Emissions Control System

GENERAL	
CRANKCASE EMISSION CONTROL SYSTEM	EC -8
EVAPORATIVE EMISSION CONTROL SYSTEM	EC -11
EXHAUST EMISSION CONTROL SYSTEM	EC -15

GENERAL

SPECIFICATIONS EEHA0010

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	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

EVAP : Evaporative Emission

SERVICE STANDARD

EVAP Canister Purge Solenoid Valve	
	0.45A or below (at 12V)

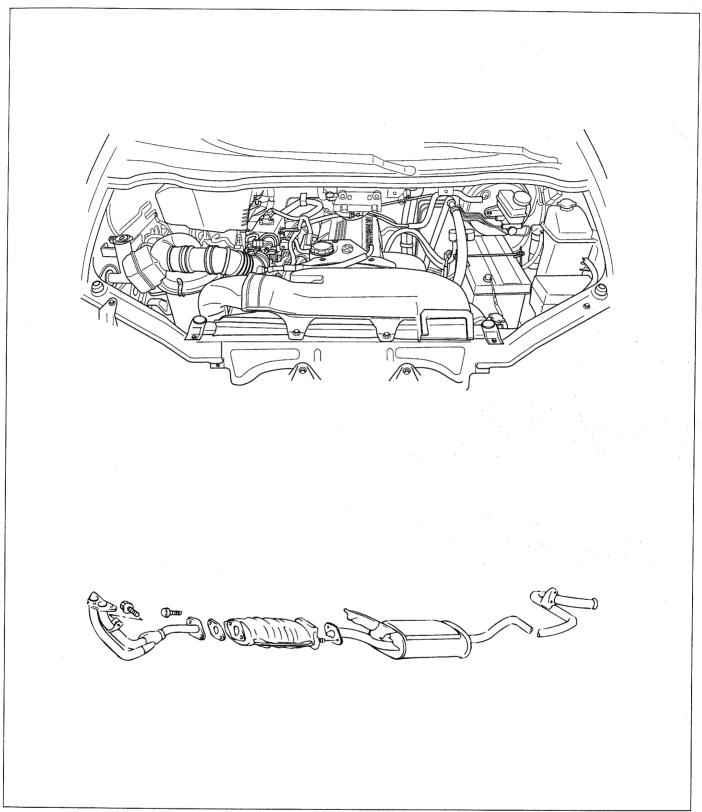
TIGHTENING TORQUE

Item	Nm	kg·cm	lb·ft
Positive crankcase ventilation valve	8-12	80-120	6-9

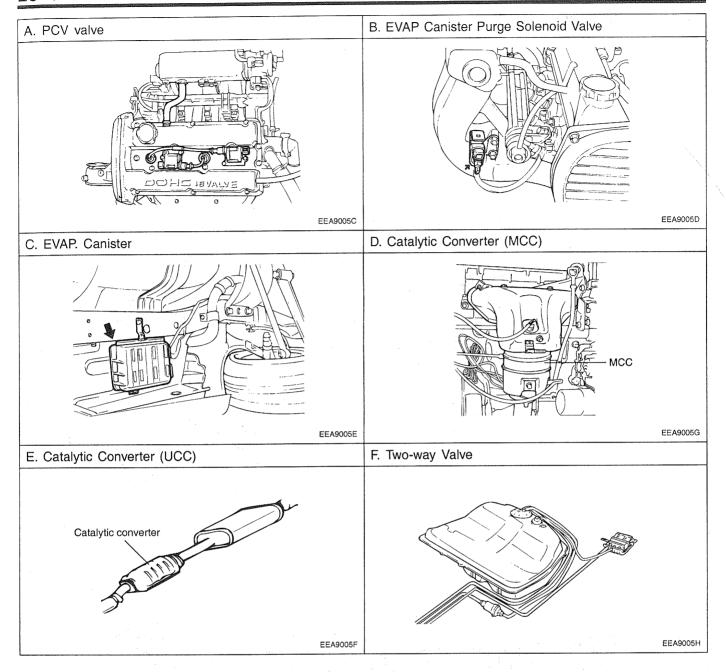
TROUBLESHOOTING

Symptom	Probable cause	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged EGR valve is not closed Malfunction of the EVAP Canister Purge Solenoid Valve	Repair or replace Repair or replace Repair or replace
Rough idle or engine stalls	Vacuum hose disconnected or damaged EGR valve is not closed Malfunction of the PCV valve Malfunction of the EVAP Canister Purge System	Repair or replace Repair or replace Replace 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
Poor fuel mileage	Malfunction of the exhaust gas recirculation	Check the system; if there is a problem, check its component parts

