General Information

Specifications

Fuel Delivery System

Items	Specification	
Fuel Tank	Capacity	53lit. (14.0 U.S.gal., 11.7 Imp.gal.)
Fuel Filter (built in Fuel Pump Assembly)	Type	High pressure type
Fuel Pressure Regulator (built in Fuel Pump Assembly)	Regulated Fuel Pressure	338 ~ 348kpa (3.45 ~ 3.55kgf/㎠, 49.0 ~ 50.5psi)
Fuel Pump	Type	Electrical, in-tank type
	Driven by	Electric motor
Fuel Retrun System	Pressure	Returnless

Sensors

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAPS)

▷ Type: Piezo-resistive pressure sensor type

▷ Specification

Pressure (kPa)	Output Voltage (V)
20.0	0.79
46.7	1.84
101.32	4.0

INTAKE AIR TEMPERATURE SENSOR (IATS)

▷ Type: Thermistor type

▷ Specification

Temperature [℃(˚F)]	Resistance(kΩ)
-40(-40)	40.93 ~ 48.35
-30(-22)	23.43 ~ 27.34
-20(-4)	13.89 ~ 16.03
-10(14)	8.50 ~ 9.71
0(32)	5.38 ~ 6.09
10(50)	3.48 ~ 3.90
20(68)	2.31 ~ 2.57
25(77)	1.90 ~ 2.10
30(86)	1.56 ~ 1.74
40(104)	1.08 ~ 1.21
60(140)	0.54 ~ 0.62
80(176)	0.29 ~ 0.34

ENGINE COOLANT TEMPERATURE SENSOR (ECTS)

▷ Type: Thermistor type

▷ Specification

Temperature [℃(˚F)]	Resistance(kΩ)
-40(-40)	48.14
-20(-4)	14.13 ~ 16.83
0(32)	5.79
20(68)	2.31 ~ 2.59
40(104)	1.15
60(140)	0.59
80(176)	0.32

THROTTLE POSITION SENSOR (TPS)

▷ Type: Variable resistor type

▷ Specification

Throttle Angle	Output Voltage (V)
C.T	0.25 ~ 0.9V
W.O.T	Min. 4.0V

Items	Specification
Sensor Resistance (kΩ)	1.6 ~ 2.4

HEATED OXYGEN SENSOR (HO2S)

▷ Type: Zirconia (ZrO2) Type

▷ Specification

A/F Ratio	Output Voltage (V)
Rich	0.6 ~ 1.0
Lean	0 ~ 0.4

Items	Specification
Heater Resistance (Ω)	Approx. 9.0 [20℃(68˚F)]

CAMSHAFT POSITION SENSOR (CMPS)

▷ Type: Hall effect type

CRANKSHAFT POSITION SENSOR (CKPS)

▷ Type: Hall effect type

KNOCK SENSOR (KS)

▷ Type: Piezo-electricity type

▷ Specification

Items	Specification
Capacitance (pF)	950 ~ 1,350
Resistance(MΩ)	4.87

CVVT OIL TEMPERATURE SNESOR (OTS)

▷ Type: Thermistor type

▷ Specification

Temperature [℃(˚F)]	Resistance (kΩ)
-40(-40)	52.15
-20(-4)	16.52
0(32)	6.0
20(68)	2.45
40(104)	1.11
60(140)	0.54
80(176)	0.29

Actuators

INJECTOR

▷ Number: 4

▷ Specification

Items	Specification
Coil Resistance (Ω)	13.8 ~ 15.2 [20℃(68˚F)]

IDLE SPEED CONTROL ACTUATOR (ISCA)

▷ Type: Double coil type

▷ Specification

Items	Specification
Closing Coil Resistance (Ω)	14.6 ~ 16.2 [20℃(68˚F)]
Opening Coil Resistance (Ω)	11.1 ~ 12.7 [20℃(68˚F)]

Duty (%)	Air Flow Rate (㎥/h)
15	1.0 ~ 2.3
35	7.5 ~ 12.7
70	43.0 ~ 55.0
96	63.0 ~ 71.0

PURGE CONTROL SOLENOID VALVE (PCSV)

▷ Specification

Items	Specification
Coil Resistance (Ω)	16.0 [20℃(68˚F)]

CVVT OIL CONTROL VALVE (OCV)

▷ Specification

Items	Specification
Coil Resistance (Ω)	6.9 ~ 7.9 [20℃(68˚F)]

IGNITION COIL

▷ Type: Double ended type

▷ Specification

Items	Specification
Primary Coil Resistance (Ω)	0.58Ω±10% [20℃(68˚F)]
Secondary Coil Resistance (kΩ)	8.8kΩ±15% [20℃(68˚F)]

Service Standard

Ignition Timing	BTDC 5° ± 10°		
Idle Speed	A/CON OFF	Neutral,N,P-range	660 ± 100 rpm
		D-range	
	A/CON ON	Neutral,N,P-range	
		D-range	

Tightening Torques

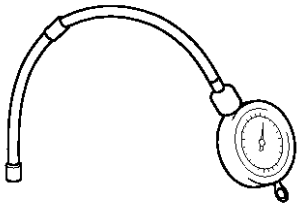
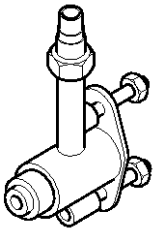
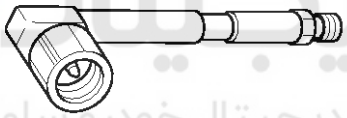
Engine Control System

Item	Kgf·m	N·m	lbf·ft
ECM installation bolts	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Manifold absolute pressure sensor installation bolt	0.8 ~ 1.2	7.8 ~ 11.8	5.8 ~ 8.7
Engine coolant temperature sensor installation	2.0 ~ 4.0	19.6 ~ 39.2	14.5 ~ 28.9
Throttle position sensor installation screws	0.15 ~ 0.25	1.5 ~ 2.5	1.1 ~ 1.8
Crankshaft position sensor installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Camshaft position sensor installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Knock sensor installation bolt	1.7 ~ 2.7	16.7 ~ 26.5	12.3 ~ 19.5
Heated oxygen sensor (Bank 1 / Sensor 1) installation	4.0 ~ 5.0	39.2 ~ 49.1	28.9 ~ 36.2
Heated oxygen sensor (Bank 1 / Sensor 2) installation	4.0 ~ 5.0	39.2 ~ 49.1	28.9 ~ 36.2
CVVT Oil temperature sensor installation	0.2 ~ 0.4	2.0 ~ 3.9	1.4 ~ 2.9
Idle speed control actuator installation screws	0.8 ~ 1.2	7.8 ~ 11.8	5.8 ~ 8.7
CVVT Oil control valve installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Ignition coil assembly installation bolts/nuts	1.9 ~ 2.7	18.6 ~ 26.5	13.7 ~ 19.5
Throttle body installation nuts	1.9 ~ 2.4	18.6 ~ 26.5	13.7 ~ 17.4

Fuel Delivery System

Item	Kgf·m	N·m	lbf·ft
Fuel pump installation bolt	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Delivery pipe installation bolts	1.9 ~ 2.4	18.6 ~ 23.5	13.7 ~ 17.4

Special Service Tools

Tool (Number and name)	Illustration	Application
09353-24100 Fuel Pressure Gauge		Measuring the fuel line pressure
09353-38000 Fuel Pressure Gauge Adapter		Connection between the delivery pipe and fuel feed line
09353-24000 Fuel Pressure Gauge Connector		Connection between Fuel Pressure Gauge (09353-24100) and Fuel Pressure Gauge Adapter (09353-38000)

Basic Troubleshooting

Basic Troubleshooting Guide

1	**Bring Vehicle to Workshop**

2	**Analyze Customer's Problem**
	Ask the customer about the conditions and environment relative to the issue (Use CUSTOMER PROBLEM ANALYSIS SHEET).

3	**Verify Symptom, and then Check DTC and Freeze Frame Data**
	Connect Hi-Scan (Pro) to Diagnostic Link Connector (DLC). Record the DTC and freeze frame data. ***NOTE*** *To erase DTC and freeze frame data, refer to Step 5.*

4	**Confirm the Inspection Procedure for the System or Part**
	Using the SYMPTOM TROUBLESHOOTING GUIDE CHART, choose the correct inspection procedure for the system or part to be checked.

5	**Erase the DTC and Freeze Frame Data**
	WARNING **NEVER erase DTC and freeze frame data before completing Step 2 MIL/DTC in "CUSTOMER PROBLEM ANALYSIS SHEET".**

6	**Inspect Vehicle Visually**
	Go to Step 11, if you recognize the problem.

7	**Recreate (Simulate) Symptoms of the DTC**
	Try to recreate or simulate the symptoms and conditions of the malfunction as described by customer. If DTC(s) is/are displayed, simulate the condition according to troubleshooting procedure for the DTC.

8	**Confirm Symptoms of Problem**
	If DTC(s) is/are not displayed, go to Step 9. If DTC(s) is/are displayed, go to Step 11.

9	**Recreate (Simulate) Symptom**
	Try to recreate or simulate the condition of the malfunction as described by the customer.

10	**Check the DTC**
	If DTC(s) does(do) not occur, refer to INTERMITTENT PROBLEM PROCEDURE in BASIC INSPECTION PROCEDURE. If DTC(s) occur(s), go to Step 11.

11	**Perform troubleshooting procedure for DTC**

12	**Adjust or repair the vehicle**

13	**Confirm test**

14	**END**

LW8F1001

Customer Problem Analysis Sheet

1. VEHICLEINFORMAITON

VIN No.		Transmission	☐ M/T ☐ A/T ☐CVT ☐ etc.
Production date		Driving type	☐ 2WD (FF) ☐ 2WD (FR) ☐ 4WD
Odometer Reading	_____km/mile		

2. SYMPTOMS

☐ Unable to start	☐ Engine does not turn over ☐ Incomplete combustion ☐ Initial combustion does not occur
☐ Difficult to start	☐ Engine turns over slowly ☐ Other_____
☐ Poor idling	☐ Rough idling ☐ Incorrect idling ☐ Unstable idling (High:_____ rpm, Low:_____rpm) ☐ Other
☐ Engine stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C ON ☐ Shifting from N to D-range ☐ Other_____
☐ Others	☐ Poor driving (Surge) ☐ Knocking ☐ Poor fuel economy ☐ Back fire ☐ After fire ☐ Other_____

3. ENVIRONMENT

Problem frequency	☐ Constant ☐ Sometimes (_____) ☐ Once only ☐ Other_____
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other_____
Outdoor temperature	Approx. _____ °C/°F
Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other_____
Engine temperature	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temperature
Engine operation	☐ Starting ☐ Just after starting (____min) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other_____

4. MIL/DTC

MIL (Malfunction Indicator Lamp)		☐ Remains ON ☐ Sometimes lights up ☐ Does not light
DTC	Normal check (Pre-check)	☐ Normal ☐ DTC (_____) ☐ Freeze Frame Data
	Check mode	☐ Normal ☐ DTC (_____) ☐ Freeze Frame Data

5. ECM/PCM INFORMATION

ECM/PCM Part No.	
ROM ID	

SCMFL6150L

Basic Inspection Procedure

Measuring Condition Of Electronic Parts' Resistance

The measured resistance at high temperature after vehicle running may be high or low. So all resistance must be measured at ambient temperature (20℃, 68˚F), unless stated otherwise.

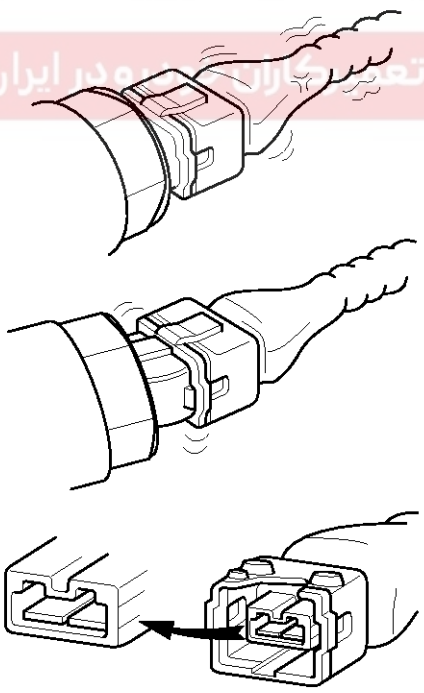
NOTICE

The measured resistance in except for ambient temperature (20℃, 68˚F) is reference value.

Intermittent Problem Inspection Procedure

Sometimes the most difficult case in troubleshooting is when a problem symptom occurs but does not occur again during testing. An example would be if a problem appears only when the vehicle is cold but has not appeared when warm. In this case, the technician should thoroughly make out a "CUSTOMER PROBLEM ANALYSIS SHEET" and recreate (simulate) the environment and condition which occurred when the vehicle was having the issue.

1. Clear Diagnostic Trouble Code (DTC).
2. Inspect connector connection, and check terminal for poor connections, loose wires, bent, broken or corroded pins, and then verify that the connectors are always securely fastened.



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3. Slightly shake the connector and wiring harness vertically and horizontally.
4. Repair or replace the component that has a problem.
5. Verify that the problem has disappeared with the road test.

● SIMULATING VIBRATION

a. Sensors and Actuators

: Slightly vibrate sensors, actuators or relays with finger.

WARNING

Strong vibration may break sensors, actuators or relays

b. Connectors and Harness

: Lightly shake the connector and wiring harness vertically and then horizontally.

● SIMULATING HEAT

a. Heat components suspected of causing the malfunction with a hair dryer or other heat source.

WARNING

- **DO NOT heat components to the point where they may be damaged.**
- **DO NOT heat the ECM directly.**

● SIMULATING WATER SPRINKLING

a. Sprinkle water onto vehicle to simulate a rainy day or a high humidity condition.

WARNING

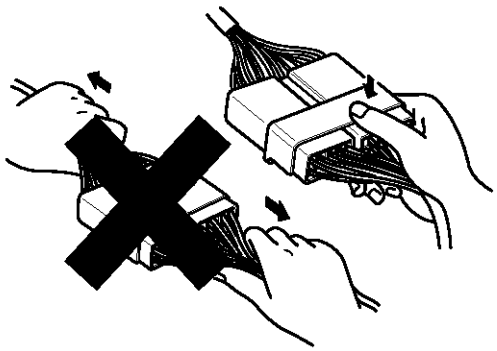
DO NOT sprinkle water directly into the engine compartment or electronic components.

● SIMULATING ELECTRICAL LOAD

a. Turn on all electrical systems to simulate excessive electrical loads (Radios, fans, lights, rear window defogger, etc.).

Connector Inspection Procedure

1. Handling of Connector
   a. Never pull on the wiring harness when disconnecting connectors.



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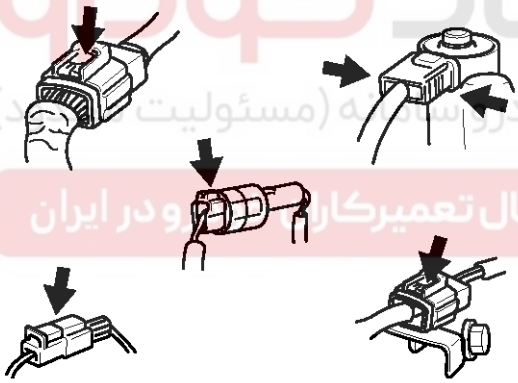
   b. When removing the connector with a lock, press or pull locking lever.



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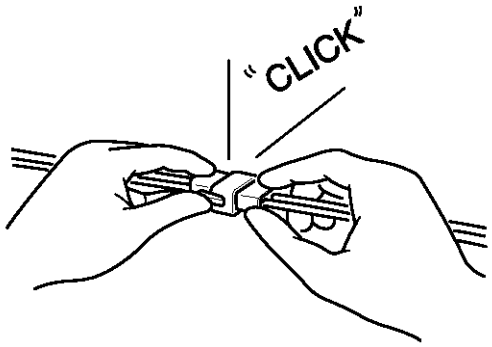
   c. Listen for a click when locking connectors. This sound indicates that they are securely locked.



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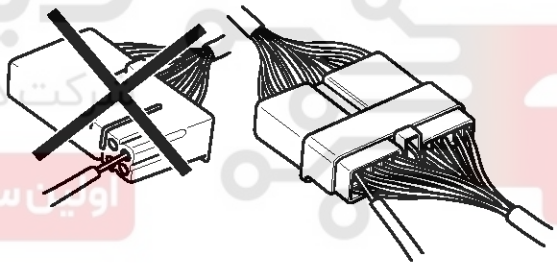
   d. When a tester is used to check for continuity, or to measure voltage, always insert tester probe from wire harness side.



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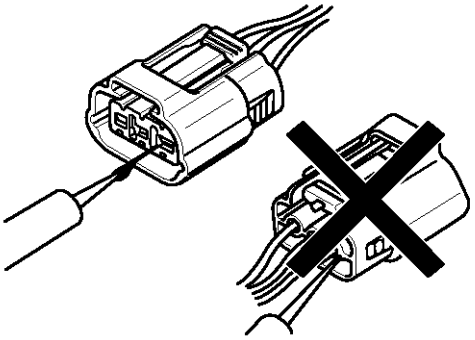
e. Check waterproof connector terminals from the connector side. Waterproof connectors cannot be accessed from harness side.



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NOTICE

- *Use a fine wire to prevent damage to the terminal.*
- *Do not damage the terminal when inserting the tester lead.*

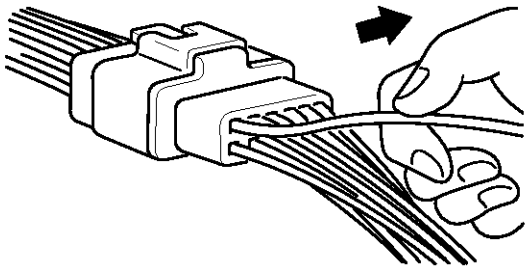
2. Checking Point for Connector

a. While the connector is connected:
Hold the connector, check connecting condition and locking efficiency.

b. When the connector is disconnected:
Check missed terminal, crimped terminal or broken core wire by slightly pulling the wire harness.
Visually check for rust, contamination, deformation and bend.

c. Check terminal tightening condition:
Insert a spare male terminal into a female terminal, and then check terminal tightening conditions.

d. Pull lightly on individual wires to ensure that each wire is secured in the terminal.



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3. Repair Method of Connector Terminal

a. Clean the contact points using air gun and/or shop rag.

NOTICE
Never use sand paper when polishing the contact points, otherwise the contact point may be damaged.

b. In case of abnormal contact pressure, replace the female terminal.

Wire Harness Inspection Procedure

1. Before removing the wire harness, check the wire harness position and crimping in order to restore it correctly.
2. Check whether the wire harness is twisted, pulled or loosened.
3. Check whether the temperature of the wire harness is abnormally high.
4. Check whether the wire harness is rotating, moving or vibrating against the sharp edge of a part.
5. Check the connection between the wire harness and any installed part.
6. If the covering of wire harness is damaged; secure, repair or replace the harness.

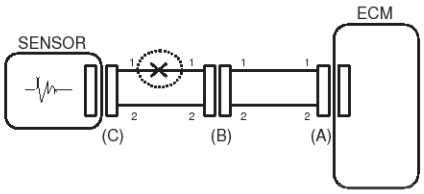
Electrical Circuit Inspection Procedure

● Check Open Circuit

1. Procedures for Open Circuit
   - Continuity Check
   - Voltage Check

   If an open circuit occurs (as seen in [FIG. 1]), it can be found by performing Step 2 (Continuity Check Method) or Step 3 (Voltage Check Method) as shown below.

FIG 1



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2. Continuity Check Method

   NOTICE

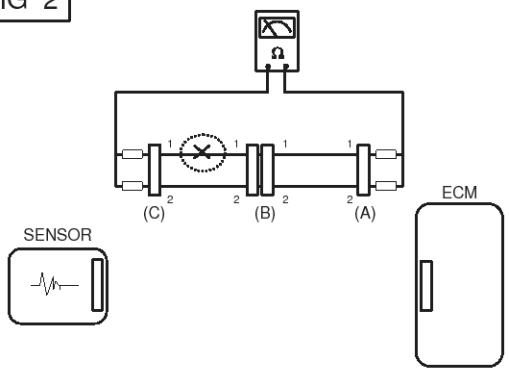
   When measuring for resistance, lightly shake the wire harness above and below or from side to side.

Specification (Resistance)
1Ω or less → Normal Circuit
1MΩ or Higher → Open Circuit

   a. Disconnect connectors (A), (C) and measure resistance between connector (A) and (C) as shown in [FIG. 2].

      In [FIG.2.] the measured resistance of line 1 and 2 is higher than 1MΩ and below 1 Ω respectively. Specifically the open circuit is line 1 (Line 2 is normal). To find exact break point, check sub line of line 1 as described in next step.

FIG 2



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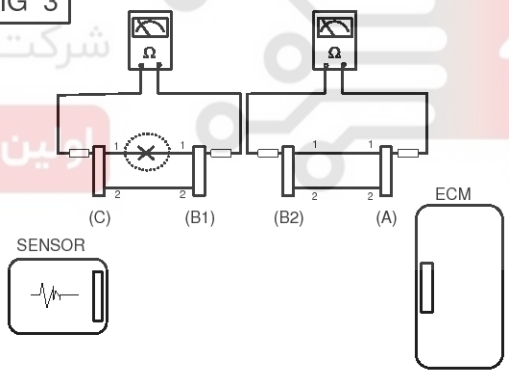
   b. Disconnect connector (B), and measure for resistance between connector (C) and (B1) and between (B2) and (A) as shown in [FIG. 3].

