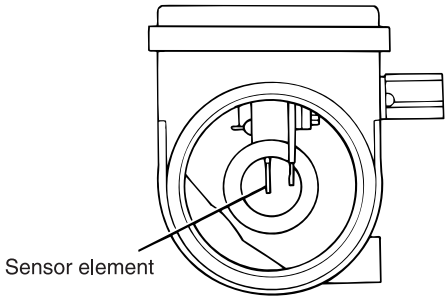
1. Disconnect mass air flow sensor connector.
2. Loosen air intake hose retaining clamps on both sides of mass air flow sensor.
3. Disconnect air intake hose from mass air flow sensor.
4. Remove two bolts attaching mass air flow sensor to mounting bracket.
5. Remove mass air flow sensor.

INSPECTION EE9179DA4

1. Attach mass air flow sensor to air intake hose and to mounting bracket.
2. Replace two bolts to retain mass air flow sensor to mounting bracket.

Tightening Torque: 69~96.3 lb·in (7.8~10.8 N·m, 0.8~1kg·m)

3. Reconnect air intake hose to the mass air flow sensor.
4. Tighten bolts of retaining clamps on both sides of mass air flow sensor.
5. Reconnect mass air flow sensor connector to sensor.



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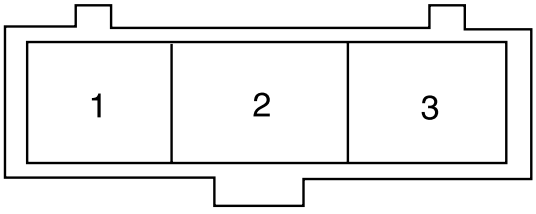
6. Warm up engine to normal operating temperature and let engine idle.
7. Connect voltmeter between terminal 2 (G/L) and ground.
8. Verify that the voltage varies between 0.6V~0.8V.
9. Rev up engine and verify that voltage varies between 3.0V~4.0V.
10. If voltage is not within specification, replace mass air flow sensor.



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KNOCK SENSOR (KS)

INSPECTION EE2CADF1F

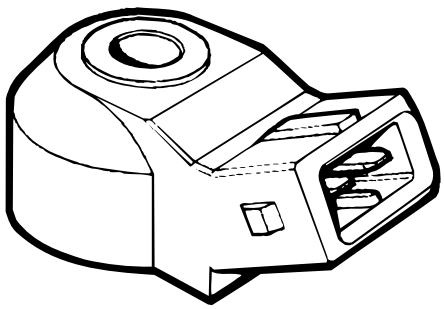
1. Disconnect knock sensor connector and remove knock sensor from vehicle. Mount knock sensor in the jaws of a bench vise and connect a voltmeter between terminals 1 and 2.
2. Wrap on the bench vise sharply with a hammer and observe voltmeter.
3. Verify that a voltage spike (less than 1V) is output from the knock sensor.
4. If no voltage spike is observed, replace the knock sensor.

REMOVAL EE349E324

1. Remove intake manifold support bracket.
2. Disconnect wire harness.
3. Loosen bolt and remove sensor.

INSTALLATION EE44EF8C9

1. Install sensor and tighten bolt.
2. Install wire harness.
3. Reinstall intake manifold support bracket.



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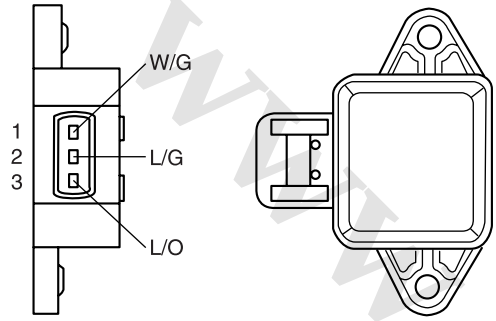
THROTTLE POSITION (TP) SENSOR

INSPECTION EEDD41C5C

1. Disconnect connector from throttle position sensor.
2. Connect ohmmeter between sensor terminals 1 and 2.
3. Verify that resistance increases linearly according to throttle angle.



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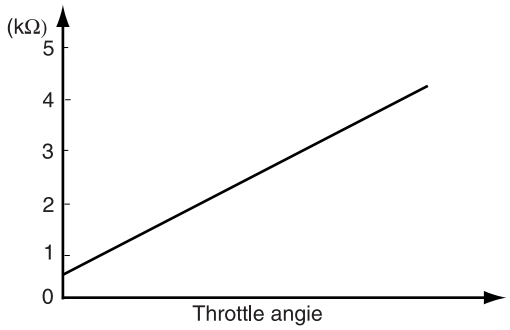
Specification: 1.6~2.4kΩ(with throttle valve closed)

4. If resistance is not as specified, replace the throttle position sensor.
5. Connect throttle position sensor connector.



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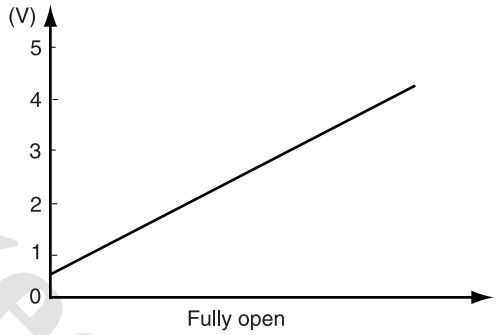
VOLTAGE INSPECTION

1. Verify that throttle is at the closed throttle position.
2. Turn ignition switch ON (engine OFF).
3. Connect voltmeter between terminals 2(L/G) and 1(W/G) on throttle position sensor connector. Check for 5V reference voltage.
4. Connect the voltmeter between terminal 1(W/G) and terminal 3(L/O) on the TPS connector.
5. Measure the voltage at the fully open and fully closed position.
6. If not as specified, replace throttle position sensor.

SPECIFICATION :

Measuring condition	Voltage (V)
Fully closed	0.2~0.8V
Fully open	4.0~4.8V



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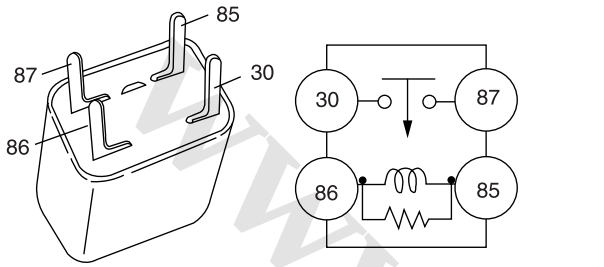
MAIN RELAY

INSPECTION EEF0A06DB

1. Remove cover from main fuse block.
2. Place a finger on main relay.
3. Verify that relay clicks when ignition switch is turned ON.



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4. Verify that main relay clicks when ignition switch is turned ON and OFF.
5. Apply battery voltage (B+) to terminal 85 and ground terminal 86 of the relay.
6. Check continuity of relay as shown.

Terminals	B+ applied	B+ not applied
30 - 87	Continuity	No continuity

7. If not as specified, replace main relay.
8. Turn ignition switch OFF.
9. Replace the cover on main fuse block.

PUMP RELAY

FUEL PUMP RELAY INSPECTION EEB24DF66

CHECK OPERATION

WARNING

The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnectingany fuel line to reduce the chance of personal injury or fire damage to vehicle components.

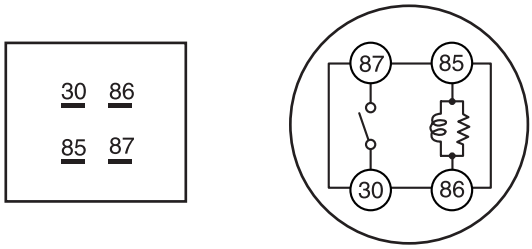
Listen for fuel pump relay clicking as ignition switch is turned "ON".

CONTINUITY INSPECTION

Check continuity between relay terminals.

B+: Battery positive voltage

Terminal 85-86	Terminal 87-30
Apply B+ and ground	Continuity
B+ and ground not applied	No continuity



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OXYGEN SENSOR (O2S)

INSPECTION OF TERMINAL VOLTAGE FOR FRONT & REAR HEATED OXYGEN SENSOR EEA2D1A1A

1. Warm up the engine to normal operating temperature.
2. Run engine at idle speed.
3. Connect a voltmeter between terminal 1 (LG/R) and ground.
4. Increase and decrease engine speed quickly several times.
5. Verify that meter reading varies between 0~1.0V.

NOTE

Rear oxygen sensor voltage does not fluctuate as quickly as front oxygen sensor.

6. If not as specified, inspect:
   - On-board diagnostic system
   - System inspection
   - Intake manifold vacuum
   - Fuel line pressure
7. If all systems are normal, replace the heated oxygen sensor.

INSPECTION OF FRONT & REAR HEATED OXYGEN SENSOR HEATERS

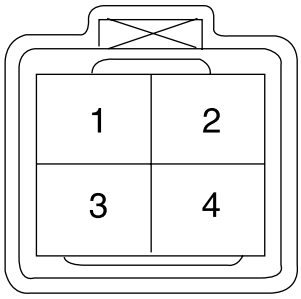
1. Ensure ignition switch is OFF.
2. Disconnect heated oxygen sensor connector.
3. Connect ohmmeter between terminals 1 and 3 and measure resistance.

Specification: Approx. 3~7Ω(68°F{20°C})

4. If not as specified, replace heated oxygen sensor.

Tightening Torque: 22-36 lb·ft(30~49 N·m, 3~5 kg·m)

5. Reconnect heated oxygen sensor connector.



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REMOVAL EEEFD6D22

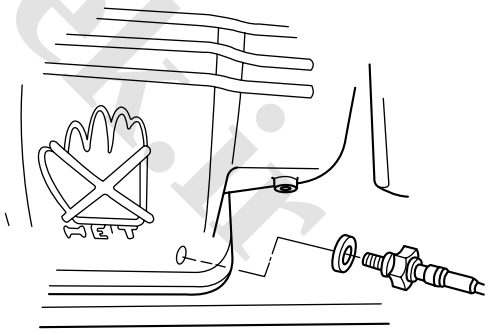
1. Disconnect heated oxygen sensor connector.
2. With standard oxygen sensor socket, remove heated oxygen sensor and washer.

INSTALLATION EEF0381C7

1. Install heated oxygen sensor and washer.

Tightening Torque:22-36 lb·ft(30~49 N·m, 3~5 kg·m)

2. Reconnect heated oxygen sensor connector.



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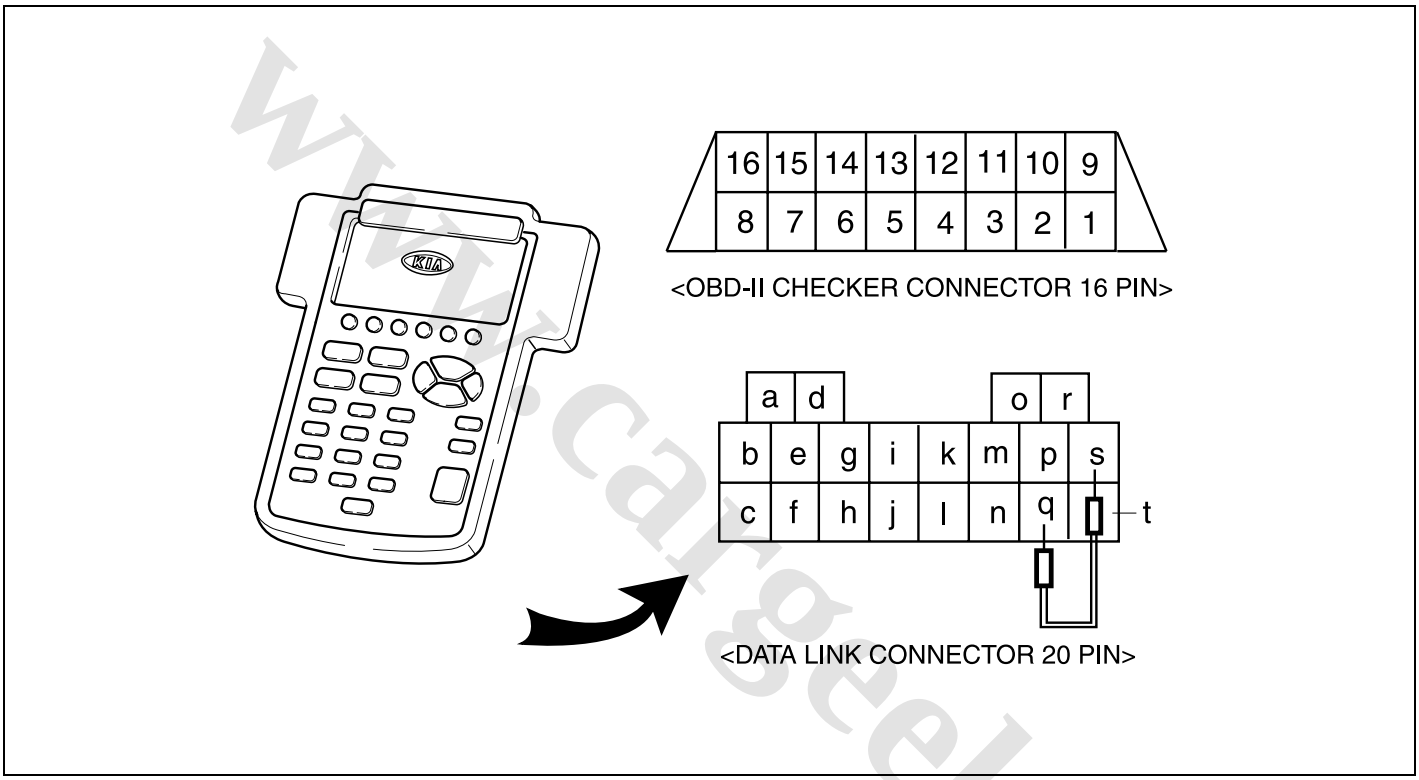
DIAGNOSIS

DIAGNOSTIC TROUBLE CODES RETRIEVAL PROCEDURE EEA4CBAA6

1. Connect the Hi-scan pro to the Data Link Connector (DLC).
2. Turn the ignition switch ON.
3. Retrieve any DTC in ECM memory.

CLEARING DIAGNOSTIC TROUBLE CODES

1. Connect the Hi-scan pro to the Data Link Connector(DLC).
2. Turn the ignition switch ON.
3. Erase any DTC stored in ECM.



LF2D001K

DATA LINK CONNECTOR 20 PIN LAYOUT

PIN NO.	TERMINAL FUNCTION
a	Fuel pump test
b	Power supply (B+)
d	Cooling fan test
f	Air bag unit
h	ABS unit
k	Communication diagnosis terminals for Hi-scan pro (K-Line)
m	Fail code output terminal for A/T vehicle
n	Test ground for A/T vehicle
o	Power supply for IG ON
p	Engine fail code output terminal
q	Spark plug timing adjust
r	Ground
s	Ground
t	Engine monitor terminal

DATA LINK CONNECTOR 16 PIN LAYOUT

PIN NO.	TERMINAL FUNCTION
4	Ground
5	Ground
7	Communication diagnosis terminal (K-Line)
16	Power supply (ECU 10A)

ECM TERMINAL VOLTAGE EE6AF369E

CONNECTOR B-01

Terminal	Signal	Connected to	Test condition	Voltage
9	Power input	Ignition switch	Key ON	B+
8	Power input	Ignition switch	Key ON	B+
1	Ignition input	Ignition switch	Key ON	B+
4	Ground	Ground	Constant	<0.5V
6	Ground	Ground	Constant	<0.5V
5	Ground	Ground	Constant	<0.5V
3	Diagnosis K-line	Data link connector	-	-
7	Power	Battery	Constant	B+

CONNECTOR B-02 (EUROPE ONLY)

Terminal	Signal	Connected to	Test condition	Voltage
18	Wheel speed sensor input	Wheel speed sensor	Wheel stop	0V or 5V
			Wheel rolling	1~2V (wave)
12	Wheel speed sensor ground	Wheel speed sensor	Constant	<1V
17	HO2S down input	HO2S down	Key ON/ENG OFF	0.4V
			Idle	0~1V
11	HO2S down ground	HO2S down	Constant	B+
19	HO2S down heater	HO2S down	Key ON/ENG OFF	B+
			Idle	O~B+

CONNECTOR B-03

Terminal	Signal	Connected to	Test condition	Voltage
47	Fuel injection valve control	Fuel injector No. 2	Key ON/ENG OFF	B+
			Idle	B+
48	Fuel injection valve control	Fuel injector No. 4	Key ON/ENG OFF	B+
			Idle	B+
49	Fuel injection valve control	Fuel injector No. 1	Key ON/ENG OFF	B+
			Idle	B+
50	Fuel injection valve control	Fuel injector No. 3	Key ON/ENG OFF	B+
			Idle	B+
31	Engine RPM signal output	Instrument cluster	Key ON/ENG OFF	B+
			Idle	6-7V(duty 45~50%)
28	TPS signal output	Transaxle control module	Key ON(throttle valve close)	1-2V(duty 8~12%)
			Key ON(throttle valve open)	9-12V(duty 88~90%)

Terminal	Signal	Connected to	Test condition	Voltage
27	Torque signal output	Transaxle control module	Idle	1-2V(duty 8~12%)
15	TPS voltage	TPS	Key ON	5V
42	EVAP purge solenoid valve	EVAP purge solenoid valve	Key ON/ENG OFF	B+
			Idle	10-12V(duty)
44	ISC valve output control (closing)	ISC valve	Key ON/ENG OFF	6-7V(duty 42~52%)
			Idle	9-10V(duty 60~70%)
43	ISC valve output control (opening)	ISC valve	Key ON/ENG OFF	7-8V(duty 50~60%)
			Idle	4-6V(duty 30~40%)
20	Knock sensor shield	Knock sensor	Constant	1V
33	Knock sensor ground	Knock sensor	Constant	<0.5V
46	Knock sensor input	Knock sensor	Key ON	2-3V
36*2	MAF sensor input	MAF sensor	Key ON	0.5V
			Idle	0.6-0.8V
23*2	MAF sensor ground	MAF sensor	Constant	<1V
			Idle	0-B+
35	HO2S up input	HO2S up	Key ON/ENG OFF	0.4V
			Idle	0-1V
22	HO2S up ground	HO2S up	Constant	<1V
40	HO2S up heater control	HO2S up	Key ON/ENG OFF	B+
			Idle	6-8V(duty 48~52%)
36*1	MAP sensor input	MAP sensor	Key ON	0.5V
			Idle	0.5-1.5V
23*1	MAP sensor ground	MAP sensor	Constant	<1V
			Idle	0~B+
16*1	Power output	Tank pressure sensor	Key ON	5V

*1 : Except for Europe
*2 : Only Europe

CONNECTOR B-04

Terminal	Signal	Connected to	Test condition	Voltage
33	Cooling fan relay control	Cooling fan relay	Key ON/cooling fan non-operation	B+
			Key ON/cooling fan operation	<1V
36	A/C relay control	A/C relay	A/C non-operation	B+
			A/C operation	<1V
23	DPS signal input	DPS	A/C non-operation	B+
			A/C operation	<1V
24	A/C switch signal input	A/C switch	A/C switch ON	B+
			A/C switch OFF	<1V
25	Power steering switch input	Power steering switch	Key ON/switch operation	<1V
			Key ON/switch non-operation	B+
37	MIL control	MIL (instrument cluster)	Key ON/ENG OFF	<1V
			Idle (DTC non-present)	B+
			Idle (DTC present)	<1V
30	Park/Neutral signal input	Transaxle control module	Key ON (P/N range)	<1V
			Key ON (other range)	B+
26	Headlight switch signal input	Headlight switch	Key ON/switch HEAD	B+
			Key ON	<1V
34	Main relay control	Main relay	Key ON	<1V
			Key OFF	B+
17	TPS signal input	TPS	Key ON (throttle valve close)	0.2~0.8V
			Key ON (throttle valve open)	4.0~4.8V
7	TPS ground	TPS	Constant	<1V
18	Camshaft position sensor signal input	Camshaft position sensor	Key ON/ENG OFF	0V or 5V
			Idle	2-3V (duty 40~50%)
8	Camshaft position sensor ground	Camshaft position sensor	Constant	<1V
11*2	Intake air temperature sensor signal input	Intake air temperature sensor	Key ON/ENG OFF (at 20℃)	1-4V
1*2	Intake air temperature sensor ground	Intake air temperature sensor	Constant	<1V
35	Fuel pump relay control	Fuel pump	Key ON/ENG OFF	B+
			Idle	<1V
20	Crankshaft position sensor signal input	Crankshaft position sensor	Key ON/ENG OFF	<0.5V
			Idle	2-3V(duty 40~50%)

Terminal	Signal	Connected to	Test condition	Voltage
10	Crankshaft position sensor ground	Crankshaft position sensor	Constant	<1V
29	Torque reduction control	Transaxle control module	-	9-10V
15	Engine coolant temperature signal input	Engine coolant temperature	Key ON/ENG OFF (at 80°C)	1-2V
5	Engine coolant temperature ground	Engine coolant temperature	Constant	<1V
27*2	TCU MIL signal input	Transaxle control module	TCU fault code	B+ (duty)
11*1	Air temperature signal input	MAP sensor	Key ON/ENG OFF (at 20°C)	1-4V
22*1	Vehicle speed sensor input	Vehicle speed sensor	Vehicle stop	0V/5V
			Vehicle rolling	2-3V

*1 : Except for Europe
*2 : Only Europe

CONNECTOR B-05

Terminal	Signal	Connected to	Test condition	Voltage
4	Ignition coil control	Ignition coil (cylinder no.1&4)	Key ON/ENG OFF	B+
			Idle	B+(pulse)
6	Ignition coil control	Ignition coil (cylinder no.2&3)	Key ON/ENG OFF	B+
			Idle	B+(pluse)

DIAGNOSTIC TROUBLE CODE(EXCEPT FOR EUROPE) EE67F1C3D

DTC	CONTENT	MIL
P0107	Manifold absolute circuit malfunction	O
P0108	Manifold absolute circuit range/performance problem	O
P0112	Intake air temperature circuit low input	▲
P0113	Intake air temperature circuit high input	▲
P0117	Engine coolant temperature circuit low input	O
P0118	Engine coolant temperature circuit high input	O
P0122	Throttle position sensor circuit low input	O
P0123	Throttle position sensor circuit high input	O
P0131	Heated O2 sensor circuit low input (bank 1, sensor1)	▲
P0132	Heated O2 sensor circuit high input (bank 1, sensor1)	▲
P0135	Heated O2 sensor heater current malfunction (bank 1, sensor1)	▲
P0201	Cylinder 1 injector circuit malfunction	O
P0202	Cylinder 2 injector circuit malfunction	O
P0203	Cylinder 3 injector circuit malfunction	O
P0204	Cylinder 4 injector circuit malfunction	O
P0325	Knock sensor circuit malfunction	▲
P0335	Crankshaft position (CKP) sensor circuit malfunction	▲
P0340	Camshaft position (CMP) sensor circuit malfunction	▲
P0440	Evaporative emission control system purge control valve circuit malfunction	O
P0501	Vehicle speed sensor circuit range/performance problem	▲
P0606	ECU self test failed	▲
P1505	Idle control valve opening signal low	O
P1506	Idle control valve opening signal high	O
P1507	Idle control valve closing signal low	O
P1508	Idle control valve closing signal high	O

O : Fault code memory and MIL ON
▲ : Fault code memory and MIL OFF

DIAGNOSTIC TROUBLE CODE(FFOR EUROPE)

DTC	CONTENT	MIL
P0101	Mass or Volume Air Flow Circuit Range/Performance Problem	O
P0102	Mass or Volume Air Flow Circuit Low Input	O
P0103	Mass or Volume Air Flow Circuit High Input	O
P0112	Intake Air Temperature Circuit Low Input	O
P0113	Intake Air Temperature Circuit High Input	O
P0116	Enigne Coolant Temperature Circuit Range/Performance Problem	O
P0117	Enigne Coolant Temperature Circuit Low Input	O
P0118	Enigne Coolant Temperature Circuit High Input	O
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	O
P0121	Throttle Position Sensor Circuit Range/Performance Problem	O
P0122	Throttle Position Sensor Circuit Low Input	O
P0123	Throttle Position Sensor Circuit High Input	O
P0130	HO2S Circuit Malfunction (Bank 1, Sensor 1)	O
P0131	HO2S Circuit Low Voltage (Bank 1, Sensor 1)	O
P0132	HO2S Circuit High Voltage (Bank 1, Sensor 1)	O
P0133	HO2S Circuit Slow Responsive (Bank 1, Sensor 1)	O
P0134	HO2S Circuit No Activity Detected (Bank 1, Sensor 1)	O
P0030	HO2S Heater Circuit Malfunction (Bank 1, Sensor 1)	O
P0031	HO2S Heater Circuit Low Input (Bank 1, Sensor 1)	O
P0032	HO2S Heater Circuit High Input (Bank 1, Sensor 1)	O
P0136	HO2S Circuit Malfunction (Bank 1, Sensor 2)	O
P0137	HO2S Circuit Low Input (Bank 1, Sensor 2)	O
P0138	HO2S Circuit High Input (Bank 1, Sensor 2)	O
P0139	HO2S Circuit Slow Responsive (Sensor 2)	O
P0140	HO2S Circuit No Activity Detected (Sensor 2)	O
P0036	HO2S Heater Circuit Malfunction (Bank 1, Sensor 2)	O
P0037	HO2S Heater Circuit Low Input (Bank 1, Sensor 2)	O
P0038	HO2S Heater Circuit High Input (Bank 1, Sensor 2)	O
P0171	Fuel System Too Lean	O
P0172	Fuel System Too Rich	O
P0261	Cylinder 1 - Injector Circuit Low Input	O
P0264	Cylinder 2 - Injector Circuit Low Input	O
P0267	Cylinder 3 - Injector Circuit Low Input	O
P0270	Cylinder 4 - Injector Circuit Low Input	O
P0262	Cylinder 1 - Injector Circuit High Input	O
P0265	Cylinder 2 - Injector Circuit High Input	O
P0268	Cylinder 3 - Injector Circuit High Input	O

DTC	CONTENT	MIL
P0271	Cylinder 4 - Injector Circuit High Input	O
P0300	Random Misfire Detected	O
P0301	Cylinder 1 - Misfire Detected	O
P0302	Cylinder 2 - Misfire Detected	O
P0303	Cylinder 3 - Misfire Detected	O
P0304	Cylinder 4 - Misfire Detected	O
P0325	Knock Sensor Circuit Malfunction	O
P0335	Crankshaft Position Sensor Circuit Malfunction	O
P0340	Camshaft Position Sensor Circuit Malfunction	O
P0420	Main Catalyst System Efficiency Below Threshold (Bank 1)	O
P0444	EVAP Emission Control System - Purge Control Valve Circuit Open	O
P0445	EVAP Emission Control System - Purge Control Valve Circuit Shorted	O
P0501	Vehicle Speed Sensor Range/Performance	O
P0506	Idle Control System RPM Lower Than Expected	O
P0507	Idle Control System RPM Higher Than Expected	O
P0560	System Voltage Malfunction	O
P0562	System Voltage Low Input	O
P0563	System Voltage High Input	O
P0605	Internal Control Module ROM Error (ECM-Selftest Failed)	O
P1166	Lambda bank control limit	O
P1505	Idle Air Control Valve Opening Coil Signal Low Input	O
P1506	Idle Air Control Valve Opening Coil Signal High Input	O
P1507	Idle Air Control Valve Closing Coil Signal Low Input	O
P1508	Idle Air Control Valve closing Coil Signal High Input	O
P1586	AT/MT Encoding Malfunction	O
P1600	VIM Communication Malfunction	▲
P1611	No Answer From Immobilizer	▲
P1612	Plausibility Check Communication (Mismatched Code)	▲
P1529	TCU Request for MIL ON/Freeze Frame to ECM via CAN	O
P1693	MIL Request Circuit Malfunction	O

O : Fault code memory and MIL ON
▲ : Fault code memory and MIL OFF

TROUBLESHOOTING

DIAGNOSTIC TROUBLE CODE TABLE(EUROPE)

