

Emissions Control System

GENERAL

CRANKCASE EMISSION CONTROL SYSTEM

POSITIVE CRANKCASE VENTILATION (PCV) VALVE

EVAPORATIVE EMISSION CONTROL SYSTEM

CANISTER
PURGE CONTROL SOLENOID VALVE (PCSV)
FUEL FILLER CAP

EXHAUST EMISSION CONTROL SYSTEM
CONTINUOUS VARIABLE VALVE TIMING (CVVT)

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



EC -2

EMISSIONS CONTROL SYSTEM

GENERAL**DESCRIPTION** E654E70F

| 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 EE7E324F**PURGE CONTROL SOLENOID VALVE (PCSV)**

Specification

| Item | Specification |
|---------------------|--------------------------|
| Coil Resistance () | 1.6 DOHC 16.0 [20 (68)] |
| | 2.0 DOHC 26.0 [20 (68)] |

TIGHTENING TORQUES E10B94AC

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

TROUBLESHOOTING E3BDF1DF

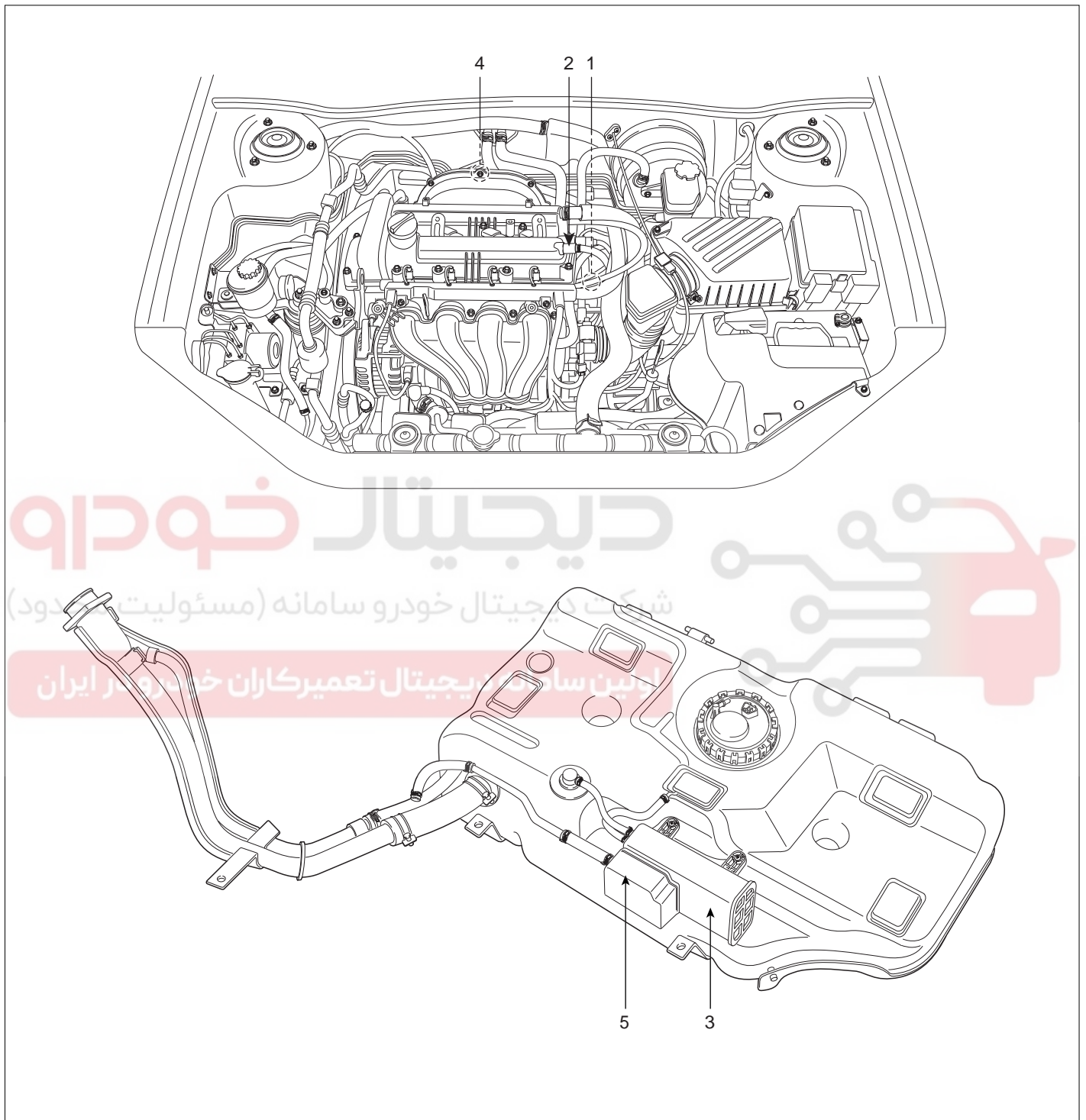
| Symptom | Suspect area | Remedy |
|--|---|---|
| Engine will not start or hard to start | Vacuum hose disconnected or damaged | Repair or replace |
| | Malfunction of the Purge Control Solenoid Valve | Repair or replace |
| Rough idle or engine stalls | Vacuum hose disconnected or damaged | Repair 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

EC -3

COMPONENT LOCATION E8B64BCB

[1.6 DOHC]

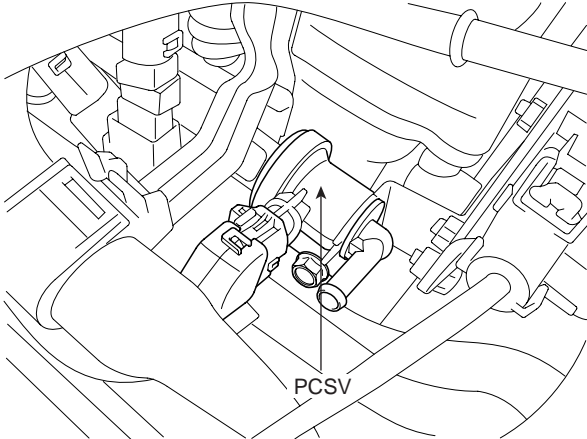
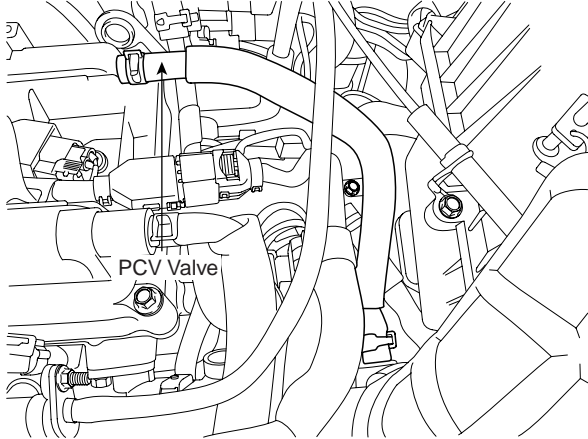
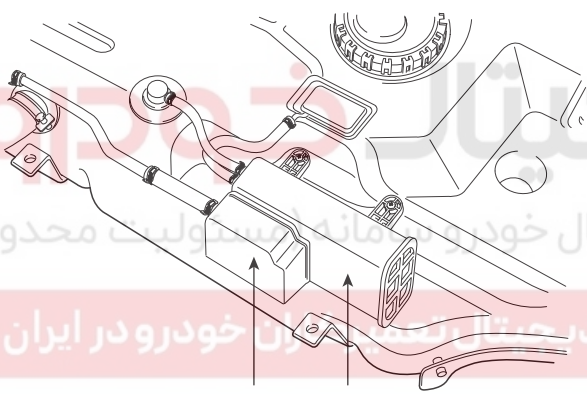
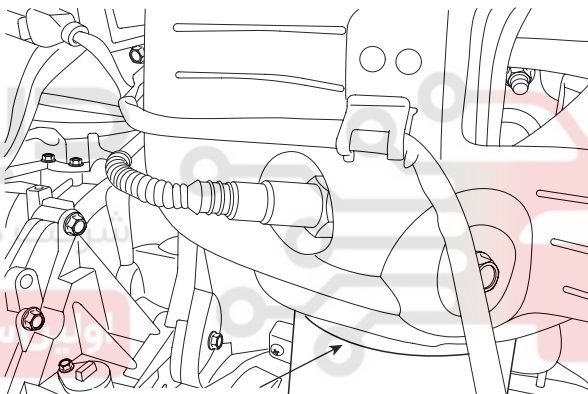


