

EC-2

Emission Control System

General Information

Description

Components	Function	Remarks
Crankcase Emission System - Positive Crankcase Ventilation (PCV) valve	HC reduction	Variable flow rate type
Evaporative Emission System - Evaporative emission canister - Purge Control Solenoid Valve (PCSV)	HC reduction HC reduction	Duty control solenoid valve
Exhaust Emission System - MFI system (air-fuel mixture control device) - Three-way catalytic converter	CO, HC, NOx reduction CO, HC, NOx reduction	Heated oxygen sensor feedback type Monolithic type

Specifications

Purge Control Solenoid Valve (PCSV)

▷ Specification

Item	Specification
Coil Resistance (Ω)	2.0/2.4 DOHC 19.0 ~ 22.0 [20°C (68°F)]
	2.7 V6 14.0 ~ 18.0 [20°C (68°F)]

Tightening Torques

Item	N.m	kgf.m	lb-ft
Positive Crankcase Ventilation Valve	8.0 ~ 12.0	0.8 ~ 1.2	6.0 ~ 8.0

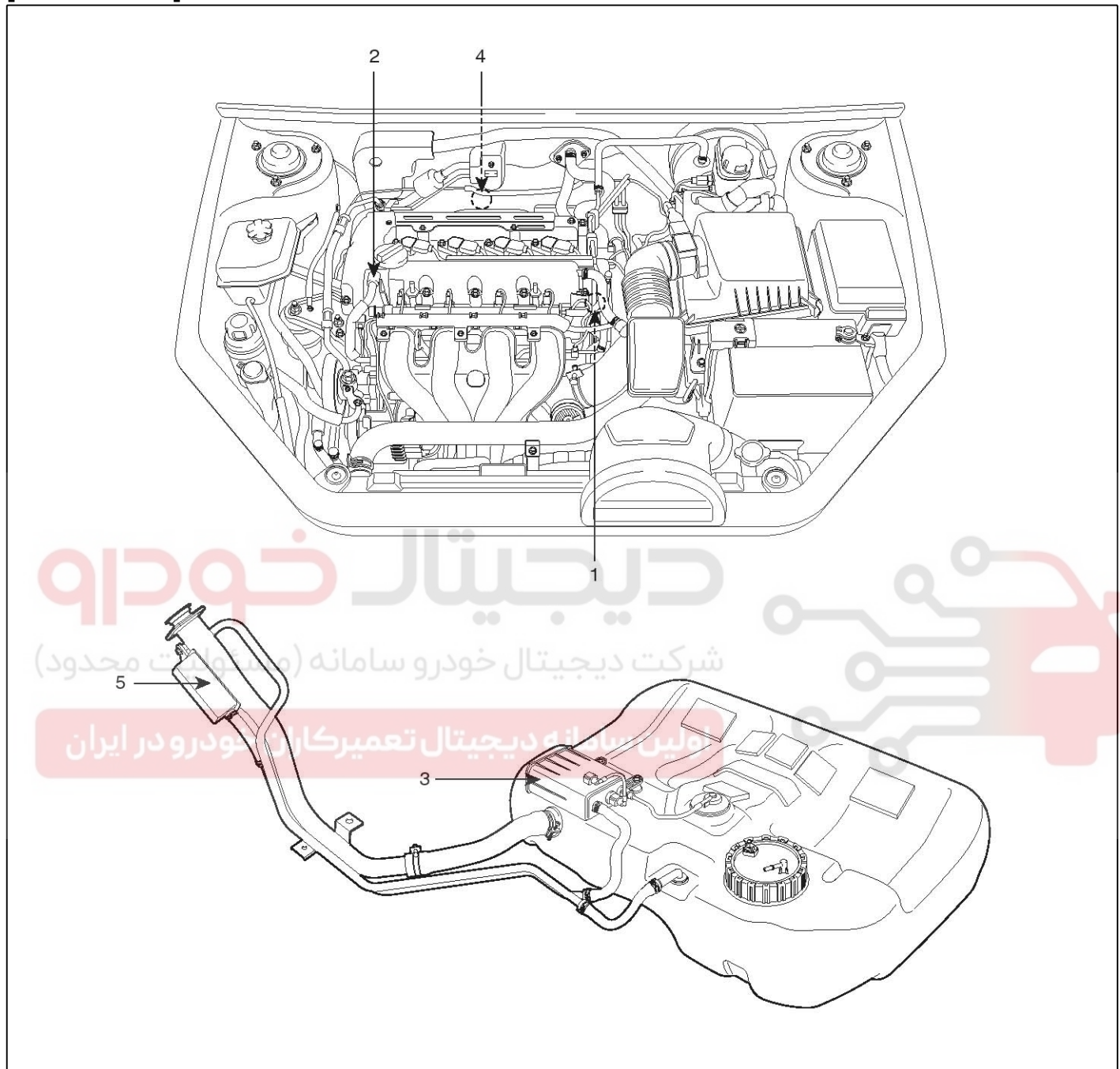
Troubleshooting

Symptom	Suspect area	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	Malfunction of the Purge Control Solenoid Valve	Repair or replace
Rough idle or engine stalls	Vacuum hose disconnected or damaged	Repair or replace
	Malfunction of the PCV valve	Replace
	Malfunction of the evaporative emission canister-purge system	Check the system; if there is a problem, check related components parts
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system

General Information

EC-3

Component Location [2.0/2.4 DOHC]



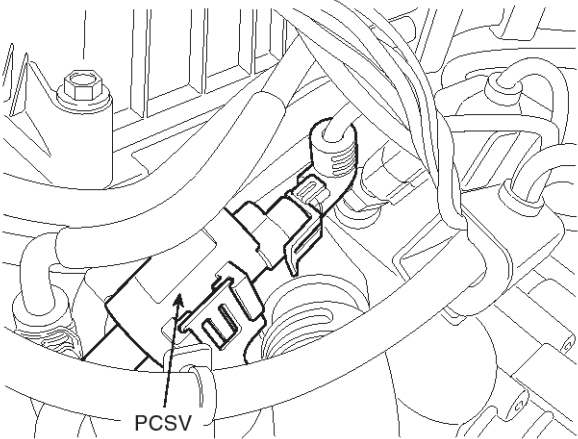
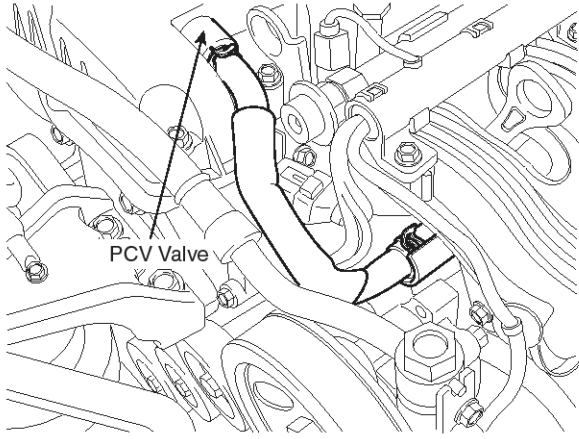
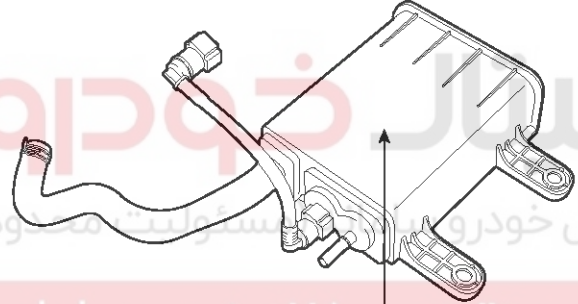
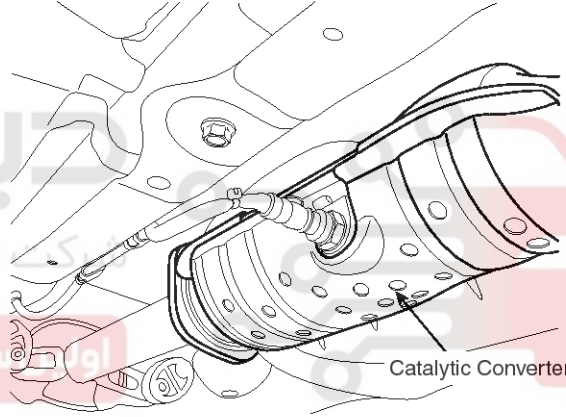
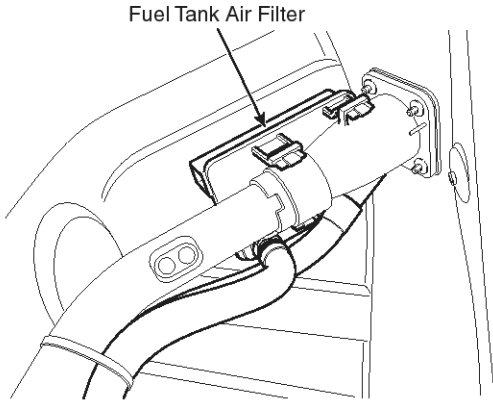
SMGEC9100L

