



Emission Control System

General Information



Schematic drawing

- * 1-1 OXYGEN SENSOR(BANK1 SENSOR1)
- * 1-2 OXYGEN SENSOR(BANK1 SENSOR2)
- * 2-1 OXYGEN SENSOR(BANK2 SENSOR1)
- * 2-2 OXYGEN SENSOR(BANK2 SENSOR2)
- * 3 AIR FLOW SENSOR
- * 4 AIR TEMP. SENSOR
- * 5 I.P.S
- * 6 CAM POSITION SENSOR
- * 7 CRANK ANGLE SENSOR
- * 8 WATER TEMP SENSOR
- * 9 MAP SENSOR
- * 10 KNOCK SENSOR

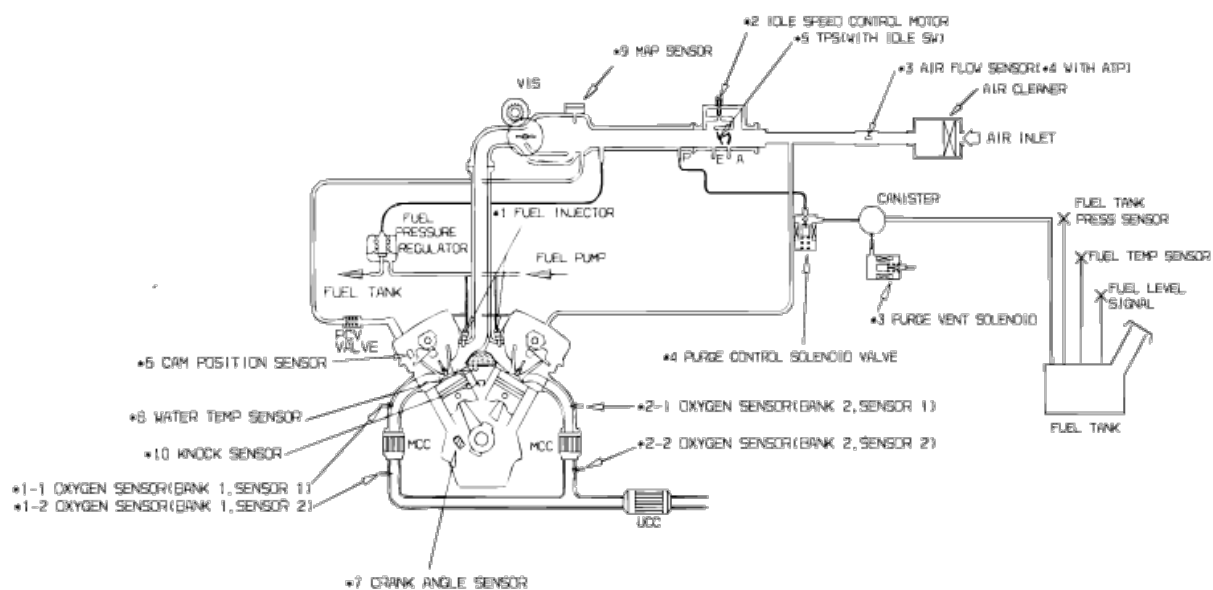
- * IGNITION SWITCH
- * BATTERY VOLTAGE
- * VEHICLE SPEED SENSOR
- * POWER STEERING SWITCH
- * IGNITION DETECT SIGNAL
- * FUEL TEMP SENSOR
- * FUEL TANK PRESS SENSOR
- * FUEL LEVEL SIGNAL

INPUT

COMPUTER

OUTPUT

- * 1 FUEL INJECTOR
- * 2 IDLE SPEED CONT. MOTOR
- * 3 PURGE VENT SOLENOID
- * 4 PURGE CONTROL SOLENOID
- * COOLER RELAY
- * IGNITION TIMING CONTROL
- * FUEL PUMP CONTROL
- * CONTROL RELAY
- * DIAGNOSIS





Specifications

Components	Function	Remarks
Crankcase Emission System Positive crankcase ventilation (PCV) valve	HC reduction	Variable flow rate type
Evaporative Emission System EVAP Canister EVAP Canister Purge Solenoid Valve	HC reduction HC reduction	Duty solenoid valve
Exhaust Emission System MFI system (air-fuel mixture control device) Three-way catalytic converter	CO, HC, NOx reduction CO, HC, NOx reduction NOx reduction	Oxygen sensor feedback type Monolith type

EVAP : Evaporative Emission

Service standard

EVAP Canister Purge Solenoid Valve Coil resistance	30~34Ω[at20°C(68°F)]
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Sealant

Engine coolant temperature sensor threaded portion	THREE BOND 2403 or equivalent
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Troubleshooting

Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	Malfunction of the EVAP Canister Purge	Repair or replace
	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 EVAP Canister Purge System	Check the system; if there is a problem, check its component parts
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system

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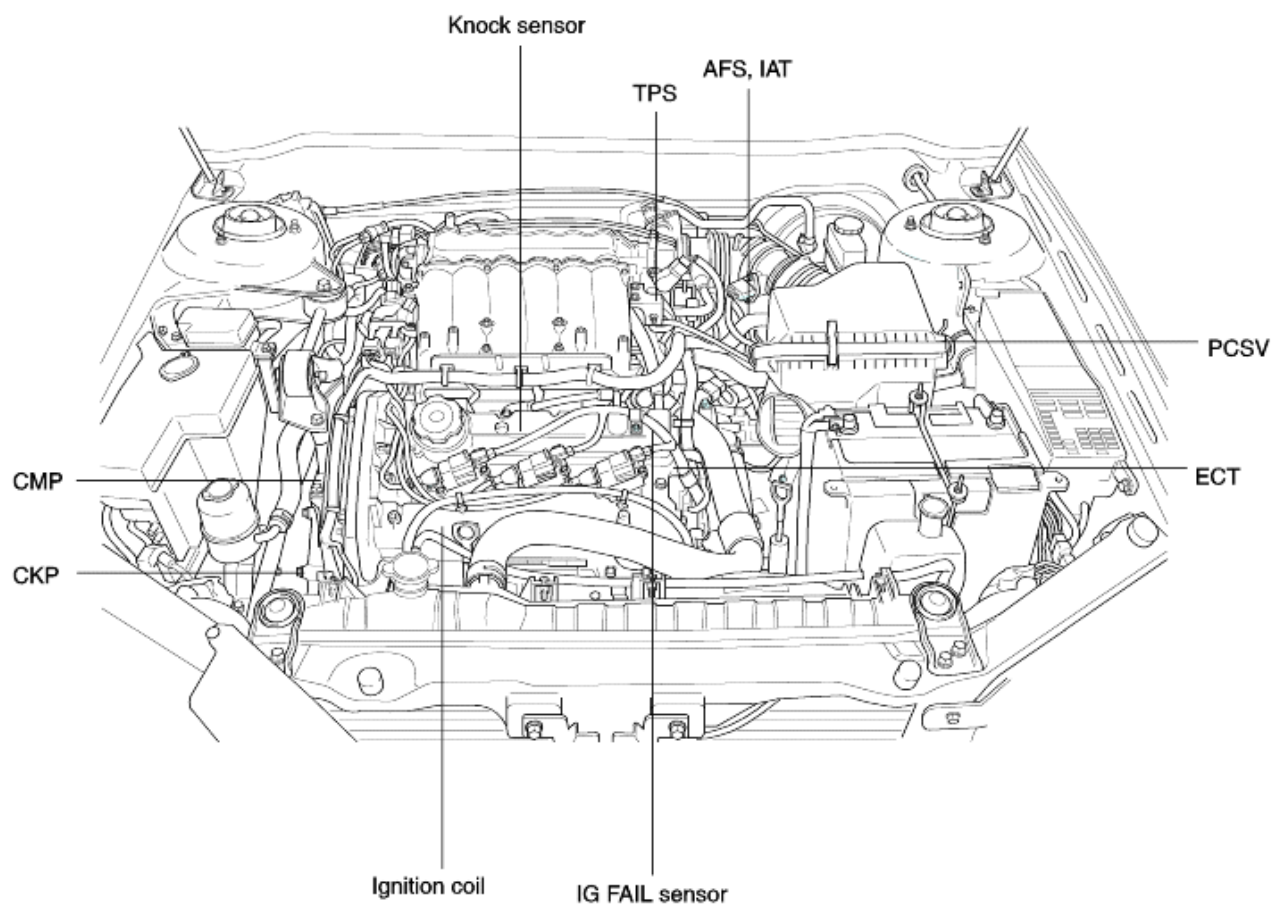
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Troubleshooting

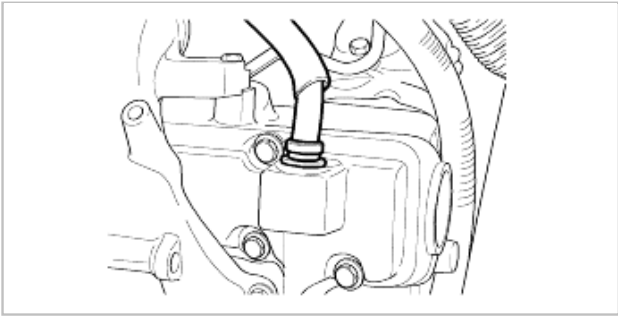
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Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system



