

## EC-2

## Emission Control System

## General Information

## Description

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

## Specifications

## ▷ Specification

| Item                         | Specification             |
|------------------------------|---------------------------|
| Coil Resistance ( $\Omega$ ) | 19.0 ~ 22.0 [20°C (68°F)] |

## Tightening Torques

| Item                                 | N·m        | kgf·m     | lbf·m     |
|--------------------------------------|------------|-----------|-----------|
| Positive Crankcase Ventilation Valve | 8.0 ~ 12.0 | 0.8 ~ 1.2 | 6.0 ~ 8.0 |

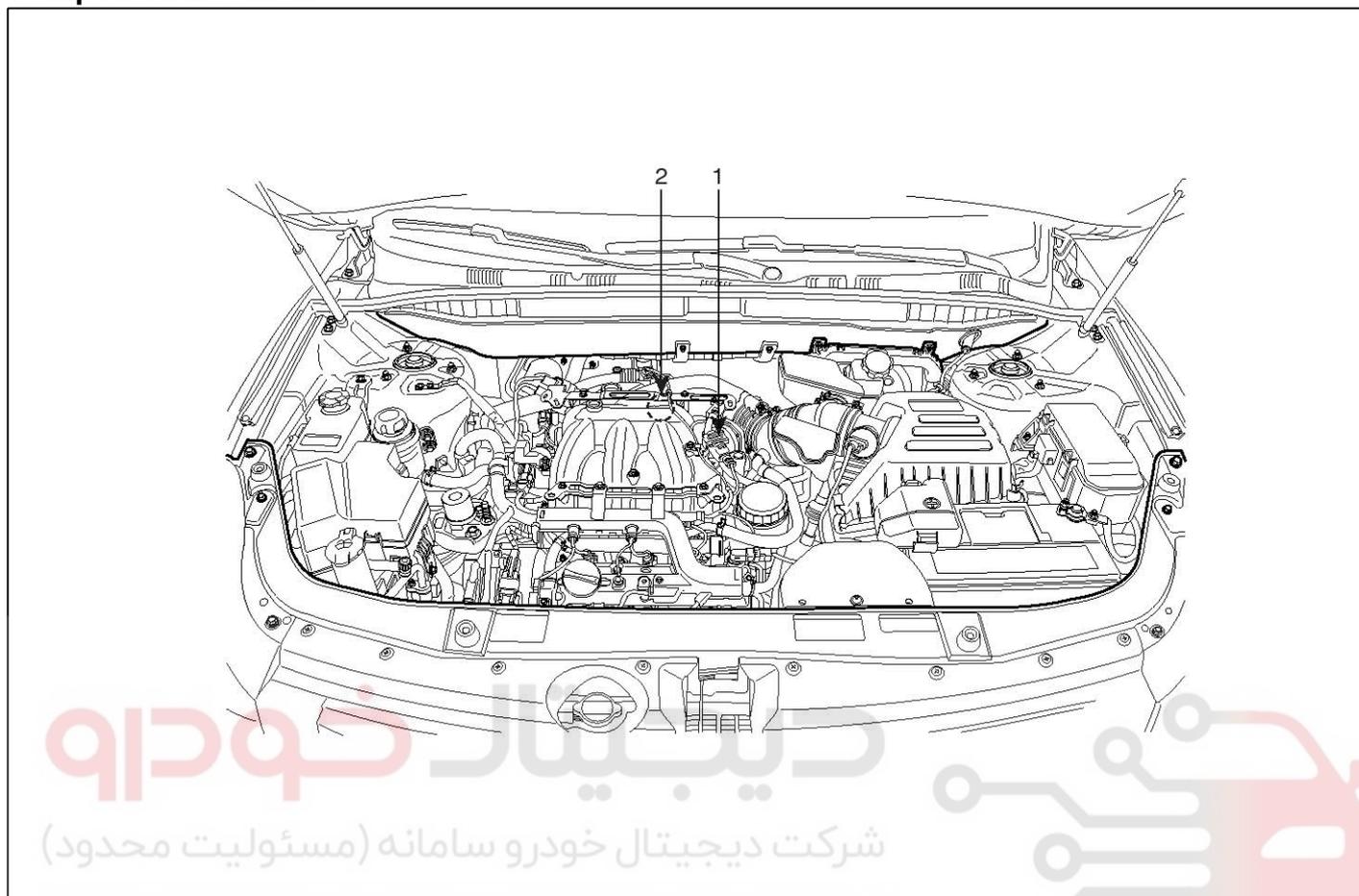
## Troubleshooting

| 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



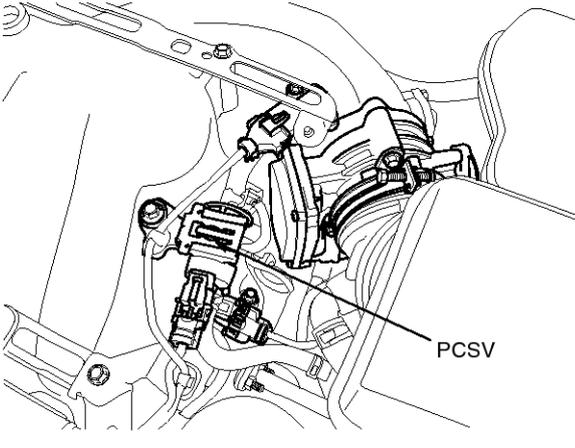
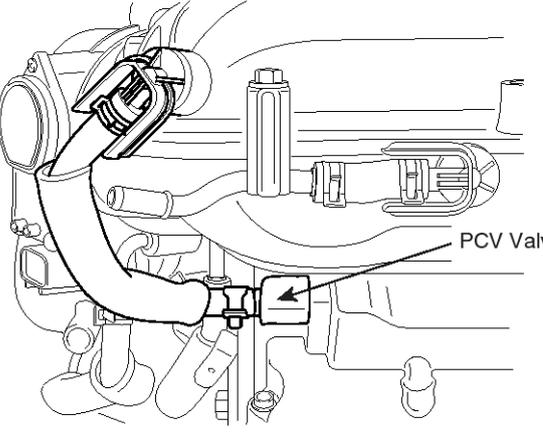
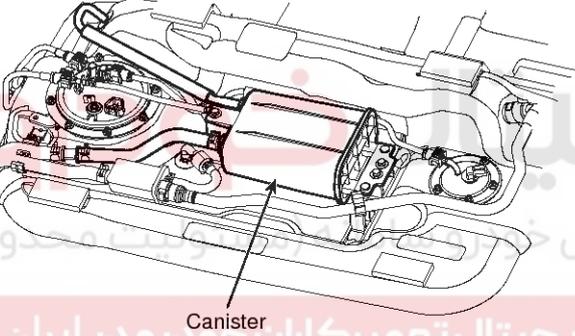
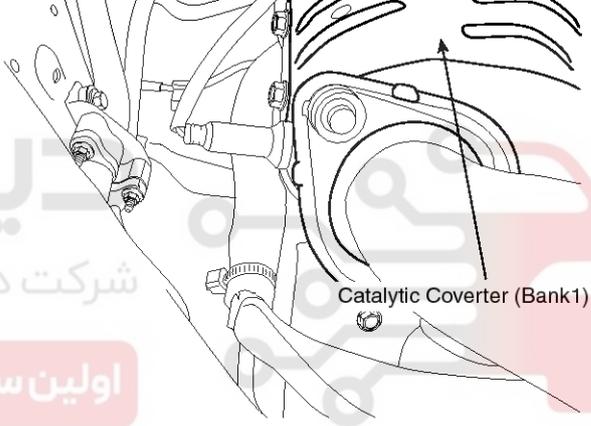
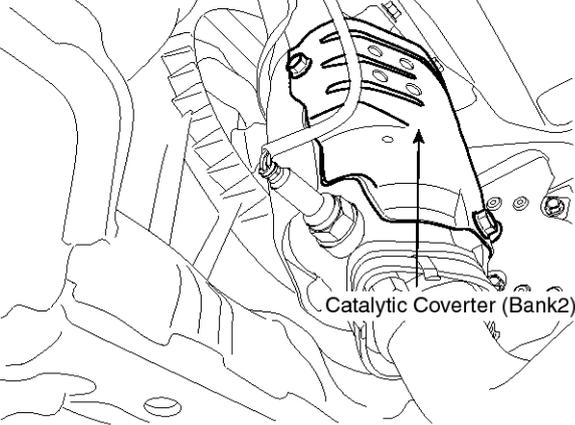
1. Purge Control Solenoid Valve (PCSV)
2. PCV Valve
3. Canister