EMISSION CONTROLS LOCATION EEUC0050



EEUC005A



SCHEMATIC DRAWING (2.4

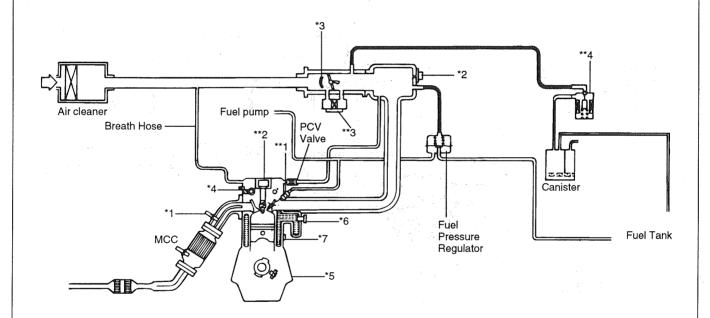
14-EOBD) EEAC5070

[UNLEADED]

- *1. HEATER OXYGEN SENSOR (HO2S)
- *2. MAP SENSOR
- *3. THROTTLE POSITION SENSOR (With Idle Switch)
- *4. CAMSHAFT POSITION SENSOR
- (CMP SENSOR)
 *5. CRANKSHAFT POSITION SENSOR (CKP SENSOR)
- *6. ENGINE COOLANT TEMP. SENSOR (ECT Sensor)
- *7. KNOCK SENSOR

- o IGNITION SWITCH
- VEHICLE SPEED SENSOR
- COOLER LOAD SIGNAL
- o "PNP" SWITCH (A/T ONLY)
- o POWER STEERING SWITCH
- o IGNITION DETECT SIGNAL
- o BATTERY VOLTAGE

- **1. FUEL INJECTOR
- **2. IGNITION COIL
- **3. ISC MOTOR
 - (Linear Solenoid Type)
- **4. EVAP Canister Purge Solenoid Valve
 - o FUEL PUMP CONTROL
 - o MFI CONTROL RELAY
 - o COOLER RELAY
 - o IGNITION TIMING CONTROL
 - o DIAGNOSIS



INPUT

ECM

OUTPUT

ECM: Engine Control Module **EVAP**: Evaporative Emission MCC: Manifold Catalytic Converter UCC: Under floor Catalytic Converter

SCHEMATIC DRAWING (2.4 14)

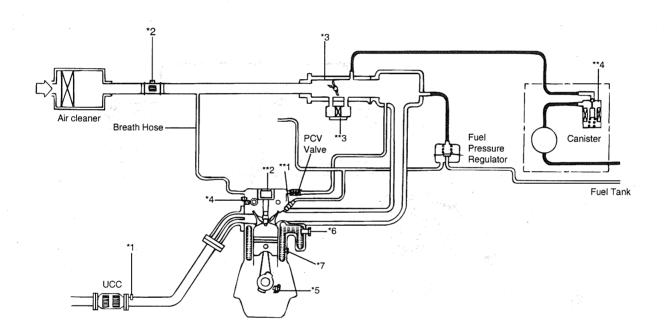
[UNLEADED]

- *1. HEATER OXYGEN SENSOR (HO2S)
- *2. HOT FILM SENSOR
- *3. THROTTLE POSITION SENSOR (With Idle Switch)
- *4. CAMSHAFT POSITION SENSOR (CMP SENSOR)
- CRANKSHAFT POSITION SENSOR (CKP SENSOR)
- *6. ENGINE COOLANT TEMP. SENSOR (ECT Sensor)
 *7. KNOCK SENSOR

- o IGNITION SWITCH
- o VEHICLE SPEED SENSOR
- o COOLER LOAD SIGNAL
- o "PNP" SWITCH (A/T ONLY)
- o POWER STEERING SWITCH
- o IGNITION DETECT SIGNAL
- o BATTERY VOLTAGE