1. Purge Control Solenoid Valve (PCSV)
2. PCV Valve
3. Canister
4. Catalytic Converter
5. Fuel Tank Air Filter

SLDEC7100L

EC -4

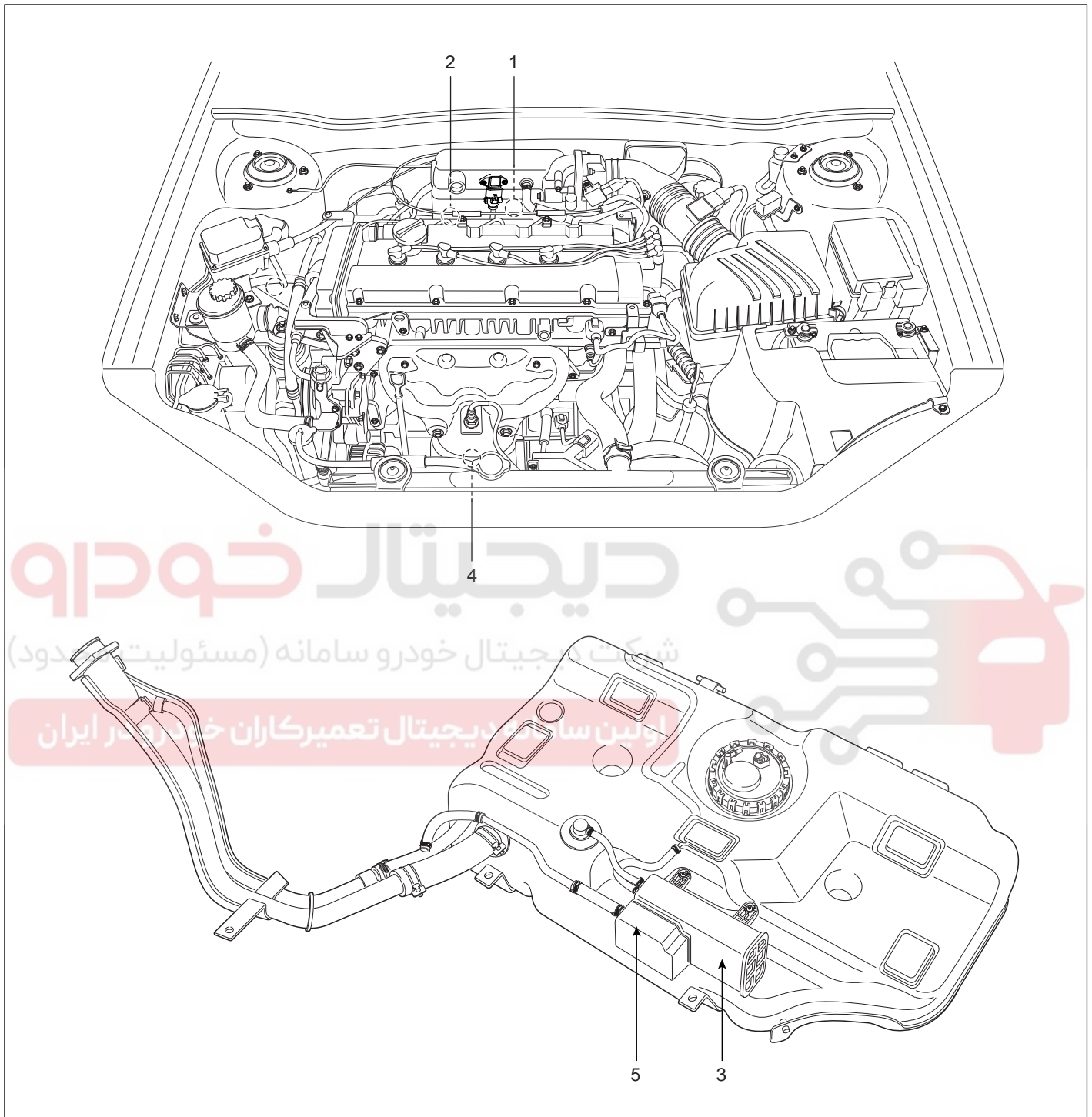
EMISSIONS CONTROL SYSTEM

| | | | |
|---|-------------------------------------|--|--|
| 1 | Purge Control Solenoid Valve (PCSV) | 2 | Positive Crankcase Ventilation (PCV) Valve |
|  <p>PCSV</p> <p>SHDEC6101L</p> | |  <p>PCV Valve</p> <p>SHDEC6102L</p> | |
| 3 | Canister | 4 | Catalytic Converter |
| 5 | Fuel Tank Air Filter | | |
|  <p>Fuel Tank Air Filter Canister</p> <p>SLDEC7101L</p> | |  <p>Catalytic Converter</p> <p>SHDEC6104L</p> | |

GENERAL

EC -5

[2.0 DOHC]