      In this case the measured resistance between connector (C) and (B1) is higher than 1MΩ and the open circuit is between terminal 1 of connector (C) and terminal 1 of connector (B1).

FIG 3



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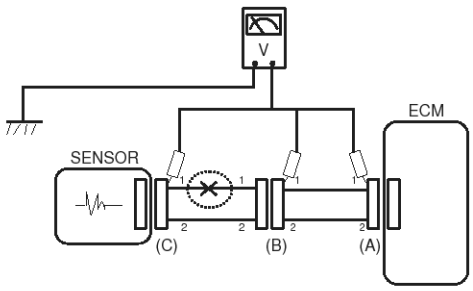
3. Voltage Check Method
   a. With each connector still connected, measure the voltage between the chassis ground and terminal 1 of each connectors (A), (B) and (C) as shown in [FIG. 4].

The measured voltage of each connector is 5V, 5V and 0V respectively. So the open circuit is between connector (C) and (B).

FIG 4



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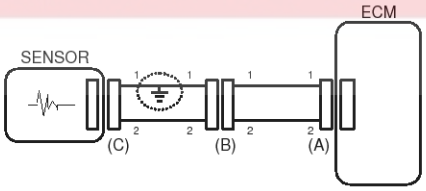
● Check Short Circuit

1. Test Method for Short to Ground Circuit
   - Continuity Check with Chassis Ground

   If short to ground circuit occurs as shown in [FIG. 5], the broken point can be found by performing Step 2 (Continuity Check Method with Chassis Ground) as shown below.

FIG 5



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2. Continuity Check Method (with Chassis Ground)

   NOTICE

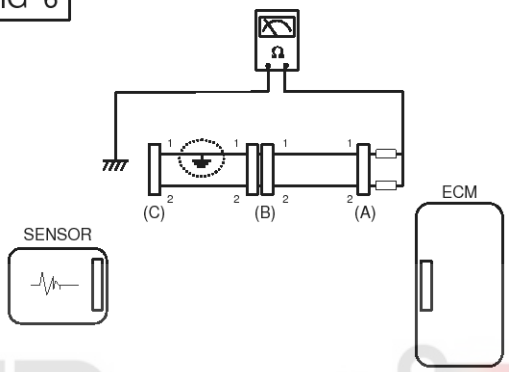
   Lightly shake the wire harness above and below, or from side to side when measuring the resistance.

Specification (Resistance)
1Ω or less → Short to Ground Circuit
1MΩ or Higher → Normal Circuit

a. Disconnect connectors (A), (C) and measure for resistance between connector (A) and Chassis Ground as shown in [FIG. 6].

The measured resistance of line 1 and 2 in this example is below 1 Ω and higher than 1MΩ respectively. Specifically the short to ground circuit is line 1 (Line 2 is normal). To find exact broken point, check the sub line of line 1 as described in the following step.

FIG 6



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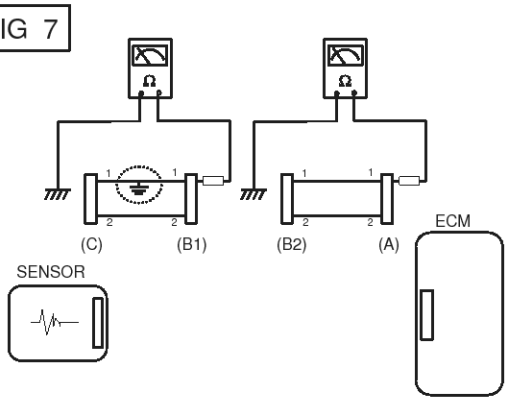
b. Disconnect connector (B), and measure the resistance between connector (A) and chassis ground, and between (B1) and chassis ground as shown in [FIG. 7].

The measured resistance between connector (B1) and chassis ground is 1Ω or less. The short to ground circuit is between terminal 1 of connector (C) and terminal 1 of connector (B1).

FIG 7



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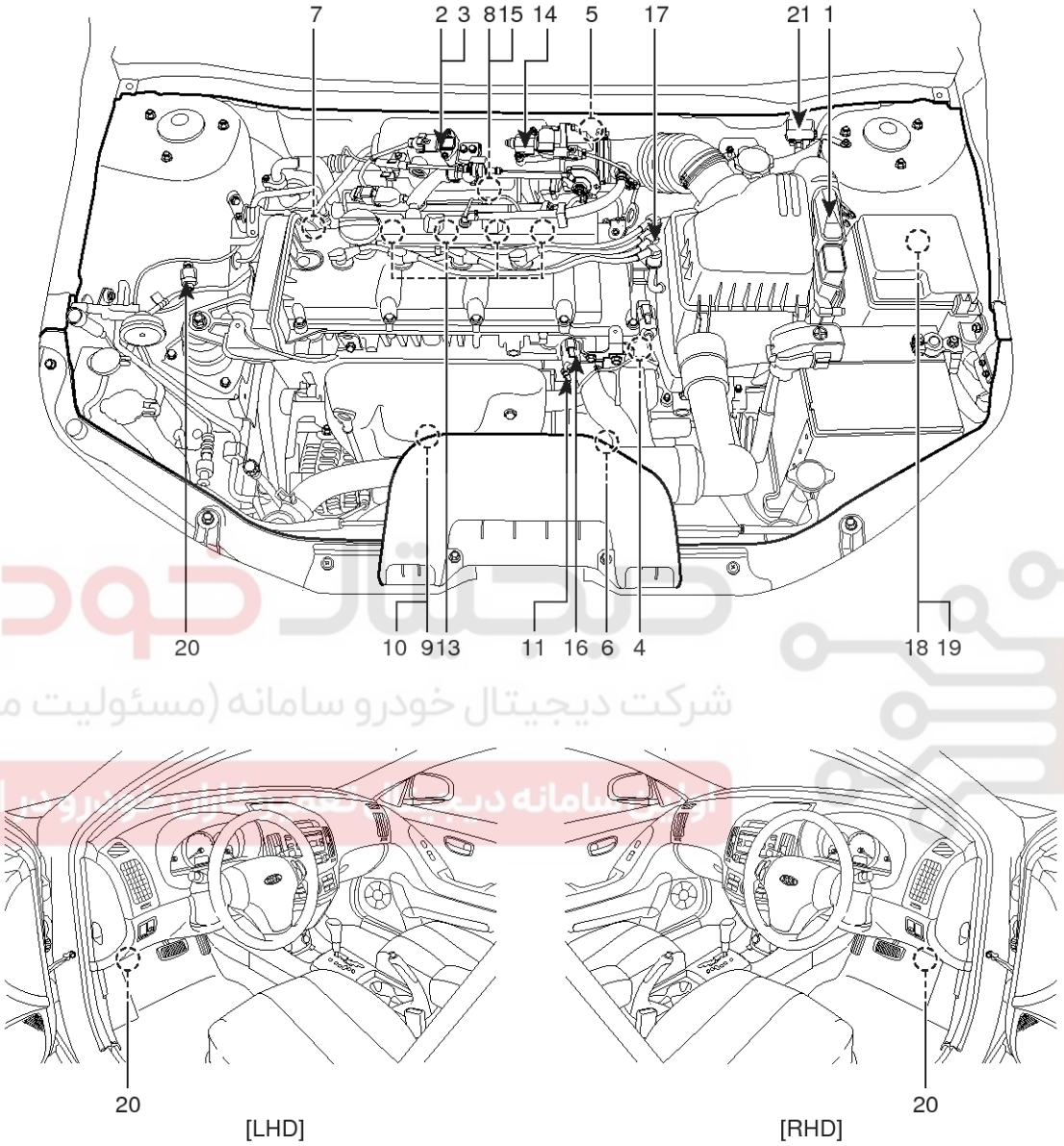
Symptom Troubleshooting Guide Chart

Main Symptom	Diagnostic Procedure	Also Check For
Unable to start (Engine does not turn over)	1. Test the battery 2. Test the starter 3. Inhibitor switch (A/T) or clutch start switch (M/T)	
Unable to start (Incomplete combustion)	1. Test the battery 2. Check the fuel pressure 3. Check the ignition circuit 4. Troubleshooting the immobilizer system (In case of immobilizer lamp flashing)	• DTC • Low compression • Intake air leaks • Slipped or broken timing belt • Contaminated fuel
Difficult to start	1. Test the battery 2. Check the fuel pressure 3. Check the ECT sensor and circuit (Check DTC) 4. Check the ignition circuit	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Poor idling (Rough, unstable or incorrect Idle)	1. Check the fuel pressure 2. Check the Injector 3. Check the long term fuel trim and short term fuel trim (Refer to CUSTOMER DATASTREAM) 4. Check the idle speed control circuit (Check DTC) 5. Inspect and test the Throttle Body 6. Check the ECT sensor and circuit (Check DTC)	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Engine stall	1. Test the Battery 2. Check the fuel pressure 3. Check the idle speed control circuit (Check DTC) 4. Check the ignition circuit 5. Check the CKPS Circuit (Check DTC)	• DTC • Intake air leaks • Contaminated fuel • Weak ignition spark
Poor driving (Surge)	1. Check the fuel pressure 2. Inspect and test Throttle Body 3. Check the ignition circuit 4. Check the ECT Sensor and Circuit (Check DTC) 5. Test the exhaust system for a possible restriction 6. Check the long term fuel trim and short term fuel trim (Refer to CUSTOMER DATASTREAM)	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Knocking	1. Check the fuel pressure 2. Inspect the engine coolant 3. Inspect the radiator and the electric cooling fan 4. Check the spark plugs	• DTC • Contaminated fuel
Poor fuel economy	1. Check customer's driving habits • Is A/C on full time or the defroster mode on? • Are tires at correct pressure? • Is excessively heavy load being carried? • Is acceleration too much, too often? 2. Check the fuel pressure 3. Check the injector 4. Test the exhaust system for a possible restriction 5. Check the ECT sensor and circuit	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark

Main Symptom	Diagnostic Procedure	Also Check For
Hard to refuel (Overflow during refueling)	1. Test the canister close valve 2. Inspect the fuel filler hose/pipe • Pinched, kinked or blocked? • Filler hose is torn 3. Inspect the fuel tank vapor vent hose between the EVAP. canister and air filter 4. Check the EVAP. canister	• Malfunctioning gas station filling nozzle (If this problem occurs at a specific gas station during refueling)

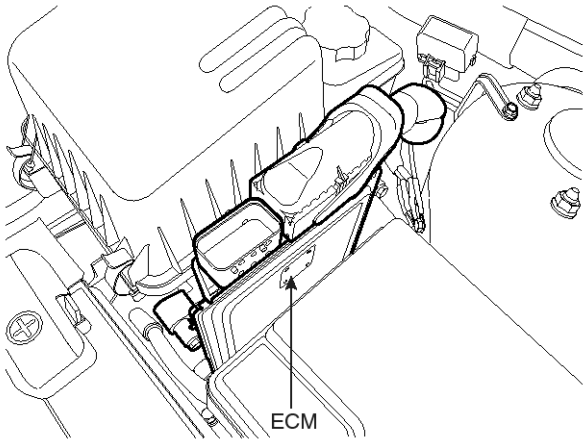
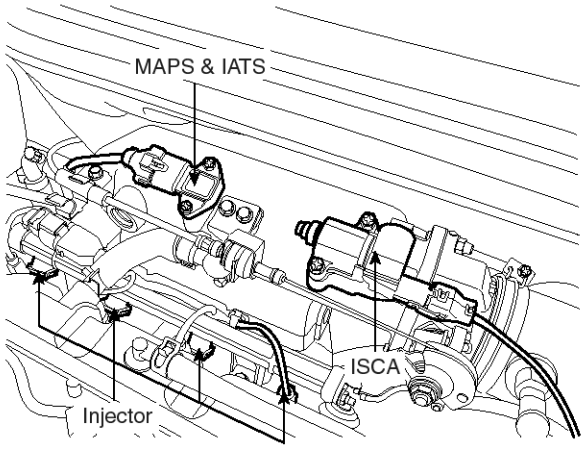
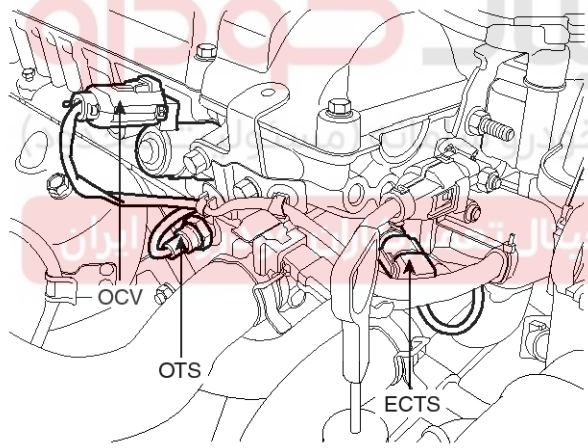
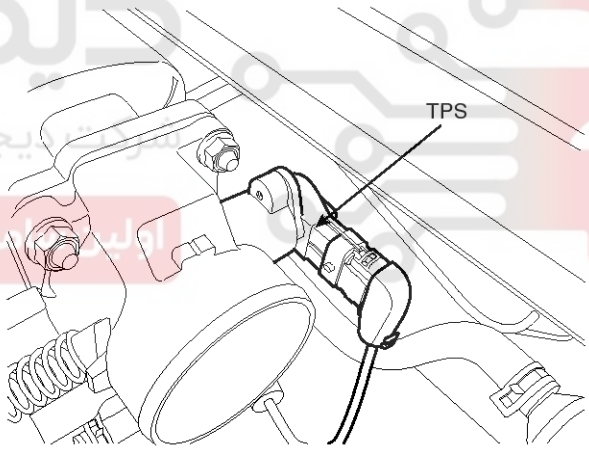
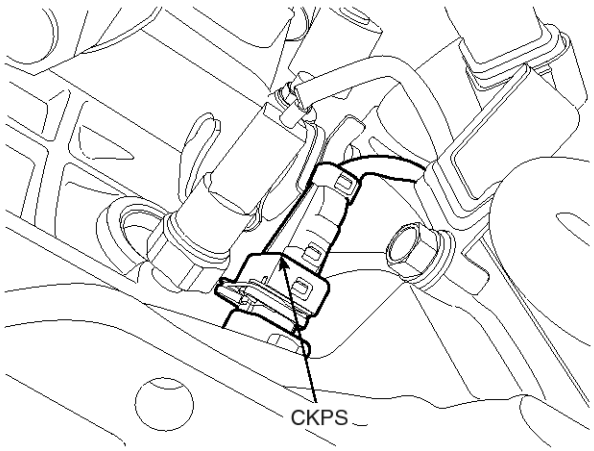
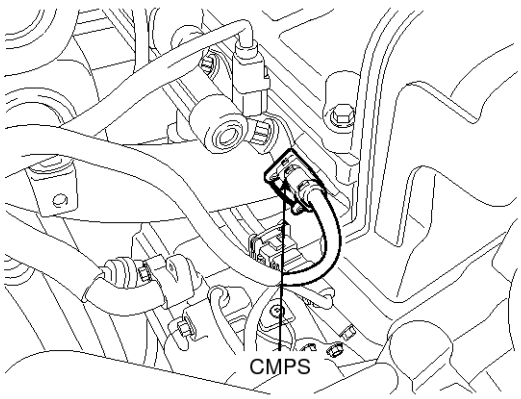
Engine Control System

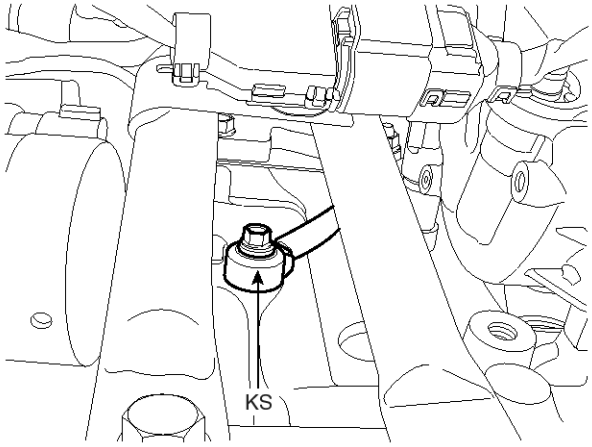
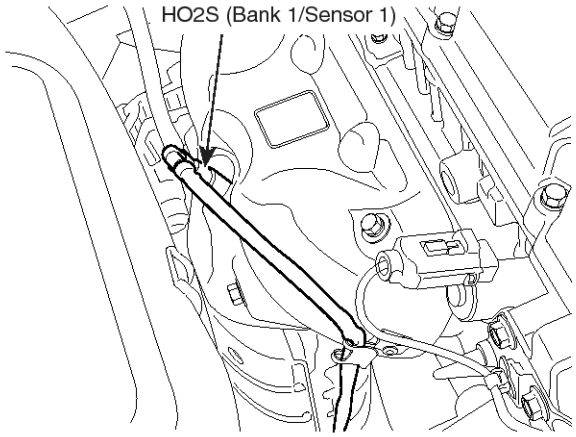
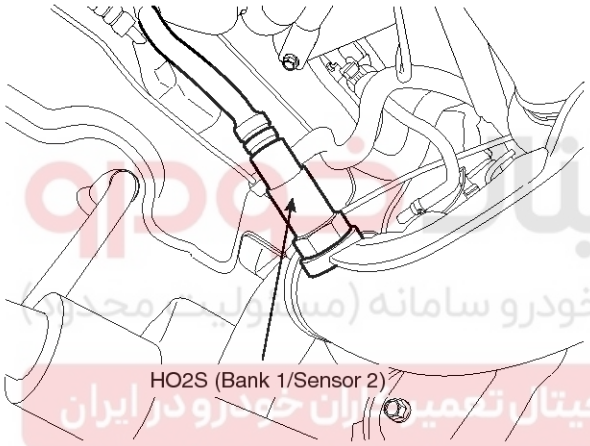
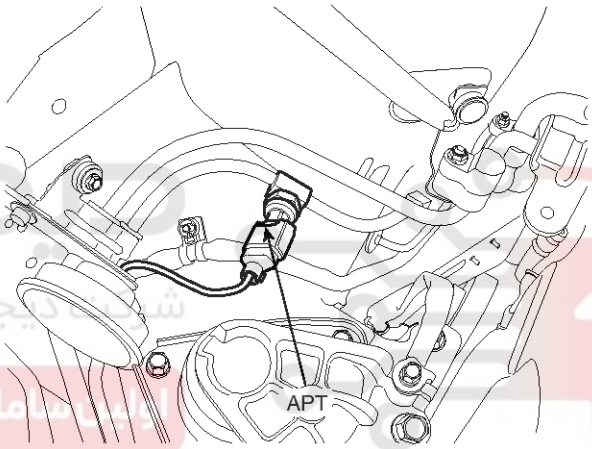
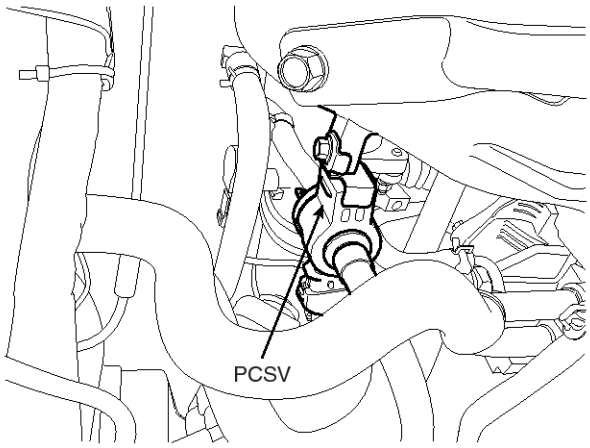
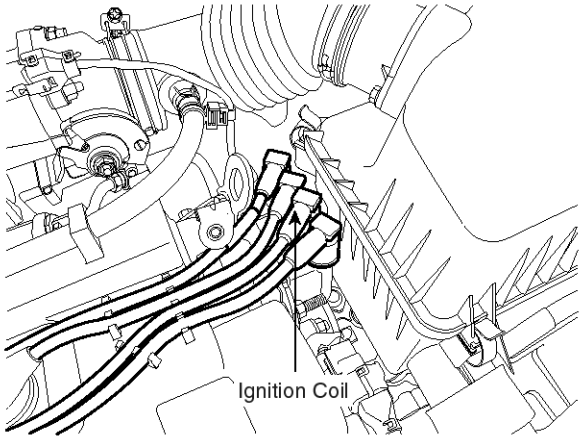
Components Location

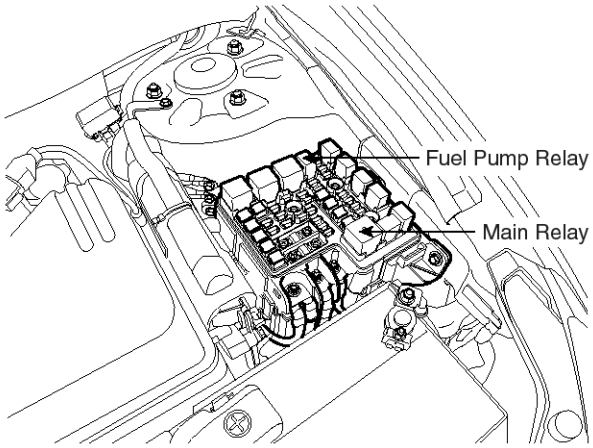


1. ECM (Engine Control Module)
2. Manifold Absolute Pressure Sensor (MAPS)
3. Intake Air Temperature Sensor (IATS)
4. Engine Coolant Temperature Sensor (ECTS)
5. Throttle Position Sensor (TPS)
6. Crankshaft Position Sensor (CKPS)
7. Camshaft Position Sensor (CMPS)
8. Knock Sensor (KS)
9. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1]
10. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]
11. CVVT Oil Temperature Sensor (OTS)
12. A/C Pressure Transducer (APT)
13. Injector
14. Idle Speed Control Actuator (ISCA)
15. Purge Control Solenoid Valve (PCSV)
16. CVVT Oil Control Valve (OCV)
17. Ignition Coil
18. Main Relay
19. Fuel Pump Relay
20. Data Link Connector (DLC)
21. Multi-Purpose Connecto

SEDF17005L

1. ECM (Engine Control Module)	2. Manifold Absolute Pressure Sensor (MAPS) 3. Intake Air Temperature Sensor (IATS) 13. Injector 14. Idle Speed Control Actuator (ISCA)
	
4. Engine Coolant Temperature Sensor (ECTS) 11. CVVT Oil Temperature Sensor (OTS) 16. CVVT Oil Control Valve (OCV)	5. Throttle Position Sensor (TPS)
	
6. Crankshaft Position Sensor (CKPS)	7. Camshaft Position Sensor (CMPS)
	

8. Knock Sensor (KS)	9. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1]
	
10. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]	12. A/C Pressure Transducer (APT)
	
15. Purge Control Solenoid Valve (PCSV)	17. Ignition Coil
	

18. Main Relay 19. Fuel Pump Relay	
	

Description

If the Gasoline Engine Control system components (sensors, ECM, injector, etc.) fail, interruption to the fuel supply or failure to supply the proper amount of fuel for various engine operating conditions will result. The following situations may be encountered.