- 1. Purge Control Solenoid Valve (PCSV)
- 2. Positive Crankcase Ventilation (PCV) Valve
- 3. Canister

- 4. Catalytic Converter
- 5. Fuel Tank Air Filter

EC-4

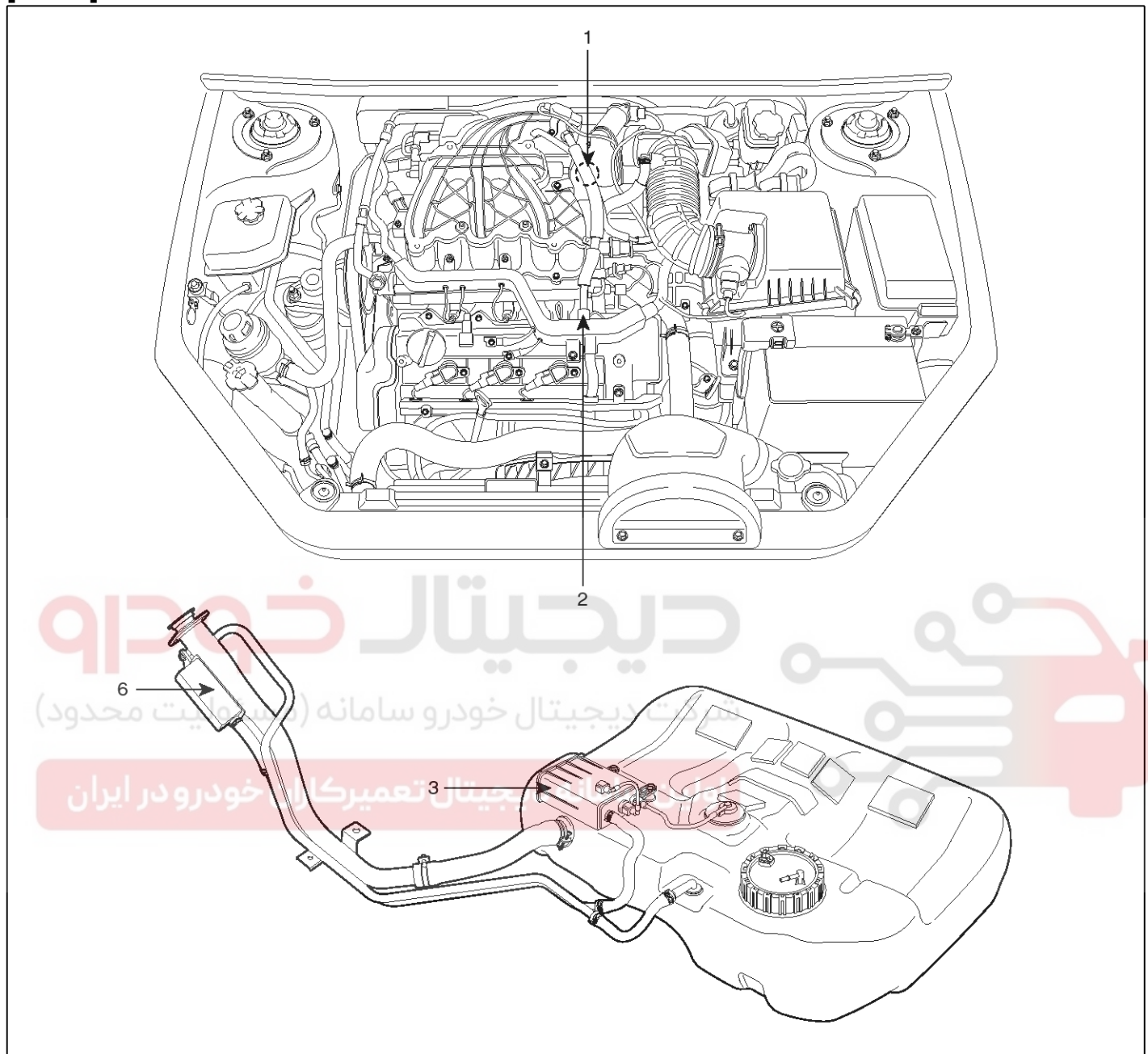
Emission Control System

<p>1 Purge Control Solenoid Valve (PCSV)</p>	<p>2 Positive Crankcase Ventilation (PCV) Valve</p>
 <p>PCSV</p> <p>AELG001B</p>	 <p>PCV Valve</p> <p>LELG001B</p>
<p>3 Canister</p>	<p>4 Catalytic Converter</p>
 <p>Canister</p> <p>LELG001C</p>	 <p>Catalytic Converter</p> <p>SNFEC9119N</p>
<p>5 Fuel Tank Air Filter</p>	
 <p>Fuel Tank Air Filter</p> <p>SMGEC9101L</p>	

General Information

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[2.7 V6]



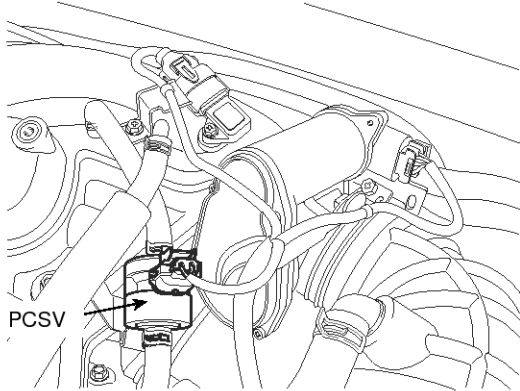
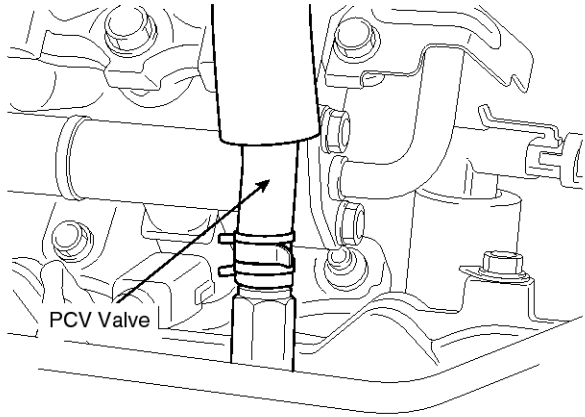
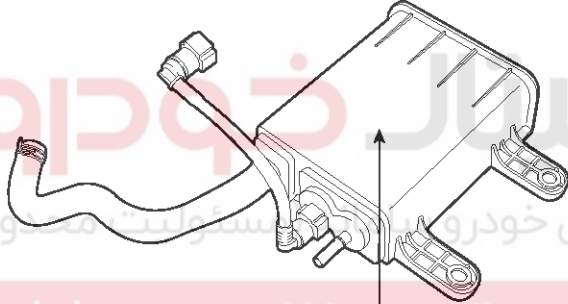
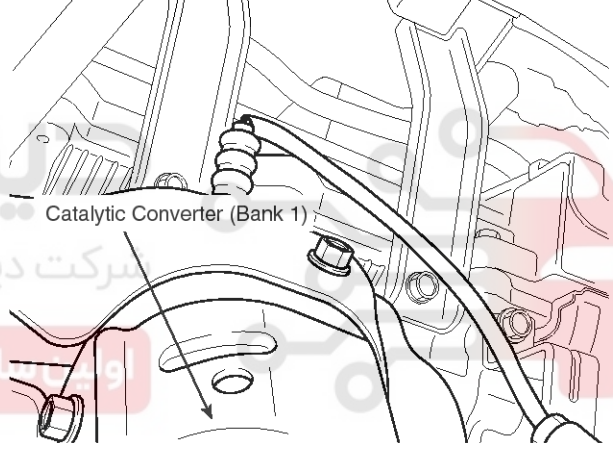
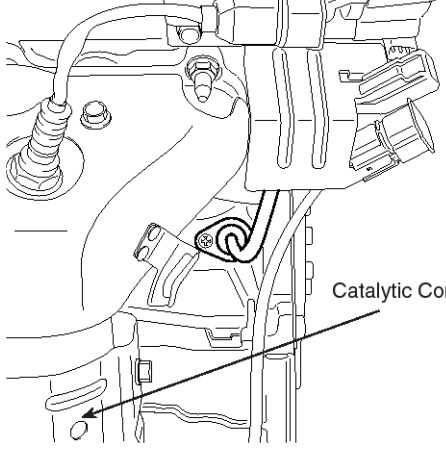
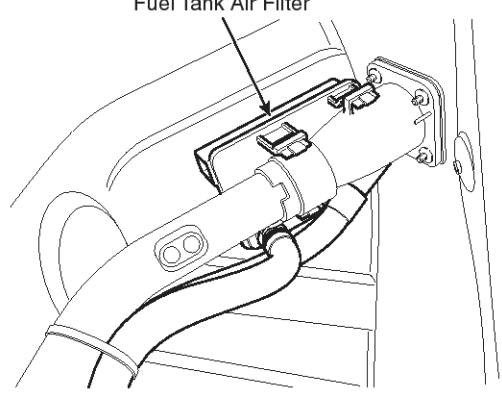
SMGEC9102L