DTC	Diagnostic items	Trouble area	MIL
P0101	Mass or Volume Air Flow Circuit Range/Performance Problem	• Dirty air cleaner • Air leak in intake system • Vacuum leak in intake system • Improper PCV valve • Contaminated, deteriorated or damaged MAFS • Faulty MAFS or TPS • Poor connections at ECM, MAFS, or TPS	O
P0102	Mass or Volume Air Flow Circuit Low Input	• Open or short to ground between MAFS signal and ECM • Open or short to ground between MAFS reference power and main relay • Faulty MAFS	O
P0103	Mass or Volume Air Flow Circuit High Input	• Short to battery between MAFS signal and ECM • Open between MAFS ground and ECM • Faulty MAFS	O
P0112	Intake Air Temperature Circuit Low Input	• Short to ground between IATS signal and ECM • Faulty IATS	O
P0113	Intake Air Temperature Circuit High Input	• Open or short to battery between IATS signal and ECM • Open between IATS ground and ECM • Faulty IATS	O
P0116	Engine Coolant Temperature Sensor Circuit Range/Performance Problem	• After engine start-up, the elapsed time before feedback operation is initiated is too long (engine coolant temperature sensor input is insufficient for closed loop operation) • Poor connections between ECTS and ECM • Misplaced, loose or corroded terminals • Foreign materials fouled, contaminated, deteriorated ECTS • Faulty ECTS • Faulty thermostat	O
P0117	Engine Coolant Temperature Circuit Low Input	• Short to ground between ECTS signal and ECM • Faulty ECTS	O
P0118	Engine Coolant Temperature Circuit High Input	• Open or short to battery between ECTS signal and ECM • Open between ECTS ground and ECM • Faulty ECTS	O
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	• After engine start-up, the elapsed time before feedback operation is initiated is too long (engine coolant temperature sensor input is insufficient for closed loop operation) • Poor connections between ECTS and ECM • Misplaced, loose or corroded terminals • Foreign materials fouled, contaminated, deteriorated ECTS • Faulty ECTS • Faulty thermostat	O

DTC	Diagnostic items	Trouble area	MIL
P0121	Throttle Position Sensor Circuit Range/Performance Problem	• Poor connections between TPS and ECM • Misplaced, loose or corrodes terminals • Contaminated, deteriorated TPS • Faulty TPS	O
P0122	Throttle Position Sensor Circuit Low Input	• Open or short to ground between TPS reference power and ECM • Short to ground between TPS signal and ECM • Faulty TPS	O
P0123	Throttle Position Sensor Circuit High Input	• Open or short to battery between TPS signal and ECM • Open between TPS ground and ECM • Faulty TPS	O
P0130	HO2S Circuit Malfunction (Bank 1, Sensor 1)	• Open or short to battery between front HO2S and ECM • Short to ground between front HO2S and ECM • Short between front HO2S wires • Faulty front HO2S • Poor connections between front HO2S and ECM • Misplaced, bent, loose or corroded connector terminals	O
P0131	HO2S Circuit Low Input (Bank 1, Sensor 1)	• Short to ground between front HO2S signal and ECM • Faulty front HO2S	O
P0132	HO2S Circuit High Input (Bank 1, Sensor 1)	• Open or short to battery between front HO2S signal and ECM • Faulty front HO2S	O
P0133	HO2S Circuit Slow Responsive (Bank 1, Sensor 1)	• Abnormal combustion • Improper fuel pressure • Front and rear HO2S connections reversed • Faulty fuel delivery system • Leak in intake system • Leak in exhaust system • Faulty front HO2S	O
P0134	HO2S Circuit No Activity Detected (Bank 1, Sensor 1)	• Open or short between HO2S signal terminal and ECM • Contaminated, deteriorated or aged HO2S • Misplaced, bent, loose or corroded connector terminals • Faulty front HO2S	O
P0030	HO2S Heater Circuit Malfunction (Bank 1, Sensor 1)	• Open or short to battery between front HO2S heater and ECM • Short to ground between front HO2S heater and ECM • Open or short to chassis ground between front HO2S heater and main relay • Incorrect front HO2S heater resistance • Faulty front HO2S heater	O
P0031	HO2S Heater Circuit Low Input (Bank 1, Sensor 1)	• Open or short to ground front HO2S heater signal and ECM • Open or short to ground front HO2S heater battery power and main relay • Faulty front HO2S heater	O
P0032	HO2S Heater Circuit High Input (Bank 1, Sensor 1)	• Short to battery between front HO2S heater signal and ECM • Faulty front HO2S	O

DTC	Diagnostic items	Trouble area	MIL
P0136	HO2S Circuit Malfunction (Bank 1, Sensor 2)	• Open or short to chassis ground between rear HO2S and ECM • Short to battery between rear HO2S and ECM • Short between rear HO2S wires • Misplaced, bent, loose or corroded connector terminals • Faulty rear HO2S	O
P0137	HO2S Circuit Low Input (Bank 1, Sensor 2)	• Short to ground between rear HO2S signal and ECM • Faulty rear HO2S	O
P0138	HO2S Circuit High Input (Bank 1, Sensor 2)	• Open or short to battery between rear HO2S signal and ECM • Faulty rear HO2S	O
P0139	HO2S Circuit Slow Responsive (Bank 1, Sensor 2)	• Abnormal combustion • Improper fuel pressure • Front and rear HO2S connections reversed • Faulty fuel delivery system • Leak in intake system • Leak in exhaust system • Faulty rear HO2S	O
P0140	HO2S Circuit No Activity Detected (Bank 1, Sensor 2)	• Open or short between rear HO2S signal terminal and ECM • Contaminated, deteriorated or aged rear HO2S • Misplaced, bent, loose or corroded connector terminals • Faulty rear HO2S	O
P0036	HO2S Heater Circuit Malfunction (Bank 1, Sensor 2)	• Open or short to battery between rear HO2S heater and ECM • Short to ground between rear HO2S heater and ECM • Open or short to chassis ground between rear HO2S heater and main relay • Incorrect rear HO2S heater resistance • Faulty rear HO2S heater	O
P0037	HO2S Heater Circuit Low Input (Bank 1, Sensor 2)	• Open or short to battery between rear HO2S heater and ECM • Open or short to ground rear HO2S heater battery power and main relay • Faulty rear HO2S heater	O
P0038	HO2S Heater Circuit High Input (Bank 1, Sensor 2)	• Short to battery between rear HO2S heater signal and ECM • Faulty rear HO2S	O
P0171	Fuel System Too Lean (Bank 1)	• Faulty fuel delivery system • Clogged fuel injectors • Faulty fuel injectors • Leak in intake system • Leak in exhaust system • Faulty MAFS • Faulty TPS	O

DTC	Diagnostic items	Trouble area	MIL
P0172	Fuel System Too Rich	• Faulty ignition system • EVAP canister purge valve malfunction • Leak in intake system • Leak in exhaust system • Faulty fuel delivery system - Clogged fuel injectors - Faulty fuel injectors - Fuel pressure too high - Fuel pressure regulator failure • Faulty MAFS • Faulty front HO2S • Faulty TPS	O
P0261	Cylinder 1 Injector Circuit Low Input	• Open or short to ground between main relay and injector • Open or short to ground between ECM and injector • Faulty fuel injector	O
P0262	Cylinder 1 Injector Circuit High Input	• Short to battery between ECM and injector • Faulty fuel injector	O
P0264	Cylinder 2 Injector Circuit Low Input	• Open or short to ground between main relay and injector • Open or short to ground between ECM and injector • Faulty fuel injector	O
P0265	Cylinder 2 Injector Circuit High Input	• Short to battery between ECM and injector • Faulty fuel injector	O
P0267	Cylinder 3 Injector Circuit Low Input	• Open or short to ground between main relay and injector • Open or short to ground between ECM and injector • Faulty fuel injector	O
P0268	Cylinder 3 Injector Circuit High Input	• Short to battery between ECM and injector • Faulty fuel injector	O
P0270	Cylinder 4 Injector Circuit Low Input	• Open or short to ground between main relay and injector • Open or short to ground between ECM and injector • Faulty fuel injector	O
P0271	Cylinder 4 Injector Circuit High Input	• Short to battery between ECM and injector • Faulty fuel injector	O
P0300	Random Misfire Detected	• Vacuum leak in air intake system • CKPS circuit malfunction • Ignition circuit malfunction • Faulty ignition coil or plug wire • Spark plug malfunction • Low compression due to blown head gasket, leaking valve or piston ring • Low/high fuel pressure due to faulty pressure regulator, restricted fuel lines, plugged fuel filter or faulty fuel pump • Fuel injector circuit malfunction • Faulty fuel injector	O
P0301	Cylinder 1 Misfire Detected		O
P0302	Cylinder 2 Misfire Detected		O
P0303	Cylinder 3 Misfire Detected		O
P0304	Cylinder 4 Misfire Detected		O

DTC	Diagnostic items	Trouble area	MIL
P0325	Knock Sensor Circuit Malfunction (Bank 1)	• Open or short to ground between knock sensor and ECM • Source of high resistance between knock sensor and ECM • Faulty knock sensor	O
P0335	Crankshaft Position Sensor Circuit Malfunction	• Open or short to ground between CKPS and ECM • Short to battery between CKPS and ECM • Short between CKPS wires • Out of allowable air gap • Faulty Target wheel tolerance • Faulty CKPS	O
P0340	Camshaft Position Sensor Circuit Malfunction	• Open or short to ground between CMPS and ECM • Short to battery between CMPS and ECM • Short between CMPS wires • Poor connection between CMPS connector & harness connector • Faulty CMPS	O
P0420	Main Catalyst Efficiency Below Threshold (Bank1)	• Manifold(or warm-up) catalytic converter deteriorated	O
P0444	EVAP Emission Control System Purge Control Valve Circuit Open	• Open or short between main relay and purge solenoid valve • Open or short between purge solenoid valve and ECM • Faulty purge solenoid valve	O
P0445	EVAP Emission Control System Purge Control Valve Circuit Short		O
P0501	Vehicle Speed Sensor Circuit Range/Performance	• Open or short to battery between VSS and ECM • Short to ground between VSS and ECM • Open or short between VSS wires • Faulty VSS	O
P0506	Idle Control System RPM Lower Than Expected	• Open or short between main relay and IACV • Open or short between ECM and IACV • Intake system is plugged • Carbon fouled throttle plate • Faulty IACV	O
P0507	Idle Control System RPM Higher than Expected	• Short to ground between IACV and ECM • Air leak in intake system • Improperly adjusted accelerator cable • Faulty IACV • Faulty TPS • Faulty PCV/PSV	O
P0560	System Voltage Malfunction	• Open or short to ground between ECM and battery • Reverse battery cable connection (+/- reverse) • ECM internal faulty • Faulty Alternator	O
P0562	System Voltage Low Input		O
P0563	System Voltage High Input		O
P0605	Internal Control Module ROM Error (ECM-Selttest Failed)	• Internal ECM malfunction	O

DTC	Diagnostic items	Trouble area	MIL
P1166	Lambda bank control limit	• P1166 is case for HO2S (Bank1, Sensor 1) Signal line open • Fuel System (Fuel Tank/Pressure Regulator/Fuel Pump/PSV) Failure • Poor Connection to Fuel Line Hose/ Sealing/Cut • Sealing Between Purge Valve and Fuel Tank • Air Leakage in Exhaust System • Ignition System (Ignition Coil, Spark Plug, Cable) Failure • Surge Tank and Intake Port Failure	O
P1505	Idle Air Control Valve Opening Coil Signal Low Input	• Open or short to ground between IACV and ECM • Faulty IACV	O
P1506	Idle Air Control Valve Opening Coil Signal High Input	• Short to battery between IACV and ECM • Faulty IACV	O
P1507	Idle Air Control Valve Closing Coil Signal Low Input	• Open or short to ground between IACV and ECM • Faulty IACV	O
P1508	Idle Air Control Valve Closing Coil Signal High Input	• Short to battery between IACV and ECM • Faulty IACV	O
P1586	AT/MT Encoding Malfunction	• Poor connection to chassis ground at ECM • Open or short circuit between ECM AT/MT and chassis ground • Normal condition: AT-chassis ground, MT-open	O
P1600	VIM Communication Malfunction	• Open or short between ECM and ICU • Faulty ICU	▲
P1611	No Answer From Immobilizer		▲
P1612	Plausibility Check Communication (Mismatched code)	• Mismatched • Faulty ICU	▲
P1529	TCU Request for MIL ON/Freeze Frame to ECU via CAN	• This is only a request from TCM to turn the MIL ON. The fault code is stored in the TCM. The freeze frame data is storedin the ECM under the P1529 request code. Be sure to retrieve freeze frame data before clearing code P1529 from ECM.	O
P1693	MIL Request Circuit Malfunction	• Open or short to chassis ground between TCM signal and ECM • Short to battery between TCM and ECM • Message timeout from TCM • Faulty TCM	O

O : Fault code memory and MIL ON
▲ : Fault code memory and MIL OFF

SYMPTOM RELATED DIAGNOSTIC PROCEDURE

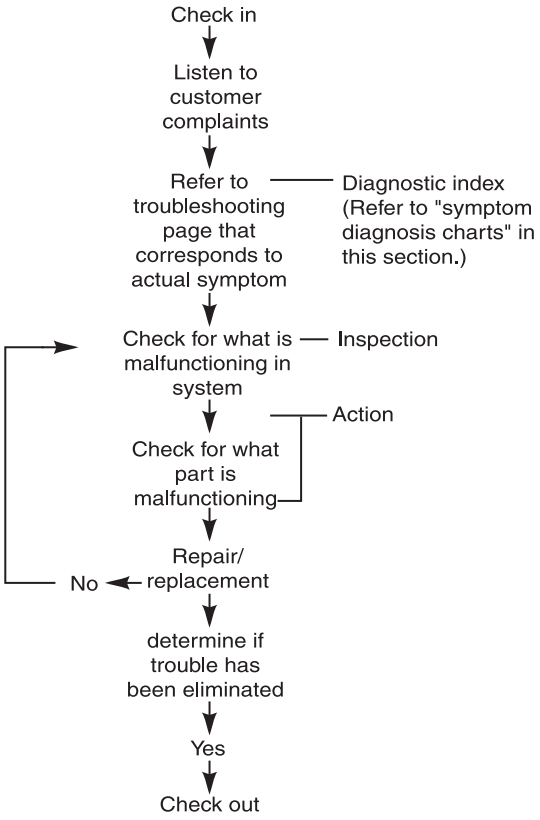
USING THIS SECTION

Introduction

Most of the fuel and emission control system is electrically controlled, often making it difficult to diagnose problems in the system, especially intermittent problems.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer is often a good source of information on such problems, especially intermittent ones. Through talks withthe customer, one can find out what the symptoms are and under what conditions they occur.

WORK FLOW



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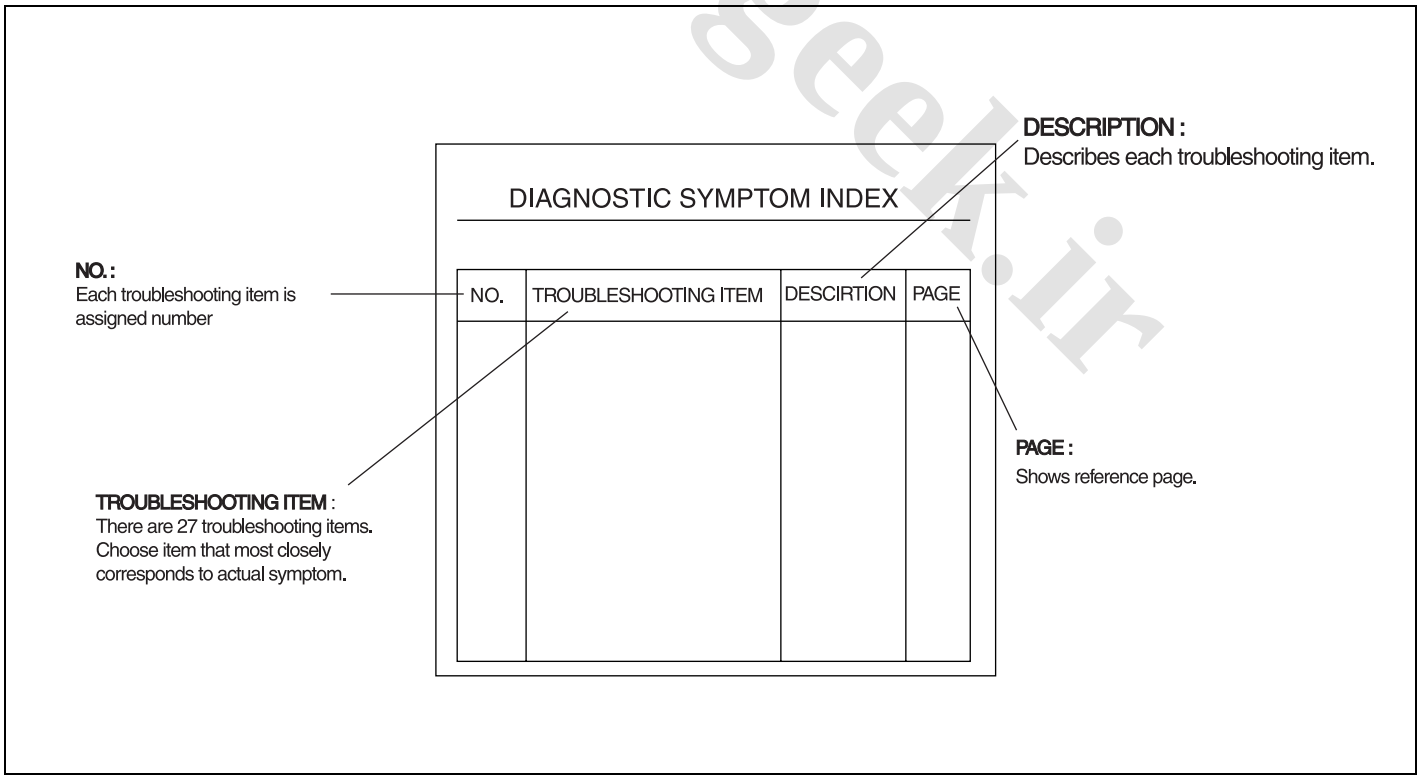
DIAGNOSTIC INDEX



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SYMPTOM DIAGNOSIS CHARTS

Description : Further describes the symptom.
Confirm that the chart addresses the actual symptom before beginning troubleshooting
Troubleshooting hints : This describes the possible point of malfunction.
Step : This shows the order of troubleshooting. Proceed with troubleshooting as indicated.
Check : This describes an inspection to determine the malfunction of parts quickly.
Remedy : This recommends the appropriate action to take as a result (Yes/No) of the check.

DIAGNOSTIC SYMPTOM INDEX

No.	Troubleshooting item		Descriotion
1	Will not crank or cranks slowly		Refer to engine electrical system
2	Cranks normally but will not start	No combustion	Engine cranks at normal speed but shows no sign of firing
3		Partial combustion Engine cold	Engine cranks at normal speed but shows only partial combustion and will not continue to run
4		Partial combustion after warm-up	Engine starts normally when cold, but will not start after running and hot soaked
5	Cranks normally but hard to start	Always	Engine cranks at normal speed but requires excessive cranking time before starting
6		When engine is cold	Same condition as No. 5 after running and cold ; restarts normally after warm-up
7		After warm-up	Same condition as No. 5 after running and hot soaked; starts normally when cold
8	Rough idle (Low idle speed/engine stalls at idle)	Always	Engine stalls or vibrates excessively at idle
9		Before warm-up	Engine stalls or vibrates excessively at idle during warm-up
10		After warm-up	Engine runs normally at idle during warm-up but vibrates excessively or stalls after warm-up
11		When A/C ON	Engine stalls or vibrates excessively at idle when A/C ON
12	Rough idle/engine stalls just after starting		Engine stalls or vibrates excessively only just after starting (acceleration from idle)
13	High idle speed after warm-up		Idle speed excessive after warm-up
14	Idle moves up and down/idle hunting		Engine speeds up and down periodically at idle
15	Engine stalls on deceleration		Engine unexpectedly stops running while decelerating or after deceleration
16	Engine stalls suddenly (intermittent)		Engine intermittently stops running
17	Stumbles/hesitates on acceleration		Flat spot occurs just after accelerator depressed or mild jerking occurs during acceleration
18	Surges while cruising		Unexpected change in engine speed which is usually repetitive
19	Lack of power		Performance poor under load when throttle valve wide open Maximum speed reduced
20	Poor acceleration		Performance poor while accelerating
21	Runs rough on deceleration/backfire		Engine runs rough while decelerating and abnormal combustion occurs in exhaust system
22	Knocking		Abnormal combustion accompanied by audi-ble "pinging" noise
23	Fuel odor		Gasoline odor in cabin
24	High oil consumption		Oil consumption excessive
25	MIL always ON		Hi-scan pro tool does not indicate diagnostic trouble code but MIL always ON
26	MIL always ON		Hi-scan pro tool indicates malfunction
27	A/C does not work		Blower fan operates but magnetic clutch does not operate

DRIVEABILITY DEFINITIONS

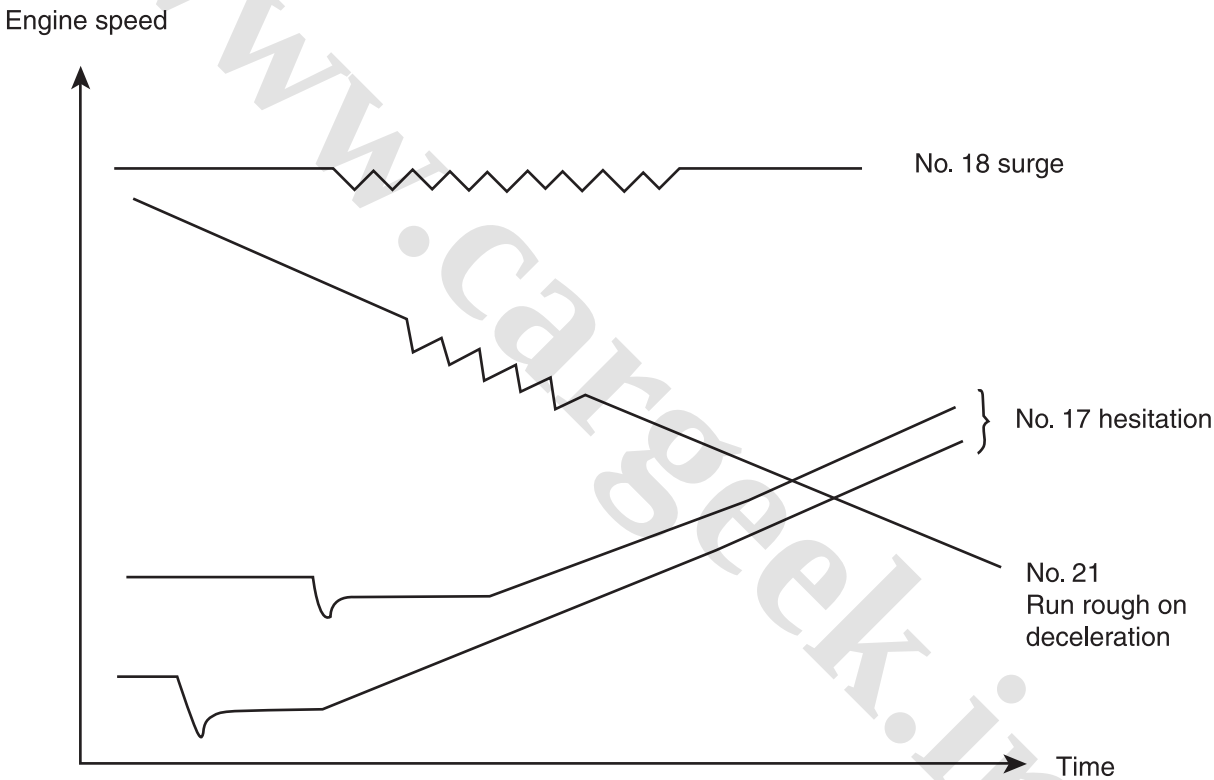
Stumble : Mild jerking during acceleration.
Hesitation : Delay increase in engine speed occurring just after the accelerator pedal is depressed.
Surge : Continuous soft jerking during cruise.

PRECAUTIONS FOR SYMPTOM DIAGNOSIS

Fuel system pressure release

WARNING

The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnectingany fuel line to reduce the chance of personal injury or fire damage to vehicle components. Fuel is explosive. An emptyfuel tank can still contain explosive gases. Supply adequate ventilation to the work area. Do not smoke, and keep sparks and open flames away. Refer to fuel system pressure release procedure.



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SYMPTOM DIAGNOSIS CHART(CRANKS)

2	Cranks normally, but will not start (no combustion)
Description	• Cranks normally, but no combustion • Battery is OK • Throttle valve closed while cranking

(Troubleshooting hint)
No fuel injection to engine because of fuel shortage or no ignition in all cylinders

1. No spark
   - Ignition control malfunction
   - Malfunction of ignition system component

2. No fuel injection
   - Malfunction of fuel pump
   - Malfunction of injector

3. Low fuel line pressure
4. Low engine compression pressure

Step	Inspection		Action
1	Check for a strong blue spark plug with spark plug wire disconnected. Is blue spark present?	Yes	Go to step 5.
		No	Go to next step.
2	Check that malfunction indicator light is illuminated while ignition switch is ON. Does MIL stay on after engine start-up?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
3	Check ignition system. Check resistance of DLI coils. **Primary: approx. 0.6~0.8Ω** **Secondary: 11~15kΩ** Check wiring harness between ECM and DLI coil. Is resistance within specification?	Yes	Go to next step.
		No	Replace ignition coils or repair wiring harness.
4	Check spark plug wires. **Resistance: 4.48~6.72 kΩ/m** Check for damage to spark plug wires. Are spark plug wires OK?	Yes	Go to next step.
		No	Replace spark plug wires.
5	Connect data link connector terminals Fuel pump and B+ with a jumper wire and check operational sound of fuel pump. Does fuel pump operate?	Yes	Check if engine starts on this condition. - Check main relay or wiring harness if engine starts. - Go to step 7 if engine does not start.
		No	Go to next step.
6	Check that battery voltage is applied on R/W wire of fuel pump connector B10 when ignition switch is ON.	Yes	Check continuity of fuel pump (between R/W and B).
		No	Check main relay.
7	Crank engine and check operational sound of injector.	Yes	Go to step 10.
		No	Go to next step.
8	Check that battery voltage is applied to injector connector when engine is running.	Yes	Go to next step.
		No	Check wire between main relay and injector.

Step	Inspection		Action
9	Check that the resistance of injector is 13.5~15.5Ω.	Yes	Go to next step.
		No	Temporarily install a known good injector and check for proper operation. If problem is corrected, replace injector.
10	Connect data link connector terminals Fuel pump and B+ with a jumper wire and check fuel line pressure while ignition switch is ON. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5 kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
11	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275 kPa,13.0 kg/cm²) at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine condition: - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve stuck to guide
12	Check condition of all spark plugs. **Spark plug gap(A3E) : 0.031~0.035 in (0.8~0.9 mm)** **Spark plug gap(A5D) : 0.027~0.031 in (0.7~0.8 mm)** Check for excessive carbon deposit and correct contact with spark plug wires. Are spark plugs OK?	Yes	Go to next step.
		No	Clean or replace.
13	Check crankshaft position sensor. Is crankshaft position sensor OK?	Yes	Go to next step.
		No	Check crankshaft position sensor and related wire harness.
14	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(CRANKS)

3	Cranks normally, but won't start (partial combustion) - When engine is cold
Description	• Cranks normally, but partial, not continuous, combustion occurs • Battery is OK • Fuel present in tank

(Troubleshooting hint)

1. Overrich air/fuel ratio
   - Clogged air cleaner element
   - Malfunction of mass air flow sensor

2. Overlean air/fuel ratio
   - Incorrect fuel injection control (correction for engine coolant temperature)
   - Low fuel line pressure
   - Air leakage into intake system

3. Low engine compression pressure

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated. Does the MIL remain on after engine start-up?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Disconnect spark plug. Crank engine and check for spark at plug wire terminal. Is spark OK?	Yes	Go to next step.
		No	Replace ignition coil or repair wiring harness.
3	Connect data link connector terminals Fuel pump and B+ with a jumper wire and check fuel line pressure while ignition switch is ON. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5 kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
4	Do injectors operate while cranking engine?	Yes	Go to next step.
		No	Check that battery voltage is applied to injector connector and check wire between main relay and injector.
5	Check resistance of injectors. **Resistance: 13.5~15.5Ω** Is resistance within specification?	Yes	Go to next step.
		No	Replace injector.