1. Engine is hard to start or does not start at all.
2. Unstable idle.
3. Poor driveability

If any of the above conditions are noted, first perform a routine diagnosis that includes basic engine checks (ignition system malfunction, incorrect engine adjustment, etc.). Then, inspect the Gasoline Engine Control system components with the HI-SCAN (Pro).

NOTICE

- *Before removing or installing any part, read the diagnostic trouble codes and then disconnect the battery negative (-) terminal.*
- *Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of the battery cable during engine operation or while the ignition switch is ON could cause damage to the ECM.*
- *The control harnesses between the ECM and heated oxygen sensor are shielded with the shielded ground wires to the body in order to prevent the influence of ignition noises and radio interference. When the shielded wire is faulty, the control harness must be replaced.*
- *When checking the generator for the charging state, do not disconnect the battery '+' terminal to prevent the ECM from damage due to the voltage.*
- *When charging the battery with the external charger, disconnect the vehicle side battery terminals to prevent damage to the ECM.*

Malfunction Indicator Lamp (MIL) [EOBD]

A malfunction indicator lamp illuminates to notify the driver that there is a problem with the vehicle. However, the MIL will go off automatically after 3 subsequent sequential driving cycles without the same malfunction. Immediately after the ignition switch is turned on (ON position - do not start), the MIL will illuminate continuously to indicate that the MIL operates normally.

Faults with the following items will illuminate the MIL.

- Catalyst
- Fuel system
- Mass Air Flow Sensor (MAFS)
- Intake Air Temperature Sensor (IATS)
- Engine Coolant Temperature Sensor (ECTS)
- Throttle Position Sensor (TPS)
- Upstream Oxygen Sensor
- Upstream Oxygen Sensor Heater
- Downstream Oxygen Sensor
- Downstream Oxygen Sensor Heater
- Injector
- Misfire
- Crankshaft Position Sensor (CKPS)
- Camshaft Position Sensor (CMPS)
- Evaporative Emission Control System
- Vehicle Speed Sensor (VSS)
- Idle Speed Control Actuator (ISCA)
- Power Supply
- ECM/ PCM
- MT/AT Encoding
- Acceleration Sensor
- MIL-on Request Signal
- Power Stage

NOTICE

Refer to "Inspection CHART FOR DIAGNOSTIC TROUBLE CODES (DTC)" for more information.

[NON-EOBD]

A malfunction indicator lamp illuminates to notify the driver that there is a problem with the vehicle. However, the MIL will go off automatically after 3 subsequent sequential driving cycles without the same malfunction. Immediately after the ignition switch is turned on (ON position - do not start), the MIL will illuminate continuously to indicate that the MIL operates normally.

Faults with the following items will illuminate the MIL

- Heated oxygen sensor (HO2S)
- Mass Air Flow sensor (MAFS)
- Throttle position sensor (TPS)
- Engine coolant temperature sensor (ECTS)
- Idle speed control actuator (ISCA)
- Injectors
- ECM

NOTICE

Refer to "Inspection CHART FOR DIAGNOSTIC TROUBLE CODES (DTC)" for more information.

[Inspection]

1. After turning ON the ignition key, ensure that the light illuminates for about 5 seconds and then goes out.
2. If the light does not illuminate, check for an open circuit in the harness, a blown fuse or a blown bulb.

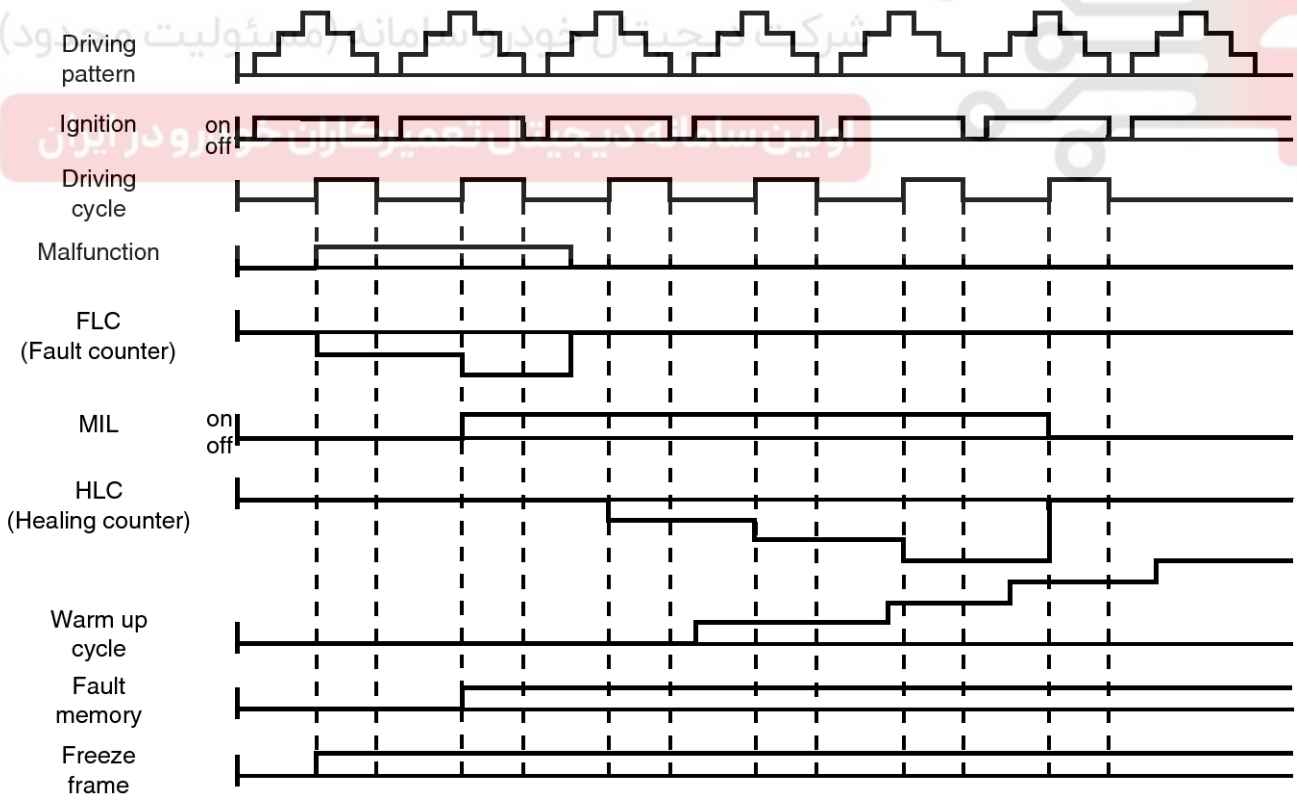
Self-Diagnosis

The ECM monitors the input/output signals (some signals at all times and the others under specified conditions). When the ECM detects an irregularity, it records the diagnostic trouble code, and outputs the signal to the Data Link connector. The diagnosis results can be read with the MIL or HI-SCAN (Pro). Diagnostic Trouble Codes (DTC) will remain in the ECM as long as battery power is maintained. The diagnostic trouble codes will, however, be erased when the battery terminal or ECM connector is disconnected, or by the HI-SCAN (Pro).

NOTICE

If a sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code (DTC) is recorded. In this case, disconnect the battery negative terminal (-) for 15 seconds or more, and the diagnosis memory will be erased.

The Relation Between DTC And Driving Pattern In EOBD System



LGIF601Q

1. When the same malfunction is detected and maintained during two sequential driving cycles, the MIL will automatically illuminate.
2. The MIL will go off automatically if no fault is detected after 3 sequential driving cycles.
3. A Diagnostic Trouble Code(DTC) is recorded in ECM memory when a malfunction is detected after two sequential driving cycles. The MIL will illuminate when the malfunction is detected on the second driving cycle.

   If a misfire is detected, a DTC will be recorded, and the MIL will illuminate, immediately after a fault is first detected.
4. A Diagnostic Trouble Code(DTC) will automatically erase from ECM memory if the same malfunction is not detected for 40 driving cycles.

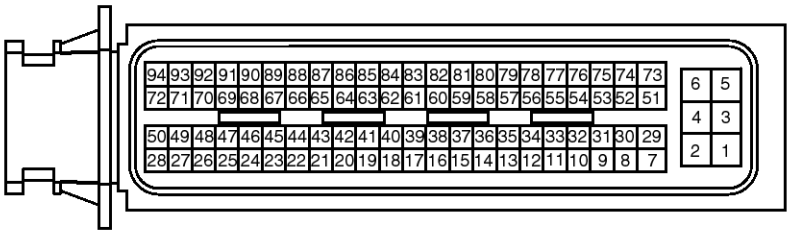
NOTICE

- *A "warm-up cycle" means sufficient vehicle operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit from engine starting and reaches a minimum temperature of 160 degress Fahrenheit.*
- *A "driving cycle" consists of engine startup, vehicle operation beyond the beginning of closed loop operation.*

Engine Control Module (ECM)

Engine Control Module (ECM)

1. HARNESS CONNECTOR



CONNECTOR [CBG-K]

SHDF16115L

2. TERMINAL FUNCTION

Connector [CBG-K]

PinNo.	Description	Connected to
1	Power Ground	Chassis Ground
2	Battery voltage supply after ignition switch	Ignition Switch
3	Power Ground	Chassis Ground
4	Battery voltage supply after main relay	Main Relay
5	ECM Ground	Chassis Ground
6	Battery Power	Battery
7	Ignition Coil (Cylinder #1,4) control output	Ignition Coil (Cylinder #1,4)
8	Shield	Ignition Coil
9	Sensor ground	Manifold Absolute Pressure Sensor (MAPS)
10	Manifold Absolute Pressure Sensor signal input	Manifold Absolute Pressure Sensor (MAPS)
11	-	
12	Ground	Immobilizer Control Module
13	A/C Pressure Transducer signal input	A/C Pressure Transducer (APT)
14	Sensor ground	Engine Coolant Temperature Sensor (ECTS)
15	Engine Coolant Temperature Sensor signal input	Engine Coolant Temperature Sensor (ECTS)
16	Sensor ground	Heated Oxygen Sensor (Sensor 1)
17	Heated Oxygen Sensor (Sensor 1) signal input	Heated Oxygen Sensor (Sensor 1)
18	Intake Air Temperature Sensor signal input	Intake Air Temperature Sensor (IATS)
19	-	
20	-	
21	Sensor ground	Knock Sensor (KS)
22	Knock Sensor signal input	Knock Sensor (KS)
23	Sensor power (+5V)	Throttle Position Sensor (TPS)

PinNo.	Description	Connected to
24	-	
25	Injector (Cylinder #1) control output	Injector (Cylinder #1)
26	Injector (Cylinder #3) control output	Injector (Cylinder #3)
27	Injector (Cylinder #4) control output	Injector (Cylinder #4)
28	Injector (Cylinder #2) control output	Injector (Cylinder #2)
29	Ignition Coil (Cylinder #2,3) control output	Ignition Coil (Cylinder #2,3)
30	-	
31	-	
32	-	
33	-	
34	-	
35	-	
36	-	
37	Sensor ground	CVVT Oil Temperature Sensor (OTS)
38	Heated Oxygen Sensor (Sensor 2) signal input	Heated Oxygen Sensor (Sensor 2)
39	Sensor ground	Heated Oxygen Sensor (Sensor 2)
40	CVVT Oil Temperature Sensor signal input	CVVT Oil Temperature Sensor (OTS)
41	Throttle Position Sensor signal input	Throttle Position Sensor (TPS)
42	Sensor ground	Throttle Position Sensor (TPS)
43	-	
44	-	
45	-	
46	-	
47	Sensor power (+5V)	A/C Pressure Transducer (APT)
48	Sensor power (+5V)	Manifold Absolute Pressure Sensor (MAPS)
49	-	
50	-	
51	-	
52	-	
53	Vehicle speed signal input	ABS/ESP Control Module [With ABS/ESP]
54	-	
55	Wheel Speed Sensor [A] signal input	Wheel Speed Sensor (WSS)[Without ABS/ESP]
56	Wheel Speed Sensor [B] signal input	Wheel Speed Sensor (WSS)[Without ABS/ESP]
57	Sensor ground	A/C Pressure Transducer (APT)
58	-	

PinNo.	Description	Connected to
59	-	
60	A/C switch "ON" signal input	A/C Switch
61	-	
62	A/C thermal switch signal input	A/C Thermal Switch
63	Fuel consumption signal output	Trip Computer
64	Main Relay control output	Main Relay
65	Cooling Fan Relay [Low] control output	Cooling Fan Relay [Low]
66	CVVT Oil Control Valve control output	CVVT Oil Control Valve (OCV)
67	Purge Control Solenoid Valve control output	Purge Control Solenoid Valve (PCSV)
68	-	
69	Immobilizer lamp control output	Immobilizer Lamp
70	Fuel Pump Relay control output	Fuel Pump Relay
71	-	
72	-	
73	Battery voltage supply after main relay	Main Relay
74	Alternator load signal input	Alternator
75	Immobilizer communication line	Immobilizer Control Module
76	Diagnosis Data Line (K-Line)	Data Link Connector (DLC), Multi-Purpose Check C-onnector
77	CAN [HIGH]	Other control module
78	CAN [LOW]	Other control module
79	Sensor ground	Camshaft Position Sensor (CMPS)
80	Camshaft Position Sensor signal input	Camshaft Position Sensor (CMPS)
81	Sensor ground	Crankshaft Position Sensor (CKPS)
82	Crankshaft Position Sensor signal input	Crankshaft Position Sensor (CKPS)
83	-	
84	Clutch Switch signal input	Clutch Switch
85	-	
86	Engine speed signal output	Cluster (Tachometer)
87	A/C Compressor Relay control output	A/C Compressor Relay
88	Cooling Fan Relay [High] control output	Cooling Fan Relay [High]
89	Idle Speed Control Actuator [OPEN] control output	Idle Speed Control Actuator (ISCA)
90	Idle Speed Control Actuator [CLOSE] control output	Idle Speed Control Actuator (ISCA)
91	-	
92	Malfunction Indicator Lamp (MIL) control output	Cluster (Malfunction Indicator Lamp)

PinNo.	Description	Connected to
93	Heated Oxygen Sensor (Sensor 1) Heater control output	Heated Oxygen Sensor (Sensor 1)
94	Heated Oxygen Sensor (Sensor 2) Heater control output	Heated Oxygen Sensor (Sensor 2)

3. TERMINAL INPUT/OUTPUT SIGNAL

Connector [CBG-K]

Pin No.	Description	Condition	Type	Level	Test Result
1	Power Ground	Idle	DC	Max. 50mV	
2	Battery voltage supply after ignition switch	IG OFF	DC	Max. 1.0V	1.18mV
		IG ON		Battery Voltage	12.7V
3	Power Ground	Idle	DC	Max. 50mV	-4.37mV
4	Battery voltage supply after main relay	IG OFF	DC	Max. 1.0V	-5.1mV
		IG ON		Battery Voltage	12.3V
5	ECM Ground	Idle	DC	Max. 50mV	10.1mV
6	Battery Power	Always	DC	Battery Voltage	12.2V
7	Ignition Coil (Cylinder #1,4) control output	Idle	Pulse	1st Voltage: 300 ~ 400V	372V
				ON Voltage: Max. 2.0V	1.6V
8	Shield	Idle	DC	Max. 50mV	18.3mV
9	Sensor ground	Idle	DC	Max. 50mV	18.7mV
10	Manifold Absolute Pressure Sensor signal input	IG ON	DC	3.9 ~ 4.1V	4.09V
		Idle		9.8 ~ 1.6V	1.44V
11	-				
12	Ground	Idle	DC	Max. 50mV	
13	A/C Pressure Transducer signal input	Idle	DC	0.4 ~ 4.6V	A/C OFF:1.18V A/C ON:1.48V
14	Sensor ground	Idle	DC	Max. 50mV	13.0mV
15	Engine Coolant Temperature Sensor signal input	Idle	DC	0.5 ~ 4.5V	1.84V
16	Sensor ground	Idle	DC	Max. 50mV	
17	Heated Oxygen Sensor (Sensor 1) signal input	Racing	Analog	Rich: 0.6 ~ 1.0V	
				Lean: Max. 0.4V	
18	Intake Air Temperature Sensor signal input	Idle	Analog	0 ~ 5.0V	3.63V
19	-				
20	-				
21	Sensor ground	Idle	DC	Max. 50mV	
22	Knock Sensor signal input	Knocking	Variable Frequency		
		Normal			
23	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.03V