1. Purge Control Solenoid Valve (PCSV)
2. Positive Crankcase Ventilation (PCV) Valve
3. Canister

4. Catalytic Converter (Bank 1)
5. Catalytic Converter (Bank 2)
6. Fuel Tank Air Filter

EC-6

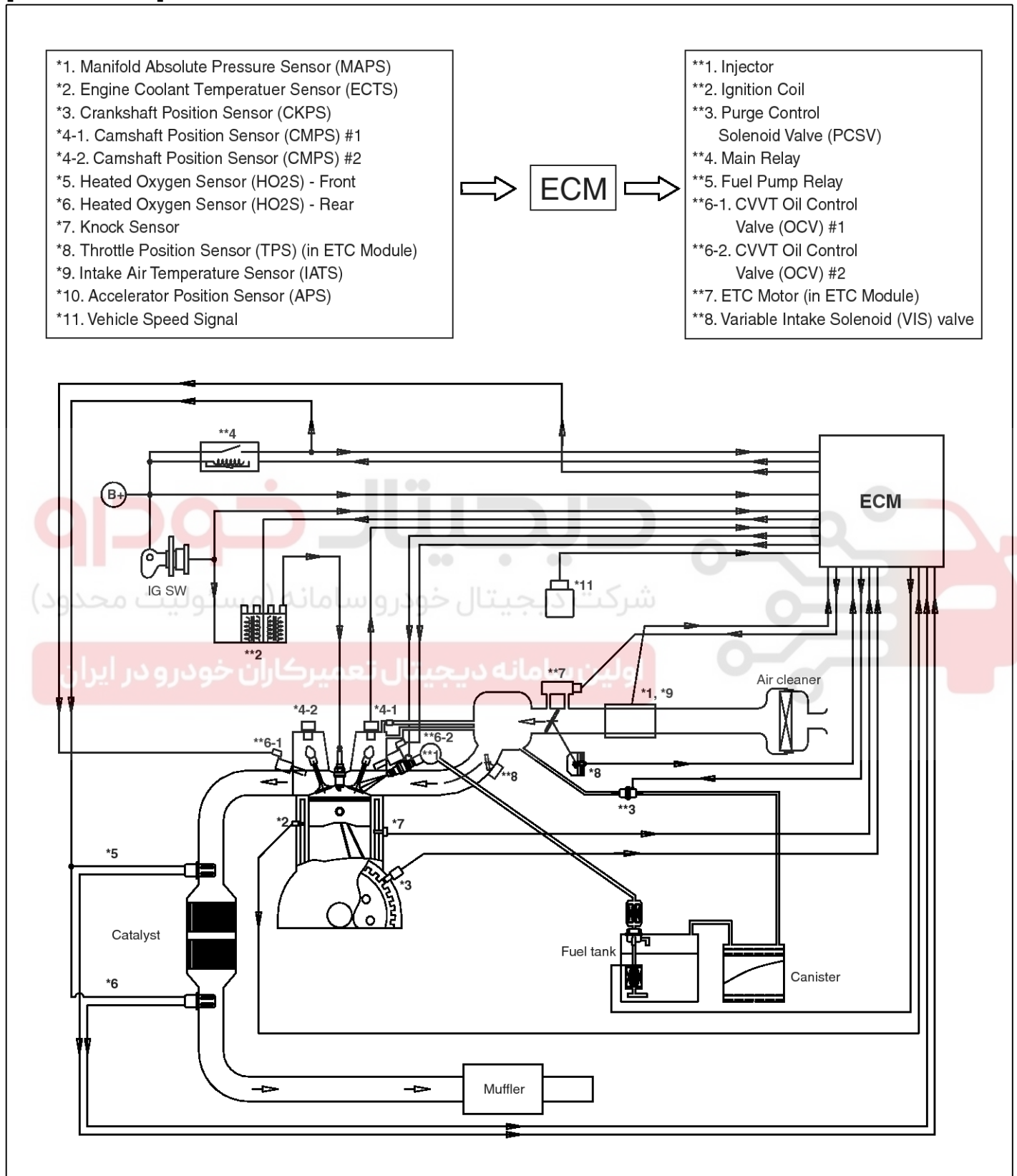
Emission Control System

<p>1 Purge Control Solenoid Valve (PCSV)</p>	<p>2 Positive Crankcase Ventilation (PCV) Valve</p>
 <p>PCSV</p> <p>SMGEC9105L</p>	 <p>PCV Valve</p> <p>LELG001G</p>
<p>3 Canister</p>	<p>4 Catalytic Converter (Bank 1)</p>
 <p>Canister</p> <p>LELG001C</p>	 <p>Catalytic Converter (Bank 1)</p> <p>LELG001H</p>
<p>5 Catalytic Converter (Bank 2)</p>	<p>6 Fuel Tank Air Filter</p>
 <p>Catalytic Converter (Bank 2)</p> <p>LELG001I</p>	 <p>Fuel Tank Air Filter</p> <p>SMGEC9101L</p>

General Information

EC-7

Schematic Diagram [2.0/2.4 DOHC]

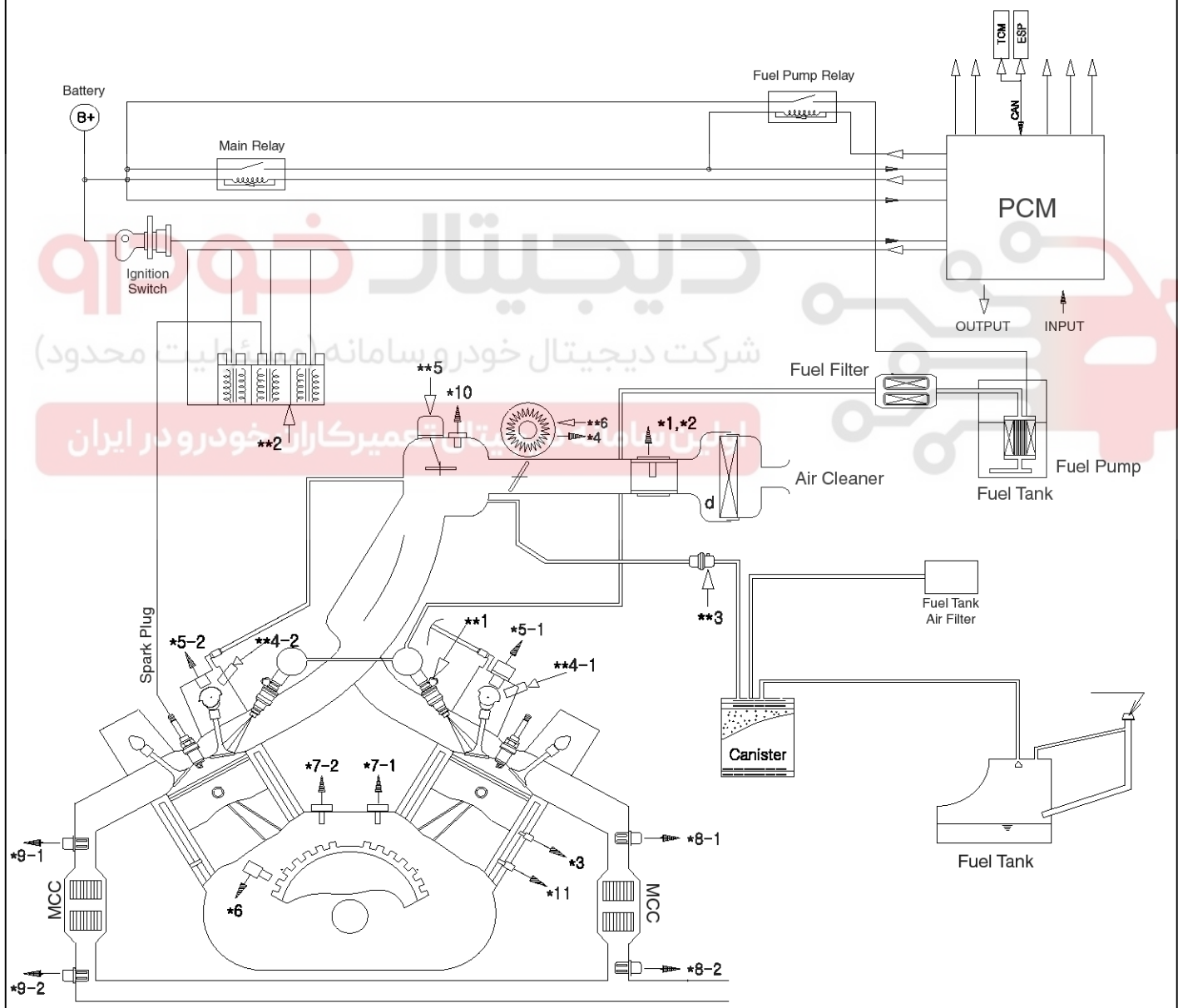
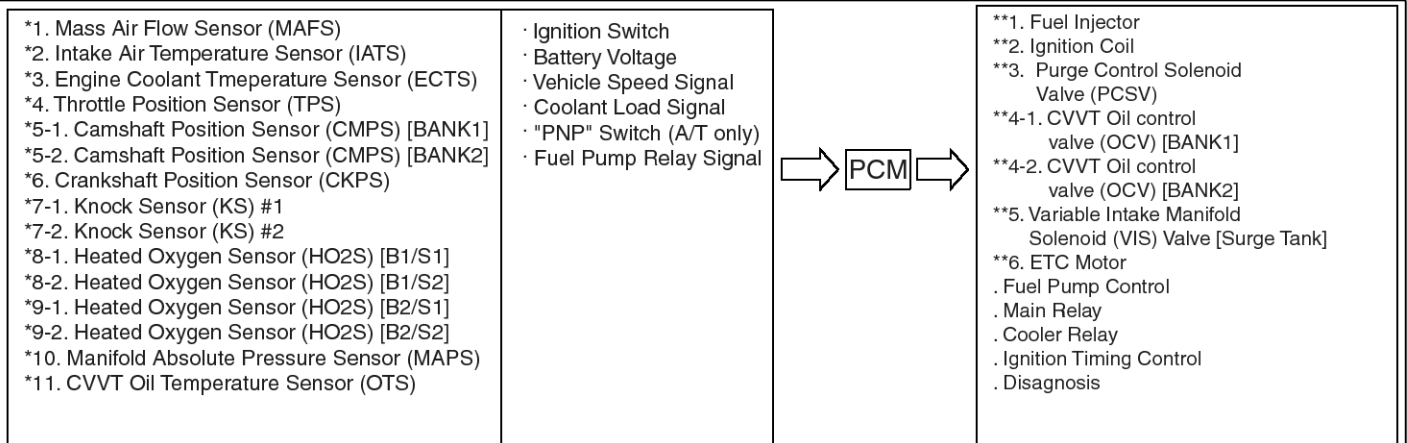