Step	Inspection		Action
6	Check condition of ISC valve. Check for open circuit between ISC valve and ECM. Check battery voltage is applied to R/Y wire of ISC valve with engine running. Check ISC valve hose connection. Is ISC valve OK?	Yes	Go to next step.
		No	Open circuit or incorrect voltage: - Repair wiring harness incorrect ISC valve resistance. - Replace ISC valve.
7	Check terminal voltage of manifold absolute pressure sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors functioning properly?	Yes	Go to next step.
		No	Repair as necessary.
8	Check MAF sensor and related DTC. Is MAF sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good MAF(or MAP)sensor and check for proper operation. If problem is corrected, replace MAF(or MAP) sensor.
9	Check that engine starts when engine coolant temperature sensor connector is disconnected. Does engine start?	Yes	Check engine coolant temperature sensor. -If normal:check wiring harness between engine coolant temperature sensor and ECM. -If not normal: replace engine coolant temperature sensor.
		No	Go to next step.
10	Check for air leakage at intake system components.	Yes	Repair or replace.
		No	Go to next step.
11	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275 kPa,13.0 kg/cm²) at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine condition: - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve stuck to guide
12	Check condition of all spark plugs. **Spark plug gap(A3E) : 0.031~0.035 in (0.8~0.9 mm)** **Spark plug gap(A5D) : 0.027~0.031 in (0.7~0.8 mm)** - Excessive carbon deposit. - Contact with high spark plug wire. Are spark plugs OK?	Yes	Go to next step.
		No	Clean or replace.
13	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMTON DIAGNOSIS CHART (CRANKS)

4	**Cranks normally, but won't start (partial combustion) - After engine is warmed up**
Descrip-tion	• After engine is left hot after running, cranking speed is OK • Battery is OK • Engine starts normally when engine is cold

(Troubleshooting hint)

1. Overrich air/fuel ratio
   - Correction for coolant temperature
   - Fuel leakage at injector

2. Vapor lock occurs
   - Fuel pressure decrease after engine stops

Step	Inspection		Action
1	Warm up engine to normal operating temperature and stop engine. Connect data link connector terminal fuel pump and B+ with a jumper wire for 3 minutes while ignition switch in ON. Then check that engine starts. Does engine start?	Yes	Replace fuel with another brand.
		No	Go to step 2.
2	Connect data link connector terminals Fuel pump and B+ with a jumper wire and check fuel line pressure while ignition switch is ON. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5 kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
3	Plug fuel pressure regulator outlet and check that fuel pressure is retained while ignition switch is OFF. **Fuel line pressure:** **25 psi (180 kPa, 1.8 kg/cm²) for 15minutes** Is fuel line pressure retention within specification?	Yes	Replace fuel pressure regulator.
		No	Check fuel pump pressure is kept. - If normal: check fuel leakage from injector - If not normal: replace fuel delivery module
4	Check that engine starts when engine coolant temperature sensor connector is disconnected. Does engine start?	Yes	Check engine coolant temperature sensor. - If nor normal: check wiring harness between engine coolant temperature sensor and ECM -If not normal: replace engine coolant temperature sensor
		No	Go to next step.
5	Check that malfunction indicator light is illuminated. Is MIL illuminated?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.

Step	Inspection		Action
6	Check terminal voltage of manifold absolute pressure sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensor terminals voltage correct?	Yes	Go to next step.
		No	Check for causes.
7	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(CRANKS)

5	Cranks, normally, but hard to start - Always
Description	• Cranks normally, but cranking time up to starting is excessively long • Battery is OK • Engine is normal while engine is idling (Refer to "Rough Idling", if not in good idling condition)

(Troubleshooting hint)

1. Overrich air/fuel ratio
   - Incorrect fuel injection control (correction for engine coolant temperature)
   - Low fuel line pressure
   - Air leakage at intake system
2. Overrich air/fuel ratio
   - Clogged air cleaner element
   - Malfunction of mass air flow sensor
3. Spark plugs not in good condition

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated for more than 3 seconds after ignition is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check intake manifold vacuum while engine is idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check air leakage at intake system.
3	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Check air leakage at intake system.
4	Check if engine starts easily when throttle valve is held one quarter open. Does engine start easily?	Yes	Check carbon deposit on throttle valve and go to step 6.
		No	Go to next step.
5	Check fuel line pressure while engine is idling. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
6	Check condition of ISC valve. Check for open circuit between ISC valve & ECM. Measure Battery voltage is applied to R/Y wire engine running. Check ISC valve hose connection. Is ISC valve OK?	Yes	Go to next step.
		No	Check for causes.

Step	Inspection		Action
7	Connect data link connector terminals Fuel Pump and B+ with a jumper wire and check that engine starts. Does engine start?	Yes	Check fuel pump relay. - If normal, repair or replace wiring harness. - If not normal, replace relay.
		No	Go to next step.
8	Check MAF sensor and related DTC. Is MAF sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good MAF(or MAP) sensor and check for proper operation. If problem is corrected, replace MAF(or MAP) sensor.
9	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275kPa, 13.0 kg/cm²) at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine condition. - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve stuck to guide
10	Check spark plug condition. **Spark plug gap(A3E) : 0.031~0.035 in (0.8~0.9 mm)** **Spark plug gap(A5D) : 0.027~0.031 in (0.7~0.8 mm)** Check for excessive carbon deposit and correct contact with spark plug wires. Are spark plugs OK?	Yes	Go to next step.
		No	Clean or replace.
11	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(CRANKS)

6	Cranks normally, but hard to start - When engine is cold
Description	• Cranks normally, but cranking time up to starting is excessively long • Battery is OK • Restart is normal after engine warmed up • Engine is normal while engine is idling(Refer to "Rough Idling" if not in good idling condition)

(Troubleshooting hint)

1. Overrich air/fuel ratio
   - Malfunction of mass air flow sensor
   - Contaminated air cleaner element

2. Overlean air/fuel ratio
   - Malfunction of injection control (correction for engine coolant temperature)

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check terminal voltage of manifold absolute pressure sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK?	Yes	Go to next step.
		No	Check for causes.
3	Check if engine starts easily when throttle valve is held one quarter open. Does engine start easily?	Yes	Check carbon deposit on throttle valve and go to step 6.
		No	Go to next step.
4	Check vacuum in intake manifold while engine is idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check air leakage at intake air system component.
5	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.
6	Connect data link connector terminal fuel pump and B+ with a jumper wire and check fuel line pressure while ignition switch is ON. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
7	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(CRANKS)

7	**Cranks normally, but hard to start - After engine is warmed up**
Descrip-tion	• After engine is left hot after running, cranks normally, but cranking time up to starting is excessively long • Battery is OK • Starts normally when engine is cold • Engine is normal while engine is idling(Refer to "Rough Idling", if not in good idling condition)

(Troubleshooting hint)

1. Overrich air/fuel ratio
   - Malfunction of fuel ratio calculation
   - Fuel leakage from injector

2. Vapor lock
   - Fuel leakage from injector

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check terminal voltage of manifold absolute pressure sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK?	Yes	Go to next step.
		No	Check for causes.
3	After engine idling and turn ignition switch OFF. Check that fuel line pressure is retained. **Fuel line pressure: more than 25 psi (180 kPa, 1.8 kg/cm²) for 15 minutes** Is fuel line pressure retention within specification?	Yes	Go to next step.
		No	Plug outlet of fuel pressure regulator and turn ignition switch OFF. Then check that fuel line Pressure is retained. - If normal: replace fuel pressure regulator - If not normal: check fuel pump pressure kept Is fuel pump is normal, check fuel leakage from injector?
4	Warm up engine to normal operating temperature and stop engine. Connect data link connector terminals fuel pump and B+ with a jumper wire for 3 minutes while ignition switch is ON. Then check that engine starts easily. Does engine start easily?	Yes	Replace fuel with another brand.
		No	Go to next step.
5	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(IDLING)

8	Rough idling / engine stops while idling - always
Description	• Engine starts normally, but engine stops or vibrates while idling

(Troubleshooting hint)

1. Overrich air/fuel ratio
   - Air leakage
   - Malfunction if fuel injection control
   - Low fuel line pressure
2. Clogging or malfunction of one or more injector
3. Malfunction of mass air flow sensor
4. Malfunction of IAC valve or related wiring
5. Malfunction of spark plugs
6. Low engine compression pressure
7. Malfunction of throttle position sensor or related wiring

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check terminal voltage of manifold absolute pressure sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK?	Yes	Go to next step.
		No	Check for causes.
3	Check operating sound of injectors while engine is idling. Are injectors operating?	Yes	Go to step 5.
		No	Go to next step.
4	Check that voltage is applied to injector connectors while engine is running (approx. 12V). Is voltage within specification?	Yes	Go to next step.
		No	Check wiring harness between ECM and injector .
5	Check resistance of injector. **Resistance: 13.5~15.5Ω?** Is resistance within specification?	Yes	Go to next step.
		No	Replace injector.
6	Ignition ON, throttle closed, measure voltage of throttle position sensor (0.2~0.8V). Is voltage within specification?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor
7	Check MAF(or MAP) sensor and related DTC. Is MAF(or MAP) sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good MAF sensor and check for proper operation. If problem is corrected, replace MAF sensor.

Step	Inspection		Action
8	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275kPa, 13.0 kg/cm²) at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine condition. - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Valve stuck to guide
9	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(IDLING)

9	Rough idling / engine stops while engine is idling - engine cold
Description	• Engine speed is slow, engine stops or vibrates while warming up engine.

(Troubleshooting hint)

1. Insufficient intake air
   - Malfunction of mass air flow sensor
   - Clogged air cleaner element
   - Malfunction of IAC valve

2. Malfunction of fuel injection control
   - Malfunction of fuel injection control devices(correction for engine coolant temperature)

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check intake manifold vacuum at dynamic chamber while engine is idling. **Vacuum: 18.9 inHg (480 mmHg) at idle** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check air leakage in intake system.
3	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.
4	Check terminal voltage of manifold absolute pressure sensor, throttle position sensor, ignition coils, engine coolant temperature sensor. Are sensors OK?	Yes	Go to next step.
		No	Check for causes.
5	Check resistance of engine coolant temperature sensor. **-AT -4°F (-20°C) : 14.6-17.8 KΩ** **-AT 68°F (20°C) : 2.2-2.7KΩ** **-AT 176°F (80°C) : 0.29-0.35KΩ** Is resistance within specification?	Yes	Go to next step.
		No	Temporarily install a known good ECT sensor and check for proper operation. If problem is corrected, replace ECT sensor.
6	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(IDLING)

10	**Rough idling / engine stops while engine is idling - After engine is warmed up**
Descrip-tion	• Engine operation is normal while warming up engine, but engine stops or vibrates after warming up

(Troubleshooting hint)
1. Malfunction of IAC valve
2. Overlean air/fuel ratio
   - Air leakage
   - Low fuel line pressure
3. Malfunction of ignition system
4. Overrich air/fuel ratio
   - Malfunction of fuel injection control(correction for coolant temperature)
5. Low engine compression pressure

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check terminal voltage of manifold absolute pressure sensor, throttle position sensor, ignition coils and engine coolant temperature sensor. Are sensors OK?	Yes	Go to next step.
		No	Check for causes.
3	Check vacuum of intake manifold. **Vacuum: more than 18.9inHg (480mmHg) at idle**	Yes	Go to next step.
		No	Check for air leakage at intake system component.
4	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner.
5	Check fuel line pressure while engine is idling. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
6	Disconnect engine coolant temperature sensor connector and check that engine condition improves. Does engine condition improve?	Yes	Replace engine coolant temperature sensor.
		No	Go to next step.
7	Check operating sound of injector whileengine is idling. Are injectors operating?	Yes	Go to step 10.
		No	Go to next step.

Step	Inspection		Action
8	Check resistance of injector. **Resistance: 13.5~15.5Ω** Is resistance within specification?	Yes	Go to step 10.
		No	Temporarily install a known good injector and check for proper operation. If problem is corrected, replace injector.
9	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275kPa, 13.0 kg/cm²) at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine.
10	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(IDLING)

11	Rough idling / engine stops while engine is idling - When A/C is in operation
Description	• Engine stops or vibrates excessively when A/C is operating • Idling condition is normal when A/C is turned OFF
(Troubleshooting hint) 1. Malfunction of ISC control system 2. Malfunction of A/C operation switch 3. Malfunction of blower switch	

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check air conditioner cut relay is ON/OFF when air conditioner switch and blower switch are ON/OFF. Are A/C cut relay, blower switch and A/C switch OK?	Yes	Go to next step.
		No	Malfunction of air conditioner switch, relay, or blower switch.
3	Check for continuity between B04-24, B04-23 and B04-36 of ECM. Does continuity exist?	Yes	Go to next step.
		No	Repair wiring harness.
4	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(IDLING)

12	**Abnormal idling / engine stops immediately after starting**
Descrip-tion	• Starting is normal, but engine vibrates excessively or stops immediately after starting (when accelerating from idling condition) • Idling condition is normal on other conditions

(Troubleshooting hint)
1. Malfunction of ISC system
2. Air leakage at intake system
3. Malfunction of MAF(or MAP) sensor

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check MAF(or MAP) sensor and related DTC. Is MAF(or MAP) sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good MAF(or MAP) sensor and check for proper operation. If problem is corrected, replace MAF(or MAP) sensor.
3	Check that voltage of throttle position sensor terminal is 0.2~0.8V and does not vary. Is voltage within specification?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.
4	Check for air leakage at intake system and vacuum at dynamic chamber while engine is idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check intake system and dynamic chamber.
5	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(IDLE SPEED)

13	High idle speed after engine warmed up
Descrip-tion	• Excessively high idle speed after engine warmed up

(Troubleshooting hint)
Excessive intake air flow
1. Throttle valve not closed completely
2. Malfunction of idle speed control
   - ISC valve stuck
   - ISC valve connector disconnected
   - Incorrect input signal from engine coolant temperature sensor

Step	Inspection		Action
1	Check that throttle valve is closed completely when accelerator pedal is released. Is throttle valve closed?	Yes	Go to next step.
		No	Check correct installation and free operation of throttle linkage. If not normal, clean or adjust linkage.
2	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
3	Disconnect engine coolant temperature sensor connector and check if engine condition improves. Does engine condition improves?	Yes	Temporarily install a known good ECT sensor and check for proper operation. If problem is corrected, replace ECT sensor.
		No	Go to next step.
4	Plug PCV hose connected with dynamic chamber and check if engine speed decrease. Does engine speed decrease?	Yes	Check or replace PCV valve.
		No	Go to next step.
5	Check that voltage of throttle position sensor terminal 3(L/O) is 0.2~0.8V and does not vary.	Yes	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.
		No	Go to next step.
6	Check following ECM terminal voltage. - ISC valve control - A/C switch input - Park/neutral input Are voltage correct?	Yes	Go to next step.
		No	Replace as necessary.
7	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(IDLE SPEED)

14	Variation of idle speed / Idle hunting
Description	• Periodic engine speed increase and decrease while engine is idling

(Troubleshooting hint)
1. Malfunction of throttle position sensor system
2. Air leakage
3. Malfunction of ISC system
4. Fuel injection is irregular
5. Malfunction of ignition system

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check that voltage of throttle position sensor terminal is 0.2-0.8V and does not vary. Is voltage within specification?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corected, replace TP sensor.
3	Check air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.
4	Disconnect high tension cord and check equal engine speed decrease in all cylinders.	Yes	Go to next step.
		No	Go to step 7.
5	Check following ECM terminal voltage. • ISC valve control • A/C switch input • Park/neutral input Are voltage correct?	Yes	Go to next step.
		No	Check for causes.
6	Check MAF sensor and related DTC. Is MAF sensor OK?	Yes	Go to next step.
		No	Temporaily install a known good MAF(or MAP) sensor and check for proper operation. If problem is corrected, replace MAF(or MAP) sensor.
7	Check operating sound of injector while engine is idling. Are injectors OK?	Yes	Go to step 9.
		No	Go to next step.
8	Check that approx. battery voltage is applied to injector connector terminals. Is voltage within specification?	Yes	Go to next step.
		No	Check the wiring harness between ECM and injector.
9	Check resistance of injector. **Resistance : 13.5~15.5Ω** Is resistance within specification?	Yes	Go to next step.
		No	Replace injector.
10	Check spark plugs for proper operation. Are spark plugs OK?	Yes	Go to next step.
		No	Clean or replace.

Step	Inspection		Action
11	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275kPa, 13.0 kg/cm²) at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check for cause.
12	Check for fuel leakage from injectors. Do injectors leak?	Yes	Temporarily install al known good injector and check for proper operation. If problem is corrected, replace injector.
		No	Go to next step.
13	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(ENGINE)

15	Engine stalls on deceleration
Description	• Engine stops unexpectedly during or after deceleration • Idling condition is normal

(Troubleshooting hint)
Engine speed decreases abruptly when accelerator pedal is released, which can cause connectors to come loose
1. Malfunction of idle air control
2. Malfunction of throttle position sensor system
3. Malfunction of fuel cut control

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check throttle position sensor, ISC valve terminal voltage and related wiring harness. Are sensors OK?	Yes	Go to next step.
		No	Repair the wiring harness or replace defective component.
3	Check ECM terminal voltages for B04-35, B04-34, B04-17, B04-15 and B04-7. Are voltage within specification?	Yes	Go to next step.
		No	Check for cause and repair as necessary.
4	Check contact condition of following connectors: -Throttle position sensor, manifold absolute pressure sensor, ignition coils, injector, crankshaft position sensor and ECM. Are terminal connections OK?	Yes	Go to next step.
		No	Repair or replace.
5	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(ENGINE)

16	Engine stalls suddenly (intermittent), sudden engine stop
Description	• Engine stops suddenly and intermittently • Engine is normal until engine stops

(Troubleshooting hint)
1. Malfunction of ISC control system
2. Malfunction of throttle position sensor system
3. Intermittent loosened electrical contact

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check contact condition of following connectors: -Throttle position sensor, manifold absolute pressure sensor, ignition coils, injector, crankshaft position sensor, ECM. Are terminal connections OK?	Yes	Go to next step.
		No	Repair or replace as necessary.
3	Measure crankshaft position sensor and manifold absolute pressure sensor signals. Are sensor signals OK?	Yes	Go to next step.
		No	Repair or replace.
4	Check ECM terminal voltages for B04-35, B04-34, B04-17, B04-15 and B04-7. Are voltages OK?	Yes	Go to next step.
		No	Check for cause and repair as necessary.
5	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(STUMBLE / HESITATION ON ACCELERATION)

17	Stumble / Hesitation on acceleration
Description	• Vehicle seems to stop for a time immediately after pressing accelerator or rattles a little during acceleration

(Troubleshooting hint)

1. Lean air/fuel ration on acceleration
   - Low fuel line pressure
   - Air leakage
   - Malfunction of fuel injection control

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check vacuum in intake manifold while engine idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check air leakage at air intake system and repair.
3	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.
4	Check if MAF(or MAP) sensor is OK.	Yes	Go to next step.
		No	Temporarily install a known good MAF(or MAP) sesor and check for proper operation. If problem is corrected,replace MAF(or MAP) sensor.
5	Check engine coolant temperature sensor and related DTC. Is ECT sensors OK?	Yes	Go to next step.
		No	Replace the engine coolant temperature sensor.
6	Check throttle position sensor and related DTC. **Voltage between terminals:** **Idling condition: 0.2~0.8V** **Throttle valve full open: 4.0~4.8V** Is TP sensors OK?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.
7	Disconnect injector connector one by one while engine in idling, and check equal engine speed decrease for each cylinder. Does engine speed decrease equally for all cylinders?	Yes	Go to next step.
		No	Check injector.
8	Check correct installation and free operation of throttle linkage. Is throttle linkage OK?	Yes	Go to next step.
		No	Adjust or replace joint or damaged linkage and adjust deflection of throttle cable.

Step	Inspection		Action
9	Check fuel line pressure while engine is idling. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5kg/cm²)**	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
10	Check air passage and vacuum hose installation. Are vacuum hoses OK?	Yes	Go to next step.
		No	Repair as necessary.
11	Check exhaust system clogging. Is exhaust system clogged?	Yes	Repair or replace necessary.
		No	Go to next step.
12	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(SURGING WHILE CRUISING)

18	Surging while cruising
Descrip-tion	• Repeated engine speed variation occurs at all times

(Troubleshooting hint)
1. Malfunction of throttle position sensor system
2. Misfire
3. Intermittent electrical connection
4. Lean air/fuel ratio

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check vacuum in intake manifold while engine idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check air leakage at air intake system and repair.
3	Check throttle position sensor and related DTC. **Voltage between terminals:** **Idling condition: 0.2~0.8V** **Throttle valve full open: 4.0~4.8V** Is TP sensors OK?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.
4	Disconnect heated oxygen sensor connector and check for proper operation. Is HO2S OK?	Yes	Go to next step.
		No	Replace front heated oxygen sensor.
5	Check that vehicle speed sensor signal input to ECM B02-18. Is signal correct?	Yes	Go to next step.
		No	Repair wiring harness or vehicle speed sensor.
6	Check ECM terminal voltages for B04-17, B03-15, and B04-7. Are voltages OK?	Yes	Go to next step.
		No	Check for causes and repair.
7	Check correct installation and free operation of throttle linkage. Is throttle linkage OK?	Yes	Go to next step.
		No	Adjust or replace joint or damaged linkage and adjust deflection of throttle body cable.
8	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.

Step	Inspection		Action
9	Check fuel line pressure while engine is idling. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
10	Check exhaust system clogging. Is exhaust system clogged?	Yes	Repair as necessary.
		No	Go to next step.
11	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(LACK OF POWER)

19	Lack of power
Description	• Lack of power at full throttle • Lower maximum vehicle speed • Idling speed is normal

(Troubleshooting hint)

1. Insufficient intake air
   - Throttle valve does not open fully
   - Clogged intake air system
2. Lean air/fuel ratio
   - Fuel line pressure decrease
   - Malfunction of fuel injection
3. Malfunction of ignition
4. Low engine compression pressure

Step	Inspection		Action
1	Check following items. - Clutch slippage - Brake dragging - Lack of tire air pressure - Improper tire size Are these systems OK?	Yes	Go to next step.
		No	Repair as necessary.
2	Is throttle valve open fully when depressing accelerator pedal fully?	Yes	Go to step 5.
		No	Go to next step.
3	Check correct installation of throttle cable. Is throttle cable OK?	Yes	Go to next step.
		No	Repair or adjust throttle cable.
4	Check correct operation of throttle body. Is throttle body OK?	Yes	Go to next step.
		No	Repair or replace throttle body.
5	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
6	Check the camshaft position sensor and DTC related. Is CMP sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good CMP sensor and check for proper operation. If problem is corrected, replace CMP sensor.
7	Check throttle position sensor and related DTC. **Voltage between terminals:** **Idling condition: 0.2~0.8V** **Throttle valve full open: 4.0~4.8V** Is TP sensors OK?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.

Step	Inspection		Action
8	Check vacuum in intake manifold while engine idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Repair intake system or dynamic chamber.
9	Disconnect injector connector one by one while engine in idling, and check equal engine speed decrease for each cylinder. Does engine speed decrease equally for all cylinders?	Yes	Go to next step.
		No	Check injector.
10	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.
11	Keep engine idling and turn ignition switch OFF. Check that fuel line pressure is retained. **Fuel line pressure: more than 25 psi (180 kPa,1.8kg/cm²) for 15 minutes** Is fuel pressure retention within specification?	Yes	Go to next step.
		No	Plug outlet of pressure regulator and turn ignition switch OFF. Then check fuel line pressure is retained. - If normal: replace pressure regulator - If not normal: check fuel pump If fuel pump is normal, check fuel leakage from injector.
12	Does fuel line pressure increase when accelerating abruptly? **Fuel line pressure: 48 psi (330 kPa, 3.3 kg/cm²)**	Yes	Go to next step.
		No	Check fuel line and fuel filter clogging and repair if as necessary.
13	Check the MAF sensor and related DTC. Is MAF sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good MAF sensor and check for proper operation. If problem is corrected, replace MAF sensor.
14	Check ignition system - Check resistance of DLI coil **Primary: 0.6~0.8Ω** **Secondary: 11~15kΩ** - Check wiring harness between DLI coil and ECM Is ignition system OK?	Yes	Go to next step.
		No	Replace ignition coils or repair wiring harness.
15	Check spark plug wires. Are spark plug wires OK?	Yes	Go to next step.
		No	Replace spark plug wires.
16	Check spark plug. Are spark plugs OK?	Yes	Go to next step.
		No	Clean or replace.
17	Check engine compression pressure. **Engine compression pressure: 184 psi (1275 kPa, 13.0 kg/cm²)at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine condition - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve guide stuck
18	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(POOR ACCELERATION / LACK OF POWER)

20	Poor acceleration / Lack of power
Description	• Lack of power on acceleration • Lack of power at full throttle • Lower maximum vehicle speed • Idling speed is normal

(Troubleshooting hint)

1. Factors except engine malfunction
   - Clutch slippage
   - Brake dragging
   - Lack of tire air pressure
   - Improper tire size
   - Overload
2. Insufficient intake air
   - Throttle valve does not open fully
   - Intake system clogging
3. Overlean air/fuel ratio
4. Malfunction of ignition system
5. Low engine compression pressure

Step	Inspection		Action
1	Check following items. - Clutch slippage - Brake dragging - Lack of tire air pressure - Improper tire size - Overload Are the items OK?	Yes	Go to next step.
		No	Repair as necessary.
2	Is throttle valve open fully when depressing accelerator pedal fully?	Yes	Go to step 5.
		No	Go to next step.
3	Check correct installation of throttle cable. Is throttle cable OK?	Yes	Go to next step.
		No	Repair or replace throttle cable.
4	Check correct operation of throttle body. Is throttle body OK?	Yes	Go to next step.
		No	Repair or replace throttle body.
5	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
6	Check camshaft position sensor and connector. Is CMP sensor OK?	Yes	Go to next step.
		No	Replace camshaft position sensor or repair related wire harness.

Step	Inspection		Action
7	Check throttle position sensor and related DTC. **Voltage between terminals:** **Idling condition: 0.2~0.8V** **Throttle valve full open: 4.0~4.8V** Is TP sensors OK?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.
8	Check vacuum in intake manifold while engine is idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check air leakage into intake system and repair as necessary.
9	Disconnect injector connector one by one while engine is idling. Is there an equal engine speed decrease for each cylinder?	Yes	Go to next step.
		No	Check injectors.
10	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.
11	Check fuel line pressure while engine is idling. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.
12	Does fuel line pressure increase when accelerating abruptly? **Fuel line pressure: 48 psi (330 kPa, 3.3 kg/cm²)**	Yes	Go to next step.
		No	Check fuel line and fuel filter clogging and repair if as necessary.
13	Check the MAF sensor and related DTC. Is MAF sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good MAF sensor and check for proper operation. If problem is corrected, replace MAF sensor.
14	Check ignition system - Check resistance of DLI coil **Primary: 0.6~0.8Ω** **Secondary: 11~15kΩ** - Check wiring harness between DLI coil and ECM Is ignition system OK?	Yes	Go to next step.
		No	Replace ignition coils or repair wiring harness.
15	Check spark plug wires. Are spark plug wires OK?	Yes	Go to next step.
		No	Replace spark plug wires.

Step	Inspection		Action
16	Check spark plugs. **Spark plug gap(A3E) : 0.031~0.035 in (0.8~0.9 mm)** **Spark plug gap(A5D) : 0.027~0.031 in (0.7~0.8 mm)** - Excessive carbon deposit - Contact with high tension cord Are spark plug OK?	Yes	Go to next step.
		No	Clean or replace as necessary.
17	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275 kPa, 13.0 kg/cm²)at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine condition - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve guide stuck
18	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(DECELERATION/ BACKFIRE)

21	Rough engine running on deceleration/ backfire
Description	• Rough engine running on deceleration and backfire • Transmission is normal

(Troubleshooting hint)

1. Overrich air/fuel ratio
   - Air cleaner element clogged
   - Malfunction of fuel injection system(fuel cut control)
   - Fuel leakage from injector
   - Malfunction of throttle position sensor

Step	Inspection		Action
1	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Check vacuum in intake manifold while engine is idling. **Vacuum: more than 18.9 inHg (480mmHg)** Is intake manifold vacuum within specification?	Yes	Go to next step.
		No	Check air leakage into air intake system.
3	Check cleanness of air cleaner element. Is air cleaner element OK?	Yes	Go to next step.
		No	Replace air cleaner element.
4	Check ECM terminal voltages for B04-20, B04-18, B05-6 and B05-4. Are terminal voltages OK?	Yes	Go to next step.
		No	Check for cause and repair as necessary.
5	Check fuel injection system. Is fuel injection system OK?	Yes	Go to next step.
		No	Repair injection system as necessary.
6	Check mass air flow sensor and related DTC. Is MAF sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good MAF sensor and check for proper operation. If problem is corrected, replace MAF sensor.
7	Check throttle position sensor and DTC related to sensor. - Voltage between terminals **When idling: 0.2~0.8V** **When opening throttle valve fully : 4.0~4.8V** - Check that idling voltage return to specified valve when releasing after pulling accelerator cable. Is TP sensor OK?	Yes	Go to next step.
		No	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.
8	Check throttle body contamination. Is throttle body contaminated?	Yes	Clean or replace as necessary.
		No	Go to next step.
9	Check fuel leakage from injector. Do fuel injectors leak?	Yes	Go to next step.
		No	Clean or replace as necessary.
10	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(KNOCKING)

22	Knocking
Description	• Abnormal combustion occurs, accompanied by audible "pinging" noise

(Troubleshooting hint)
1. Improper ignition timing
2. Carbon deposit in cylinder
3. Engine overheat
4. Overlean air/fuel ratio
   - Incorrect fuel injection
   - Fuel line pressure decrease on acceleration

Step	Inspection		Action
1	Check if malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch is turned ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
2	Is throttle valve open fully when depressing accelerator pedal fully?	Yes	Go to step 5.
		No	Go to next step.
3	Check correct installation of throttle cable. Is throttle cable OK?	Yes	Go to next step.
		No	Repair or replace throttle cable.
4	Check correct installation of throttle body. Is throttle body OK?	Yes	Go to next step.
		No	Repair or replace throttle body.
5	Check engine compression pressure. **Engine compression pressure:** **184 psi (1275 kPa, 13.0 kg/cm²)at 300 rpm** Is engine compression pressure within specification?	Yes	Go to next step.
		No	Check engine condition - Wear of piston, piston ring and cylinder wall - Defect of cylinder head gasket - Deformation of cylinder head - Improper valve clearance - Valve guide stuck
6	Check camshaft position sensor and related DTC. Is CMP sensor OK?	Yes	Go to next step.
		No	Temporaily install a known good CMP sensor and check for proper operation. If problem is corrected, replace CMP sensor.
7	Check fuel line pressure while engine is idling. **Fuel line pressure:** **46~51 psi (320~350 kPa, 3.2~3.5kg/cm²)** Is fuel line pressure within specification?	Yes	Go to next step.
		No	**High pressure:** Disconnect return line from fuel filter side. Blow through line towards tank. If line is clear, try with new pressure regulator. If line is blocked, check for blockage in return line and clean or replace as necessary. **Low pressure:** Clamp return line and check if pressure rises. If pressure rises, replace pressure regulator. If pressure does not rise, check fuel filter at fuel delivery module. If it is OK, measure fuel pump max pressure and replace as necessary.