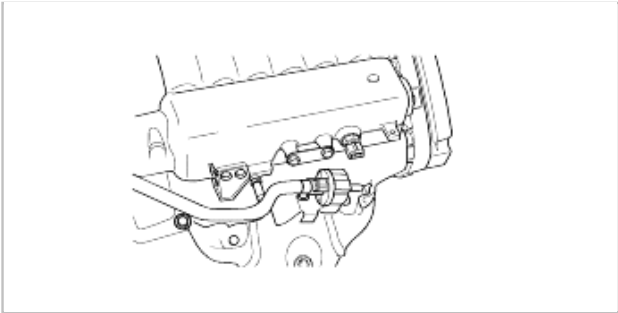
Emissioncontrol location



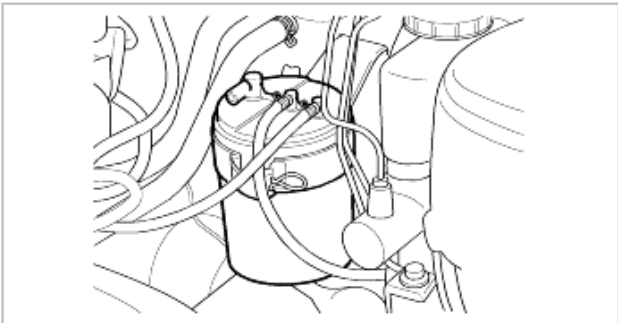
1. PCV Valve



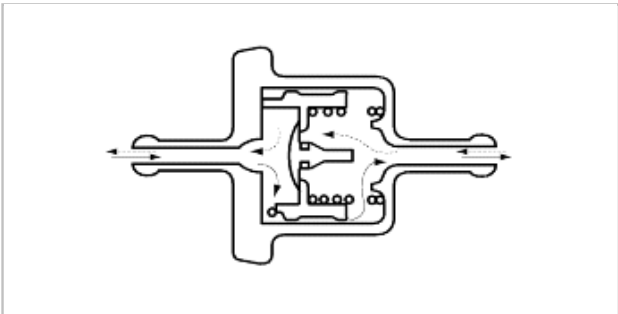
2. EVAP Canister Purge Solenoid Valve



3. EVAP Canister



4. Two-way Valve





Emission Control System

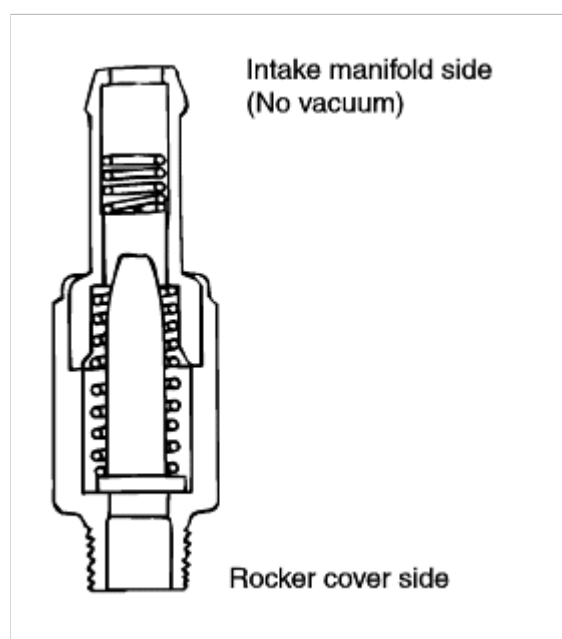
Crankcase Emission Control System

Emission Control System

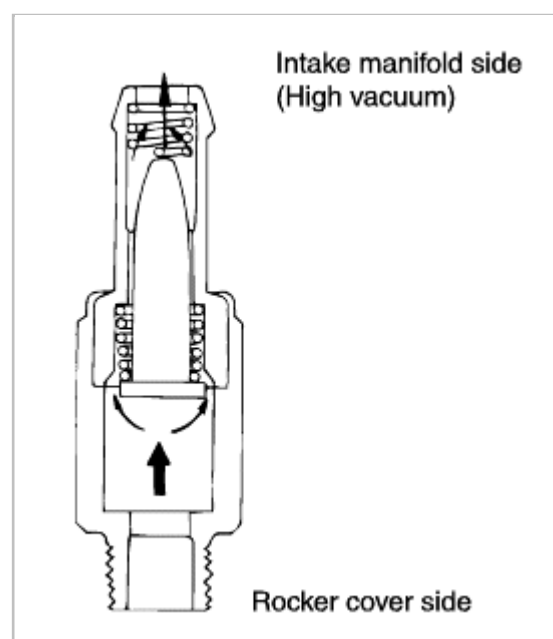
Crankcase Emission Control System -
Positive Crankcase Ventilation (PCV) Valve