SNFEC9101L

EC-8

Emission Control System

[2.7 V6]



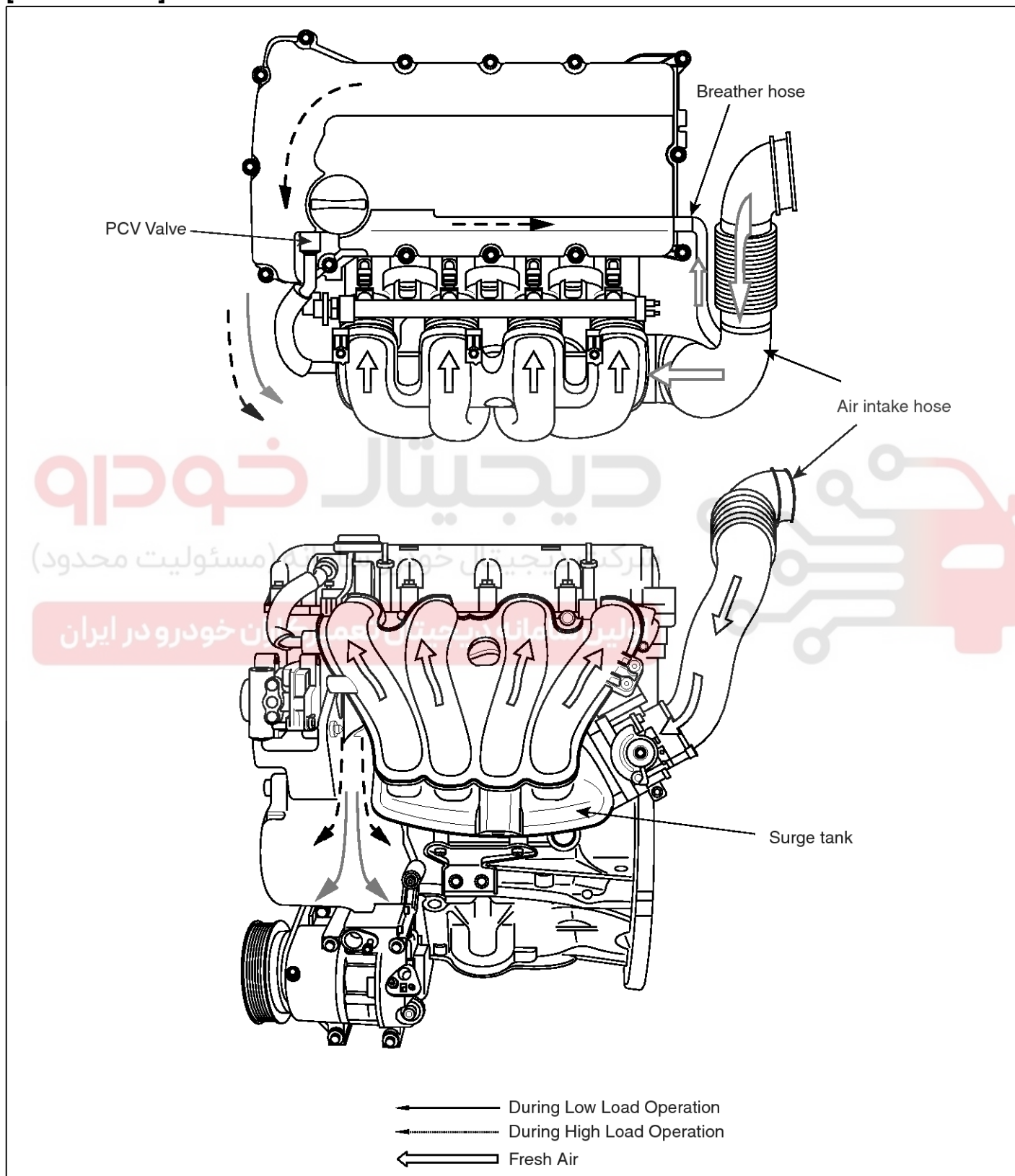
SMGEC9104L

Crankcase Emission Control System

EC-9

Crankcase Emission Control System

Components
[2.0/2.4 DOHC]

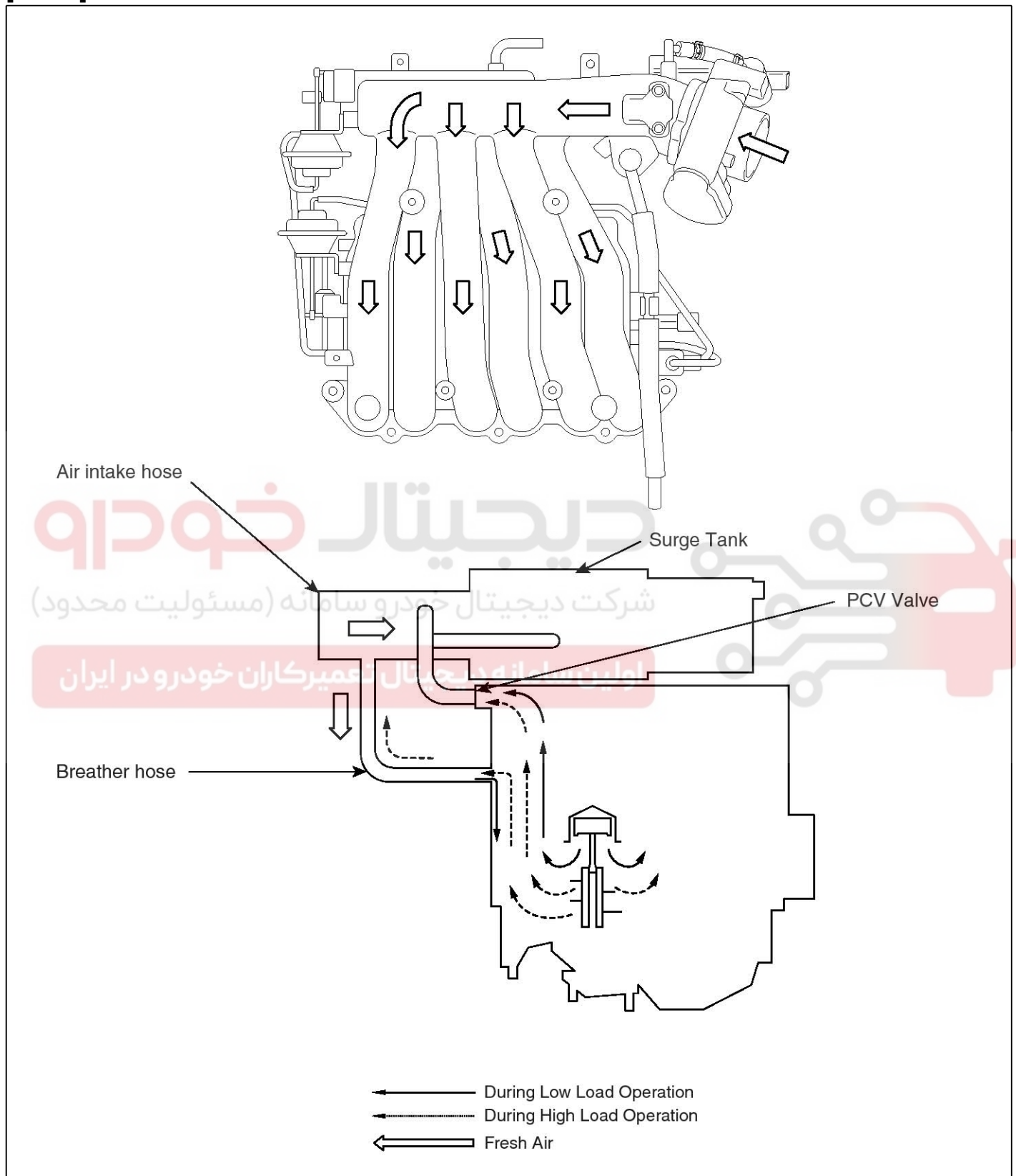


EC-10

Emission Control System

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[2.7 V6]