- FUEL INJECTOR
- **2. IGNITION COIL
- **3. ISC MOTOR
 - (Linear Solenoid Type)
- **4. EVAP Canister Purge Solenoid Valve
 - o FUEL PUMP CONTROL o MFI CONTROL RELAY
 - o COOLER RELAY
 - o IGNITION TIMING
 - CONTROL
 - o DIAGNOSIS



ECM: Engine Control Module **EVAP**: Evaporative Emission

UCC: Underfloor Catalytic Converter

SCHEMATIC DRAWING (2.4 14) EEUC0080

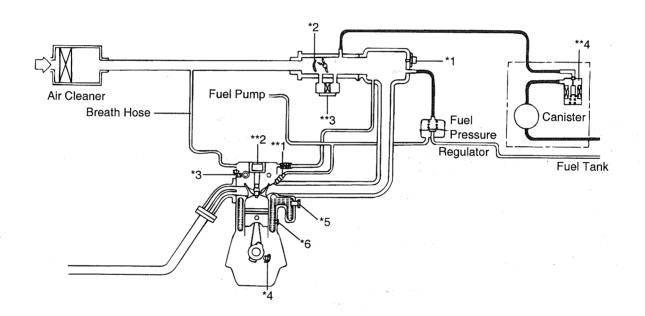
[LEADED]

- *1. MAP & IAT SENSOR
- *2. THROTTLE POSITION SENSOR (With Idle Switch)
- *3. CAMSHAFT POSITION SENSOR (CMP SENSOR)
- *4. CAMSHAFT POSITION SENSOR (CKP SENSOR)
- *5. ENGINE COOLANT TEMP. SENSOR (ECT SENSOR)
 *6. KNOCK SENSOR

- o IGNITION SWITCH
- o VEHICLE SPEED SENSOR
- o COOLER LOAD SIGNAL
- o "PNP" SWITCH (A/T ONLY)
- o POWER STEERING SWITCH o IGNITION DETECT SIGNAL
- o BATTERY VOLTAGE
- o VARIABLE REGISTER
- INPUT ECM OUTPUT
- **FUEL INJECTOR** **2. IGNITION COIL **3. ISC MOTOR
- - (Linear Solenoid Type)

