General Information

Specification

Fuel Delivery System

Items	Specification	
Fuel Tank	Capacity	78 lit. (20.6 U.S.gal., 17.1 Imp. gal.)
Fuel Filter (built in Fuel Pump assembly)	Type	High pressure type
Fuel Pressure Regulator (built in Fuel Pump assembly)	Regulated Fuel Pressure	375 ~ 385 kPa(3.82 ~ 3.92 kgf/㎠, 54.3 ~ 55.8 psi)
Fuel Pump	Type	Electrical, in-tank type
	Driven by	Electric motor

Sensor

Mass Air Flow SensoR (MAFS)

▷ Type: Hot-film type

▷ Specification

Air Flow (kg/h)	Frequency (Hz)
12.6 kg/h	2,617Hz
18.0 kg/h	2,958Hz
23.4 kg/h	3,241Hz
32.4 kg/h	3,653Hz
43.2 kg/h	4,024Hz
57.6 kg/h	4,399Hz
72.0 kg/h	4,704Hz
108.0 kg/h	5,329Hz
144.0 kg/h	5,897Hz
198.0 kg/h	6,553Hz
270.0 kg/h	7,240Hz
360.0 kg/h	7,957Hz
486.0 kg/h	8,738Hz
666.0 kg/h	9,644Hz
900.0 kg/h	10,590Hz

Intake Air Temperature Sensor (IATS)

▷ Type: Thermistor type

▷ Specification

Temperature		Resistance (kΩ)
℃	°F	
-40	-40	100.87kΩ
-20	-4	28.58kΩ
0	32	9.40kΩ
10	50	5.66kΩ
20	68	3.51kΩ
40	104	1.47kΩ
60	140	0.67kΩ
80	176	0.33kΩ

Manifold Absolute Pressure Sensor (MAPS)

▷ Type: Piezo-resistive pressure type

▷ Specification

Pressure (kPa)	Output Voltage (V)
20.0kPa	0.79V
46.66kPa	1.84V
101.32kPa	4.00V

Engine Coolant Temperature Sensor (ECTS)

▷ Type: Thermistor type

▷ Specification

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

Throttle Position SensoR (TPS)

▷ Type: Variable resistor type

▷ Specification (When reference voltage = 5.0V)

Throttle Angle (˚)	Output Voltage(V)	
	TPS1	TPS2
0˚	0V	5.0V
10˚	0.5V	4.5V
20˚	0.9V	4.1V
30˚	1.4V	3.6V
40˚	1.8V	3.2V
50˚	2.3V	2.7V
60˚	2.7V	2.3V
70˚	3.2V	1.8V
80˚	3.6V	1.4V
90˚	4.1V	0.9V
100˚	4.5V	0.5V
110˚	5.0V	0V

Item	Sensor Resistance (kΩ)
TPS1	4.0 ~ 6.0kΩ at 20℃ (68˚F)
TPS2	2.72 ~ 4.08kΩ at 20℃ (68 ˚F)

Accelerator Position Sensor (APS)

▷ Type: Variable resistor type

▷ Specification (When reference voltage = 5.0V)

Accelerator Position	Output Voltage (V)	
	APS1	APS2
C.T	0.7 ~ 0.8V	0.29 ~ 0.46V
W.O.T	3.85 ~ 4.35V	1.93 ~ 2.18V

Item	Sensor Resistance (kΩ)
APS1	0.7 ~ 1.3kΩ at 20℃ (68˚F)
APS2	1.4 ~ 2.6kΩ at 20℃ (68˚F)

Heated Oxygen SensoR (HO2S)

▷ Type: Zirconia (ZrO2) type

▷ Specification

A/F Ratio	Output Voltage (V)
RICH	0.75 ~ 1.00V
LEAN	0 ~ 0.12V

Item	Resistance (Ω)
Sensor Heater	8.1 ~ 11.1Ω at 21℃ (69.8˚F)

Camshaft Position Sensor (CMPS)

▷ Type: Hall effect type

▷ Specification

Item	Specification
Output Voltage (V)	High: 5.0V
	Low: 0.7V
Air Gap (mm)	0.5 ~ 1.5mm

Crankshaft Position Sensor (CKPS)

▷ Type: Magnetic field sensitive type

▷ Specification

Item	Specification
Coil Resistance (Ω)	630 ~ 770Ω at 20℃ (68˚F)
Air Gap (mm)	0.5 ~ 1.5mm

Knock Sensor (KS)

▷ Type: Piezo-electricity type

▷ Specification

Item	Specification
Capacitance (pF)	1,480 ~ 2,220pF

Cvvt Oil Temperature Sensor (OTS)

▷ Type: Thermistor type

▷ Specification

Temperature		Resistance (kΩ)
℃	˚F	
-20	-4	16.52kΩ
20	68	2.45kΩ
80	176	0.29kΩ

Actuators

Injector

▷ Number: 6

▷ Specification

Item	Specification
Coil Resistance (Ω)	11.4 ~ 12.6Ω at 20℃ (68˚F)

Purge Control Solenoid Valve (PCSV)

▷ Type: Duty control type

▷ Specification

Item	Specification
Coil Resistance (Ω)	19.0 ~ 22.0Ω at 20℃ (68˚F)

Variable Intake Solenoid (VIS) Valve

▷ Specification

Item	Specification
Coil Resistance (Ω)	30.0 ~ 35.0Ω [22℃ (71.6˚F)]

Cvvt Oil Control Valve (OCV)

▷ Specification

Item	Specification
Coil Resistance (Ω)	6.7 ~ 7.7Ω at 20℃ (68˚F)

ETC Motor

▷ Specification

Item	Specification
Coil Resistance (Ω)	1.275 ~ 1.725Ω at 20℃ (68 ˚F)

Ignition Coil

▷ Type: Stick type

▷ Specification

Item	Specification
Primary Coil Resistance (Ω)	0.62Ω±10% at 20℃ (68˚F)
Secondary Coil Resistance (kΩ)	7.0kΩ±15% at 20℃ (68˚F)

Service Standard

Ignition Timing	BTDC 11˚± 5˚		
Idle Speed	A/CON OFF	Neutral,N,P-range	710 ± 100 rpm
		D-range	710 ± 100 rpm
	A/CON ON	Neutral,N,P-range	710 ± 100 rpm
		D-range	710 ± 100 rpm

Tightening Torques

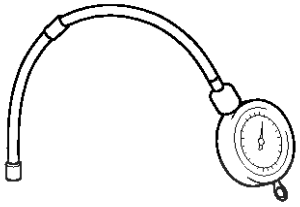
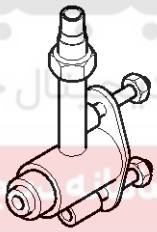
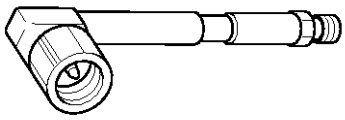
Engine Control System

Item	Kgf.m	N.m	lb-ft
PCM installation bolts (on bracket)	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
PCM bracket installation bolt/nuts	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 4.3
Mass air flow sensor installation bolts (on air cleaner assembly)	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Mass air flow sensor clamp tightening screw	0.3 ~ 0.5	2.9 ~ 4.9	2.2 ~ 3.6
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
Heated oxygen sensor (Bank 2 / Sensor 1) installation	4.0 ~ 5.0	39.2 ~ 49.1	28.9 ~ 36.2
Heated oxygen sensor (Bank 2 / Sensor 2) installation	4.0 ~ 5.0	39.2 ~ 49.1	28.9 ~ 36.2
Engine coolant temperature sensor installation	2.0 ~ 4.0	19.6 ~ 39.2	14.5 ~ 28.9
Manifold absolute pressure sensor installation bolt	0.9 ~ 1.2	8.8 ~ 11.8	6.5 ~ 8.7
Camshaft position sensor [Bank 1] installation bolt	0.7 ~ 1.0	6.9 ~ 9.8	5.1 ~ 7.2
Camshaft position sensor [Bank 2] installation bolt	0.7 ~ 1.0	6.9 ~ 9.8	5.1 ~ 7.2
Crankshaft position sensor installation	0.7 ~ 1.0	6.9 ~ 9.8	5.1 ~ 7.2
Knock sensor #1,2 installation	1.9 ~ 2.4	18.6 ~ 23.5	13.7 ~ 17.4
ETC module installation bolt (on throttle body)	0.7 ~ 1.1	6.9 ~ 10.8	5.1 ~ 8.0
ETC module installation bolt (on ETC stay)	1.6 ~ 2.6	15.7 ~ 25.5	11.6 ~ 18.8
CVVT Oil temperature sensor installation	2.0 ~ 4.0	19.6 ~ 39.2	14.5 ~ 28.9
CVVT Oil control valve [Bank 1] installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
CVVT Oil control valve [Bank 2] installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Vacuum valve (Variable intake actuator) installation bolts	0.9 ~ 1.2	8.8 ~ 11.8	6.5 ~ 8.7
Ignition coil condenser installation bolt	0.7 ~ 1.1	6.9 ~ 10.8	5.1 ~ 8.0
Ignition coil installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7

Fuel Delivery System

Item	Kgf.m	N.m	lb-ft
Fuel Tank band mounting nuts	4.0 ~ 5.5	39.2 ~ 53.9	28.9 ~ 39.8
Accelerator pedal module installation bolts	0.9 ~ 1.4	8.8 ~ 13.7	6.5 ~ 10.1
Delivery pipe installation bolts	0.9 ~ 1.2	8.8 ~ 11.8	6.5 ~ 8.7
Fuel pump installation bolts	0.2 ~ 0.3	2.0 ~ 2.9	1.4 ~ 2.2
Sub fuel sender installation bolts	0.2 ~ 0.3	2.0 ~ 2.9	1.4 ~ 2.2

Special Service Tools

Tool (Number and name)	Illustration	Application
09353-24100 Fuel Pressure Gauge	 EFDA003A	Measuring the fuel line pressure
09353-38000 Fuel Pressure Gauge Adapter	 BF1A025D	Connection between the delivery pipe and fuel feed line
09353-24000 Fuel Pressure Gauge Connector	 EFDA003C	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	**Confirmation test**

14	**END**

LW8F1001

Customer Problem Analysis Sheet

1. VEHICLE INFORMAITON

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

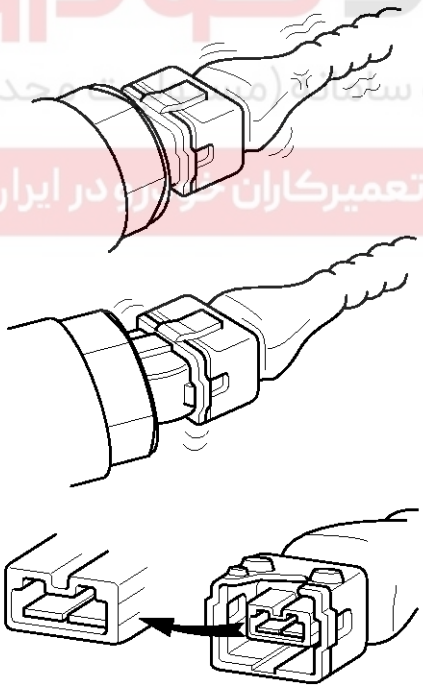
The measured resistance at high temperature after vehicle running may be high or low. So all resistance must be measured at ambient temperature (20℃, 68°F), unless stated otherwise.

NOTICE

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

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

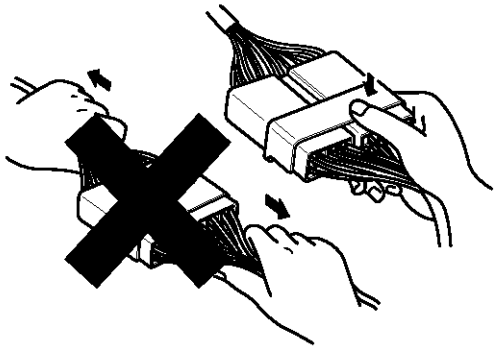
DO NOT sprinkle water directly into the engine compartment or electronic components.

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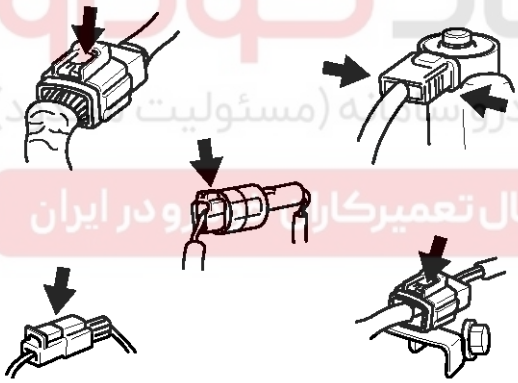
   b. When removing the connector with a lock, press or pull locking lever.



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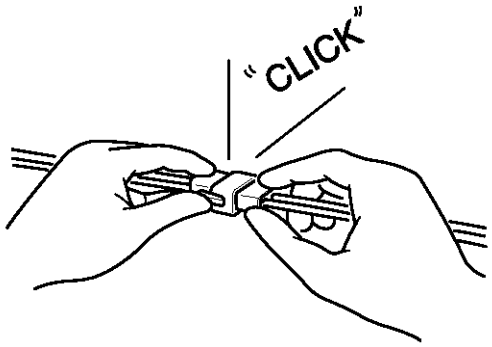
   c. Listen for a click when locking connectors. This sound indicates that they are securely locked.



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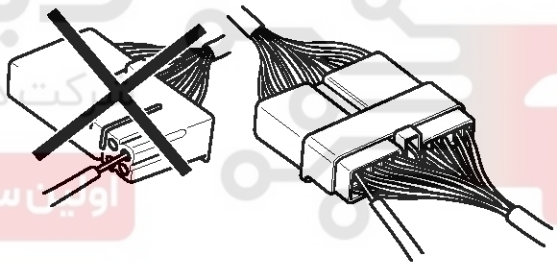
   d. When a tester is used to check for continuity, or to measure voltage, always insert tester probe from wire harness side.



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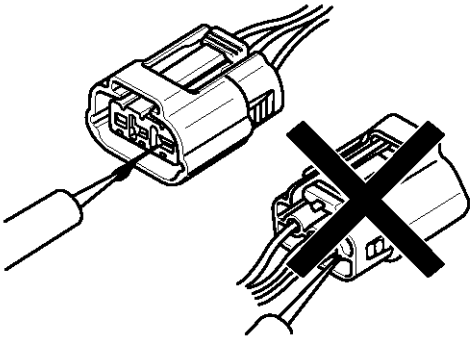
e. Check waterproof connector terminals from the connector side. Waterproof connectors cannot be accessed from harness side.



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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.*

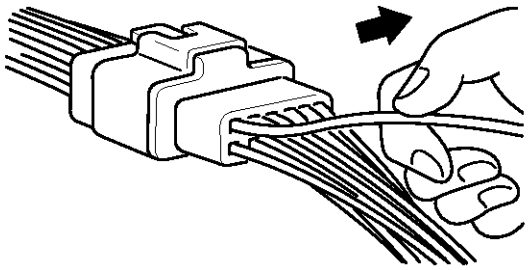
2. Checking Point for Connector

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.

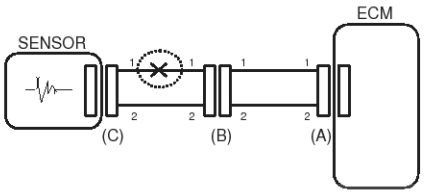
Electrical Circuit Inspection Procedure

● 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)

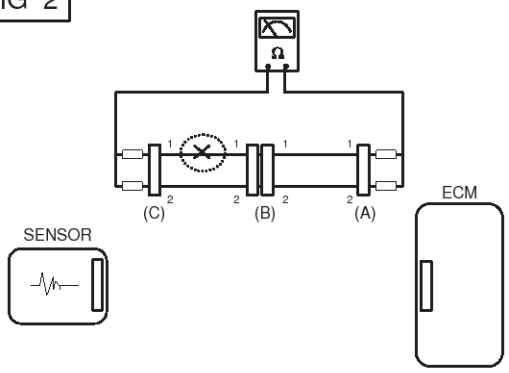
1Ω or less → Normal Circuit

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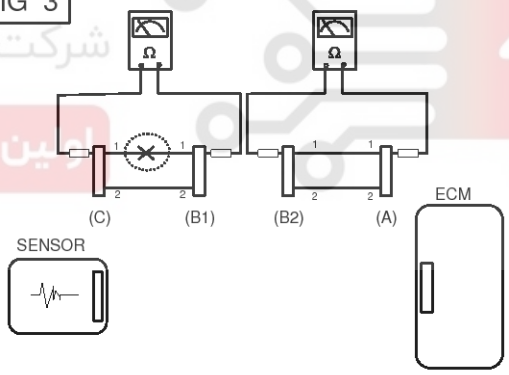
   b. Disconnect connector (B), and measure for resistance between connector (C) and (B1) and between (B2) and (A) as shown in [FIG. 3].

      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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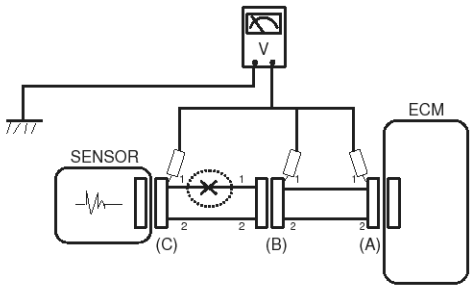
3. Voltage Check Method

   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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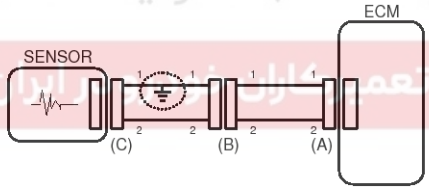
● Check Short Circuit

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.

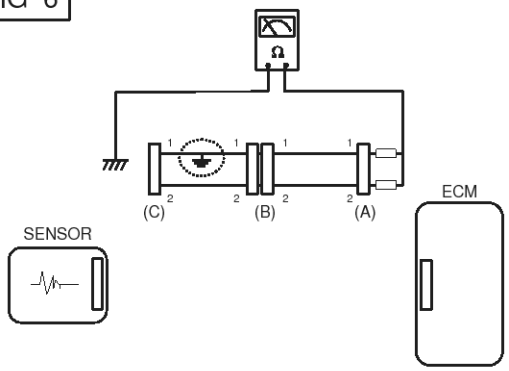
Specification (Resistance)

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

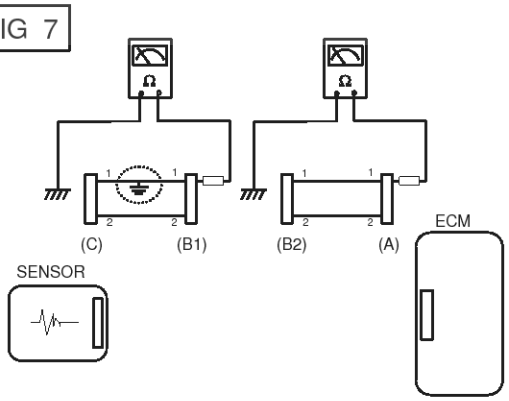


BFGE501F

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



BFGE501G

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

Description

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)

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.

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.

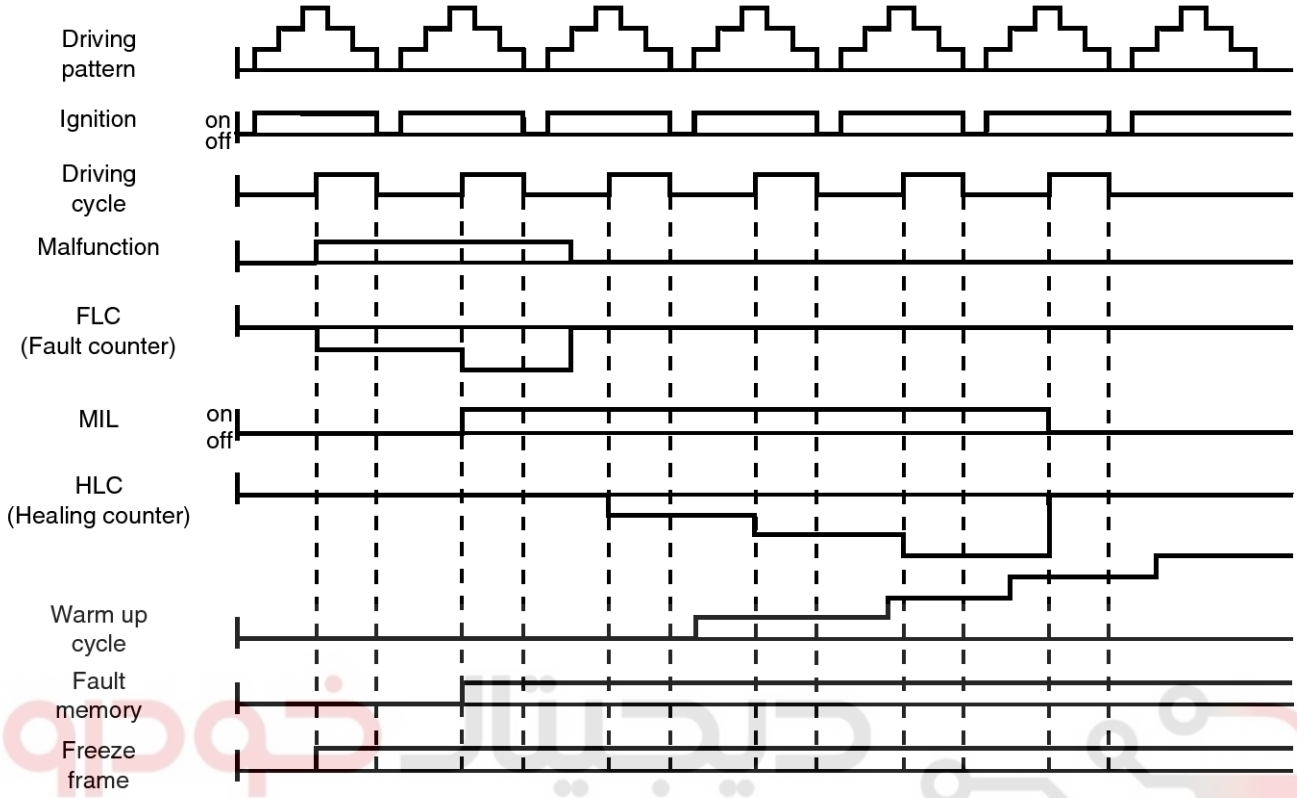
1. After turning ON the ignition key, ensure that the light illuminates for about 5 seconds and then goes out.
2. If the light does not illuminate, check for an open circuit in the harness, a blown fuse or a blown bulb.

Self-Diagnosis

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

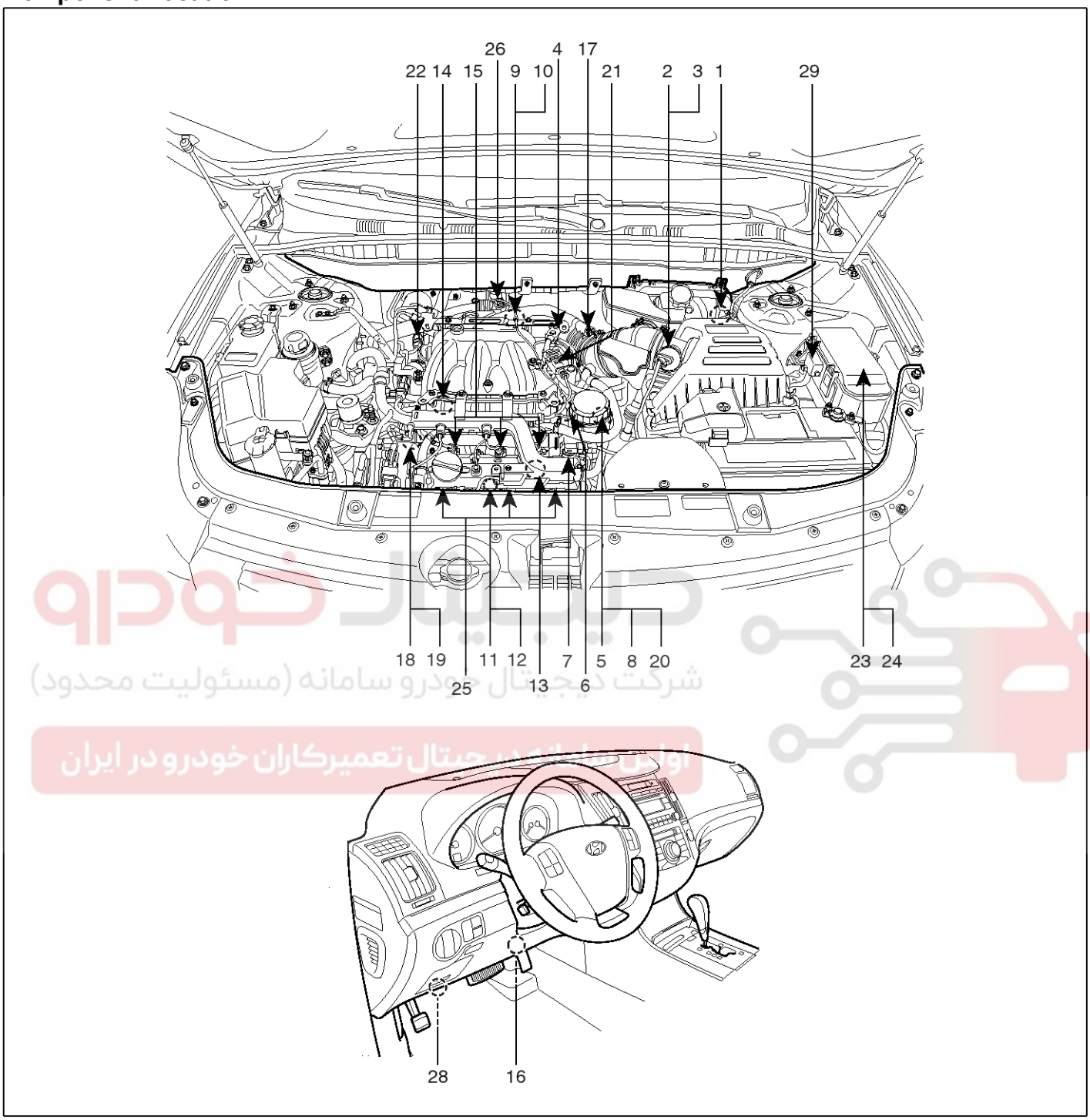
1. When the same malfunction is detected and maintained during two sequential driving cycles, the MIL will automatically illuminate.
2. The MIL will go off automatically if no fault is detected after 3 sequential driving cycles.
3. A Diagnostic Trouble Code(DTC) is recorded in ECM memory when a malfunction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

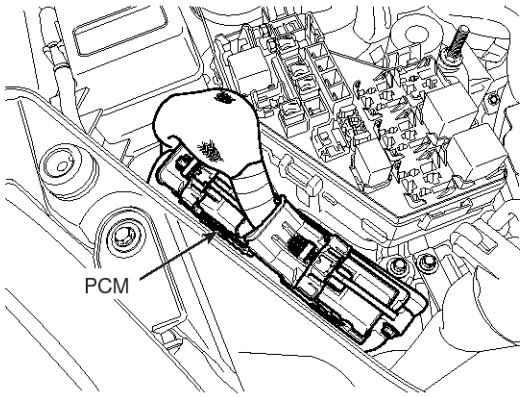
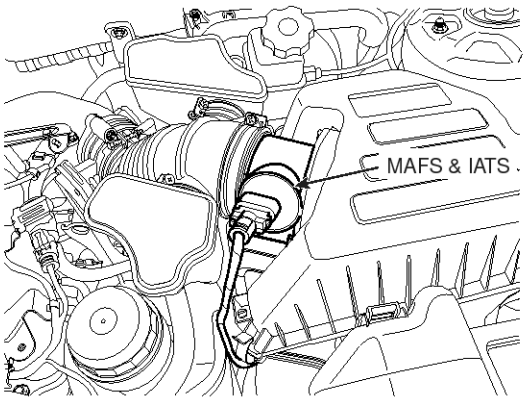
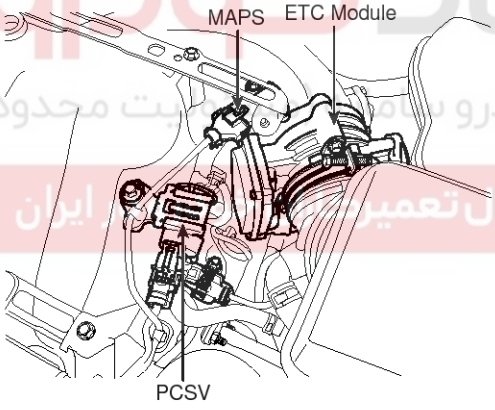
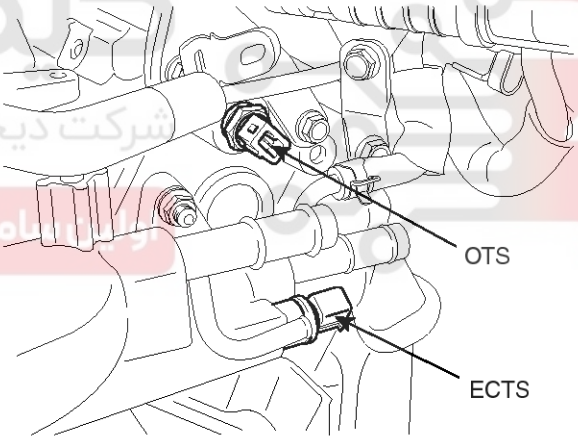
- *A "warm-up cycle" means sufficient vehicle operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit from engine starting and reaches a minimum temperature of 160 degress Fahrenheit.*
- *A "driving cycle" consists of engine startup, vehicle operation beyond the beginning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