FLA-28 Fuel System

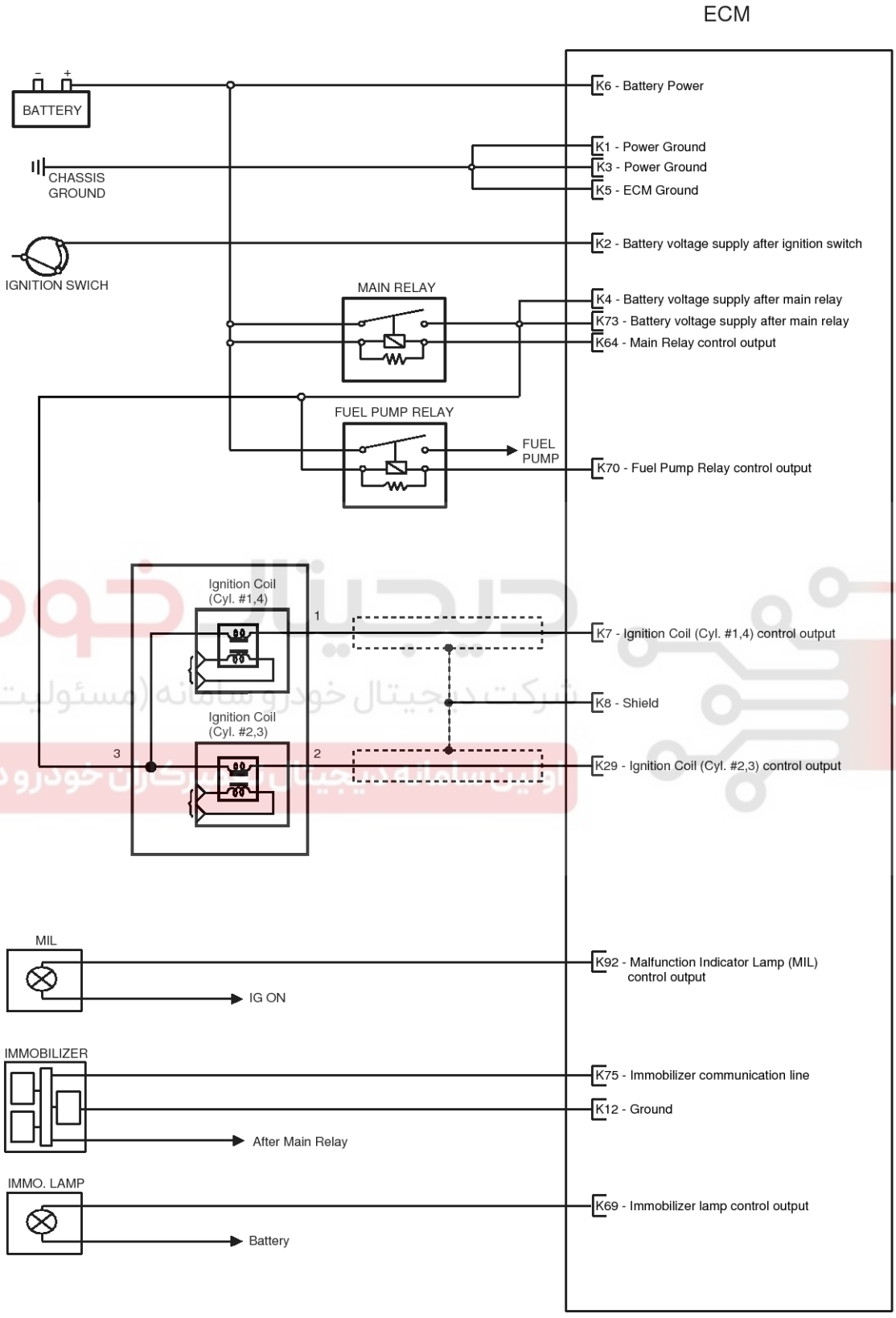
Pin No.	Description	Condition	Type	Level	Test Result
24	-				
25	Injector (Cylinder #1) control output	Idle	DC	Hi: Battery Voltage	14.4V
				Lo: Max. 1.0V	280mV
				Vpeak: Max. 80V	48.8V
26	Injector (Cylinder #3) control output	Idle	DC	Hi: Battery Voltage	14.2V
				Lo: Max. 1.0V	240mV
				Vpeak: Max. 80V	49.0V
27	Injector (Cylinder #4) control output	Idle	DC	Hi: Battery Voltage	14.4V
				Lo: Max. 1.0V	280mV
				Vpeak: Max. 80V	48.8V
28	Injector (Cylinder #2) control output	Idle	DC	Hi: Battery Voltage	14.2V
				Lo: Max. 1.0V	240mV
				Vpeak: Max. 80V	49.0V
29	Ignition Coil (Cylinder #1,4) control output	Idle	Pulse	1st Voltage: 300 ~ 400V	376V
				ON Voltage: Max. 2.0V	1.36V
30	-				
31	-				
32	-				
33	-				
34	-				
35	-				
36	-				
37	Sensor ground	Idle	DC	Max. 50mV	17.3mV
38	Heated Oxygen Sensor (Sensor 2) signal input	Racing	Analog	Rich: 0.6 ~ 1.0V	640mV
				Lean: Max. 0.4V	22mV
39	Sensor ground	Idle	DC	Max. 50mV	3.14mV
40	CVVT Oil Temperature Sensor signal input	Idle	Analog	0.5 ~ 4.5V	950mV
41	Throttle Position Sensor signal input	C.T	Analog	0.25 ~ 0.9V	307mV
		W.O.T		Min. 4.0V	4.28V
42	Sensor ground	Idle	DC	Max. 50mV	13.6mV
43	-				
44	-				
45	-				

Pin No.	Description	Condition	Type	Level	Test Result
46	-				
47	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	2.61mV
		IG ON		4.9 ~ 5.1V	5.04V
48	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	3.16mV
		IG ON		4.9 ~ 5.1V	5.06V
49	-				
50	-				
51	-				
52	-				
53	Vehicle speed signal input	Vehicle Run	Pulse	Hi: Min. 4.5V	13.0V
				Lo: Max. 0.5V	-200mV
54	-				
55	Wheel Speed Sensor [A] signal input	Vehicle Run (30 km/h)	SINE Wave	15Hz: Min. 0.13Vp-p	
				1,000Hz: Min 0.2V-pp	
				Overall: Max. 250 Vpp	
56	Wheel Speed Sensor [B] signal input	Vehicle Run (30 km/h)	SINE Wave	15Hz: Min. 0.13Vp-p	
				1,000Hz: Min 0.2V-pp	
				Overall: Max. 250 Vpp	
57	Sensor ground	Idle	DC	Max. 50mV	10mV
58	-				
59	-				
60	A/C switch "ON" signal input	A/C S/W OFF	DC	Max. 1.0V	0mV
		A/C S/W ON		Battery Voltage	12.8V
61	-				
62	A/C thermal switch signal input	A/C S/W OFF	DC	Max. 1.0V	0mV
		A/C S/W ON		Battery Voltage	12.8V
63	Fuel consumption signal output	Idle	Pulse	Hi: Battery Voltage	13.8V
				Lo: Max. 0.5V	0.1V
64	Main Relay control output	Relay OFF	DC	Battery Voltage	12.9V
		Relay ON		Max. 1.0V	0.88V

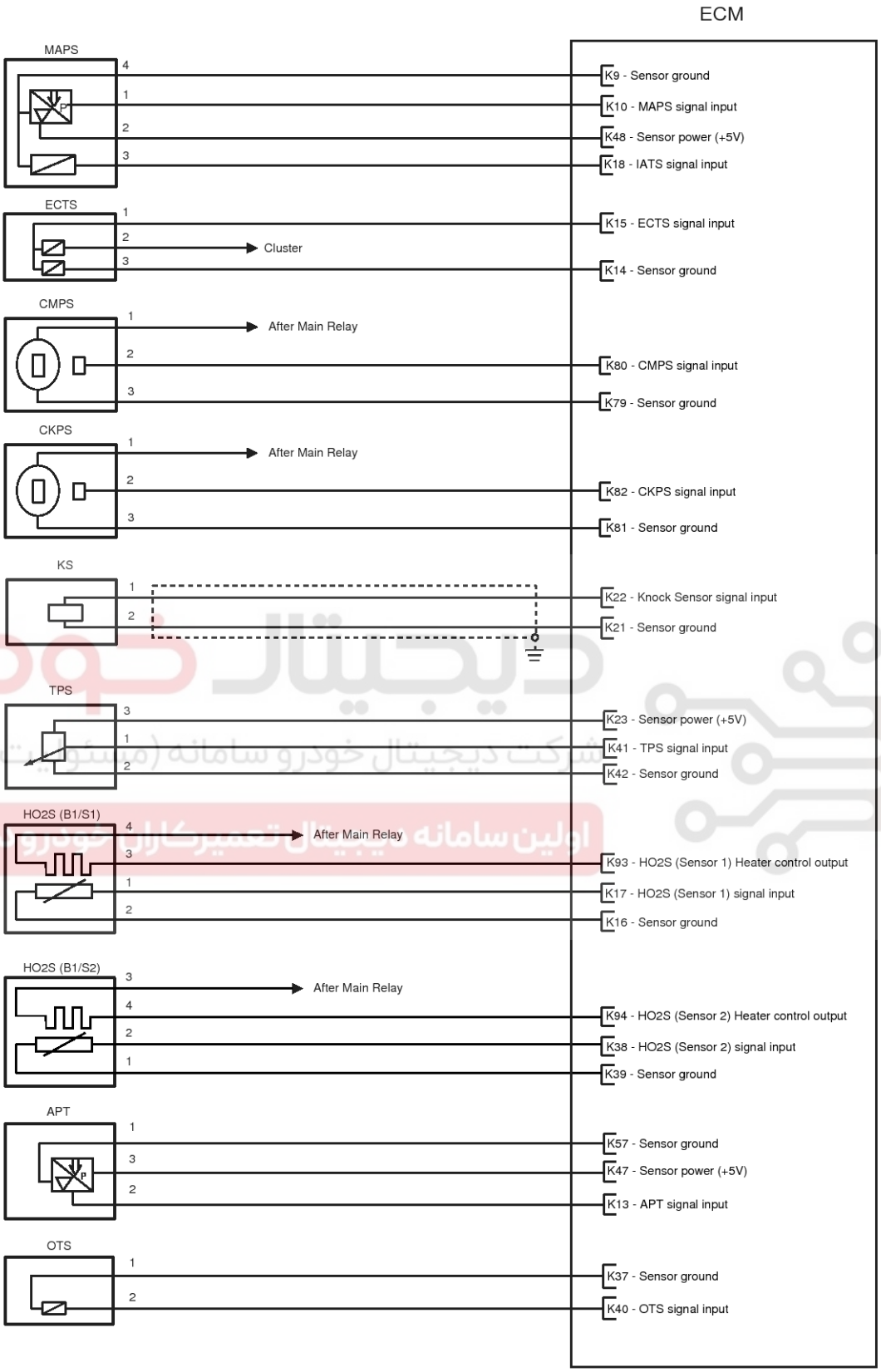
Pin No.	Description	Condition	Type	Level	Test Result
65	Cooling Fan Relay [Low] control output	Relay OFF	DC	Battery Voltage	12.9V
		Relay ON		Max. 1.0V	30mV
66	CVVT Oil Control Valve control output	Idle	Pulse	Battery Voltage	14.8V
				Max. 1.0V	100mV
67	Purge Control Solenoid Valve c-ontrol output	Active Inactive	Pulse	Hi: Battery Voltage	14.2V
				Lo: Max. 1.0V	100mV
68	-				
69	Immobilizer lamp control output	Lamp OFF	DC	Battery Voltage	
		Lamp ON		Max. 2.0V	
70	Fuel Pump Relay control output	Relay OFF	DC	Battery Voltage	13V
		Relay ON		Max. 1.0V	100mV
71	-				
72	-				
73	Battery voltage supply after mai-n relay	IG OFF	DC	Max. 1.0V	-5.1mV
		IG ON		Battery Voltage	12.3V
74	Alternator load signal input	Idle	Pulse	Hi: Battery Voltage	14V
				Lo: Max. 1.5V	10mV
75	Immobilizer communication line	When communi-cating after IG ON	Pulse	Hi: Min. 8.5V	
				Lo: Max. 3.5V	
76	Diagnosis Data Line (K-Line)	When transmitti-ng	Pulse	Hi: Min. Vbatt × 80 %	12.2V
				Lo: Max. Vbatt × 20%	260mV
		When receiving		Hi: Min. Vbatt × 70 %	12.2V
				Lo: Max. Vbatt × 30%	860mV
77	CAN [HIGH]	RECESSIVE	Pulse	2.0 ~ 3.0V	2.55V
		DOMINANT		2.75 ~ 4.5V	3.57V
78	CAN [LOW]	RECESSIVE	Pulse	2.0 ~ 3.0V	2.55V
		DOMINANT		0.5 ~ 2.25V	1.44V
79	Sensor ground	Idle	DC	Max. 50mV	10mV
80	Camshaft Position Sensor signal input	Idle	Pulse	Hi: Vcc	5.0V
				Lo: Max. 0.5V	0.2V
81	Sensor ground	Idle	DC	Max. 50mV	10mV

Pin No.	Description	Condition	Type	Level	Test Result
82	Crankshaft Position Sensor signal input	Idle	Pulse	Hi: Vcc	5.0V
				Lo: Max. 0.5V	40mV
83	-				
84	Clutch Switch signal input	Release	DC	Max. 0.5V	
		Push		Battery Voltage	
85	-				
86	Engine aspeed signal output	Idle	Pulse	Hi: Battery Voltage	14.0V
				Lo: Max. 0.5V	100mV
				Freq.: 20 ~ 26Hz	21.8Hz
87	A/C Compressor Relay control output	Relay OFF	DC	Battery Voltage	14.1V
		Relay ON		Max. 1.0V	0.1V
88	Cooling Fan Relay [High] control output	Relay OFF	DC	Battery Voltage	14.1V
		Relay ON		Max. 1.0V	320mV
89	Idle Speed Control Actuator [OPEN] control output	Idle	Pulse	Hi: Battery Voltage	14.6V
				Lo: Max. 1.0V	192mV
90	Idle Speed Control Actuator [CLOSE] control output	Idle	Pulse	Hi: Battery Voltage	14.9V
				Lo: Max. 1.0V	248mV
91	-				
92	Malfunction Indicator Lamp (MIL) control output	Lamp OFF	DC	Battery Voltage	13V
		Lamp ON		Max. 1.0V	50mV
93	Heated Oxygen Sensor (Sensor 1) Heater control output	Engine Run	Pulse	Hi: Battery Voltage	14V
				Lo: Max. 1.0V	0.3V
94	Heated Oxygen Sensor (Sensor 2) Heater control output	Engine Run	Pulse	Hi: Battery Voltage	14V
				Lo: Max. 1.0V	0.3V

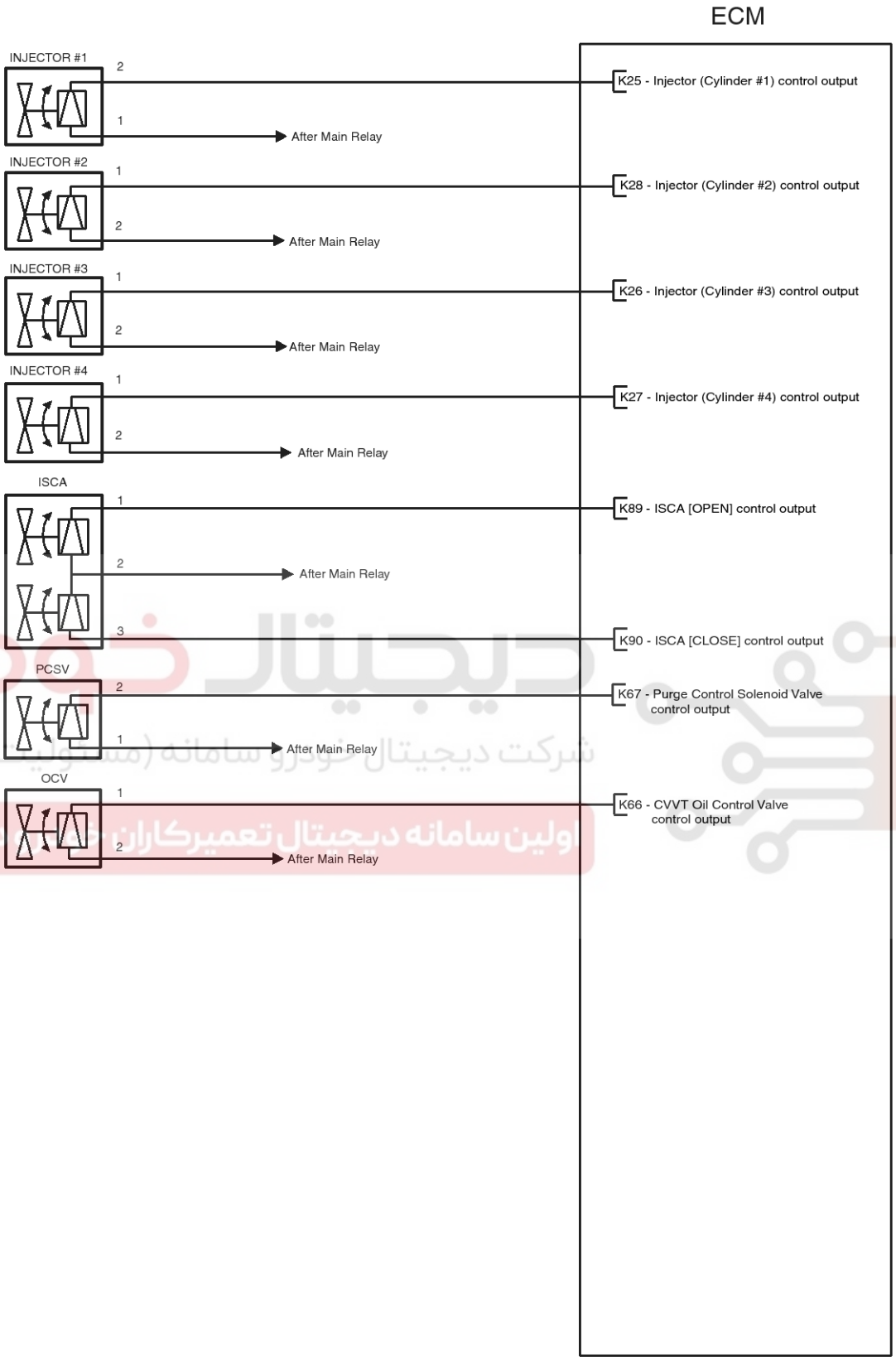
Circuit Diagram



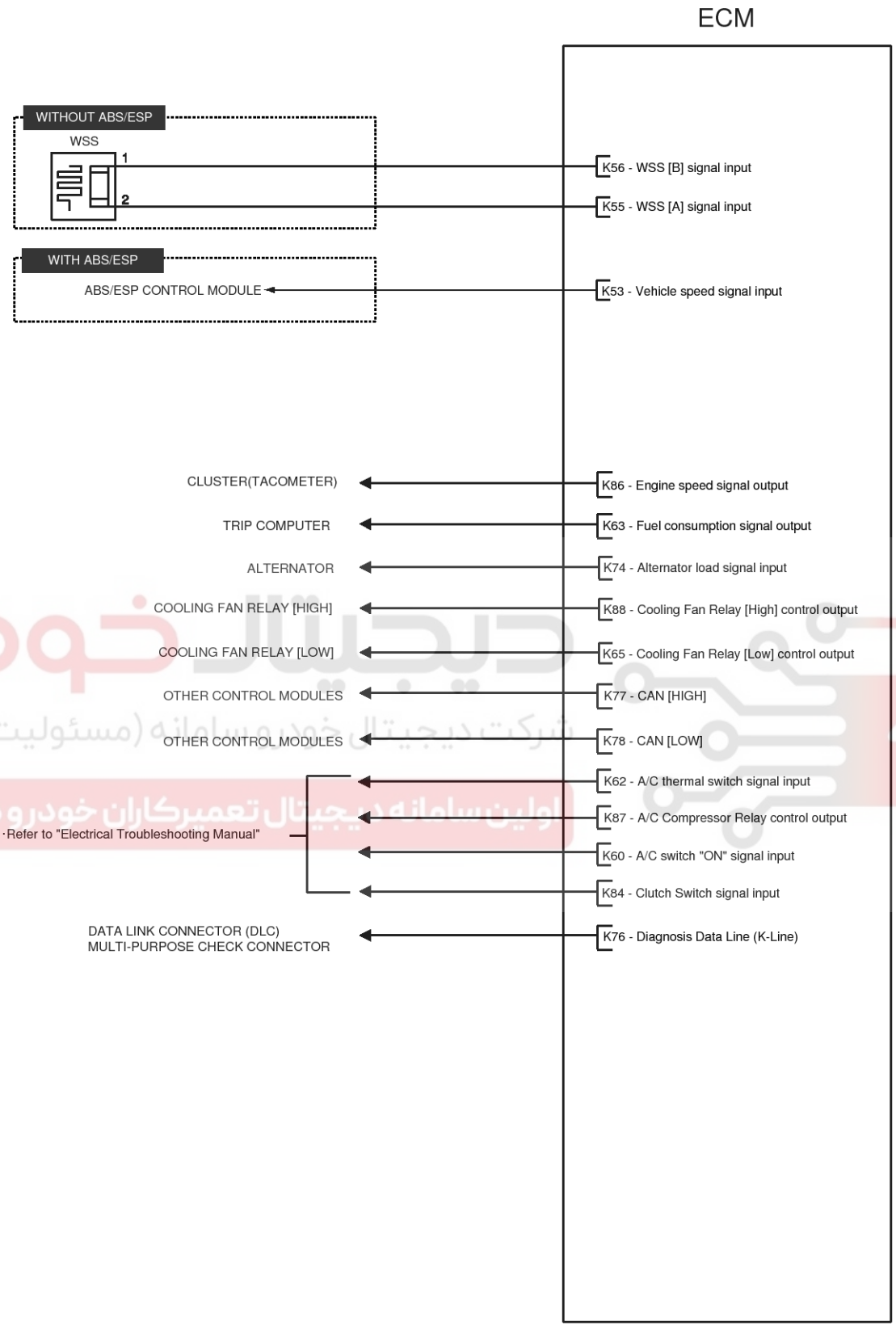
SEDF17002L



SEDF17003L



SHDF16118L



SEDF17004L

ECM Problem Inspection Procedure

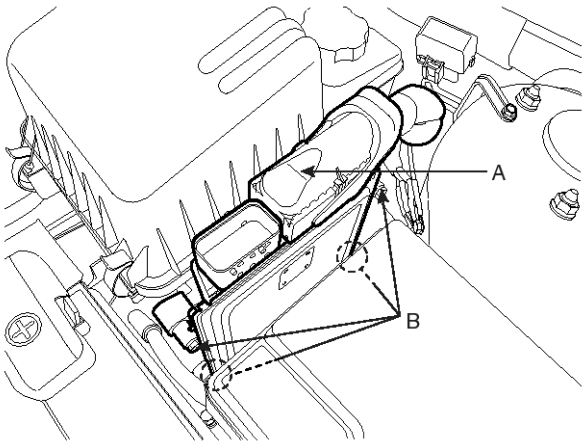
1. TEST ECM GROUND CIRCUIT: Measure resistance between ECM and chassis ground using the backside of ECM harness connector as ECM side check point. If the problem is found, repair it.

Specification (Resistance): 1Ω or less

2. TEST ECM CONNECTOR: Disconnect the ECM connector and visually check the ground terminals on ECM side and harness side for bent pins or poor contact pressure. If the problem is found, repair it.
3. If problem is not found in Step 1 and 2, the ECM could be faulty. If so, replace the ECM with a new one, and then check the vehicle again. If the vehicle operates normally then the problem was likely with the ECM.
4. RE-TEST THE ORIGINAL ECM : Install the original ECM (may be broken) into a known-good vehicle and check the vehicle. If the problem occurs again, replace the original ECM with a new one. If problem does not occur, this is intermittent problem (Refer to INTERMITTENT PROBLEM PROCEDURE in BASIC Inspection PROCEDURE).