4. Catalytic Converter (Bank1)
5. Catalytic Converter (Bank2)

SENEC9001L

EC-4

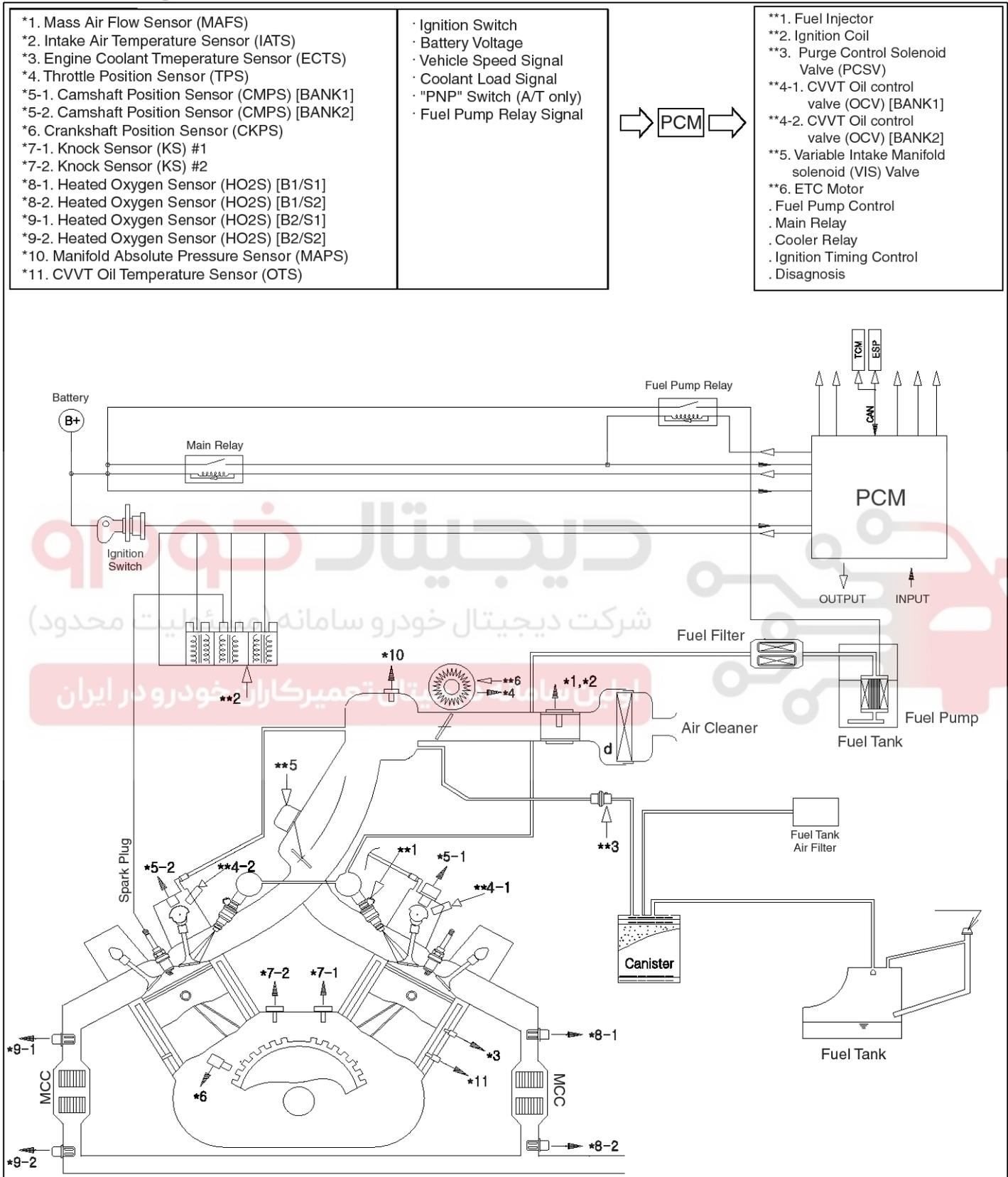
Emission Control System

|   |  |   |  |
|---|--|---|--|
| 1 | <p>Purge Control Solenoid Valve (PCSV)</p>  <p>PCSV</p>                   | 2 | <p>Positive Crankcase Ventilation (PCV) Valve</p>  <p>PCV Valve</p>      |
| 3 | <p>Canister</p>  <p>Canister</p>   | 4 | <p>Catalytic Converter (Bank 1)</p>  <p>Catalytic Converter (Bank1)</p> |
| 5 | <p>Catalytic Converter (Bank 2)</p>  <p>Catalytic Converter (Bank2)</p> |   |  |