LELG001L

Crankcase Emission Control System

EC-11

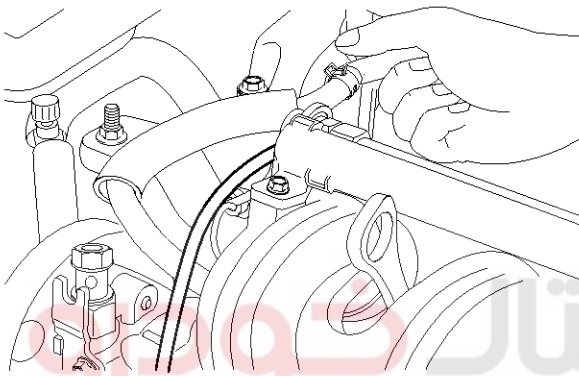
Inspection

1. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Remove the PCV valve from the rocker cover and reconnect it to the ventilation hose.
2. Run the engine at idle and put a finger on the open end of the PCV valve and make sure that intake manifold vacuum can be felt.

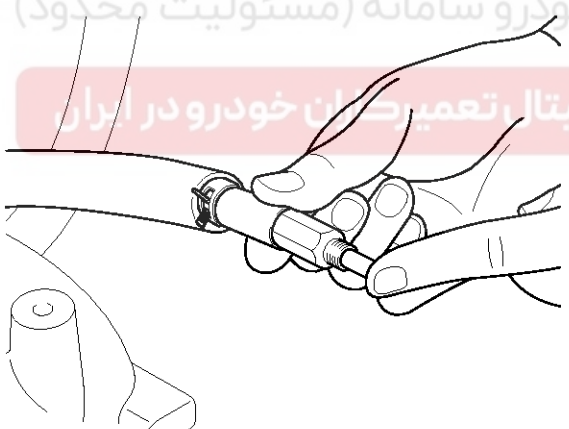
NOTICE

The plunger inside the PCV valve will move back and forth.

[2.0/2.4 DOHC]



[2.7 V6]



LELG001M

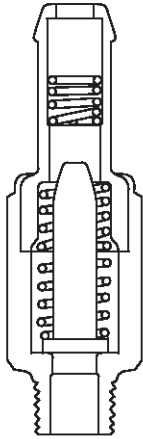
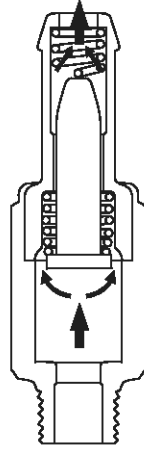
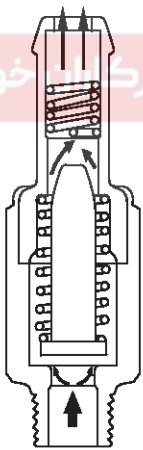
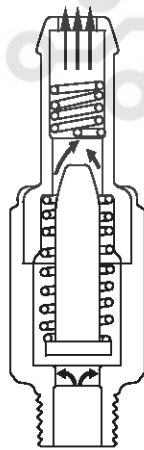


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Emission Control System

Positive Crankcase Ventilation (PCV) Valve

Operation

Intake manifold side (No vacuum)		Intake manifold side (High vacuum)	
			
Rocker cover side		Rocker cover side	
Engine condition	Not running	Engine condition	Idling or decelerating
PCV valve	Not operating	PCV valve	Fully operating
Vacuum passage	Restricted	Vacuum passage	Small
Intake manifold side (Moderate vacuum)		Intake manifold side (Low vacuum)	
			
Rocker cover side		Rocker cover side	
Engine condition	Normal operation	Engine condition	Accelerating and high load
PCV valve	Properly operating	PCV valve	Slightly operating
Vacuum passage	Large	Vacuum passage	Very large

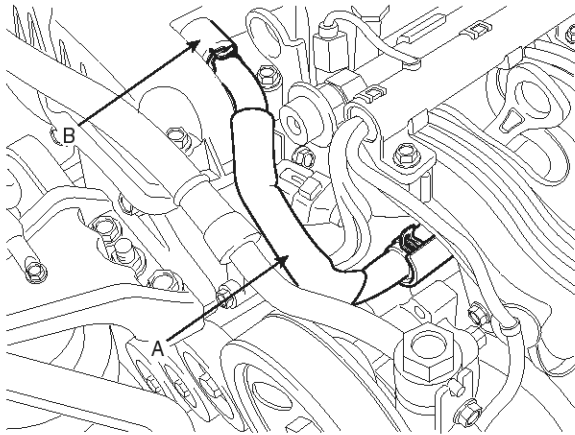
Crankcase Emission Control System

EC-13

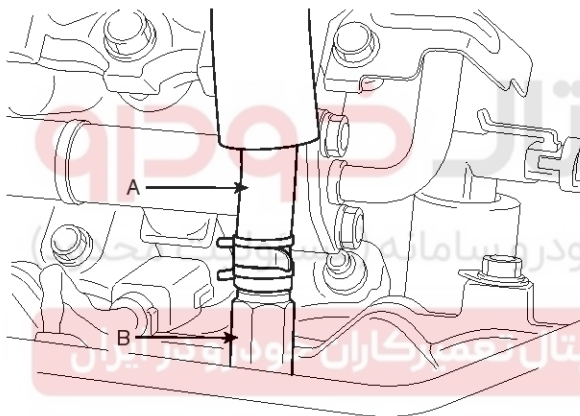
Removal

1. Disconnect the vacuum hose (A) and remove the PCV valve (B).

[2.0/2.4 DOHC]



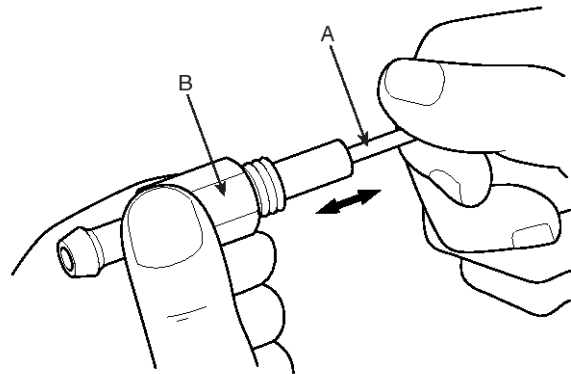
[2.7 V6]



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Inspection

1. Remove the PCV valve.
2. Insert a thin stick(A) into the PCV valve(B) from the threaded side to check that the plunger moves.
3. If the plunger does not move, the PCV valve is clogged. Clean it or replace.



EERF600J

Installation

Install the PCV valve and tighten to the specified torque.

PCV Valve installation :

7.8 ~ 11.8 N.m (0.8 ~ 1.2 kgf.m, 5.8 ~ 8.7 lb-ft)