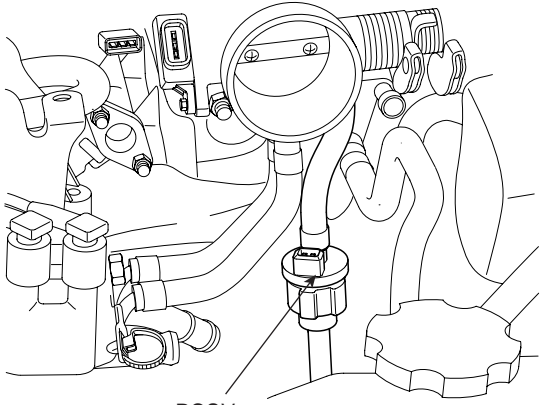
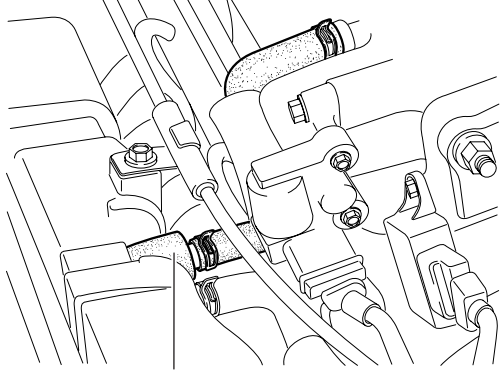
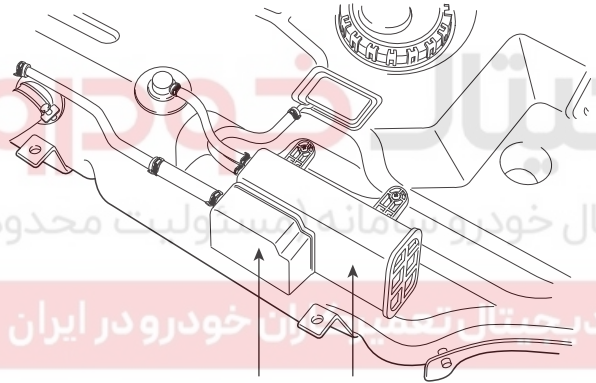
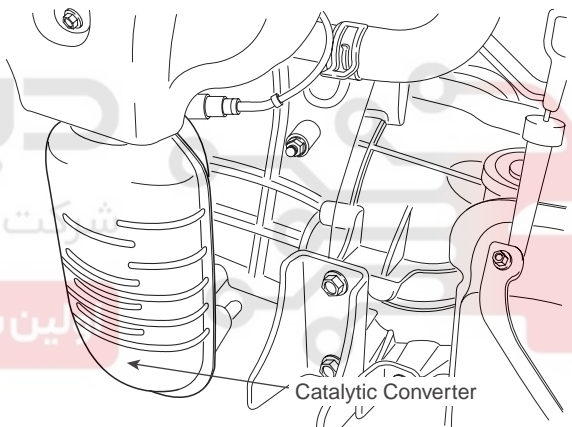


1. Purge Control Solenoid Valve (PCSV)
2. PCV Valve
3. Canister
4. Catalytic Converter
5. Fuel Tank Air Filter

SLDEC7102L

EC -6

EMISSIONS CONTROL SYSTEM

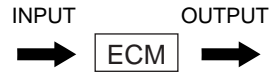
| | | | |
|---|-------------------------------------|---|--|
| 1 | Purge Control Solenoid Valve (PCSV) | 2 | Positive Crankcase Ventilation (PCV) Valve |
|  <p style="text-align: center;">PCSV</p> <p style="text-align: right;">BFGE302B</p> | |  <p style="text-align: center;">PCV valve</p> <p style="text-align: right;">SLDEC7103L</p> | |
| 3 | Canister | 4 | Catalytic Converter |
| 5 | Fuel Tank Air Filter | | |
|  <p style="text-align: center;">Fuel Tank Air Filter Canister</p> <p style="text-align: right;">SLDEC7101L</p> | |  <p style="text-align: center;">Catalytic Converter</p> <p style="text-align: right;">SLDEC7104L</p> | |

GENERAL

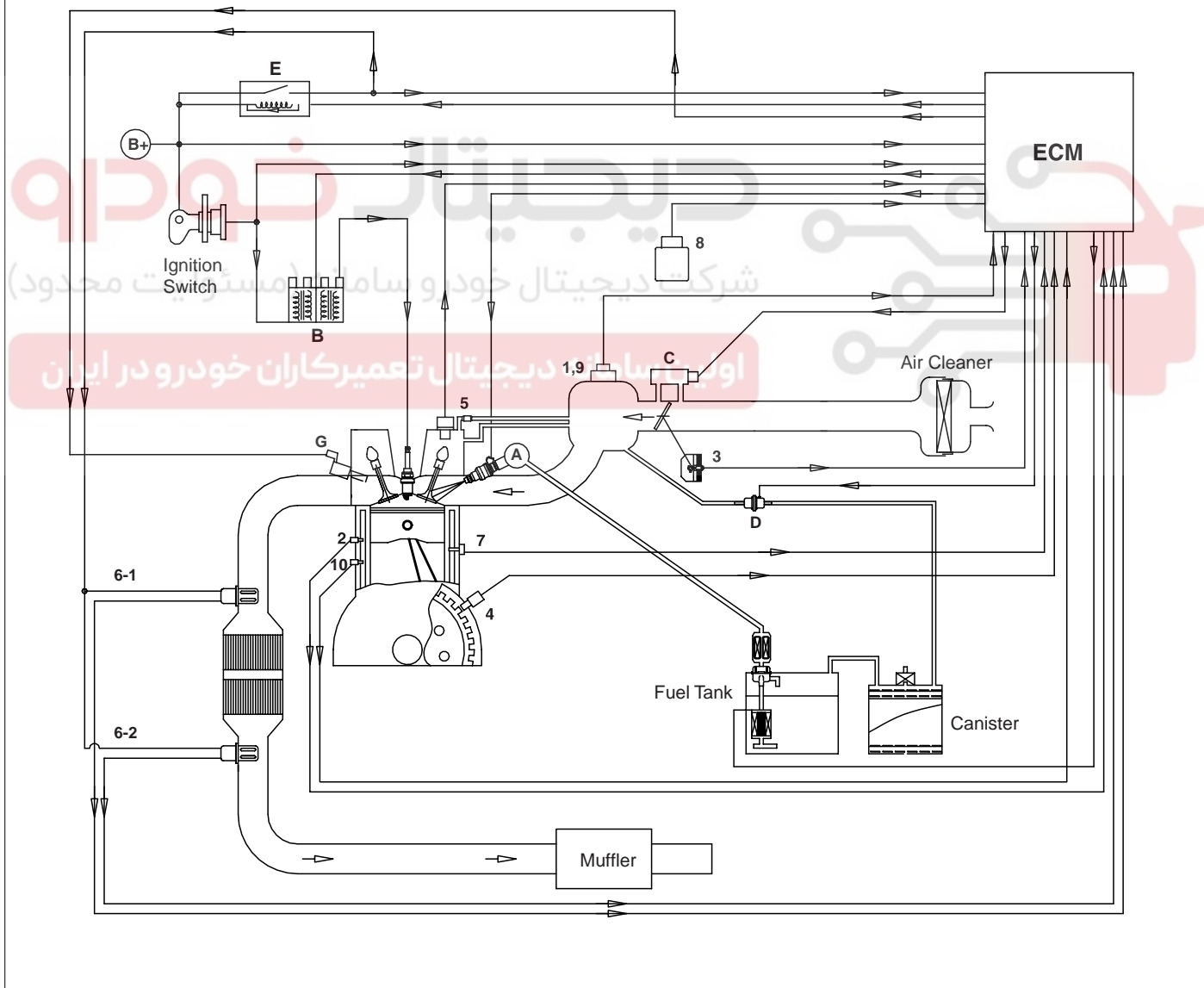
EC -7

SCHEMATIC DIAGRAM ED1E459F

- 1. Manifold Absolute Pressure Sensor (MAPS)
- 2. Engine Coolant Temperature Sensor (ECTS)
- 3. Throttle Position Sensor (TPS)
- 4. Crankshaft Position Sensor (CKPS)
- 5. Camshaft Position Sensor (CMPS)
- 6-1. Heated Oxygen Sensor (HO2S, Sensor 1)
- 6-2. Heated Oxygen Sensor (HO2S, Sensor 2)
- 7. Knock Sensor
- 8. Vehicle Speed Sensor (VSS)
- 9. Intake Air Temperature Sensor (IATS)
- 10. CVVT Oil Temperature Sensor (OTS) [2.0 DOHC]
- Switch Input Signals