# General Information

# EC-5

## Schematic Diagram



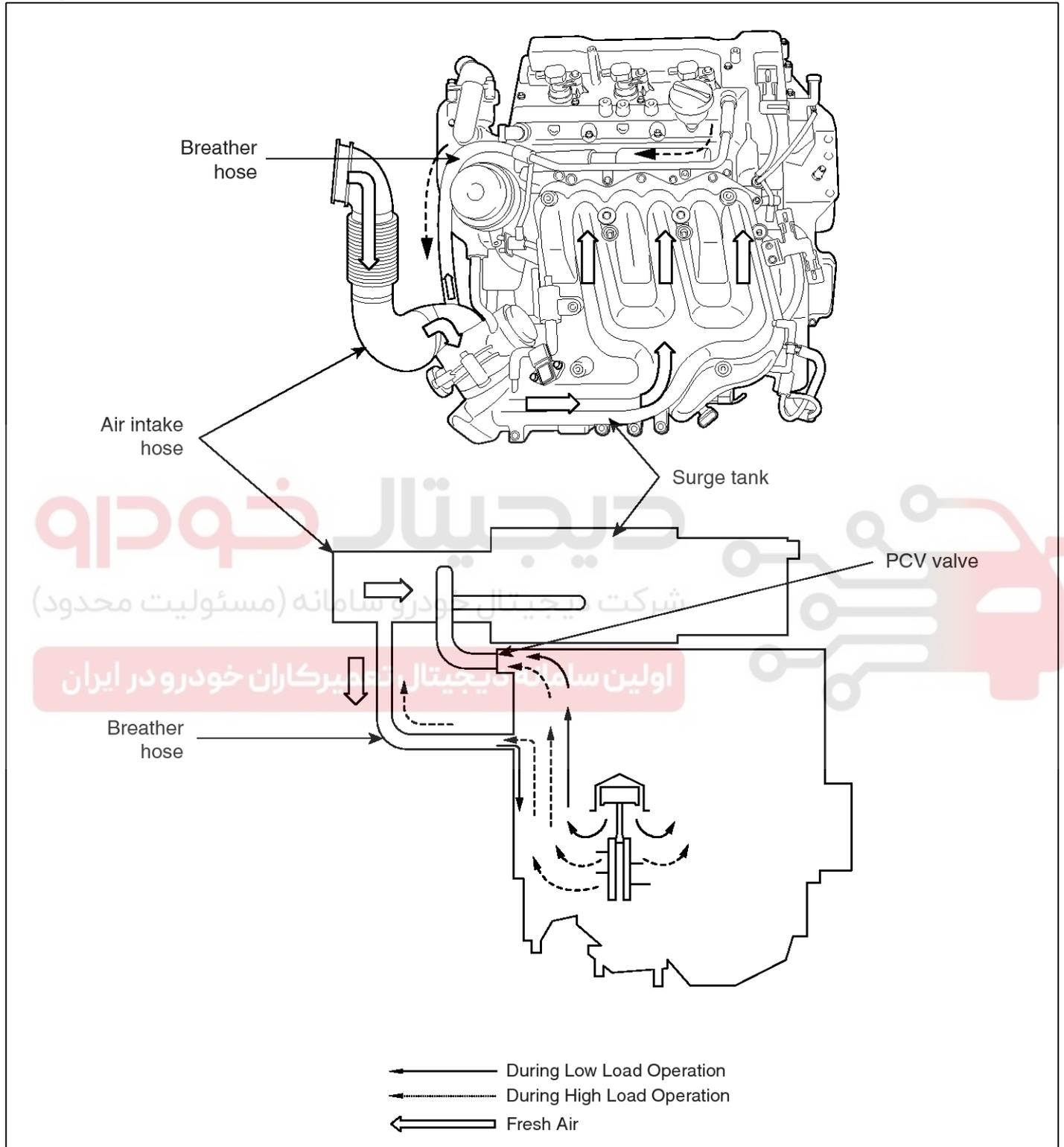
LEKG022A

# EC-6

# Emission Control System

## Crankcase Emission Control System

### Components



EERF086B

# Crankcase Emission Control System

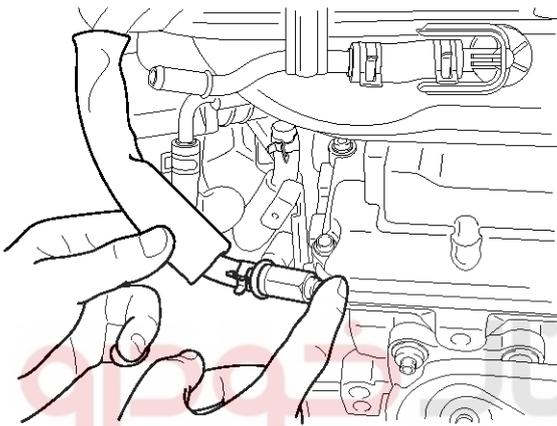
## EC-7

### 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.*



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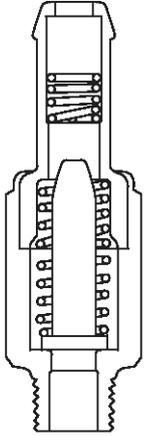
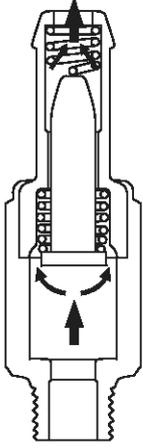
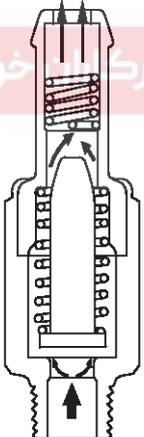
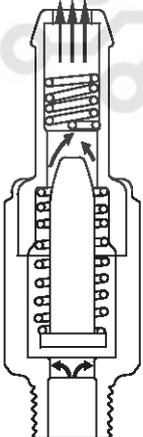
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

# EC-8

# Emission Control System

## Positive Crankcase Ventilation (PCV) Valve

### Operation

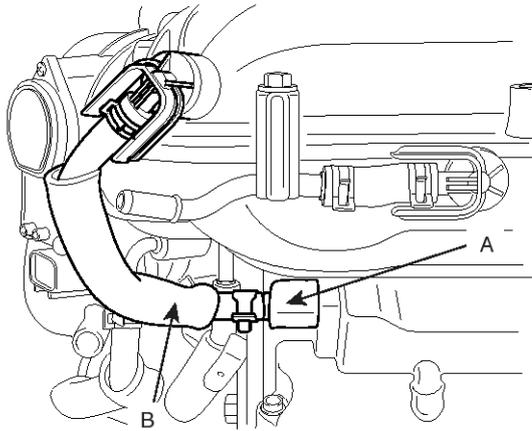
|   |                    |   |                            |
|---|--------------------|---|----------------------------|
| Intake manifold side (No vacuum)  |                    | Intake manifold side (High vacuum)  |                            |
|    |                    |    |                            |
| 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-9