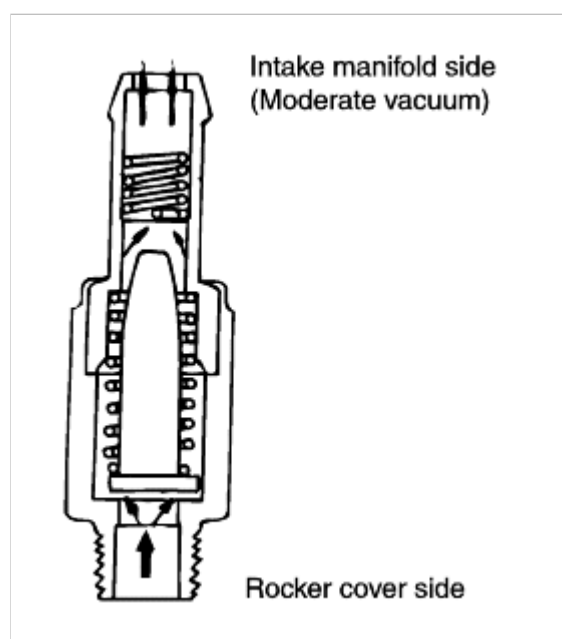
PCV Valve Operating



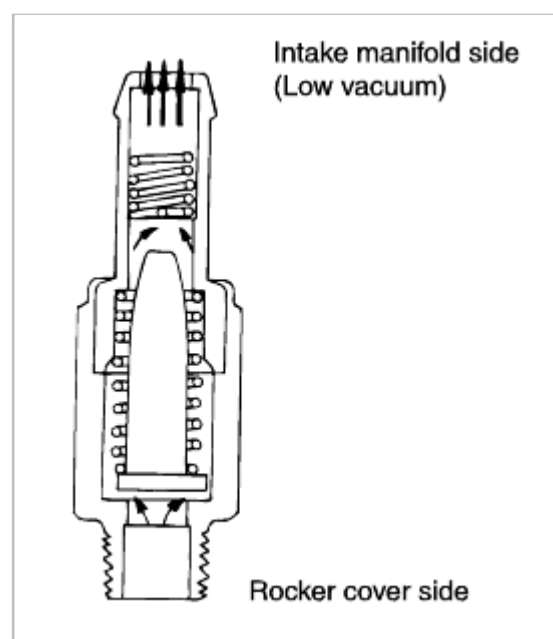
Engine condition	Not running
PCV valve	Not operating



Engine condition	Idling or decelerating
PCV valve	Fully operating (Full open)



Engine condition	Normal operation
PCV valve	Properly operating

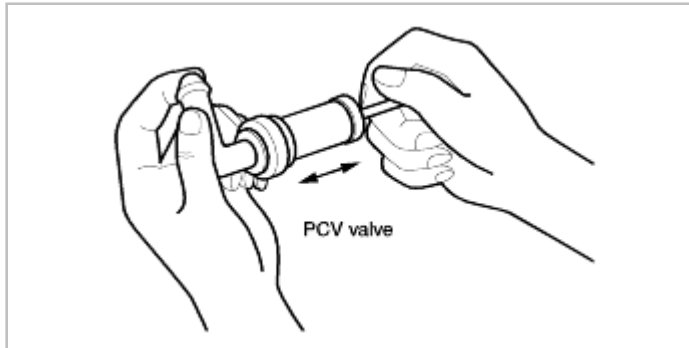


Engine condition	Accelerating and high load
PCV valve	Slightly operating



Checking PCV valve

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



Installation

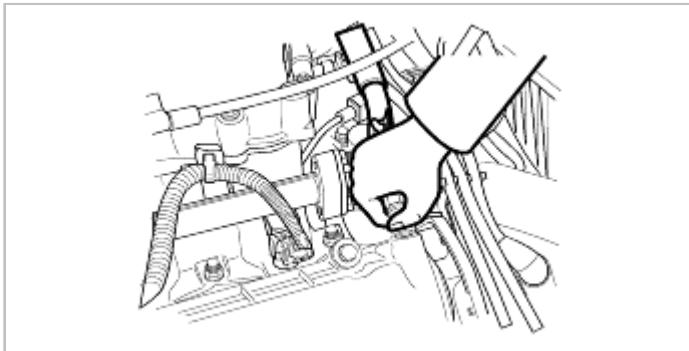
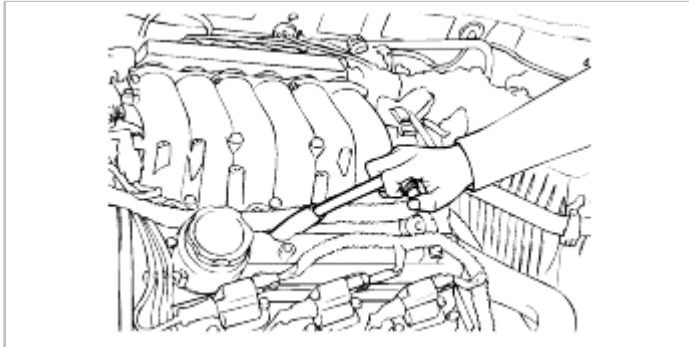
Install the PCV valve and tighten it to the specified torque.