Step	Inspection		Action
8	Check cooling system. Is cooling system OK?	Yes	Go to next step.
		No	Repair or replace.
9	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(FUEL ODOR)

23	Fuel odor
Descrip-tion	• Fuel odor in passenger compartment
(Troubleshooting hint) 1. Loose connection of fuel system or evaporative engine system 2. Malfunction of evaporative emissions system	

Step	Inspection		Action
1	Check damage or leakage of fuel system or evaporative emission system. Is system leaking or damaged?	Yes	Repair or replace as necessary.
		No	Go to next step.
2	Check that malfunction indicator light is illuminated while ignition switch is ON. Is MIL illuminated longer than 3 seconds after ignition switch ON?	Yes	Malfunction indicator light is illuminated. Check for causes. Refer to troubleshooting with diagnostic trouble codes.
		No	Go to next step.
3	Warm up engine fully. After disconnecting vacuum hose from evaporative emissions canister to purge solenoid valve, check that vacuum is applied to it. Is vacuum applied?	Yes	Go to step 6.
		No	Go to next step.
4	Check operational sound of EVAP canister purge solenoid valve is normal. Is EVAP canister purge valve OK?	Yes	Check vacuum hose clogging.
		No	Go to next step.
5	Check that vacuum is applied to vacuum hose after applying battery voltage to EVAP canister purge valve. Is vacuum applied?	Yes	Check ECM terminal voltage.
		No	Replace EVAP canister purge valve.
6	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.		

SYMPTOM DIAGNOSIS CHART(HIGH OIL CONSUMPTION)

24	High oil consumption
Description	• High oil consumption

(Troubleshooting hint)
1. Malfunction of PCV valve
2. Malfunction of engine (oil leakage)

Step	Inspection		Action
1	Check damage, removal, clogging or sticking of PCV hose, or ventilation hose fittings. Is PCV system OK?	Yes	Go to next step.
		No	Repair or replace as necessary.
2	Check if there is air pressure or oil in ventilation hose. Is ventilation hose OK?	Yes	Go to next step.
		No	Check engine condition: - Oil leakage - Wear of valve seal - Wear of valve stem - Wear of valve guide
3	Check if vacuum is applied at PCV valve while engine is idling. Is vacuum applied?	Yes	Check engine condition: - Wear of piston ring groove - Malfunction of piston ring - Wear of piston or cylinder
		No	Replace PCV valve.

SYMPTOM DIAGNOSIS CHART(MIL ON CONTINUOUSLY)

25	MIL on continuously
Descrip-tion	• Hi-scan pro tool does not display diagnostic trouble code, but MIL light on continuously
(Troubleshooting hint) 1. Short circuit of wiring harness 2. Malfunction of ECM	

Step	Inspection		Action
1	Disconnect wire (L/Y) from ECM and check that MIL remains illuminated. Is MIL illuminated?	Yes	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.
		No	Check short circuit from meter set to ECM.

SYMPTOM DIAGNOSIS CHART(MIL DOSE LIGHT ILLUMINATE)

26	MIL dose light illuminate
Descrip-tion	• Hi-scan pro tool displays malfunction code, but MIL does not illuminate
(Troubleshooting hint) 1. Bulb is blown 2. Open circuit	

Step	Inspection		Action
1	Check MIL buib is OK. Is buib OK?	Yes	Go to next step.
		No	Replace bulb.
2	Ground ECM wire (L/Y) with a jumper wire and check if MIL illuminates. Does MIL illuminate?	Yes	Go to next step.
		No	Repair wiring harness from ECM to meter set.
3	Check ECM connections. Are ECM connections OK?	Yes	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.
		No	Repair or replace ECM connector.

SYMPTOM DIAGNOSIS CHART(AIR CONDITIONER)

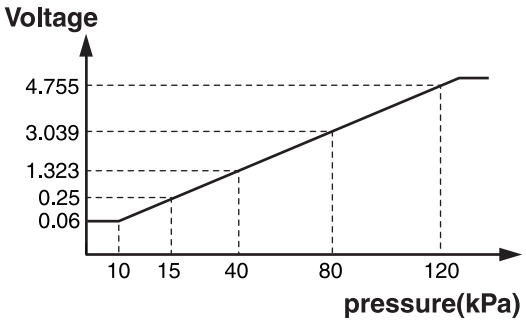
27	Air conditioner does not operate
Descrip-tion	• Blower motor operates, but magnetic clutch not engaged

(Troubleshooting hint)
1. Short or open circuit of wiring harness
2. Malfunction of air conditioner relay, air conditioner switch, magnetic switch
3. Malfunction of ECM

Step	Inspection		Action
1	Check voltage of ECM terminal B04-24. Is voltage OK?	Yes	Go to next step.
		No	Check for causes.
2	Check voltage of ECM terminal B04-23. Is voltage OK?	Yes	Check air condition system.
		No	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EEDD2C88C

P0107 : Manifold absolute circuit malfunction
P0108 : Manifold absolute circuit range/performance problem

Circuit description	
The MAP sensor is directly installed onto the intake manifold and incorporates the IAT sensor into it. This sensor is a pressure sensitive variable resistor type, and translate the vacuum pressure into the voltage signal and sends this voltage to ECM. The voltage of the sensor should be 0.5~1.5V (high vacuum pressure) at idle and Approx 5V (low vacuum pressure) at wide open throttle or with engine not running The ECM calculates the load according to this voltage and determines the injection duration and ignition timing.	 LF2D001A

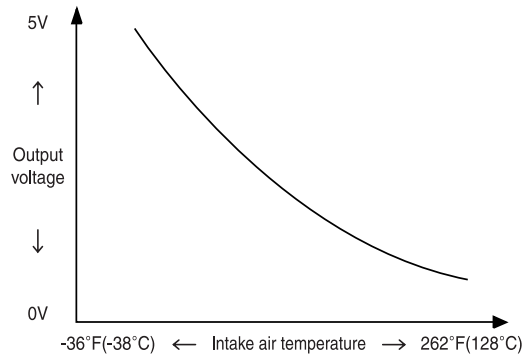
DTC	Fault type	Fault condition
P0107 P0108	GND short / Open	• Load is lower than 323mb when engine is stopped • Load is lower than 166mb while throttle angle is above 43% and engine speed is below 3000rpm
	Battery short	• Load is higher than 1130 mb while closed throttle information is detected and engine speed is above 2400rpm

Diagnostic trouble code No. P0107	**Manifold absolute circuit malfunction**
Diagnostic trouble code No. P0108	**Manifold absolute circuit range/performarce problem**
[Related items]	• Open or short between MAP sensor voltage supply line and main relay • Open or short between MAP sensor signal line and ECM • MAP sensor malfunction

Step	Inspection	Action	
1	Ignition OFF & disconnect MAP sensor connector. Ignition ON, measure voltage between sensor harness connector B13-C (L) (to ECM) and GND (approx. 5V) Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between sensor connector B13-C and ECM connector B03-16. Repair as necessary.
2	Ignition OFF, measure resistance between MAP sensor harness connector B13-A (Y) (to ECM) and GND(0Ω). Is resistance within specification?	Yes	Go to step 3.
		No	Open or short between sensor connector B13-A and ECM connector B03-23. Repair as necessary.
3	Disconnect ECM connector. Ignition ON, measure resistance between MAP sensor harness connector B13-D (G/L) and ECM harness connector B03-36 (<1Ω). Is resistance within specification?	Yes	Go to step 4.
		No	Open between sensor connector B13-D and ECM connector B03-36. Repair as necessary.
4	Connect MAP sensor connector and ECM connector. Start engine and allow engine until engine reaches operating temperature. Measure voltage between MAP sensor connector B13-D (G/L) and GND (0.5~1.5V). Is voltage within specification?	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Temporarily install a known good MAP and check for proper operation. If problem is corrected, replace MAP sensor.
5	Return vehicle to orignial condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EE66AD3AF

P0112 : Intake air temperature (IAT) sensor circuit low input
P0113 : Intake air temperature (IAT) sensor circuit high input

Circuit description	
An intake air temperature (IAT) sensor is threaded into the dynamic chamber. The IAT sensor is a thermistor. The ECM supplies a reference voltage (5V) to the IAT sensor and monitors output voltages produced by the resistance changes due to the intake air temperature changes. As the intake air gets warmer, the sensor resistance decreases and the output voltage is decreased. As the intake air gets cooler, the sensor resistance increases and the output voltage is increased.	 LF2D001B

DTC	Fault type	Fault condition
P0112 P0113	GND short	• IAT sensor signal is higher than approx. 262°F (128°C) approx. 60 seconds after engine starts.
	Battery short, Open	• IAT sensor signal is lower than approx. -36°F (-38°C) approx. 60 seconds after engine starts.

Diagnostic trouble code No. P0112	**Intake air temperature (IAT) sensor circuit low input**
Diagnostic trouble code No. P0113	**Intake air temperature (IAT) sensor circuit high input**
[Related items]	• Open or Short between MAP sensor signal and ECM • Open or Short between MAP sensor GND and ECM • MAP sensor malfunction

Step	Inspection	Action	
1	Ignition OFF & disconnect MAP sensor connector. Ignition ON, measure voltage between sensor harness connector B13-B (L/R) (to ECM) and GND (approx. 5V). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between sensor connector B13-B and ECM B04-11. Repair as necessary.
2	Ignition OFF, measure resistance between MAP sensor harness connector (to ECM) B13-A (Y) and GND(<1Ω). Is resistance within specification?	Yes	Go to step 3.
		No	Open or short between sensor connector B13-A and ECM B03-23. Repair as necessary.
3	Measure resistance between sensor connector B13 terminal A and B.	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Temporarily install a known good MAP sensor and check for proper operation. If problem is corrected, replace MAP sensor.
4	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Temperature	Resistance (kΩ)
-4°F (-20°C)	14.6 ~ 17.8
68°F (20°C)	2.2 ~ 2.7
176°F (80°C)	0.29 ~ 0.35

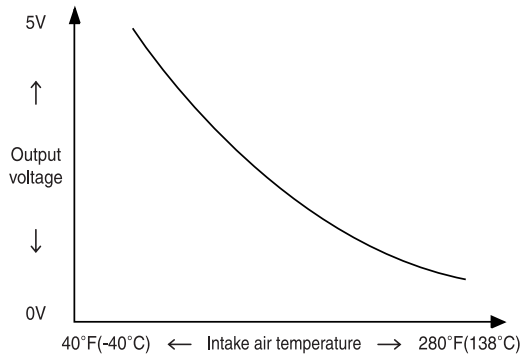
LF2D001T

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EE767EE13

P0117 : Engine coolant temperature (ECT) circuit low input
P0118 : Engine coolant temperature (ECT) circuit high input

Circuit description

An engine coolant temperature (ECT) sensor is installed at engine cylinder head. The ECT sensor is a thermistor. The ECM supplies a reference voltage (5V) to the ECT sensor and monitors output voltage produced by the resistance changes due to engine coolant temperature changes. As the coolant gets warmer, the sensor resistance decreases and the output voltage is decreased. As the coolant gets cooler, the sensor resistance increases and the output voltage is increased. The ECM detects the output voltage of the engine coolant temperature and increases the fuel injection duration when engine is cold.



LF2D001C

DTC	Fault type	Fault condition
P0117 P0118	GND short	• ECT sensor signal is higher than approx. 280°F (138°C) approx. 600 seconds after engine starts.
	Battery short, Open	• ECT sensor signal is lower than approx. -36°F (-38°C) approx. 600 seconds after engine starts.

Diagnostic trouble code No. P0117	**Engine coolant temperature (ECT) sensor circuit low input**
Diagnostic trouble code No. P0118	**Engine coolant temperature (ECT) sensor circuit high input**
[Related items]	• Open or Short between ECT sensor signal and ECM • Open or Short between ECT sensor GND and ECM • ECT sensor malfunction

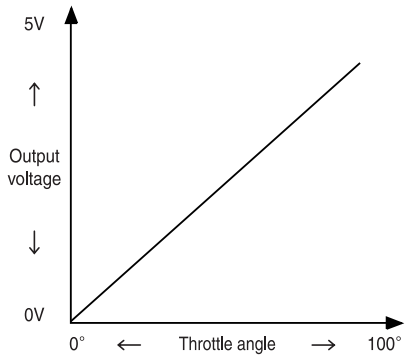
Step	Inspection	Action	
1	Ignition OFF & disconnect ECT sensor connector. Ignition ON, measure voltage between sensor harness connector B11-A (L/Y) (to ECM) and GND(approx. 5V). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between sensor connector B11-A and ECM B04-15. Repair as necessary.
2	Ignition OFF, measure resistance between ECT sensor harness connector (to ECM) B11-C (G/O) and GND(0Ω). Is resistance within specification?	Yes	Go to step 3.
		No	Open or short between sensor connector B11-C and ECM B04-5. Repair as necessary.
3	Measure resistance between sensor connector B11 terminal A and C.	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Temporarily install a known good ECT sensor and check for proper operation. if problem is corrected, replace ECT sensor.
4	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Temperature	Resistance (kΩ)
-4°F (-20°C)	14.6 ~ 17.8
68°F (20°C)	2.2 ~ 2.7
176°F (80°C)	0.29 ~ 0.35

LF2D001T

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EEFE5A22F

P0122 : Throttle position (TP) sensor circuit low input
P0123 : Throttle position (TP) sensor circuit high input

Circuit description	
A throttle position (TP) sensor is mounted on the throttle body and detects the opening of the throttle valve. The ECM determines operating conditions such as idle (closed throttle), part load, acceleration / deceleration, and wide open throttle from the TP sensor. The ECM supplies a reference voltage (5V) to the TP sensor and the output voltage increases directly with the opening of the throttle valve. The output voltage will vary from 0.2~0.8 volt at closed throttle to 4.0~4.8 volts at wide open throttle.	 LF2D001D

DTC	Fault type	Fault condition
P0122 P0123	GND short / Open	• TP sensor voltage is lower than 0.14V when ignition switch is turned ON.
	Battery short	• TP sensor voltage is higher than 4.86V when ignition switch is turned ON.

Diagnostic trouble code No. P0122	**Throttle position (TP) sensor circuit low input code**
Diagnostic trouble code No. P0123	**Throttle position (TP) sensor circuit high input code**
[Related items]	• Open or short between TP sensor 5 volt reference and ECM • Open or short between TP sensor signal and ECM • Open or short between TP sensor GND and ECM • TP sensor malfunction

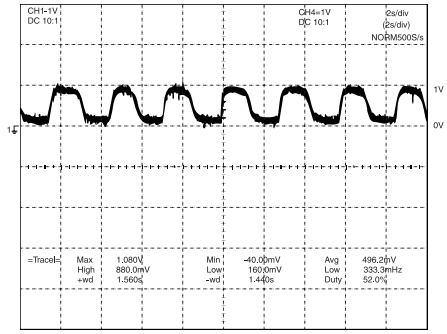
Step	Inspection	Action	
1	Ignition OFF & disconnect TP sensor connector. Ignition ON, measure voltage between sensor harness connector B15-B (L/G) (to ECM) and GND (approx. 5V). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between sensor connector B15-B and ECM B03-15. Repair as necessary.
2	Ignition OFF, measure resistance between TP sensor harness connector B15-A (W/G) (to ECM) and GND (0Ω). Is resistance within specification?	Yes	Go to step 3.
		No	Open or short between sensor connector B15-A and ECM B04-7. Repair as necessary.
3	Reconnect TP sensor connector. Ignition ON, measure voltage between sensor connector B15-C (L/O) and GND (0.2~0.8V) with throttle closed. Is voltage within specification?	Yes	Go to step 4.
		No	Open or short between sensor connector B15-C and ECM. Repair as necessary.
4	Press accelerator pedal fully and measure voltage between sensor connector B15-C (L/O) and GND (4.0~4.8V). Is voltage within specification?	Yes	Temporarily install a known good TP sensor and check for proper operation. If problem is corrected, replace TP sensor.
		No	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
5	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EED4DCFCA

P0131 : Heated O_2 sensor circuit low input (bank 1, sensor 1)
P0132 : Heated O_2 sensor circuit high input (bank 1, sensor 1)

Circuit description

A heated oxygen sensor (HO2S) is mounted in the front exhaust pipe and detects the oxygen content in the exhaust gas.
If the air/fuel ratio is lean, the sensor should output a low voltage (lower than 450mV). If the air/fuel ratio is rich, the sensor should output a high voltage (higher than 450mV). The HO2S acts as rich/lean switch and sends the information to the ECM.
Based on this signal, ECM increases/decreases the fuel injection duration. The HO2S contains a heater which reduces its warming-up time so that it can control feedback immediately upon engine start-up. The main relay supplies voltage to the heater. The ECM provides a ground circuit for activating the heater.



LF2D001E

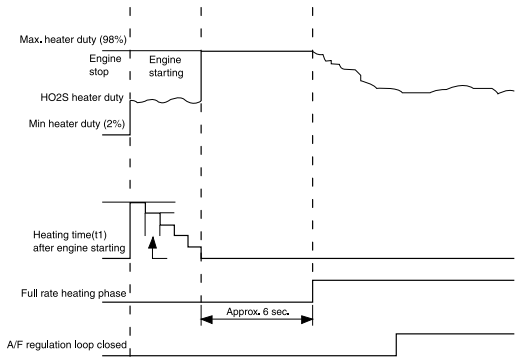
DTC	Fault type	Fault condition
P0131 P0132	Battery short	• HO2S voltage is higher than 1.4V
	GND short	• HO2S voltage is lower than 0.02V and its resistance is lower than 20Ω
	Opent	• 0.4V < HO2S voltage < 0.5V for 25 senconds

Diagnostic trouble code No. P0131	**O_2 sensor circuit low input (bank 1, sensor 1)**
Diagnostic trouble code No. P0132	**O_2 sensor circuit high input (bank 1, sensor 1)**
[Related items]	• Open or short circuit in oxygen sensor heater circuit • Incorrect oxygen sensor heater resistance • Oxygen sensor malfunction

Step	Inspection	Action	
1	Ignition OFF, disconnect front HO2S connector. Measure resistance between sensor harness connector B09 terminal A (Y/G) and B (Y/L). Is measured resistance less than 1Ω?	Yes	Short between front HO2 sensor harness connector B09-A and ECM connector B03-35 or sensor connector B09-B and ECM sensor B03-22. Repair as needed.
		No	Go to step 2.
2	Measure resistance between front HO2S sensor connector B09 terminalsC (G) and D (R/B) (approx.3~7Ω at 68°F(20°C). Is resistance within specification?	Yes	Go to step 3.
		No	Temporarily install a known good H02S and check for proper operation. If problem is corrected, replace H02S
3	Connect HO2S connector, start engine and allow engine to idle until engine reaches operating temperature. Measure voltage between sensor harness connector B09-D (R/B) and GND (B+). Is voltage within specification?	Yes	Go to step 4.
		No	Go to step 6.
4	Measure resistance between harness connector B09-C (G) and ECM connector B03-40 (<1Ω). Is resistance within specification?	Yes	Go to step 5.
		No	Open between HO2 sensor connector B09-C and ECM connector B03-40. Repair as necessary.
5	Warm up engine to normal operating temperature for more than 10 minutes. Using Scan Tool, monitor front HO2S signal. Does the front HO2S signal switch lean to rich or rich to lean over 3 times for 10 seconds?	Yes	Inspect for terminal contact failure. Repair as necessary.
		No	Repair front HO2S.
6	Measure voltage between R/B wire of X03 and GND (B+). Is voltage within specification?	Yes	Check "INJECT (15A)" fise. Replace fuse as necessary.
		No	Open between harness connector X03 and HO2S connector B09-D. Repair as needed.
7	Return vehicle to original condition. Clear all Diagnostic trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EE4AEA16B

P0135 : O_2 sensor heater current malfunction (Bank 1, Sensor 1)

Circuit description	
When the engine starts, the HO2S heater is pre-heated for the time (t1) depending upon engine coolant at start and the intake air mass. The HO2S heater during pre-heating is duty-controlled according to the battery voltage, engine speed, and intake air mass. After the pre-heating time is expired, the HO2S heater is fully-heated for a specified time (approx. 6 sec). Then the HO2S heater is again duty-controlled based on battery voltage, intake air mass, engine speed, and HO2S voltage. The HO2S contains a heater which reduces its warning-up time so that it can control feedback immediately upon engine start up. Main relay supplies voltage to the heater. The ECM provides a ground circuit for activating the heater.	 LF2D001F

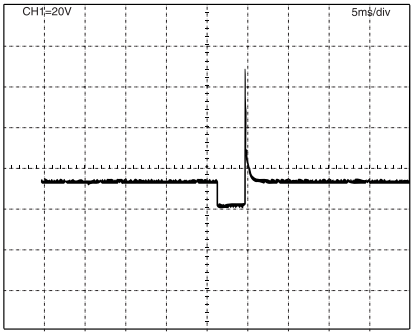
DTC	Fault type	Fault condition
P0135	Open	• NO signal when ignition switch is turned ON.
	GND short	• Signal below lower limit when ignition switch is turned ON.
	Battery short	• Signal above upper limit when ignition switch is turned ON.

Diagnostic trouble code No. P0135	O_2 sensor heater circuit malfunction (bank 1, sensor 1)
[Related items]	• Open or short circuit oxygen sensor heater circuit • Wrong oxygen sensor heater resistance

Step	Inspection	Action	
1	Ignition OFF, disconnect front HO2S connector. Start engine and allow engine to idle until engine reaches operating temperature. Measure voltage between sensor harness connector B09-D (R/B) and GND (B+). Is voltage within specification?	Yes	Go to step 2.
		No	Go to step 6.
2	Ignition ON & engine OFF, measure voltage between sensor harness connector B09-C (G) and GND (B+). Is voltage within specification?	Yes	Short to battery voltage between sensor connector B09-C and ECM connector B03-40. Repair as necessary.
		No	Go to step 3.
3	Measure resistance between sensor connector B09-C (G) and GND (<1Ω). Is resistance within specification?	Yes	Short to GND between sensor connector B09-C and ECM connector B03-40. Repair as necessary.
		No	Go to step 4.
4	Disconnect ECM connector. Measure resistance between sensor harness connector B09-C (G) and ECM harness connector B03-40 (<1Ω). Is resistance within specification?	Yes	Go to step 5.
		No	Repair wiring between HO2 sensor harness connector B09-C and ECM connector B03-40, confirm repair and road test vehicle.
5	Ignition OFF, measure resistance between sensor connector B09 terminals C (G) and D (R/B) (approx. 3~7 Ω at 68°F (20°C)). Is resistance within specification?	Yes	Temporarily install a known good ECM and check for proper operation. If problem is corrected, replace ECM.
		No	Replace front HO2 sensor,confirm repair and road test vehicle.
6	Measure voltage between R/B wire of connector X03 and GND (B+). Is voltage within specification?	Yes	Check "INJECT (15A)" fuse. Replace fuse as necessary.
		No	Repair wiring between harness connector X03 and HO2S connector B09-D, confirm repair and road test vehicle.
7	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EED25C67F

P0201 : Cylinder 1 injector circuit malfunction
P0202 : Cylinder 2 injector circuit malfunction
P0203 : Cylinder 3 injector circuit malfunction
P0204 : Cylinder 4 injector circuit malfunction

Circuit description	
Based on information from various sensors, the ECM measures the amount of time the injector is open for each spray and outputs this as a signal to control the injectors. The main relay provides voltage to the injectors. The ECM controls each injector by grounding the control circuit. When ECM energizes the injector circuit, the circuit voltage should be low. When ECM de-energizes the injector circuit, the circuit voltage should be high. If the circuit detects a voltage out of what is expected, this causes the DTC to be set.	 LF2D001G

DTC	Fault type	Fault condition
P0201 P0202 P0203 P0204	Battery short	• Signal above upper limit when engine speed is above 25rpm.
	Open	• No signal when engine speed is above 25rpm.
	GND short	• Signal below lower limit when engine speed is above 25rpm.