- A. Injector
- B. Ignition Coil
- C. Idle Speed Control Actuator (ISCA)
- D. Purge Control Solenoid Valve (PCSV)
- E. Main Relay
- F. Fuel Pump Relay
- G. CVVT Oil Control Valve (OCV)

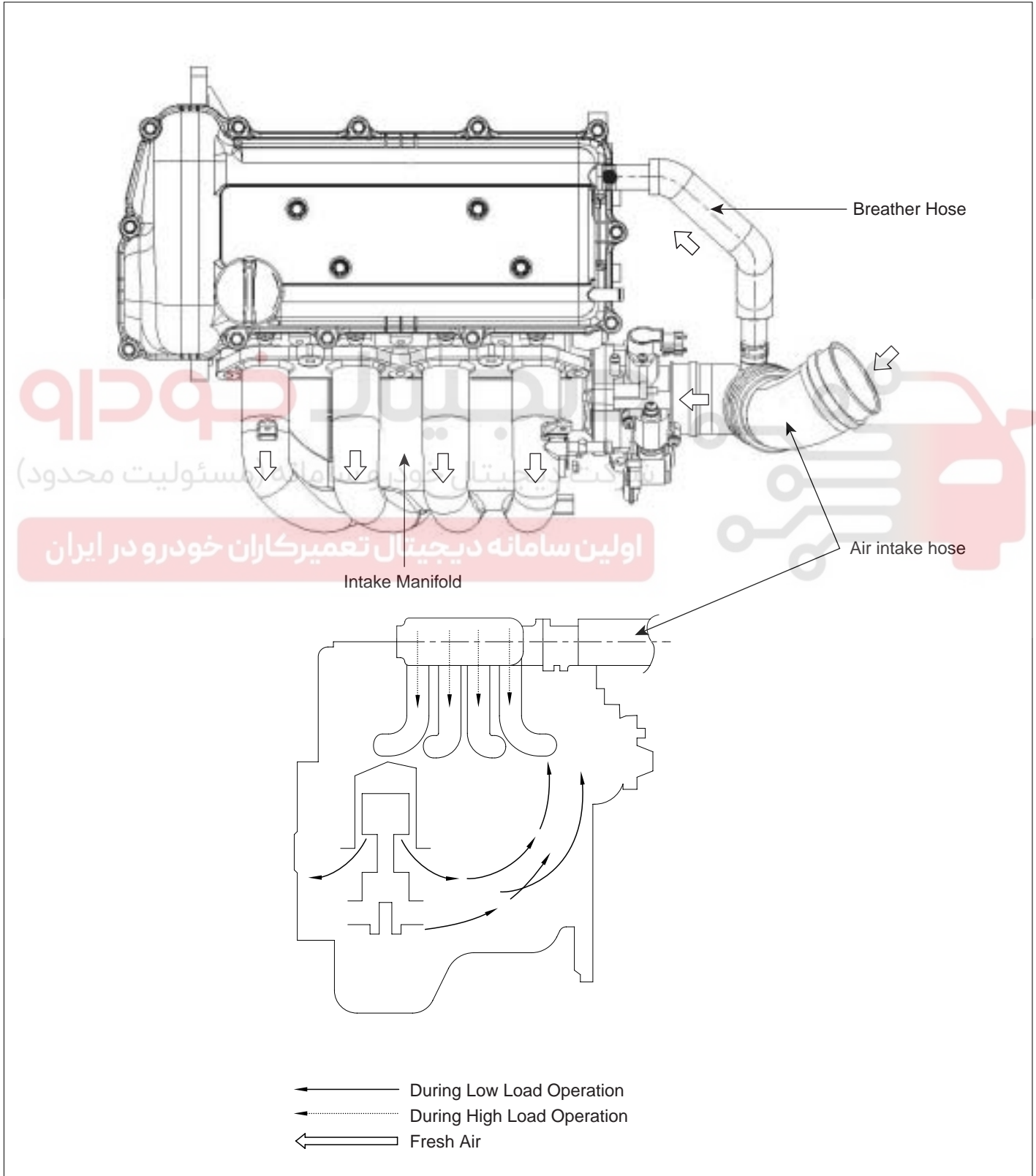


SHDEC6109L

CRANKCASE EMISSION CONTROL SYSTEM

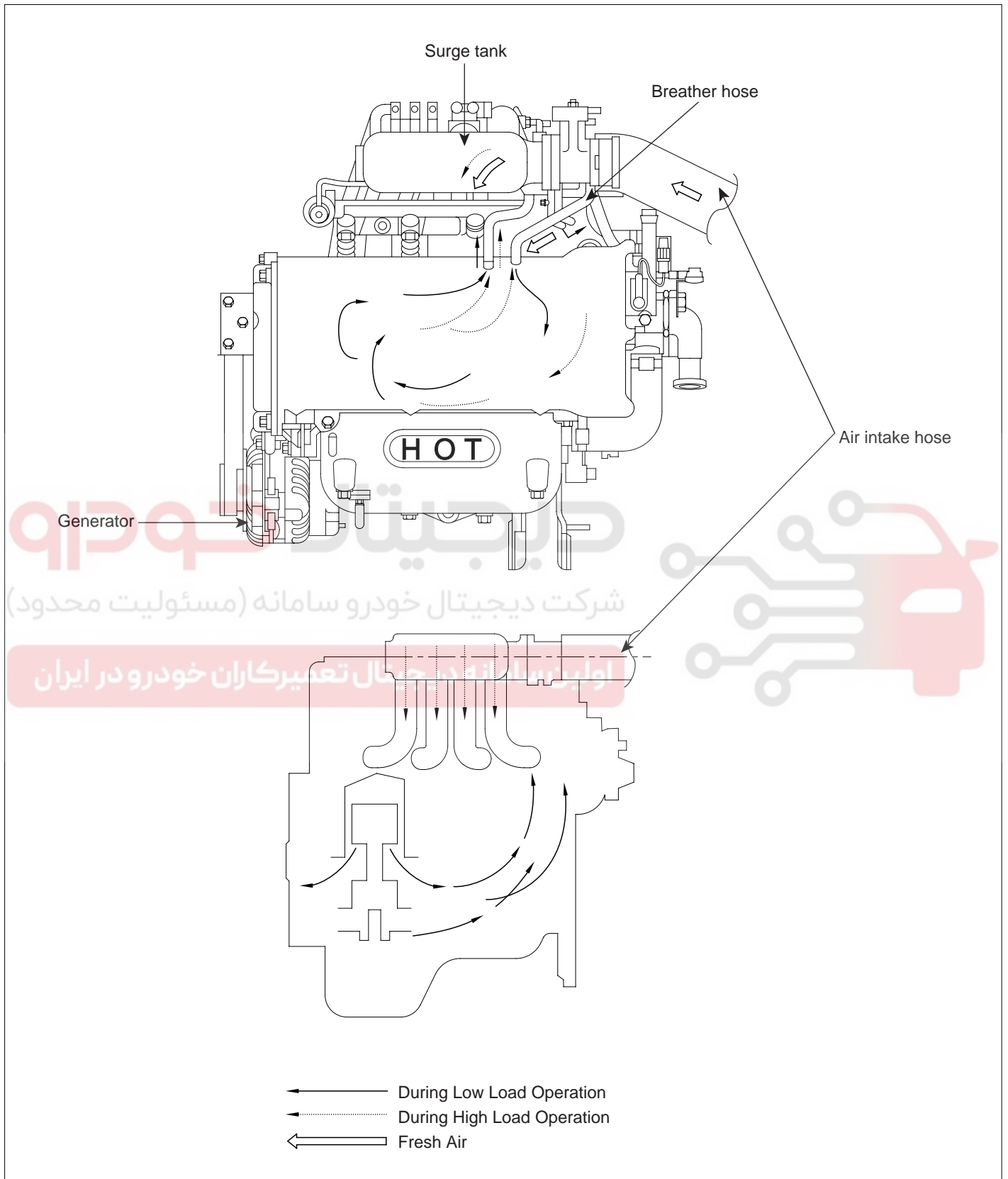
COMPONENTS EE4AD903

[1.6 DOHC]