EC-14

Emission Control System

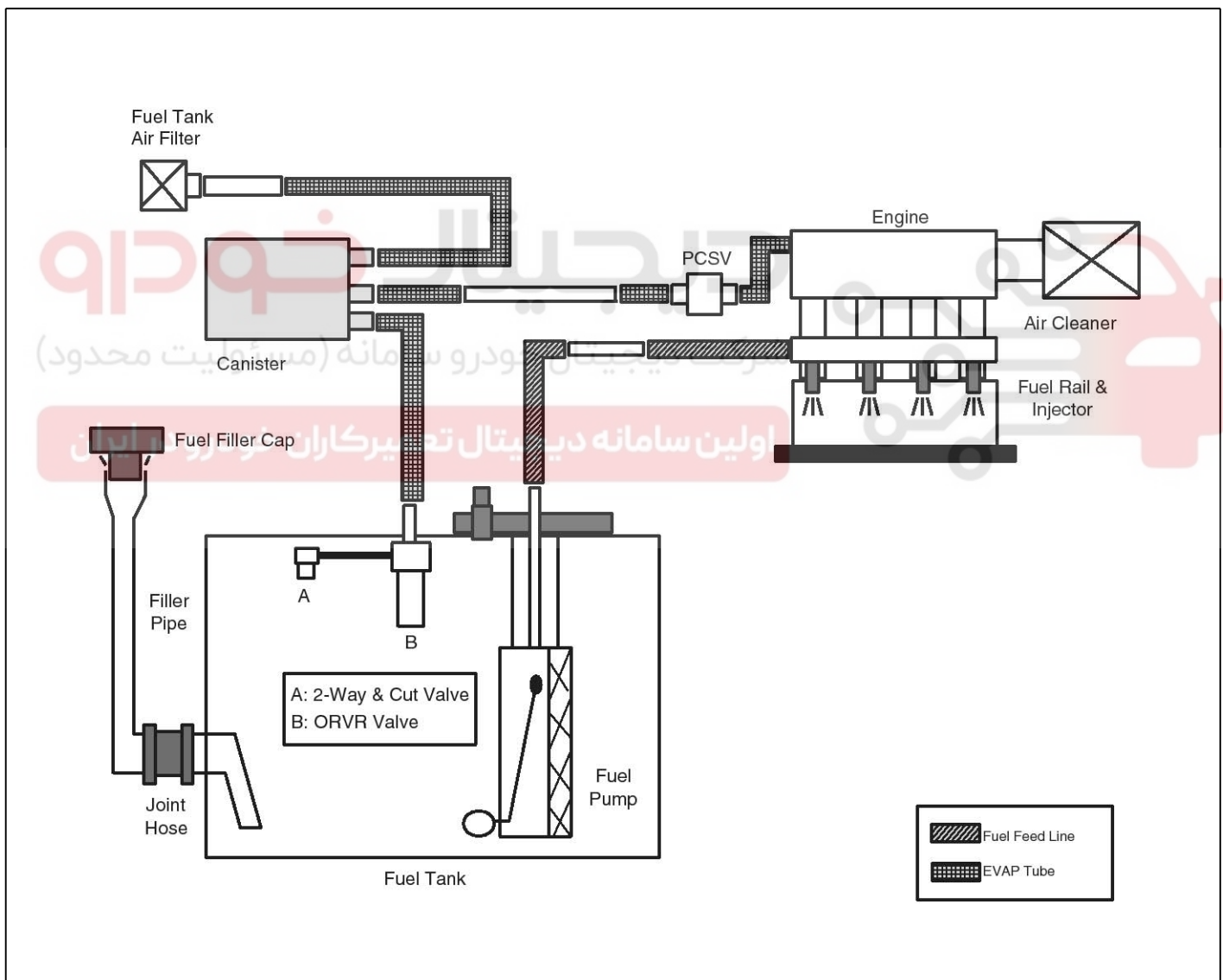
Evaporative Emission Control System

Description

Evaporative Emission Control System prevents fuel vapor stored in fuel tank from vaporizing into the atmosphere.

When the fuel evaporates in the fuel tank, the vapor passes through vent hoses or tubes to the canister filled with charcoal and the canister temporarily holds the vapor in the charcoal.

If ECM determines to draw the gathered vapor into the combustion chambers during certain operating conditions, it will use vacuum in intake manifold to move it.



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Evaporative Emission Control System

EC-15

Canister

Canister is filled with charcoal and absorbs evaporated vapor in fuel tank. The gathered fuel vapor in canister is drawn into the intake manifold by the ECM/PCM when appropriate conditions are set.

Purge Control Solenoid Valve (PCSV)

Purge Control Solenoid Valve (PCSV) is installed in the passage connecting canister and intake manifold. It is a duty type solenoid valve and is operated by ECM/PCM signal. To draw the absorbed vapor into the intake manifold, the ECM/PCM will open the PCSV, otherwise the passage remains closed.

Fuel Filler Cap

A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would seal the fuel filler. After the gasket on the fuel filler cap and the fill neck flange contact each other, the ratchet produces a loud clicking noise indicating the seal has been set.

Inspection

1. Disconnect the vacuum hose from the throttle body, and connect a vacuum pump to the vacuum hose.
2. Check the following points when the engine is cold [engine coolant temperature 60°C(140°F) or below] and when it is warm [engine coolant temperature 80°C(176°F) or higher].

When Engine Is Cold

Engine operating condition	Applied vacuum	Result
Idling	50 kPa (7.3 psi)	Vacuum is held
3,000 rpm		

When Engine Is Warm

Engine operating condition	Applied vacuum	Result
Idling	50 kPa (7.3 psi)	Vacuum is held
Within 3 minutes after engine start at 3,000 rpm	Try to apply vacuum	Vacuum is released
After 3 minutes have passed after engine start at 3,000 rpm	50 kPa (7.3 psi)	Vacuum will be held momentarily, after which, it will be released

Purge Control Solenoid Valve (PCSV)

Inspection

NOTICE

When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.

1. Disconnect the vacuum hose from the solenoid valve.
2. Detach the harness connector.
3. Connect a vacuum pump to the nipple which is connected to intake manifold.
4. Apply vacuum and check when voltage is applied to the PCSV and when the voltage is discontinued.

Battery voltage	Normal condition
When applied	Vacuum is released
When discontinued	Vacuum is maintained

5. Measure the resistance between the terminals of the solenoid valve.

PCSV coil resistance(Ω) :

19.0 ~ 22.0Ω [20°C (68°F)] [2.0/2.4 DOHC]

14.0 ~ 18.0Ω [20°C (68°F)] [2.7 V6]

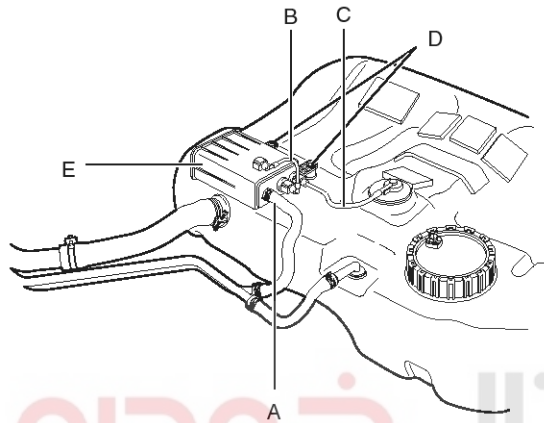
EC-16

Emission Control System

Canister

Removal

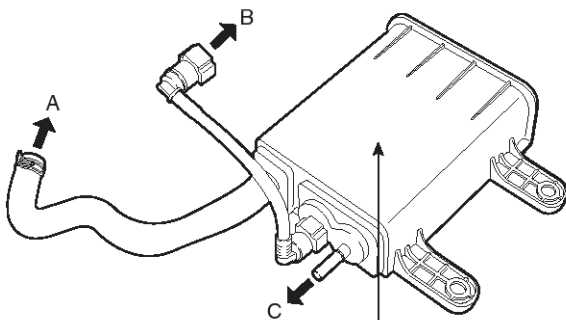
1. Remove the fuel tank (Refer to "FL" Group in this WORKSHOP MANUAL).
2. Disconnect the vacuum hose (A) and the vacuum tubes (B,C) from the canister.
3. Remove the canister (E) after unscrewing the mounting screws (D).



LELG001O

Inspection

1. Look for loose connections, sharp bends or damage to the fuel vapor lines.
2. Look for distortion, cracks or fuel damage.
3. After removing the canister, inspect for cracks, damage or saturated canister.



A : To Fuel Tank Air Filter

B : To Intake Manifold

C : To Fuel Tank

Canister

LELG001P

Installation

Install the canister according to the reverse order of "REMOVAL" procedure.



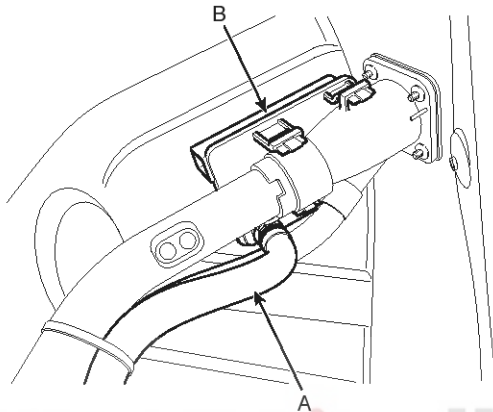
Evaporative Emission Control System

EC-17

Fuel Tank Air Filter

Replacement

1. Remove the rear left wheel house inner cover (Refer to "BD" Group in this WORKSHOP MANUAL).
2. Disconnect the hose (A) connected with the canister.
3. Remove the fuel tank air filter (B) from the filler-neck assembly and install a new one.