### Removal

1. Remove the valve pad (A) and disconnect the vacuum hose (B).

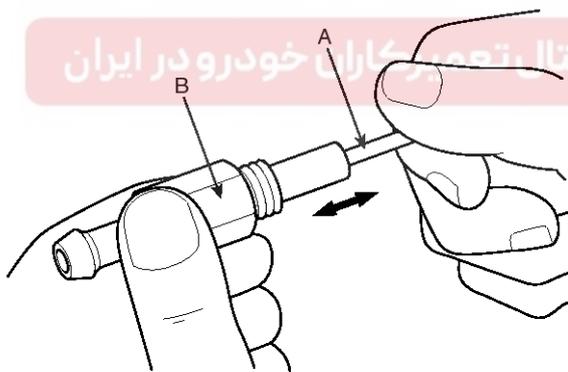


EERF600I

2. Remove the PCV Valve.

### 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 ~ 8.7lb-ft)



## EC-10

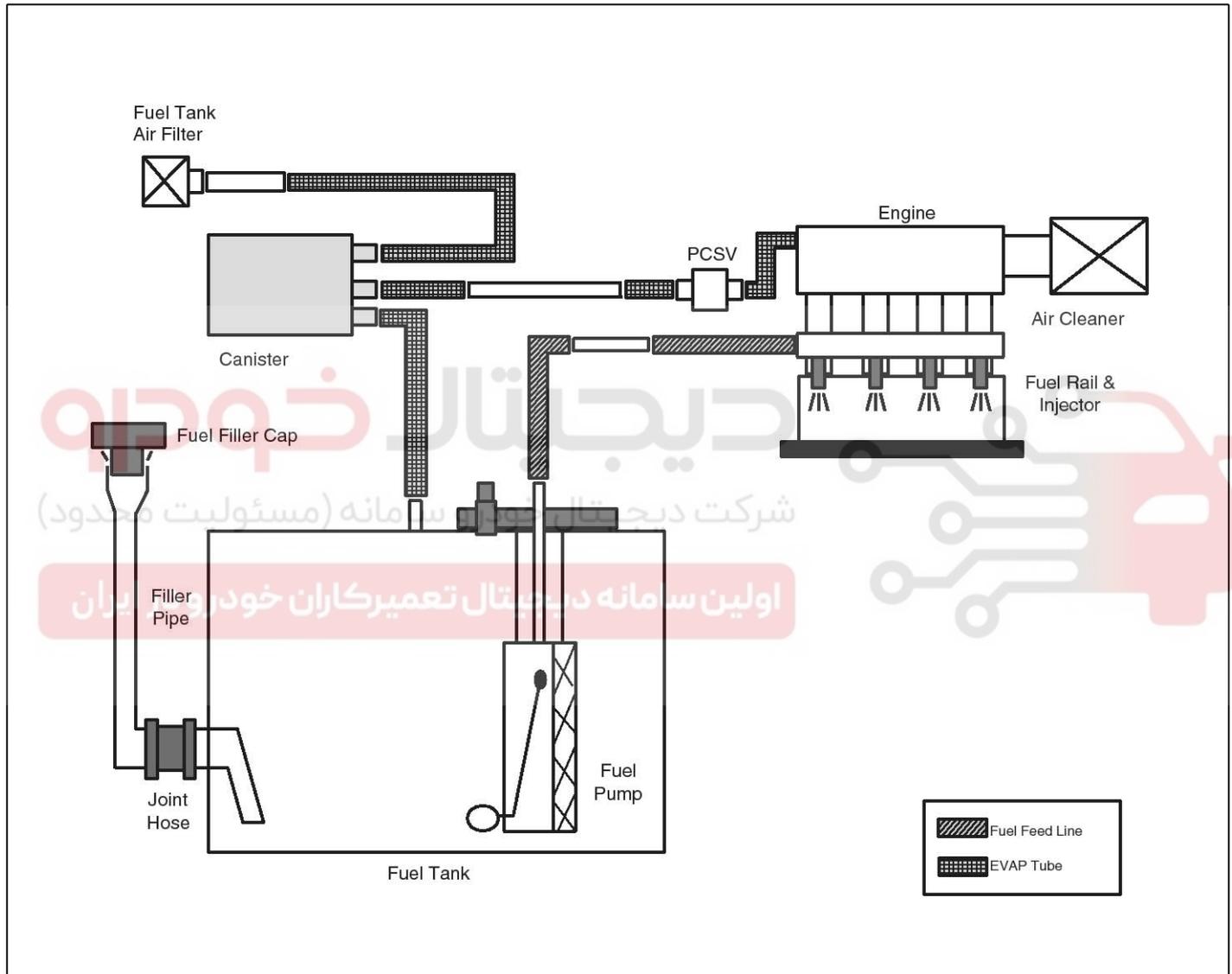
## Emission Control System

### 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.



SENEC9002L

#### 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.

# Evaporative Emission Control System

## EC-11

### 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

#### [Evaporative Emission Control System]

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<br>3,000 rpm        | 50 kPa<br>(7.3 psi) | Vacuum is held |

#### WHEN ENGINE IS WARM

| Engine operating condition                                  | Applied vacuum      | Result  |
|---|---------------------|---|
| Idling  | 50 kPa<br>(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<br>(7.3 psi) | Vacuum will be held momentarily, after which, it will be released |

### [Purge Control Solenoid Valve (PCSV)]

#### 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( $\Omega$ ) :  
19.0 ~ 22.0 [20°C (68°F)]

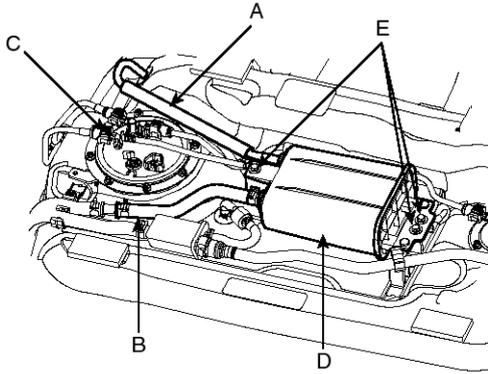
## EC-12

## Emission Control System

### Canister

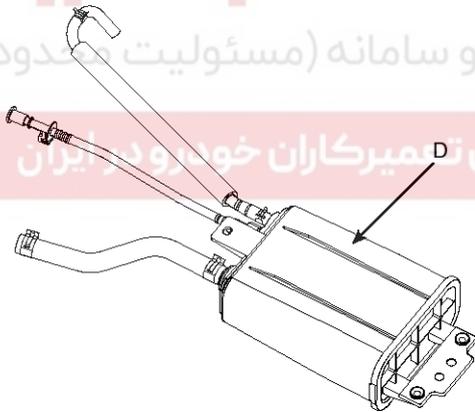
#### Removal

1. Remove the fuel tank. (Refer to group FL)
2. Disconnect the vacuum hoses (A,B) and tube quick-connector (C).



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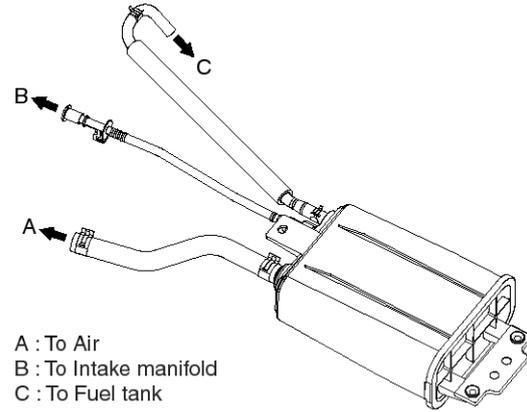
3. Remove the canister assembly (D) with unscrewing three mounting bolts (E).