PCV valve tightening torque : 0.8~1.2kg·m



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, making sure that intake manifold vacuum is felt.
3. If vacuum is not felt, clean the PCV valve and ventilation hose in cleaning solvent or replace if necessary.



NOTICE

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

4. Clean the PCV valve and ventilation hose with cleaning solvent or replace if necessary.



Emission Control System

Evaporative Emission Control System -
Canister

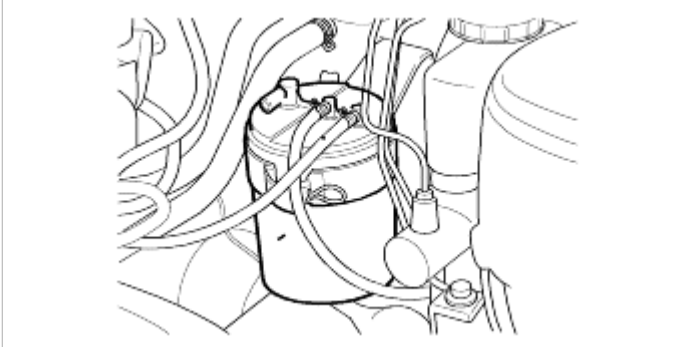


EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION

When the engine is not running, fuel vapors generated inside the fuel tank are absorbed and stored in the canister.

When the engine is running, the fuel vapors contained in the EVAP Canister are drawn into the surge tank through the EVAP Canister Purge Solenoid Valve.





Inspection

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

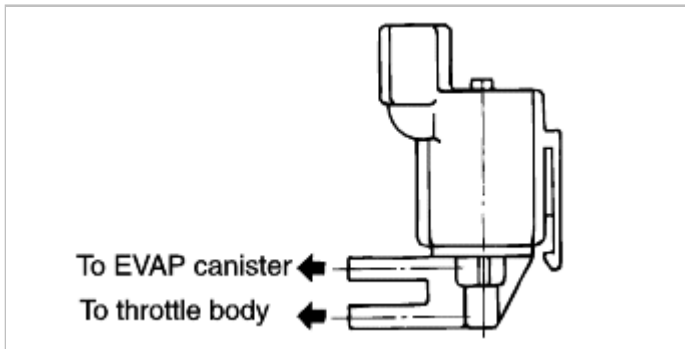
Emission Control System

Evaporative Emission Control System -
Purge Control Solenoid Valve (PCSV)



DESCRIPTION

The EVAP Canister Purge Solenoid Valve is controlled by the ECM; when the engine coolant temperature is low, and also during idling, the valve closes so that evaporated fuel is not drawn into the surge tank. After engine warm-up, during ordinary driving, it opens to let stored vapors into the surge tank.



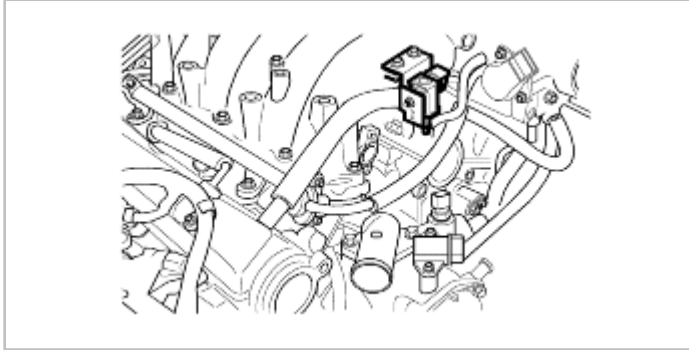


Inspection

NOTICE

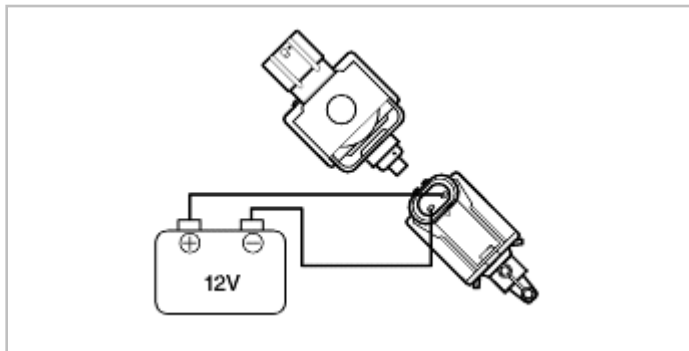
When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.