Diagnostic trouble code No. P0201	Cylinder 1 injector circuit malfunction
[Related items]	• Open or short between injector control and ECM • Open or short between injector voltage supply and main relay • Cylinder 1 injector malfunction

Step	Inspection	Action	
1	Ignition OFF & disconnect cylinder 1 injector connector. Ignition ON, measure voltage between injector harness connector B25-A (R/B) and GND (B+). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between injector connector 25-A and main relay. Repair as necessary.
2	Reconnect cylinder 1 injector connector. Measure voltage between injector connector B25-B (BR/R) and GND (B+). Is voltage within specification.	Yes	Go to step 3.
		No	Open or short between injector connector B25-B and ECM connector B03-49. Repair as necessary.
3	Ignition OFF, disconnect cylinder 1 injector connector. Measure voltage between harness connector B25-B (BR/R) (to ECM) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 4.
		No	Short to battery between injector connector B25-B and ECM connector B03-49. Repair as necessary.
4	Measure resistance between cylinder 1 injector connector B25 terminals A and B (13.5~15.5Ω at 68°F (20°C)). Is resistance within specification?	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Replace cylinder 1 injector.
5	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Diagnostic trouble code No. P0202	Cylinder 2 injector circuit malfunction
[Related items]	• Open or short to battery between ECTS signal and ECM • Open or short between injector voltage supply and main relay • Cylinder 2 injector malfunction

Step	Inspection	Action	
1	Ignition OFF & disconnect cylinder 2 injector connector. Ignition ON, measure voltage between injector harness connector B24-A (R/B) and GND (B+). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between injector connector B24-A and main relay. Repair as necessary.
2	Reconnect cylinder 2 injector connector. Measure voltage between injector connector B24-B (G/B) (to ECM) and GND (B+). Is voltage within specification.	Yes	Go to step 3.
		No	Open or short between injector connector B24-B and ECM connector B03-47. Repair as necessary.
3	Ignition OFF, disconnect cylinder 2 injector connector. Turn ignition ON and measure voltage between harness connector B24-B (G/B) (to ECM) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 4.
		No	Short to battery between injector connector B24-B and ECM connector B03-47. Repair as necessary.
4	Measure resistance between cylinder 2 injector connector B24 terminals A and B (13.5~15.5Ω at 68°F (20°C)). Is resistance within specification?	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Replace cylinder 2 injector.
5	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Diagnostic trouble code No. P0203	Cylinder 3 injector circuit malfunction
[Related items]	• Open or short between injector control and ECM • Open or short between injector voltage supply and main relay • Cylinder 3 injector malfunction

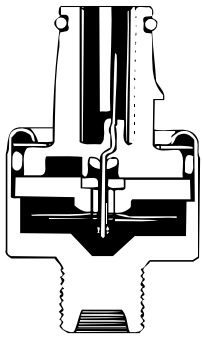
Step	Inspection	Action	
1	Ignition OFF & disconnect cylinder 3 injector connector. Ignition ON, measure voltage between injector harness connector B23-A (R/B) and GND (B+). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between injector connector B23-A and main relay. Repair as necessary.
2	Reconnect cylinder 3 injector connector. Measure voltage between injector connector B23-B (BR) (to ECM) and GND (B+). Is voltage within specification.	Yes	Go to step 3.
		No	Open or short between injector connector B23-B and ECM connector B03-50. Repair as necessary.
3	Ignition OFF, disconnect cylinder 3 injector connector. Turn ignition ON and measure voltage between harness connector B23-B (BR) (to ECM) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 4.
		No	Short to battery between injector connector B23-B and ECM connector B03-50. Repair as necessary.
4	Measure resistance between cylinder 3 injector connector B23 terminals A and B (13.5~15.5Ω at 68°F (20°C)). Is resistance within specification?	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Replace cylinder 3 injector.
5	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Diagnostic trouble code No. P0204	Cylinder 4 injector circuit malfunction
[Related items]	• Open or short between injector control and ECM • Open or short between injector voltage supply and main relay • Cylinder 4 injector malfunction

Step	Inspection	Action	
1	Ignition OFF & disconnect cylinder 4 injector connector. Ignition ON, measure voltage between injector harness connector B22-A (R/B) and GND (B+). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between injector connector B22-A and main relay. Repair as necessary.
2	Reconnect cylinder 4 injector connector. Measure voltage between injector connector B22-B (R) (to ECM) and GND (B+). Is voltage within specification.	Yes	Go to step 3.
		No	Open or short between injector connector B22-B and ECM connector B03-48. Repair as necessary.
3	Ignition OFF, disconnect cylinder 4 injector connector. Measure voltage between harness connector B22-B (R) (to ECM) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 4.
		No	Short to battery between injector connector B22-B and ECM connector B03-48. Repair as necessary.
4	Measure resistance between cylinder 4 injector connector B22 terminals A and B (13.5~15.5Ω at 68°F (20°C)). Is resistance within specification?	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Replace cylinder 4 injector.
5	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EEBF682F0

P0325 : Knock sensor circuit malfunction

Circuit description	
A knock sensor is mounted in cylinder block. The sensor contains a piezoelectric element that converts vibration (or noise) into voltage signal and sends this signal to ECM. With input signals from CMP sensor and CKP sensor, ECM can identify which cylinder is knocking. ECM filters vibrations and determines if the vibrations are knocking signal. Based on this signal, ECM retards ignition timing.	 LF2D001H

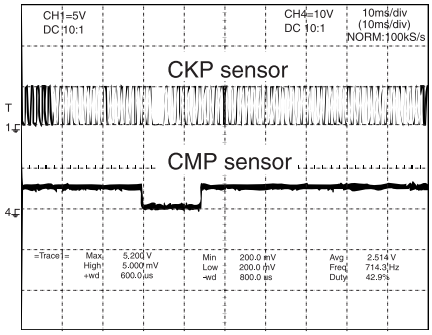
DTC	Fault type	Fault condition
P0325	Difference knock signal-noise level	• Difference is higher than threshold value (approx. 0.049V)

Diagnostic trouble code No. P0325	Knock sensor circuit malfunction
[Related items]	• Knock sensor malfunction • Open or short between Knock sensor signal and ECM • Open or short between Knock sensor ground and ECM

Step	Inspection	Action	
1	Ignition OFF, disconnect knock sensor connector and ECM connector B03. Measure resistance between sensor harness connector B19-B (R) and ECM harness connector B03-33(<1Ω). Is resistance within specification?	Yes	Go to step 2.
		No	Open between connector B19-B and ECM connector B03-33. Repair wire as necessary.
2	Measure resistance between sensor harness connector B19-A (B) and B19-B (R). Is measured resistance infinite?	Yes	Go to step 3.
		No	Short between sensor harness connector B19-A and B19-B.
3	Measure resistance between sensor harness connector B19-A (B)and ECM harness connector B03-46(<1Ω). Is resistance within specification?	Yes	Go to step 4.
		No	Open between sensor connector B19-A and ECM connector B03-46. Repair wire as necessary.
4	Correct connection at knock sensor connector and ECM pin. Connect ECM connector and measure resistance between harness connector B19-A (B) and GND. Is measured resistance infinite?	Yes	Go to step 5.
		No	Short to GND between connector B19-A and ECM connector B03-46. Repair wire as necessary.
5	Measure resistance between knock sensor connector or B19 terminals A and B (4.87MΩ ± 10% @ 20°C [68°F]) Is resistance within specification?	Yes	Poor terminal contact due to oxidation, bent or misplaced terminal. Repair as necessary.
		No	Temporarily install a known good knock sensor and check for proper operation. If problem is corrected, replace knock sensor.
6	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EED012B1A

P0335 : Crankshaft position (CKP) sensor circuit malfunction

Circuit description	
A crankshaft position (CKP) sensor is mounted on the front of transmission case adjacent to the flywheel. The CKP sensor is a hall-effect type sensor that generates voltage using a sensor and a target wheel mounted on the crankshaft. There are 58 slots and one longer slot on the target wheel. When the slot in the wheel aligns with the sensor, the sensor voltage output is low (approx. 0V). and it is high (approx.5V) when a slot is not aligned with the sensor. During one crankshaft rotation there are 58 rectangular signals and one longer signal. The ECM calculates the frequency to compute engine rpm to determine the injection duration and ignition timing. Using the signal differences caused by the longer slot, ECM identifies which cylinder is on top dead center.	 LF2D001I

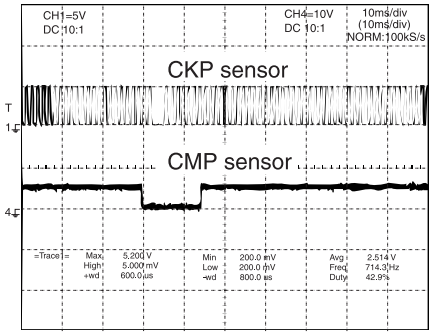
DTC	Fault type	Fault condition
P0335	No signal	• No CKP sensor signal
	Invalid signal	• Valid crankshaft slot detected but synchronization not successful • Valid crankshaft teeth not detected whereas camshaft signal is valid • Can not detect TDC with valid crankshaft teeth and camshaft teeth

Diagnostic trouble code No. P0335	Crankshaft position (CKP) sensor malfunction
[Related items]	• Open or short between CKP sensor signal (+) and ECM • Open or short between CKP sensor signal (-) and ECM • CKP Sensor Malfunction

Step	Inspection	Action	
1	Ignition OFF, disconnect CKP sensor connector. Turn ignition ON and measure voltage between sensor harness connector B12-A (R/Y) and GND (B+). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between sensor connector B12-A and main relay. Repair as necessary.
2	Ignition OFF, disconnect ECM connector. Measure resistance between sensor harness connector B12-B (W) and ECM harness connector B04-20 (<1Ω). Is resistance within specification?	Yes	Go to step 3.
		No	Open between sensor connector B12-B and ECM connector B04-20. Repair as necessary.
3	Measure resistance between sensor harness connector B12-C (G) and ECM harness connector B04-10 (<1Ω). Is resistance within specification?	Yes	Go to step 4.
		No	Open or between sensor connector B12-C and ECM connector B04-10. Repair as necessary.
4	Measure resistance between sensor harness connector B12-B (W) and harness connector B12-C (G) (infinite resistance). Is measured resistance of specified value?	Yes	Go to step 5.
		No	Short between sensor connector B12-B and connector B12-C. Repair as necessary.
5	Ignition ON, measure voltage between sensor harness connector B12-B (W) (to ECM) and GND (<0.5V). Is measured voltage within specified value?	Yes	Go to step 6.
		No	Short to battery voltage in connector B12-B. Repair as necessary.
6	Measure gap between CKP sensor and target wheel 0.012~0.067 in (0.3~1.7 mm). Is gap within specification?	Yes	Replace CKP sensor.
		No	Check target wheel for proper installation. Adjust target wheel gap.
7	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EE3FF92CE

P0340 : Camshaft position (CMP) sensor circuit malfunction

Circuit description	
A camshaft position (CMP) sensor is mounted at the rear of the cylinder head. The CMP sensor sends a signal to ECM when the number one cylinder is at top dead center. The CMP sensor consists of hall effect device and magnet. When the magnetic field of the hall effect device is interrupted by half-moon shape of camshaft target wheel, the sensor voltage outputs 0V. If not, the sensor voltage outputs 5V.	 LF2D001I

DTC	Fault type	Fault condition
P0340	No signal	• No CMP sensor signal when CKP sensor is not faulty
	Invalid signal	• CMP sensor is detected out of window range of CKP sensor when CKP sensor is not faulty

Diagnostic trouble code No. P0340	Camshaft position (CMP) sensor circuit malfunction
[Related items]	• Open or short between CMP sensor signal (+) and ECM • Open or short between CMP sensor signal (-) and ECM • CMP sensor malfunction

Step	Inspection	Action	
1	Ignition OFF, disconnect CMP sensor connector. Ignition ON, measure voltage between CMP sensor harness connector B14-A (R/Y) and GND (B+). Is voltage within specification?	Yes	Go to step 2.
		No	Open or short between sensor connector B14-A and main relay. Repair as necessary.
2	Ignition OFF,disconnect ECM connector B04 and measure resistance between CMP sensor harness connector B14-C (Y) (to ECM) and GND(<1Ω). Is resistance within specification?	Yes	Go to step 3.
		No	Short to ground between sensor connector B14-C and ECM connector B04-8. Repair as necessary.
3	Ignition OFF, measure resistance between sensor harness connector B14-B (R/B) (to ECM) and GND (infinite resistance). Is resistance within specification?	Yes	Go to step 4.
		No	Short to GND between sensor connector B14-B and ECM connector B04-18. Repair as necessary.
4	Measure resistance between CMP sensor harness connector B14-2 (R/B) (to ECM) and ECM harness connector B04-18 (<1Ω). Is resistance within specification?	Yes	Go to step 5.
		No	Open between sensor connector B14-B and ECM connector B04-18. Repair as necessary.
5	Ignition ON, measure voltage between CMP sensor harness connector B14-B (R/B) (to ECM) and GND (<0.5V). Is voltage within specification?	Yes	Go to step 6.
		No	Short to battery voltage between sensor connector B19-B and ECM connector B04-18. Repair as necessary.
6	Disconnect CMP sensor installed at cylinder head and check half-moon installation. Is half-moon wheel installed properly?	Yes	Temporarily install a known good CMP sensor and check for proper operation. If problem is corrected, replace CMP sensor.
		No	Remove camshaft and install half-moon wheel correctly.
7	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EE61F46B6

P0440 : Evaporative emission control system purge control valve circuit malfunction

Circuit description	
The evaporative system prevents hydrocarbon vapors from the fuel tank escaping into the atmosphere where they would form photo-chemical smog. Gasoline vapors are collected in the charcoal canister. The ECM controls the purge control solenoid valve, to purge any collected vapors from the canister back to the engine for burning. EMS system considers the adaptive function in the EVAP emission control in the ECM. Any purge of EVAP canister results in the A/F regulation loop control deviations. During purging of EVAP canister (opening of EVAP purge valve), adaptive valve is maintained to neutral and adaptive A/F regulation function is inhibited. Adaptive A/F regulation loop control is allowed only when no purging of EVAP canister (closing of EVAP purge valve) is feeding the vapors into the intake manifold. A check valve is used to control pressures in the fuel tank and to prevent fuel spillage in the event of a roll-over.	< Blank >

DTC	Fault type	Fault condition
P0440	GND short	• Signal below lower limit when ignition switch is turned ON.
	Battery short	• Signal above upper limit when ignition switch is turned ON.
	Open	• No signal when ignition switch is turned ON.

Diagnostic trouble code No. P0440	Evaporative emission control system purge control circuit malfunction
[Related items]	• Open circuit in EVAP canister purge control valve wiring • EVAP canister purge valve malfunction • Short to battery voltage or short to ground in EVAP canister valve circuit

Step	Inspection	Action	
1	Ignition OFF, disconnect EVAP purge valve connector. Ignition ON, engine OFF, measure voltage between harness connector B21-A (R/Y) (to ECM) and GND. Is measured voltage B+?	Yes	Go to step 2.
		No	Open between connector B21-A and main relay. Repair as necessary.
2	Ignition OFF, measure resistance between EVAP purge valve harness connector B21-A (R/Y) (to ECM) and GND. Is measured resistance less than 1?	Yes	Short to ground in connector B21-A. Repair as necessary.
		No	Go to step 3.
3	Disconnect ECM connector. Check for continuity between harness connector B21-B (W/L) and ECM harness connector B03-42. Does continuity exist?	Yes	Go to step 4.
		No	Open between connector B21-B and ECM connector B03-42. Repair as necessary.
4	Ignition ON, engine OFF measure voltage between EVAP purge valve harness connector B21-A (R/Y) and GND (B+). Is voltage within specification?	Yes	Go to step 5.
		No	Open or short between connector B21-A and main relay. Repair as necessary.
5	Check for proper connections at connector B21-A (R/Y) and main relay. Are connections correct?	Yes	Go to step 6.
		No	Repair connection as necessary
6	Measure resistance between EVAP canister purge valve connector B21 terminals A and B (approx. 24~28Ω at 68°F (20°C)). Is resistance within specification?	Yes	Visually inspect for terminal contact failure (oxidized, deformed or misplaced, etc). Repair as necessary.
		No	Replace EVAP canister purge valve.
7	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EECAC0E9D

P0501 : Vehicle speed sensor circuit range/performance problem

Circuit description	
A vehicle speed sensor is located on transmission housing and generates 4 pulse signals per revolution at drive shaft. The frequency of signal is proportional to the speed of vehicle. This signal is converted into square wave in instrument cluster and sent to ECM determine vehicle speed based on the frequency of the signal.	< Blank >

DTC	Fault type	Fault condition
P0501	No signal	• Vehicle speed is zero with high engine speed and engine load.

Diagnostic trouble code No. P0501	Vehicle speed sensor circuit range /performance problem
[Related items]	• Open circuit between "METER(10A)" fuse and speed sensor • Open circuit speed sensor and GND • Open circuit between speedometer and ECM • Faulty speed sensor • Faulty speedometer

Step	Inspection	Action	
1	Ignition OFF, disconnect ECM connector B04. Measure resistance between harness connector B04-22 and GND. Is measured resistance infinite?	Yes	Go to step 2.
		No	Short to GND between speedometer C01-2D and ECM connector B04-22. Repair as necessary.
2	Connect ECM connector B04, Ignition ON, measure voltage between connector C01-2D and GND (<0.5V). Is voltage within specification?	Yes	Go to step 3.
		No	Short to battery voltage between speedometer sensor C01-2D and ECM connector B04-22. Repair as necessary.
3	Is there continuity between connector B04-22 and speedometer C01-2D.	Yes	Go to step 4.
		No	Open circuit between connector C01-2D and ECM connector B04-22. Repair as necessary.
4	Measure voltage between speed sensor(C02-C) and GND (<0.5V). Is voltage within specification?	Yes	Go to step 5.
		No	Short to battery voltage between vehice speed sensor C02-C and speedometer C01-2C. Repair as necessary.
5	Is there continuity between connector C02-C and speedometer C01-2C.	Yes	Temporarily install a Known good vehicle speed sensor and check for proper operation. If problem is corrected, replace vehicle speed sensor.
		No	Open circuit between connector C02-C and C01-2C Repair as necessary.
6	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EEF2CFD56

Diagnostic trouble code No. P00606	**ECU self test failed**
[Related items]	• Poor terminal contact or open at IAC back-up voltage supply circuit • ECM malfunction

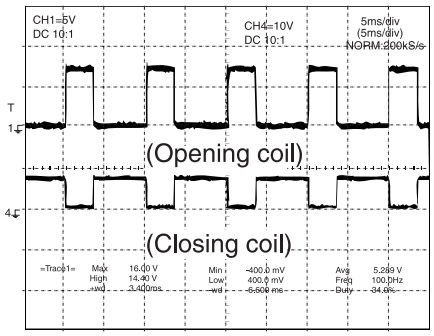
Step	Inspection	Action	
1	Ignition ON, measure voltage between ECM connector B01-8/9 and gnd (approx. 12V). Is voltage within specification?	Yes	Temporarily install a Known good ECM and check for proper operation. If problem is corrected, replace ECM
		No	Go to step 2.
2	Visually check "EMS (10A)" fuse in passenger compartment fuse box. Is "EMS (10A)" fuse melted?	Yes	Replace "EMS (10A)" fuse
		No	Poor connection open between ECM connector B01-8/9 and passenger compartment fuse box or intermittently poor terminal contact. Repair poor connection or clean oxidization. Repair as necessary.
3	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (EXCEPT FOR EUROPE) EEF22A1E2

P1505 : Idle control valve opening coil signal low
P1506 : Idle control valve opening coil signal high
P1507 : Idle control valve closing coil signal low
P1508 : Idle control valve closing coil signal high

Circuit description

An IAC valve is installed on the throttle body and controls the intake airflow that is bypassed around the throttle plate. The function of IAC valve is to maintain idle speed according to various engine loads and conditions, and also to provide additional air during starting. Moreover, it performs an electronic dashpot during deceleration. The IAC valve consists of opening coil, closing coil, and permanent magnet. Based on information from various sensors, the ECM controls both coils by grounding their control circuit. According to the control signals from the ECM, the valve rotor rotates to control the bypass airflow into engine.



LF2D001J

DTC	Fault type	Fault condition
P0107 P0108	GND short	• Signal below lower limit when ignition switch is turned ON.
	Battery short	• Signal above upper limit when ignition switch is turned ON
	Open	• No signal when ignition switch is turned ON.

Diagnostic trouble code No. P1505	Idle control valve opening coil signal low
[Related items]	• Open circuit in IAC valve wiring • IAC valve malfunction • Short to battery voltage or short to ground in IAC valve circuit

Step	Inspection	Action	
1	Ignition OFF, disconnect IAC valve connector. Ignition ON, engine OFF, measure voltage between harness connector B20-A (W) (to ECM) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 2.
		No	Short to battery voltage in connector B20-A. Repair as necessary.
2	Ignition OFF, measure resistance between IAC valve harness connector B20-A (W) (to ECM) and GND. Is measured resistance infinite?	Yes	Go to step 3.
		No	Short to ground in connector B20-B. Repair as necessary.
3	Disconnect ECM connector. Check for continuity between harness connector B20-A (W) and ECM harness connector B03-43. Does continuity exist?	Yes	Go to step 4.
		No	Open between connector B20-A and ECM connector B03-43. Repair as necessary.
4	Ignition ON, engine OFF, measure voltage between IAC valve harness connector B20-B (R/Y) and GND (B+) Is voltage within specification?	Yes	Go to step 5.
		No	Open or short between connector B20-B and main relay . Repair as necessary.
5	Check for proper connections at connector B20-B (R/Y) and main relay. Are connections correct?	Yes	Go to step 6.
		No	Repair connection as necessary
6	Measure resistance between IAC valve connector B20 terminals A and B (16.5~18.5Ω at 68°F (20°C)). Is resistance within specification?	Yes	Visually inspect for terminal contact failure (oxidized, deformed or misplaced, etc). Repair as necessary.
		No	Temporarily install a Known good IAC valve and check for proper operation. If problem is corrected, replace IAC valve.
7	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Diagnostic trouble code No. P1506	Idle control opening coil signal high
[Related items]	• Short to battery voltage between IAC valve and ECM • IAC valve malfunction

Step	Inspection	Action	
1	Ignition OFF, disconnect IAC valve connector. Ignition ON, engine OFF, measure voltage between harness connector B20-A (W) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 2.
		No	Short to battery voltage between IAC valve connector B20-A and ECM connector B03-43. Repair as necessary.
2	Measure resistance between connector B20 terminals A and B (16.5~18.5Ω at 68°F(20°C)). Is resistance within specification?	Yes	Poor terminal contact due to oxidation, bent, or misplaced pin at IAC valve (opening coil) connector B20-A or ECM connector B03-43.
		No	Temporarily install a known good IAC valve and check and check for proper operation. If problem is corrected, replace IAC valve.
3	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Diagnostic trouble code No. P1507	Idle control valve closing signal low
[Related items]	• Open circuit in IAC valve wiring • IAC valve malfunction • Short to battery voltage or short to ground in IAC valve circuit

Step	Inspection	Action	
1	Ignition OFF, disconnect IAC valve connector. Ignition ON, engine OFF, measure voltage between harness connector B20-C (W/R) (to ECM) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 2.
		No	Short to battery voltage in connector B20-C. Repair as necessary.
2	Ignition OFF, measure resistance between IAC valve harness connector B20-C (W/R) (to ECM) and GND. Is measured resistance infinite?	Yes	Go to step 3.
		No	Short to ground in connector B20-C. Repair as necessary.
3	Disconnect ECM connector. Check for continuity between harness connector B20-C (W/R) and ECM harness connector B03-44. Does continuity exist?	Yes	Go to step 4.
		No	Open between connector B20-C and ECM connector B03-44. Repair as necessary.
4	Ignition ON, engine OFF, measure voltage between ISC valve harness connector B20-B (R/Y) and GND (B+). Is voltage within specification?	Yes	Go to step 5.
		No	Open or short between connector B20-B and main relay. Repair as necessary.
5	Check for proper connections at connector B20-B (R/Y) and main relay. Are connections correct?	Yes	Go to step 6.
		No	Repair connection as necessary
6	Measure resistance between IAC valve connector B20 terminals B and C (14.5~16.5Ω at 68°F (20°C)).Is resistance within specification?	Yes	Visually inspect for terminal contact failure (oxidized, deformed or misplaced, etc). Repair as necessary.
		No	Temporaily install a Known good IAC valve and check for proper operation. If problem is corrected, replace IAC valve.
7	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

Diagnostic trouble code No. P1508	Idle control valve closing coil signal high
[Related items]	• Short to battery voltage between IAC valve and ECM • IAC valve malfunction

Step	Inspection	Action	
1	Ignition OFF, disconnect IAC valve connector. Ignition ON, engine OFF, measure voltage between harness connector B20-C (W/R) and GND. Is measured voltage less than 0.5V?	Yes	Go to step 2.
		No	Short to battery voltage between IAC valve connector B20-C and ECM connector B03-44. Repair wire as nessary.
2	Measure resistance between connector B20 terminals B and C (14.5~16.5Ω at 68°F(20°C)). Is resistance within specification?	Yes	Poor terminal contact due to oxidation, bent, or misplaced pin at IAC valve connector B20-C and ECM connector B03-44. Inspect and repair as necessary.
		No	Temporarily install a Known good IAC valve and check for proper operation. If problem is corrected, replace IAC valve
3	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEE873FC0

Diagnostic trouble code No. P0101	**Mass or volume air flow circuit range/performance problem**
[Related items]	• Dirty air cleaner • Air leak in intake system • Contaminated, deteriorated or damaged MAFS • Poor connections at ECM, MAFS, or TPS • Faulty MAFS or TPS ***NOTE*** *If any codes relating to MAFS or TPS are present, do all repairs associated with them before this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any DTC relating to MAFS or TPS set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Using SCAN TOOL, monitor MAFS voltage signals. • **0.6~1.0V @ idle** Is signal within specification?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and MAFS.
		No	Go to step 3.
3	Thoroughly check MAFS for loose, poor connection, bent, corrosion, contamination, deterioration or damage. Is MAFS okay?	Yes	Go to step 4.
		No	Clean or repair as necessary.
4	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL, monitor TP voltage signals. • **0.3~0.9V (0.71~1.38 KΩ) @ idle** • **4.0~4.4V (2.2~3.4 KΩ) @ full open** Is signal within specifications?	Yes	Go to step 5.
		No	Do all repairs associated with TPS before proceeding the next step.
5	Turn ignition switch to OFF and disconnect MAFS connector. Turn ignition switch to ON and measure voltage of MAFS power circuit between MAFS harness connector and chassis ground. • **Specification: approximately 5V** Is voltage within specification?	Yes	Go to step 6.
		No	Open circuit or short circuit to chassis ground between MAFS harness connector and ECM connector.Repair as necessary.

Step	Inspection	Action	
6	Turn ignition to OFF and disconnect ECM connector. Measure resistance of MAFS signal circuit between MAFS harness connector and ECM harness connector. Measure resistance of MAFS ground circuit between MAFS harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 7.
		No	Open circuit between MAFS harness connector and ECM harness connector. Repair as necessary.
7	ECM connector and MAFS connector is still disconnected. Turn ignition to ON. Measure voltage of MAFS signal circuit between MAFS harness connector and chassis ground. • **Specification: below 0.5V** Does voltage within specification?	Yes	Go to step 8.
		No	Short circuit to battery between MAFS harness connector and ECM harness connector. Repair as necessary.
8	ECM connector and MAFS connector is still disconnected. Turn ignition to OFF. Measure resistance between MAFS harness connector and chassis ground at MAFS signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Temporarily install a known good MAFS and check for proper operation. If problem is corrected, replace MAFS.
		No	Short circuit to chassis ground between MAFS harness connector and ECM harness connector. Repair as necessary.
9	Check air cleaner for dirt, blockage, or damage. Is air cleaner okay?	Yes	Go to step 10.
		No	Repair or replace as necessary.
10	Check entire air intake system for leaks or blockages such as; • Throttle body • PCV valve • Intake manifold • Gasket between intake manifold and surge tank • Seals between intake manifold and fuel injectors • Seals between surge tank and PCV pipe • Etc Is entire air intake system okay?	Yes	Temporarily install a known good MAFS and check for proper operation. If problem is corrected, replace MAFS.
		No	Repair or replace as necessary.
11	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEFFC54DD

Diagnostic trouble code No. P0102	Mass or volume air flow circuit low input
[Related items]	• Open or short to ground between MAFS and ECM • Open or short to ground between MAFS battery power and engine main relay • Faulty MAFS

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Start engine and monitor MAFS voltage signals. • **Specification: 0.6~1.0V @ idle** Is signal within specification?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and MAFS.
		No	Go to step 2.
2	Turn ignition switch to OFF and disconnect MAFS connector. Turn ignition switch to ON. Measure voltage of MAFS battery power circuit between MAFS harness connector and chassis ground. • **Specification: approximately B+** Is voltage within specification?	Yes	Go to step 3.
		No	Open circuit or short circuit to chassis ground between MAFS harness connector and main relay. Repair as necessary.
3	Turn ignition switch to OFF and disconnect MAFS connector. Turn ignition switch to ON. Measure voltage of MAFS reference 5V circuit between MAFS harness connector and chassis ground. • **Specification: approximately 5V** Is voltage within specification?	Yes	Go to step 4.
		No	Open circuit or short circuit to chassis ground between MAFS harness connector and ECM connector. Repair as necessary.
4	Turn ignition to OFF and disconnect ECM connector. Measure resistance of MAFS signal circuit between MAFS harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 5.
		No	Open circuit between MAFS harness connector and ECM harness connector. Repair as necessary.
5	ECM connector and MAFS connector is still disconnected. Turn ignition to OFF. Measure resistance between MAFS harness connector and chassis ground at MAFS signal circuit. Measure resistance between MAFS signal circuit and MAFS ground circuit. • **Specification: infinite** Does each resistance indicate open circuit?	Yes	Temporarily install a known good MAFS and check for proper operation. If problem is corrected, replace MAFS.
		No	Short circuit to chassis ground between MAFS harness connector and ECM harness connector. Short circuit between MAFS signal circuit and ground circuit. Repair as necessary.
6	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EED6DA06E

Diagnostic trouble code No. P0103	**Mass or volume air flow circuit high input**
[Related items]	• Short to battery between MAFS signal and ECM • Faulty MAFS

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Start engine and monitor MAFS voltage signals. • **Specification: 0.6~1.0V @ idle** Is signal within specification?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and MAFS.
		No	Go to step 2.
2	Turn ignition switch to OFF and disconnect MAFS connector. Measure resistance of MAFS ground circuit between MAFS harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 3.
		No	Open circuit between MAFS harness connector and ECM harness connector. Repair as necessary.
3	ECM connector and MAFS connector is still disconnected. Turn ignition to ON. Measure voltage of MAFS signal circuit between MAFS harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specification?	Yes	Temporarily install a known good MAFS and check for proper operation. If problem is corrected, replace MAFS.
		No	Short circuit to battery between MAFS harness connector and ECM harness connector. Repair as necessary.
4	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE762B4E3

Diagnostic trouble code No. P0112	**Intake air temperature circuit low input**
[Related items]	• Short to battery between MAFS signal and ECM • Faulty MAFS