CRANKCASE EMISSION CONTROL SYSTEM

[2.0 DOHC]



SHDEC6111L

EC -10

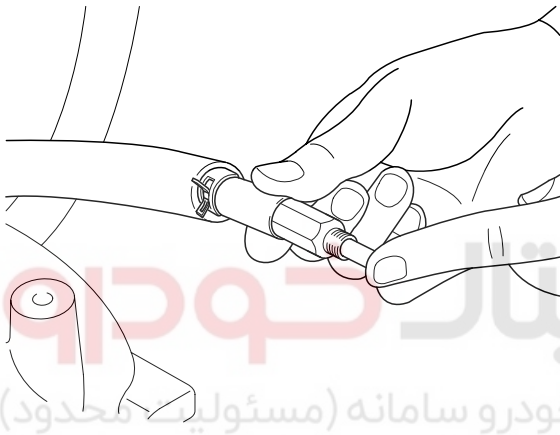
EMISSIONS CONTROL SYSTEM

INSPECTION EB79D9CD

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.

 **NOTE**

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



SCMEC6004L

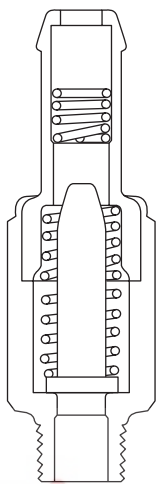
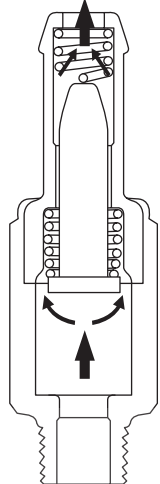
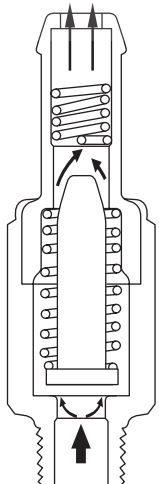
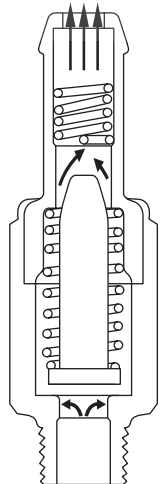
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CRANKCASE EMISSION CONTROL SYSTEM

EC -11

POSITIVE CRANKCASE VENTILATION (PCV) VALVE

OPERATION E49D169E

| | | | |
|--|--------------------|---|----------------------------|
| <p>Intake manifold side (No vacuum)</p>  <p>Rocker cover side</p> | | <p>Intake manifold side (High vacuum)</p>  <p>Rocker cover side</p> | |
| Engine condition | Not running | Engine condition | Idling or decelerating |
| PCV valve | Not operating | PCV valve | Fully operating |
| Vacuum passage | Restricted | Vacuum passage | Small |
| <p>Intake manifold side (Moderate vacuum)</p>  <p>Rocker cover side</p> | | <p>Intake manifold side (Low vacuum)</p>  <p>Rocker cover side</p> | |
| 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 |

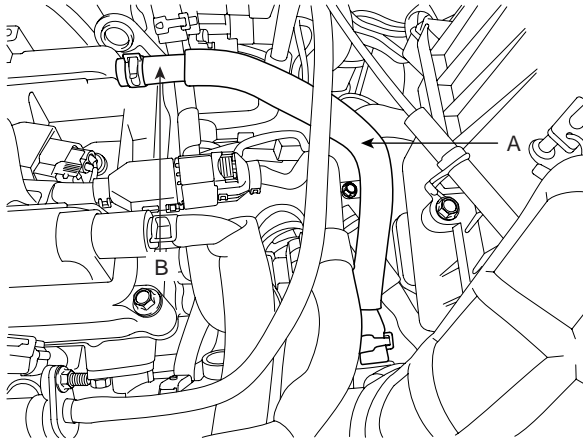
SUNEC7105L

EC -12

EMISSIONS CONTROL SYSTEM

REMOVAL EBF3C35D

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

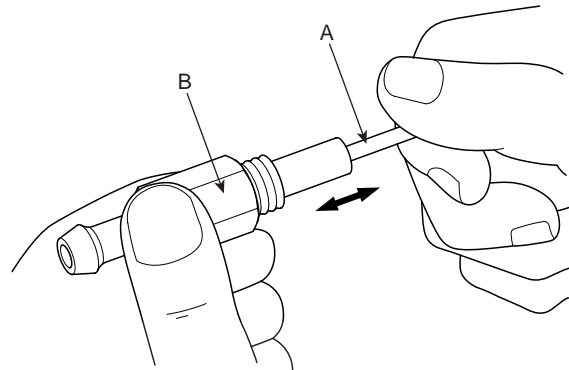


[1.6 DOHC]

SHDEC6112L

INSPECTION E430AB45

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.

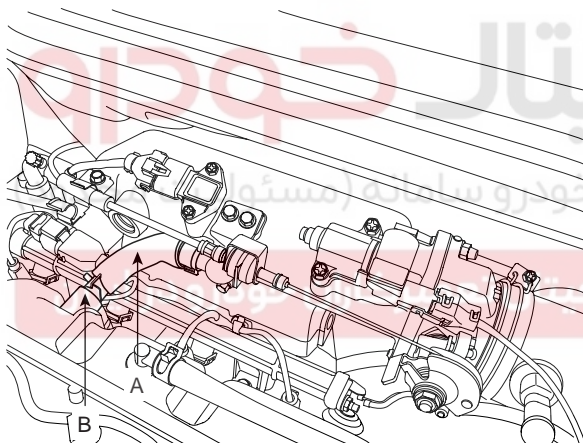


EERF600J

INSTALLATION EC72F7BB

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 ~ 8.7lbf·ft)



[2.0 DOHC]