 **4. EVAP Canister Purge Solenoid Valve
 o FUEL PUMP CONTROL
 o MFI CONTROL RELAY
 o COOLER RELAY
 o IGNITION TIMING

 - CONTROL
 - o DIAGNOSIS



ECM: Engine Control Module **EVAP**: Evaporative Emission

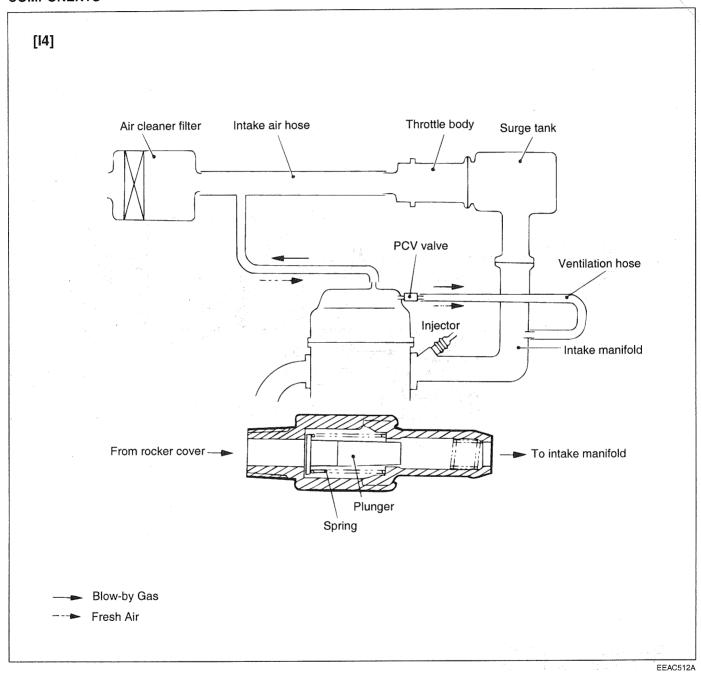
EEA9008A

CRANKCASE EMISSION CONTROL SYSTEM

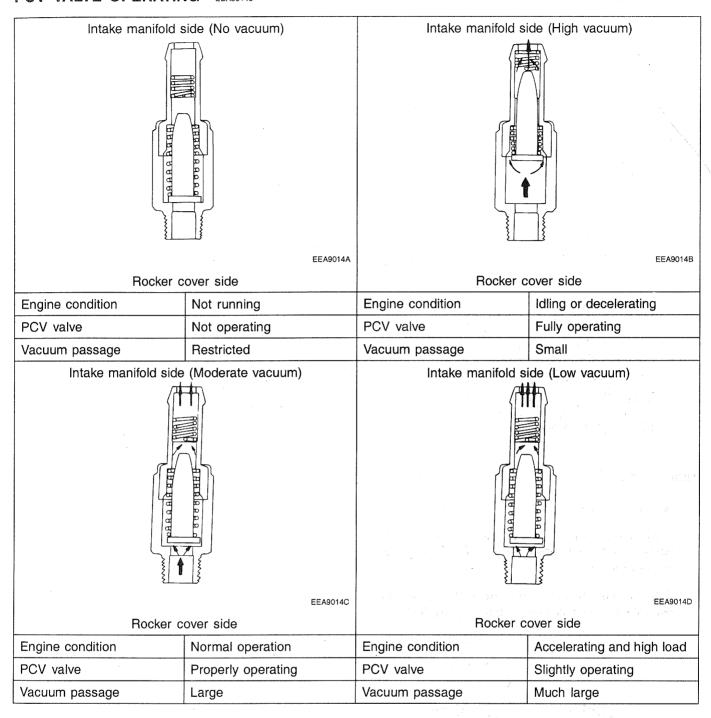
POSITIVE CRANKCASE VENTILATION

(PCV) VALVE EEAC5120

COMPONENTS



PCV VALVE OPERATING EEA90140



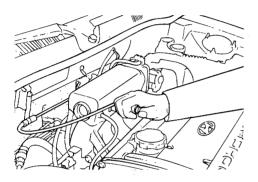
DISASSEMBLY EEA90150

- 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 is felt.

NOTE

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

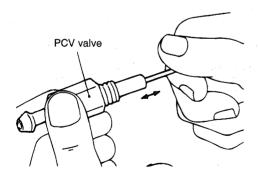
3. If vacuum is not felt, clean the PCV valve and ventilation hose in cleaning solvent, or replace if necessary.



EEA9015A

INSPECTION

- 1. Remove the positive crankcase ventilation valve.
- 2. Insert a thin stick into the positive crankcase ventilation 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 or replace it.



EEA9015B

INSTALLATION

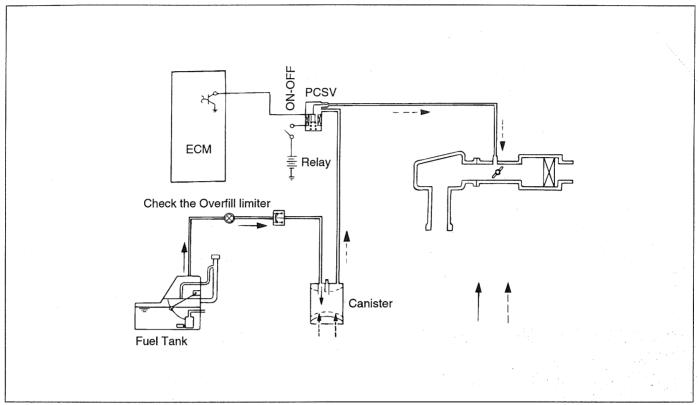
Install the positive crankcase ventilation valve and tighten to the specified torque.

Tightening torque

PCV valve: 8-12 Nm (80-120 kg·cm, 6-8 lb·ft)

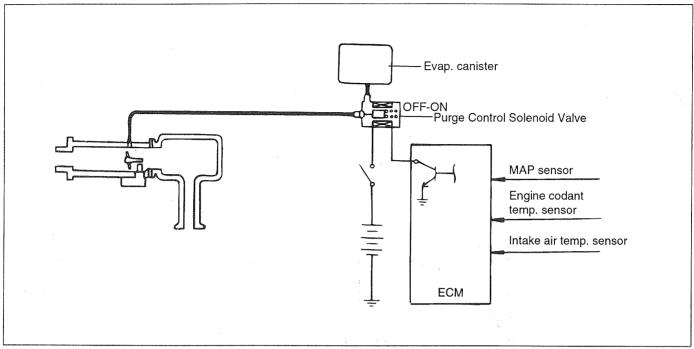
EVAPORATIVE EMISSION CONTROL SYSTEM

COMPONENTS EEUC0180



EEUC018A

EVAPORATIVE (EVAP) CANISTER PURGE SOLENOID VALVE EEUCCOOO

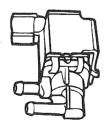


EEUC020A

EVAP CANISTER PURGE SOLENOID VALVE



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 the stored vapors flow into the surge tank.