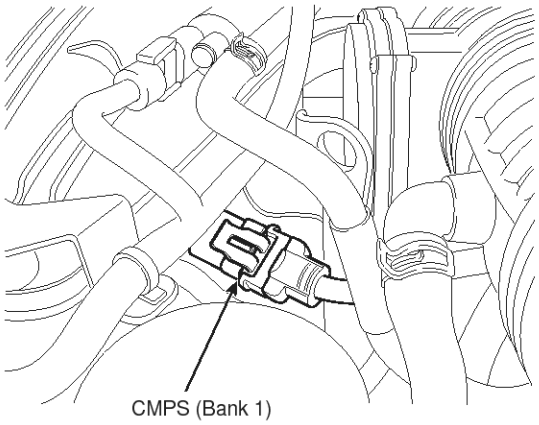
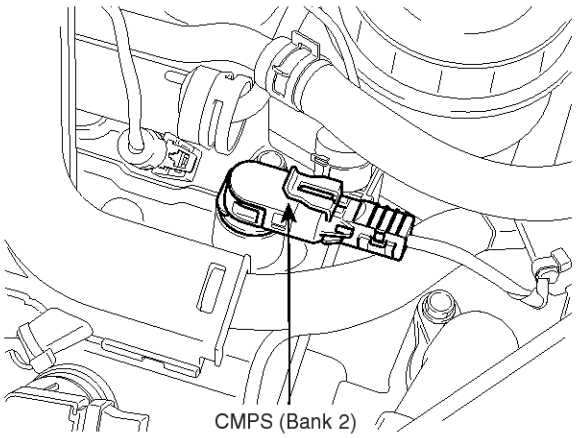
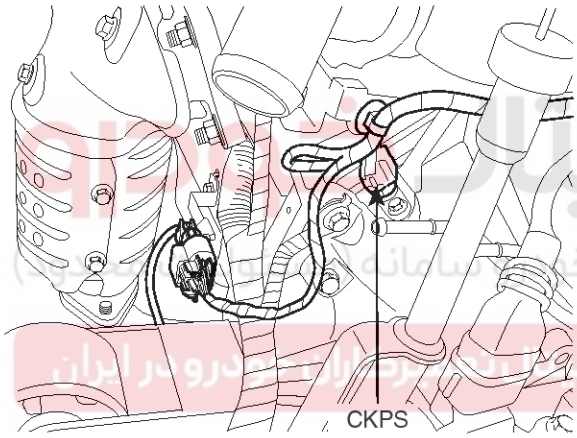
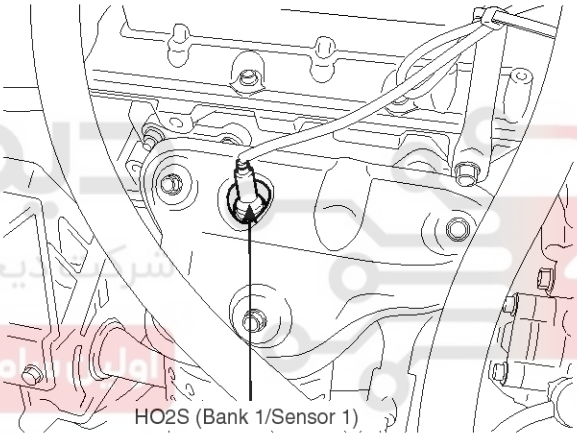
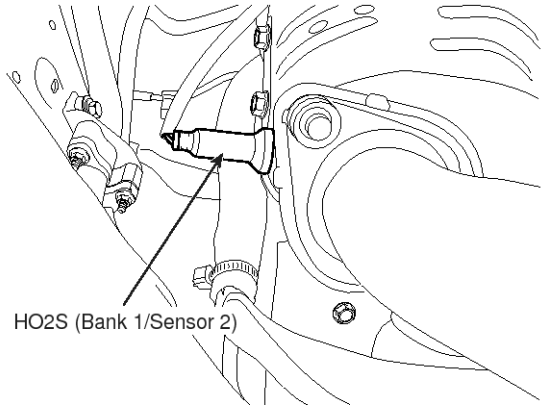
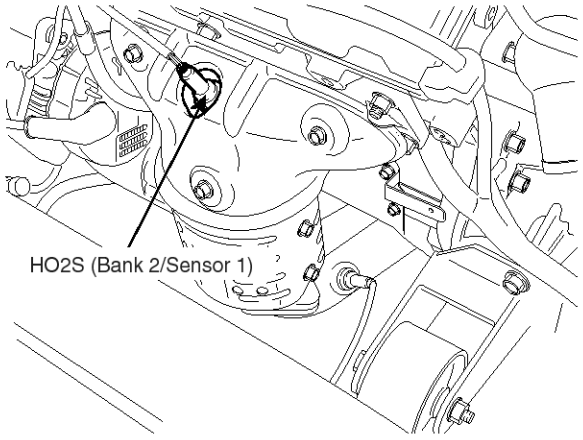
Component Location

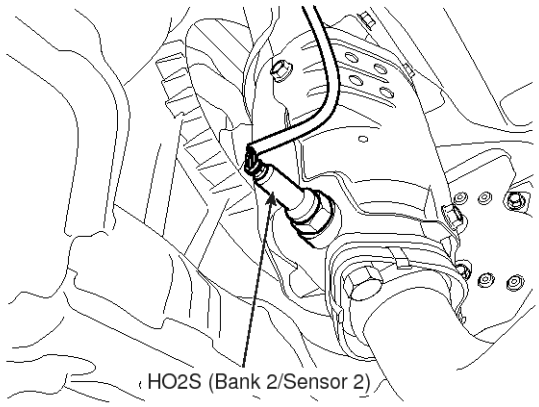
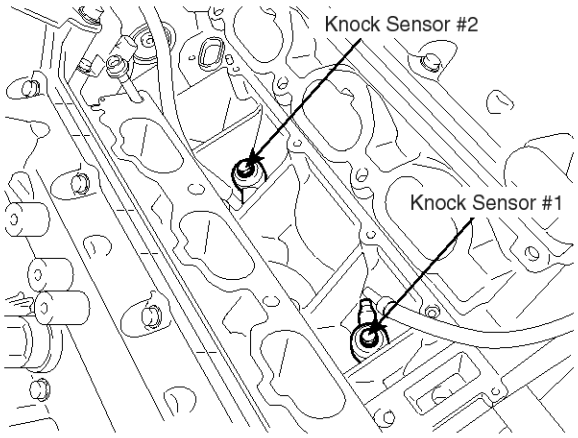
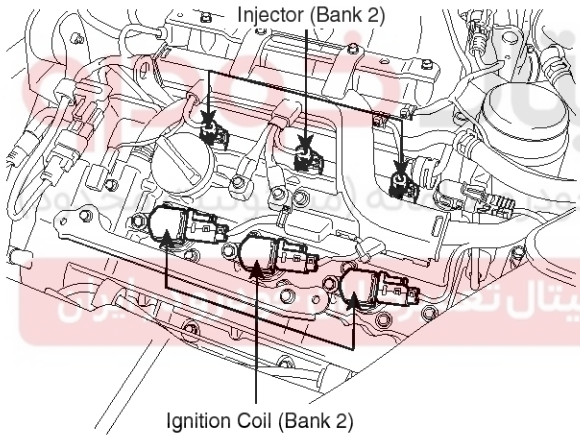
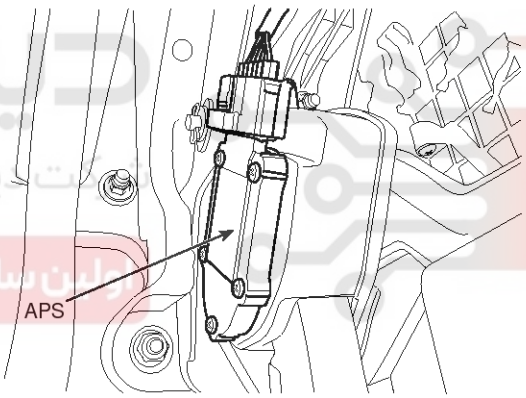


SENF19001L

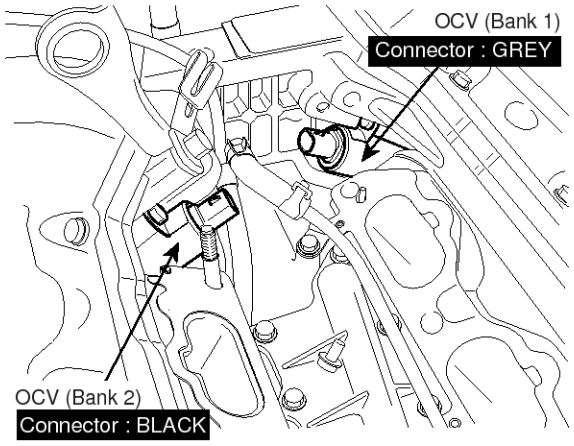
1. PCM (Powertrain Control Module)
2. Mass Air Flow Sensor (MAFS)
3. Intake Air Temperature Sensor (IATS)
4. Manifold Absolute Pressure Sensor (MAPS)
5. Engine Coolant Temperature Sensor (ECTS)
6. Camshaft Position Sensor (CMPS) [Bank 1]
7. Camshaft Position Sensor (CMPS) [Bank 2]
8. Crankshaft Position Sensor (CKPS)
9. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
10. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]
11. Heated Oxygen Sensor (HO2S) [Bank 2 / Sensor 1]
12. Heated Oxygen Sensor (HO2S) [Bank 2 / Sensor 2]
13. Knock Sensor (KS) #1
14. Knock Sensor (KS) #2
15. Injector
16. Accelerator Position Sensor (APS)
17. ETC Module [Throttle Position Sensor (TPS) + ETC Motor]
18. CVVT Oil Control Valve (OCV) [Bank 1]
19. CVVT Oil Control Valve (OCV) [Bank 2]
20. CVVT Oil Temperature Sensor (OTS)
21. Purge Control Solenoid Valve (PCSV)
22. Variable Intake Solenoid (VIS) Valve
23. Fuel Pump Relay
24. Main Relay
25. Ignition Coil
26. A/C Pressure Transducer (APT)
27. Wheel Speed Sensor (WSS)
28. Data Link Connector (DLC)
29. Multi-Purpose Check Connector

1. PCM (Powertrain Control Module)	2. Mass Air Flow Sensor (MAFS) 3. Intake Air Temperature Sensor (IATS)
 SENF17002L	 SENF17003L
4. Manifold Absolute Pressure Sensor (MAPS) 21. Purge Control Solenoid Valve (PCSV) 17. ETC Module [Throttle Position Sensor (TPS) + ETC M-otor]	5. Engine Coolant Temperature Sensor (ECTS) 20. CVVT Oil Temperature Sensor (OTS)
 SCMF16040N	 KFCF101D

6. Camshaft Position Sensor (CMPS) [Bank 1]	7. Camshaft Position Sensor (CMPS) [Bank 2]
 BFKG001C	 EGRF205A
8. Crankshaft Position Sensor (CKPS)	9. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
 KFCF101G	 EGRF207A
10. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]	11. Heated Oxygen Sensor (HO2S) [Bank 2 / Sensor 1]
 SCMF16050N	 EGRF209A

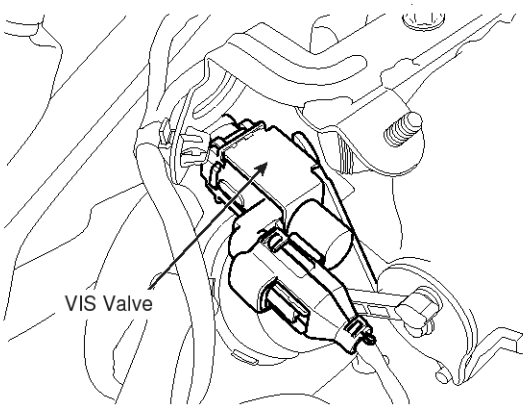
12. Heated Oxygen Sensor (HO2S) [Bank 2 / Sensor 2]	13. Knock Sensor (KS) #1 14. Knock Sensor (KS) #2
 SCMF16060N	 EGRF211A
15. Injector 25. Ignition Coil	16. Accelerator Position Sensor (APS)
 EGRF212A	 SCMF16070N

18. CVVT Oil Control Valve (OCV) [Bank 1]
19. CVVT Oil Control Valve (OCV) [Bank 2]



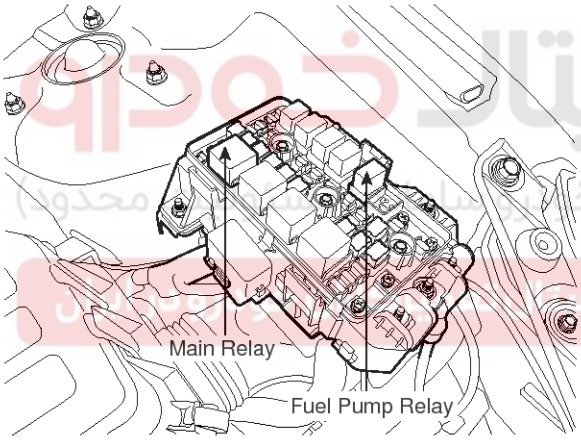
EGRF215A

22. Variable Intake Solenoid (VIS) Valve



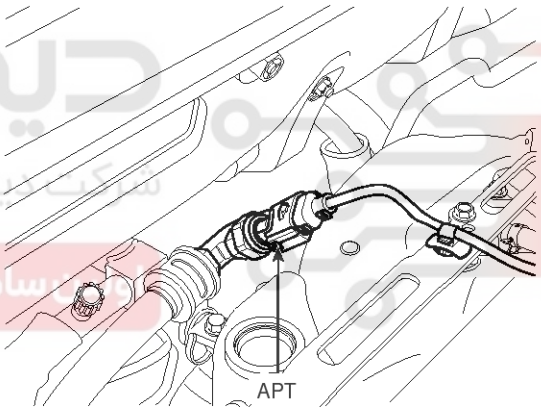
SCMF16090N

23. Fuel Pump Relay
24. Main Relay



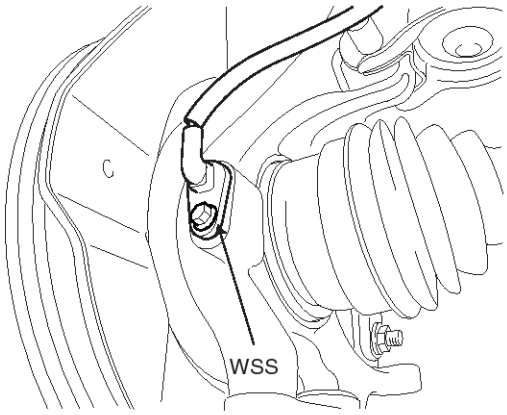
SENF17004L

26. A/C Pressure Transducer (APT)



SENF17005L

27. Wheel Speed Sensor (WSS)

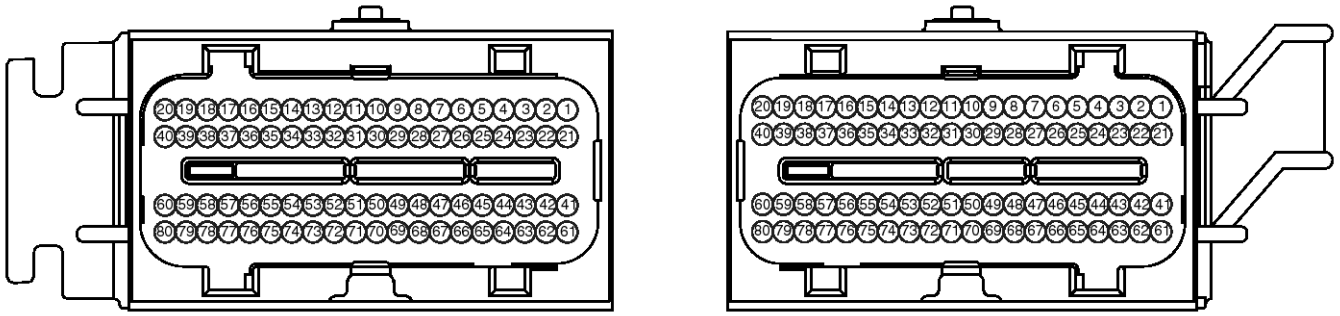


AFLG500C

Powertrain Control Module (PCM)

ECM Terminal And Input/Output signal

1. PCM Harness Connector



Connector [CLG-A] Connector [CLG-B]

SENF17021L

2. PCM Terminal Function

Connector [CLG-A]

Pin No.	Description	Connected to
1	2nd CAN [High]	Multi-Purpose Check Connector
2	2nd CAN [Low]	Multi-Purpose Check Connector
3	For Auto transaxle Control	
4	For Auto transaxle Control	
5	For Auto transaxle Control	
6	For Auto transaxle Control	
7	For Auto transaxle Control	
8	For Auto transaxle Control	
9	For Auto transaxle Control	
10	-	
11	For Auto transaxle Control	
12	-	
13	For Auto transaxle Control	
14	-	
15	Alternator load signal input	Alternator
16	Cruise Switch ground	Cruise Switch
17	-	
18	Air conditioner switch "ON" signal input	Air Conditioner Control Module
19	-	
20	For Auto transaxle Control	

Pin No.	Description	Connected to
21	Brake switch signal input	Brake Switch
22	-	
23	Brake lamp signal input	Brake Switch
24	-	
25	Cruise Switch signal input	Cruise Switch
26	Air conditioner blower switch signal input	Air Conditioner Control Module
27	Diagnostic Data Line (K-Line)	Data Link Connector (DLC), Multi-Purpose Check C-onnector
28	-	
29	-	
30	-	
31	-	
32	A/C Pressure Transducer signal input	A/C Pressure Transducer (APT)
33	Sensor ground	A/C Pressure Transducer (APT)
34	-	
35	-	
36	-	
37	-	
38	Battery voltage supply after main relay	Main Relay
39	Battery voltage supply after main relay	Main Relay
40	Battery voltage supply after main relay	Main Relay
41	CAN [High]	4WD Control Module, ESC Control Module
42	CAN [Low]	4WD Control Module, ESC Control Module
43	Main Relay control output	Main Relay
44	Intake Air Temperature Sensor signal input	Intake Air Temperature Sensor (IATS)
45	Immobilizer communication line	Immobilizer
46	For Auto transaxle control	
47	Mass Air Flow Sensor signal input	Mass Air Flow Sensor (MAFS)
48	Sensor ground	Accelerator Position Sensor (APS) #2
49	Accelerator Position Sensor #2 signal input	Accelerator Position Sensor (APS) #2
50	For Autotransaxle Control	
51	-	
52	Vehicle speed signal input	ESC Control Module
53	Sensor ground	Intake Air Temperature Sensor (IATS)
54	Accelerator Position Sensor #1 signal input	Accelerator Position Sensor (APS) #1

Pin No.	Description	Connected to
55	Sensor ground	Accelerator Position Sensor (APS) #1
56	-	
57	Sensor power (+5V)	Accelerator Position Sensor (APS) #2
58	Sensor Power (+5V)	A/C Pressure Transducer (APT)
59	Sensor power (+5V)	Accelerator Position Sensor (APS) #1
60	For Auto transaxle Control	
61	Engine speed signal output	Cluster (Tachometer)
62	Fuel consumption signal output	Trip Computer
63	Malfunction Indicator Lamp (MIL) control output	Cluster (Malfunction Indicator Lamp)
64	Air Conditioner Compressor Relay control output	Air Conditioner Compressor Relay
65	Radiator fan relay control output	Radiator fan relay
66	Condenser fan relay #1 control output	Condenser fan relay #1
67	For Auto transaxle Control	
68	-	
69	-	
70	Fuel Pump Relay control output	Fuel Pump Relay
71	Variable Intake Solenoid Valve control output	Variable Intake Solenoid (VIS) Valve
72	Immobilizer lamp control output	Immobilizer Lamp
73	For Auto transaxle Control	
74	For Auto transaxle Control	
75	For Auto transaxle Control	
76	For Auto transaxle Control	
77	For Auto transaxle Control	
78	Purge Control Solenoid Valve control output	Purge Control Solenoid Valve (PCSV)
79	-	-
80	-	-

Connector [CLG-B]

Pin No.	Description	Connected to
1	ETC Motor [-] control output	ETC Motor (in ETC Module)
2	ETC Motor [+] control output	ETC Motor (in ETC Module)
3	For Auto transaxle Control	
4	CVVT Oil Temperature Sensor signal input	CVVT Oil Temperature Sensor (OTS)
5	-	
6	For Autotransaxle Control	
7	Engine Coolant Temperature Sensor signal input	Engine Coolant Temperature Sensor (ECTS)
8	Manifold Absolute Pressure Sensor signal input	Manifold Absolute Pressure Sensor (MAPS)
9	For Auto transaxle Control	
10	For Auto transaxle Control	
11	Sensor power (+5V)	Manifold Absolute Pressure Sensor (MAPS)
12	Battery voltage supply after ignition switch	Ignition Switch
13	Sensor power (+5V)	Throttle Position Sensor (TPS) #2
14	Sensor power (+5V)	Throttle Position Sensor (TPS) #1
15	Sensor power (+5V)	Camshaft Position Sensor (CMPS) [Bank 2]
16	Sensor power (+5V)	Throttle Position Sensor (TPS) #1
17	Sensor ground	Camshaft Position Sensor (CMPS) [Bank 2]
18	Sensor ground	Camshaft Position Sensor (CMPS) [Bank 1]
19	Ignition Coil (Cylinder #6) control output	Ignition Coil (Cylinder #6)
20	-	
21	Crankshaft Position Sensor [High] signal input	Crankshaft Position Sensor (CKPS)
22	For Auto transaxle Control	
23	Sensor Shield	Crankshaft Position Sensor (CKPS), Knock Sensor (KS) #1,2
24	Camshaft Position Sensor [Bank 2] signal input	Camshaft Position Sensor (CMPS) [Bank 2]
25	Camshaft Position Sensor [Bank 1] signal input	Camshaft Position Sensor (CMPS) [Bank 1]
26	-	
27	-	
28	Sensor ground	HO2S (B2/S1)
29	Sensor ground	HO2S (B2/S2)
30	Sensor ground	HO2S (B1/S1)
31	Sensor ground	HO2S (B1/S2)
32	Sensor power (+5V)	Camshaft Position Sensor (CMPS) [Bank 1]
33	Sensor ground	Engine Coolant Temperature Sensor (ECTS)

Pin No.	Description	Connected to
34	Sensor ground	Manifold Absolute Pressure Sensor (MAPS), CVVT Oil Temperature Sensor (OTS)
35	Power ground	Chassis Ground
36	Power ground	Chassis Ground
37	Power ground	Chassis Ground
38	Power ground	Chassis Ground
39	Power ground	Chassis Ground
40	Ignition Coil (Cylinder #4) control output	Ignition Coil (Cylinder #4)
41	Crankshaft Position Sensor [Low] signal input	Crankshaft Position Sensor (CKPS)
42	For Auto transaxle Control	
43	For Auto transaxle Control	
44	For Auto transaxle Control	
45	For Auto transaxle Control	
46	-	
47	-	
48	Throttle Position Sensor #1 signal input	Throttle Position Sensor (TPS) #1
49	Heated Oxygen Sensor [Bank 1 / Sensor 1] signal input	HO2S (B1/S1)
50	Heated Oxygen Sensor [Bank 1 / Sensor 2] signal input	HO2S (B1/S2)
51	Heated Oxygen Sensor [Bank 2 / Sensor 1] signal input	HO2S (B2/S1)
52	Heated Oxygen Sensor [Bank 2 / Sensor 2] signal input	HO2S (B2/S2)
53	Knock Sensor (KS) #2 [High] signal input	Knock Sensor (KS) #2 [High]
54	Knock Sensor (KS) #2 [Low] signal input	Knock Sensor (KS) #2 [Low]
55	Knock Sensor (KS) #1 [Low] signal input	Knock Sensor (KS) #1 [Low]
56	Knock Sensor (KS) #1 [High] signal input	Knock Sensor (KS) #1 [High]
57	Throttle Position Sensor #2 signal input	Throttle Position Sensor (TPS) #2
58	Sensor ground	Throttle Position Sensor (TPS) #2
59	For Auto transaxle Control	
60	Ignition Coil (Cylinder #2) control output	Ignition Coil (Cylinder #2)
61	CVVT Oil Control Valve [Bank 2] control output	CVVT Oil Control Valve (OCV) [Bank 2]
62	CVVT Oil Control Valve [Bank 1] control output	CVVT Oil Control Valve (OCV) [Bank 1]
63	Injector (Cylinder #2) control output	Injector (Cylinder #2)
64	Injector (Cylinder #3) control output	Injector (Cylinder #3)

Pin No.	Description	Connected to
65	-	
66	-	
67	Heated Oxygen Sensor [Bank 2 / Sensor 1] Heater control output	HO2S (B2/S1)
68	Injector (Cylinder #4) control output	Injector (Cylinder #4)
69	Injector (Cylinder #5) control output	Injector (Cylinder #5)
70	Heated Oxygen Sensor [Bank 1 / Sensor 1] Heater control output	HO2S (B1/S1)
71	Injector (Cylinder #6) control output	Injector (Cylinder #6)
72	Injector (Cylinder #1) control output	Injector (Cylinder #1)
73	Heated Oxygen Sensor [Bank 2 / Sensor 2] Heater control output	HO2S (B2/S2)
74	Heated Oxygen Sensor [Bank 1 / Sensor 2] Heater control output	HO2S (B1/S2)
75	For Auto transaxle Control	
76	Battery Voltage	Battery
77	Ignition Coil (Cylinder #3) control output	Ignition Coil (Cylinder #3)
78	Ignition Coil (Cylinder #5) control output	Ignition Coil (Cylinder #5)
79	Ignition Coil (Cylinder #1) control output	Ignition Coil (Cylinder #1)
80	-	

3. PCM Terminal Input/output Signal

Connector [CLG-A]

Pin No.	Description	Condition	Type	Level	Test Result
1	2nd CAN [High]	Idle	DC	2.0 ~ 3.0V	2.5V
2	2nd CAN [Low]	Idle		2.0 ~ 3.0V	2.5V
3	For Auto transaxle Control				
4	For Auto transaxle Control				
5	For Auto transaxle Control				
6	For Auto transaxle Control				
7	For Auto transaxle Control				
8	For Auto transaxle Control				
9	For Auto transaxle Control				
10	-				
11	For Auto transaxle Control				
12	-				
13	For Auto transaxle Control				
14	-				
15	Alternator load signal input	Idle	PULSE	High: Battery Voltage	13.6V
				Low: Max. 1.5V	0V
				140 ~ 190Hz	160Hz
16	Cruise Switch ground				
17	-				
18	Air conditioner switch "ON" signal input	A/C Relay OFF	DC	Battery Voltage	9.1V
		A/C Relay ON		Max. 1.0V	0.1V
19	-				
20	For Auto transaxle Control				
21	Brake switch signal input	Brake pedal releasing	DC	Battery Voltage	12.7V
		Brake pedal pressing		Max. 0.5V	0.03V
22	-				
23	Brake lamp signal input	Brake pedal releasing	DC	Max. 0.5V	0V
		Brake pedal pressing		Battery Voltage	13.0V
24	-				
25	Cruise Switch signal input				