SHDEC6113L

EVAPORATIVE EMISSION CONTROL SYSTEM

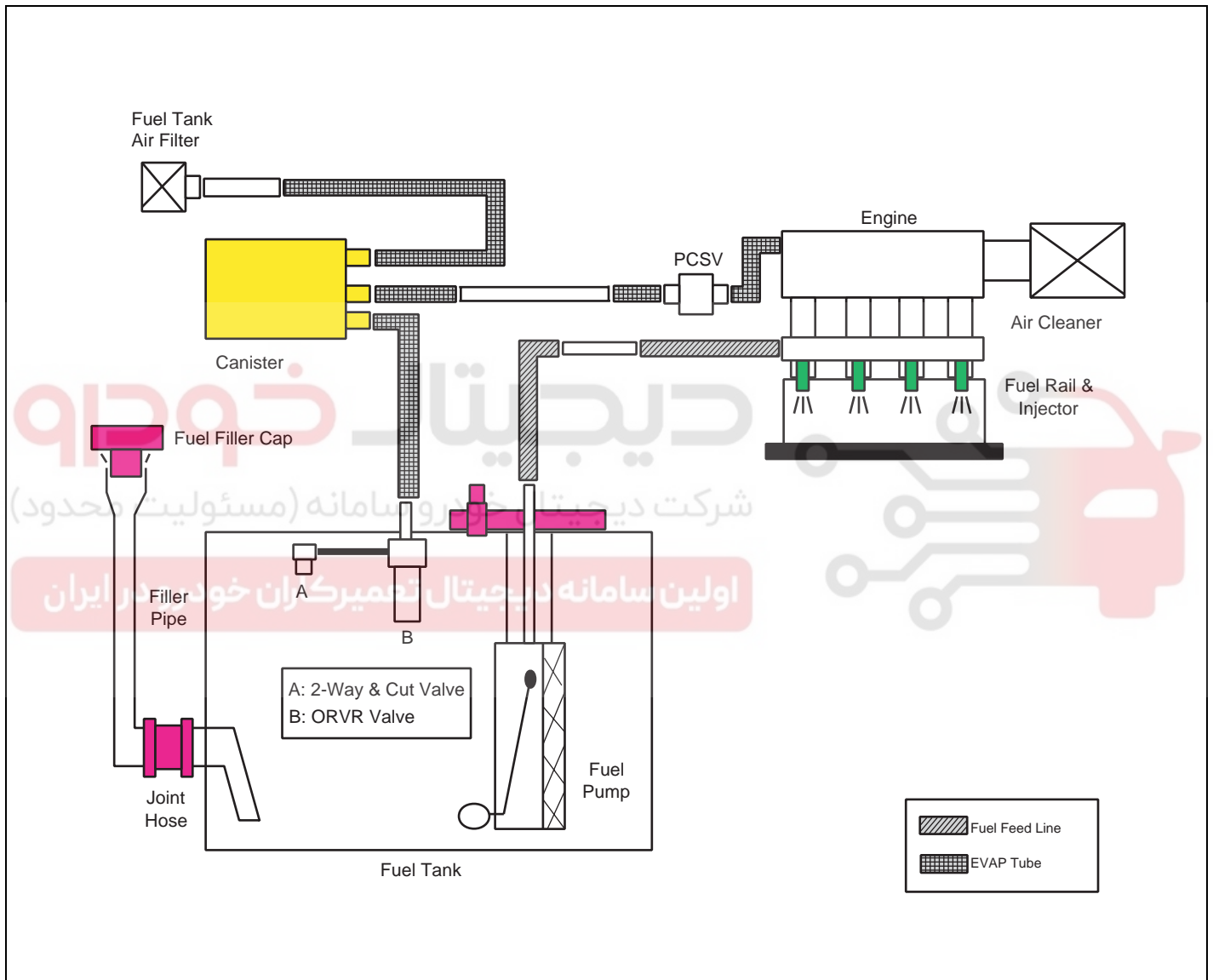
EC -13

EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION EA1BD7FA

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.



LEKG033A

EC -14

EMISSIONS CONTROL SYSTEM

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 E3C3DA96

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 | | |

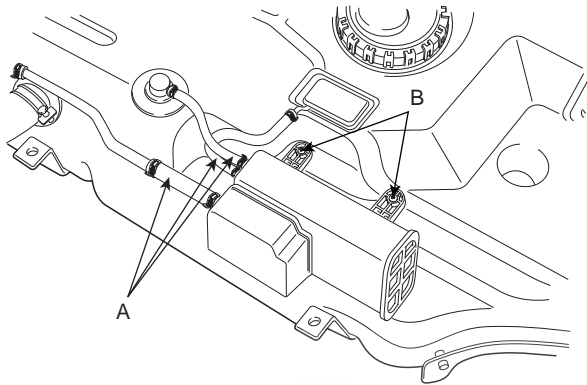
WHEN ENGINE IS WARM

| 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 |

در جیتال خودرو
جیتال خودرو سامانه (مسئولیت محدود)
مانه دیجیتال تعمیرکاران خودرو در ایران

EVAPORATIVE EMISSION CONTROL SYSTEM**EC -15****CANISTER****REMOVAL** E94491F8

1. Remove the fuel tank (Refer to "FUEL TANK" in FL group).
2. Disconnect the vacuum hoses (A).

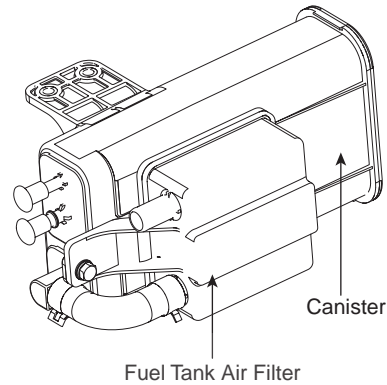


SLDEC7105L

3. Unscrew the mounting screws (B), and then remove the canister assembly from the vehicle.

INSPECTION E5A42C4B

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.



Fuel Tank Air Filter

Canister

SLDEC7106L

INSTALLATION EB7CDF82

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

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EC -16

EMISSIONS CONTROL SYSTEM

PURGE CONTROL SOLENOID VALVE (PCSV)

INSPECTION EE73826A

NOTE

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() :

16.0 at 20 (68) [1.6 DOHC]
26.0 at 20 (68) [2.0 DOHC]