Replacement

1. Turn ignition switch off.
2. Disconnect the battery (-) cable from the battery.
3. Disconnect the ECM connector(s) (A).
4. Unscrew the ECM mounting bolts (B) and remove the ECM from the air cleaner assembly.



SHDF16500L

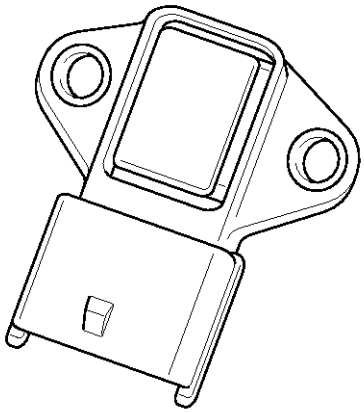
5. Install a new ECM.

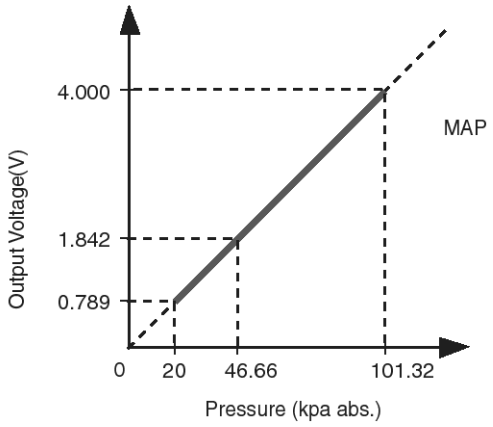
ECM mounting bolts: 9.8 ~ 11.8 N·m (1.0 ~ 1.2 kgf·m, 7.2 ~ 8.7 lbf·ft)

Manifold Absolute Pressure Sensor (MAPS)

Inspection

Function and operation priciple





LGLG002A

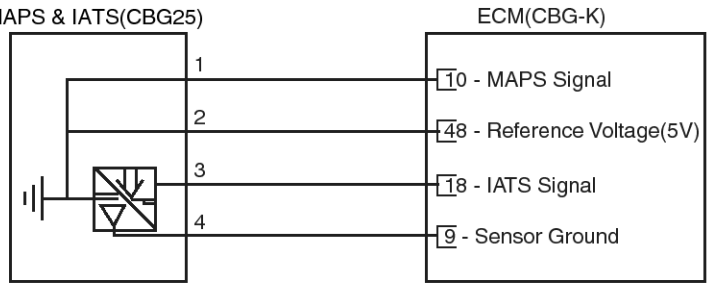
Manifold Absolute Pressure Sensor (MAPS) is speed-density type sensor and is installed on the surge tank. This MAPS senses absolute pressure in surge tank and transfers this analog signal proportional to the pressure to the ECM. The ECM calculates the intake air quantity and engine speed based on this signal. This MAPS consists of piezo-electric element and hybrid IC that amplifies the element output signal. The element is silicon diaphragm type and adapts pressure sensitive variable resistor effect of semi-conductor. 100% vacuum and the manifold pressure applies to both sides of it respectively. That is, this sensor outputs the silicon variation proportional to pressure change by voltage.

Specification

Pressure(kPa)	Output Voltage (V)
20.0	0.79
46.66	1.84
101.32	4.0

Circuit Diagram

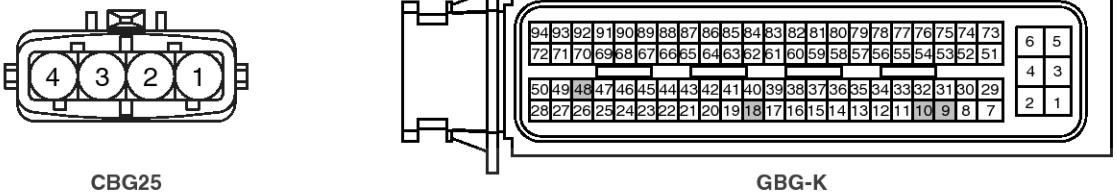
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	ECM CBG-K (10)	MAPS signal
2	ECM CBG-K (48)	Sensor Power (+5V)
3	ECM CBG-K (18)	IATS signal
4	ECM CBG-K (9)	Sensor ground

[Harness Connector]



CBG25
MAPS

GBG-K
ECM

SHDF16212L

Component Inspection

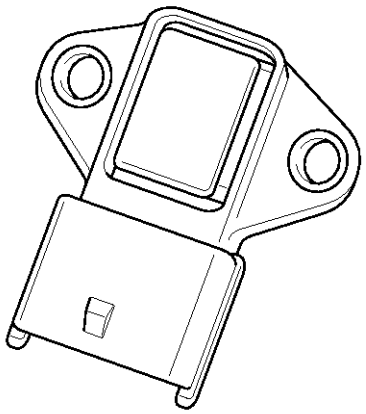
1. Connect a scantool on Diagnisis Link Connector (DLC).
2. Check MAPS output voltage at idle and IG ON.

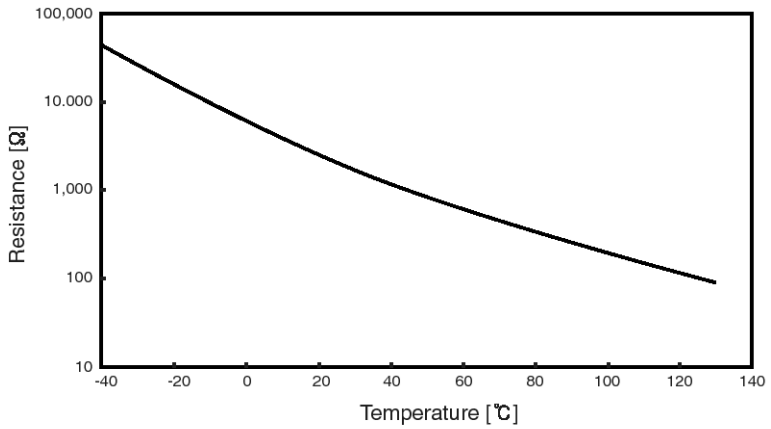
Condition	Output Voltage (V)
IG ON	3.9 ~ 4.1
Idle	0.8 ~ 1.6

Intake Air Temperature Sensor (IATS)

Inspection

Function And Operation Priciple





SHDF16121L

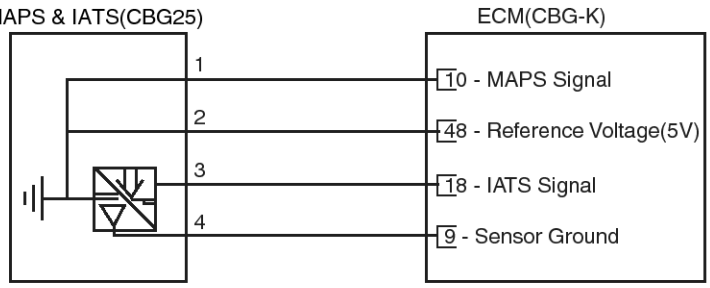
Intake Air Temperature Sensor (IATS) is installed inside the Manifold Absolute Pressure Sensor (MAPS) and detects the intake air temperature. To calculate precise air quantity, correction of the air temperature is needed because air density varies according to the temperature. So the ECM uses not only MAPS signal but also IATS signal. This sensor has a Negative Temperature Coefficient (NTC) and its resistance is in inverse proportion to the temperature.

Specification

Temperature [℃(°F)]	Resistance(kΩ)
-40(-40)	40.93 ~ 48.35
-30(-22)	23.43 ~ 27.34
-20(-4)	13.89 ~ 16.03
-10(14)	8.50 ~ 9.71
0(32)	5.38 ~ 6.09
10(50)	3.48 ~ 3.90
20(68)	2.31 ~ 2.57
25(77)	1.90 ~ 2.10
30(86)	1.56 ~ 1.74
40(104)	1.08 ~ 1.21
60(140)	0.54 ~ 0.62
80(176)	0.29 ~ 0.34

Circuit Diagram

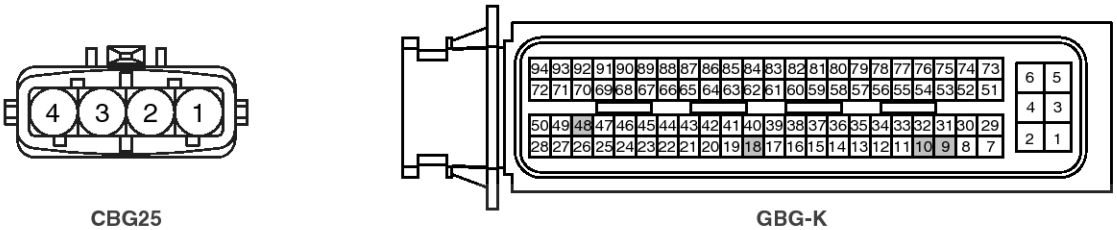
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	ECM CBG-K (10)	MAPS signal
2	ECM CBG-K (48)	Sensor Power (+5V)
3	ECM CBG-K (18)	IATS signal
4	ECM CBG-K (9)	Sensor ground

[Harness Connector]



CBG25
MAPS

GBG-K
ECM

SHDF16212L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect IATS connector.
3. Measure resistance between IATS terminals 3 and 4.
4. Check that the resistance is within the specification.

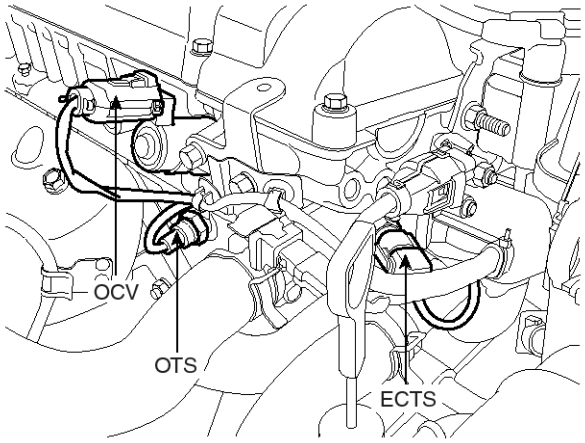
Specification: Refer to SPECIFICATION.

Engine Coolant Temperature Sensor (ECTS)

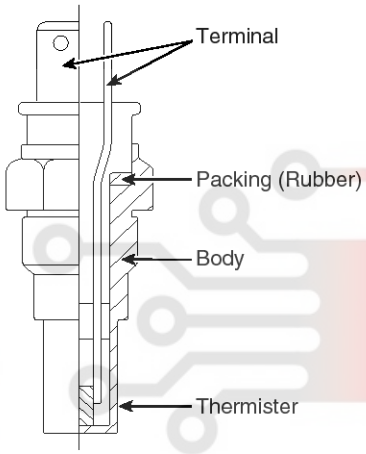
Inspection

Function And Operation Priciple

Engine Coolant Temperature Sensor (ECTS) is located in the engine coolant passage of the cylinder head for detecting the engine coolant temperature. The ECTS uses a thermistor whose resistance changes with the temperature. The electrical resistance of the ECTS decreases as the temperature increases, and increases as the temperature decreases. The reference 5 V in the PCM is supplied to the ECTS via a resistor in the PCM.That is, the resistor in the PCM and the thermistor in the ECTS are connected in series. When the resistance value of the thermistor in the ECTS changes according to the engine coolant temperature, the output voltage also changes. During cold engine operation the PCM increases the fuel injection duration and controls the ignition timing using the information of engine coolant temperature to avoid engine stalling and improve drivability.



SHDF16104L



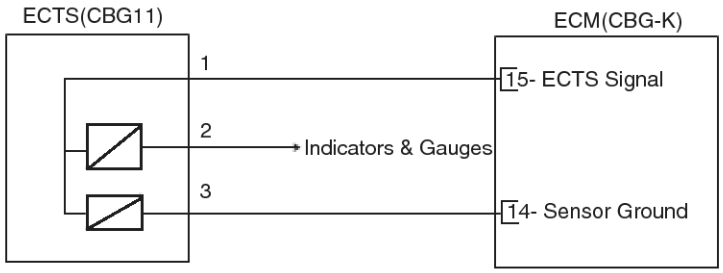
EGRF241A

Specification

Temperature [℃(℉)]	Resistance(kΩ)
-40(-40)	48.14
-20(-4)	14.13 ~ 16.83
0(32)	5.79
20(68)	2.31 ~ 2.59
40(104)	1.15
60(140)	0.59
80(176)	0.32

Circuit Diagram

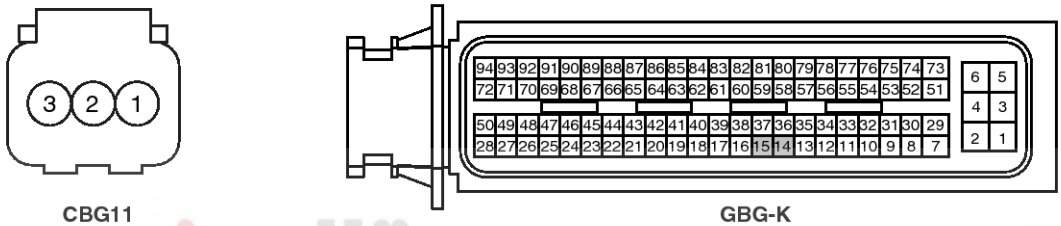
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	ECM CBG-K (15)	ECTS Signal
2	Indicators & Gauges	-
3	ECM CBG-K (14)	Sensor Ground

[Harness Connector]



SHDF16224L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect ECTS connector.
3. Remove the ECTS.
4. After immersing the thermistor of the sensor into engine coolant, measure resistance between ECTS terminals 1 and 3.
5. Check that the resistance is within the specification.

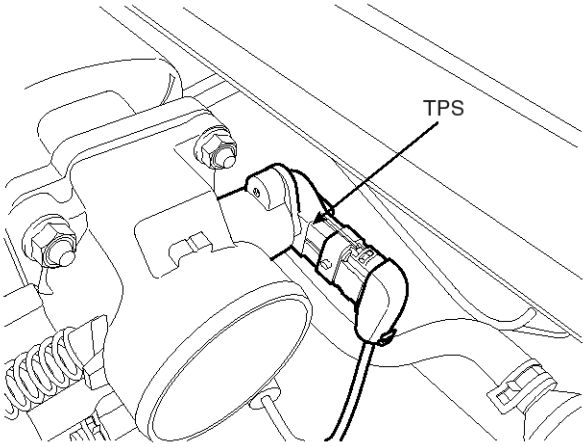
Specification: Refer to SPECIFICATION.

Throttle Position Sensor (TPS)

Inspection

Function And Operation Principle

The Throttle Position Sensor (TPS) is mounted on the throttle body and detects the opening angle of the throttle plate. The TPS has a variable resistor (potentiometer) whose characteristic is the resistance changing according to the throttle angle. During acceleration, the TPS resistance between the reference 5V and the signal terminal decreases and output voltage increases; during deceleration, the TPS resistance increases and TPS output voltage decreases. The ECM supplies a reference 5V to the TPS and the output voltage increases directly with the opening of the throttle valve. The TPS output voltage will vary from 0.2~0.8V at closed throttle to 4.3~4.8V at wide-open throttle. The ECM determines operating conditions such as idle (closed throttle), part load, acceleration/deceleration, and wide-open throttle from the TPS. Also The ECM uses the Manifold Absolute Pressure Sensor (MAPS) signal along with the TPS signal to adjust fuel injection duration and ignition timing.



SHDF16105L

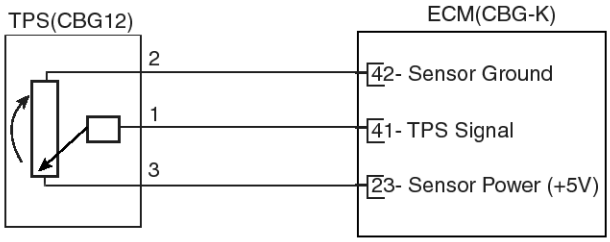
Specification

Throttle Angle	Output Voltage (V)
C.T	0.25 ~ 0.9
W.O.T	Min. 4.0V

Items	Specification
Sensor Resistance (kΩ)	1.6 ~ 2.4kΩ at 20℃(68˚F)

Circuit Diagram

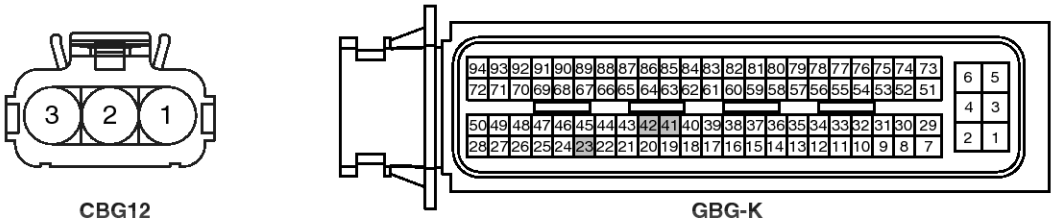
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	ECM CBG-K (41)	TPS Signal
2	ECM CBG-K (42)	Sensor Ground
3	ECM CBG-K (23)	Sensor Power (+5V)

[Harness Connector]



CBG12
TPS

GBG-K
ECM

SHDF16230L

Component Inspection

1. Connect a scantool on the Data Link Connector (DLC).
2. Start engine and check output voltages of TPS at C.T and W.O.T.

Specification: Refer to SPECIFICATION.

3. Turn ignition switch OFF and disconnect the scantool from the DLC.
4. Disconnect TPS connector and measure resistance between TPS terminals 2 and 3

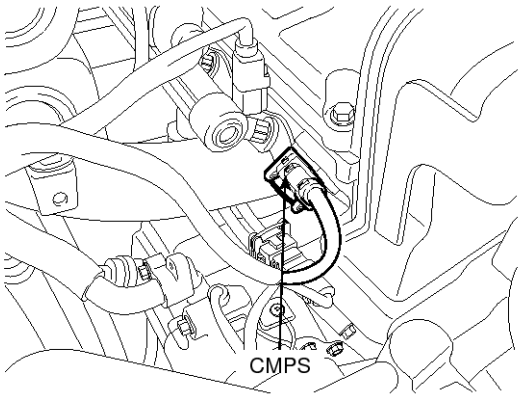
Specification: Refer to SPECIFICATION.

Camshaft Position Sensor (CMPS)

Inspection

Function And Operation Priciple

Camshaft Position Sensor (CMPS) is a hall sensor and detects the camshaft position by using a hall element. It is related with Crankshaft Position Sensor (CKPS) and detects the piston position of each cylinder which the CKPS can't detect. The CMPS are installed on engine head cover and uses a target wheel installed on the camshaft. This sensor has a hall-effect IC which output voltage changes when magnetic field is made on the IC with current flow.