Pin No.	Description	Condition	Type	Level	Test Result
26	Air conditioner blower switch signal input	A/C OFF	DC	Max. 1.0V	0V
		A/C ON		Battery Voltage	11.9V
27	Diagnostic Data Line (K-Line)	When transmitting	PULSE	High: Min. Vbatt * 80%	11.3V
				Low: Max. Vbatt * 20%	0.14V
		When receiving		High: Min. Vbatt * 70%	11.3V
				Low: Max. Vbatt * 30%	0.32V
28	-				
29	-				
30	-				
31	-				
32	A/C Pressure Transducer signal input	A/C OFF	DC	0 ~ 5.0V	
		A/C ON			1.85 ~ 2.2V
33	Sensor ground	Idle	DC	Max. 50mV	40mV
34	-				
35	-				
36	-				
37	-				
38	Battery voltage supply after main relay	IG OFF	DC	Max. 1.0V	0V
		IG ON		Battery Voltage	12.1V
39	Battery voltage supply after main relay	IG OFF	DC	Max. 1.0V	0V
		IG ON		Battery Voltage	12.1V
40	Battery voltage supply after main relay	IG OFF	DC	Max. 1.0V	0V
		IG ON		Battery Voltage	12.1V
41	CAN [High]	RECESSIVE	PULSE	2.0 ~ 3.0V	3.85V
		DOMINANT		2.75~4.5V	2.5V
42	CAN [Low]	RECESSIVE	PULSE	2.0 ~ 3.0V	2.55V
		DOMINANT		2.75~4.5V	1.34V
43	Main Relay control output	Relay ON	DC	Battery Voltage	12.3V
		Relay OFF		Max. 1.0V	0.87V
44	Intake Air Temperature Sensor signal input	Idle	Analog	0 ~ 5.0V	1.86V
45	Immobilizer communication line				
46	For Auto transaxle Control				

Pin No.	Description	Condition	Type	Level	Test Result
47	Mass Air Flow Sensor signal input	Idle	PULSE	High: Vref	5.04V
				Low: Max. 0.5V	0.27V
				Idle: 3.0KHz	
		3,000 rpm		High: Vref	5.04V
				Low: Max. 0.5V	0.27V
				3000rpm: 4.5 kHz	
48	Sensor ground	Idle	DC	Max. 50mV	35mV
49	Accelerator Position Sensor #2 signal input	C.T	Analog	0.3 ~ 0.9V	0.4V
		W.O.T		1.5 ~ 3.0V	2.1V
50	For Auto transaxle Control				
51	-				
52	Vehicle speed signal input	Vehicle running	PULSE	High: Min. 5.0V	12.6V
				Low: Max. 1.0V	0.2V
53	Sensor ground	Idle	DC	DC Max. 50mV	34mV
54	Accelerator Position Sensor #1 signal input	C.T	Analog	0.3 ~ 0.9V	0.77V
		W.O.T		4.0 ~ 4.8V	4.23V
55	Sensor ground	Idle	DC	DC Max. 50mV	36mV
56	-				
57	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.08V
58	Sensor power (+5V)	IG OFF		Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.08V
59	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.08V
60	For Auto transaxle Control				
61	Engine speed signal output	Idle	PULSE	High: Battery Voltage	13.0V
				Low: Max. 0.5V	0V
				20~26Hz	35Hz
62	-				
63	Malfunction Indicator Lamp (MIL) control output	MIL OFF	DC	High: Battery Voltage	4.24V
		MIL ON		Low: Max. 2.0V	0V
64	Air Conditioner Compressor Relay control output	A/C OFF	DC	Battery Voltage	13.0V
		A/C ON		Max. 1.0V	0.14V
65	Radiator fan relay control output	A/C			

Pin No.	Description	Condition	Type	Level	Test Result
66	Condenser fan relay #1 control output				
67	For Auto transaxle Control				
68	-				
69	-				
70	Fuel Pump Relay control output	Relay OFF	DC	Battery Voltage	12.5V
		Relay ON		Max. 1.0V	0.09V
71	Variable Intake Solenoid Valve control output	Active	DC	Max. 1.0V	0.1V
		Inactive		Battery Voltage	12.4V
72	Immobilizer lamp control output				
73	For Auto transaxle Control				
74	For Auto transaxle Control				
75	For Auto transaxle Control				
76	For Auto transaxle Control				
77	For Auto transaxle Control				
78	Purge Control Solenoid Valve control output	Inactive	PULSE	High: Battery Voltage	13.2V
		Active		Low: Max. 1.0V	0.08V
					16Hz
79	-				
80	-				

Connector [CLG-B]

Pin No.	Description	Condition	Type	Level	Test Result
1	ETC Motor [-] control output	Idle	PULSE	High: Battery Voltage	13.3V
				Low: Max. 1.0V	0.3V
					3.14KHz
2	ETC Motor [+] control output	Idle	PULSE	High: Battery Voltage	13.3V
				Low: Max. 1.0V	0.4V
					3.14KHz
3	For Autotransaxle Control				
4	CVVT Oil Temperature Sensor signal input	Idle	Analog	0.5 ~ 4.5V	1.68V
5	-				
6	For Auto transaxle Control				
7	Engine Coolant Temperature Sensor signal input	Idle	Analog	0.5 ~ 4.5V	0.47V
8	Manifold Absolute Pressure Sensor signal input	IG ON	Analog	3.9 ~ 4.1V	4.01V
		Idle		0.8 ~ 1.6V	1.59V
9	For Auto transaxle Control				
10	For Auto transaxle Control				
11	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.08V
12	Battery voltage supply after ignition switch	IG OFF	DC	Max. 0.5V	0V
		IG ON		Battery Voltage	12.2V
13	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.05V
14	Sensor ground	Idle	DC	Max. 50mV	30mV
15	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.06V
16	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.06V
17	Sensor power (+5V)	Idle	DC	Max. 50mV	30mV
18	Sensor power (+5V)	Idle	DC	Max. 50mV	30mV
19	Ignition Coil (Cylinder #6) control output	Idle	PULSE	1st: 300~400V	272V
				ON: Max. 2V	1.2V
					5.8Hz
20	-				

FLA-36 Fuel System

Pin No.	Description	Condition	Type	Level	Test Result
21	Crankshaft Position Sensor [High] signal input	Idle	Sine Wave	Vp_p: Min.1.0V	8V
					700Hz
22	For Autotransaxle Control				
23	Sensor Shield	Idle	DC	Max. 50mV	32mV
24	Camshaft Position Sensor [Bank 2] signal input	Idle	PULSE	High: Vref	5.08V
				Low: Max. 0.5V	0.06V
					40Hz
25	Camshaft Position Sensor [Bank 1] signal input	Idle	PULSE	High: Vref	5.08V
				Low: Max. 0.5V	0.06V
					40Hz
26	-				
27	-				
28	Sensor ground	Idle	DC	Max. 50mV	27mV
29	Sensor ground	Idle	DC	Max. 50mV	27mV
30	Sensor ground	Idle	DC	Max. 50mV	26V
31	Sensor ground	Idle	DC	Max. 50mV	27mV
32	Sensor power (+5V)	IG OFF	DC	Max. 0.5V	0V
		IG ON		4.9 ~ 5.1V	5.06V
33	Sensor ground	Idle	DC	Max. 50mV	13mV
34	Sensor ground	Idle	DC	Max. 50mV	13mV
35	Power ground	Idle	DC	Max. 50mV	0mV
36	Power ground	Idle	DC	Max. 50mV	0mV
37	Power ground	Idle	DC	Max. 50mV	0mV
38	Power ground	Idle	DC	Max. 50mV	2mV
39	Power ground	Idle	DC	Max. 50mV	2mV
40	Ignition Coil (Cylinder #4) control output	Idle	PULSE	1st: 300~400V	263V
				ON: Max. 2V	1.4V
					5.8Hz
41	Crankshaft Position Sensor [Low] signal input	Idle	Sine Wave	Vp_p: Min.1.0V	8V
					700Hz
42	For Auto transaxle Control				
43	For Auto transaxle Control				
44	For Auto transaxle Control				
45	For Auto transaxle Control				

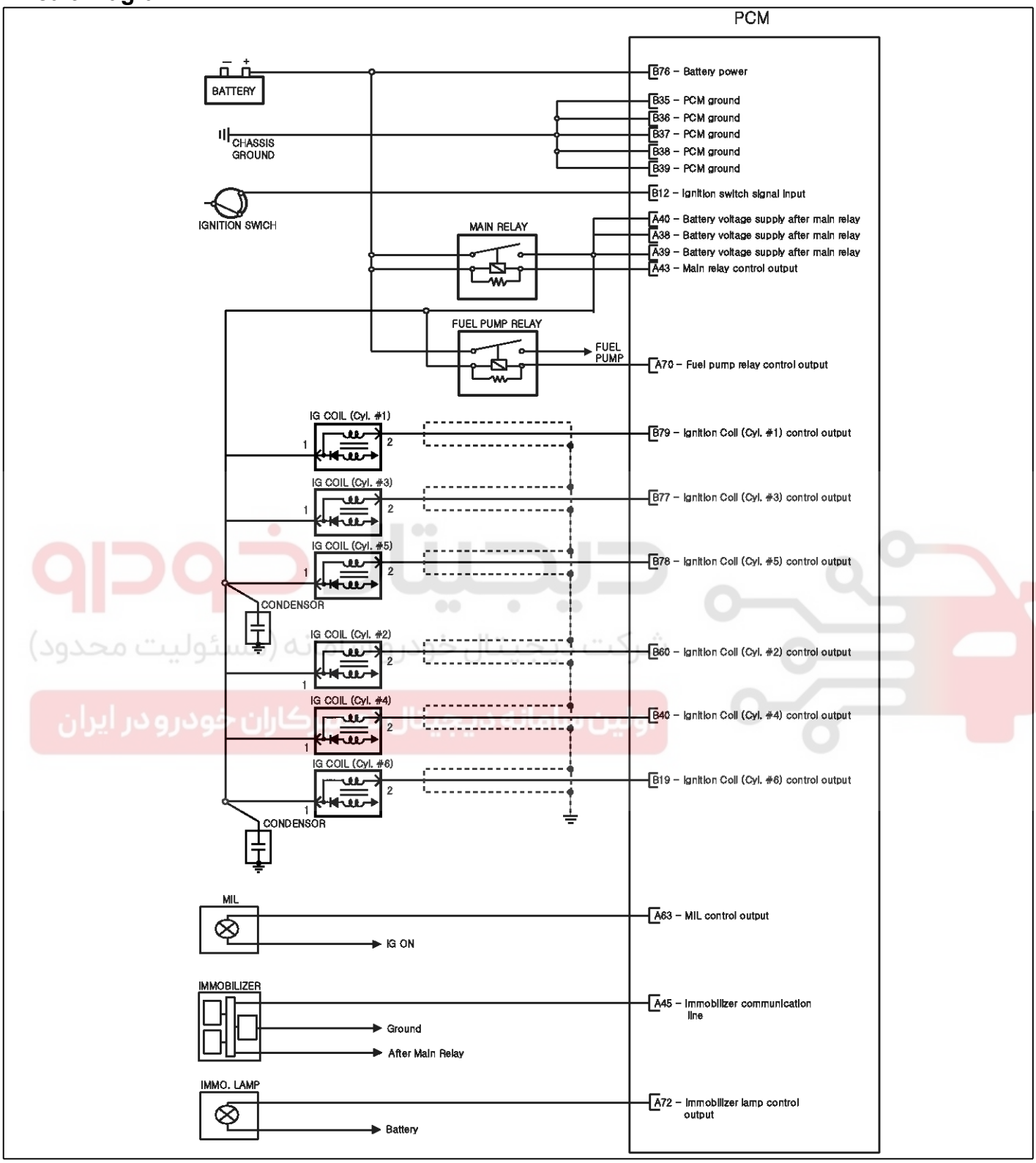
Pin No.	Description	Condition	Type	Level	Test Result
46	-				
47	-				
48	Throttle Position Sensor #1 signal input	C.T	Analog	0.25 ~ 0.9V	
		W.O.T		Min. 4.0V	
49	Heated Oxygen Sensor [Bank 1 / Sensor 1] signal input	Engine Running	DC	Rich: 0.6 ~ 1.0V	0.95V
				Lean: 0 ~ 0.4V	0.13V
50	Heated Oxygen Sensor [Bank 1 / Sensor 2] signal input	Engine Running	DC	Rich: 0.6 ~ 1.0V	0.88V
				Lean: 0 ~ 0.4V	0.21V
51	Heated Oxygen Sensor [Bank 2 / Sensor 1] signal input	Engine Running	DC	Rich: 0.6 ~ 1.0V	0.91V
				Lean: 0 ~ 0.4V	0.18V
52	Heated Oxygen Sensor [Bank 2 / Sensor 2] signal input	Engine Running	DC	Rich: 0.6 ~ 1.0V	0.89V
				Lean: 0 ~ 0.4V	0.22V
53	Knock Sensor (KS) #2 [High] signal input	Knocking	Variable Frequency	-0.3 ~ 0.3 V	1.7V
		Normal		0 V	
54	Knock Sensor (KS) #2 [Low] signal input	Knocking	Variable Frequency	-0.3 ~ 0.3 V	1.7V
		Normal		0 V	
55	Knock Sensor (KS) #1 [Low] signal input	Knocking	Variable Frequency	-0.3 ~ 0.3 V	1.7V
		Normal		0 V	
56	Knock Sensor (KS) #1 [High] signal input	Knocking	Variable Frequency	-0.3 ~ 0.3 V	1.7V
		Normal		0 V	
57	Throttle Position Sensor #2 signal input	C.T	Analog	Min. 4.0V	
		W.O.T		0.25 ~ 0.9V	
58	Sensor ground	Idle	DC	Max. 50mV	17mV
59	For Auto transaxle Control				
60	Ignition Coil (Cylinder #2) control output	Idle	PULSE	1st: 300~400V	266V
				ON: Max. 2V	1.3V
					5.8Hz
61	CVVT Oil Control Valve [Bank 2] control output	Idle	PULSE	Battery Voltage	14.5V
				Max. 1.0V	0.1V
				Duty variance when operating the accelerator	128Hz
62	CVVT Oil Control Valve [Bank 1] control output	Idle	PULSE	Battery Voltage	14.3V
				Max. 1.0V	0.1V
				Duty variance when operating the accelerator	128Hz

FLA-38 Fuel System

Pin No.	Description	Condition	Type	Level	Test Result
63	Injector (Cylinder #2) control output	Idle	PULSE	High: Battery Voltage	13.8V
				Low: Max. 1.0V	0.13V
				Vpeak: Max. 80V	57.5V
					5.8Hz
64	Injector (Cylinder #3) control output	Idle	PULSE	High: Battery Voltage	13.8V
				Low: Max. 1.0V	0.13V
				Vpeak: Max. 80V	56.8V
					5.8Hz
65	-				
66	-				
67	Heated Oxygen Sensor [Bank 2 / Sensor 1] Heater control output	Engine Running	PULSE	High: Battery Voltage	13.8V
				Low: Max. 1.0V	0.17V
					16Hz
68	Injector (Cylinder #4) control output	Idle	PULSE	High: Battery Voltage	13.8V
				Low: Max. 1.0V	0.13V
				Vpeak: Max. 80V	56.8V
					5.8Hz
69	Injector (Cylinder #5) control output	Idle	PULSE	High: Battery Voltage	13.7V
				Low: Max. 1.0V	0.13V
				Vpeak: Max. 80V	56.8V
					5.8Hz
70	Heated Oxygen Sensor [Bank 1 / Sensor 1] Heater control output	Engine Running	PULSE	High: Battery Voltage	13.8V
				Low: Max. 1.0V	0.17V
					16Hz
71	Injector (Cylinder #6) control output	Idle	PULSE	High: Battery Voltage	13.8V
				Low: Max. 1.0V	0.13V
				Vpeak: Max. 80V	56.8V
					5.8Hz
72	Injector (Cylinder #1) control output	Idle	PULSE	High: Battery Voltage	13.8V
				Low: Max. 1.0V	0.13V
				Vpeak: Max. 80V	56.8V
					5.8Hz

Pin No.	Description	Condition	Type	Level	Test Result
73	Heated Oxygen Sensor [Bank 2 / Sensor 2] Heater control output	Engine Running	PULSE	High: Battery Voltage	13.9V
				Low: Max. 1.0V	0.19V
					16Hz
74	Heated Oxygen Sensor [Bank 1 / Sensor 2] Heater control output	Engine Running	PULSE	High: Battery Voltage	13.9V
				Low: Max. 1.0V	0.18V
					16Hz
75	For Auto transaxle Control				
76	Battery Voltage	Always	DC	Battery Voltage	13.0V
77	Ignition Coil (Cylinder #3) control output	Idle	PULSE	1st: 300~400V	266V
				ON: Max. 2V	1.4V
					5.8Hz
78	Ignition Coil (Cylinder #5) control output	Idle	PULSE	1st: 300~400V	267V
				ON: Max. 2V	1.4V
					5.8Hz
79	Ignition Coil (Cylinder #1) control output	Idle	PULSE	1st: 300~400V	268V
				ON: Max. 2V	1.4V
					5.8Hz
80	-				

Circuit Diagram



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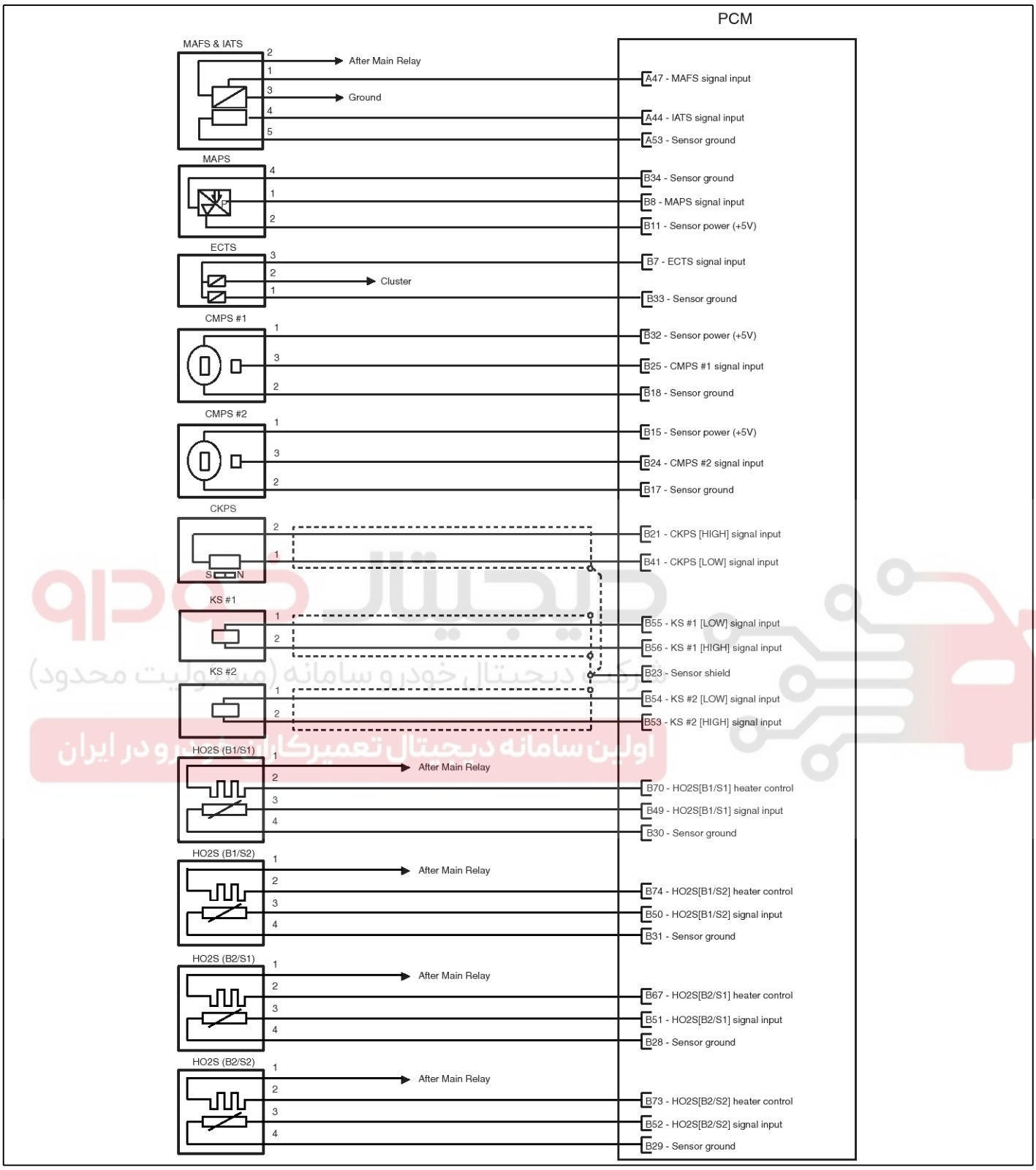

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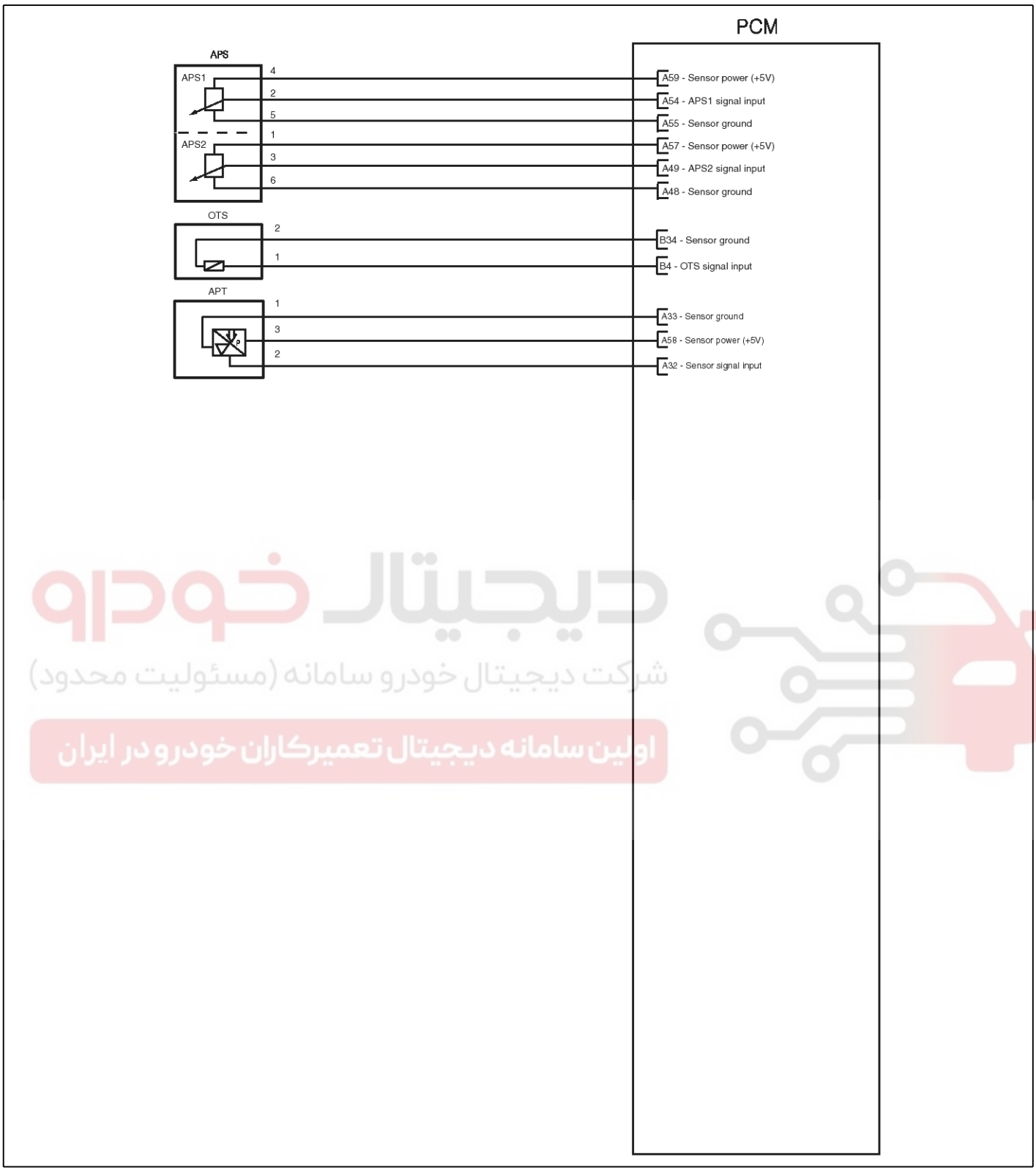

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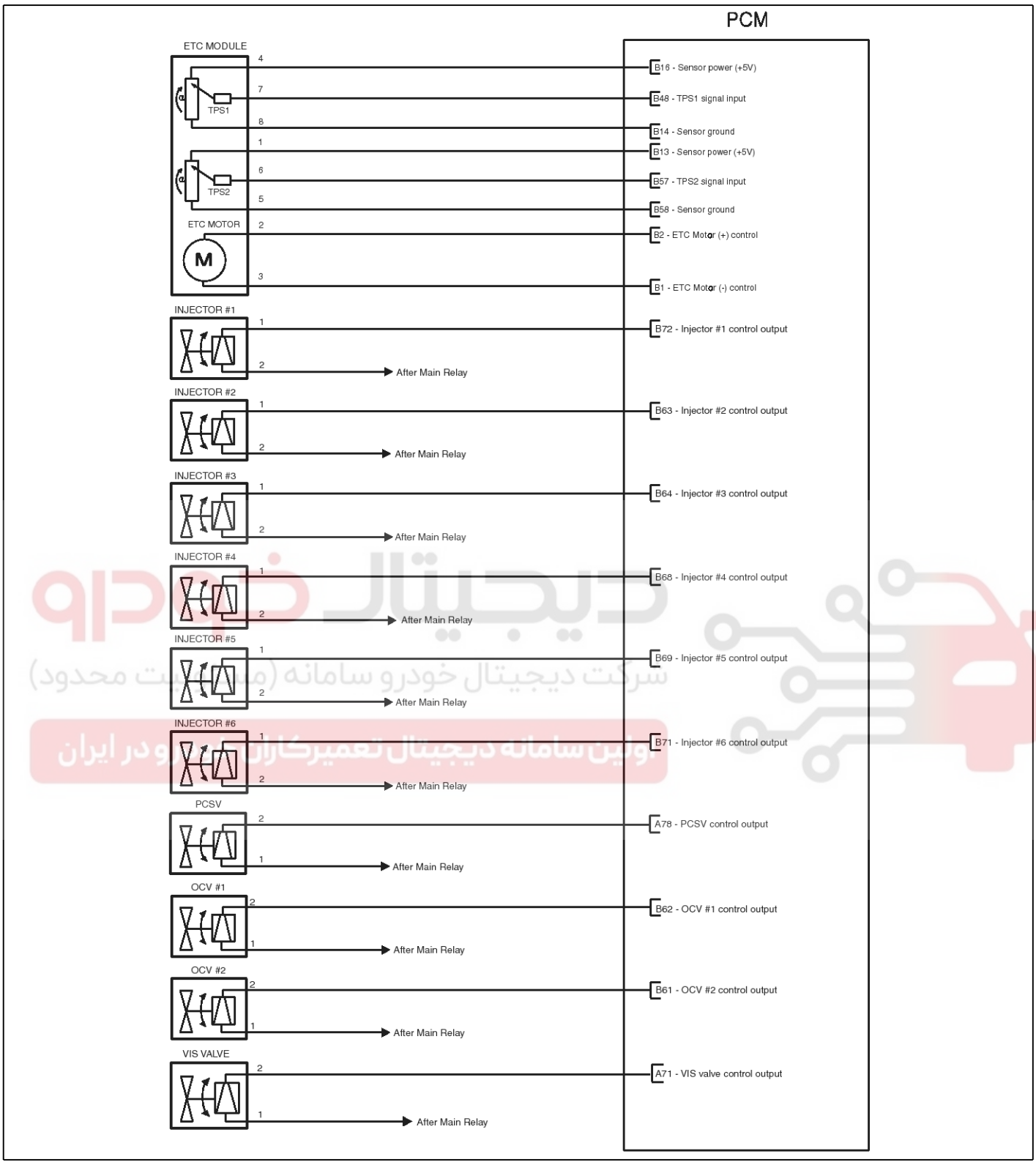