EVAPORATIVE EMISSION CONTROL SYSTEM

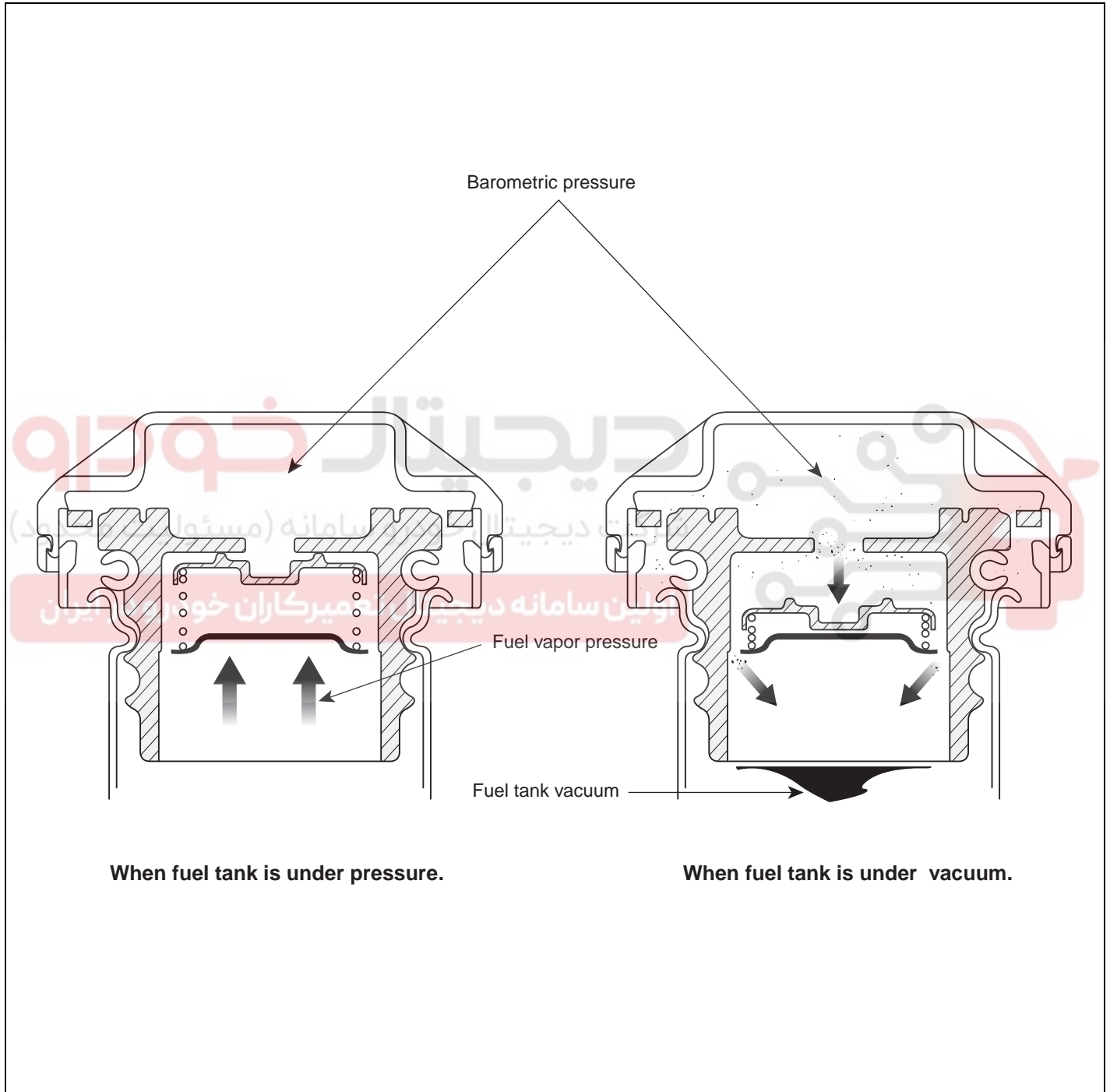
EC -17

FUEL FILLER CAP

DESCRIPTION EE6CA1EF

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

DESCRIPTION E3F4D599

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 [MULTI-PORT FUEL INJECTION (MFI) SYSTEM]

The MFI system is a system which uses the signals from the heated oxygen sensor to activate and control the injector installed in the manifold for each cylinder, thus precisely regulating the air/fuel mixture ratio and reducing emissions.

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.

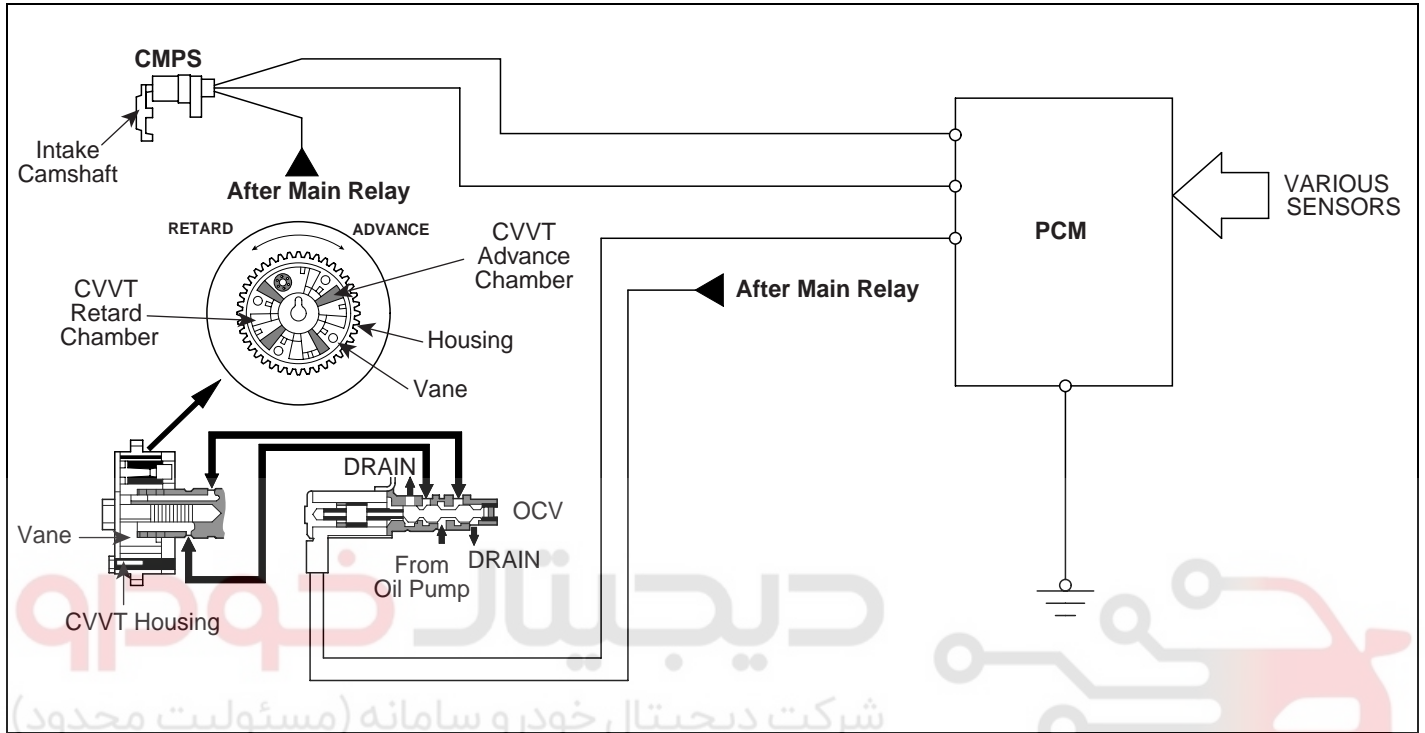
1. Open Loop air/fuel ratio is controlled by information programmed into the ECM.
2. Closed Loop air/fuel ratio is adjusted by the ECM based on information supplied by the oxygen sensor.



EXHAUST EMISSION CONTROL SYSTEM

CONTINUOUS VARIABLE VALVE TIMING (CVVT)