SENEC7004L

#### 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 Air  
B : To Intake manifold  
C : To Fuel tank

SENEC7005L

#### Installation

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

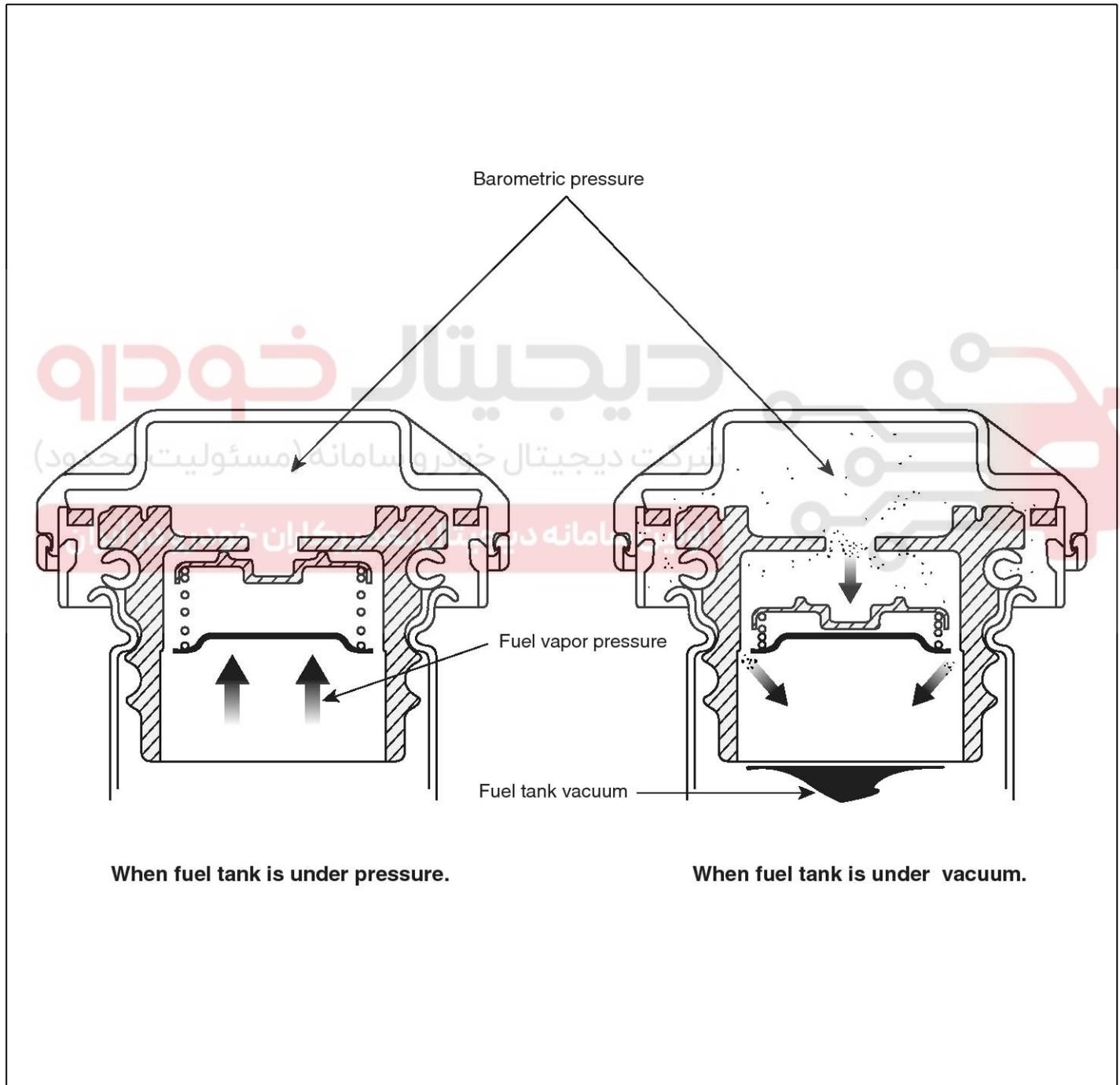
# Evaporative Emission Control System

## EC-13

### 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.



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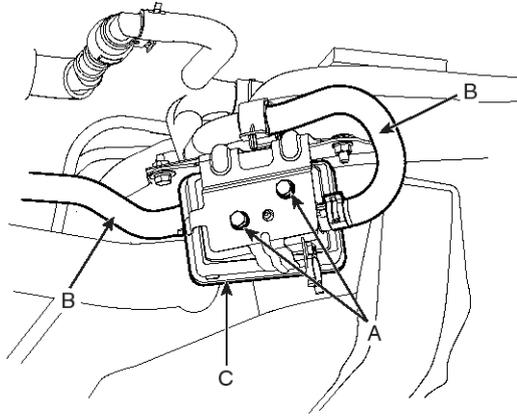
## EC-14

## Emission Control System

### Fuel Tank Air Filter

#### Replacement

1. Lift the vehicle.
2. Unfasten two mounting bolts (A) and disconnect the air filter hoses (B).



SENEC7006L

3. Remove the canister air filter (C).
4. Install a new canister air filter.

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# Exhaust Emission Control System

EC-15

## Exhaust Emission Control System

### Description

Exhaust emissions (CO, HC, NOx) are controlled by a combination of engine modifications and the addition of special control components.

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.