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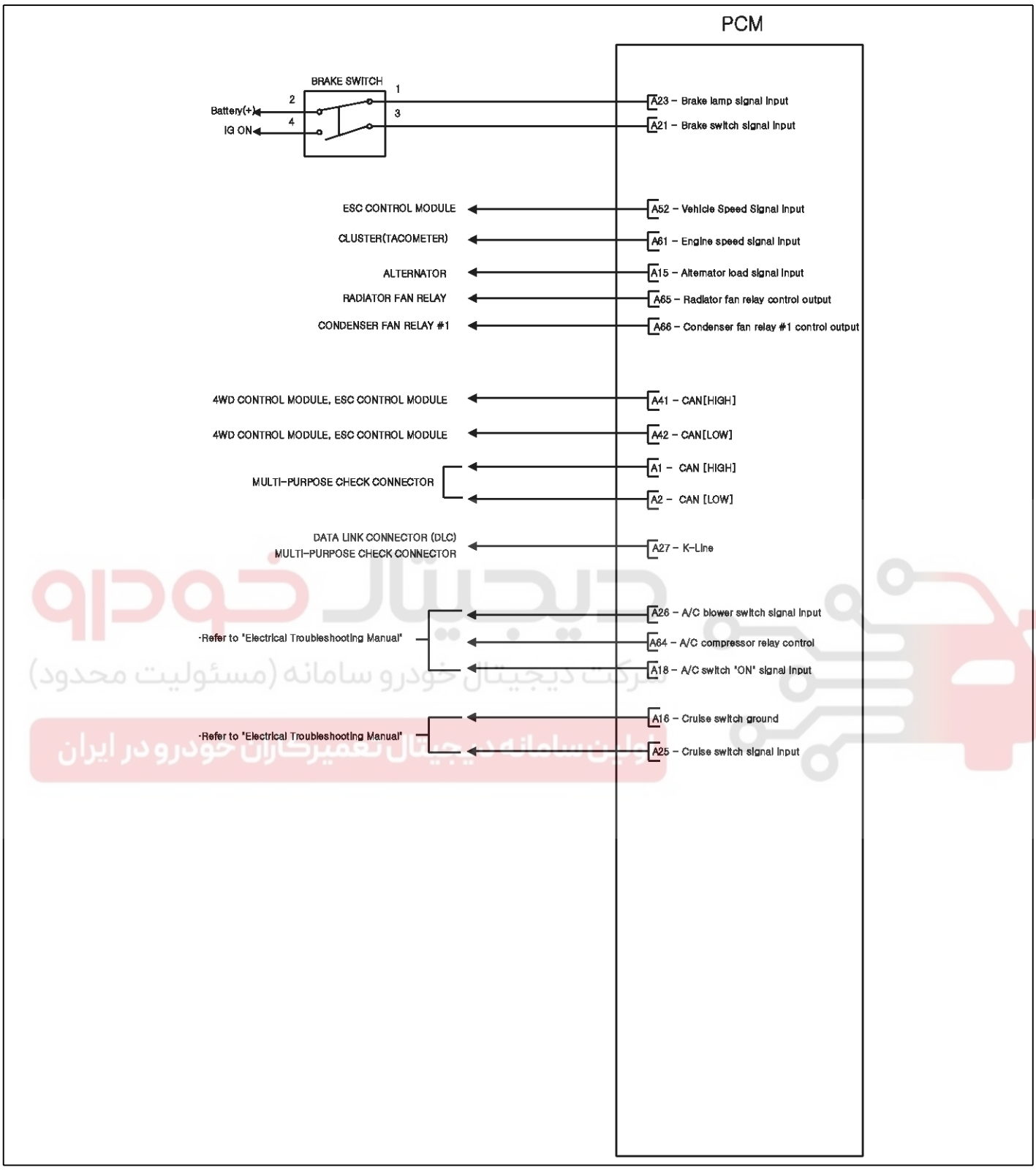


SENF17024L

PCM Problem Inspection Procedure

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

Specification (Resistance): 1Ω or less

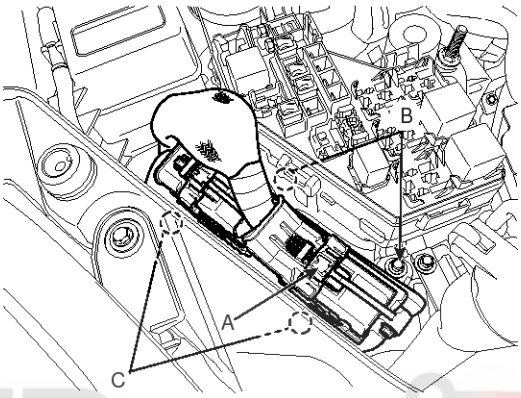
2. TEST PCM CONNECTOR: Disconnect the PCM connector and visually check the ground terminals on PCM side and harness side for bent pins or poor contact pressure. If the problem is found, repair it.
3. If problem is not found in Step 1 and 2, the PCM could be faulty. If so, replace the PCM with a new one,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

Replacement

⚠CAUTION

- **In the case of the vehicle equipped with immobilizer, perform "Key Teaching" procedure together (Refer to "Immobilizer" in BE group).**

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the cover of the PCM & relay box.
3. Disconnect the PCM connector (A).



SENF17350L

4. Unscrew the PCM bracket mounting bolts (B) and the nuts (C), and then remove the PCM.
5. Install a new PCM.

PCM installation bolts (on bracket) :
9.8 ~ 11.8 N·m (1.0 ~ 1.2 kgf·m, 7.2 ~ 8.7 lb.ft)
PCM bracket installation bolt/nuts:
9.8 ~ 11.8 N·m (1.0 ~ 1.2 kgf·m, 7.2 ~ 8.7 lb.ft)

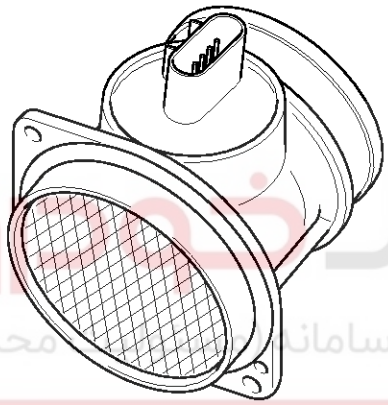
6. Perform "Key Teaching" procedure (Refer to "IMMOBILIZER" in BE group).

Mass Air Flow Sensor (MAFS)

Inspection

Function And Operation Principle

Mass Air Flow Sensor (MAFS) is a hot-film type sensor and is located in between the air cleaner and the throttle body. It consists of a tube, a sensor assembly and honeycomb cell and detects intake air quantity flowing into the intake manifold. Air flows from the air cleaner assembly through the honeycomb cell and over the hot film element. At this time, heat transfer is generated by convection and this sensor loses its energy. This sensor detects the mass air flow by using the energy loss and transfers the information to the PCM by frequency. The PCM calculates fuel quantity and ignition timing.



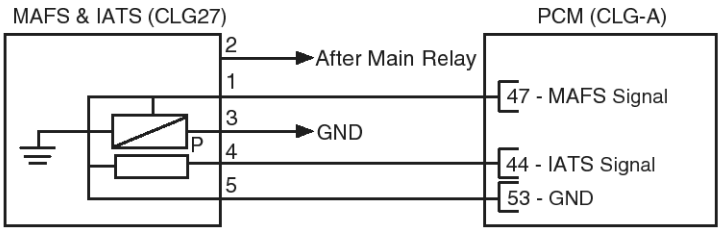
KFCF1021

Specification

Air Flow (kg/h)	Output Frequency (Hz)
12.6 kg/h	2,617Hz
18.0 kg/h	2,958Hz
23.4 kg/h	3,241Hz
32.4 kg/h	3,653Hz
43.2 kg/h	4,024Hz
57.6 kg/h	4,399Hz
72.0 kg/h	4,704Hz
108.0 kg/h	5,329Hz
144.0 kg/h	5,897Hz
198.0 kg/h	6,553Hz
270.0 kg/h	7,240Hz
360.0 kg/h	7,957Hz
486.0 kg/h	8,738Hz
666.0 kg/h	9,644Hz
900.0 kg/h	10,590Hz

Schematic Diagram

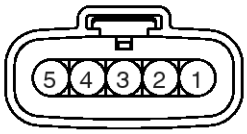
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

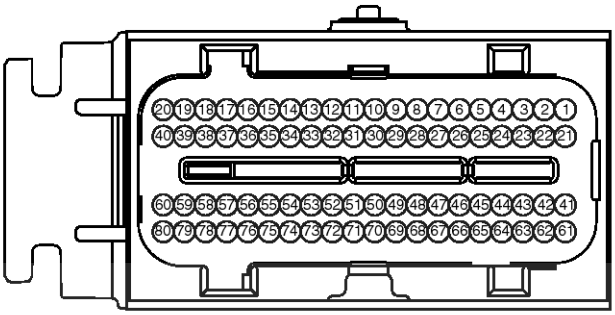
Terminal	Connected to	Function
1	PCM CLG-A (47)	MAFS Signal
2	Main Relay	Battery Voltage (B+)
3	Chassis Ground	Ground
4	PCM CLG-A (44)	IATS Signal
5	PCM CLG-A (53)	Sensor Ground

[HARNESS CONNECTORS]



CLG27

MAFS & IATS



CLG-A

PCM

SENF17008L

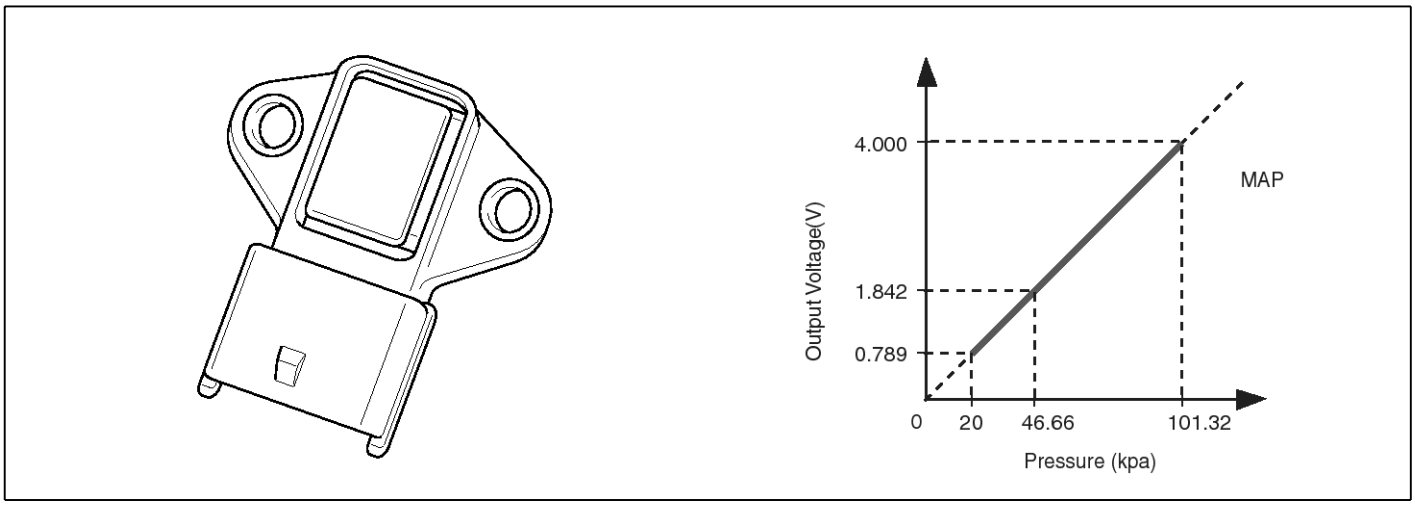
Component Inspection

1. Check the MAFS visually.
   - Mounting direction correct.
   - Any contamination, corrosion or damage on connector.
   - Air cleaner's clogging or wet.
   - MAFS cylinder's deforming or blocking by any foreign material.
2. Check any leakage on intake system and intercooler system.

Manifold Absolute Pressure Sensor (MAPS)

Inspection

Function And Operation Principle



EGRF239A

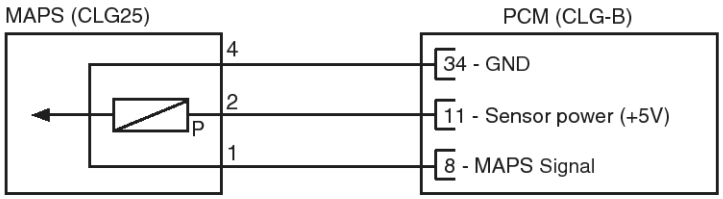
Manifold Absolute Pressure Sensor (MAPS) is speed-density type sensor and is installed on the surge tank. This MAPS senses absolute pressure in surge tank and transfers this analog signal proportional to the pressure to the PCM. The PCM calculates the intake air quantity and engine speed based on this 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)
20.0kPa	0.79V
46.66kPa	1.84V
101.32kPa	4.00V

Schematic Diagram

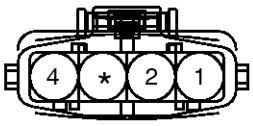
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

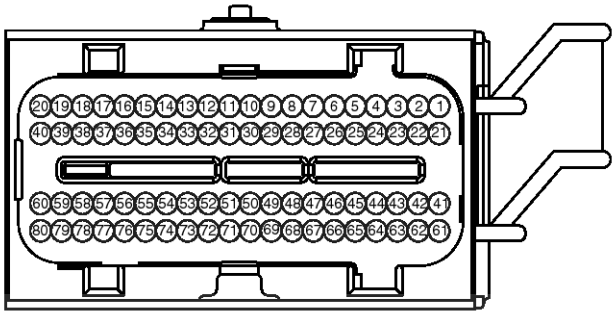
Terminal	Connected to	Function
1	PCM CLG-B (8)	MAPS Signal
2	PCM CLG-B (11)	Sensor power (+5V)
3	-	-
4	PCM CLG-B (34)	Sensor ground

[HARNESS CONNECTORS]



CLG25

MAPS



CLG-B

PCM

SENF17009L

Component Inspection

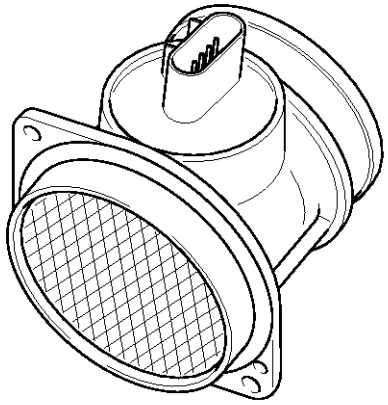
1. Connect a scan tool to the Diagnosis Link Connector (DLC).
2. Check MAPS output voltage at idle and IG ON.

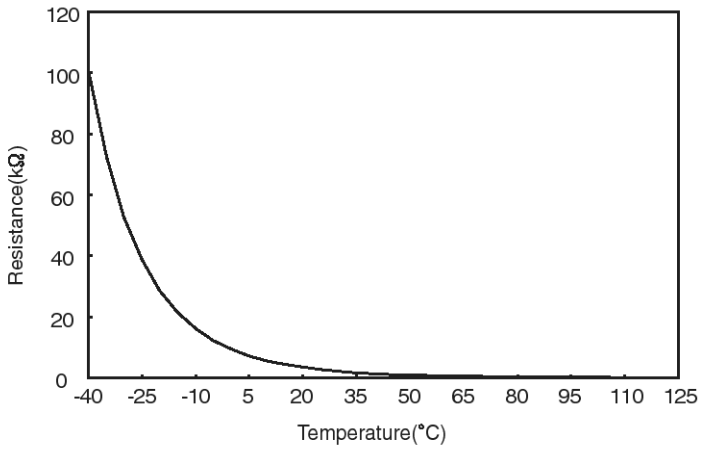
Condition	Output Voltage (V)
Idle	0.8V ~ 1.6V
IG ON	3.9V ~ 4.1V

Intake Air Temperature Sensor (IATS)

Inspection

Function And Operation Principle





EGRF238A

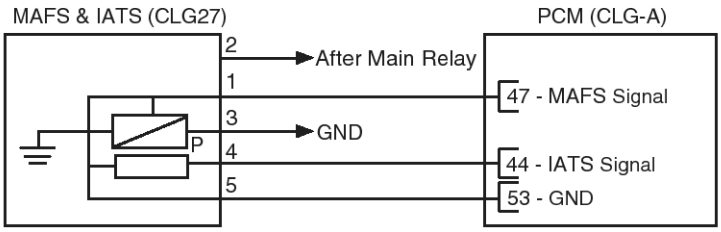
Intake Air Temperature Sensor (IATS) is installed inside the Mass Air Flow Sensor (MAFS) and detects the intake air temperature. To calculate precise air quantity, correction of the air temperature is needed because air density varies according to the temperature. So the PCM uses not only MAFS signal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

Specification

Temperature		Resistance (kΩ)
℃	°F	
-40	-40	100.87kΩ
-20	-4	28.58kΩ
0	32	9.40kΩ
10	50	5.66kΩ
20	68	3.51kΩ
40	104	1.47kΩ
60	140	0.67kΩ
80	176	0.33kΩ

Schematic Diagram

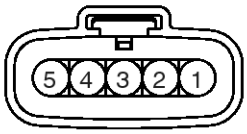
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

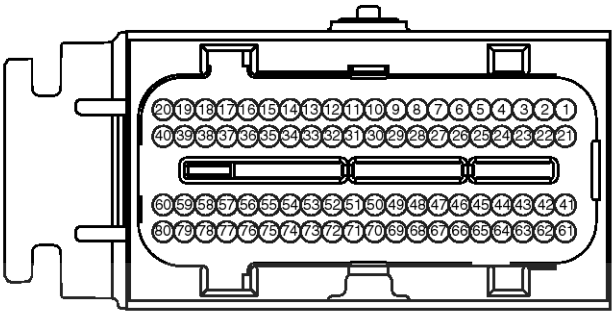
Terminal	Connected to	Function
1	PCM CLG-A (47)	MAFS Signal
2	Main Relay	Battery Voltage (B+)
3	Chassis Ground	Ground
4	PCM CLG-A (44)	IATS Signal
5	PCM CLG-A (53)	Sensor Ground

[HARNESS CONNECTORS]



CLG27

MAFS & IATS



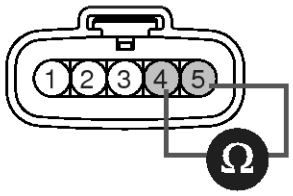
CLG-A

PCM

SENF17008L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect IATS connector.
3. Measure resistance between IATS terminals 4 and 5.



SMGF16103N

4. Check that the resistance is within the specification.

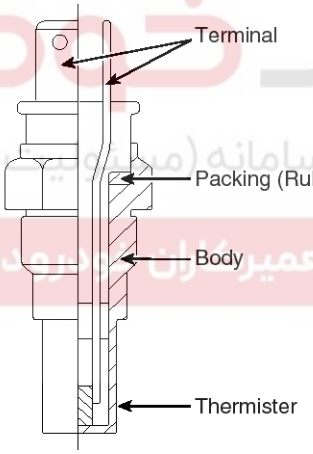
Specification: Refer to SPECIFICATION.

Engine Coolant Temperature Sensor (ECTS)

Inspection

Function And Operation Principle

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.



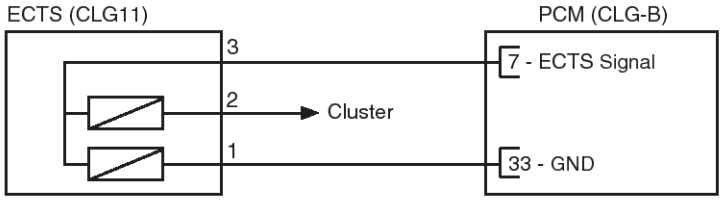
EGRF241A

Specification

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

Schematic Diagram

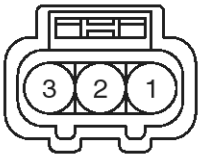
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

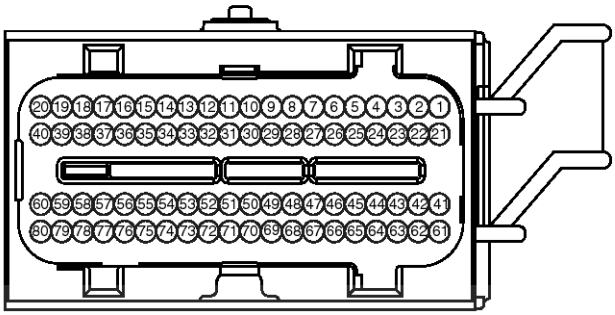
Terminal	Connected to	Function
1	PCM CLG-B (33)	Sensor ground
2	Cluster	-
3	PCM CLG-B (7)	ECTS Signal

[HARNESS CONNECTORS]



CLG11

ECTS



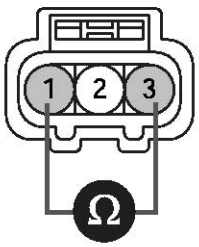
CLG-B

PCM

SENF17010L

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.



SUNF17008N

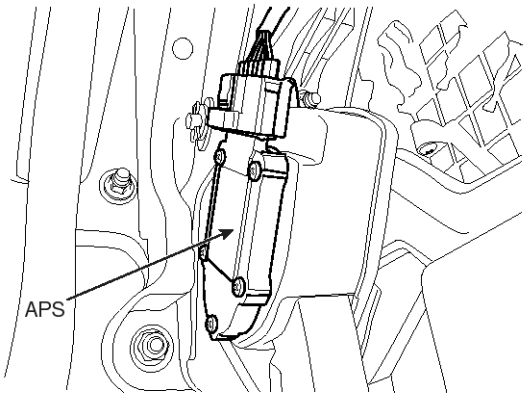
5. Check that the resistance is within the specification.

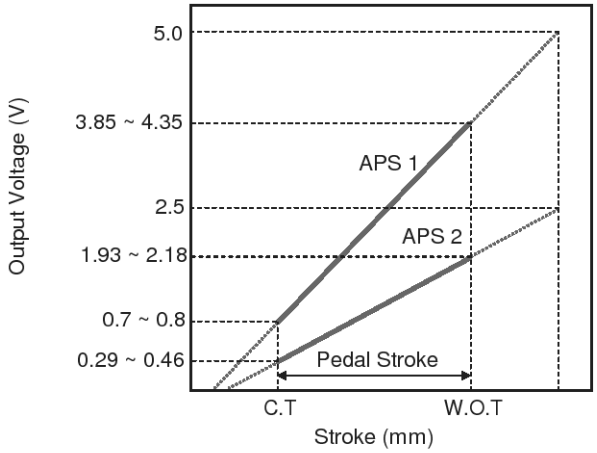
Specification: Refer to SPECIFICATION.

Accelerator Position Sensor (APS)

Inspection

Function And Operation Principle





SCMF16260N

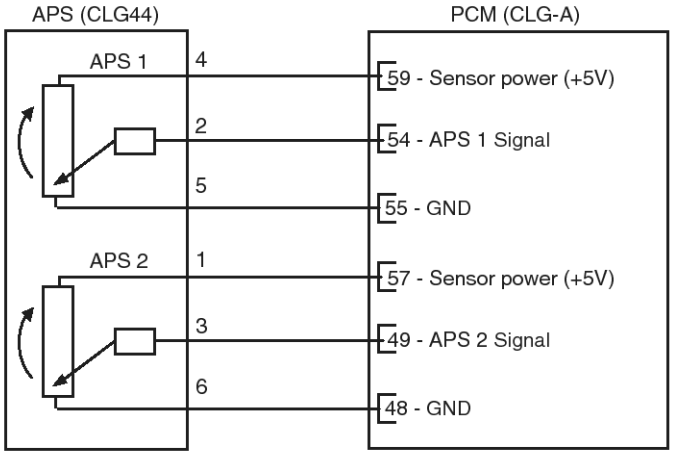
Accelerator Position Sensor (APS) is installed on the accelerator pedal module and detects the rotation angle of the accelerator pedal. The APS is one of the most important sensors in engine control system, so it consists of the two sensors which adapt individual sensor power and ground line. The second sensor monitors the first sensor and its output voltage is half of the first one. If the ratio of the sensor 1 and 2 is out of the range (approximately 1/2), the diagnostic system judges that a malfunction has occurred.

Specification

Item	Sensor Resistance
APS1	0.7 ~ 1.3㏀ at 20℃ (68°F)
APS2	1.4 ~ 2.6㏀ at 20℃ (68°F)

Schematic Diagram

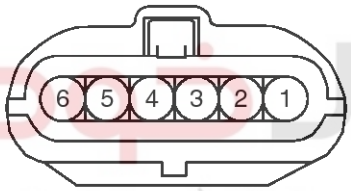
[CIRCUIT DIAGRAM]



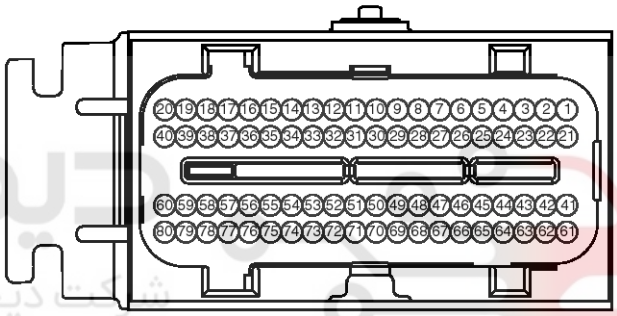
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM CLG-A (57)	APS 2 Sensor power (+5V)
2	PCM CLG-A (54)	APS 1 Signal
3	PCM CLG-A (49)	APS 2 Signal
4	PCM CLG-A (59)	APS 1 Sensor power (+5V)
5	PCM CLG-A (55)	APS 1 Ground
6	PCM CLG-A (48)	APS 2 Ground

[HARNESS CONNECTORS]



CLG44
APS



CLG-A
PCM

SENF17020L

Component Inspection

1. Connect a scan tool to the Diagnoisis Link Connector (DLC).
2. Start engine and check output voltages of APS 1 and 2 at C.T and W.O.T.

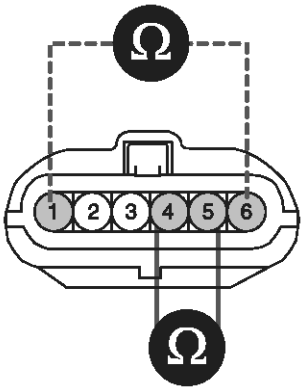
Specification

Condition	Output Voltage (V)	
	APS1	APS2
C.T	0.70 ~ 0.80	0.29 ~ 0.46
W.O.T	3.85 ~ 4.35	1.93 ~ 2.18

3. Turn ignition switch OFF and disconnect the scantool from the DLC.
4. Disconnect APS connector and measure resistance between APS terminals 4 and 5 (APS 1).

Specification: Refer to SPECIFICATION.

5. Disconnect APS connector and measure resistance between APS terminals 1 and 6 (APS 2).



SMGF16109N

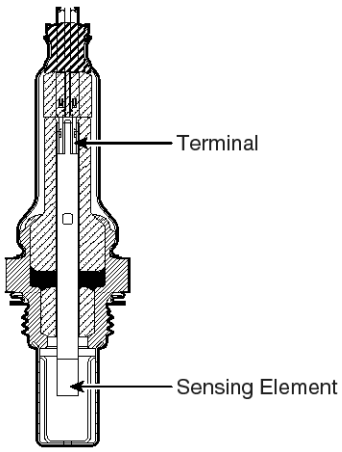
Specification: Refer to SPECIFICATION.