1. Disconnect the vacuum hose (black with red stripe) from the solenoid valve.



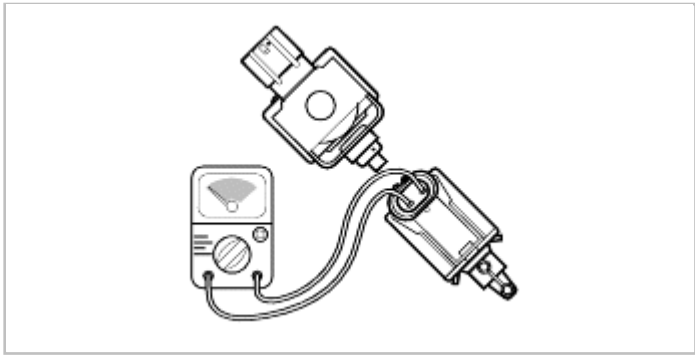
2. Detach the harness connector.
3. Connect a vacuum pump to the nipple to which the red-striped vacuum hose was connected.
4. Apply vacuum and check when voltage is applied to the EVAP Canister Purge Solenoid Valve and when the voltage is discontinued.

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.

EVAP Canister Purge Solenoid Valve
Coil resistance : 30-34Ω[at 20°C (68°F)]





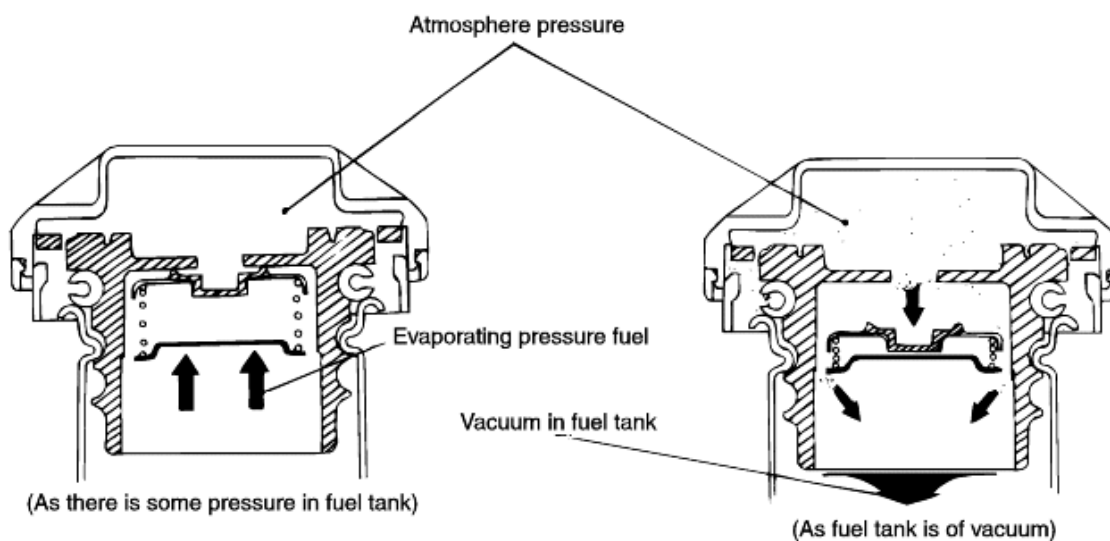
Emission Control System

Evaporative Emission Control System - Fuel
Filler Cap



Fuel filler cap

The fuel filler cap is equipped with a vacuum relief valve to prevent the escape of fuel vapor into the atmosphere.