دیجیتال خودرو

SMGEC9103L

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



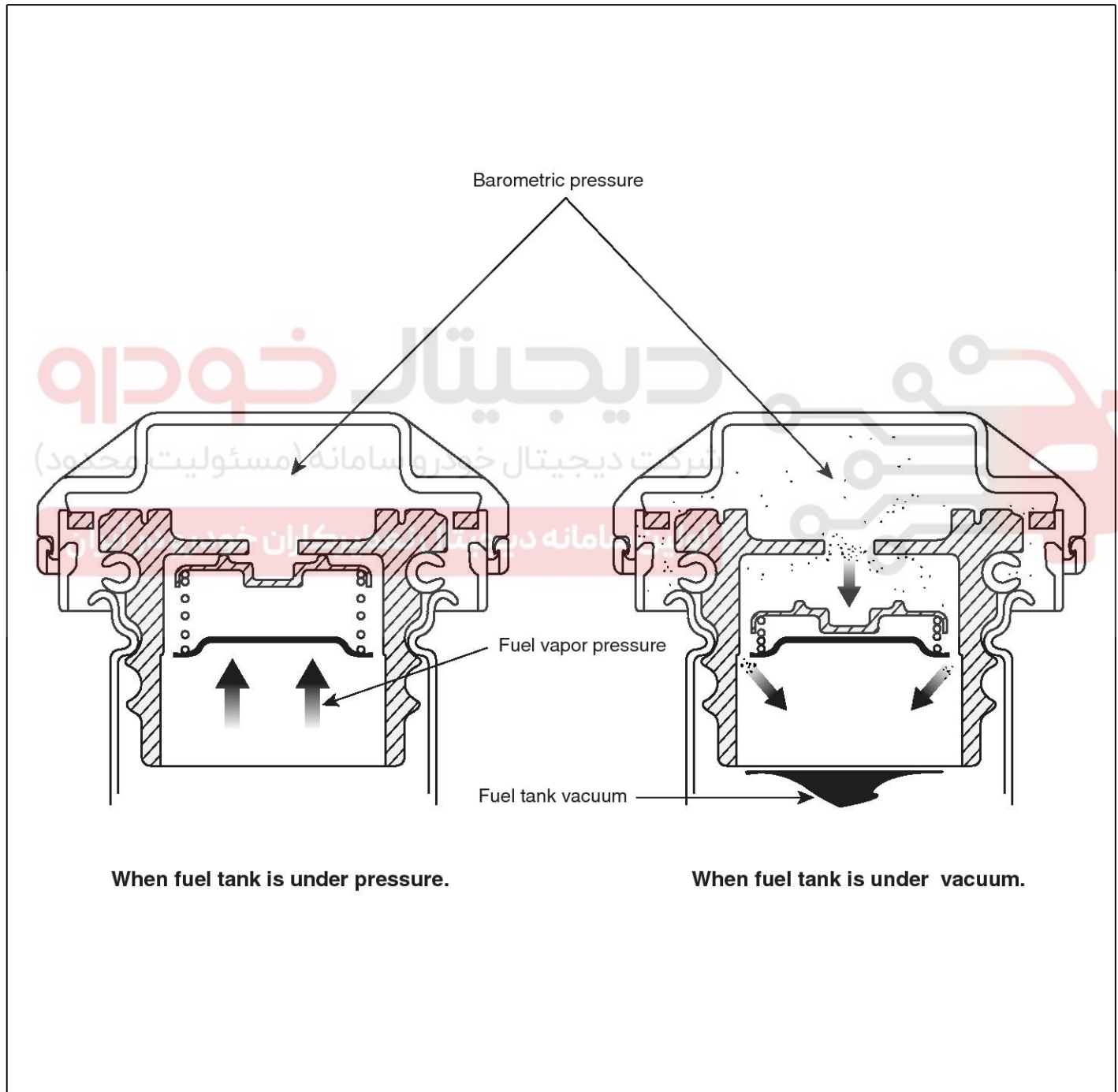
EC-18

Emission Control System

Fuel Filler Cap

Description

A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would seal the fuel filler. After the gasket on the fuel filler cap and the filler neck flange contact each other, the ratchet produces a loud clicking noise indicating the seal has been set.



LEGE015A

Exhaust Emission Control System

EC-19

Exhaust Emission Control System

Description

Modifications to the combustion chamber, intake manifold, camshaft and ignition system form the basic control system.

These items have been integrated into a highly effective system which controls exhaust emissions while maintaining good driveability and fuel economy.

Air/fuel Mixture Control System [Multiport Fuel Injection (MFI) System]

This in turn allows the engine to produce exhaust gases of the proper composition to permit the use of a three way catalyst. The three way catalyst is designed to convert the three pollutants (1) hydrocarbons (HC), (2) carbon monoxide (CO), and (3) oxides of nitrogen (NOx) into harmless substances. There are two operating modes in the MFI system.

1. Open Loop air/fuel ratio is controlled by information programmed into the ECM.
2. Closed Loop air/fuel ratio is adjusted by the ECM based on information supplied by the oxygen sensor.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



EC-20

Emission Control System

CVVT (Continuously Variable Valve Timing) System

Description

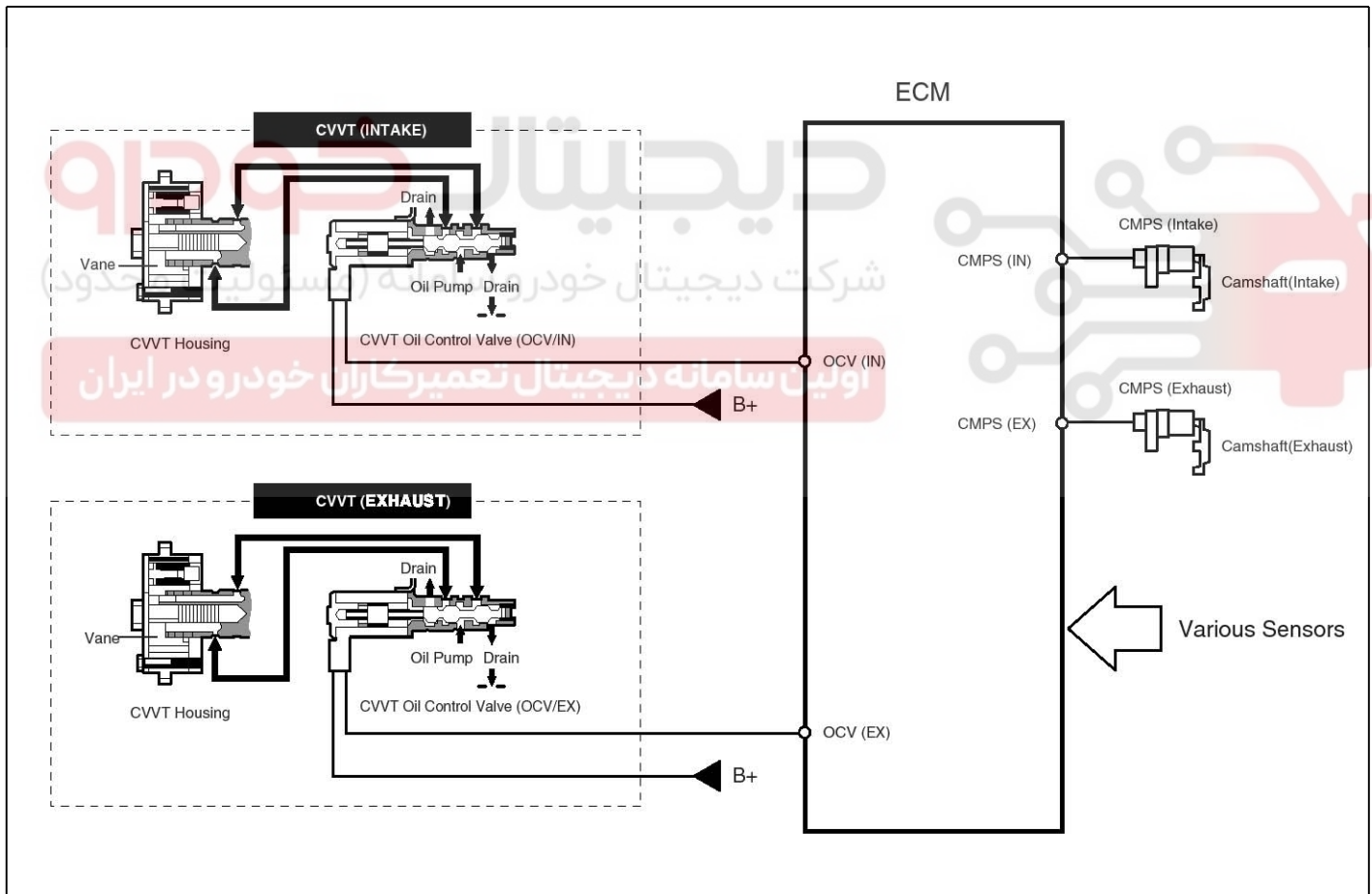
Continuous Variable Valve Timing (CVVT) system advances or retards the valve timing of the intake and exhaust valve in accordance with the ECM control signal which is calculated by the engine speed and load.

By controlling CVVT, the valve over-lap or under-lap occurs, which makes better fuel economy and reduces exhaust gases (NOx, HC). CVVT improves engine performance through reduction of pump loss, internal EGR effect, improvement of combustion stability, improvement of volumetric efficiency, and increase of expansion work.

This system consists of

- the CVVT Oil Control Valve (OCV) which supplies the engine oil to the cam phaser or runs out the engine oil from the cam phaser in accordance with the ECM PWM (Pulse With Modulation) control signal,
- the CVVT Oil Temperature Sensor (OTS) which measures the engine oil temperature,
- and the Cam Phaser which varies the cam phase by using the hydraulic force of the engine oil.

The engine oil flowing through the CVVT oil control valve varies the cam phase in the direction (Intake Advance/Exhaust Retard) or opposite direction (Intake Retard/Exhaust Advance) of the engine rotation by rotating the rotor connected with the camshaft inside the cam phaser.