Heated Oxygen Sensor (HO2S)

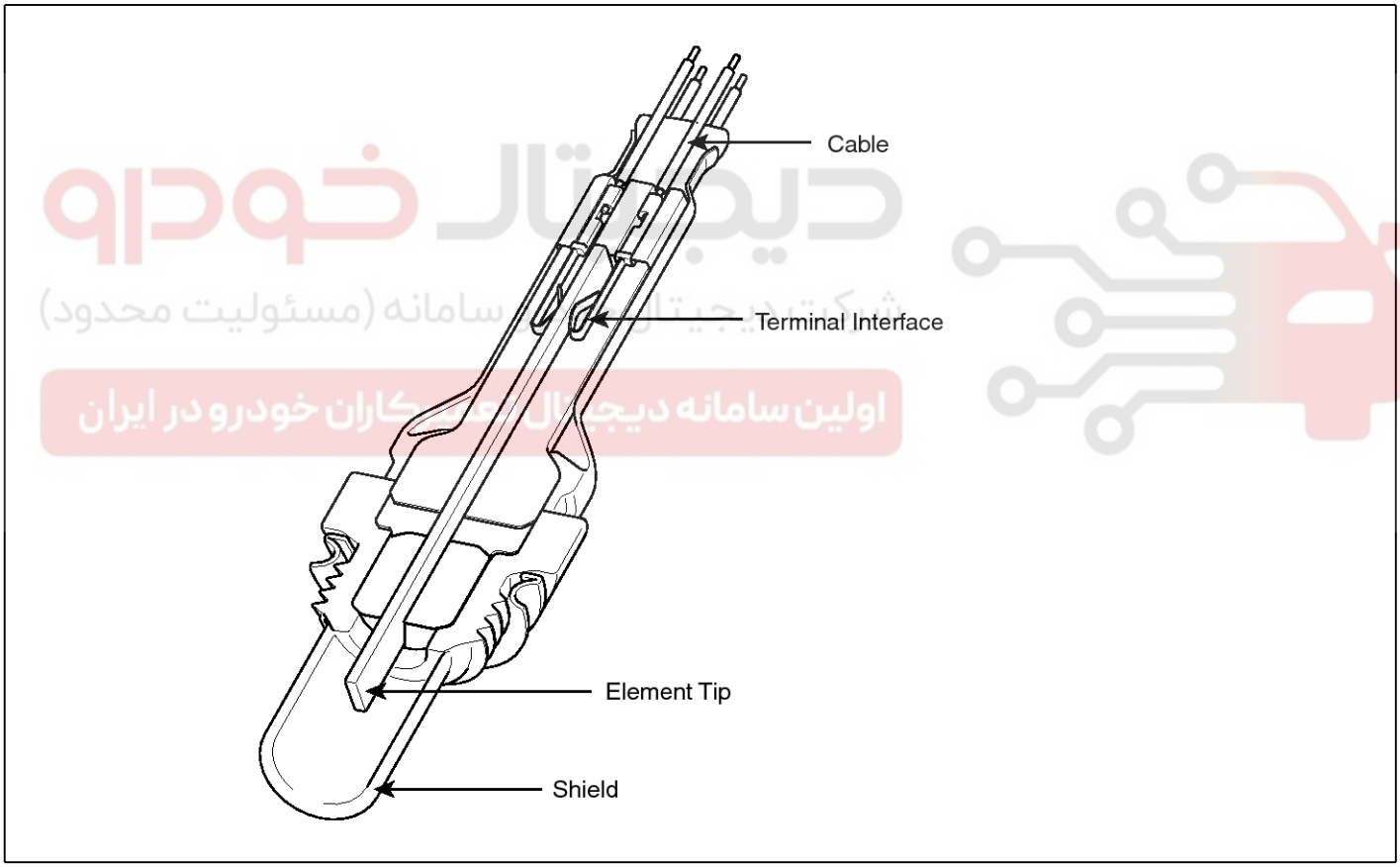
Inspection

Function And Operation Principle

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 PCM. 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 PCM duty signal. When the exhaust gas temperature is lower than the specified value, the heater warms the sensor tip.



EGRF247A



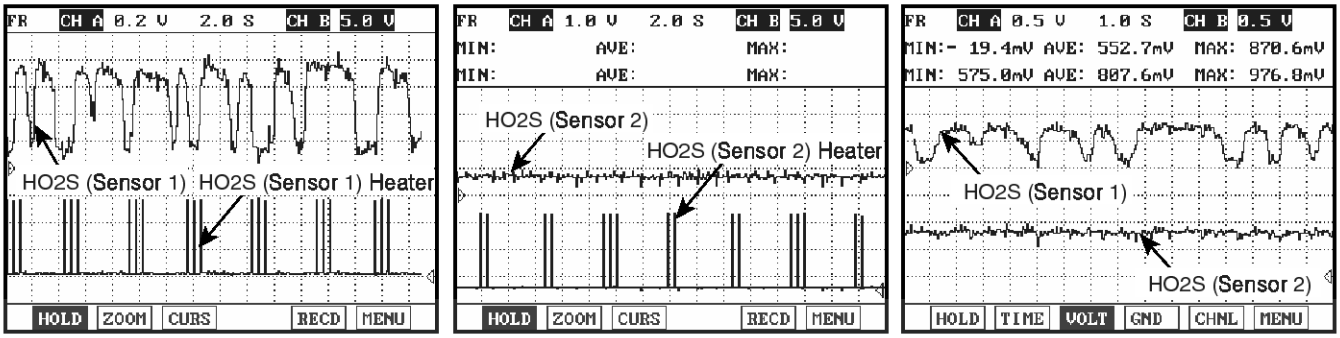
EGRF248A

Specification

A/F Ratio	Output Voltage (V)
RICH	0.75 ~ 1.00V
LEAN	0 ~ 0.12V

Item	Specification
Heater Resistance (Ω)	8.1 ~ 11.1Ω at 21℃ (69.8°F)

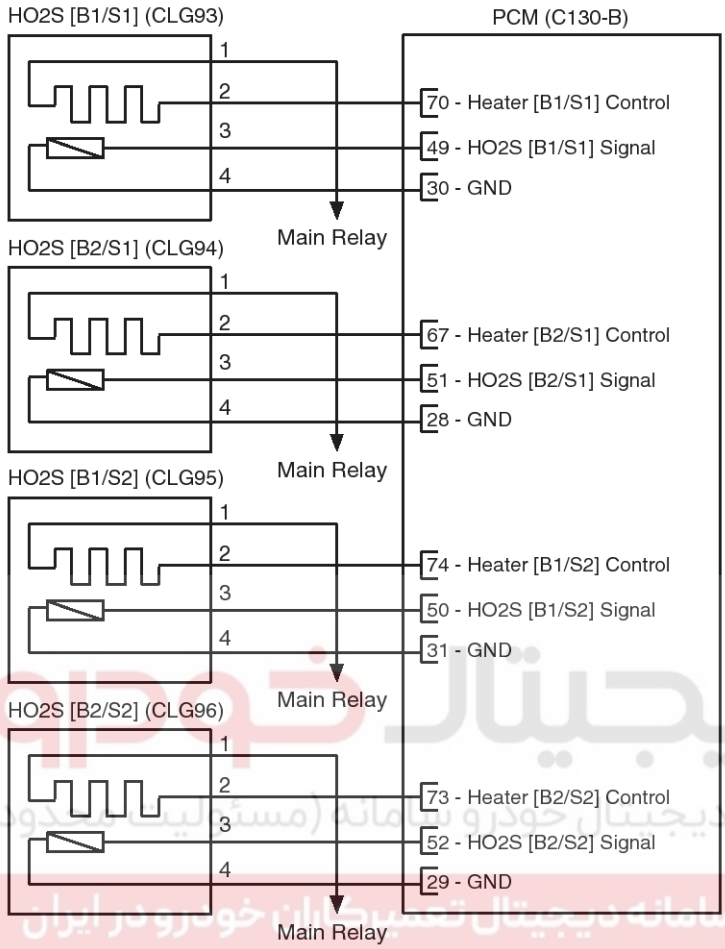
Waveform



EGRF249A

Schematic Diagram

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

HO2S [B1/S1]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	PCM CLG-B (70)	Heater [B1/S1] Control
3	PCM CLG-B (49)	HO2S [B1/S1] Signal
4	PCM CLG-B (30)	Sensor ground

HO2S [B2/S1]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	PCM CLG-B (67)	Heater [B2/S1] Control
3	PCM CLG-B (51)	HO2S [B2/S1] Signal
4	PCM CLG-B (28)	Sensor ground

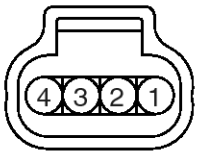
HO2S [B1/S2]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	PCM CLG-B (74)	Heater [B1/S2] Control
3	PCM CLG-B (50)	HO2S [B1/S2] Signal
4	PCM CLG-B (31)	Sensor ground

HO2S [B2/S2]

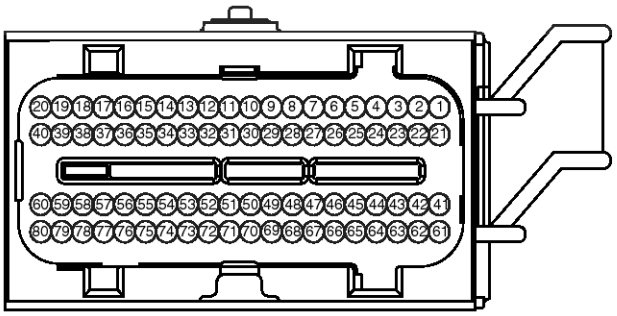
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	PCM CLG-B (73)	Heater [B2/S2] Control
3	PCM CLG-B (52)	HO2S [B2/S2] Signal
4	PCM CLG-B (29)	Sensor ground

[HARNESS CONNECTORS]



CLG93,94,95,96

HO2S [Bank 1/Sensor 1]
HO2S [Bank 2/Sensor 1]
HO2S [Bank 1/Sensor 2]
HO2S [Bank 2/Sensor 2]



CLG-B
PCM

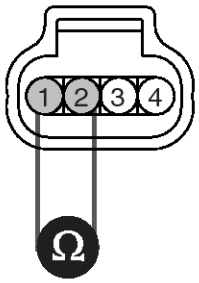
SENF17013L

Component Inspection

1. Check signal waveform of HO2S using a scantool.

Specification: Refer to "Waveform".

2. Disconnet the HO2S connector.
3. Measure resistance between HO2S heater terminals 1 and 2.



SENF17039L

4. Check that the resistance is within the specification.

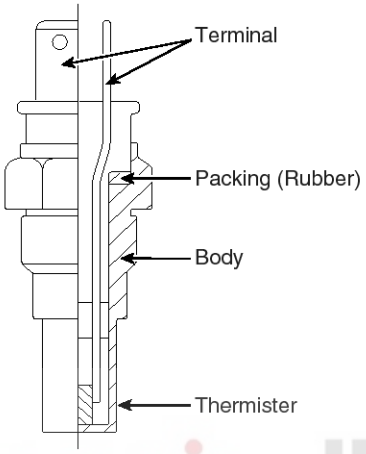
Specification: Refer to Specification.

CVVT Oil Temperature Sensor (OTS)

Inspection

Function And Operation Principle

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.



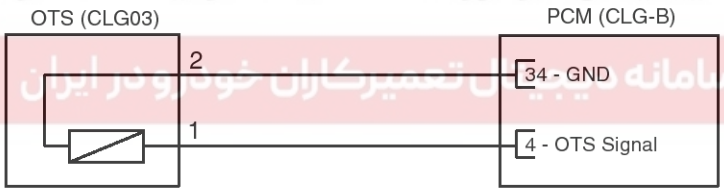
EGRF241A

Specification

Temperature		Resistance(kΩ)
℃	℉	
-20	-4	16.52kΩ
20	32	2.45kΩ
80	176	0.29kΩ

Schematic Diagram

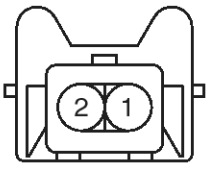
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

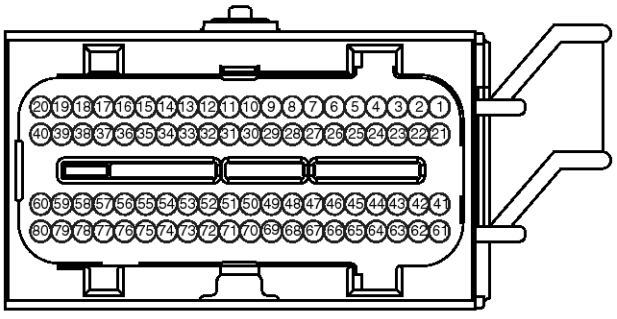
Terminal	Connected to	Function
1	PCM CLG-B (4)	OTS Signal
2	PCM CLG-B (34)	Sensor ground

[HARNESS CONNECTORS]



CLG03

OTS



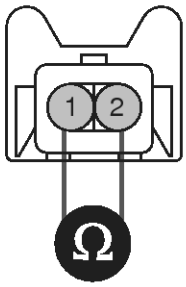
CLG-B

PCM

SENF17017L

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.



SMGF16127N

5. Check that the resistance is within the specification.

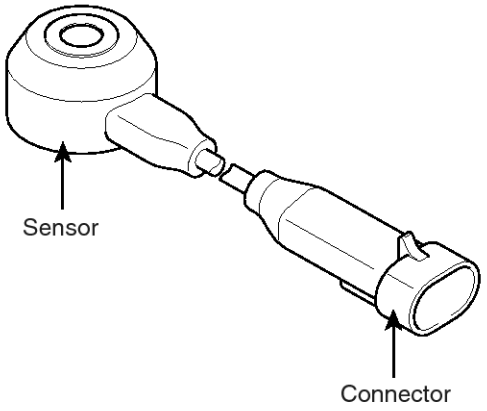
Specification: Refer to Specification.

Knock Sensor (KS)

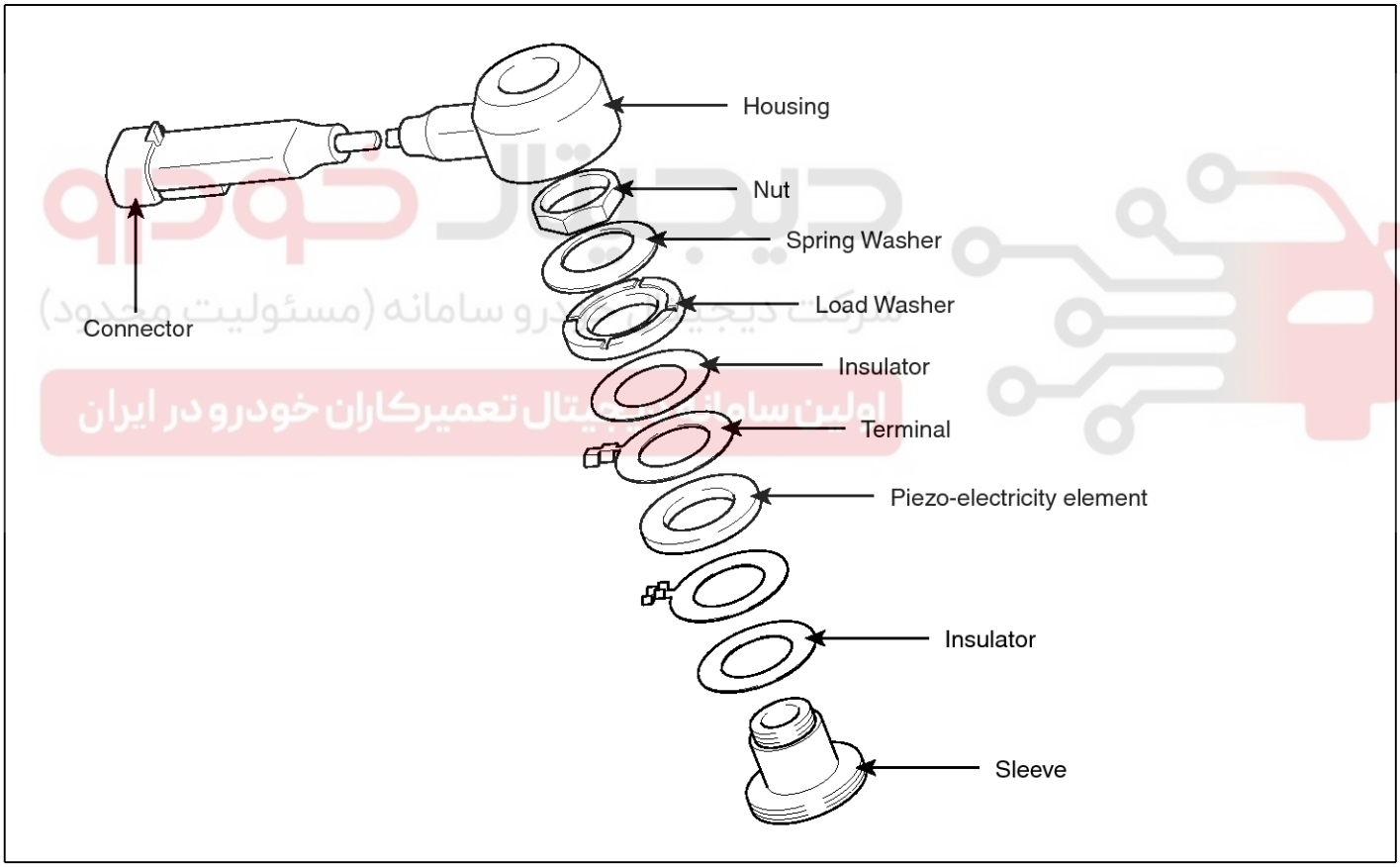
Inspection

Function And Operation Principle

Knocking is a phenomenon characterized by undesirable vibration and noise and can cause engine damage. Knock Sensor (KS) senses engine knocking and the two sensors are installed inside the V-valley of 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 PCM and the PCM retards the ignition timing. If the knocking disappears after retarding the ignition timing, the PCM will advance the ignition timing. This sequential control can improve engine power, torque and fuel economy.



EGRF251A



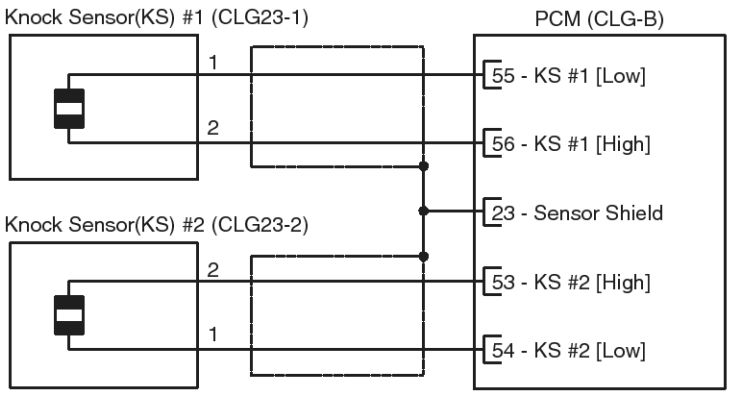
EGRF252A

Specification

Item	Specification
Capacitance (pF)	1,480 ~ 2,220pF

Schematic Diagram

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

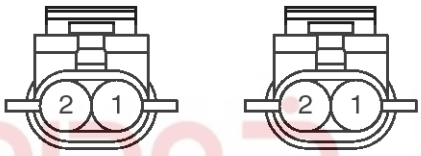
KS #1

Terminal	Connected to	Function
1	PCM CLG-B (55)	KS #1 [Low] signal
2	PCM CLG-B (56)	KS #1 [High] signal

KS #2

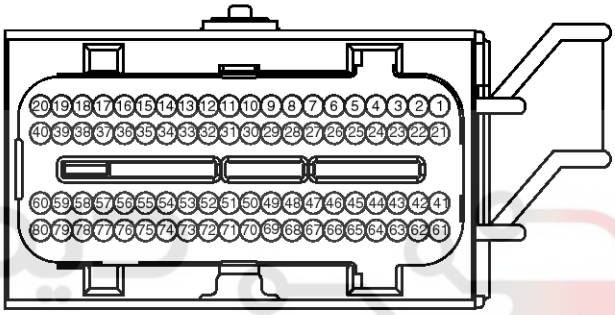
Terminal	Connected to	Function
1	PCM CLG-B (54)	KS #2 [Low] signal
2	PCM CLG-B (53)	KS #2 [High] signal

[HARNESS CONNECTORS]



CLG23-1
KS #1

CLG23-2
KS #2



CLG-B
PCM

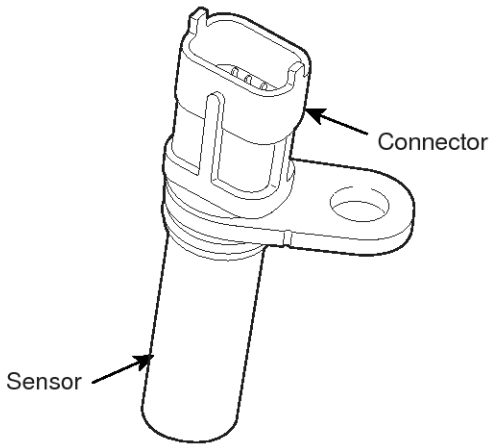
SENF17014L

Crankshaft Position Sensor (CKPS)

Inspection

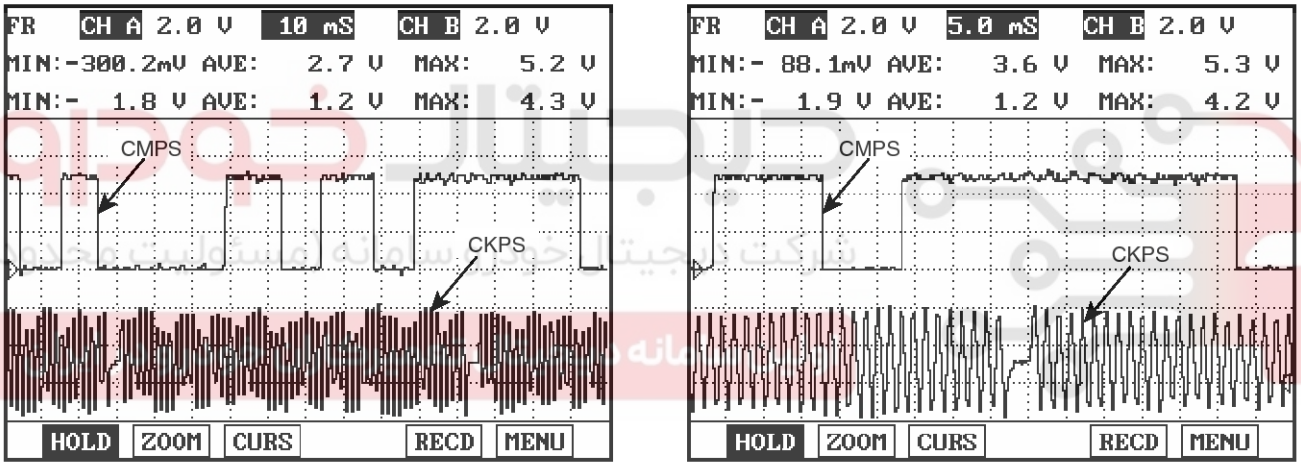
Function And Operation Principle

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).



UFBG245A

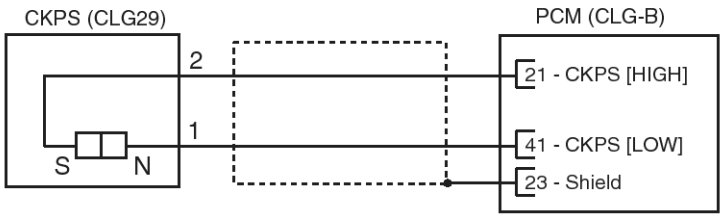
Waveform



KFCF102M

Schematic Diagram

[CIRCUIT DIAGRAM]



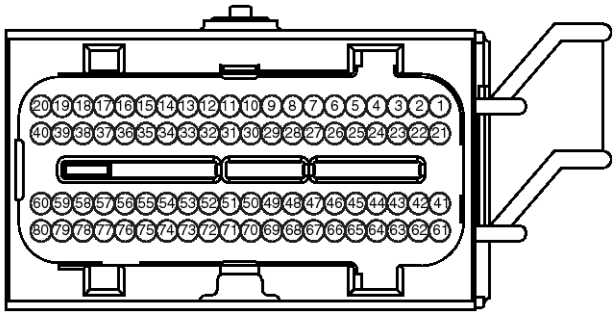
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM CLG-B (41)	CKPS [LOW] Signal
2	PCM CLG-B (21)	CKPS [HIGH] Signal

[HARNESS CONNECTORS]

CLG29

CKPS



CLG-B

PCM

SENF17012L

Component Inspection

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

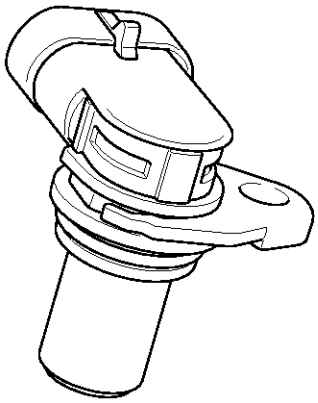
Specification : Refer to "Wave Form"

Camshaft Position Sensor (CMPS)

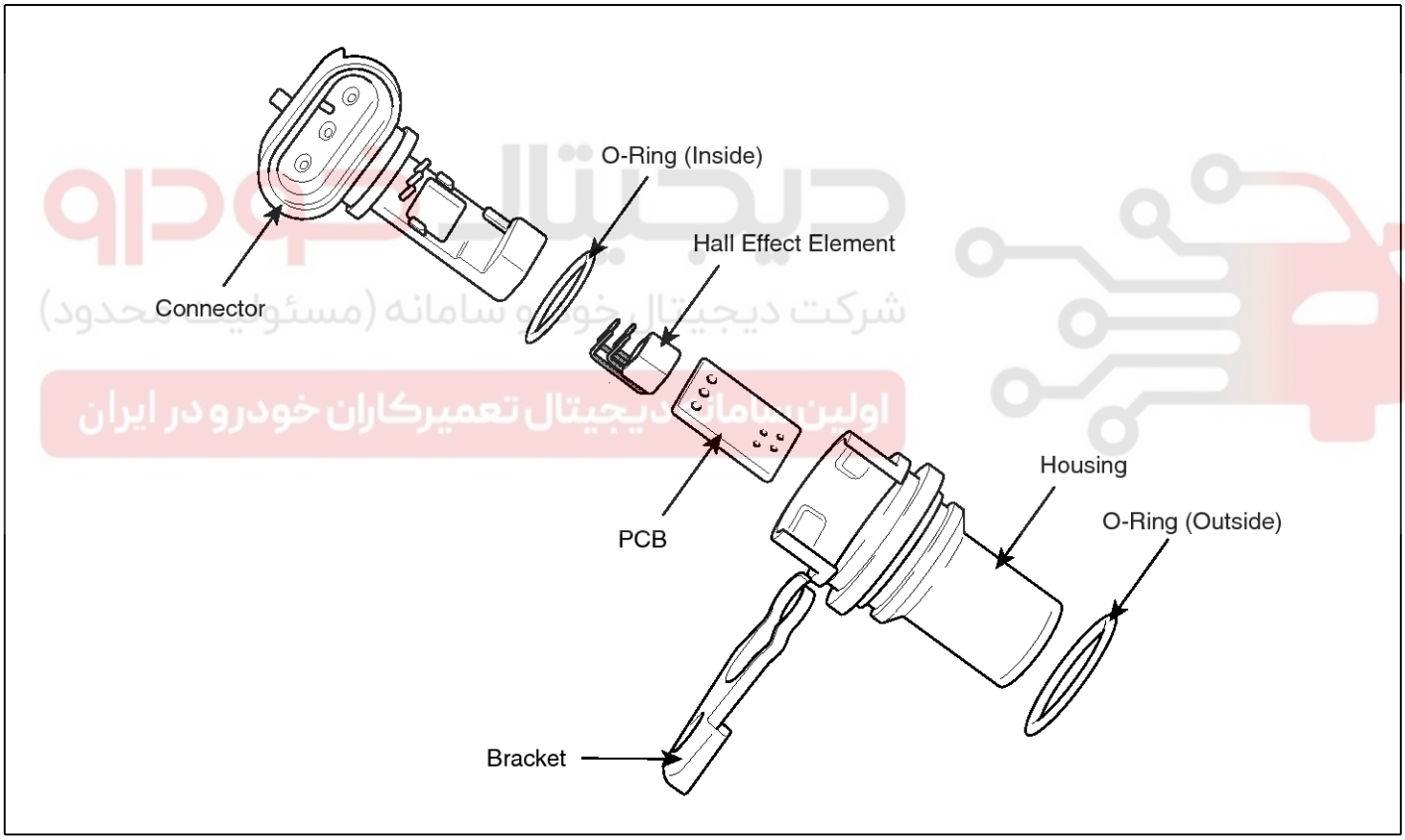
Inspection

Function And Operation Principle

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 two CMPS are installed on engine head cover of bank 1 and 2 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.