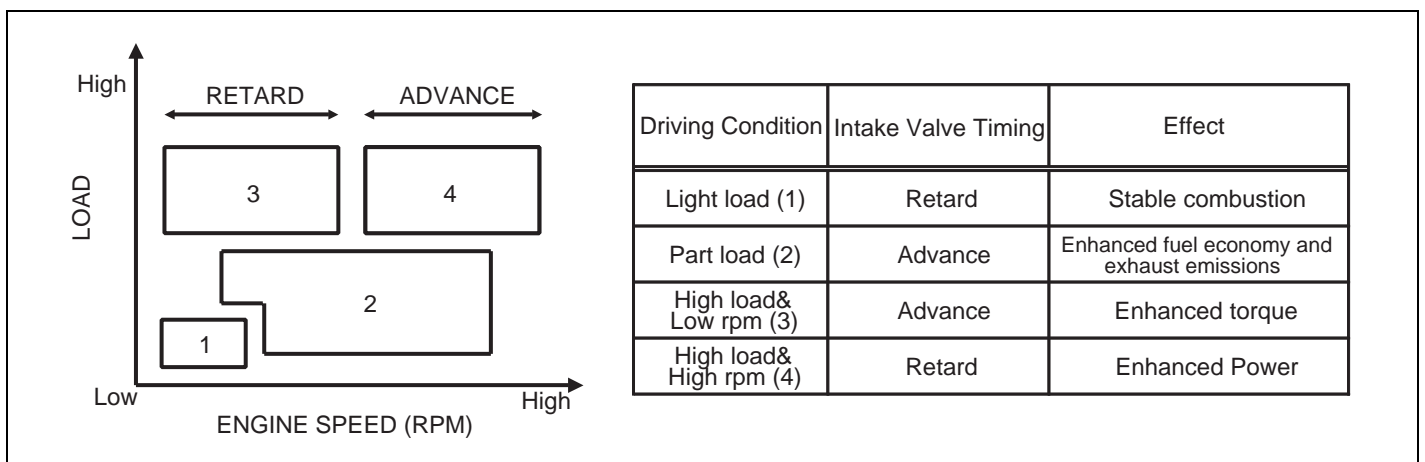
DESCRIPTION EC294E0D



SLDEC7107L

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

OPERATION EBACEED0

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

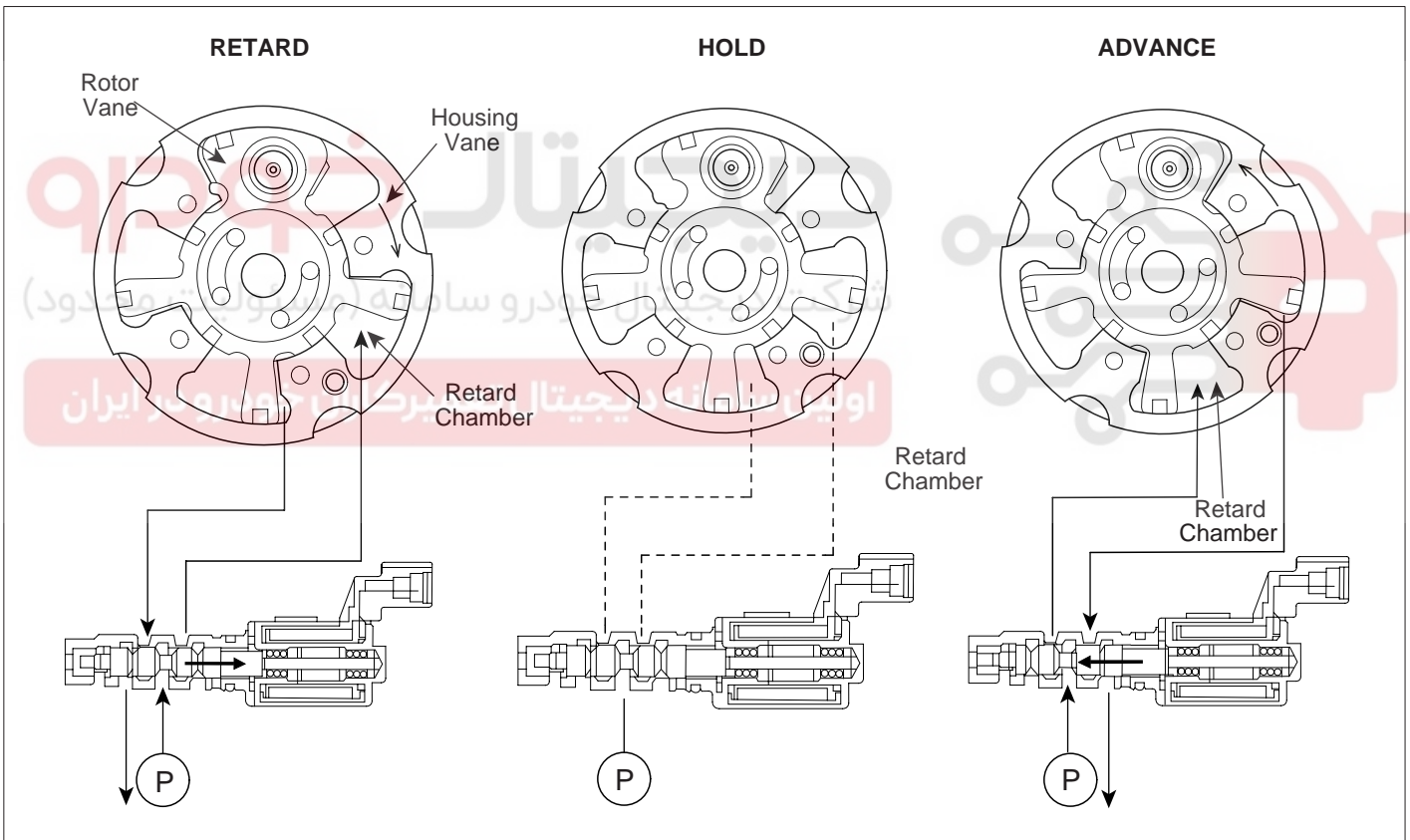
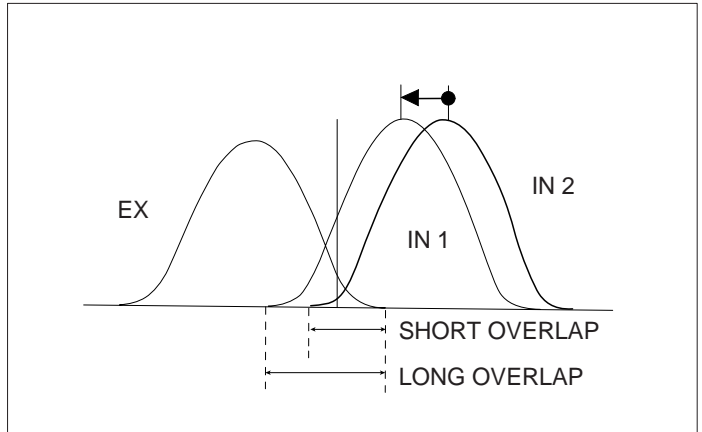
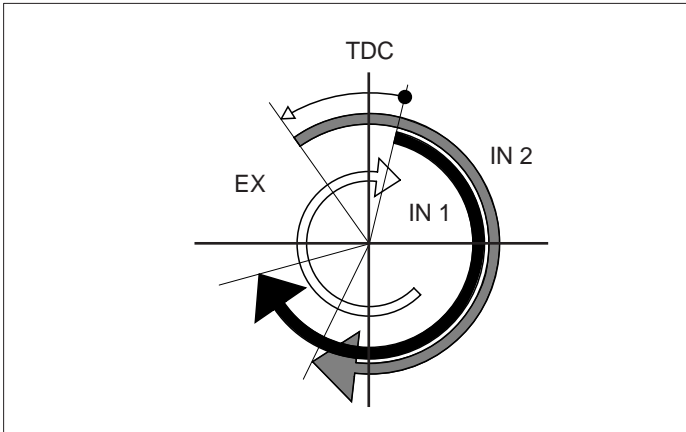
Intake valve timing is optimized to allow the engine to produce maximum power. Cam angle is advanced to obtain the EGR effect and reduce pumping loss. The intake valve is closed quickly to

EC -20

EMISSIONS CONTROL SYSTEM

reduce the entry of the air/fuel mixture into the intake port and improve the changing 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

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.

Be sure there might be a difference in the position according to the engine running state (rpm, oil temperature, and oil pressure).

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