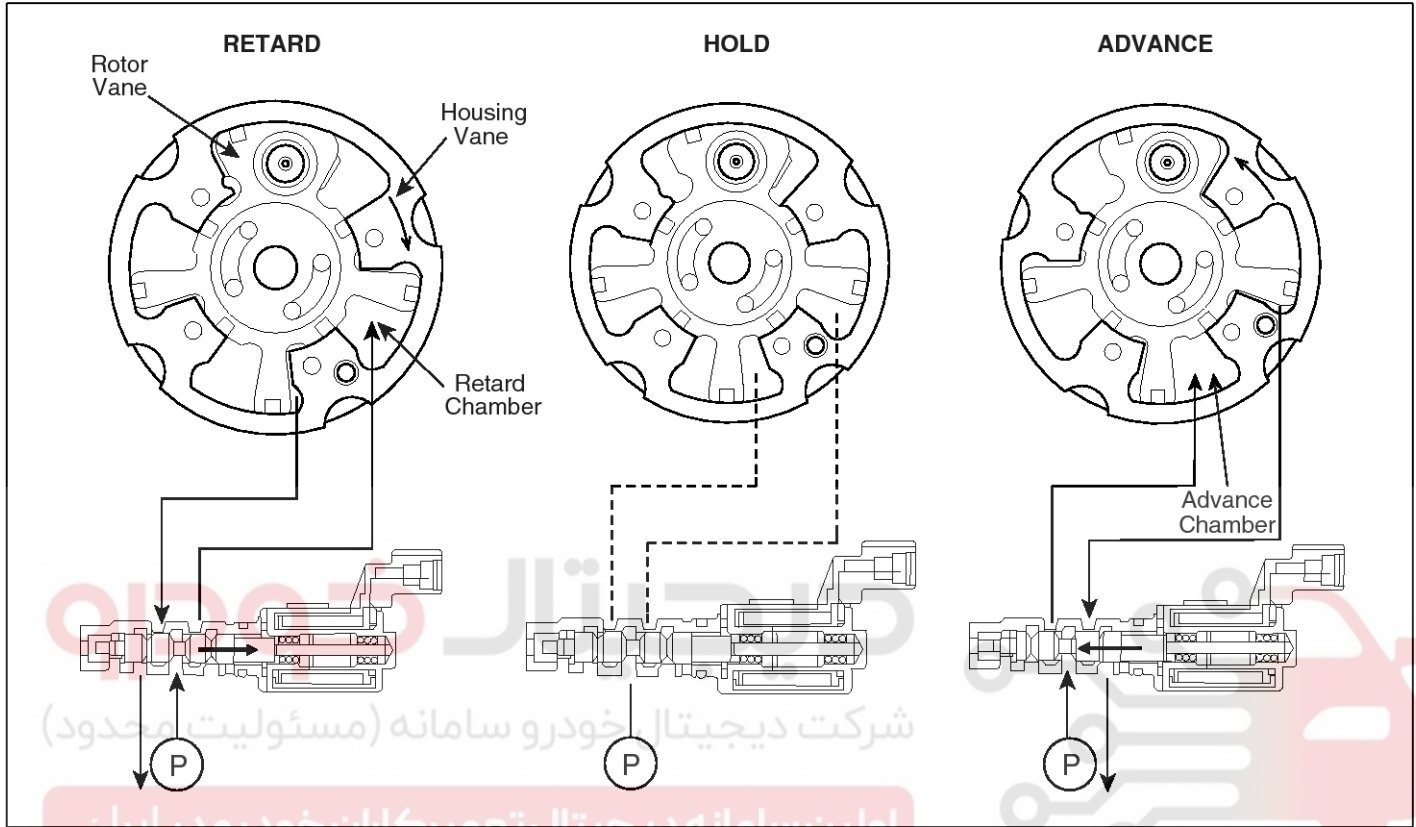
SBHEC9119N

Exhaust Emission Control System

EC-21

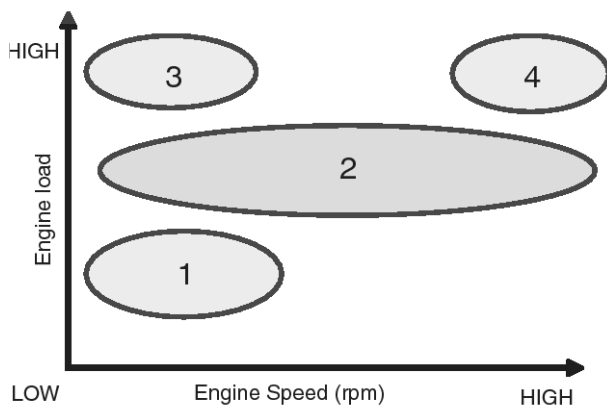
Operation Principle

The CVVT has the mechanism rotating the rotor vane with hydraulic force generated by the engine oil supplied to the advance or retard chamber in accordance with the CVVT oil control valve control.



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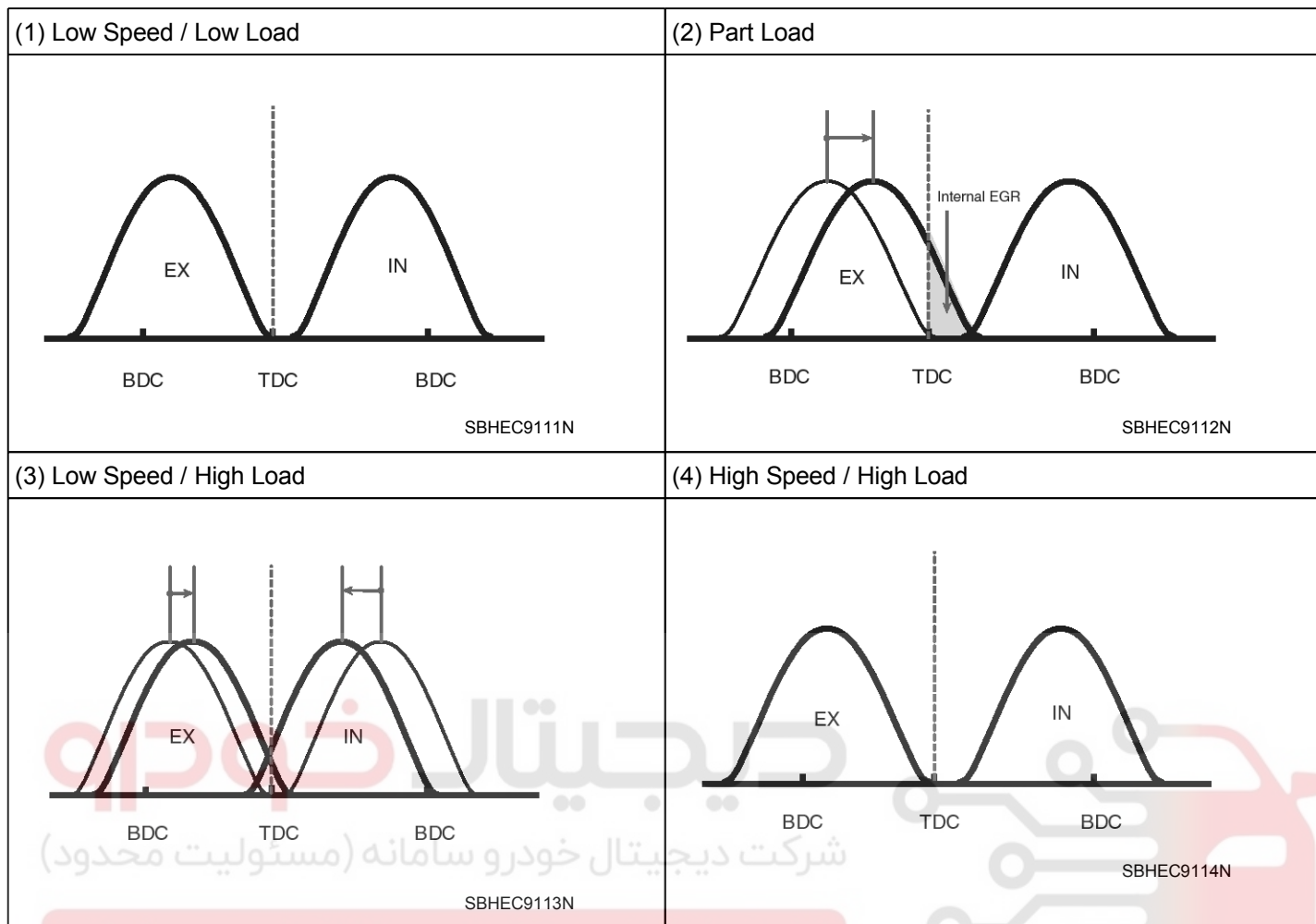
[CVVT System Mode]



SBHEC9110N

EC-22

Emission Control System



Driving Condition	Exhaust Valve		Intake Valve	
	Valve Timing	Effect	Valve Timing	Effect
(1) Low Speed /Low Load	Completely Advance	* Valve Under-lap * Improvement of combustion stability	Completely Retard	* Valve Under-lap * Improvement of combustion stability
(2) Part Load	Retard	* Increase of expansion work * Reduction of pumping loss * Reduction of HC	Retard	* Reduction of pumping loss
(3) Low Speed /High Load	Retard	* Increase of expansion work	Advance	* Prevention of intake back flow (Improvement of volumetric efficiency)
(4) High Speed /High Load	Advance	* Reduction of pumping loss	Retard	* Improvement of volumetric efficiency