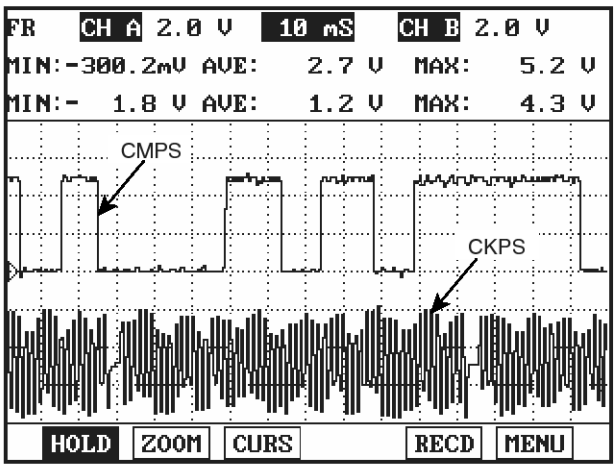


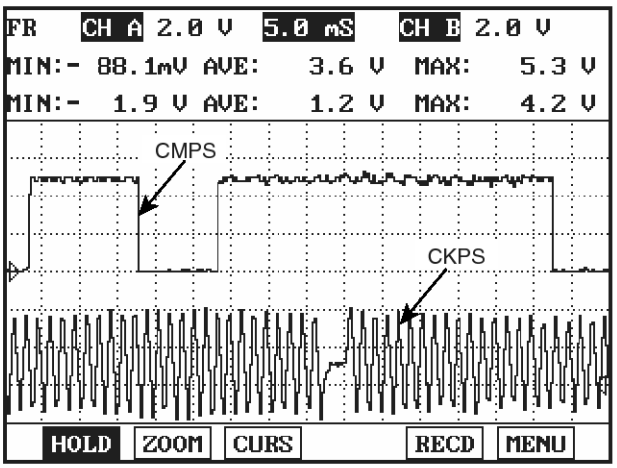
KFCF1022



EGRF243A

Waveform

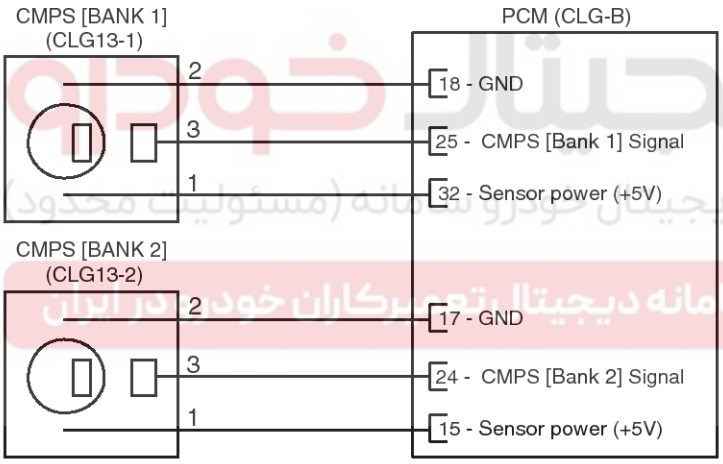




KFCF102M

Schematic Diagram

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

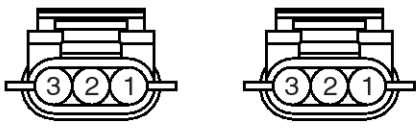
CMPS [BANK 1]

Terminal	Connected to	Function
1	PCM CLG-B (32)	Sensor power (+5V)
2	PCM CLG-B (18)	Sensor ground
3	PCM CLG-B (25)	CMPS [Bank 1] signal

CMPS [BANK 2]

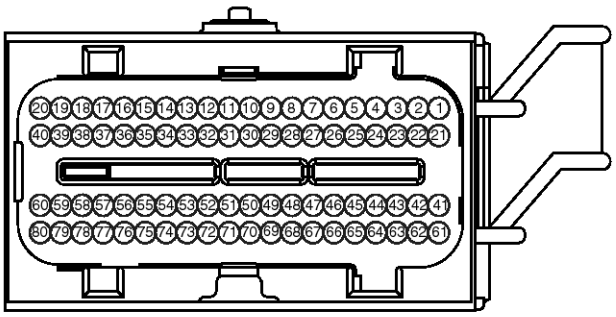
Terminal	Connected to	Function
1	PCM CLG-B (15)	Sensor power (+5V)
2	PCM CLG-B (17)	Sensor ground
3	PCM CLG-B (24)	CMPS [Bank 2] signal

[HARNESS CONNECTORS]



CLG13-1
CMPS [BANK 1]

CLG13-2
CMPS [BANK 2]



CLG-B
PCM

SENF17011L

Component Inspection

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

Specification : Refer to "Wave Form"

Injector

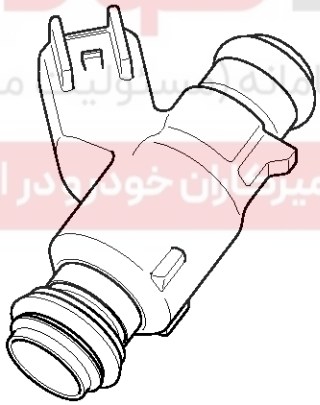
Inspection

Function And Operation Principle

Based on information from various sensors, the PCM 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 PCM controls each injector by grounding the control circuit. When the PCM energizes the injector by grounding the control circuit, the circuit voltage should be low (theoretically 0V) and the fuel is injected. When the PCM de-energizes the injector by opening control circuit, the fuel injector is closed and circuit voltage should momentarily peak.

WARNING

If an injector connector is disconnected for more than 46 seconds while the engine runs, the PCM will determine that the cylinder is misfiring and cut fuel supply. So be careful not to exceed 46 seconds. But the engine runs normally in 10 seconds after turning the ignition key off.



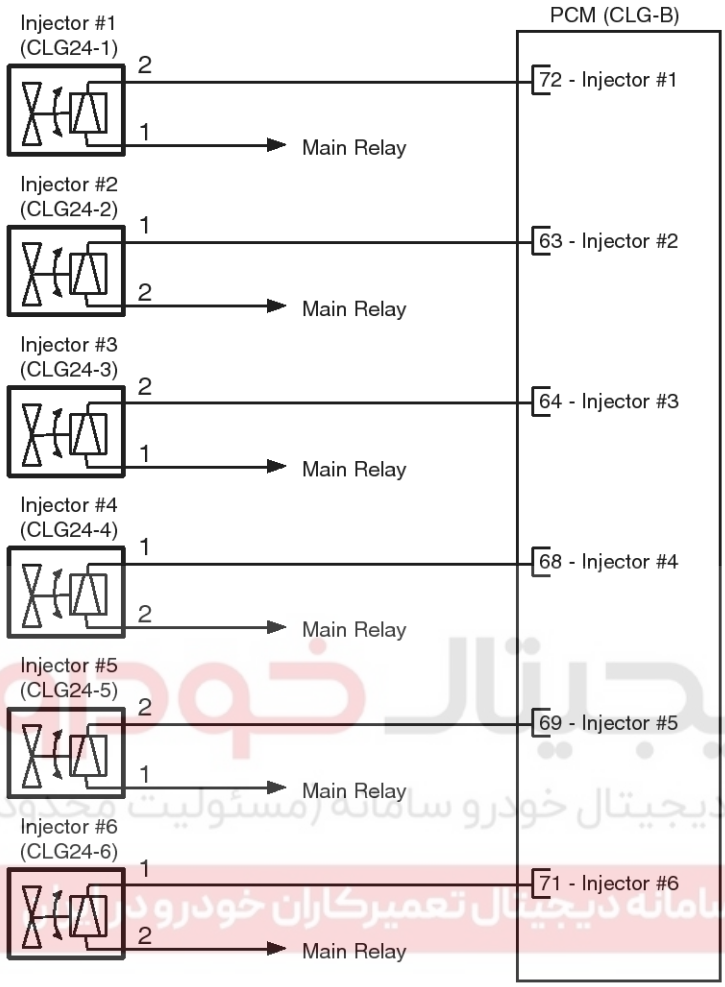
KFCF1026

Specification

Item	Specification
Coil Resistance (Ω)	11.4 ~ 12.6Ω at 20℃ (68˚F)

Schematic Diagram

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	PCM CLG-B (72)	Injector #1 control
2	Main Relay	Battery Voltage (B+)

Injector #2

Terminal	Connected to	Function
1	PCM CLG-B (63)	Injector #2 control
2	Main Relay	Battery Voltage (B+)

Injector #3

Terminal	Connected to	Function
1	PCM CLG-B (64)	Injector #3 control
2	Main Relay	Battery Voltage (B+)

Injector #4

Terminal	Connected to	Function
1	PCM CLG-B (68)	Injector #4 control
2	Main Relay	Battery Voltage (B+)

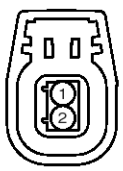
Injector #5

Terminal	Connected to	Function
1	PCM CLG-B (69)	Injector #5 control
2	Main Relay	Battery Voltage (B+)

Injector #6

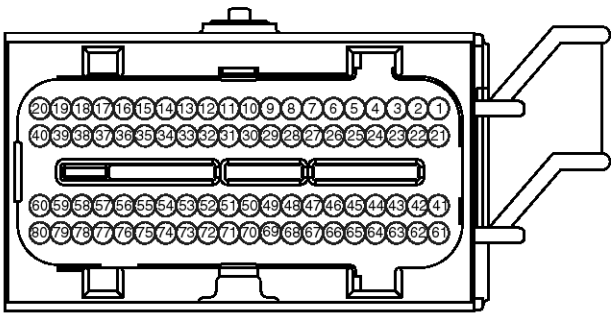
Terminal	Connected to	Function
1	PCM CLG-B (71)	Injector #6 control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTORS]



CLG24-1,2,3,4,5,6

Injector #1,2,3,4,5,6



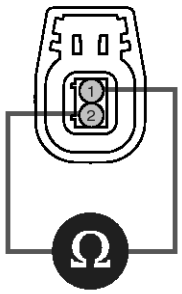
CLG-B

PCM

SENF17015L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect injector connector.
3. Measure resistance between injector terminals 1 and 2.



SENF17040L

4. Check that the resistance is within the specification.

Specification: Refer to Specification.

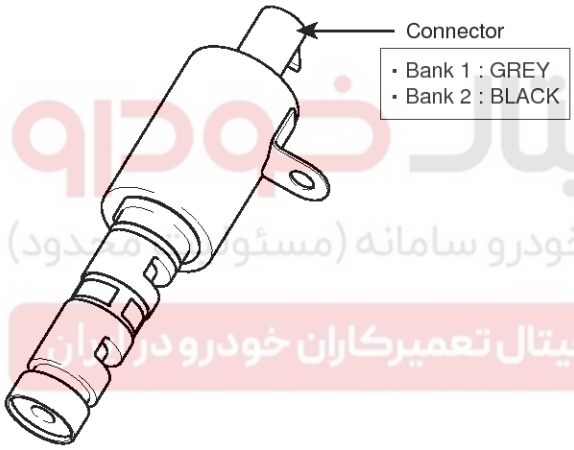
CVVT Oil Control Valve (OCV)

Inspection

Function And Operation Principle

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 each intake camshaft through PCM control of an oil control valve. This system uses two oil control valves, one on each bank. An Oil Temperature Sensor (OTS) is used to allow PCM 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

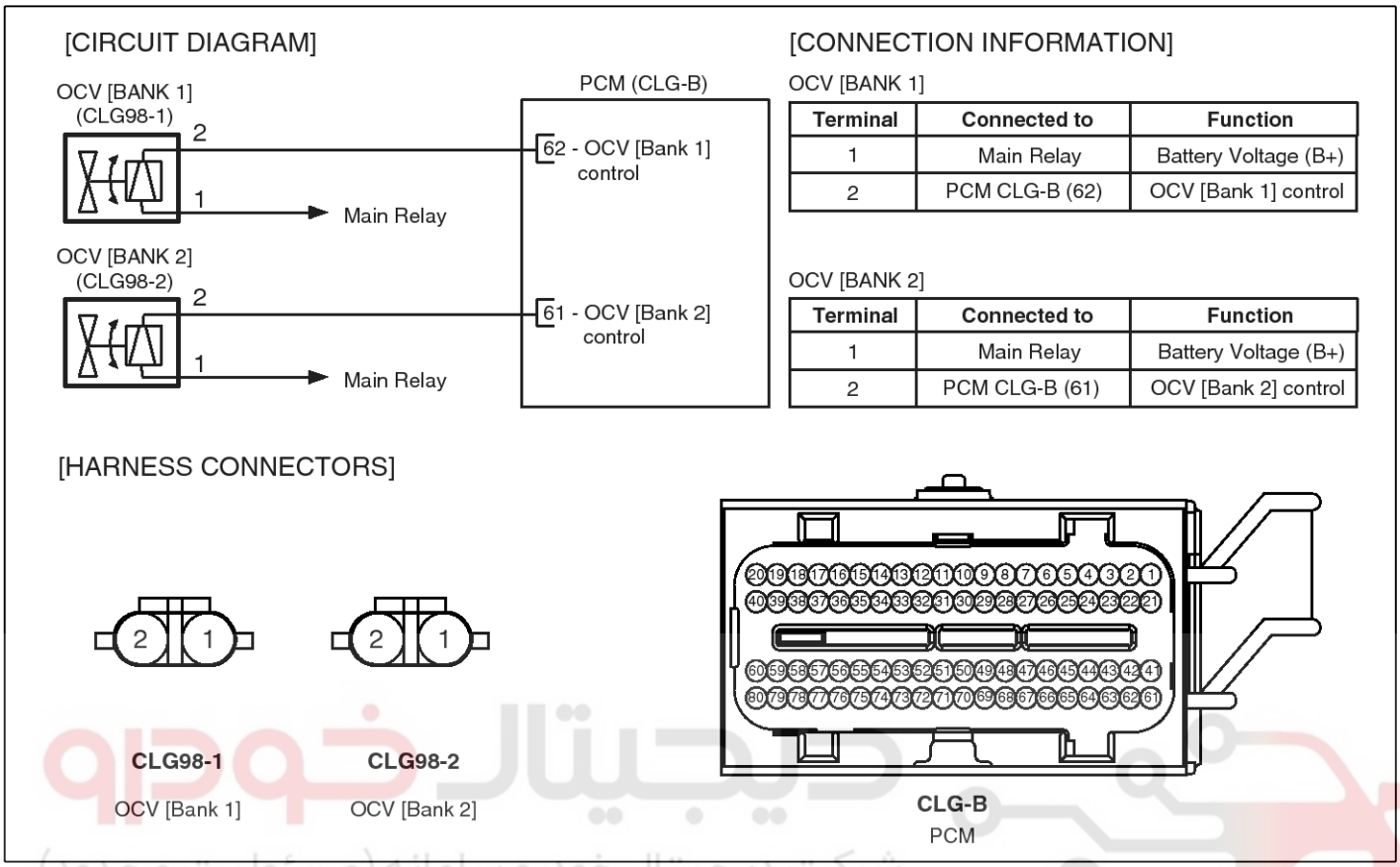


EFBF1027

Specification

Item	Specification
Coil Resistance (Ω)	6.7 ~ 7.7Ω at 20℃ (68˚F)

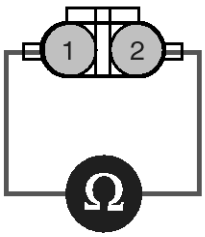
Schematic Diagram



SENF17016L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect OCV connector.
3. Measure resistance between OCV terminals 1 and 2.



SENF17041L

4. Check that the resistance is within the specification.

Specification: Refer to Specification.

Installation

⚠CAUTION

If the OCVs are installed incorrectly, the vehicle may be damaged.

So when installing them, ensure the OCV and harness connector colors match(Components and harness side).

[Bank and its color]

Bank	Component side	Harness side
Bank 1 (RH)	Grey	Grey
Bank 2 (LH)	Black	Black

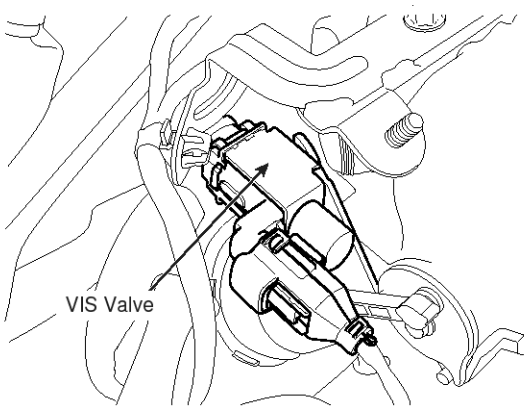
Variable Intake Solenoid (VIS) Valve

Inspection

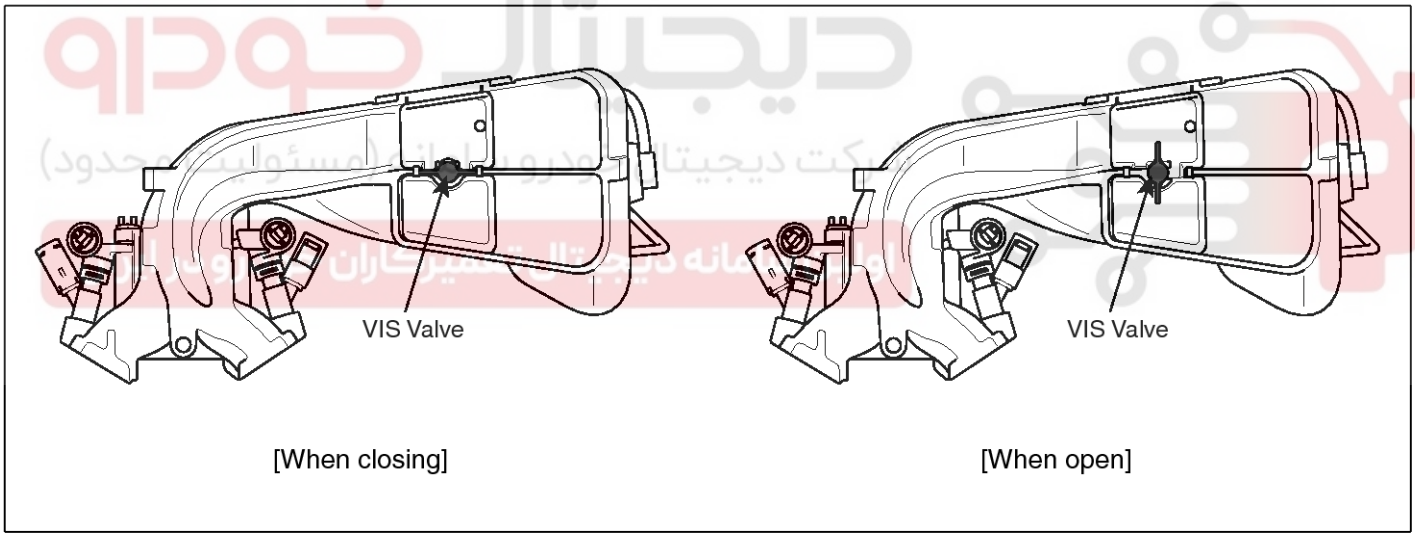
Function And Operation Principle

Variable Intake Solenoid (VIS) Valve is installed on the intake manifold and changes the effective length of the intake passenger to improve intake efficiency under varying engine conditions.

1. Low/Middle Speed: VIS Valve Close → Resonation Effect → Improving Intake Efficiency
2. High Speed: VIS Valve Open → Improving Intake Inertia Effect → Improving Intake Efficiency



SCMF16090N

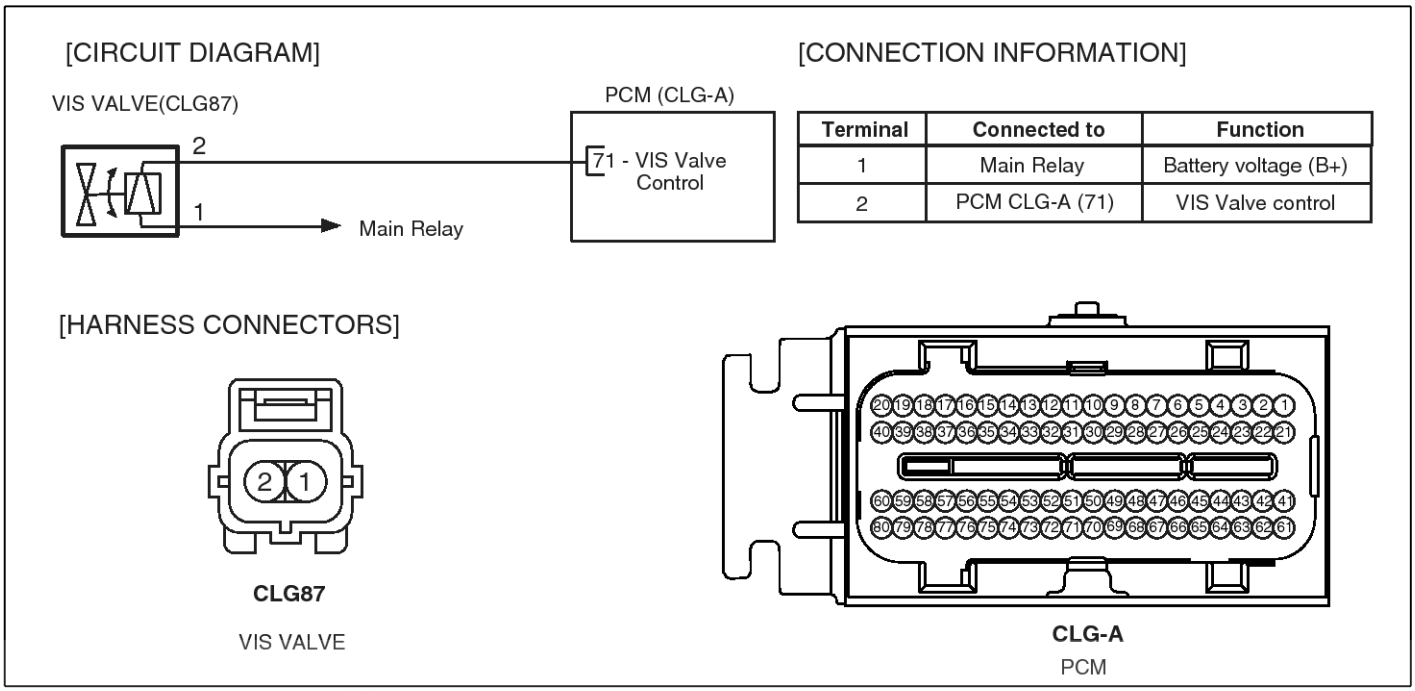


EGRF258A

Specification

Item	Specification
Coil Resistance (Ω)	30.0 ~ 35.0 Ω at 22℃ (71.6˚F)

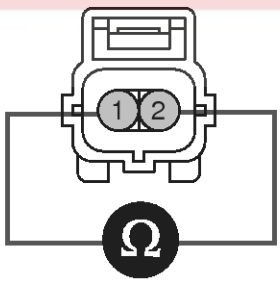
Schematic Diagram



SENF17019L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect VIS Valve connector.
3. Measure resistance between VIS Valve #1,2 terminals 1 and 2.



SMGF16108N

4. Check that the resistance is within the specification.

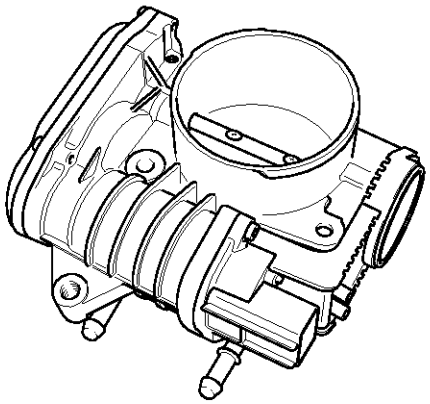
Specification: Refer to Specification.

Electronic Throttle System (ETS)

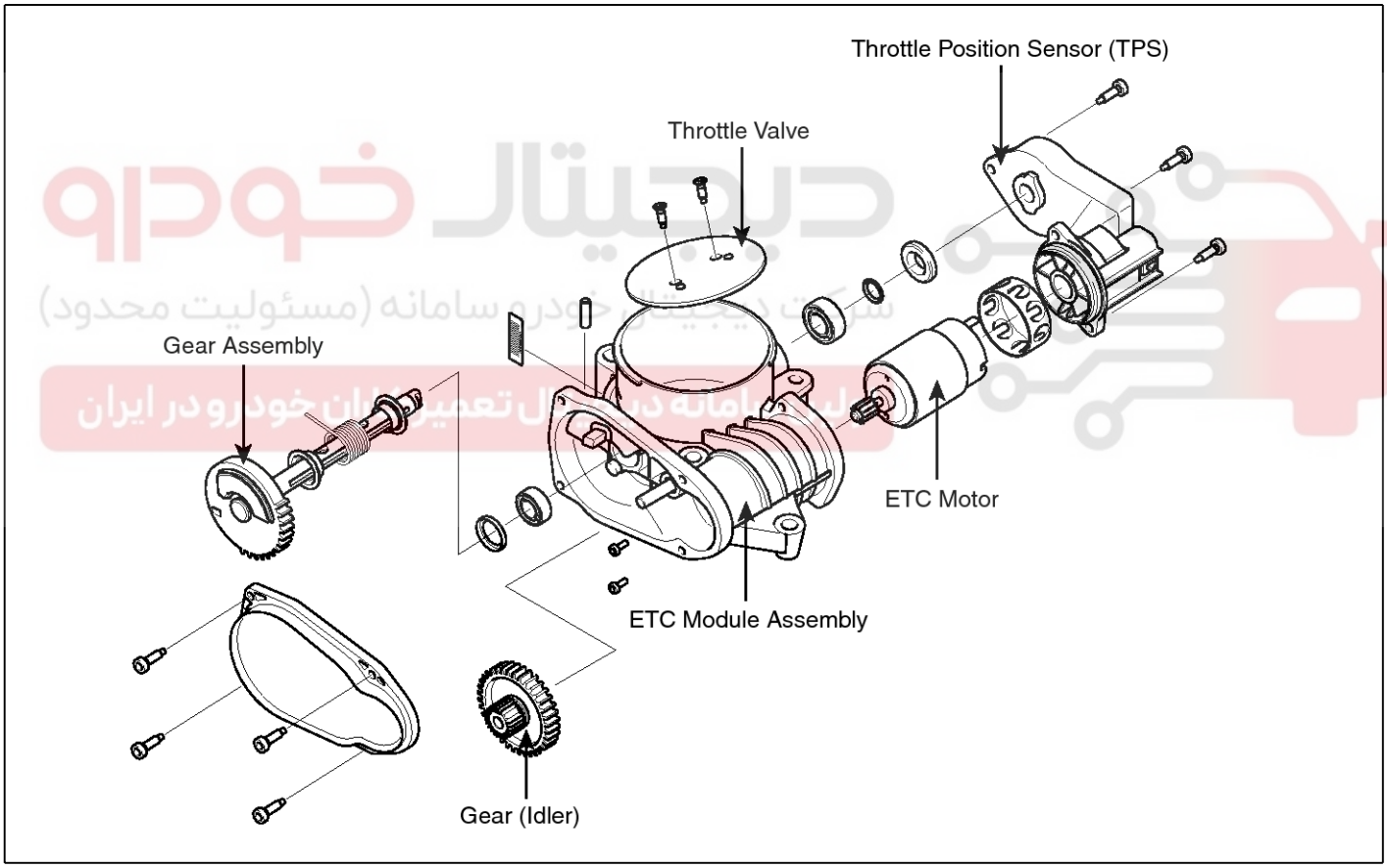
Inspection

Function And Operation Principle

ETC (Electronic Throttle Control) system is electronically controlled throttle device which controls the throttle valve. It consists of ETC motor, throttle body and throttle position sensor (TPS). A mechanical throttle control system receives a driver's intention via a wire cable between the accelerator and the throttle valve, while this ETC system uses the signal from the Accelerator Position Sensor (APS) installed on the accelerator pedal. After the PCM receives the APS signal and calculates the throttle opening angle, it activates the throttle valve by using the ETC motor. Additionally, it can handle cruise control function without any special devices.