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any DTC relating to MAFS set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL and monitor IAT signals. • **3.6~3.8V (2.22~2.82 kΩ) @ 20°C (68°F)** • **1.2~1.5V (0.29~0.36 kΩ) @ 80°C (176°F)** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and MAFS.
		No	Go to step 3.
3	Ignition OFF, IATS connector and ECM connector is still disconnected. Measure resistance between IATS signal circuit and ECTS ground circuit. Measure resistance between IATS harness connector and chassis ground at IATS signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Temporarily install a known good IATS and check for proper operation. If problem is corrected, replace IATS.
		No	Short circuit between IATS signal circuit and ground circuit. Short to chassis ground between IATS harness connector and ECM harness connector. Repair as necessary.
4	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE8EACFFF

Diagnostic trouble code No. P0113	Intake air temperature circuit high input
[Related items]	• Open or short to battery between IATS signal and ECM • Open between IATS ground and ECM • Faulty IATS

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector Turn ignition to ON and monitor other DTCs. Are any DTC relating to MAFS set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL and monitor IAT signals. • **3.6~3.8V (2.22~2.82 kΩ) @ 20°C (68°F)** • **1.2~1.5V (0.29~0.36 kΩ) @ 80°C (176°F)** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and MAFS.
		No	Go to step 3.
3	Turn ignition to OFF and disconnect IATS connector. Turn ignition to ON and measure voltage of IATS signal circuit between IATS harness connector and chassis ground. • **Specification: approximately 5V** Is voltage within specification?	Yes	Go to step 4.
		No	Open circuit or short circuit to chassis ground between IATS harness connector and ECM harness connector. Repair as necessary.
4	Turn ignition to OFF and disconnect ECM connector. Measure resistance of IATS ground circuit between IATS harness connector and ECM harness connector • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 5.
		No	Open circuit between IATS harness connector and ECM harness connector. Repair as necessary.
5	Turn ignition to ON. ECM connector is still disconnected. Measure voltage of IATS signal circuit between IATS harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specification?	Yes	Temporarily install a known good IATS and check for proper operation. If problem is corrected, replace IATS.
		No	Short circuit to battery between IATS harness connector and ECM harness connector. Repair as necessary.
6	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE9E86C0C

Diagnostic trouble code No. P0116	**Engine coolant temperature circuit range/performance problem**
Diagnostic trouble code No. P0125	**Insufficient coolant temperature for closed loop fuel control**
[Related items]	• After engine start-up, the elapsed time before feedback operation is initiated is too long (engine coolant temperature sensor input is insufficient for closed loop operation) • Poor connections between ECTS and ECM • Misplaced, loose or corroded terminals • Foreign materials fouled, contaminated, deteriorated ECTS • Faulty ECTS • Faulty thermostat ***NOTE*** *If any codes relating to ECTS are present, do all repairs associated with them before this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector Turn ignition to ON and monitor other DTCs. Are any DTC relating to ECTS set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL and monitor ECT signals. • **3.6~3.8V (2.31~2.59 kΩ) @ 20°C (68°F)** • **1.2~1.5V (0.31~0.33 kΩ) @ 80°C (176°F)** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and ECTS.
		No	Go to step 3.
3	Check ECTS for contamination, deterioration or damage. Is ECTS contaminated, deteriorated or damaged?	Yes	If ECTS is damaged or deteriorated, replace.
		No	Go to step 4.
4	Thoroughly check for loose, bent or corroded connectors at ECM connector and ECTS connector. With ignition OFF, disconnect ECM connector and ECTS connector. Measure resistance of all two circuits between ECTS harness connector and ECM harness connector. • **Specifications: below 1Ω** Does each indicate continuity circuit?	Yes	Go to step 5.
		No	Open circuit between IATS harness connector and ECM harness connector. Repair as necessary.
5	Remove thermostat and check that thermostat is stuck or damaged. Is thermostat okay?	Yes	Temporarily install a known good IATS and check for proper operation. If problem is corrected, replace ECTS.
		No	Temporarily install a known good thermostat and check for proper operation. If problem is corrected, replace thermostat.
6	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEB1DDC6F

Diagnostic trouble code No. P0117	Engine coolant temperature circuit low input
[Related items]	• Short to ground between ECTS signal and ECM • Faulty ECTS

Step	Inspection	Action	
1	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL and monitor ECT voltage signals. • **3.6~3.8V (2.22~2.82 kΩ) @ 20°C (68°F)** • **1.2~1.5V (0.29~0.36 kΩ) @ 80°C (176°F)** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and ECTS.
		No	Go to step 2.
2	Ignition OFF, disconnect ECTS connector and ECM connector. Measure resistance between ECTS signal circuit and ECTS ground circuit. Measure resistance between ECTS harness connector and chassis ground at ECTS signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Temporarily install a known good ECTS and check for proper operation. If problem is corrected, replace ECTS.
		No	Short circuit between ECTS signal circuit and ground circuit. Short to chassis ground between ECTS harness connector and ECM harness connector. Repair as necessary.
3	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEBB3EFE3

Diagnostic trouble code No. P0118	Engine coolant temperature circuit high input
[Related items]	• Open or short to battery between ECTS signal and ECM • Open between ECTS ground and ECM • Faulty ECTS

Step	Inspection	Action	
1	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL and monitor ECT voltage signals. • **3.6~3.8V (2.22~2.82 kΩ) @ 20°C (68°F)** • **1.2~1.5V (0.29~0.36 kΩ) @ 80°C (176°F)** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and ECTS.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect ECTS connector. Turn ignition to ON and measure voltage of ECTS signal circuit between ECTS harness connector and chassis ground. • **Specification: approximately 5V** Is voltage within specification?	Yes	Go to step 3.
		No	Open circuit or short circuit to chassis ground between ECTS harness connector and ECM harness connector. Repair as necessary.
3	Turn ignition to OFF and disconnect ECM connector. Measure resistance of ECTS ground circuit between ECTS harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between ECTS harness connector and ECM harness connector. Repair as necessary.
4	Turn ignition to ON. Measure voltage of ECTS signal circuit between ECTS harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Temporarily install a known good ECTS and check for proper operation. If problem is corrected, replace ECTS.
		No	Short circuit to battery between ECTS harness connector and ECM harness connector. Repair as necessary.
5	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EECBAF39F

Diagnostic trouble code No. P0121	Throttle position sensor circuit range/performance problem
[Related items]	• Open or short to chassis ground between TPS and ECM • Short to battery between TPS and ECM • Misplaced, loose or corrodes terminals • Contaminated, deteriorated TPS • Faulty TPS

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any DTC relating to TPS set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL, monitor TP voltage signals. • **0.3~0.9V (0.71~1.38 kΩ) @ idle** • **4.0~4.4V (2.2~3.4 kΩ) @ full open** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and ECTS.
		No	Go to step 3.
3	Ignition ON and engine OFF. Using SCAN TOOL and monitor TP voltage signals while slowly opening the throttle. Does voltage signal increase?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and TPS.
		No	Temporarily install a known good TPS and check for proper operation. If problem is corrected, replace TPS.
4	Turn ignition to OFF and disconnect TPS connector. Turn ignition to ON and measure voltage of TPS reference voltage between TPS harness connector and chassis ground. • **Specification: approximately 5V** Is voltage within specifications?	Yes	Go to step 5.
		No	Open circuit or short circuit to chassis ground between TPS harness connector and ECM connector. Repair as necessary.
5	Thoroughly check TPS for loose, poor connection, bent, corrosion, contamination, deterioration, or damage. Is TPS okay?	Yes	Temporarily install a known good TPS and check for proper operation. If problem is corrected, replace TPS.
		No	Clean TPS with cleaner before installing. If damaged or deteriorated, temporarily install a known good TPS and check for proper operation. If problem is corrected, replace TPS.
6	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE538B80C

Diagnostic trouble code No. P0122	Throttle position sensor circuit low input
[Related items]	• Open or short to ground between TPS reference power and ECM • Short to ground between TPS signal and ECM • Faulty TPS

Step	Inspection	Action	
1	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL, monitor TP voltage signals. • **0.3~0.9V (0.71~1.38 kΩ) @ idle** • **4.0~4.4V (2.2~3.4 kΩ) @ full open** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and TPS.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect TPS connector. Turn ignition to ON and measure voltage of TPS reference voltage between TPS harness connector and chassis ground. • **Specification: approximately 5V** Is voltage within specifications?	Yes	Go to step 3.
		No	Open circuit or short circuit to chassis ground between TPS harness connector and ECM connector. Repair as necessary.
3	Turn ignition to OFF and disconnect ECM connector. Measure resistance of TPS signal circuit between TPS harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between TPS harness connector and ECM harness connector. Repair as necessary.
4	Ignition OFF, TPS connector and ECM connector is still disconnected. Measure resistance between TPS signal circuit and ground circuit. Measure resistance between TPS harness connector and chassis ground at TPS signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Temporarily install a known good TPS and check for proper operation. If problem is corrected, replace TPS.
		No	Short circuit between TPS signal circuit and ground circuit. Short to chassis ground between TPS harness connector and ECM harness connector. Repair as necessary.
5	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE20863A6

Diagnostic trouble code No. P0123	Throttle position sensor circuit high input
[Related items]	• Open or short to battery between TPS signal and ECM • Open between TPS ground and ECM • Faulty TPS

Step	Inspection	Action	
1	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL, monitor TP voltage signals. • **0.3~0.9V (0.71~1.38 KΩ) @ idle** • **4.0~4.4V (2.2~3.4 KΩ) @ full open** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and TPS.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect TPS connector and ECM connector. Measure resistance of TPS ground circuit between TPS harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 2.
		No	Open circuit between TPS harness connector and ECM harness connector. Repair as necessary.
3	Turn ignition to ON. Measure voltage of TPS signal circuit between TPS harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Temporarily install a known good TPS and check for proper operation. If problem is corrected, replace TPS.
		No	Short circuit to battery between TPS harness connector and ECM harness connector. Repair as necessary.
4	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE3AD8F2B

Diagnostic trouble code No. P0130	HO2S circuit malfunction (bank1, sensor1)
[Related items]	• Open or short to battery between front HO2S and ECM • Short to chassis ground between front HO2S and ECM • Short between front HO2S wires • Faulty front HO2S • Poor connections between front HO2S and ECM • Misplaced, bent, loose or corroded terminals

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Warm up engine to normal operating temperature for more than 10 minutes. Using SCAN TOOL, monitor HO2S signal waveform. Does the HO2S signal switch lean to rich and rich to lean over 6 times for 10 seconds?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and HO2S.
		No	Go to step 3.
3	Turn ignition to OFF and disconnect ECM connector and HO2S connector. Measure resistance of HO2S ground circuit between HO2S harness connector and ECM harness connector. Measure resistance of HO2S signal circuit between HO2S harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between HO2S harness connector and ECM harness connector. Repair as necessary.
4	Turn ignition to ON. ECM connector is still disconnected. Measure voltage of HO2S signal circuit between HO2S harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Go to step 5.
		No	Short circuit to battery between HO2S harness connector and ECM harness connector. Repair as necessary.
5	Ignition OFF, HO2S connector and ECM connector is still disconnected. Measure resistance between HO2S signal circuit and ground circuit. Measure resistance between HO2S harness connector and chassis ground at HO2S signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Go to step 6.
		No	Short circuit between HO2S signal circuit and ground circuit. Short to chassis ground between HO2S harness connector and ECM harness connector. Repair as necessary.

Step	Inspection	Action	
6	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If connectors are okay, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
7	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEFD1E240

Diagnostic trouble code No. P0131	**HO2S circuit low input (bank1, sensor1)**
[Related items]	• Short to ground between front HO2S signal and ECM • Faulty front HO2S

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect HO2S connector and ECM connector. Measure resistance between HO2S signal circuit and ground circuit. Measure resistance between HO2S harness connector and chassis ground at HO2S signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Go to step 2.
		No	Short circuit between HO2S signal circuit and ground circuit. Short to chassis ground between HO2S harness connector and ECM harness connector. Repair as necessary.
2	Connect HO2S connector and ECM connector. Warm up engine to normal operating temperature for more than 10 minutes. Using SCAN TOOL, monitor HO2S signal waveform. Does the HO2S signal switch lean to rich and rich to lean over 6 times for 10 seconds?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and HO2S.
		No	Go to step 3.
3	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If connectors are okay, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
4	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EED21B8D2

Diagnostic trouble code No. P0132	**HO2S circuit high input (bank1, sensor1)**
[Related items]	• Open or short to battery between front HO2S signal and ECM • Faulty front HO2S

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect HO2S connector and ECM connector. Turn ignition to ON and measure voltage of HO2S signal circuit between HO2S harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Go to step 2.
		No	Short circuit to battery between HO2S harness connector and ECM harness connector. Repair as necessary.
2	Warm up engine to normal operating temperature for more than 10 minutes. Using SCAN TOOL, monitor HO2S signal waveform. Does the HO2S signal switch lean to rich and rich to lean over 6 times for 10 seconds?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and HO2S.
		No	Go to step 3.
3	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If connectors are okay, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
4	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE7BFCB7E

Diagnostic trouble code No. P0133	HO2S circuit slow responsive (bank1, sensor1)
[Related items]	• Abnormal combustionl • Improper fuel pressurel • Front and rear HO2S connections reversed • Faulty fuel delivery system • Leak in intake system • Leak in exhaust system • Faulty front HO2S ***NOTE*** *If any misfire, purge solenoid valve, MAFS or HO2S heater codes are present, do all repairs associated with those codes before proceeding this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Visually check for leak from exhaust system (especially between TWC converter and front exhaust pipe). Are any leaks present?	Yes	Repair intake system leaks as necessary.
		No	Go to step 3.
3	Visually check for leak from intake system. Are any vacuum leaks present?	Yes	Repair exhaust system leaks as necessary.
		No	Go to step 4.
4	Start engine after installing fuel pressure gauge at service valve in fuel rail. With engine running at operating temperature, is fuel pressure within specification? **Fuel pressure at idle: 46~51 psi (320~350kPa, 3.2~3.5kg/cm²)**	Yes	Temporarily install a known good HO2s and check for proper operation. If problem is corrected, replace HO2S.
		No	1. If measured pressure is too high: Go to step 5. 2. If measured pressure is too low: Go to step 6
5	Disconnect return line hose from fuel filter. Blow through line towards tank. Is return line restricted?	Yes	Check for blockage in return line, clean or replace as necessary.
		No	Repair pressure regulator.
6	Clamp a return line from fuel filter and check if pressure rises. Do fuel pressure rise?	Yes	Replace fuel delivery module.
		No	Check fuel filter at fuel pump. If it is OK, measure fuel pump maximum pressure and repair as necessary.
7	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE8C7EE82

Diagnostic trouble code No. P0134	HO2S circuit no activity detected (bank1, sensor1)
[Related items]	• Open or short between front HO2S signal terminal and ECM • Contaminated, deteriorated or aged front HO2S • Misplaced, bent, loose or corroded connector terminals • Faulty front HO2S ***NOTE*** *If any misfire, purge solenoid valve or HO2S heater codes are present, do all repairs associated with those codes before proceeding this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Warm up engine to normal operating temperature for more than 10 minutes. Using SCAN TOOL monitor HO2S signal. Does the HO2S signal switch lean to rich and rich to lean over 6 times for 10 seconds?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and HO2S.
		No	Go to step 3.
3	Turn ignition to OFF and disconnect ECM connector and HO2S connector. Measure resistance of HO2S ground circuit between HO2S harness connector and ECM harness connector. Measure resistance of HO2S signal circuit between HO2S harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between HO2S harness connector and ECM harness connector. Repair as necessary.
4	Turn ignition to ON. Measure voltage of HO2S signal circuit between HO2S harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Go to step 5.
		No	Short circuit to battery between HO2S harness connector and ECM harness connector. Repair as necessary.
5	Ignition OFF, HO2S connector and ECM connector is still disconnected. Measure resistance between HO2S signal circuit and ground circuit. Measure resistance between HO2S harness connector and chassis ground at HO2S signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Go to step 6.
		No	Short circuit between HO2S signal circuit and ground circuit. Short to chassis ground between HO2S harness connector and ECM harness connector. Repair as necessary.

Step	Inspection	Action	
6	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	Clean HO2S with cleaner before installing. If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If OK, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
7	Visually check for leak from exhaust system.(especially between TWC converter and front exhaust pipe) Are any leaks present?	Yes	Repair intake system leaks as necessary.
		No	Go to step 8.
8	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EED1D380A

Diagnostic trouble code No. P0136	HO2S circuit malfunction (bank1, sensor2)
[Related items]	• Open or short to chassis ground between rear HO2S and ECM • Short to battery between rear HO2S and ECM • Short between rear HO2S wires • Misplaced, bent, loose or corroded connector terminals • Faulty rear HO2S

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect ECM connector and HO2S connector. Measure resistance of HO2S ground circuit between HO2S harness connector and ECM harness connector. Measure resistance of HO2S signal circuit between HO2S harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 3.
		No	Open circuit between HO2S harness connector and ECM harness connector. Repair as necessary.
3	Turn ignition to ON. Measure voltage of HO2S signal circuit between HO2S harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Go to step 4.
		No	Short circuit to battery between HO2S harness connector and ECM harness connector. Repair as necessary.
4	Ignition OFF, HO2S connector and ECM connector is still disconnected. Measure resistance between HO2S signal circuit and ground circuit. Measure resistance between HO2S harness connector and chassis ground at HO2S signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Go to step 5.
		No	Short circuit between HO2S signal circuit and ground circuit. Short to chassis ground between HO2S harness connector and ECM harness connector. Repair as necessary.
5	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	Clean HO2S with cleaner before installing. If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If connectors are okay, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
6	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEEB25325

Diagnostic trouble code No. P0137	**HO2S circuit low input (bank1, sensor2)**
[Related items]	• Short to ground between rear HO2S signal and ECM • Faulty rear HO2S

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect HO2S connector and ECM connector. Measure resistance between HO2S signal circuit and ground circuit. Measure resistance between HO2S harness connector and chassis ground at HO2S signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Go to step 2.
		No	Short circuit between HO2S signal circuit and ground circuit. Short to chassis ground between HO2S harness connector and ECM harness connector. Repair as necessary.
2	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If connectors are okay, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
3	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEF2A7ECA

Diagnostic trouble code No. P0138	**HO2S circuit high input (bank1, sensor2)**
[Related items]	• Open or short to battery between rear HO2S signal and ECM • Faulty rear HO2S

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect HO2S connector and ECM connector. Turn ignition to ON and measure voltage of HO2S signal circuit between HO2S harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Go to step 2.
		No	Short circuit to battery between HO2S harness connector and ECM harness connector. Repair as necessary.
2	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If connectors are okay, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
3	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EED0A2CCB

Diagnostic trouble code No. P0139	HO2S circuit slow responsive (bank1, sensor2)
[Related items]	• Abnormal combustion • Improper fuel pressure • Front and rear HO2S connections reversed • Faulty fuel delivery system • Leak in intake system • Leak in exhaust system • Faulty rear HO2S ***NOTE*** *If any misfire, purge solenoid valve, MAFS or HO2S heater codes are present, do all repairs associated with those codes before proceeding this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Visually check for leak from exhaust system (especially between TWC converter and front exhaust pipe). Are any leaks present?	Yes	Repair intake system leaks as necessary.
		No	Go to step 3.
3	Visually check for leak from intake system. Are any vacuum leaks present?	Yes	Repair exhaust system leaks as necessary.
		No	Go to step 4.
4	Start engine after installing fuel pressure gauge at service valve in fuel rail. With engine running at operating temperature, is fuel pressure within specification? **Fuel pressure at idle: 46~51 psi (320~350kPa, 3.2~3.5kg/cm²)**	Yes	Temporarily install a known good HO2s and check for proper operation. If problem is corrected, replace HO2S.
		No	1. If measured pressure is too high: Go to step 5. 2. If measured pressure is too low: Go to step 6
5	Disconnect return line hose from fuel filter. Blow through line towards tank. Is return line restricted?	Yes	Check for blockage in return line, clean or replace as necessary.
		No	Repair pressure regulator.
6	Clamp a return line from fuel filter and check if pressure rises. Do fuel pressure rise?	Yes	Replace fuel delivery module.
		No	Check fuel filter at fuel pump. If it is OK, measure fuel pump maximum pressure and repair as necessary.
7	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EED739E64

Diagnostic trouble code No. P0140	HO2S circuit no activity detected (bank1, sensor2)
[Related items]	• Open or short between rear HO2S signal terminal and ECM • Contaminated, deteriorated or aged rear HO2S • Misplaced, bent, loose or corroded connector terminals • Faulty rear HO2S ***NOTE*** *If any misfire, purge solenoid valve or HO2S heater codes are present, do all repairs associated with those codes before proceeding this trouble area.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor other DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect ECM connector and HO2S connector. Measure resistance of HO2S ground circuit between HO2S harness connector and ECM harness connector. Measure resistance of HO2S signal circuit between HO2S harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 3.
		No	Open circuit between HO2S harness connector and ECM harness connector. Repair as necessary.
3	Turn ignition to ON. Measure voltage of HO2S signal circuit between HO2S harness connector and chassis ground. • **Specification: below 0.5V** Is voltage within specifications?	Yes	Go to step 4.
		No	Short circuit to battery between HO2S harness connector and ECM harness connector. Repair as necessary.
4	Ignition OFF, HO2S connector and ECM connector is still disconnected. Measure resistance between HO2S signal circuit and ground circuit. Measure resistance between HO2S harness connector and chassis ground at HO2S signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Go to step 5.
		No	Short circuit between HO2S signal circuit and ground circuit. Short to chassis ground between HO2S harness connector and ECM harness connector. Repair as necessary.

Step	Inspection	Action	
5	Thoroughly check HO2S for contamination, deterioration or damage. Is HO2S contaminated, deteriorated or damaged?	Yes	Clean HO2S with cleaner before installing. If damaged or deteriorated, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
		No	Verify ECM and HO2S connectors are secure. If OK, temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
6	Visually check for leak from exhaust system.(especially between TWC converter and front exhaust pipe) Are any leaks present?	Yes	Repair intake system leaks as necessary.
		No	Go to step 7.
7	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEF4CF2FE

Diagnostic trouble code No. P0030	**HO2S heater circuit malfunction (bank1, sensor1)**
Diagnostic trouble code No. P0031	**HO2S heater circuit low input (bank1, sensor1)**
Diagnostic trouble code No. P0032	**HO2S heater circuit high input (bank1, sensor1)**
[Related items]	• Open or short to battery between front HO2S heater and ECM • Short to chassis ground between front HO2S heater and ECM • Open or short to chassis ground between front HO2S heater and main relay • Incorrect front HO2S heater resistance • Faulty front HO2S heater

Step	Inspection	Action	
1	Visually inspect the HO2S circuit for exposed wiring, contamination, corrosion and proper installation. Were any concerns found during the visual inspection?	Yes	Repair any concerns found in the visual inspection.
		No	Go to step 2.
2	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor DTCs. Are any DTC related to HO2S heater also set?	Yes	Go to step 3.
		No	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and HO2S.
3	Turn ignition switch to OFF and disconnect HO2S connector. Start engine and allow an engine to idle until ECT reaches operating temperature. Measure voltage of HO2S heater battery voltage between HO2S harness connector and chassis ground. • **Specification: approximately B+** Is measured voltage within specification?	Yes	Go to step 4.
		No	Open circuit or short circuit to chassis ground between main relay and HO2S harness connector.
4	Turn ignition to OFF and disconnect ECM connector and HO2S connector. Measure resistance of HO2S heater signal circuit between HO2S harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 5.
		No	Open circuit between HO2S harness connector and ECM harness connector. Repair as necessary.
5	Measure resistance between HO2S heater signal and battery power terminal. Measure resistance between MAFS MAFS ground circuit. • **Approximately 3~7Ω at 20°C (68°F)** Is measured resistance within specification?	Yes	Go to step 6.
		No	Temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
6	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE7E83695

Diagnostic trouble code No. P0036	**HO2S heater circuit malfunction (bank1, sensor2)**
Diagnostic trouble code No. P0037	**HO2S heater circuit low input (bank1, sensor2)**
Diagnostic trouble code No. P0038	**HO2S heater circuit high input (bank1, sensor2)**
[Related items]	• Open or short to battery between rear HO2S heater and ECM • Short to chassis ground between rear HO2S heater and ECM • Open or short to chassis ground between rear HO2S heater and main relay • Incorrect rear HO2S heater resistance • Faulty rear HO2S heater

Step	Inspection	Action	
1	Visually inspect the HO2S circuit for exposed wiring, contamination, corrosion and proper installation. Were any concerns found during the visual inspection?	Yes	Repair any concerns found in the visual inspection.
		No	Go to step 2.
2	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor DTCs. Are any DTC related to HO2S heater also set?	Yes	Go to step 3.
		No	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and HO2S.
3	Turn ignition switch to OFF and disconnect HO2S connector. Start engine and allow an engine to idle until ECT reaches operating temperature. Measure voltage of HO2S heater battery voltage between HO2S harness connector and chassis ground. • **Specification: approximately B+** Is measured voltage within specification?	Yes	Go to step 4.
		No	Open circuit or short circuit to chassis ground between main relay and HO2S harness connector.
4	Turn ignition to OFF and disconnect ECM connector and HO2S connector. Measure resistance of HO2S heater signal circuit between HO2S harness connector and ECM harness connector. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 5.
		No	Open circuit between HO2S harness connector and ECM harness connector. Repair as necessary.
5	Measure resistance between HO2S heater signal and battery power terminal. • **Approximately 3~7Ω at 20°C (68°F)** Is measured resistance within specification?	Yes	Go to step 6.
		No	Temporarily install a known good HO2S and check for proper operation. If problem is corrected, replace HO2S.
6	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE459E107

Diagnostic trouble code No. P0171	Fuel system too lean (bank1)
[Related items]	• Faulty fuel delivery system • Clogged fuel injectors • Faulty fuel injectors • Leak in intake system • Leak in exhaust system • Faulty MAFS • Faulty TPS ***NOTE*** *If any codes relating to injectors, HO2S, ECTS or MAFS are stored, do all repairs associated with those codes before proceeding with this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Using SCAN TOOL, monitor long-term on fuel trim data. • **Long-term: -12~12%** Is long-term within the specifications indicated?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared.
		No	Go to step 3.
3	Visually/physically inspect the following items: • Throttle body gasket • Gasket between intake manifold and surge tank • Seals between intake manifold and fuel injectors • Seals between surge tank and PCV valves • Crankcase ventilation valve and/or system for leaks • Contaminated fuel Are the above items okay?	Yes	Go to step 4.
		No	Repair or replace as necessary.
4	Visually/physically inspect the following items: • Air cleaner element for being restricted • MAFS for proper installation and foreign objects • Exhaust system for leaks Are the above items okay?	Yes	Go to step 5.
		No	Repair or replace as necessary.
5	Check vacuum hoses for splits and proper connections to engine dynamic chamber (especially PCV, ISC hose, throttle body, intake manifold, and brake booster). Are connections OK?	Yes	Go to step 6.
		No	Repair or replace as necessary.
6	With engine idling disconnect hose between EVAP valve and canister. Check for vacuum at EVAP valve. Is vacuum available at purge valve when EVAP valve is not operating?	Yes	EVAP canister purge valve or circuit failure. Repair according to DTC P0443 repair procedures.
		No	Go to step 7.

Step	Inspection	Action	
7	After installing fuel pressure gauge to service port on fuel rail, connect DLC F/P and B (B+) with a jumper wire. • **Fuel pressure at idle: 46~51 psi (320~350kpa, 3.2~3.5kg/cm²)** Is fuel line pressure correct with ignition switch ON?	Yes	Go to step 8.
		No	**Low pressure:** Clamp return-line and check if pressure rises: - If pressure rises: replace pressure regulator. - If pressure does not rise: check the strainer at the fuel pump. **High pressure:** Disconnect return-line from fuel filter side and blow through line towards tank: - If line is clear: replace fuel delivery module. - If line is blocked: check for blockage in return line and clear or replace as necessary. If it is OK, check fuel.
8	Start engine and check for engine rpm decrease when disconnecting each injector connector in sequence. Measure the decreasing engine rpm of all 4 cylinders. Is there any cylinder with no change in rpm or only a small rpm change?	Yes	Repair as necessary.
		No	Go to step 9.
9	Remove spark plugs and inspect spark plug tips. Check for abnormal color of spark plug tips compared to other cylinders. Are any spark plugs with abnormal color compared to other cylinders?	Yes	Check for engine mechanical failure. If it is OK, replace spark plugs.
		No	Go to step 10.
10	Check for ECM input signal from MAFS, HO2S, TPS and other input signals. Are input signals within specification?	Yes	Go to step 11.
		No	Replace all failed parts.
11	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE5DEA6BB

Diagnostic trouble code No. P0172	Fuel system too rich (bank1)
[Related items]	• Faulty ignition system • EVAP canister purge valve malfunction • Leak in intake system • Leak in exhaust system • Faulty fuel delivery system - Clogged fuel injectors - Faulty fuel injectors - Fuel pressure too high - Fuel pressure regulator failure • Faulty MAFS • Faulty front HO2S • Faulty TPS ***NOTE*** *If any injectors, front HO2S, ECTS, and MAFS codes are present, do all repairs associated with those codes before proceeding this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Using SCAN TOOL, monitor long-term on fuel trim data. • **Long-term: -12~12%** Is long-term within the specifications indicated?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared.
		No	Go to step 3.
3	Visually/physically inspect the following items: • Throttle body gasket • Gasket between intake manifold and surge tank • Seals between intake manifold and fuel injectors • Seals between surge tank and PCV valves • Crankcase ventilation valve and/or system for leaks • Contaminated fuel Are the above items okay?	Yes	Go to step 4.
		No	Repair or replace as necessary.
4	Visually/physically inspect the following items: • Air cleaner element for being restricted • MAFS for proper installation and foreign objects • Exhaust system for leaks Are the above items okay?	Yes	Go to step 5.
		No	Repair or replace as necessary.