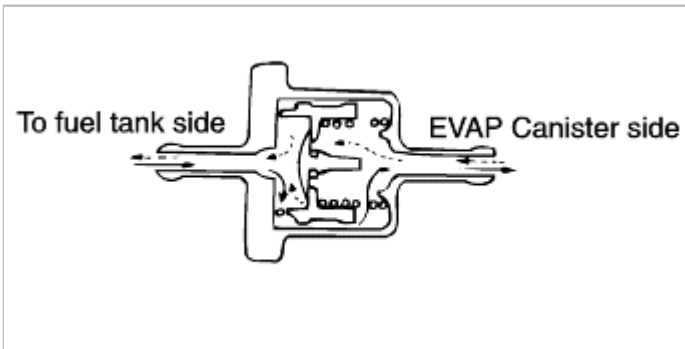
Emission Control System

Evaporative Emission Control System -
Two-way Valve



Description

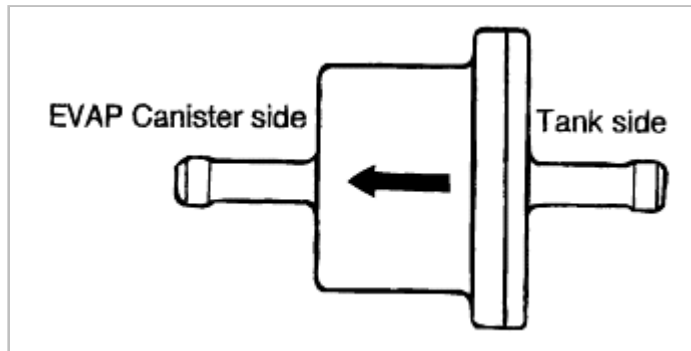
The overfill limiter consists of a pressure valve and a vacuum valve. The pressure valve is designed to open when the fuel tank internal pressure has increased over the normal pressure and the vacuum valve opens when a vacuum has been produced in the tank.





Replacement

1. Disconnect the vapor hoses, and then remove the overfill limiter.
2. Connect the overfill limiter in the correct direction.





Emission Control System

Evaporative Emission Control System -
Fuel Check Valve



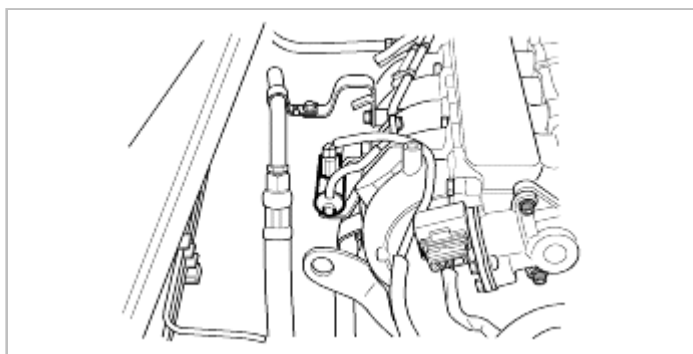
Description

The fuel check valve is used to prevent fuel leaks if the car suddenly rolls over. This valve is connected in the fuel vapor line (between the EVAP Canister and the overfill limiter) and is installed on the fuel tank. The fuel check valve contains two balls as shown in the illustration. Under normal conditions, the gasoline vapor passage in the valve is opened, but if a roll-over occurs, one of the balls closes the fuel passage, thus preventing fuel leaks.

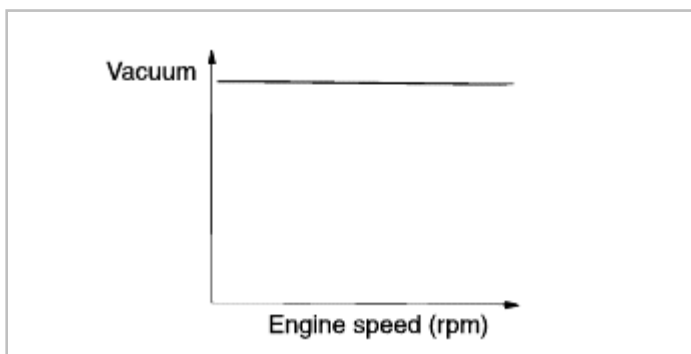


Checking

1. Disconnect the vacuum hose from the throttle body, and connect a vacuum pump to the vacuum hose.
2. Plug the nipple connected to the vacuum hose.



3. Check the following points when the engine is cold [engine coolant temperature 40°C (104°F) or below] and when it is warm [engine coolant temperature 80°C (176°F) or higher].



When engine is cold

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

When engine is warm

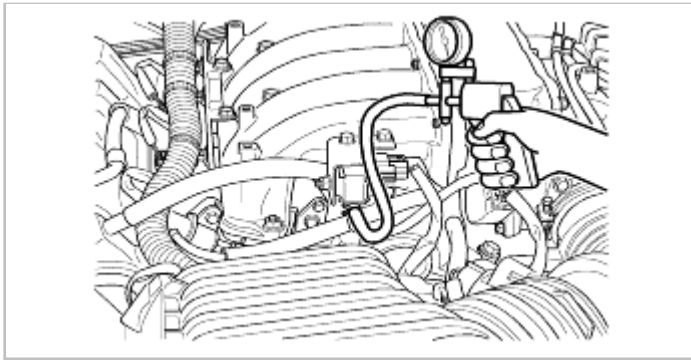
Engine operating condition	Applying vacuum	Result
Idling	50 kPa (7.3 psi)	Vacuum is held
Within 3 minutes after engine start 3,000 rpm	Try to apply vacuum	Vacuum is released
After 3 minutes have passed after engine start 3,000 rpm	50 kPa (7.3 psi)	Vacuum will be held momentarily, after which, it will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