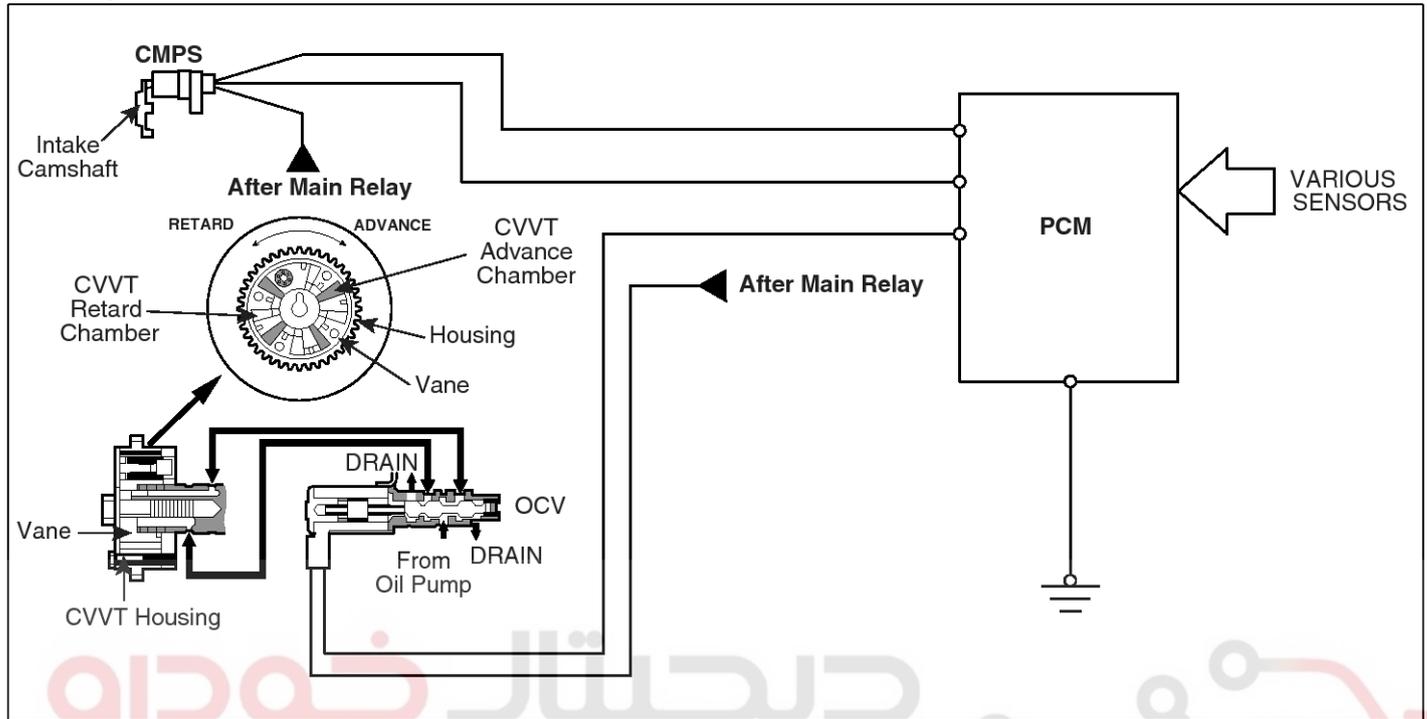


# EC-16

# Emission Control System

## CVVT (Continuously Variable Valve Timing) System

### Description



SHDEC6106N

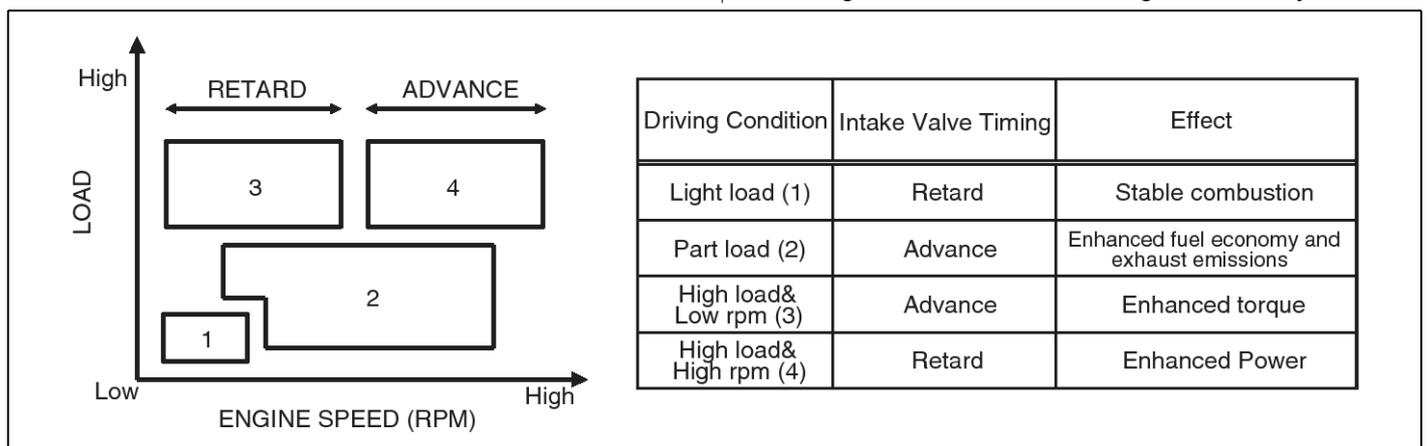
The CVVT (Continuously Variable Valve Timing) which is installed on the exhaust camshaft controls intake valve open and close timing in order to improve engine performance.

The intake valve timing is optimized by CVVT system depending on engine rpm.

This CVVT system improves fuel efficiency and reduces NOx emissions at all levels of engine speed, vehicle speed, and engine load by EGR effect because of valve over-lap optimization.

The CVVT changes the phase of the intake camshaft via oil pressure.

It changes the intake valve timing continuously.