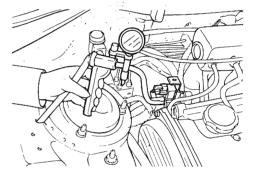


EEAA024A

INSPECTION



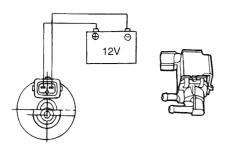
When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.



EEA9020B

- 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	nued Vacuum is maintained	

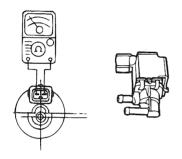


EEAA020C

Measure the current between the terminals of the solenoid valve.

EVAP Canister Purge Solenoid Valve:

Coil at 20°C (68°F) : 0.45A or below (at 12V) Coil resistance : 26Ω [at 20°C (68°F)]

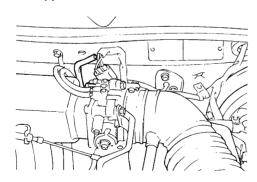


EEAA020D

VACUUM HOSE

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

1. Disconnect the vacuum hose from the intake manifold purge hose nipple and connect a hand vacuum pump to the nipple.

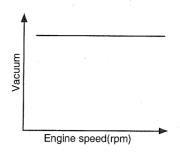


EEA9023A

2. Start the engine and check that, after raising the engine speed by racing the engine, vacuum remains fairly constant.



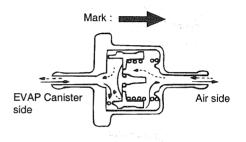
If there is no vacuum created the intake manifold port may be clogged and require cleaning.



EEA9023B

OVERFILL LIMITER (TWO WAY VALVE) EEAA0250

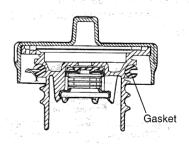
To inspect the overfill limiter (two-way valve), refer to the Fuel tank.



V5EC201D

FUEL FILER CAP EEAA0260

Check the gasket of the fuel filler cap, and the filler cap itself, for damage or deformation. Replace the cap if necessary.



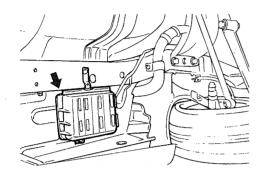
V5EC205A

EVAPORATIVE (EVAP) CANISTER EEHA024

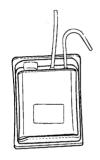
CANISTER

For monitoring, a CCV and an air filter exists as in the illustration.

- Look for loose connections, sharp bends or damage to the fuel vapor lines.
- 2. Look for distortion, cracks or fuel leakage.
- After removing the EVAP Canister, inspect for cracks or damage.



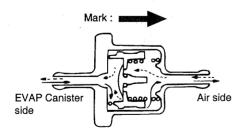
EEA9005E



EEHA005E

TWO-WAY VALVE

- 1. Inspect that air flows as shown.
- 2. Check to connect correctly such as the arrow mark on the valve.



V5EC201D

EXHAUST EMISSION CONTROL SYSTEM

VEHICLES WITH CATALYTIC CONVERTER EEA90270

Exhaust emissions (CO, HC, NOx) are controlled by a combination of engine modifications and PCM fuel control.

Modifications to the combustion chamber, intake manifold, camshaft and ignition system form the basic control system. Additional control devices include a catalytic converter and the oxygen sensors which monitor mixture control.

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

AIR/FUEL MIXTURE RATIO CONTROL SYSTEM [MULTIPORT FUEL INJECTION (MFI) SYSTEM] EEA90280

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

This 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. The two operating modes in the MFI system are as follows:

- Open loop-air/fuel ratio is controlled by information programmed into the PCM during the manufacturing process.
- Closed loop-air/fuel ratio varies by the PCM based on information supplied by the heated oxygen sensor.

(1) Johnston Charles (1998) And Anti-Service of Expression and Anti-Service of Control of Contro