SEDF17001L

Waveform

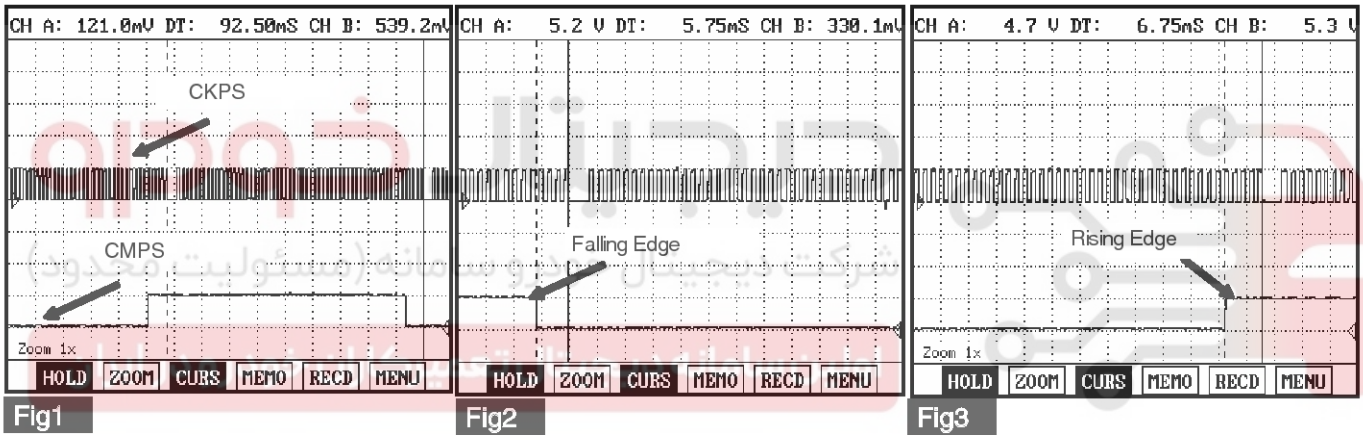
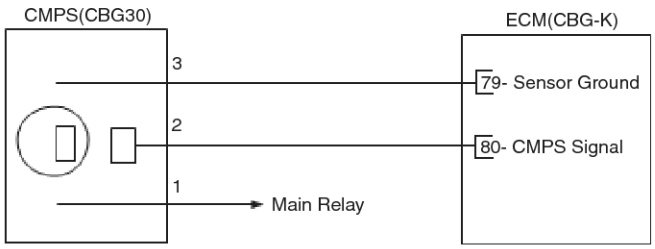


Fig.1) The square wave signal should be smooth and without any distortion.
Fig.2,3)The CMPS falling(rising) edge is coincided with 3~5 tooth of the CKP from one longer signal(missing tooth)

LFLG156A

Circuit Diagram

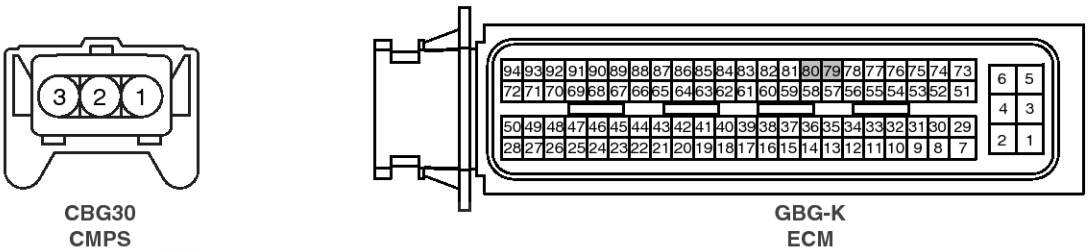
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	Main Relay	Power Supply (B+)
2	ECM CBG-K (80)	CMPS Signal
3	ECM CBG-K (79)	Sensor Ground

[Connection Information]



SHDF16281L

Component Inspection

1. Check signal waveform of CMPS and CKPS using a scantool.

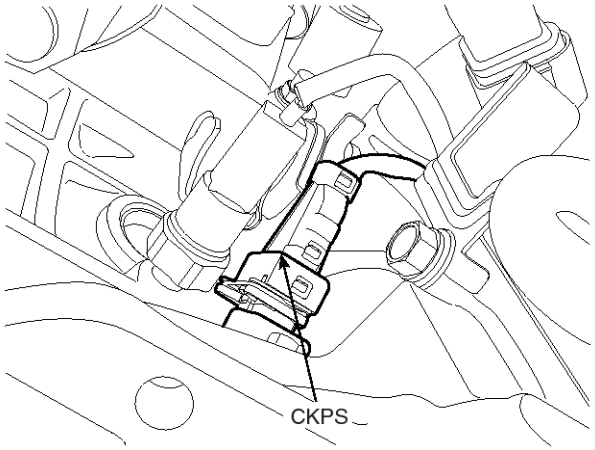
Specification : Refer to "WAVE FORM"

Crankshaft Position Sensor (CKPS)

Inspection

Function And Operation Priciple

Crankshaft Position Sensor (CKPS) detects the crankshaft position and is one of the most important sensors of the engine control system. If there is no CKPS signal input, fuel is not supplied and the main relay does not operate. That is, vehicle can't run without CKPS signal. This sensor is installed on transaxle housing and generates alternating current by magnetic flux field which is made by the sensor and the target wheel when engine runs. The target wheel consists of 58 slots and 2 missing slots on 360 CA (Crank Angle).



SHDF16106L

Waveform

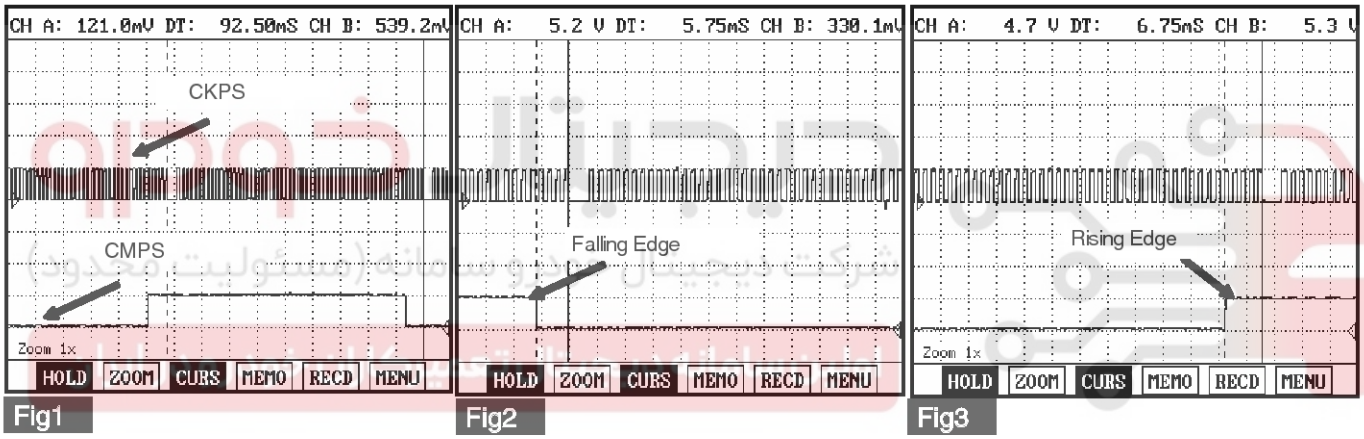
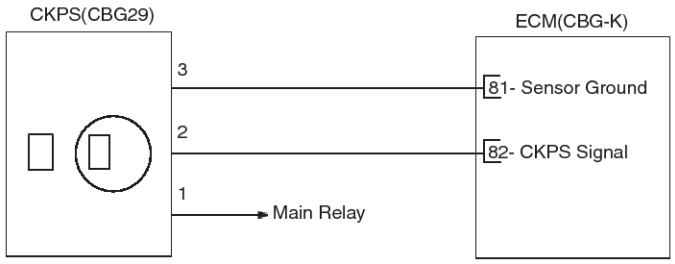


Fig.1) The square wave signal should be smooth and without any distortion.
Fig.2,3)The CMPS falling(rising) edge is coincided with 3~5 tooth of the CKP from one longer signal(missing tooth)

LFLG156A

Circuit Diagram

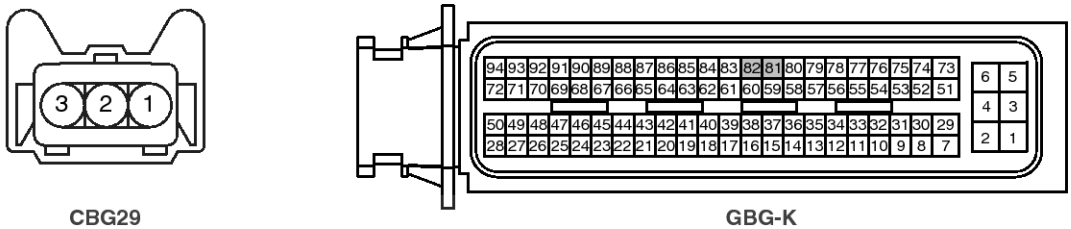
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	Main Relay	Power Supply (B+)
2	ECM CBG-K (82)	CKPS Signal
3	ECM CBG-K (81)	Sensor Ground

[Harness Connector]



CBG29
CKPS

GBG-K
ECM

SHDF16272L

Component Inspection

1. Check signal waveform of CKPS and CMPS using a scantool.

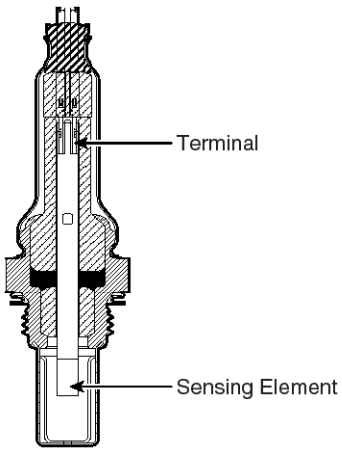
Specification : Refer to "WAVE FORM"

Heated Oxygen Sensor (HO2S)

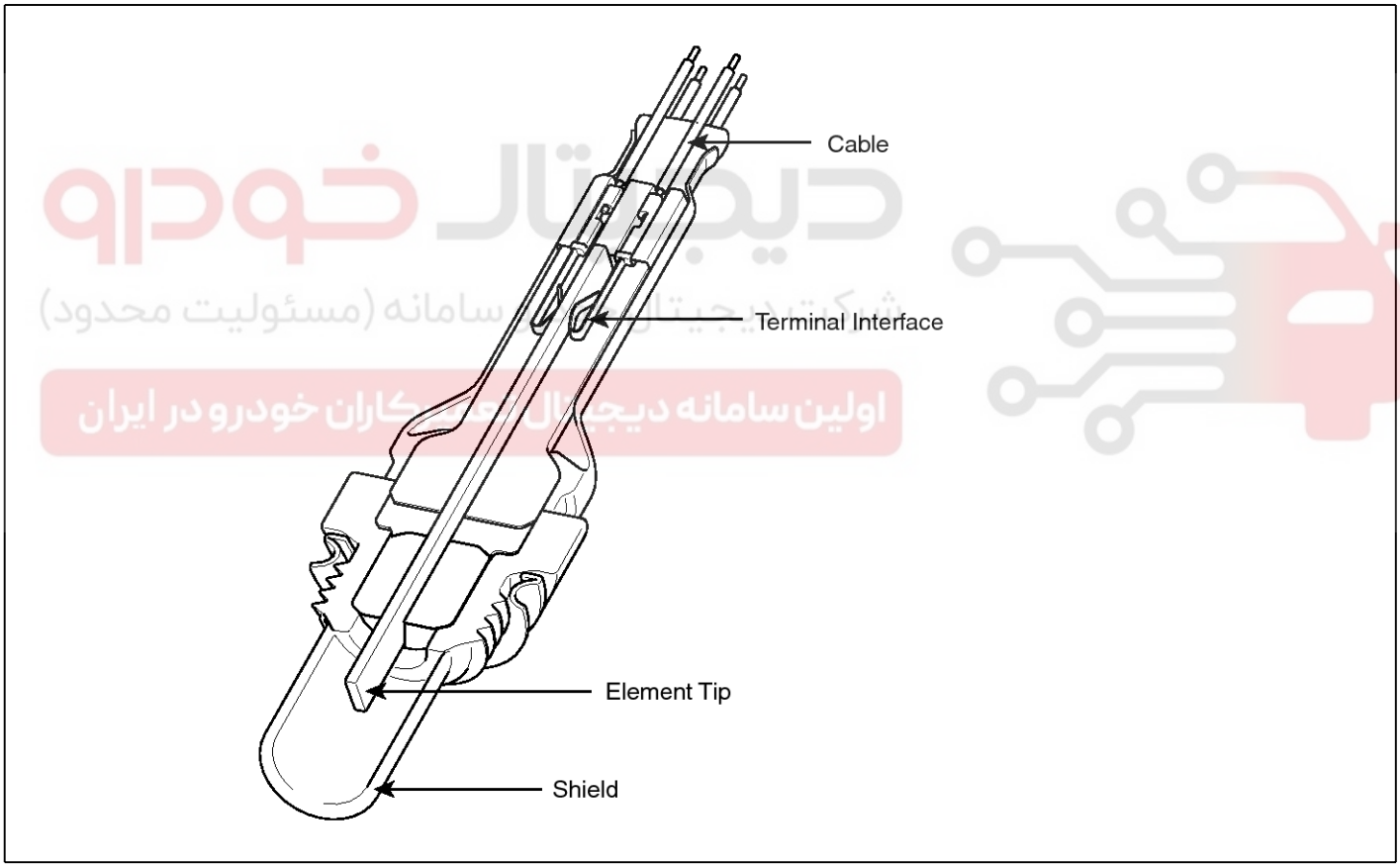
Inspection

Function And Operation Priciple

Heated Oxygen Sensor (HO2S) consists of zirconium and alumina and is installed on upstream and downstream of the Manifold Catalyst Converter (MCC). After it compares oxygen consistency of the atmosphere with the exhaust gas, it transfers the oxygen consistency of the exhaust gas to the ECM. When A/F ratio is rich or lean, it generates approximately 1V or 0V respectively. In order that this sensor normally operates, the temperature of the sensor tip is higher than 370℃ (698˚F). So it has a heater which is controlled by the ECM duty signal. When the exhaust gas temperature is lower than the specified value, the heater warms the sensor tip.



EGRF247A



EGRF248A

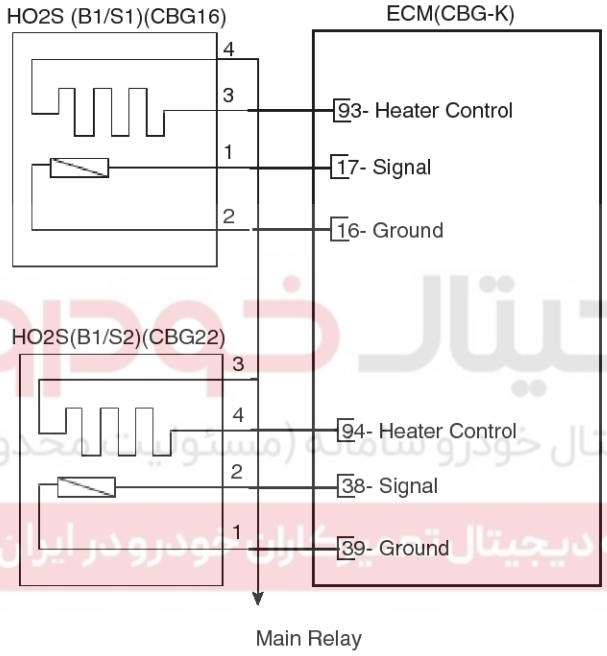
Specification

A/F Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0
LEAN	0.1 ~ 0.4

Item	Specification
Heater Resistance (Ω)	Approx. 9.0Ω at 20℃ (68˚F)

Circuit Diagram

[Circuit Diagram]



[Connection Information]

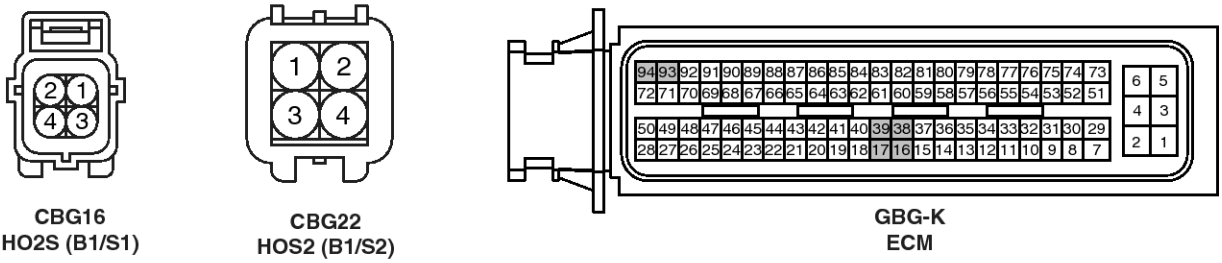
HO2S (B1/S1)

Terminal	Connected to	Function
1	ECM CBG-K (17)	HO2S (B1/S1) Signal
2	ECM CBG-K (16)	Sensor Ground
3	ECM CBG-K (93)	Heater Control
4	Main Relay	Power Supply (B+)

HO2S (B1/S2)

Terminal	Connected to	Function
1	ECM CBG-K (39)	Sensor Ground
2	ECM CBG-K (38)	HO2S (B1/S2) Signal
3	Main Relay	Power Supply (B+)
4	ECM CBG-K (94)	Heater Control

[Harness Connector]



SHDF16600L

Component Inspection

1. Disconnet the HO2S connector.
2. Measure resistance between HO2S heater terminals 3 and 4.
3. Check that the resistance is within the specification.

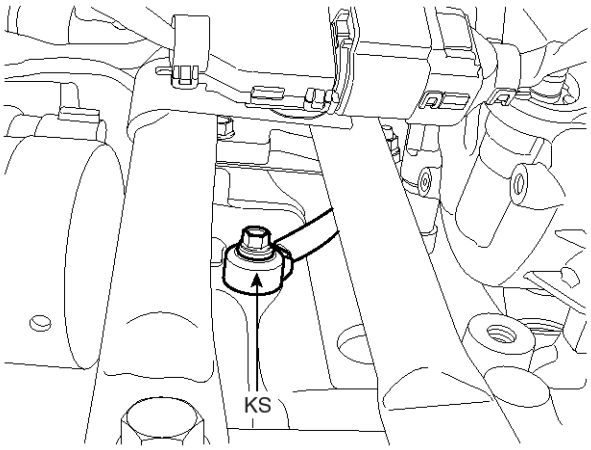
Specification: Refer to SPECIFICATION.

Knock Sensor (KS)

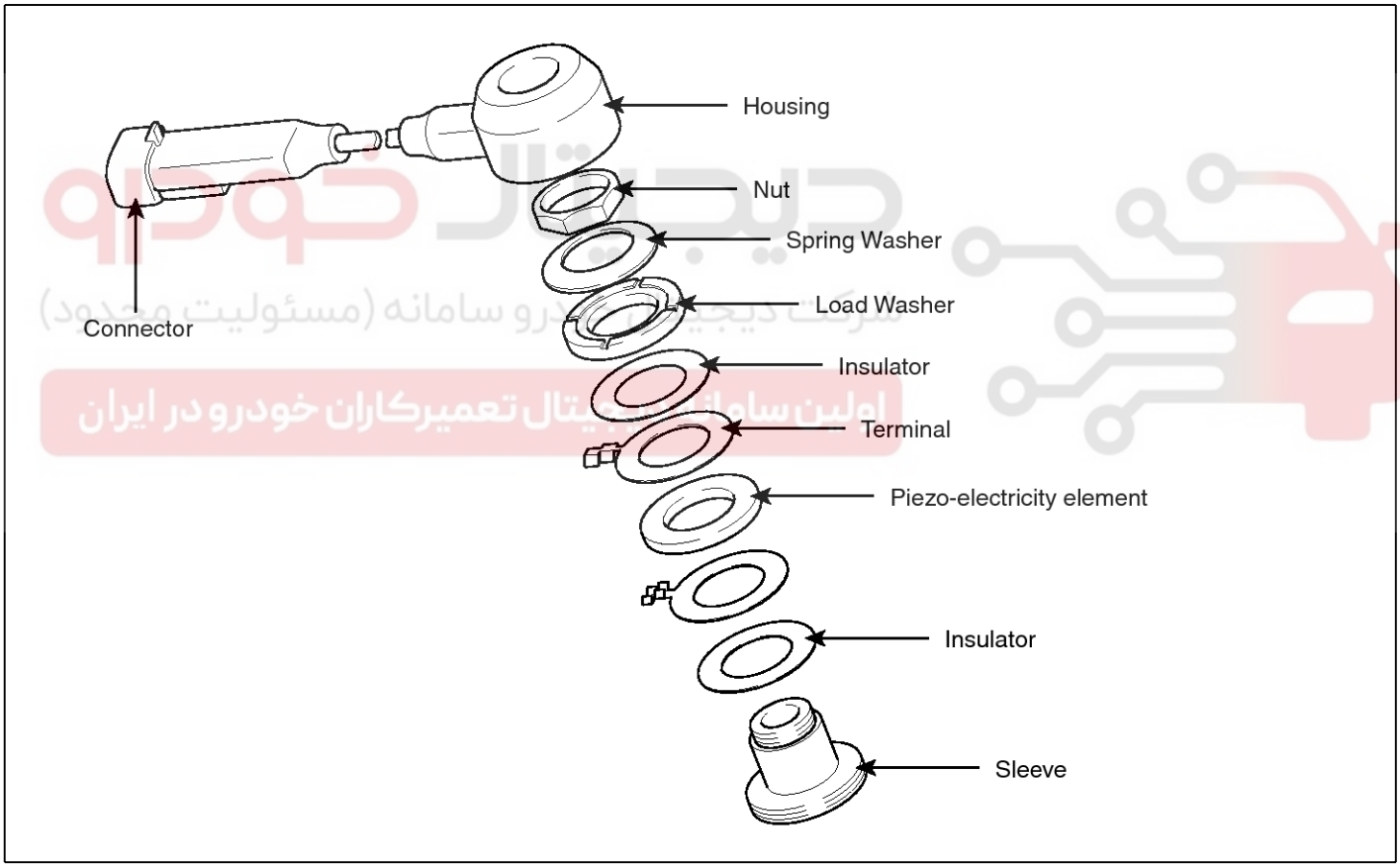
Inspection

Function And Operation Priciple

Knocking is a phenomenon characterized by undesirable vibration and noise and can cause engine damage. Knock Sensor (KS) senses engine knocking and the cylinder block. When knocking occurs, the vibration from the cylinder block is applied as pressure to the piezoelectric element. At this time, this sensor transfers the voltage signal higher than the specified value to the ECM and the ECM retards the ignition timing. If the knocking disappears after retarding the ignition timing, the ECM will advance the ignition timing. This sequential control can improve engine power, torque and fuel economy.