Step	Inspection	Action	
5	Check vacuum hoses for splits and proper connections to engine dynamic chamber (especially PCV, ISC hose, throttle body, intake manifold, and brake booster). Are connections OK?	Yes	Go to step 6.
		No	Repair or replace as necessary.
6	With engine idling disconnect hose between EVAP valve and canister. Check for vacuum at EVAP valve. Is vacuum available at purge valve when EVAP valve is not operating?	Yes	EVAP canister purge valve or circuit failure. Repair according to DTC P0443 repair procedures.
		No	Go to step 7.
7	After installing fuel pressure gauge to service port on fuel rail, connect DLC F/P and B (B+) with a jumper wire. • **Fuel pressure at idle: 46~51 psi (320~350kpa, 3.2~3.5kg/cm²)** Is fuel line pressure correct with ignition switch ON?	Yes	Go to step 8.
		No	**Low pressure:** Clamp return-line and check if pressure rises: - If pressure rises: replace pressure regulator. - If pressure does not rise: check the strainer at the fuel pump. **High pressure:** Disconnect return-line from fuel filter side and blow through line towards tank: - If line is clear: replace fuel delivery module. - If line is blocked: check for blockage in return line and clear or replace as necessary. If it is OK, check fuel.
8	Start engine and check for engine rpm decrease when disconnecting each injector connector in sequence. Measure the decreasing engine rpm of all 6 cylinders. Is there any cylinder with no change in rpm or only a small rpm change?	Yes	Repair as necessary.
		No	Go to step 9.
9	Remove spark plugs and inspect spark plug tips. Check for abnormal color of spark plug tips compared to other cylinders. Are any spark plugs with abnormal color compared to other cylinders?	Yes	Check for engine mechanical failure. If it is OK, replace spark plugs.
		No	Go to step 10.
10	Check for ECM input signal from MAFS, HO2S, TPS and other input signals. Are input signals within specification?	Yes	Go to step 11.
		No	Replace all failed parts.
11	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEEE4BA37

Diagnostic trouble code No. P0261/P0262	**Cylinder 1 injector circuit low/high input**
Diagnostic trouble code No. P0264/P0265	**Cylinder 2 injector circuit low/high input**
Diagnostic trouble code No. P0267/P0268	**Cylinder 3 injector circuit low/high input**
Diagnostic trouble code No. P0270/P0271	**Cylinder 4 injector circuit low/high input**
[Related items]	• Open or short between main relay and injectors • Open or short between ECM and injectors • Short to battery between ECM and injectors • Faulty fuel injector

Step	Inspection	Action	
1	Turn ignition switch to OFF and disconnect injector connector. Measure resistance between injector terminal 1 and terminal 2. • **13.5~15.5 W at 20°C (68°F)** Is measured resistance within specification?	Yes	Go to step 2.
		No	Temporarily install a known good injector and check for proper operation. If problem is corrected, replace HO2S.
2	Turn ignition switch to OFF and disconnect injector connector. With ignition ON and measure voltage of battery voltage between injector harness connector and chassis ground. • **Specification: approximately B+** Is measured voltage within specification?	Yes	Go to step 3.
		No	Open circuit or short circuit to chassis ground between main relay and injector harness connector. Repair as necessary.
3	Disconnect ECM connector and injector connector. Measure resistance between injector harness connector and ECM harness connector. • **Specification: below 1Ω** Does resistance indicate continuity?	Yes	Go to step 4.
		No	Open circuit between injector harness connector and ECM harness connector. Repair as necessary.
4	ECM connector and injector connector is still disconnected. Measure resistance between injector harness connector and chassis ground at injector signal circuit. • **Specification: infinite** Does resistance indicate continuity?	Yes	Temporarily install a known good injector and check for proper operation. If problem is corrected, replace injector.
		No	Short circuit to chassis ground between injector terminal 2 and ECM. Repair as necessary.
5	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEF94E493

Diagnostic trouble code No. P0300	**Random misfire detected**
Diagnostic trouble code No. P0301	**Cylinder 1 misfire detected**
Diagnostic trouble code No. P0302	**Cylinder 2 misfire detected**
Diagnostic trouble code No. P0303	**Cylinder 3 misfire detected**
Diagnostic trouble code No. P0304	**Cylinder 4 misfire detected**
[Related items]	• Vacuum leak in air intake system • CKPS circuit malfunction • Ignition circuit malfunction • Faulty ignition coil or plug wire • Spark plug malfunction • Low compression due to blown head gasket, leaking valve or piston ring • Low/high fuel pressure due to faulty pressure regulator, restricted fuel lines, plugged fuel filter or faulty fuel pump • Fuel injector circuit malfunction • Faulty fuel injector ***NOTE*** *If any injectors, HO2S, ECTS, and MAFS codes are present, do all repairs associated with those codes before proceeding this troubleshooting guide.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor DTCs. Are any other codes set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation. Are vacuum hoses and PCV okay?	Yes	Go to step 3.
		No	Replace faulty vacuum hoses or PCV.
3	Turn ignition to OFF and disconnect ignition coil connector. Turn ignition to ON and measure voltage of ignition coil battery voltage between ignition coil harness connector and chassis ground. • **Specification: approximately B+** Is battery voltage within specifications?	Yes	Go to step 4.
		No	Open circuit or short circuit to chassis ground between ignition coil harness connector and main relay. Repair as necessary.
4	Turn ignition to OFF and check ignition coils and plug wires for cracks or carbon tracing. Check resistance of primary coils**(0.6~0.8Ω at 20°C)**and secondary coils**(11~15kΩ at 20°C)**. Check for resistance of plug wires**(4.48~6.72KΩ per 1m)**. Are ignition coils and plug wires OK?	Yes	Go to step 5.
		No	Repair or replace as necessary.

Step	Inspection	Action	
5	Disconnect CKP connector and measure resistance between CKP terminal 2 and terminal 3 (800~900Ω at 20°C). Remove CKPS and calculate air gap between sensor and flywheel/torque converter**(0.3~1.7 mm 〈0.012~0.067 in〉)**{measure distance from hosing to teeth on flywheel/torque converter (measurement "A") and from mounting surface on sensor to sensor tip (measurement "B") subtract "B" from "A" = air gap}. Are air gap and resistance measurements within specifications?	Yes	Thoroughly check for loose, bent or corroded terminals between CKPS and ECM. Measure resistance between CKPS terminal 3 and chassis ground (1<Ω). Repair as necessary.
		No	Repair as necessary.
6	Release fuel pressure and attach fuel pressure gauge to service port on fuel rail. Start an engine and warm up to operating temperature. Check for fuel pressure at idle. • **Fuel pressure at idle: 46~51 psi (320~350kpa, 3.2~3.5kg/cm²)** Is fuel pressure within specification?	Yes	Go to step 7.
		No	Check fuel delivery system.
7	Remove spark plugs and check gap**(0.7~0.8 mm [0.027~0.031 in])**and plug condition. Are spark plugs gapped properly and in good condition?	Yes	Go to step 8.
		No	Repair as necessary.
8	Perform compression test [approximately**(184 psi, 12750kPa, 13.0kg/cm²) at 300rpm**(no more than 10% between highest and lowest cylinder)]. Is compression OK?	Yes	Go to step 9.
		No	Perform leak down test to determine source of low compression and repair as necessary.
9	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE1A9ACBC

Diagnostic trouble code No. P0325	Knock sensor circuit malfunction (bank 1)
[Related items]	• Open or short to GND between knock sensor and ECM • Source of high resistance between knock sensor and ECM • Faulty knock sensor

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor KS voltage signals. • **Specifications: 2.0~3.0V** Is signal within specifications?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and KS.
		No	Go to step 2.
2	Start and run engine. Using SCAN TOOL monitor KS voltage signals from idle to 3000rpm. Does voltage signal increase?	Yes	Check any other DTCs. If any DTCs is present, do all repairs associated with those codes before proceeding next step.
		No	Go to step 3.
3	Thoroughly check KS and ECM for loose, bent, corroded, contaminated, deteriorated or damaged connectors. Is any problem present?	Yes	Repair as necessary.
		No	Go to step 4.
4	Turn ignition to OFF and disconnect KS connector and ECM connector. Measures resistance of KS signal circuit between KS harness connector and ECM harness connector. Measure resistance of KS ground circuit between KS harness connector and chassis ground. • **Specification: below 1Ω** Is each resistance within specification?	Yes	Go to step 5.
		No	Open circuit between KS harness connector and ECM harness connector and/or chassis ground. Repair as necessary.
5	Turn ignition to ON. Measures voltage of KS signal circuit between KS harness connector and chassis ground. • **Specification: below 0.5V** Does voltage within specifications?	Yes	Go to step 6.
		No	Short circuit to battery between KS harness connector and ECM harness connector. Repair as necessary.
6	Ignition OFF, KS connector and ECM connector is still disconnected. Measures resistance between KS harness connector and chassis ground at KS signal circuit. Measure resistance between KS signal circuit and ground circuit. • **Specifications: infinite** Does resistance indicate open circuit?	Yes	Temporarily install a known good knock sensor and check for proper operation. If problem is corrected, replace knock sensor.
		No	Short circuit to chassis ground between KS harness connector and ECM harness connector. Short circuit between KS signal circuit and ground circuit. Repair as necessary.
7	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE98E8CC1

Diagnostic trouble code No. P0335	Crankshaft position sensor circuit malfunction
[Related items]	• Open or short to chassis ground between CKPS and ECM • Short to battery between CKPS and ECM • Short between CKPS wires • Out of allowable air gap • Faulty Target wheel tolerance • Faulty CKPS

Step	Inspection	Action	
1	Thoroughly check CKPS and ECM for loose, bent, corroded, contaminated, deteriorated or damaged connectors. Is any problem present?	Yes	Repair as necessary.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect CKPS connector. Turn ignition to ON and measure voltage of CKPS power circuit between CKPS harness connector and chassis ground. • **Specification: approximately B+** Is voltage within specification?	Yes	Go to step 3.
		No	Open circuit or short circuit to chassis ground between CKPS harness connector and main relay. Repair as necessary.
3	Turn ignition to OFF and disconnect ECM connector. Measure resistance of CKPS signal circuit between CKPS harness connector and ECM harness connector. Measure resistance of CKPS ground circuit between CKPS harness connector and chassis ground. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between CKPS harness connector and ECM harness connector and/or chassis ground. Repair as necessary.
4	Turn ignition to ON. Measure voltage of CKPS signal circuit between CKPS harness connector and chassis ground. • **Specifications: below 0.5V** Is voltage within specifications?	Yes	Go to step 5.
		No	Short circuit to battery between CKPS harness connector and ECM harness connector. Repair as necessary.
5	Tun ignition to OFF. Measures resistance between CKPS harness connector and ECM harness connector at CKPS signal circuit. Measure resistance between CKPS signal circuit and ground circuit. • **Specifications: infinite** Does resistance indicate open circuit?	Yes	Go to step 6.
		No	Short circuit to chassis ground between KS harness connector and ECM harness connector. Short circuit between CKPS signal circuit and ground circuit. Repair as necessary.

Step	Inspection	Action	
6	Remove CKPS and calculate air gap between sensor and flywheel/torque converter**(0.3~1.7 mm 〈0.012~0.067 in〉)**{measure distance from hosing to teeth on flywheel/torque converter (measurement "A") and from mounting surface on sensor to sensor tip (measurement "B") subtract "B" from "A" = air gap}. Is air gap within specifications?	Yes	Temporarily install a known good CKPS and check for proper operation. If problem is corrected, replace CKPS.
		No	Remove CKPS, install CMPS correctly, and check CKPS for proper operation. If not, temporarily install a known good CKPS and check for proper operation. If problem is corrected, replace CKPS.
7	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE0DE6278

Diagnostic trouble code No. P0340	Camshaft position sensor circuit malfunction
[Related items]	• Open or short to chassis ground between CMPS and ECM • Short to battery between CMPS and ECM • Short between CMPS wires • Faulty CMPS

Step	Inspection	Action	
1	Thoroughly check CMPS and ECM for loose, bent, corroded, contaminated, deteriorated or damaged connectors. Is any problem present?	Yes	Repair as necessary.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect CMPS connector. Turn ignition to ON and measure voltage of CMPS power circuit between CMPS harness connector and chassis ground. • **Specification: approximately B+** Is voltage within specification?	Yes	Go to step 3.
		No	Open circuit or short circuit to chassis ground between CMPS harness connector and main relay. Repair as necessary.
3	Turn ignition to OFF and disconnect ECM connector. Measure resistance of CMPS signal circuit between CMPS harness connector and ECM harness connector. Measure resistance of CMPS ground circuit between CMPS harness connector and chassis ground. • **Specification: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between CMPS harness connector and ECM harness connector and/or chassis ground. Repair as necessary.
4	Turn ignition to ON. Measure voltage of CMPS signal circuit between CMPS harness connector and chassis ground. • **Specifications: below 0.5V** Is voltage within specifications?	Yes	Go to step 5.
		No	Short circuit to power between CMPS harness connector and ECM harness connector. Repair as necessary.
5	Tun ignition to OFF. Measures resistance between CMPS harness connector and ECM harness connector at CMPS signal circuit. Measure resistance between CMPS signal circuit and ground circuit. • **Specifications: infinite** Does resistance indicate open circuit?	Yes	Go to step 6.
		No	Short circuit to chassis ground between KS harness connector and ECM harness connector. Short circuit between CMPS signal circuit and ground circuit. Repair as necessary.

Step	Inspection	Action	
6	Turn ignition to OFF and disconnect CMPS connector. Check for CMPS installation.Is CMPS installed properly?	Yes	Temporarily install a known good CMPS and check for proper operation. If problem is corrected, replace CMPS.
		No	Remove CMPS, install CMPS correctly, and check CMPS for proper operation. If not, temporarily install a known good CMPS and check for proper operation. If problem is corrected, replace CMPS.
7	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE8453BA6

Diagnostic trouble code No. P0420	Main catalyst efficiency deterioration (bank1)
[Related items]	• Manifold catalytic converter deteriorated ***NOTE*** *If any codes relating to HO2S sensor. MAFS, injectors, a P0171~P0172 are present, do all repairs associated with them before proceeding with this troubleshooting procedure.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and check other DTCs. Are DTC P0300~P0304, P0116, P0125, P0130~P0134, P0030~P0032, P0136~P0140, P0036~P0038, P1168, and/or P0171~P0172 set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Start engine and warm up to operating temperature. Using SCAN TOOL monitor both front HO2S and rear HO2S signals. Do both signals switch lean to rich and rich to lean?	Yes	Replace catalytic converter.
		No	Go to step 3.
3	Release fuel pressure and attach fuel pressure gauge to service port on fuel rail. Start an engine and warm up to operating temperature. Check for fuel pressure at idle. • **Fuel pressure at idle: 46~51 psi (320~350kPa, 3.2~3.5kg/cm²)** Is fuel pressure within specification?	Yes	Go to step 4.
		No	Check fuel delivery system.
4	Check exhaust system for leaks, cracks, loose connection (especially exhaust manifold, catalyst around rear HO2S, etc). Is exhaust system okay?.	Yes	Go to step 5.
		No	Repair or replace as necessary.
5	Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation. Are vacuum hoses and PCV okay?	Yes	Go to step 6.
		No	Replace faulty vacuum hoses or PCV.
6	Check for fuel injector operation. Are fuel injectors working normal and dispensing proper volume?	Yes	Go to step 7.
		No	Repair as necessary.

Step	Inspection	Action	
7	Check intake system for leaks, cracks, loose connection as following items: • Throttle body gasket • Gasket between intake manifold and surge tank • Seals between intake manifold and fuel injectors • Seals between surge tank and PCV valves Is intake system okay?	Yes	Replace catalytic converter as necessary.
		No	Repair or replace as necessary.
8	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEE21B8C8

Diagnostic trouble code No. P0444	**EVAP emission control system purge solenoid valve circuit open**
Diagnostic trouble code No. P0445	**EVAP emission control system purge solenoid valve circuit short**
[Related items]	• Open or short between main relay and purge solenoid valve • Open or short between purge solenoid valve and ECM • Faulty purge solenoid valve

Step	Inspection	Action	
1	Thoroughly check PCSV for loose, bent, corroded, contaminated, deteriorated or damaged connectors. Is any problem present?	Yes	Repair as necessary.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect PCSV connector. Turn ignition to ON and measure voltage of PCSV power circuit between PCSV harness connector and chassis ground. • **Specification: approximately B+** Is voltage within specification?	Yes	Go to step 3.
		No	Open circuit or short circuit to chassis ground between PCSV harness connector and main relay. Repair as necessary.
3	Turn ignition to OFF. PCSV connector is still disconnected. Measure resistance between PCSV battery power and signal terminal. • **Specification: approximately 24~28Ω @ 20°C** Is resistance within specification?	Yes	Check PCSV for poor terminal contacts due to oxidation, bent deformed, or misplaced terminals. Repair as necessary.
		No	Temporarily install a known good PCSV and check for proper operation. If problem is corrected, replace PCSV.
4	Turn ignition to OFF and disconnect ECM connector. Measure resistance of PCSV signal circuit between PCSV harness connector and ECM harness connector. • **Specification: below 1Ω** Does resistance indicate continuity circuit?	Yes	Go to step 5.
		No	Open circuit between PCSV harness connector and ECM harness connector. Repair as necessary.
5	ECM connector PCSV connector is still disconnected. Measure resistance between PCSV harness connector and chassis ground at PCSV signal circuit. Measure resistance between PCSV battery voltage circuit and signal circuit. • **Specification: infinite** Does resistance indicate open circuit?	Yes	Temporarily install a known good PCSV and check for proper operation. If problem is corrected, replace PCSV.
		No	Short circuit to chassis ground between PCSV harness connector and ECM harness connector. Short circuit between PCSV battery power circuit and signal circuit. Repair as necessary.
6	Return vehicle to original condition. Clear all Diagnostic Trouble Codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEA2460A1

Diagnostic trouble code No. P0501	**Vehicle speed sensor circuit malfunction**
[Related items]	• Open or short to battery between VSS and ECM • Short to chassis ground between VSS and ECM • Faulty VSS ***NOTE*** *If any codes relating to VSS circuits are present, do all repairs associated with those problems before proceeding with this troubleshooting procedure.*

Step	Inspection	Action	
1	Turn ignition to ON. Using SCAN TOOL and monitor VSS signal. • **B+ at ignition ON** • **0~B+ at driving** Is voltage within specification?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared. Check terminal connections at ECM and VSS.
		No	Go to step 2.
2	Turn ignition to OFF and disconnect ECM connector and VSS connector. Measure resistance between ECM harness connector and ABS harness connector at VSS signal circuit. • **Specification: below 1Ω** Does resistance indicate continuity circuit?	Yes	Go to step 3.
		No	Open circuit between ECM harness connector and VSS harness connector. Repair as necessary.
3	ECM connector and VSS connector are disconnected. Measure resistance between ECM harness connector and chassis ground at VSS signal circuit. • **Specification: infinite** Does each resistance indicate open circuit?	Yes	Go to step 4.
		No	Short circuit to chassis ground between ECM harness connector and VSS harness connector. Repair as necessary.
4	Turn ignition to ON and measure voltage between wheel speed sensor signal terminal and ground. • **B+ at ignition ON** • **0~B+ at driving** Is voltage within specification?	Yes	Check for poor terminal contacts due to oxidation, bent deformed, or misplaced terminals. If OK, open circuit or short circuit between VSS and ECM. Repair as necessary.
		No	Temporarily install a known good VSS and check for proper operation. If problem is corrected, replace VSS.
5	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEDEA1AEF

Diagnostic trouble code No. P0506	Idle control system rpm lower than expected
[Related items]	• Open or short between main relay and IACV • Open or short between ECM and IACV • Intake system is plugged • Carbon fouled throttle plate • Faulty IACV ***NOTE*** *If any codes relating to TPS, MAFS, fuel injector or IACV present, do all repairs associated with them before proceeding with this troubleshooting guide.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor DTCs. Are any other codes also set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Check accelerator cable free play [0.040~0.120 in (1.0~3.0 mm)]. Is accelerator cable free play within specification?	Yes	Go to step 3.
		No	Adjust cable.
3	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL, monitor TP voltage signals. • **0.3~0.9V (0.71~1.38 KΩ) @ idle** • **4.0~4.4V (2.2~3.4 KΩ) @ full open** Is signal within specifications?	Yes	Go to step 4.
		No	Do all repairs associated with TPS before proceeding the next step.
4	Turn ignition to OFF and disconnect IACV connector. With ignition ON, measure voltage of IACV battery voltage between IACV harness connector and chassis ground. • **Specifications: approximately B+** Is voltage within specifications?	Yes	Go to step 5.
		No	Open circuit or short circuit to chassis ground between IACV harness connector and main relay. Repair as necessary.
5	Turn ignition to OFF. Measure resistance of IACV opening coil and closing coil. • **Closing coil: 14.5~16.5Ω at 20°C (68°F)** • **Opening coil: 16.5~18.5Ω at 20°C (68°F)** Is voltage within specification?	Yes	Go to step 6.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.

Step	Inspection	Action	
6	Remove IACV from throttle body and check for excessive carbon deposits and sticking per following check. Connect IACV battery terminal to 12V power. One at a time, momentarily ground IACV opening coil signal terminal and closing coil terminal while visually verifying valve closes when the closing coil terminal is grounded and valve opens when opening coil signal terminal is grounded. Repeat numerous times to ensure valve reliability. Is IACV moving freely and is not carbon fouled? ***NOTE*** *While IACV is removed, inspect throttle body for obstructions in idle circuit ports. Repair or replace as necessary.*	Yes	Thoroughly check for loose, bent or corroded terminals at all connectors in circuit.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.
7	Turn ignition to OFF and disconnect ECM connector. Measure resistance of IACV opening coil signal circuit between IACV harness connector and ECM harness connector. Measure resistance of IACV closing coil signal circuit between IACV harness connector and ECM harness connector. • **Specifications: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 8.
		No	Open circuit between IACV harness connector and ECM harness connector. Repair as necessary.
8	ECM connector and IACV connector is still disconnected. Measure resistance between IACV harness connector and chassis ground at IACV opening coil circuit. Measure resistance between IACV harness connector and chassis ground at IACV closing coil circuit. • **Specifications: infinite** Does each resistance indicate open circuit?	Yes	Go to step 9.
		No	Short circuit to chassis ground between IACV harness connector and ECM harness connector. Repair as necessary.
9	Remove intake hose and inspect throttle plate for excessive carbon deposits. Is throttle plate being held open with excessive carbon deposits?	Yes	Clean throttle body.
		No	Go to step 10.
10	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEA0BF9A9

Diagnostic trouble code No. P0507	Idle control system rpm higher than expected
[Related items]	• Short to ground between IACV and ECM • Air leak in intake system • Improperly adjusted accelerator cable • Faulty IACV • Faulty TPS • Faulty PCV/PSV ***NOTE*** *If any codes relating to TPS, PSV, MAFS, fuel injector or IACV are present, do all repairs associated with them before proceeding with this troubleshooting guide.*

Step	Inspection	Action	
1	Connect SCAN TOOL to data link connector or OBD-II check connector. Turn ignition to ON and monitor DTCs. Are any other codes also set?	Yes	Do all repairs associated with those codes before proceeding this procedure.
		No	Go to step 2.
2	Check accelerator cable free play [0.040~0.120 in (1.0~3.0 mm)]. Is accelerator cable free play within specification?	Yes	Go to step 3.
		No	Adjust cable.
3	Start engine and allow engine to idle until engine reaches operating temperature. Using SCAN TOOL, monitor TP voltage signals. • **0.3~0.9V (0.71~1.38 KΩ) @ idle** • **4.0~4.4V (2.2~3.4 KΩ) @ full open** Is signal within specifications?	Yes	Go to step 4.
		No	Do all repairs associated with TPS before proceeding the next step.
4	Turn ignition to OFF and disconnect IACV connector. With ignition ON, measure voltage of IACV battery voltage between IACV harness connector and chassis ground. • **Specifications: approximately B+** Is voltage within specifications?	Yes	Go to step 5.
		No	Open circuit or short circuit to chassis ground between IACV harness connector and main relay. Repair as necessary.
5	Turn ignition to OFF. Measure resistance of IACV opening coil and closing coil. • **Closing coil: 14.5~16.5Ω at 20°C (68°F)** • **Opening coil: 16.5~18.5Ω at 20°C (68°F)** Is each resistance within specification?	Yes	Go to step 6.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.

Step	Inspection	Action	
6	Remove IACV from throttle body and check for excessive carbon deposits and sticking per following check. Connect IACV battery terminal to 12V power. One at a time, momentarily ground IACV opening coil signal terminal and closing coil terminal while visually verifying valve closes when the closing coil terminal is grounded and valve opens when opening coil signal terminal is grounded. Repeat numerous times to ensure valve reliability. Is IACV moving freely and is not carbon fouled? ***NOTE*** *While IACV is removed, inspect throttle body for obstructions in idle circuit ports. Repair or replace as necessary.*	Yes	Thoroughly check for loose, bent or corroded terminals at all connectors in circuit.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.
7	Turn ignition to OFF and disconnect ECM connector. Measure resistance of IACV opening coil signal circuit between IACV harness connector and ECM harness connector. Measure resistance of IACV closing coil signal circuit between IACV harness connector and ECM harness connector. • **Specifications: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 7.
		No	Open circuit between IACV harness connector and ECM harness connector. Repair as necessary.
8	ECM connector and IACV connector is still disconnected. Measure resistance between IACV harness connector and chassis ground at IACV opening coil circuit. Measure resistance between IACV harness connector and chassis ground at IACV closing coil circuit. • **Specifications: infinite** Does each resistance indicate open circuit?	Yes	Go to step 9.
		No	Short circuit to chassis ground between IACV harness connector and ECM harness connector. Repair as necessary.
9	Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation and purge solenoid valve for proper installation and operation. Are vacuum hoses, PCV and PSV okay?	Yes	Go to step 10.
		No	Replace faulty vacuum hoses, PCV or PSV
10	Visually/physically inspect the following items: • Throttle body gasket • Gasket between intake manifold and surge tank • Gasket between intake manifold and cylinder head • Seals between intake manifold and fuel injectors • Seals between surge tank and PCV valves • Crankcase ventilation valve and/or system for leaks Are the items okay?	Yes	Go to step 11.
		No	Repair or replace as necessary.