LEIF001Q

# Exhaust Emission Control System

## EC-17

### Operation

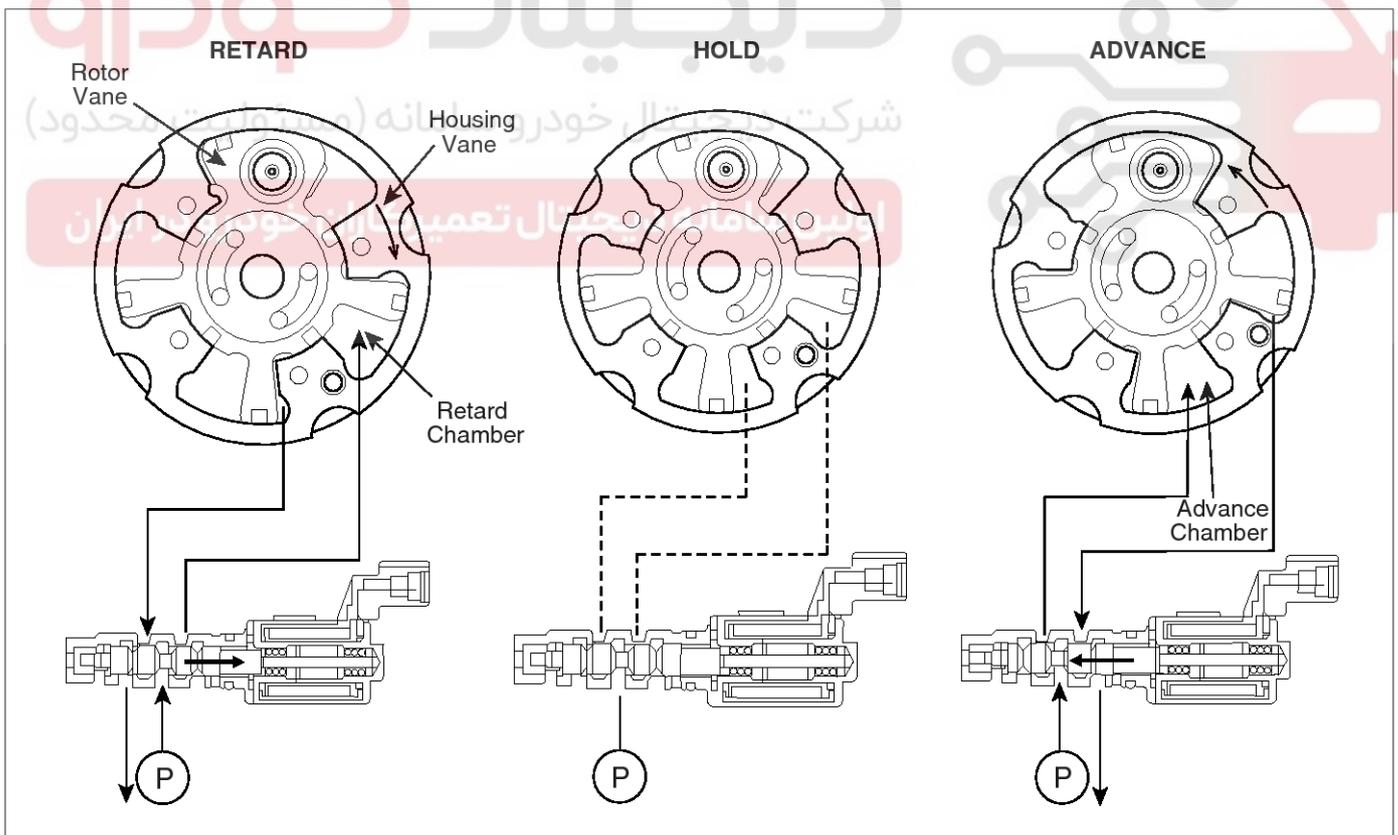
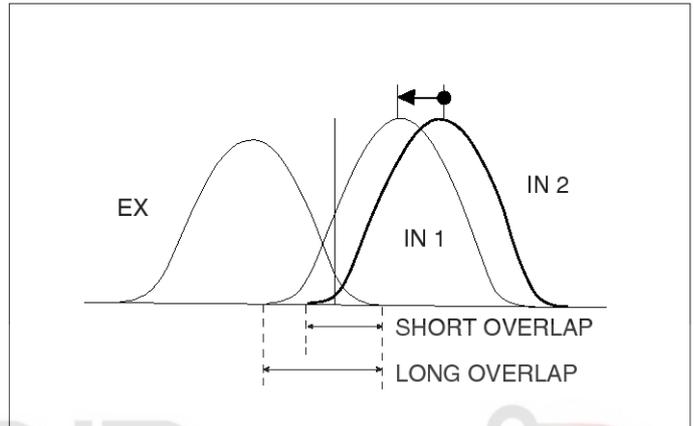
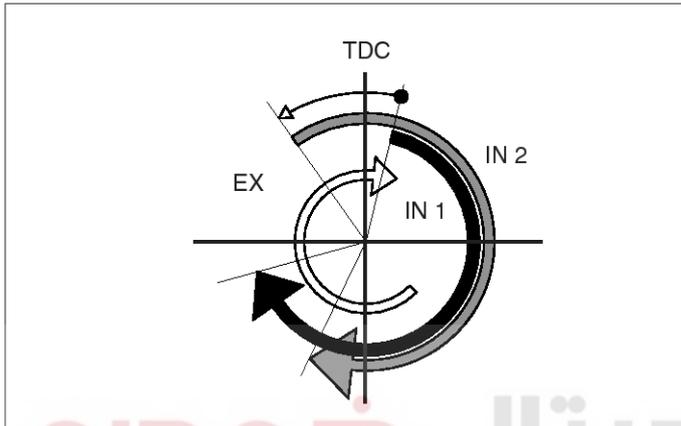
The CVVT system makes continuous intake valve timing changes based on operating conditions.

Intake valve timing is optimized to allow the engine to produce maximum power.

Cam angle is advanced to obtain the EGR effect and reduce pumping loss. The intake valve is closed quickly to reduce the entry of the air/fuel mixture into the intake port and improve the scavenging effect.

Reduces the cam advance at idle, stabilizes combustion, and reduces engine speed.

If a malfunction occurs, the CVVT system control is disabled and the valve timing is fixed at the fully retarded position.



UEBG014A

## EC-18

## Emission Control System

1. The above figure shows the relative operation structures of the housing vane to the rotor vane.
2. If the CVVT is held a certain control angle, to hold this state, oil is replenished as much as oil leaks from the oil pump.

The OCV (Oil-flow Control Valve) spool location at this time is as follows.

**Oil pump → Advance oil chamber (Little by little open the inflow side to the advance oil chamber) → Almost close the drain side**

Note that a difference may exist in the position according to the engine running state (rpm, oil temperature, and oil pressure).

# دیجیتال خودرو

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