SHDF16108L

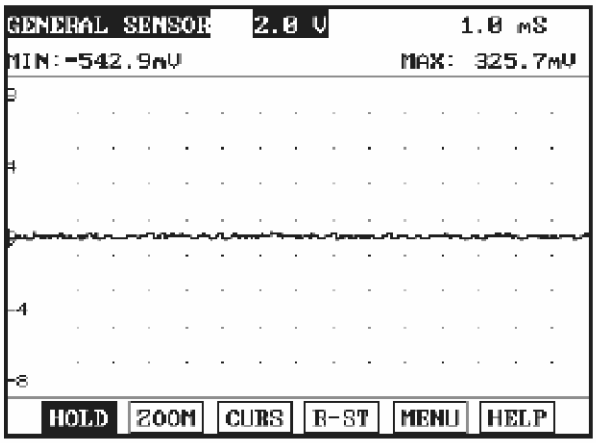


EGRF252A

Specification

Item	Specification
Capacitance (pF)	950 ~ 1,350
Resistance (MΩ)	4.87

Waveform

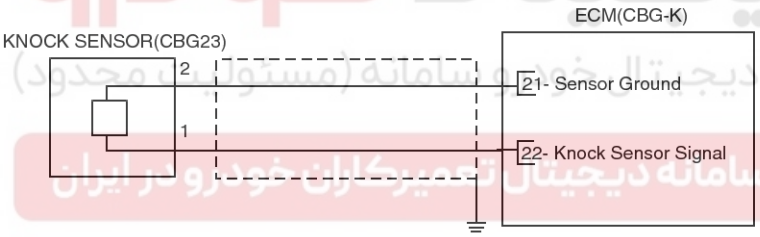


The knock sensor is installed at cycliner block to detect the vibration effectively during engine running.
The above waveform shows the signal waveform of knock sensor when knock dosen't happen. Generally, knock signal has more noise than other sensor.

EGRF610B

Circuit Diagram

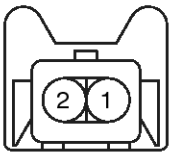
[Circuit Diagram]



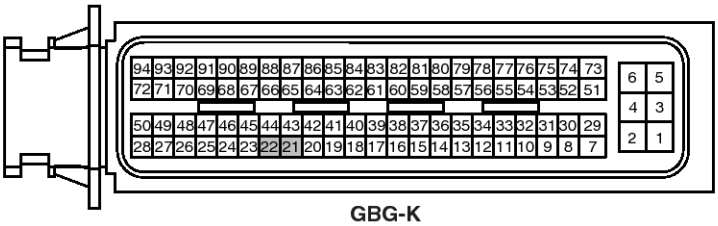
[Connection Information]

Terminal	Connected to	Function
1	ECM CBG-K (22)	Knock Sensor Signal
2	ECM CBG-K (21)	Sensor Ground

[Harness Connector]



CBG23
KNOCK SENSOR



GBG-K
ECM

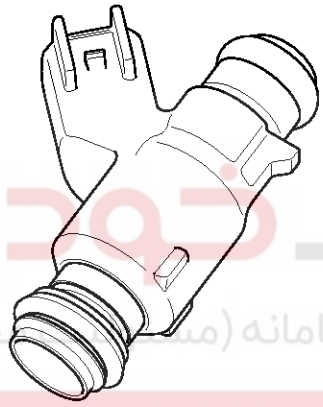
SHDF16273L

Injector

Inspection

Function And Operation Priciple

Based on information from various sensors, the ECM measures the fuel injection amount. The fuel injector is a solenoid-operated valve and the fuel injection amount is controlled by length of time that the fuel injector is held open. The ECM controls each injector by grounding the control circuit. When the ECM energizes the injector by grounding the control circuit, the circuit voltage should be low (theoretically 0V) and the fuel is injected. When the ECM de-energizes the injector by opening control circuit, the fuel injector is closed and circuit voltage should momentarily peak.



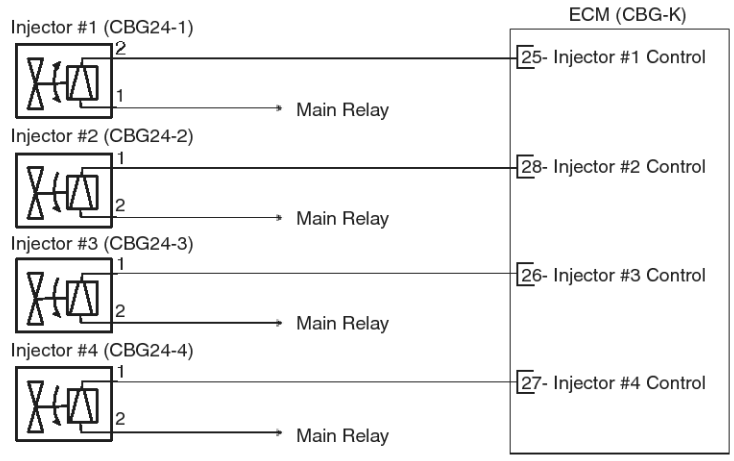
KFCF1026

Specification

Item	Specification
Coil Resistance (Ω)	13.8 ~ 15.2Ω at 20℃ (68˚F)

Circuit Diagram

[Circuit Diagram]



[Connection Information]

Injector #1 (CBG24-1)

Terminal	Connected to	Function
1	Main Relay	Power
2	ECM CBG-K (25)	Injector Control

Injector #2 (CBG24-2)

Terminal	Connected to	Function
1	ECM CBG-K (28)	Injector Control
2	Main Relay	Power

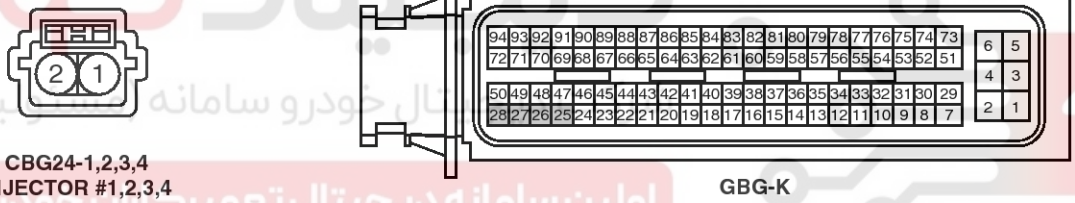
Injector #3 (CBG24-3)

Terminal	Connected to	Function
1	ECM CBG-K (26)	Injector Control
2	Main Relay	Power

Injector #4 (CBG24-4)

Terminal	Connected to	Function
1	ECM CBG-K (27)	Injector Control
2	Main Relay	Power

[Harness Connector]



SHDF16254L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect injector connector.
3. Measure resistance between injector terminals 1 and 2.
4. Check that the resistance is within the specification.

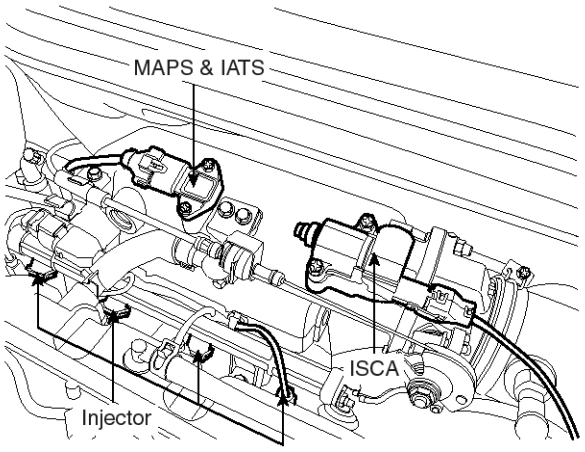
Specification: Refer to SPECIFICATION.

Idle Speed Control Actuator (ISCA)

Inspection

Function And Operation Principle

The Idle Speed Control Actuator (ISCA) is installed on the throttle body and controls the intake airflow that is bypassed around the throttle plate to keep constant engine speed when the throttle valve is closed. The function of the ISCA is to maintain idle speed according to various engine loads and conditions, and also to provide additional air during starting. The ISCA consists of an opening coil, a closing coil, and a permanent magnet. Based on information from various sensors, the ECM controls both coils by grounding their control circuits. According to the control signals from the ECM, the valve rotor rotates to control the by pass airflow into the engine.



SHDF16103L

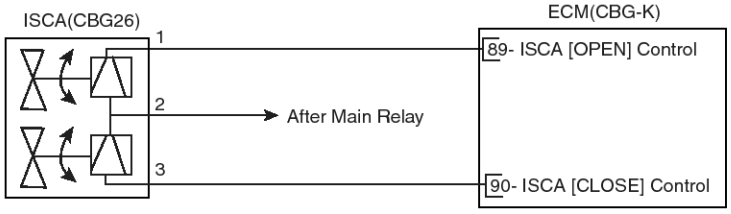
Specification

ITems	Specification
Closing Coil Resistance (Ω)	14.6 ~ 16.2 at 20℃ (68˚F)
Opening Coil Resistance (Ω)	11.1 ~ 12.7 at 20℃ (68˚F)

Duty (%)	Air Flow Rate (㎥/h)
15	1.0 ~ 2.3
35	7.5 ~ 12.7
70	43.0 ~ 55.0
96	63.0 ~ 71.0

Circuit Diagram

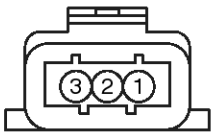
[CIRCUIT DIAGRAM]



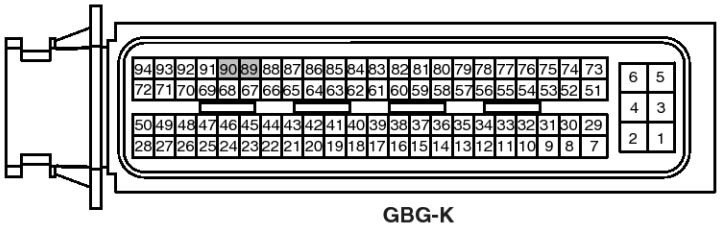
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CBG-K (89)	ISCA (OPEN) Control
2	Main Relay	Battery voltage
3	ECM CBG-K (90)	ISCA (CLOSE) Control

[HARNESS CONNECTORS]



CBG26
ISCA



GBG-K
ECM

SHDF16313L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect ISCA connector.
3. Measure resistance between ISCA terminals 2 and 1 [Opening Coil].
4. Measure resistance between ISCA terminals 2 and 3 [Closing Coil].
5. Check that the resistance is within the specification.

Specification: Refer to SPECIFICATION.

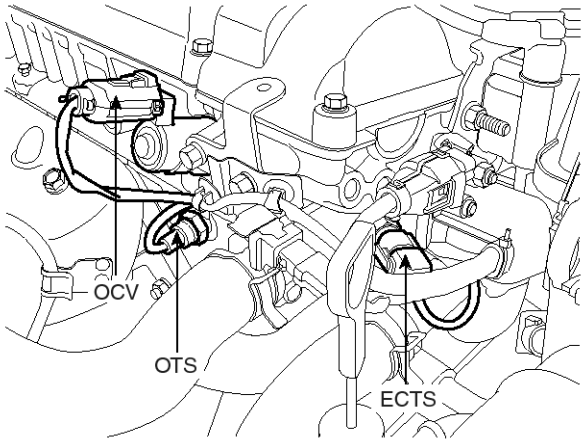
CVVT Oil Control Valve (OCV)

Inspection

Function And Operation Priciple

The Continuously Variable Valve Timing (CVVT) system controls the amount of valve overlap by varying the amount of oil flow into an assembly mounted on the intake camshaft through ECM control of an oil control valve. An Oil Temperature Sensor (OTS) is used to allow ECM monitoring of engine oil temperature. As oil is directed into the chambers of the CVVT assembly, the cam phase is changed to suit various performance and emissions requirements..

1. When camshaft rotates engine rotation-wise: Intake-Advance / Exhaust-Retard
2. When camshaft rotates counter engine rotation-wise: Intake- Retard / Exhaust- Advance



SHDF16104L

Specification

Item	Specification
Coil Resistance (Ω)	6.9 ~ 7.9Ω at 20℃ (68˚F)

Circuit Diagram

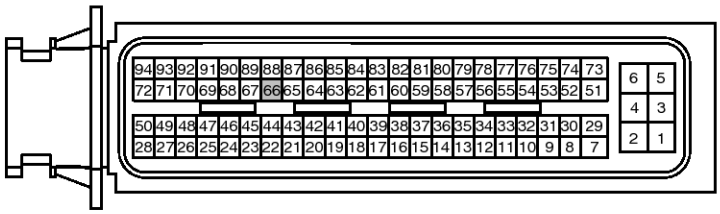
[Circuit Diagram]

[Connection Information]

Terminal	Connected to	Function
1	ECM CBG-K (66)	Control
2	Main Relay	Power

[Harness Connector]

CBG05
OCV



GBG-K
ECM

SHDF16200L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect OCV connector.
3. Measure resistance between OCV terminals 1 and 2.
4. Check that the resistance is within the specification.

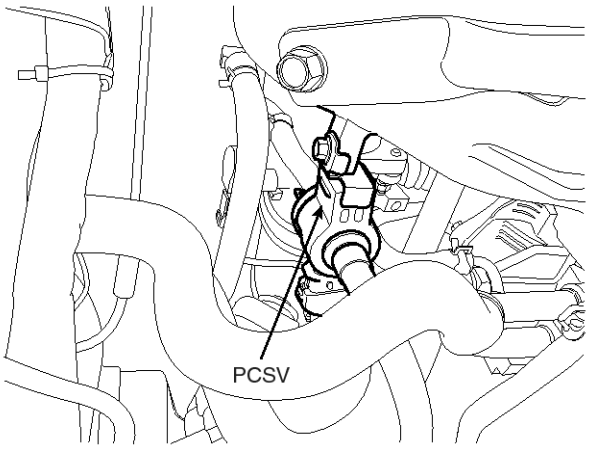
Specification: Refer to SPECIFICATION.

Purge Control Solenoid Valve (PCSV)

Inspection

Function And Operation Priciple

Purge Control Solenoid Valve (PCSV) is installed on the surge tank and controls the passage between the canister and the intake manifold. It is a solenoid valve and is open when the PCM grounds the valve control line. When the passage is open (PCSV ON), fuel vapors stored in the canister is transferred to the intake manifold.



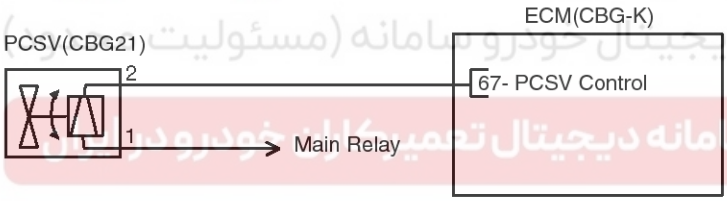
SHDF16112L

Specification

Item	Specification
Coil Resistance (Ω)	16.0Ω at 20℃ (68˚F)

Circuit Diagram

[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Connected to
1	Main Relay	Power Supply (B+)
2	ECM CBG-K (67)	PCSV Control

[Harness Connector]

CBG21
PCSV

GBG-K
ECM

SHDF16287L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect PCSV connector.
3. Measure resistance between PCSV terminals 1 and 2.
4. Check that the resistance is within the specification.

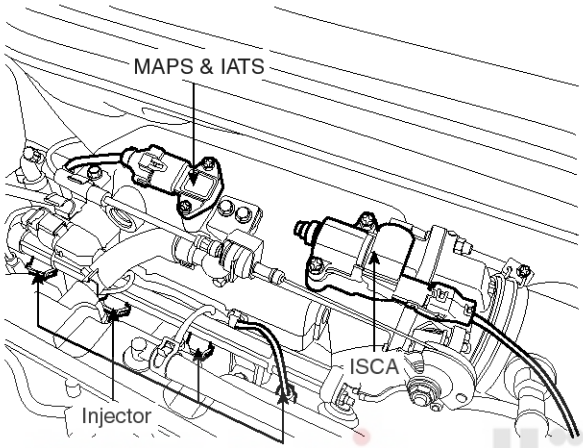
Specification: Refer to SPECIFICATION.

CVVT Oil Temperature Sensor (OTS)

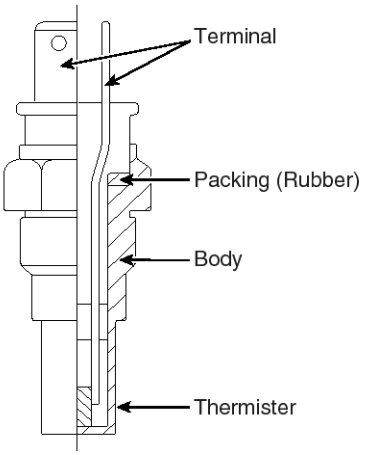
Inspection

Function And Operation Priciple

The CVVT Oil Temperature Sensor (OTS) is a negative coefficient thermistor used by the PCM tl measure engine oil temperature for the purpose of adjusting CVVT calculations.



SHDF16103L



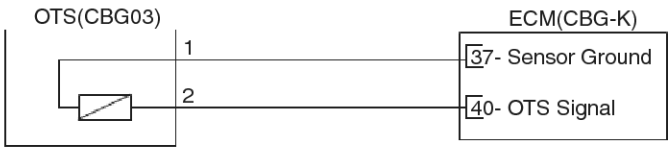
EGRF241A

Specification

Temperature [℃(℉)]	Resistance (kΩ)
-40(-40)	52.15
-20(-4)	16.52
0(32)	6.0
20(68)	2.45
40(104)	1.11
60(140)	0.54
80(176)	0.29

Circuit Diagram

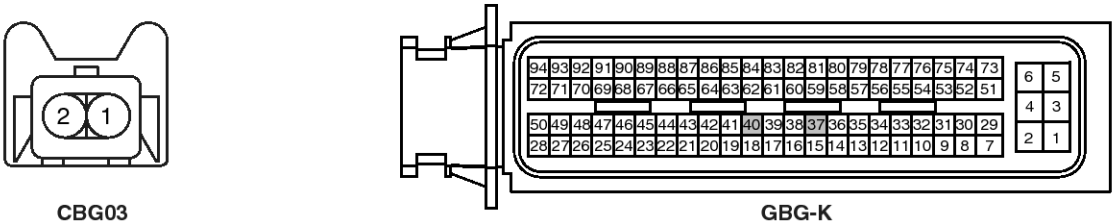
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	ECM CBG-K (37)	Sensor Ground
2	ECM CBG-K (40)	OTS Signal

[Harness Connector]



SHDF16245L

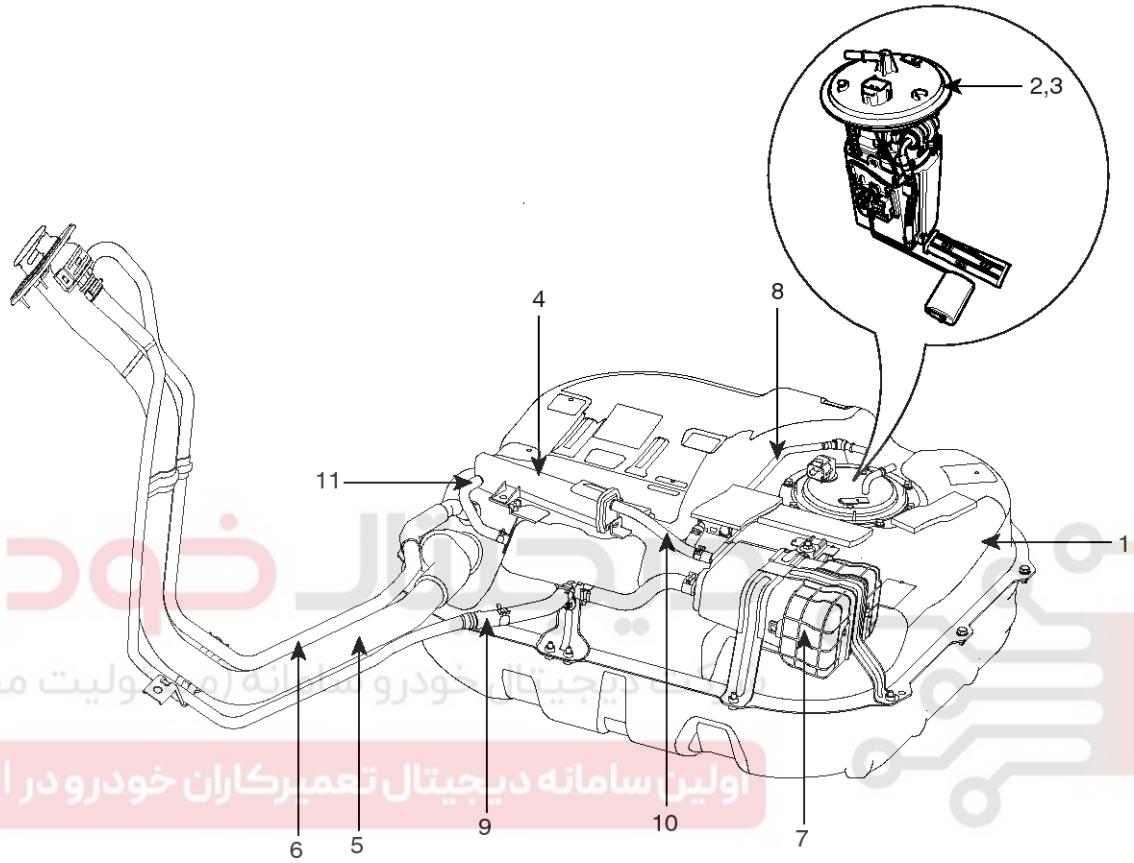
Component Inspection

1. Turn ignition switch OFF.
2. Disconnect OTS connector.
3. Remove the OTS.
4. After immersing the thermistor of the sensor into water (or engine coolant), measure resistance between OTS terminals 1 and 2.
5. Check that the resistance is within the specification.

Specification: Refer to SPECIFICATION.