Evap canister purge port vacuum check

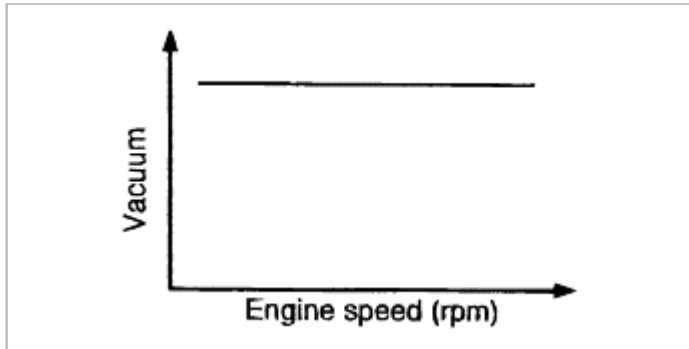
Checking Condition

Engine coolant temperature : 80-95°C(176-205°F)

1. Disconnect the vacuum hose from the throttle body EVAP Canister purge hose fitting and connect a vacuum pump.



2. Start the engine and check to see that, after increasing the engine speed, vacuum remains fairly constant.



NOTICE

If there is no vacuum created, it is possible that the throttle body port may be restricted and required cleaning.



Emission Control System

Exhaust Emission Control System



Exhaust emission control system

Exhaust emission system

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. Additional control devices include a catalytic converter.

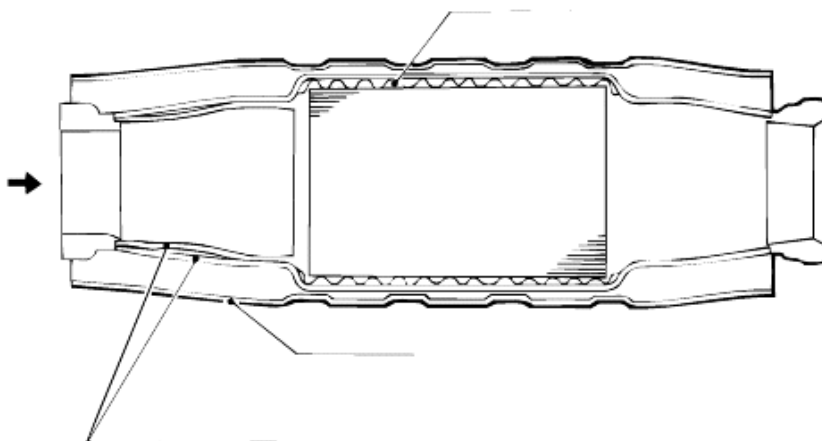
Air/fuel mixture ratio control system

[Multiport Fuel Injection (MFI) System]

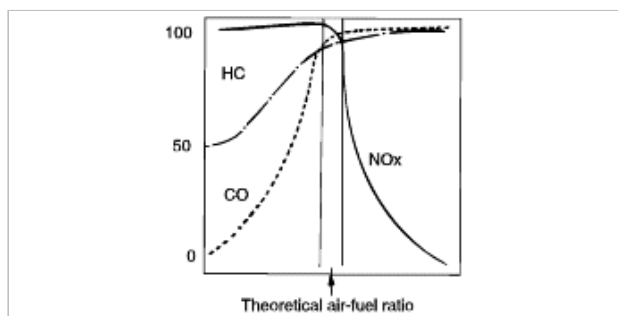
The MFI system is a system which employs the signals from the heated oxygen sensor to activate and control the injector installed in the manifold for each cylinder, thus precisely regulating the air/fuel mixture ratio and reducing emissions. This in turn allows the engine to produce exhaust gases of 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 at manufacture.
2. Closed Loop-air/fuel ratio is varied by the ECM based on information supplied by the heated oxygen sensor.

Catalytic converter



The three-way catalytic converter is a monolithic type with catalytic compositions applied to the integrally constructed honey-comb carrier surface that is installed in the center of the exhaust pipe. The converter, working in combination with the air/fuel ratio feed-back control, oxidizes CO and HC and reduces NOx.



Function

The three-way catalytic converter removes CO, HC and NOx most effectively in the vicinity of the theoretical air/fuel ratio. The air/fuel mixture to the theoretical air/fuel ratio and the catalytic converter promotes both oxidation and reduction of resultant exhaust gas to make it clean before it is released to atmosphere.

CAUTION

The catalytic converter requires the use of unleaded gasoline only. Leaded gasoline will destroy the effectiveness of the catalysts as an emission control device.

Under normal operating conditions, the catalytic converter will not require maintenance. However, it is important to keep the engine properly tuned. Engine misfiring may cause overheating of the catalyst. This may cause heat damage to the converter or vehicle components. This situation can also occur during diagnostic testing if any spark plug cables are removed and the engine is allowed to idle for a prolonged period of time with the cable removed.