Step	Inspection	Action	
11	With engine idling disconnect hose between EVAP valve and canister. Check for vacuum at EVAP valve. Is vacuum available at purge valve when EVAP valve is not operating?	Yes	EVAP canister purge valve or circuit failure. Repair according to DTC P0443 repair procedures.
		No	Go to step 12.
12	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE2AEB839

Diagnostic trouble code No. P0560	**System voltage malfunction**
Diagnostic trouble code No. P0562	**System voltage low input**
Diagnostic trouble code No. P0563	**System voltage high input**
[Related items]	• Open or short between ECM and battery • ECM internal faulty

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect ECM connector. Measure voltage of backup circuit between battery and chassis ground. • **Specification: approximately B+** Is voltage within specification?	Yes	Thoroughly check for poor connection, misplaced, corroded terminals at ECM connector. Repair as necessary.
		No	Open circuit or short circuit to chassis ground between ECM harness connector and battery. Repair as necessary.
2	• Temporarily install a known good ECM and check for proper operation. If problem is corrected replace ECM. • Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEAF509DE

Diagnostic trouble code No. P0605	**ECU ROM Error**
[Related items]	• Internal fault. There is no inspection of service possible for this diagnostic trouble code • Temporarily install a known good ECM and check for proper operation. If problem is corrected replace ECM. • Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE73E18FA

Diagnostic trouble code No. P1166	Lambda bank control limit
[Related items]	• Fuel system malfunction (fuel tank/pressure regulator/fuel pump/PCSV) • Poor connection to fuel line hose/sealing/cut • Sealing between PCSV and fuel tank • Air leakage in exhaust system • Ignition system malfunction (ignition coil, spark plug, cable) • Faulty surge tank and intake port ***NOTE*** *If any codes relating front/rear HO2S, fuel system, EVAP, and ignition system are present, do all repairs associated with them before proceeding with this troubleshooting procedure.*

Step	Inspection	Action	
1	First check for DTC relating to front/rear HO2S, fuel system, EVAP, and ignition system. Do DTCs exist?	Yes	First repair all other malfunctions on DTCs.
		No	Go to step 2.
2	Check for correct vacuum hose connections to engine dynamic chamber (especially PCV, ISC hose, and brake booster) Are connections OK?	Yes	Rectify as necessary.
		No	Go to step 3.
3	With engine idling disconnect hose between EVAP valve and canister. Check for vacuum at EVAP valveIs vacuum available at purge valve when EVAP valve is not operating?	Yes	EVAP canister purge valve or circuit failure. Repair according to DTC P0443 repair procedures.
		No	Go to step 4.
4	After installing fuel pressure gauge to service port on fuel rail, connect DLC F/P and B (B+) with a jumper wire. Is fuel line pressure correct with ignition switch ON? • **Fuel pressure at idle: 46~51 psi (320~350kPa, 3.2~3.5kg/cm²)**	Yes	Go to step 5.
		No	**Low pressure:** Clamp return-line and check if pressure rises: - If pressure rises: replace pressure regulator - If pressure does not rise: check the strainer at the fuel pump **High pressure:** Disconnect return-line from fuel filter side and blow through line towards tank - If line is clear: replace fuel delivery module - If line is blocked check for blockage in return line and clear or replace as necessary If it is OK, check fuel.
5	Warm up engine to normal operating temperature for more than 10 minutes. Using SCAN TOOL monitor HO2S signal. Does the front HO2S signal switch lean to rich and rich to lean over 6 times for 10 seconds?	Yes	Go to step 6.
		No	Temporarily install a known good front HO2S and check for proper operation. If problem is corrected, replace front HO2S.

Step	Inspection	Action	
6	Check front/rear HO2S for contamination, deterioration or damage. Is front/rear HO2S contaminated, deteriorated or damaged?	Yes	If damaged or deteriorated, replace front/rear HO2S.
		No	Go to step 7.
7	Thoroughly check for loose, bent or corroded connectors at ECM and front/rear HO2S connectors. Are connectors normal?	Yes	Go to step 8.
		No	Repair as necessary.
8	Visually check for leak from exhaust system. Are any leaks present?	Yes	Rectify as necessary.
		No	Go to step 9.
9	Start engine and check for engine rpm decrease when disconnecting each injector connector is sequence. Measure the decreasing engine rpm of all 6 cylinders. Is there any cylinder with no change in rpm or only a small rpm change?	Yes	Repair as necessary.
		No	Go to step 10.
10	Using SCAN TOOL monitor MAFS voltage signals. • **0.6~1.0V @ idle** Is signal within specifications?	Yes	Go to step 11.
		No	Do all repairs associated with MAFS.
11	Remove spark plugs and inspect spark plug tips. Check for abnormal color of spark plug tips compared to other cylinders. Are any spark plugs with abnormal color compared to other cylinders?	Yes	Check for engine mechanical failure. If it is OK, replace spark plugs.
		No	Go to step 12.
12	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEFCC5E11

Diagnostic trouble code No. P1505	Idle air control valve opening coil signal low input
[Related items]	• Open or short to chassis ground between IACV and ECM • Faulty IACV

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect IACV connector. With ignition ON, measure voltage of IACV battery voltage between IACV harness connector and main relay. • **Specifications: approximately B+** Is voltage within specifications?	Yes	Go to step 2.
		No	Open circuit or short circuit to chassis ground between IACV harness connector and main relay. Repair as necessary.
2	Turn ignition to OFF. Measure resistance of IACV opening coil. • **Opening coil: 16.5~18.5Ω at 20°C (68°F)** Is resistance within specification?	Yes	Thoroughly check for loose, bent or corroded terminals at all connectors in circuit.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.
3	IACV connector and ECM connector are still disconnected. Measure resistance of IACV opening coil signal circuit between IACV harness connector and ECM harness connector. • **Specifications: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between IACV harness connector and ECM harness connector. Repair as necessary.
4	ECM connector and IACV connector are still disconnected. Measure resistance between IACV harness connector and chassis ground at IACV opening coil circuit. • **Specifications: infinite** Does each resistance indicate open circuit?	Yes	Go to step 5.
		No	Short circuit to chassis ground between IACV harness connector and ECM harness connector. Repair as necessary.
5	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEAD172BE

Diagnostic trouble code No. P1506	**Idle air control valve opening coil signal high**
[Related items]	• Short to battery between IACV and ECM • Faulty IACV

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect IACV connector and ECM connector. With ignition ON, measure voltage of IACV opening coil circuit between IACV harness connector and chassis ground. • **Specifications: below 0.5V** Is voltage within specifications?	Yes	Go to step 2.
		No	Short circuit to battery between IACV harness connector and ECM harness connector. Repair as necessary.
2	Turn ignition to OFF. Measure resistance of IACV opening coil. • **Opening coil: 16.5~18.5Ω @ 20°C (68°F)** Is resistance within specification?	Yes	Thoroughly check for loose, bent or corroded terminals at all connectors in circuit.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.
3	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE8CFC254

Diagnostic trouble code No. P1507	**Idle air control valve closing coil signal low**
[Related items]	• Open or short to chassis ground between IACV and ECM • Faulty IACV

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect IACV connector. With ignition ON, measure voltage of IACV battery voltage between IACV harness connector and chassis ground. • **Specifications: approximately B+** Is voltage within specifications?	Yes	Go to step 2.
		No	Open circuit or short circuit to chassis ground between IACV harness connector and main relay. Repair as necessary.
2	Turn ignition to OFF. Measure resistance of IACV opening coil. • **Closing coil: 14.5~16.5Ω at 20°C (68°F)** Is resistance within specification?	Yes	Thoroughly check for loose, bent or corroded terminals at all connectors in circuit.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.
3	Turn ignition to OFF and disconnect ECM connector. Measure resistance of IACV closing coil signal circuit between IACV harness connector and ECM harness connector. • **Specifications: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 4.
		No	Open circuit between IACV harness connector and ECM harness connector. Repair as necessary.
4	ECM connector and IACV connector are still disconnected. Measure resistance between IACV harness connector and chassis ground at IACV closing coil circuit. • **Specifications: infinite** Does each resistance indicate open circuit?	Yes	Go to step 5.
		No	Short circuit to chassis ground between IACV harness connector and ECM harness connector. Repair as necessary.
5	Return vehicle to original condition Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE2388DE9

Diagnostic trouble code No. P1508	Idle air control valve closing coil signal high
[Related items]	• Short to battery between IACV and ECM • Faulty IACV

Step	Inspection	Action	
1	Turn ignition to OFF and disconnect IACV connector and ECM connector. With ignition ON, measure voltage of IACV closing coil circuit between IACV harness connector and chassis ground. • **Specifications: below 0.5V** Is voltage within specifications?	Yes	Go to step 2.
		No	Short circuit to battery between IACV harness connector and ECM harness connector. Repair as necessary
2	Turn ignition to OFF. Measure resistance of IACV closing coil. • **Closing coil: 14.5~16.5Ω at 20°C (68°F)** Is resistance within specification?	Yes	Thoroughly check for loose, bent or corroded terminals at all connectors in circuit.
		No	Temporarily install a known good IACV and check for proper operation. If problem is corrected replace IACV.
3	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by drivingvehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE0AE450D

Diagnostic trouble code No. P1529	TCU request for MIL ON / Freeze Frame to ECM via CAN
[Related items]	• This is only a request from TCM to turn the MIL ON. The fault code is stored in the TCM. The freeze frame data is stored in the ECM under the P1529 request code. Be sure to retrieve freeze frame data before clearing code P1529 from ECM. • Check TCM

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EE3CD009C

Diagnostic trouble code No. P1586	AT/MT encoding malfunction
[Related items]	• Poor connection to chassis ground at ECM • Open or short circuit between ECM AT/MT and chassis ground • Normal condition: AT-chassis ground, MT-open

Step	Inspection	Action	
1	Does vehicle have manual transmission?	Yes	Go to step 2.
		No	Go to step 3.
2	Turn ignition to OFF and disconnect ECM connector. Measure resistance between ECM AT/MT encoding terminal and ground chassis. • **Specifications: infinite** Does resistance indicate open circuit?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared.
		No	Short circuit to chassis ground at ECM AT/MT encoding terminal. Repair as necessary.
3	Turn ignition to OFF and disconnect ECM connector. Measure resistance between ECM AT/MT encoding terminal and ground chassis. • **Specifications: below 1Ω** Does resistance indicate continuity?	Yes	Problem is intermittent or was repaired and engine control module memory was not cleared.
		No	Open circuit between ECM AT/MT encoding terminal and chassis ground. Repair as necessary.
4	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

TROUBLESHOOTING PROCEDURE FOR DTC (FOR EUROPE) EEBBB9D2E

Diagnostic trouble code No. P1693	MIL request circuit malfunction
[Related items]	• Open or short to chassis ground between TCM signal and ECM • Short to battery between TCM and ECM • Message timeout from TCM • Faulty TCM

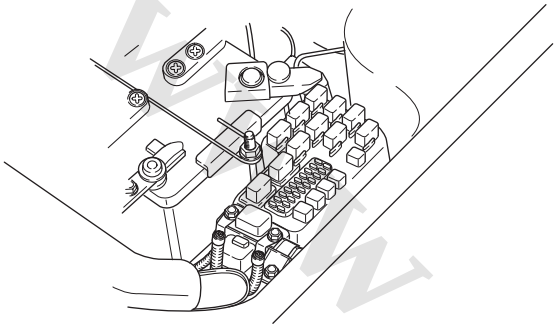
Step	Inspection	Action	
1	Turn ignition to OFF and disconnect ECM connector and TCM connector. Measure resistance of MIL request circuit between ECM harness connector and TCM harness connector. • **Specifications: below 1Ω** Does each resistance indicate continuity circuit?	Yes	Go to step 2.
		No	Open circuit between ECM harness connector and TCM harness connector. Repair as necessary.
2	ECM connector and TCM connector are still disconnected. Measure resistance between ECM harness connector and chassis ground at MIL request circuit. • **Specifications: infinite** Does each resistance indicate open circuit?	Yes	Go to step 3.
		No	Short to chassis ground between ECM harness connector and TCM harness connector. Repair as necessary.
3	Turn ignition to ON. TCM and ECM connectors are still disconnected. Measure voltage of MIL request circuit between ECM harness connector and chassis ground. • **Specifications: below 0.5V** Is each voltage within specifications?	Yes	Go to step 4.
		No	Short circuit to battery between ECM harness connector and TCM harness connector. Repair as necessary.
4	Thoroughly check for loose, bent or corroded connectors at ECM and TCM connectors. Are connectors okay?	Yes	Go to step 5.
		No	Check TCM related fault code by SCAN TOOL. Repair as necessary.
5	Return vehicle to original condition. Clear all diagnostic trouble codes. Verify by driving vehicle with SCAN TOOL connected and monitor for pending codes.		

FUEL DELIVERY SYSTEM

RELEASING FUEL SYSTEM PRESSURE EE4C0A89E

WARNING

The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnectingany fuel line to reduce the chance of personal injury or fire damage to vehicle components.



BF2C520A

1. Start engine.
2. Disconnect fuel pump connector located below rear seat cushion.
3. Let engine stall, then turn OFF ignition switch.
4. Reconnect fuel pump connector.

FUEL LINE HANDLING

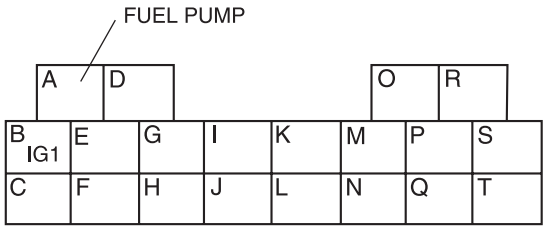
WARNING

Fuel is explosive. When working on fuel system make sure to supply adequate ventilation to the work area. Do not smoke, and keep sparks and open flames away.

1. When disconnecting fuel hose quick connectors, use shop towels to absorb fuel, protecting equipment and personnel.

PRIMING THE FUEL SYSTEM

After fuel pressure has been released, system must be primed to avoid excessive cranking to restart the engine. Follow steps below:



LF2D001L

1. Connect data link connector terminals FUEL PUMP and B+ with a jumper wire.
2. Turn ignition switch ON for no longer than 10 seconds to pressurize system and check for fuel leaks. (Jumper wire gets hot if it is left in for longer than 10 seconds.)
3. Turn ignition switch OFF and remove jumper wire.

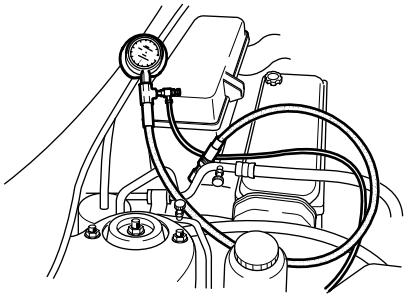
FUEL PRESSURE HOLD INSPECTION

1. Disconnect negative battery terminal.

CAUTION

The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnectingany fuel line to reduce the chance of personal injury or fire damage to vehicle components.

2. Release fuel system pressure.
3. Raise a vehicle.
4. Install SST(0K2A1 131 001A) to fuel filter as described below.



BF2C550A

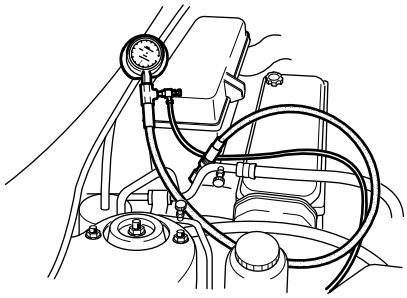
5. Connect negative battery terminal.
6. Connect data link connector terminals FUEL PUMP and B+ with jumper wire.
7. Turn ignition switch ON for 10 seconds to operate fuel pump.
8. Turn ignition switch OFF and remove jumper wire.
9. Inspect fuel pressure after 25 minutes.

Fuel pressure:
More than 25psi (180kPa, 1.8 kg/cm²)

10. If not as specified, check the following components: do following inspections:
    - Fuel pump
    - Pressure regulator
    - Injectors

FUEL LINE PRESSURE INSPECTION

1. Disconnect negative battery cable.
2. Release fuel system pressure.
3. Raise a vehicle.
4. Install SST(0K2A1 131 001A) to fuel filter as shown.
5. Connect negative battery cable.
6. Connect data link connector terminals FUEL PUMP and B+ with jumper wire.
7. Turn ignition switch ON.
8. Inspect the fuel line pressure.



BF2C550A

Fuel line pressure:
46~51psi (320~350kPa, 3.2~3.5kg/cm²)

Pressure too high:
- Check for restricted fuel return line
- If line is clean, replace pressure regulato

Pressure too low:
- Clamp return line and check if pressure risee
- If pressure does rise, replace pressure regulator
- If pressure does not rise, measure fuel pump maximum pressure

9. Turn ignition switch OFF and remove jumper wire.

FUEL INJECTOR

INSPECTION EE2803236

CHECK OPERATION

1. Warm up engine and let engine idle.
2. Listen for sound of each injector running by using sound scope or screwdriver.

WARNING

Fuel is explosive. When working on fuel system, make sure to supply adequate ventilation to the work area. Do not smoke, and keep sparks and open flames away.

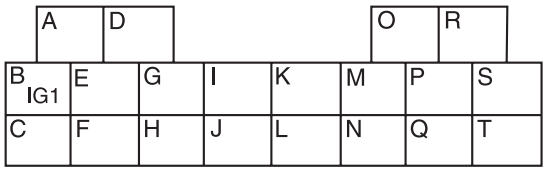
CAUTION

Make sure the fuel injectors are firmly seated on the fuel rail to prevent movement and possible damage.

3. If no sound is heard, measure injector resistance.
4. If injector is OK, check wiring to injector and voltages of ECM terminals B03-47, 48, 49, and 50.

FUEL LEAKAGE TEST

1. Remove injectors together with fuel rail.
2. Secures injectors to fuel rail with wire.
3. Connect data link connector terminals FUEL PUMP and B+ with jumper wire.



LF2D001P

4. Turn ignition switch ON.
5. Tilt injectors about 60 degrees and verify that no fuel leaks from the injector nozzles.
6. If fuel leaks, replace injector.
7. Turn ignition switch "OFF" and remove jumper wire.

VOLUME TEST

1. Remove injectors together with fuel rail.
2. Secure injectors to distributor pipe with wire.
3. Reconnect injector connectors.
4. Connect jumper wire to injector to ECM wires (BRN) and ground.
5. Turn ignition ON.
6. Inspect injector volume with graduated container.

Injector volume : A3E - 1.8g/sec, A5D - 1.9g/sec

If not as specified, replace injectors.

NOTE

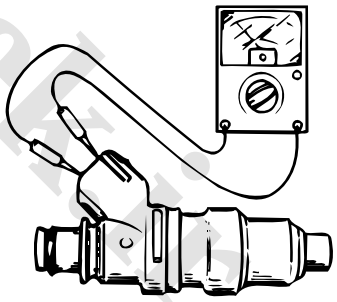
When reassembling fuel rail and injectors:

- *Use new injector O-rings*
- *Apply a small amount of clean engine oil to each O-ring before installing*

INJECTOR RESISTANCE

1. Disconnect injector harness.
2. Measure resistance of each injector.

Resistance: 13.5~15.5Ω at 68°F (20°C)



BF2C970A

3. If not within specification, replace injector.

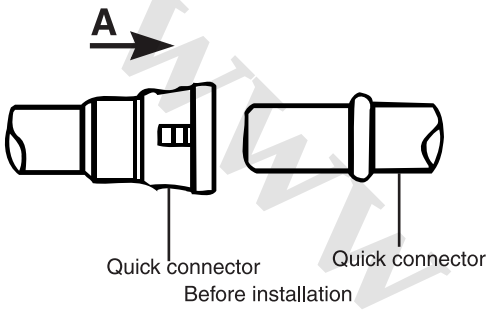
FUEL LINE

QUICK CONNECTOR REMOVAL EE0EF0BDC

NOTE

Release fuel system pressure before servicing any fuel system connection.

1. Push quick connector to direction "A".
2. Squeeze both sides of lock retainer and pull connection apart to direction "B".



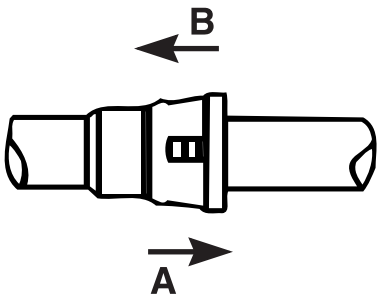
LF2D001O

CAUTION

Don's push and pull too hard.

QUICK CONNECTOR INSPECTION EEB762E79

Once installed, pull and push quick connector to direction "A" and "B" to make sure the connection is secure.



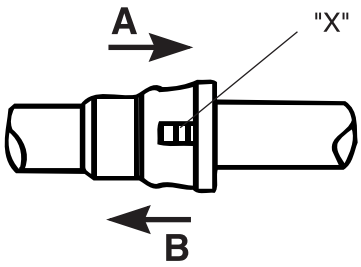
LF2D001N

NOTE

Don't press lock retainer.

QUICK CONNECTOR INSTALLATION EE39E5EDB

Position quick connector to male pipe(direction "A") and push quick connector until retainer lock in and a click is heard.

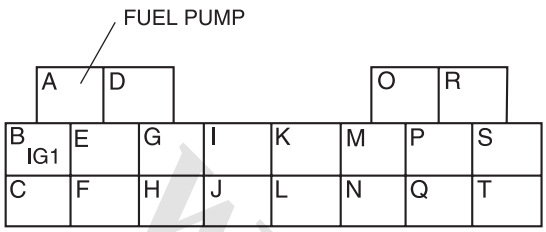


LF2D001M

FUEL PUMP

FUEL PUMP OPERATION EEAEB17BA

1. Connect data link connector terminals FUEL PUMP and B+ with jumper wire.



LF2D001L

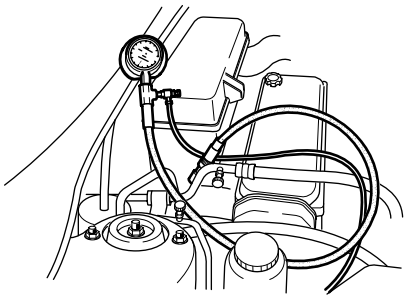
2. Remove fuel filler cap.
3. Turn ignition switch "ON".
4. Determine if fuel pump is running by listening for sound of it at fuel filler inlet.
5. Connect negative battery terminal.

WARNING

The fuel system remains under pressure when the engine is not running. Release fuel system pressure before disconnecting any fuel line to reduce the chance of personal injury or fire damage to vehicle components.

6. Connect data link connect terminals FUEL PUMP and B+ with jumper wire.
7. Turn ignition switch ON.
8. Measure fuel pump maximum pressure.

Fuel pump maximum pressure:
65~94 psi(450~650 kPa, 4.5~6.5 kg·m)

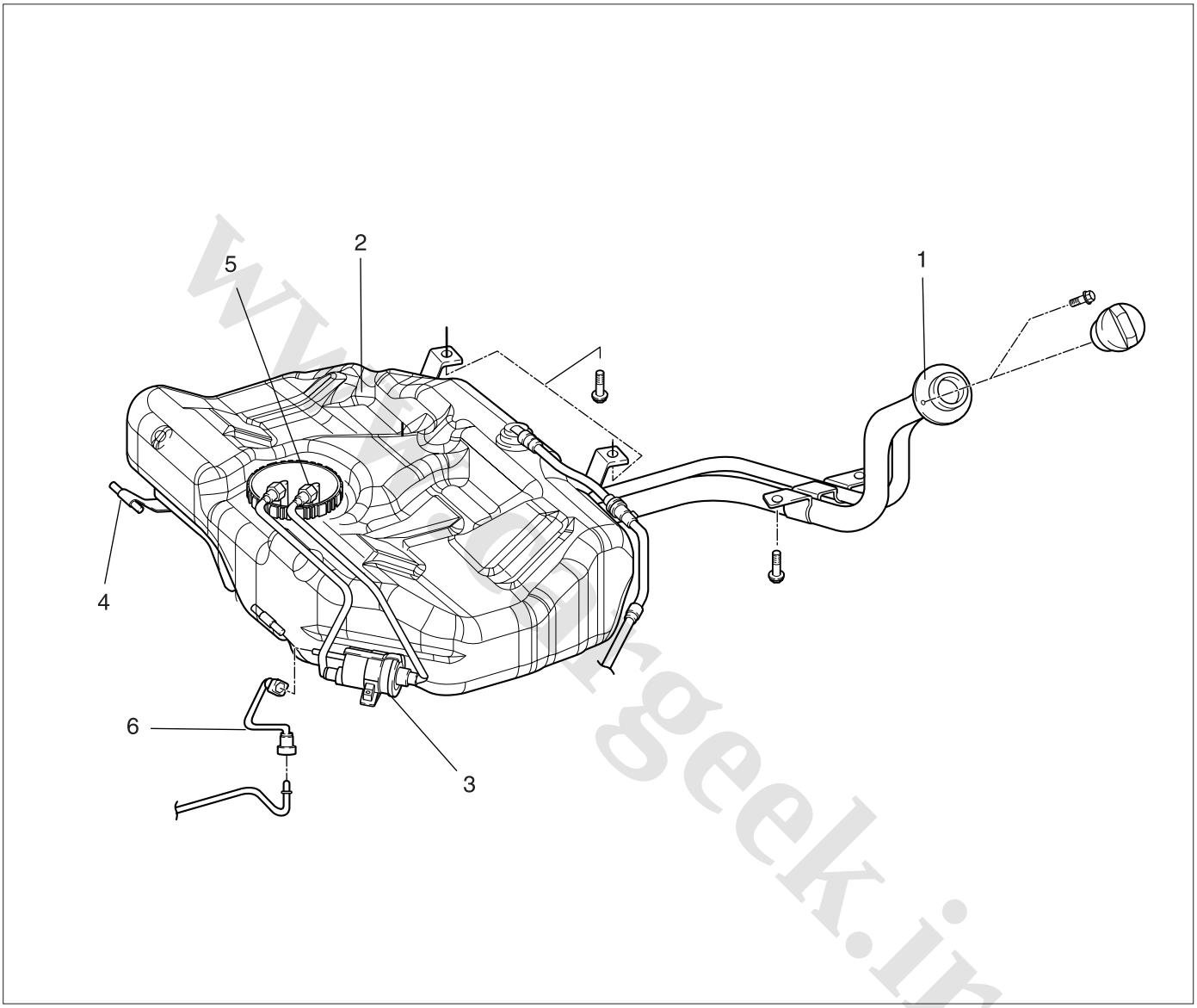


BF2C550A

9. If not within specification, replace fuel delivery module.

FUEL TANK

COMPONENTS EEB73428C



1. Filler pipe
2. Fuel tank
3. Fuel filter
4. Strap
5. Fuel pump
6. Fuel tube

BF2D974A

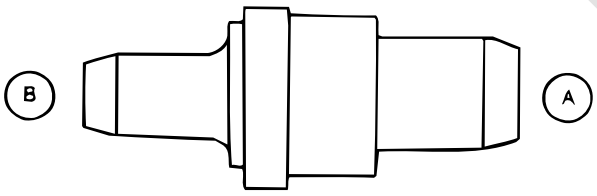
REMOVAL EECFA6EAF

1. Disconnect negative battery cable.
2. Remove rear seat.
3. Remove fuel pump cover, and then disconnect fuel pump connector.
4. Remove components in the order shown in above figure.

THE OTHER DELIVERY SYSTEM PARTS

POSITIVE CRANKCASE VENTILATION (PCV) EEA5BA211

1. Warm up engine to normal operating temperature.
2. Run engine at idle.
3. Disconnect PCV valve ventilation hose from cylinder head cover.
4. Block PCV valve opening.
5. Verify that vacuum is felt.
6. Remove PCV valve.
7. Blow through valve from port "A" and verify that air comes out of port "B".
8. Blow through valve from port "B" and verify that no air comes out of port "A".
9. Replace the PCV valve if necessary.



LF2D001Q

EVAPORATIVE CANISTER EMISSION CONTROL SYSTEM EE6CEB302

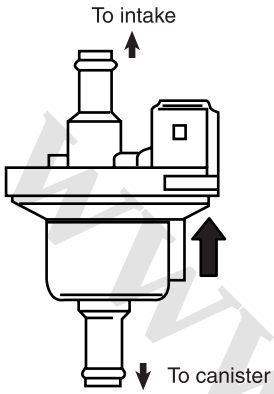
SYSTEM CHECK

1. Warm up engine to normal operating temperature.
2. Disconnect vacuum hose from EVAP canister purge valve side of hose.
3. Verify that no vacuum is felt at EVAP canister purge control solenoid valve.
4. If not as specified, check EVAP canister purge valve operation.
5. If valve is operating properly, reinstall vacuum hose.

EVAPORATIVE (EVAP) EMISSION PURGE CONTROL SOLENOID VALVE EE269CE2E

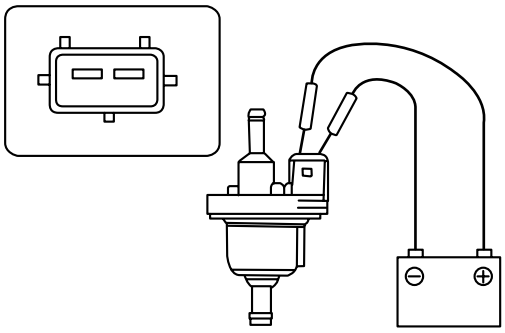
INSPECTION

1. Disconnect vacuum hoses from EVAP canister purge solenoid valve.
2. Verify that no air flows through valve.



LF2D001R

3. Disconnect valve connector and apply 12 volt battery voltage as shown in figure.
4. Verify that air flows through valve.
5. If no air flows, replace the valve.
6. Reinstall valve connector.
7. Reconnect vacuum hoses.



LF2D001S

CANISTER CLOSE VALVE EE3EE52CB

INSPECTION

1. Measure canister close valve resistance.

Resistance: Approximately 23~26Ω at 68°F (20°C)

2. If not as specified, replace the canister close valve.