Fuel Delivery System

Component Location



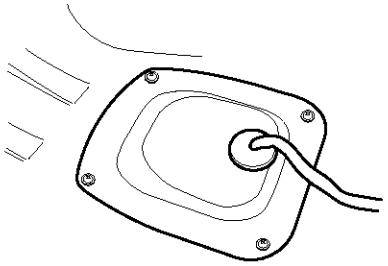
1. Fuel Tank
2. Fuel Pump (Including Fuel Filter)
3. Fuel Pressure Regulator
4. Separator
5. Fuel Filler Pipe
6. Leveling Pipe
7. Canister
8. Tube (Canister ↔ Intake Manifold)
9. Hose (Canister ↔ Fuel Tank Air Filter)
10. Hose (Canister ↔ Separator)
11. Hose (Separator ↔ Fuel Tank)

SFDFL8007L

Fuel Pressure Test

1. PREPARING

1. Remove the rear seat cushion (Refer to "SEAT" in BD group).
2. Open the service cover (A).

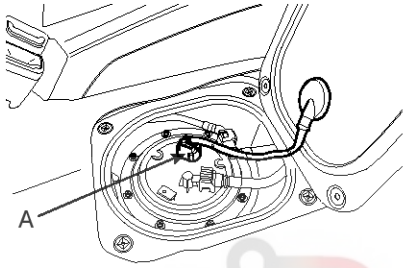


2. RELEASE THE INTERNAL PRESSURE

1. Disconnect the fuel pump connector (A).
2. Start the engine and wait until fuel in fuel line is exhausted.
3. After the engine stalls, turn the ignition switch to OFF position and disconnect the negative (-) terminal from the battery.

NOTE

Be sure to reduce the fuel pressure before disconnecting the fuel feed hose, otherwise fuel will spill out.



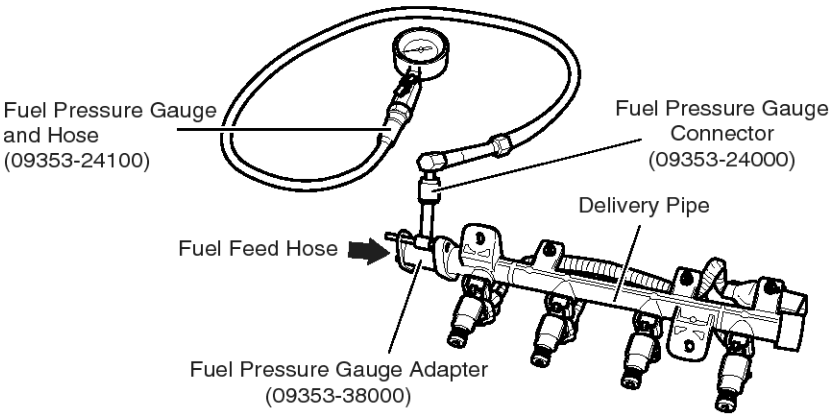
3. INSTALL THE SPECIAL SERVICE TOOL (SST) FOR MEASURING THE FUEL PRESSURE

1. Disconnect the fuel feed hose from the delivery pipe.

CAUTION

Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual pressure in the fuel line.

2. Install the Fuel Pressure Gage Adapter (09353-38000) between the delivery pipe and the fuel feed hose.
3. Connect the Fuel Pressure Gage Connector (09353-24000) to the Fuel Pressure Gage Adapter (09353-38000).
4. Connect the Fuel Pressure Gage and Hose (09353-24100) to Fuel Pressure Gage Connector (09353-24000).
5. Connect the fuel feed hose to the Fuel Pressure Gage Adapter (09353-38000).



SFDFL8008L

4. INSPECT FUEL LEAKAGE ON CONNECTION

1. Connect the battery negative (-) terminal.
2. Apply battery voltage to the fuel pump terminal and activate the fuel pump. With fuel pressure applied, check that there is no fuel leakage from the fuel pressure gauge or connection part.

5. FUEL PRESURE TEST

1. Diconnect the negative (-) terminal from the battery.
2. Connect the fuel pump connector.
3. Connect the battery negative (-) terminal.
4. Start the engine and measure the fuel pressure at idle.

Standard Value: 338 ~ 348 kpa (3.45 ~ 3.55 kgf/㎠, 49.0 ~ 50.5 psi)

- If the measured fuel pressure differs from the standard value, perform the necessary repairs using the table below.

Condition	Probable Cause	Suspected Area
Fuel Pressure too low	Clogged fuel filter	Fuel filter
	Fuel leak on the fuel-pressure regulator that is assembled on fuel pump because of poor seating of the fuel-pressure regulator.	Fuel Pressure Regulator
Fuel Pressure too High	Sticking fuel pressure regulator	Fuel Pressure Regulator

5. Stop the engine and check for a change in the fuel pressure gauge reading.

After engine stops, the gage reading should hold for about 5 minutes

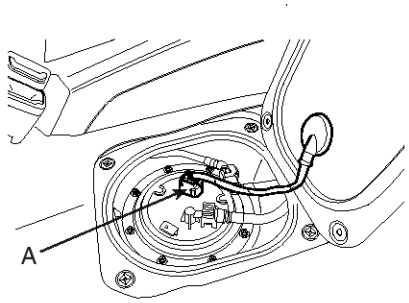
- Observing the declination of the fuel pressure when the gage reading drops and perform the necessary repairs using the table below.

Condition	Probable Cause	Supected Area
Fuel pressure drops slowly after engine is stopped	Injector leak	Injector
Fuel pressure drops immediately after engine is stopped	The check valve within the fuel pump is open	Fuel Pump

SMGFL6906N

6. RELEASE THE INTERNAL PRESSURE

1. Disconnect the fuel pump connector (A).
2. Start the engine and wait until fuel in fuel line is exhausted.
3. After the engine stalls, turn the ignition switch to OFF position and diconnect the negative (-) terminal from the battery.



NOTE

Be sure to reduce the fuel pressure before disconnecting the fuel feed hose, otherwise fuel will spill out.

7. REMOVE THE SPECIAL SERVICE TOOL (SST) AND CONNECT THE FUEL LINE

1. Disconnect the Fuel Pressure Gage and Hose (09353-24100) from the Fuel Pressure Gage Connector (09353-24000).
2. Disconnect the Fuel Pressure Gage Connector (09353-24000) from the Fuel Pressure Gage Adapter (09353-38000).
3. Disconnect the fuel feed hose from the Fuel Pressure Gage Adapter (09353-38000).
4. Disconnect the Fuel Pressure Gage Adapter (09353-38000) from the delivery pipe.

CAUTION

Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual pressure in the fuel line.

5. Conenct the fuel feed hose to the delivery pipe.

8. INSPECT FUEL LEAKAGE ON CONNECTION

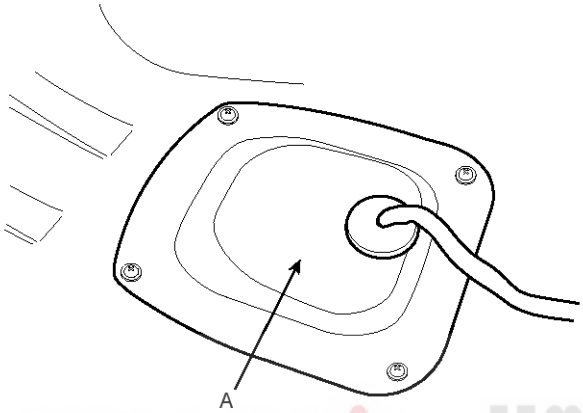
1. Connect the battery negative (-) terminal.
2. Apply battery voltage to the fuel pump terminal and activate the fuel pump. With fuel pressure applied, check that there is no fuel leakage from the fuel pressure gauge or connection part.
3. If the vehicle is normal, connect the fuel pump connector.

SFDFL8009L

Fuel Pump

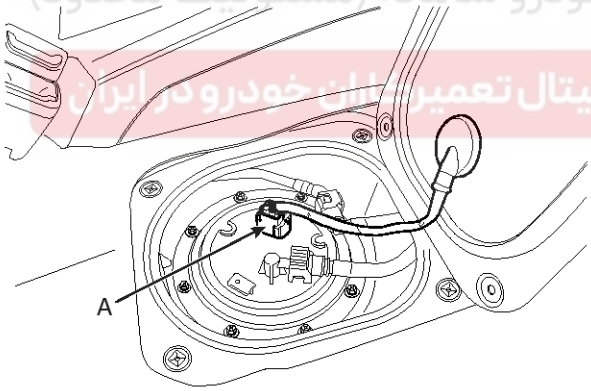
Removal (Including Fuel Filter And Fuel Pressure Regulator)

1. Preparation
   1) Fold or remove the rear seat cushion (Refer to "SEAT" in BD group).
   2) Open the service cover (A).



SHDF16125L

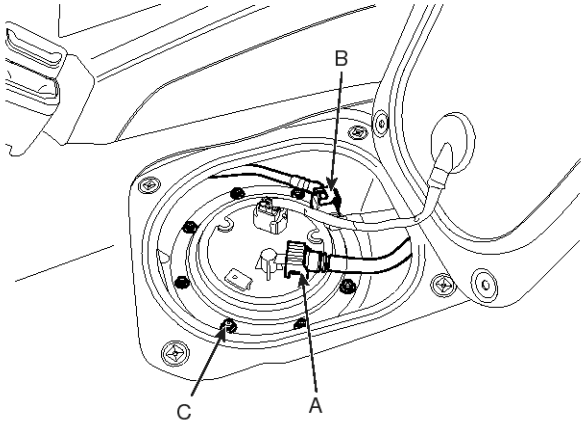
   3) Disconnect the fuel pump connector (A).



SFDFL8010L

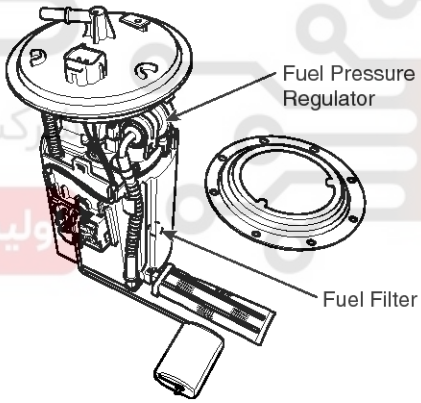
   4) Start the engine and wait until fuel in fuel line is exhausted.
   5) After engine stalls, turn the ignition switch to OFF position.

2. Disconnect the fuel feed tube quick-connector (A) and the vapor tube quick-connector (B).



SFDFL8011L

3. Unscrew the fuel pump installation bolts (C) and remove the fuel pump assembly.



SFDFL8012L

Installation

Installation is reverse of removal.

Fuel Pump installation bolts : 3.9 ~ 5.9 N·m (0.4 ~ 0.6 kgf·m, 2.9 ~ 4.3 lbf·ft)

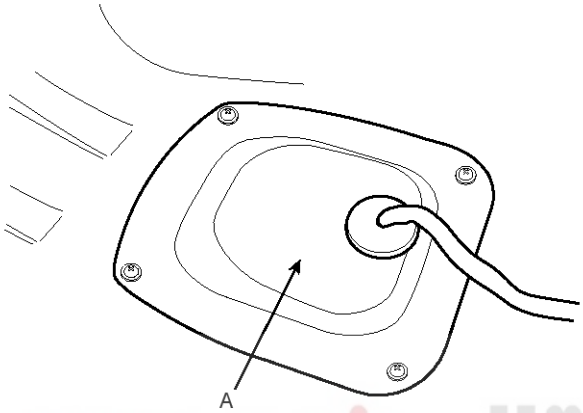
⚠CAUTION

When installing a pump module, be careful not to get the seal-ring entangled.

Fuel Tank

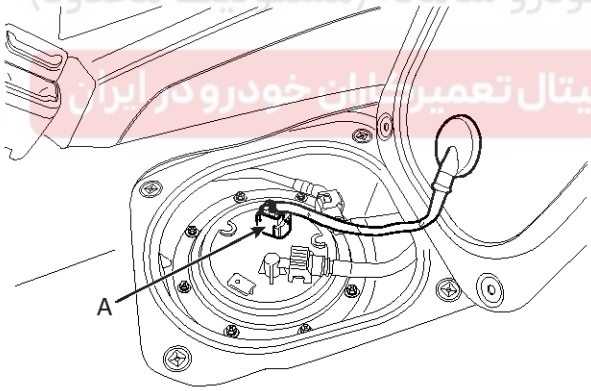
Removal (Including Fuel Filter And Fuel Pressure Regulator)

1. Preparation
   1) Remove the rear seat cushion (Refer to "SEAT" in BD group).
   2) Open the service cover (A).



SHDF16125L

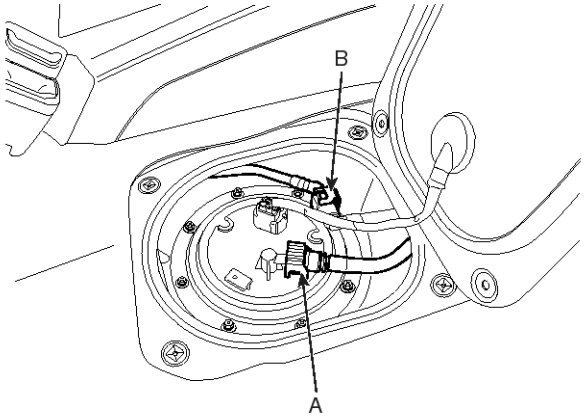
   3) Disconnect the fuel pump connector (A).



SFDFL8010L

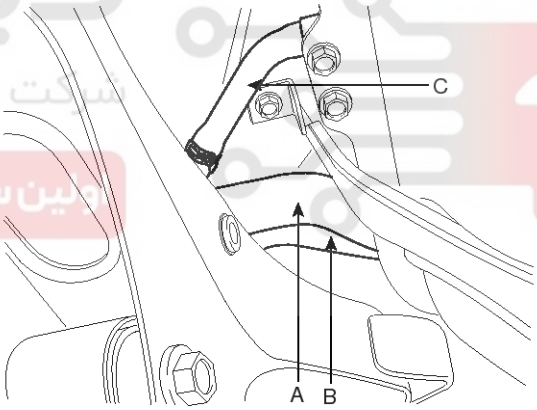
   4) Start the engine and wait until fuel in fuel line is exhausted.
   5) After engine stalls, turn the ignition switch to OFF position.

2. Disconnect the fuel feed quick-connector (A) and vapor tube quick-connector (B).



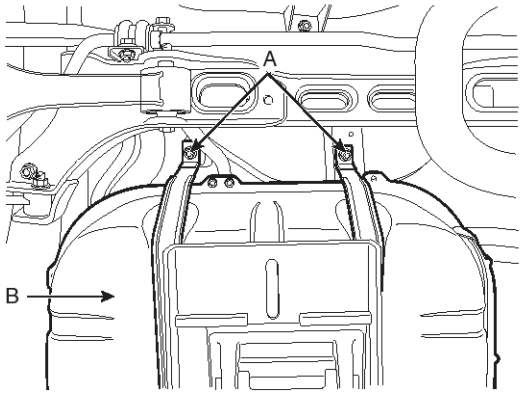
SFDFL8013L

3. Lift the vehicle and support the fuel tank with a jack.
4. Disconnect the fuel filler hose (A), the leveling hose (B) and the vapor hose (C).



SEDFL7007L

5. Unscrew the fuel tank band mounting nuts(A) and remove the fuel tank(B).



SEDF37009L

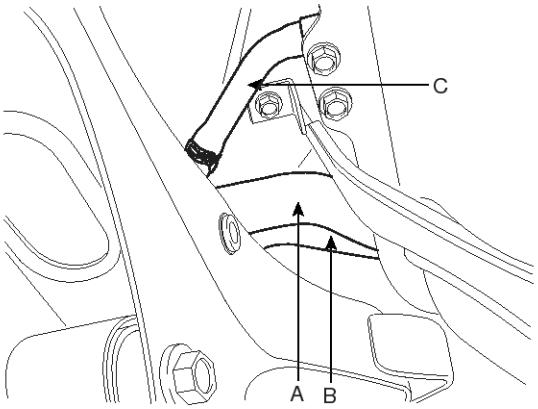
Installation

Installation is reverse of removal.

Filler-Neck Assembly

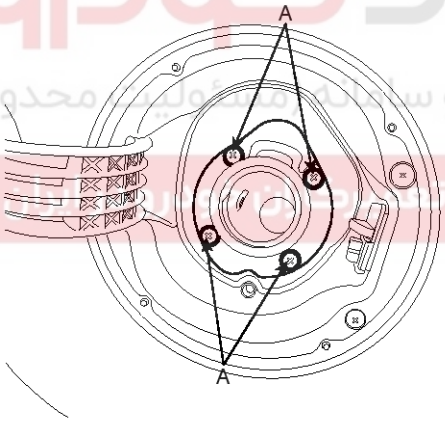
Removal

1. Disconnect the fuel filler hose (A), the leveling hose (B) and the vapor hose (C).



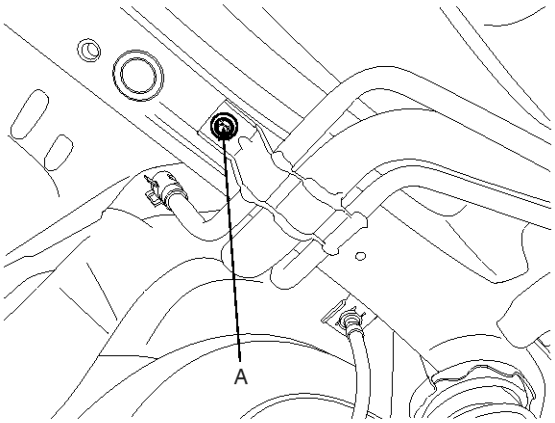
SEDFL7007L

2. Open the fuel filler door and unfasten the filler-neck assembly mounting screws (A).



SFDFL8019L

3. Remove the rear-LH wheel, tire, and the inner wheel house.
4. Remove the bracket mounting bolt (A) and remove the filler-neck assembly.



SFDFL8014L

NOTICE

If the filler neck assembly can't be removed easily, remove it again after loosening the rear cross member mounting bolt partly (Refer to "REAR LOWER ARM" in SS group).

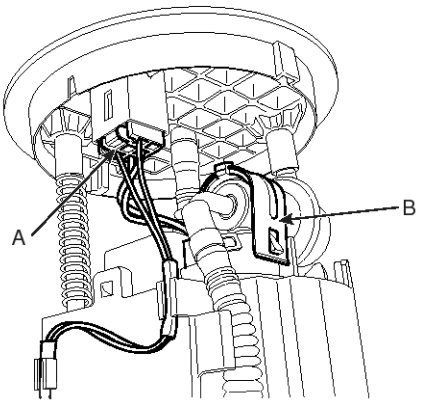
Installation

1. Installation is reverse of removal.

Fuel Filter

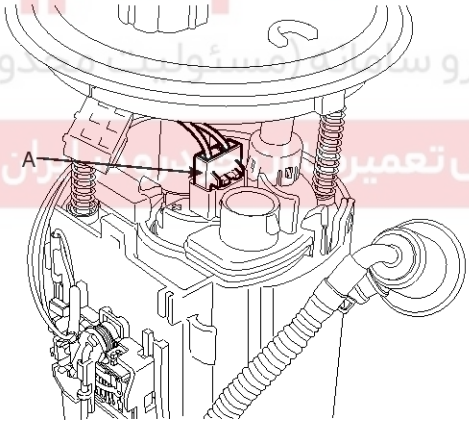
Replacement

1. Remove the fuel pump (Refer to “FUEL PUMP” in this group).
2. Disconnect the fuel pump & sender wiring connector (A) and remove the regulator cap (B).



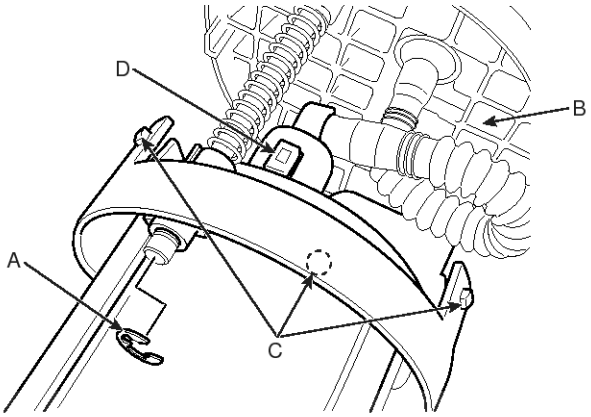
SFDFL8015L

3. Disconnect the electric pump wiring connector (A).



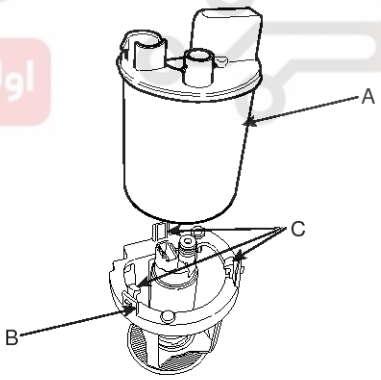
SFDFL8016L

4. Remove the cushion pipe fixing clip (A) after pressing the flange assembly (B).
5. Separate the flange assembly (B) from the fuel pump & filter assembly after disengaging three fixing hooks (C) and the feed hose connector (D).



SFDFL8017L

6. Separate the fuel filter assembly (A) from the fuel pump assembly (B) after disengaging three hooks (C).



SFDFL8018L