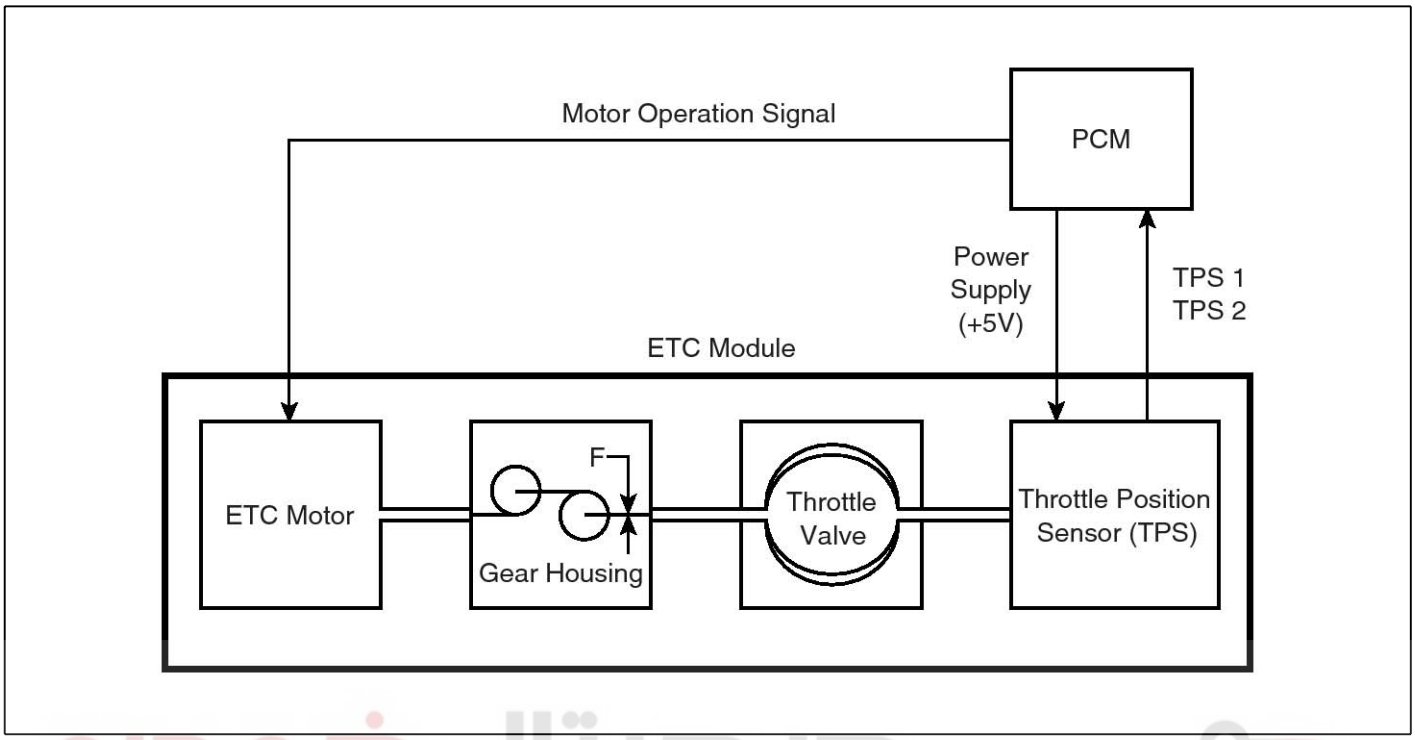


KFCF1020



EGRF233A

Components



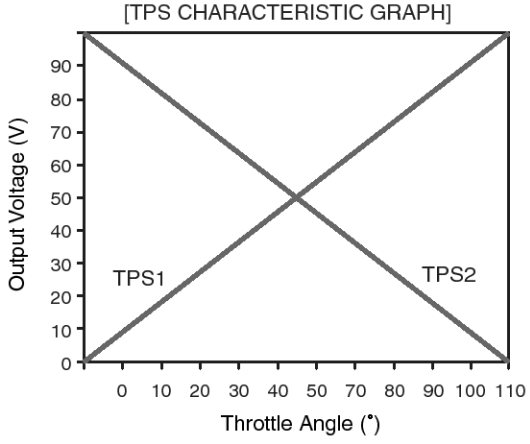
EGRF234A

Specification

[Throttle Position Sensor]

Item	Sensor Resistance
TPS1	4.0 ~ 6.0kΩ at 20℃ (68˚F)
TPS2	2.72 ~ 4.08kΩ at 20℃ (68˚F)

[TPS CHARACTERISTIC GRAPH]



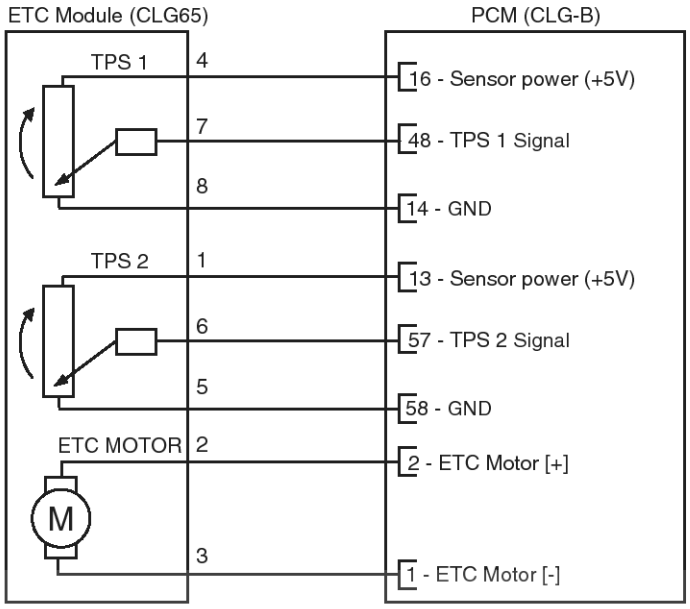
EGRF235A

[ETC Motor]

Item	Sensor Resistance
Coil Resistance (Ω)	1.275 ~ 1.725Ω at 20℃ (68˚F)

Schematic Diagram

[CIRCUIT DIAGRAM]



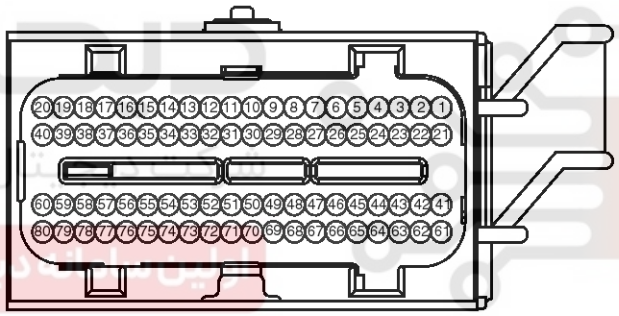
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM CLG-B (13)	TPS 2 Sensor power (+5V)
2	PCM CLG-B (2)	ETC Motor [+] Control
3	PCM CLG-B (1)	ETC Motor [-] Control
4	PCM CLG-B (16)	TPS 1 Sensor power (+5V)
5	PCM CLG-B (58)	TPS 2 Ground
6	PCM CLG-B (57)	TPS 2 Signal
7	PCM CLG-B (48)	TPS 1 Signal
8	PCM CLG-B (14)	TPS 1 Ground

[HARNESS CONNECTORS]

CLG65

ETC MODULE



CLG-B

PCM

SENF17007L

Fail-safe Mode

Mode	Description	Symptom	Possible Cause
MODE 1	FORCED ENGINE SHUTDOWN	Engine stop	• ETC system can't proceed reliable algorithm procedure - Fatal PCM internal programming error - Faulty intake system or throttle body
MODE 2	FORCED IDLE & POWER MANAGEMENT	Forced idle state controlled by fuel quantity regulation and ignition timing adjustment	• ETC system can't control engine power via throttle device • Disabled throttle control or broken throttle position information
MODE 3	FORCED IDLE	Forced idle state and no response for accelerator activation	• No information about the accelerator position - Malfuctioning APS 1 and 2, faulty A/D converter or internal controller
MODE 4	LIMIT PERFORMANCE & POWER MANAGEMENT	Engine power is determined by accelerator position and idle power requirement (Limited vehicle running)	• ETC system can't securely control engine power
MODE 5	LIMIT PERFORMANCE	1. Engine power varies with accelerator position, but driver perceives lack of engine power. 2. MIL ON (Normal vehicle running)	• Not reliable accelerator position signal or bad maximum power generation - Faulty APS, ignition voltage or internal controller
MODE 6	NORMAL	Normal	

Component Inspection

1. Connect a scan tool to the Diagnoisis Link Connector (DLC).
2. Start engine and check output voltages of TPS 1 and 2 at C.T and W.O.T.

Condition	Output Voltage (V)	
	TPS 1	TPS 2
C.T	0.25 ~ 0.9V	Min. 4.0V
W.O.T	Min. 4.0V	0.25 ~ 0.9V

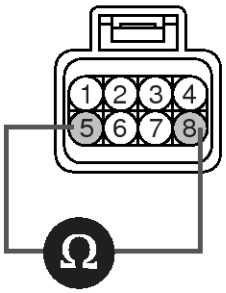
3. Turn ignition switch OFF and disconnect the scantool from the DLC.
4. Disconnect ETC module connector and measure resistance between ETC module terminals 4 and 1 (TPS 1).
5. Measure resistance beSpecification: Refer to SPECIFICATION.tween ETC module terminals 7 and 6 (TPS 2).

SMGF16101N

Specification: Refer to Specification.

ETC Motor

1. Disconnect ETC module connector and measure resistance between ETC module terminals 5 and 8.



SMGF16102N

Specification: Refer to Specification.

ETC System Initialization

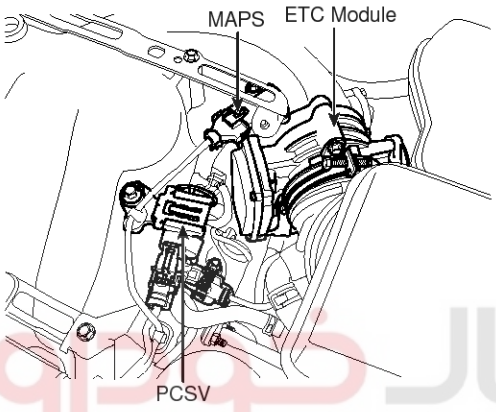
1. Erase DTC(s) memorized in PCM with a scan tool.
2. Turn ignition switch off and wait for about 10 seconds.
3. Turn ignition switch on for more then 1 second. (At this time, the PCM records initial position of ETC motor on its EEPROM).

Purge Control Solenoid Valve (PCSV)

Inspection

Function And Operation Principle

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.



SCMF16040N

Specification

Item	Specification
Coil Resistance (Ω)	19.0 ~ 22.0Ω at 20℃ (68˚F)

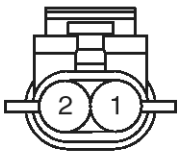
Schematic Diagram

[CIRCUIT DIAGRAM]

[CONNECTION INFORMATION]

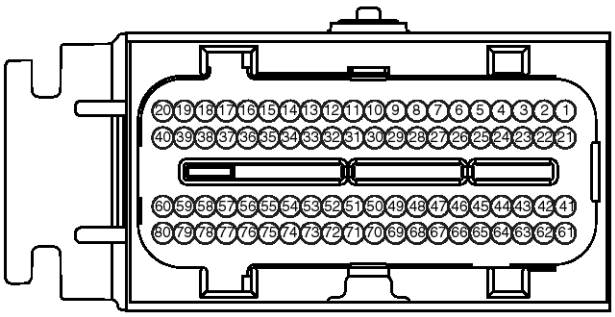
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	PCM CLG-A (78)	PCSV Control

[HARNESS CONNECTORS]



CLG21

PCSV



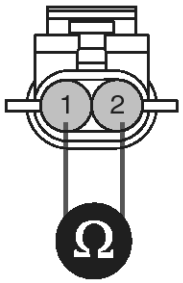
CLG-A

PCM

SENF17018L

Component Inspection

1. Turn ignition switch OFF.
2. Disconnect PCSV connector.
3. Measure resistance between PCSV terminals 1 and 2.



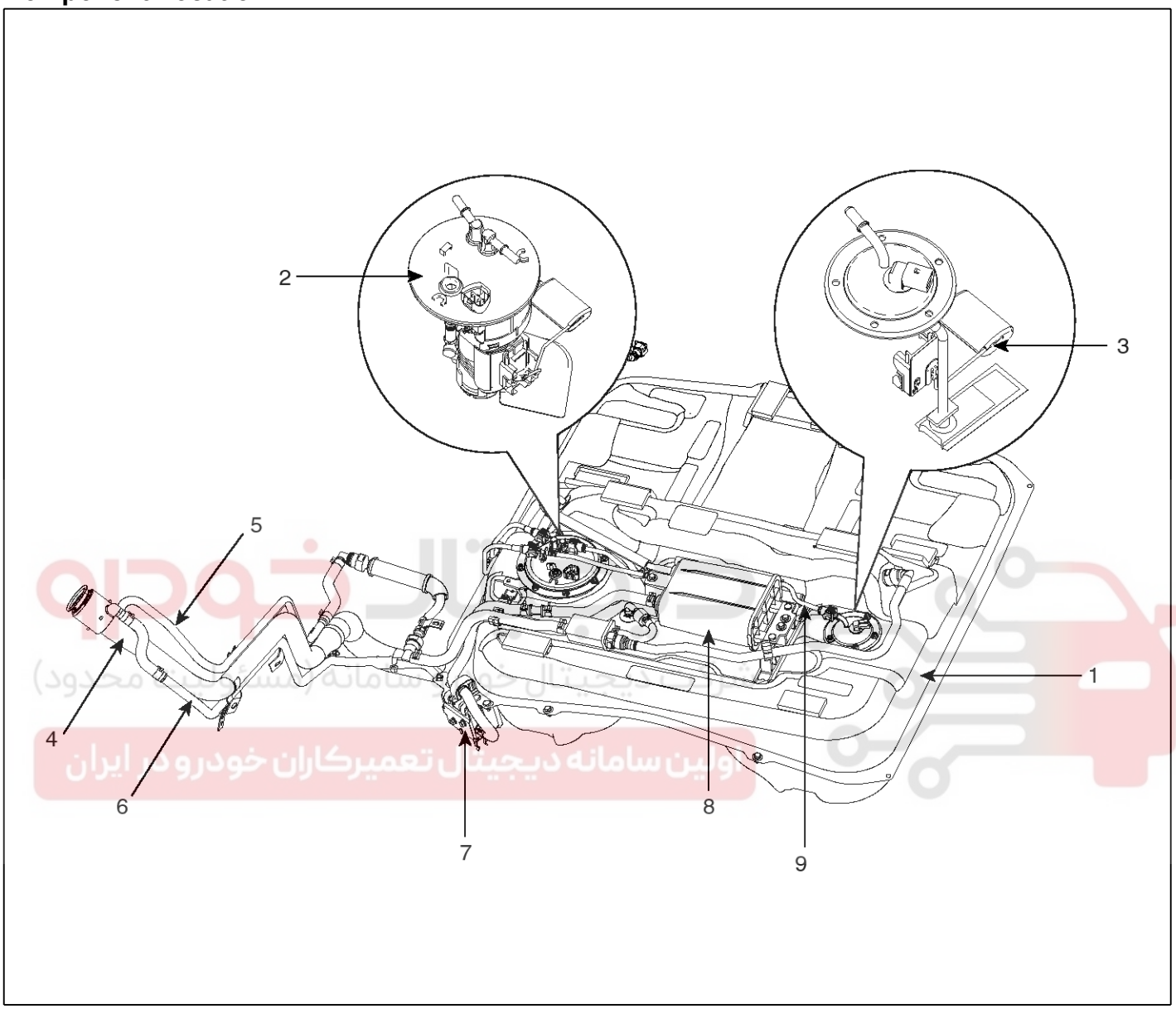
SENF17042L

4. Check that the resistance is within the specification.

Specification: Refer to Specification.

Fuel Delivery System

Component Location



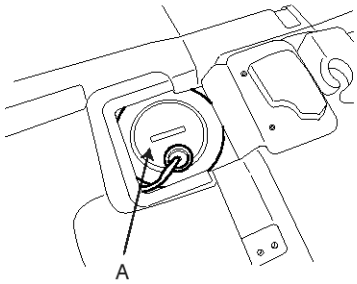
SENF19002L

1. Fuel Tank
2. Fuel Pump
   (includig Fuel Filter and Fuel Pressure Regulator)
3. Sub Fuel Sender
4. Fuel Filler Pipe
5. Leveling Pipe
6. Ventilation Pipe
7. Air Filter
8. Canister
9. Suction Tube

Fuel Pressure Test

1. PREPARING

1. Remove the 2nd seat (Refer to "BD" group in this SERVICE MANUAL).
2. Open the carpet for fuel pump and remove the service cover for fuel pump (A).

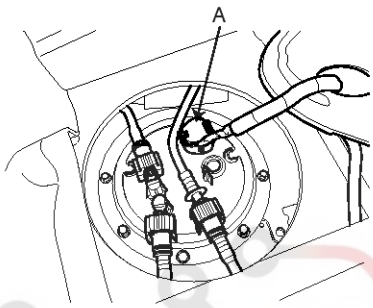


2. RELEASE THE INTERNAL PRESSURE

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.



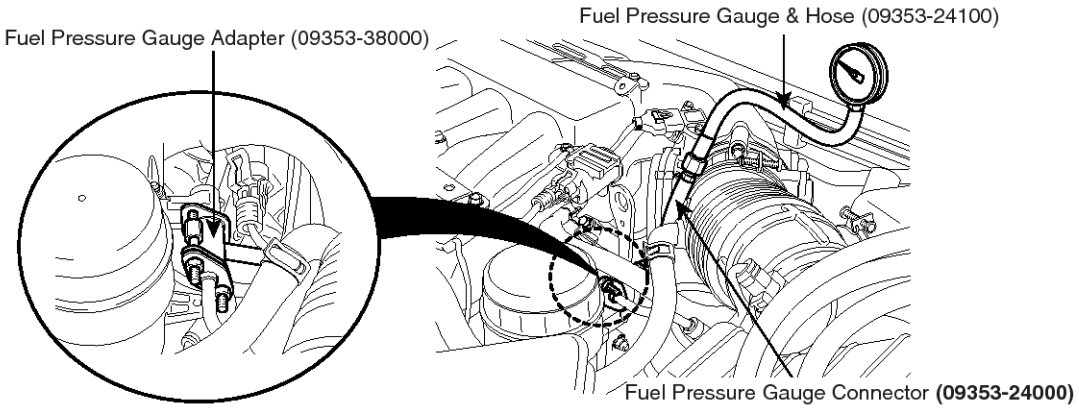
3. INSTALL THE SPECIAL SERVICE TOOL (SST) FOR MEASURING THE FUEL PRESSURE

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).



SENF17026L

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: 375 ~ 385 kpa (3.82 ~ 3.92 kgf/㎠, 54.3 ~ 55.8 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

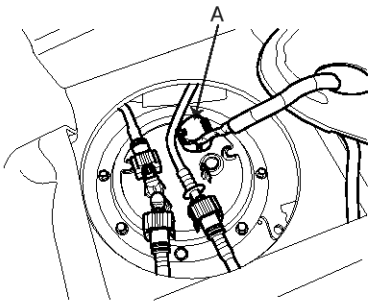
LGLG003A

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

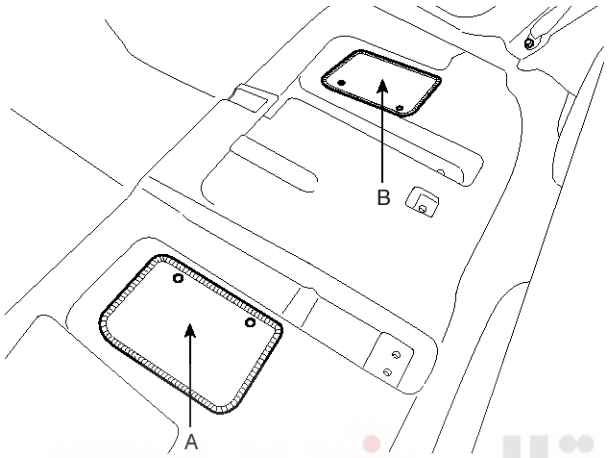
1. Connect the battery negative (-) terminal.
2. Apply battery voltage to the fuel pump terminal and activate the fuel pump. With fuel pressure applied, check that there is no fuel leakage from the fuel pressure gauge or connection part.
3. If the vehicle is normal, connect the fuel pump connector.

SENF17027L

Fuel Tank

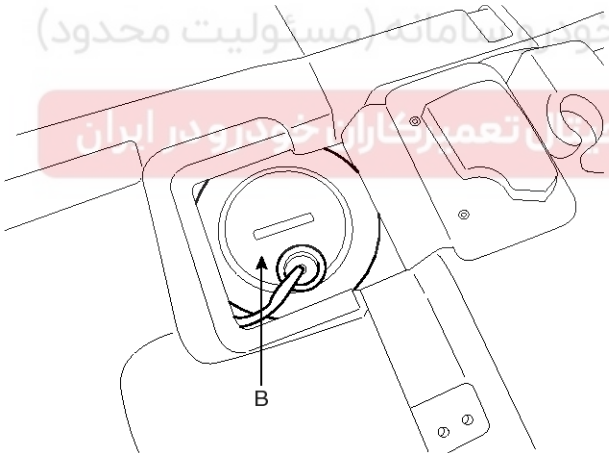
Removal

1. Preparation
   1) Remove the 2nd seat (Refer to "BD" group in this SERVICE MANUAL).
   2) Open the carpet for fuel pump (A) and for sub fuel sender (B).



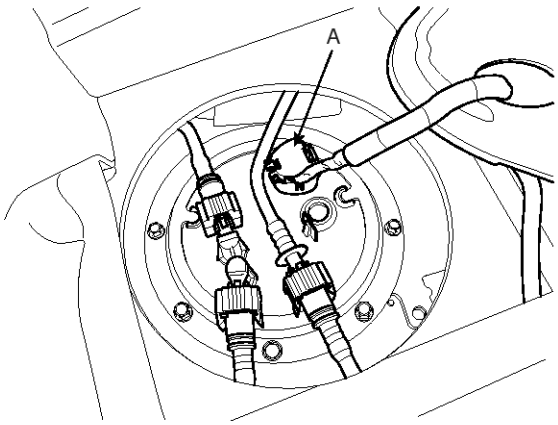
SENFL7176D

   3) Remove the service cover for fuel pump (B).



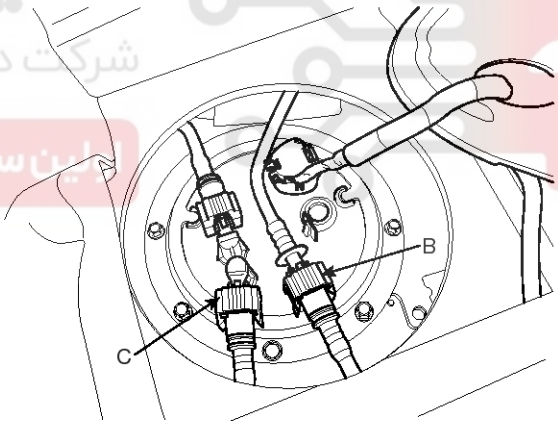
SENF17044L

   4) Disconnect the fuel pump connector (A).



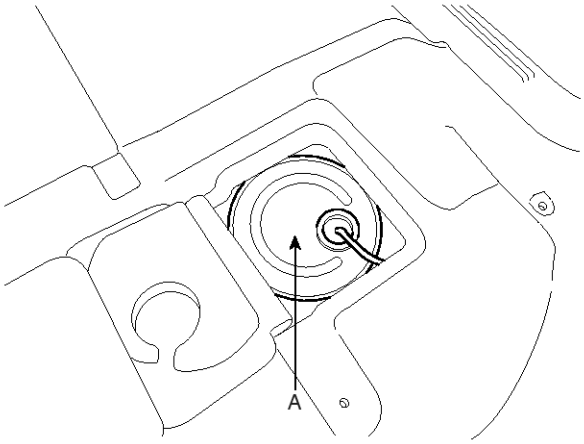
SENF17028L

   5) Start the engine and wait until fuel in fuel line is exhausted.
   6) After engine stops, turn the ignition switch off.
2. Disconnect the fuel return tube quick - connector (B) and the fuel tube feed quick-connector (C).



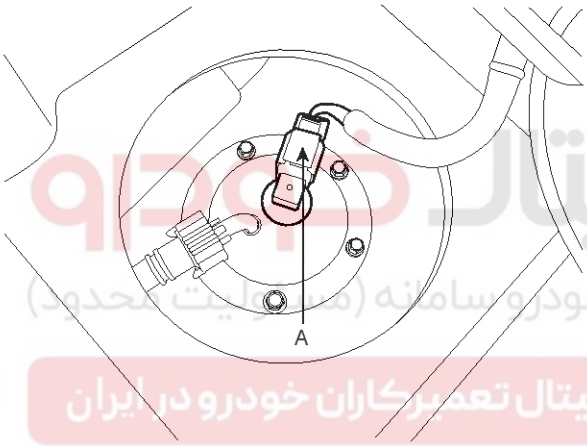
SENF17045L

3. Open the service cover for sub fuel sender (A).



SENFL7179D

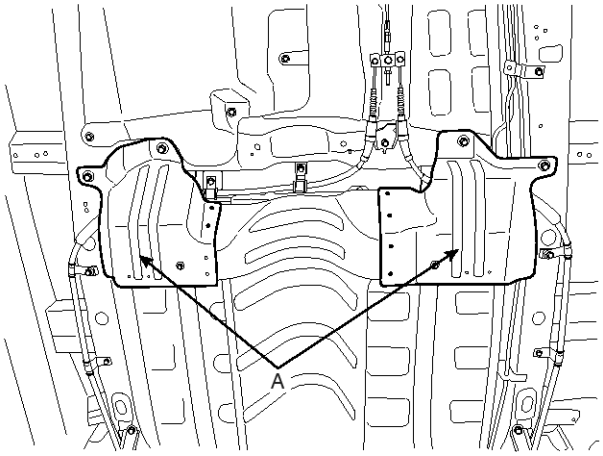
4. Disconnect the sub fuel sender connector (A).



SENFL7180D

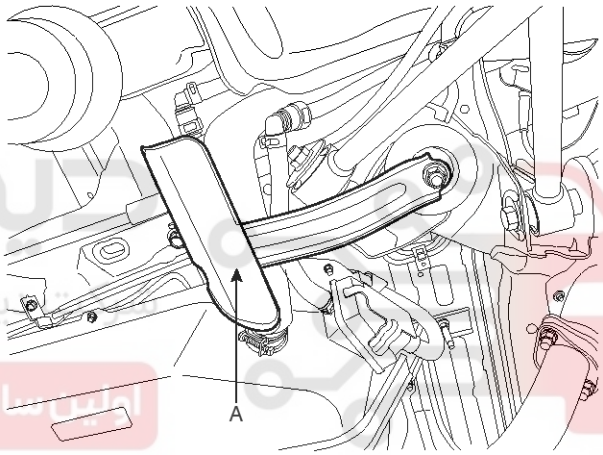
5. Lift the vehicle and remove the muffler assembly and the propeller shaft (4WD) (Refer to "EM" and "DS" groups in this SERVICE MANUAL).
6. Support the fuel tank with a jack.

7. Remove the fuel tank cover (A).



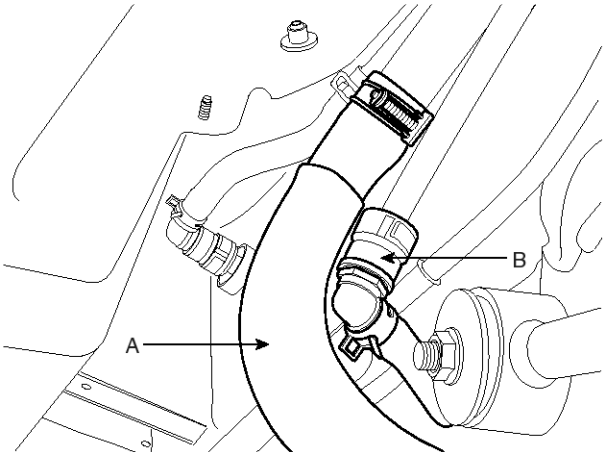
SENFL7181D

8. Remove the bracket (A).



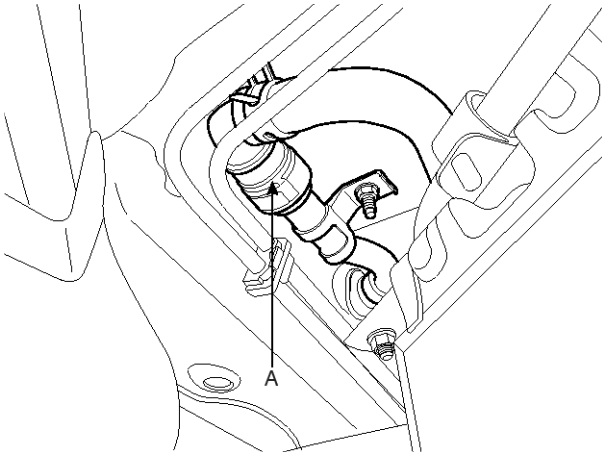
SENFL7182D

9. Disconnect the fuel filler hose (A), the ventilation tube quick-connector (B).



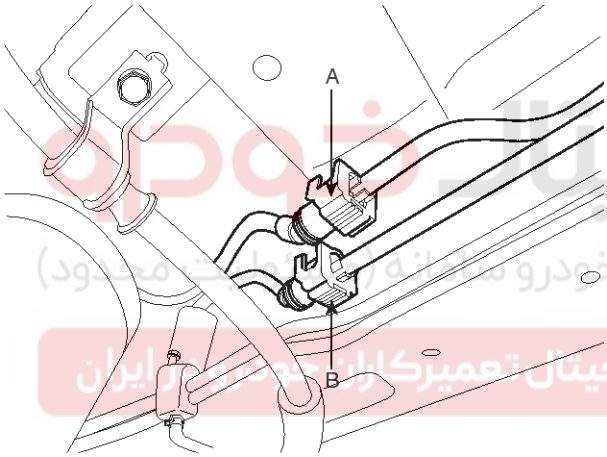
SENFL7183D

10. Disconnect the leveling hose quick-connector (A).



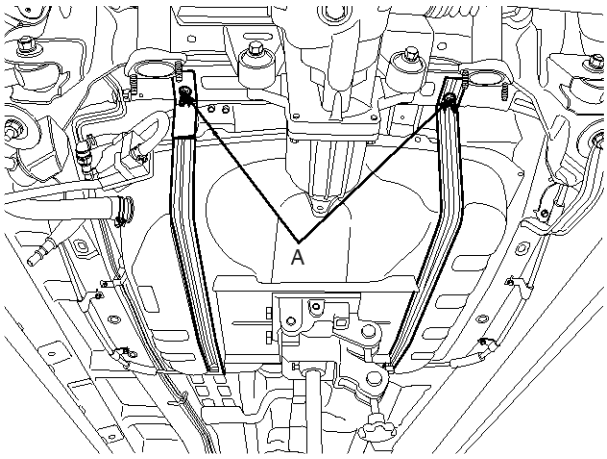
SENFL7184D

11. Disconnect the fuel feed tube quick-connector (A) and the fuel return tube quick-connector (B).



SENFL7185D

12. Unscrew the fuel tank bank mounting nuts (A) and remove the fuel tank from the vehicle.



SENFL7186D

Installation

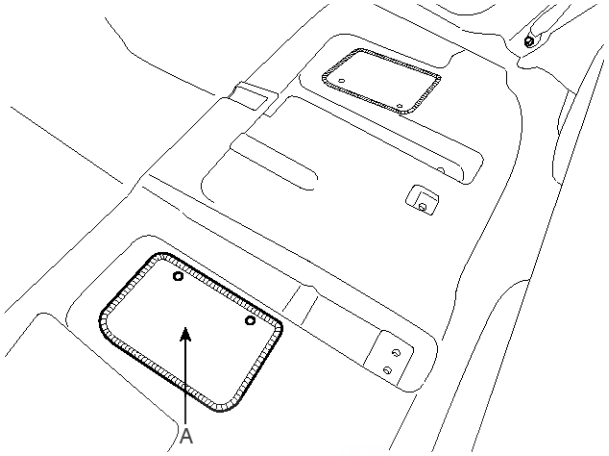
1. Install the fuel tank in according to the reverse order of "REMOVAL" procedure.

Fuel tank band mounting nuts:
39.2 ~ 53.9N·m (4.0 ~ 5.5kgf·m, 28.9 ~ 39.8lbf·ft)

Fuel Pump

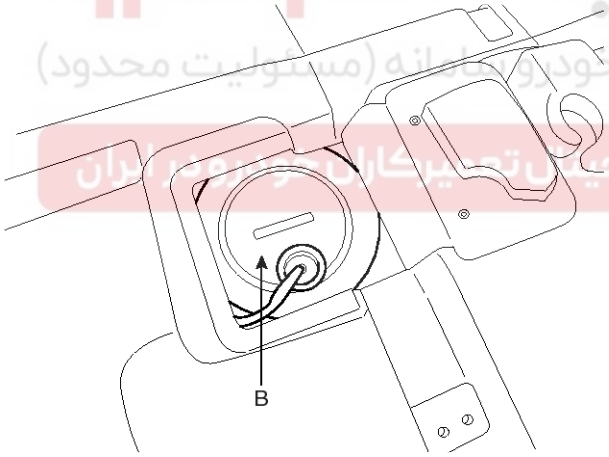
Removal

1. Preparation
   1) Remove the 2nd seat (Refer to "BD" group in this SERVICE MANUAL).
   2) Open the carpet for fuel pump (A).



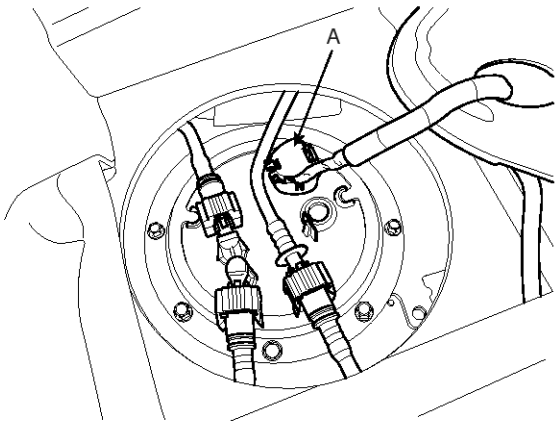
SENFL7187D

   3) Remove the service cover for fuel pump (B).



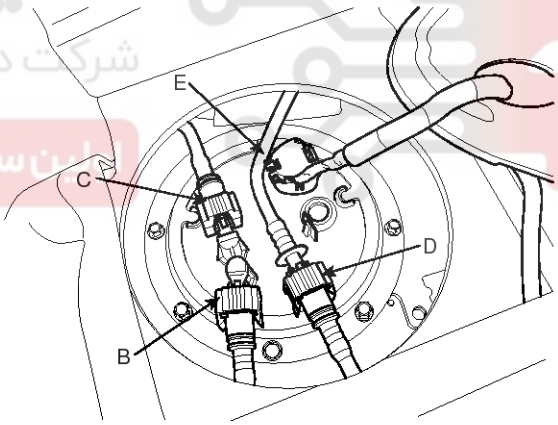
SENF17044L

   4) Disconnect the fuel pump connector (A).



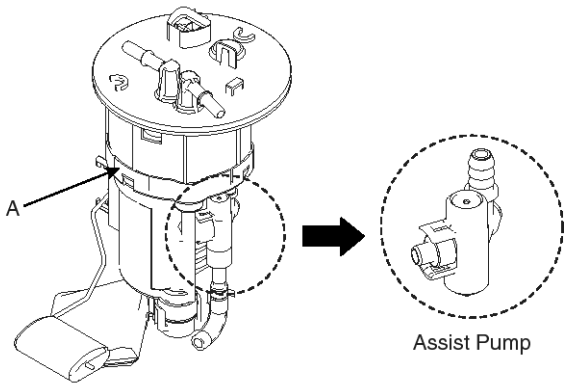
SENF17028L

   5) Start the engine and wait until fuel in fuel line is exhausted.
   6) After engine stops, turn the ignition switch off.
2. Disconnect the fuel feed tube quick-connector (B) and the suction tube quick-connector (C).



SENF17038L

3. Disconnect the return tube quick-connector (D) and the return tube (E) at the upper part of the fuel pump.
4. Remove the fuel pump (A) after unfastening the fuel pump installation bolts.



SENF17029L

Installation

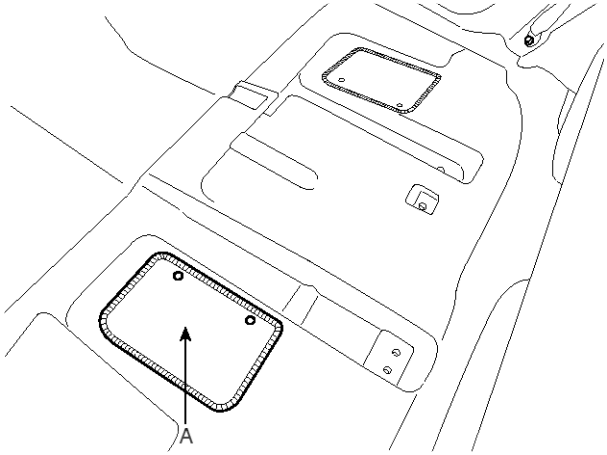
1. Install the fuel pump in according to the reverse order of "REMOVAL" procedure.

Fuel pump installation bolts :
2.0 ~ 2.7 N.m (0.2 ~ 0.3 kgf.m, 1.4 ~ 2.2 lbf.ft)

Fuel Filter

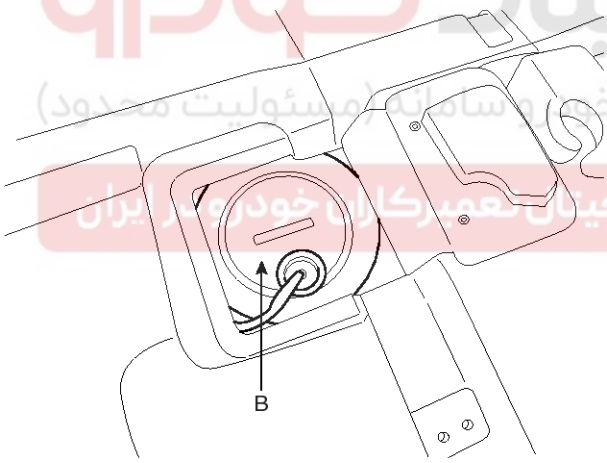
Replacement

1. Preparation
   1) Remove the 2nd seat (Driver side).
   2) Open the carpet for fuel pump (A).



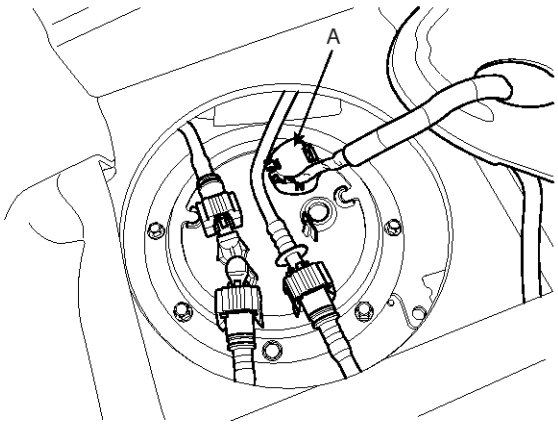
SENFL7187D

   3) Remove the service cover for fuel pump (B).



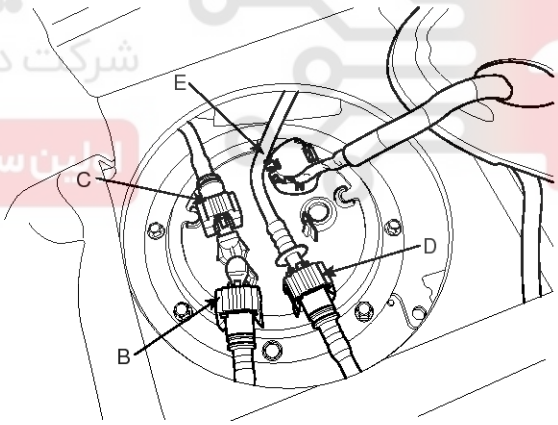
SENF17044L

   4) Disconnect the fuel pump connector (A).



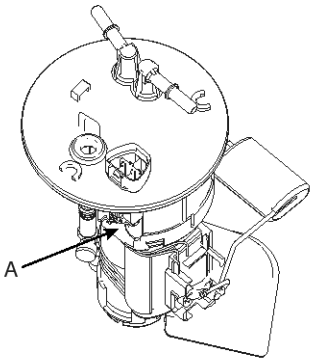
SENF17028L

   5) Start the engine and wait until fuel in fuel line is exhausted.
   6) After engine stops, turn the ignition switch off.
2. Disconnect the fuel feed tube quick-connector (B) and the suction tube quick connector (C).



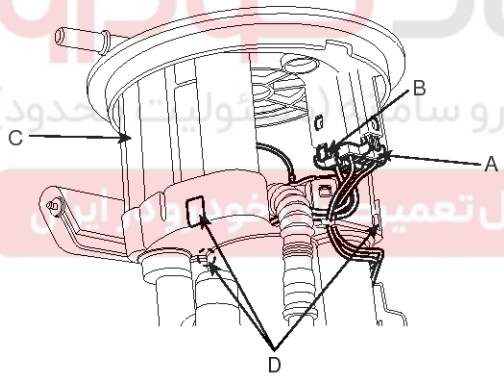
SENF17038L

3. Disconnect the return tube quick-connector (D) and the return tube (E) at the upper part of the fuel pump.
4. Remove the fuel pump (A) after unfastening the fuel pump installation bolts.



SENF17032L

5. Disconnect the fuel sender wiring connector (A) and the electric pump wiring connector (B).

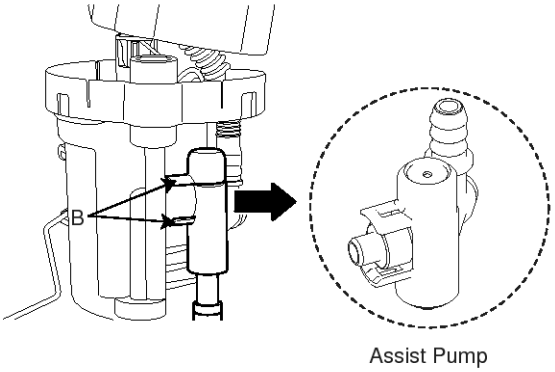


SENF17033L

6. Separate the flange assembly (C) from the fuel pump assembly with three fixing hooks (D) disengaged.

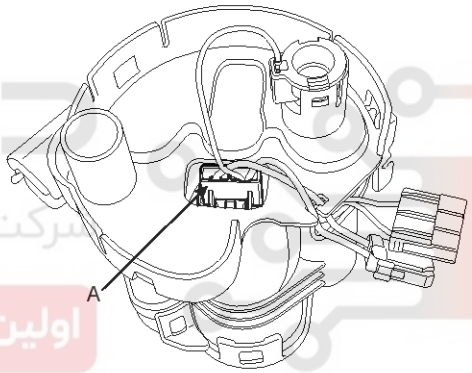
⚠CAUTION
Be careful not to break the fixing hooks. It may be broken if excessively raised.

7. Separate the assist pump with hose (A) with two fixing hooks (B) disengaged.



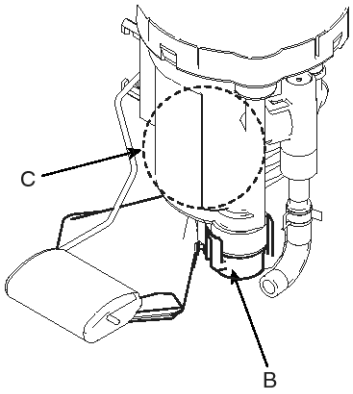
SENF17034L

8. Disconnect the connector (A) on the electric pump.



SENF17035L

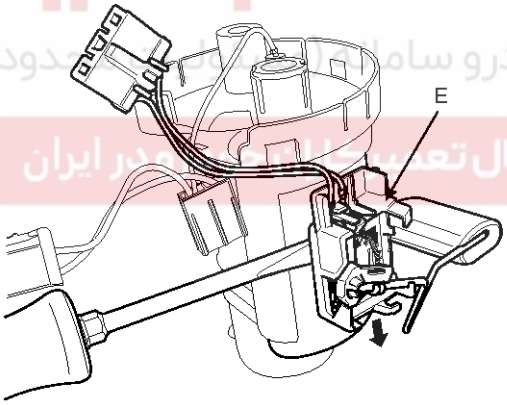
9. Separate the pre-filter (B) and the electric pump (C) from the fuel filter assembly with the three fixing hooks raised.



SENF17049L

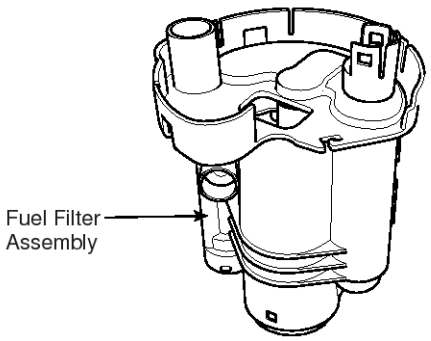
⚠CAUTION
Be careful not to break the fixing hooks. It may be broken if excessively raised.

10. Separate the fuel sender (E) and the electric pump connector after pressing the hook with a driver.



SENF17048L

11. Replace new fuel filter assembly in the reverse of removal.

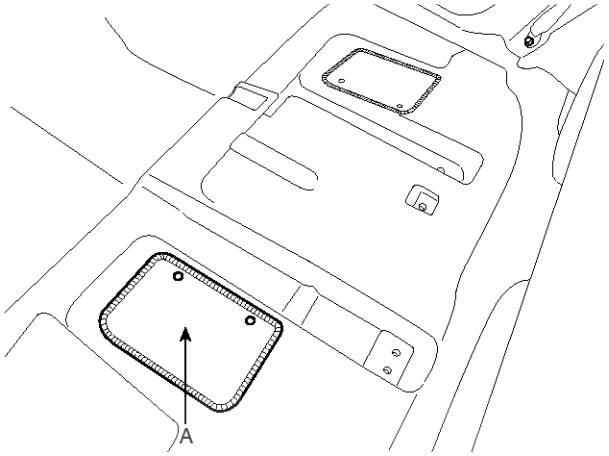


SENF17037L

Sub Fuel Sender

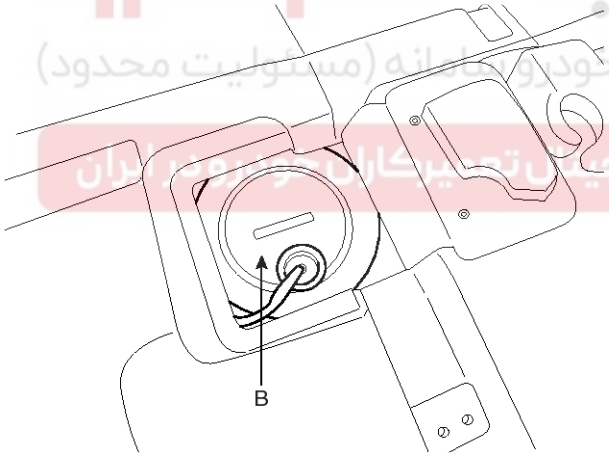
Removal

1. Preparation
   1) Remove the 2nd seat (Refer to "BD" group in this SERVICE MANUAL).
   2) Open the carpet for fuel pump (A).



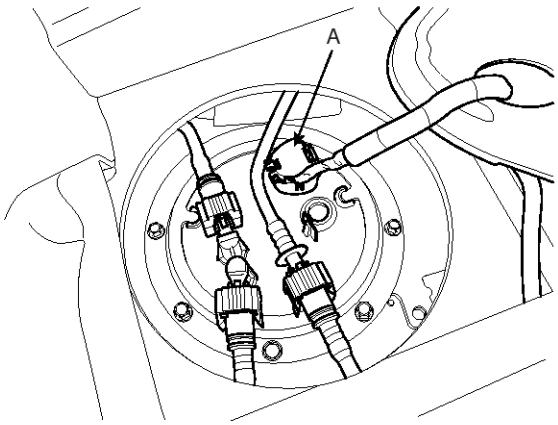
SENFL7187D

   3) Remove the service cover for fuel pump (B).



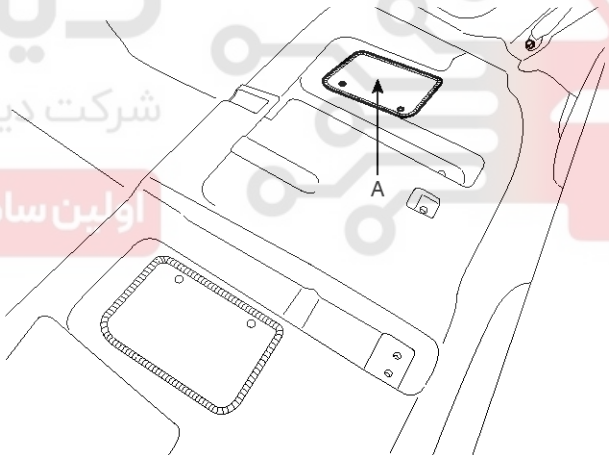
SENF17044L

   4) Disconnect the fuel pump connector (A).



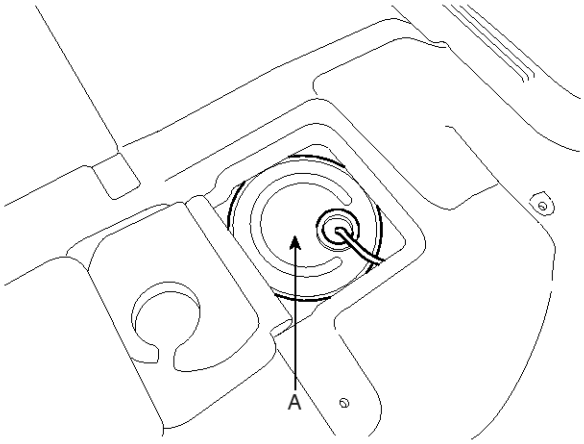
SENF17028L

   5) Start the engine and wait until fuel in fuel line is exhausted.
   6) After engine stops, turn the ignition switch off.
2. Open the carpet for sub fuel sender (A).



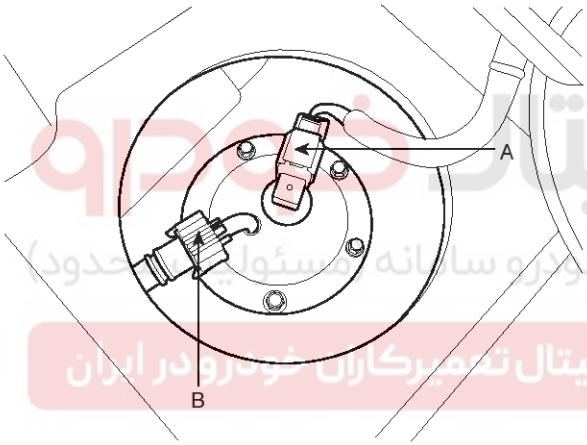
SENFL7190D

3. Open the service cover for sub fuel sender (A).



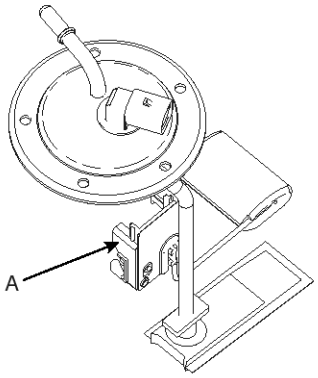
SENFL7179D

4. Disconnect the sub fuel sender connector (A) and the suction tube quick-connector (B)



SENF17046L

5. Remove the sub fuel sender (A) from the fuel tank after unfastening the sub fuel sender installation bolts.



SENF17030L

Installation

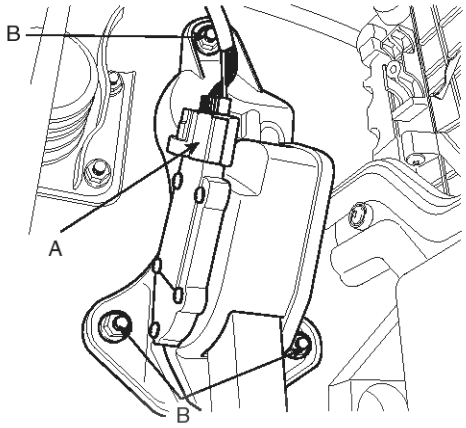
1. Install the sub fuel sender in according to the reverse order of "REMOVAL" procedure.

Sub fuel sender installation bolts :
2.0 ~ 2.9N·m (0.2 ~ 0.3kgf·m, 1.4 ~ 2.2lbf·ft)

Accelerator Pedal

Removal

1. Turn ignition switch off and disconnect the battery (-) cable from the battery.
2. Disconnect the accelerator position sensor connector (A).



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3. Unfasten the mounting nuts (B) and remove the accelerator pedal from the vehicle.

Installation

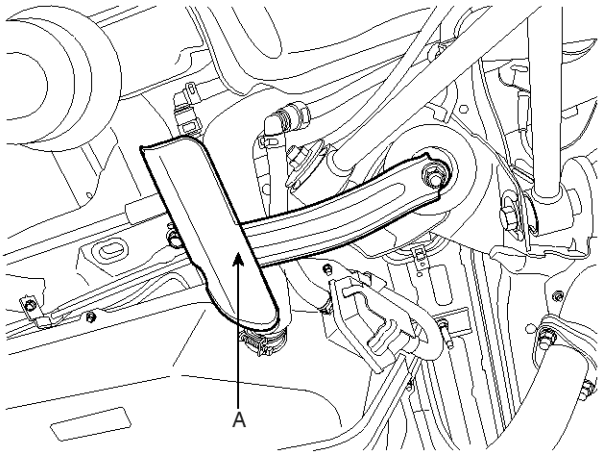
1. Install the accelerator pedal in according to the reverse order of "REMOVAL" procedure.

Accelerator pedal mounting nuts:
8.8 ~ 13.7N·m (0.9 ~ 1.4kgf·m, 6.5 ~ 10.1lbf·ft)

Filler-Neck Assembly

Removal

1. Remove the bracket (A).



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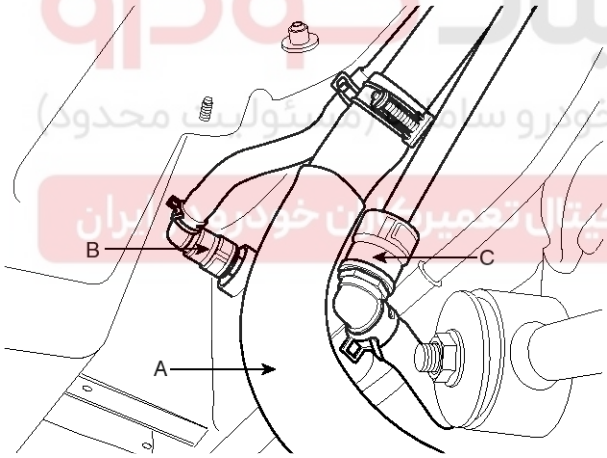
2. Disconnect the fuel filler hose (A), the leveling tube quick-connector (B) and ventilation hose quick-connector (C).



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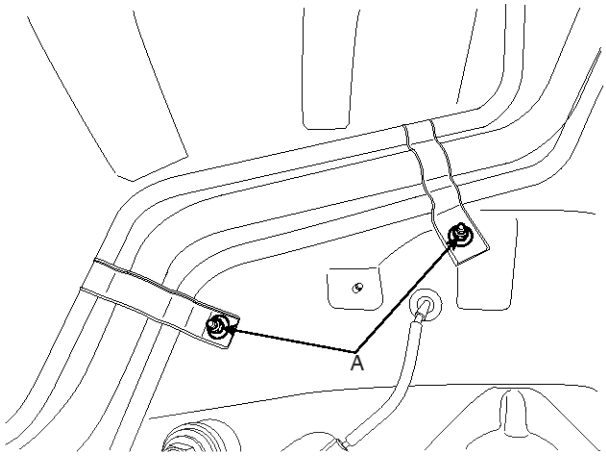
3. Remove the rear-LH wheel & tire, and the inner wheel house (Refer to "DS" group in this SERVICE MANUAL).
4. Remove the bracket mounting nut (A) and remove the filler-neck assembly.



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Installation

1. Install the filler-neck assembly in according to the reverse order of "REMOVAL" procedure.