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Emissions Control System

GENERAL

CRANKCASE EMISSION CONTROL SYSTEM
- POSITIVE CRANKCASE VENTILATION (PCV) VALVE

EVAPORATIVE EMISSION CONTROL SYSTEM
- EVAPORATIVE (EVAP) CANISTER
- EVAPORATIVE (EVAP) CANISTER PURGE SOLENOID VALVE
- FUEL FILLER CAP

EXHAUST EMISSION CONTROL SYSTEM
- CONTINUOUS VARIABLE VALVE TIMING

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GENERAL

SPECIFICATIONS EEC994D2

Item	Specification	
Purge Control Solenoid Valve (PCSV)	Type	Duty Control type
	Resistance (Ω)	24.5 ~ 27.5 at 20 °C (68 °F)

TIGHTENING TORQUE

Item	N·m	kg·cm	lb·ft
Positive Crankcase Ventilation Valve	8 ~ 12	80 ~ 120	6 ~ 8

TROUBLESHOOTING

Symptom	Suspect area	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	Malfunction of the EVAP. Canister Purge 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

COMPONENTS

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 mixtrue control device) Three-way catalytic converter	 CO, HC, NOx reduction CO, HC, NOx reduction	 Heated oxygen sensor feedback type Monolithic type

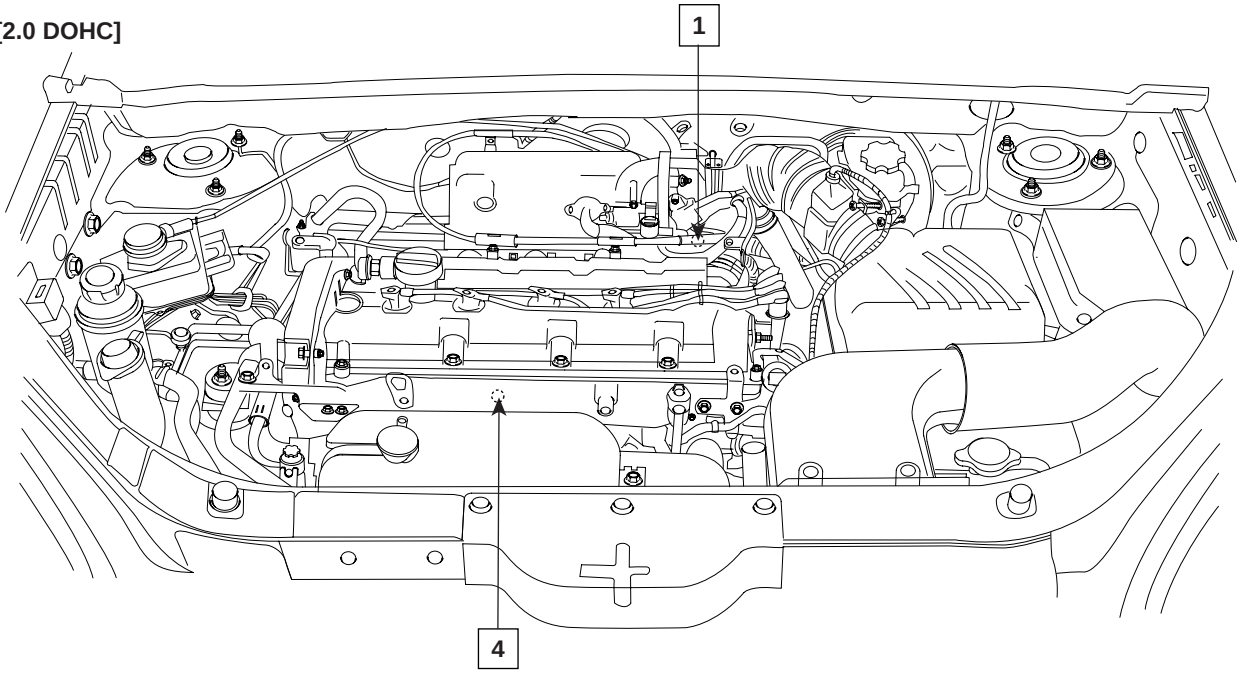
MFI : Multiport Fuel Injection
EVAP : Evaporative Emission

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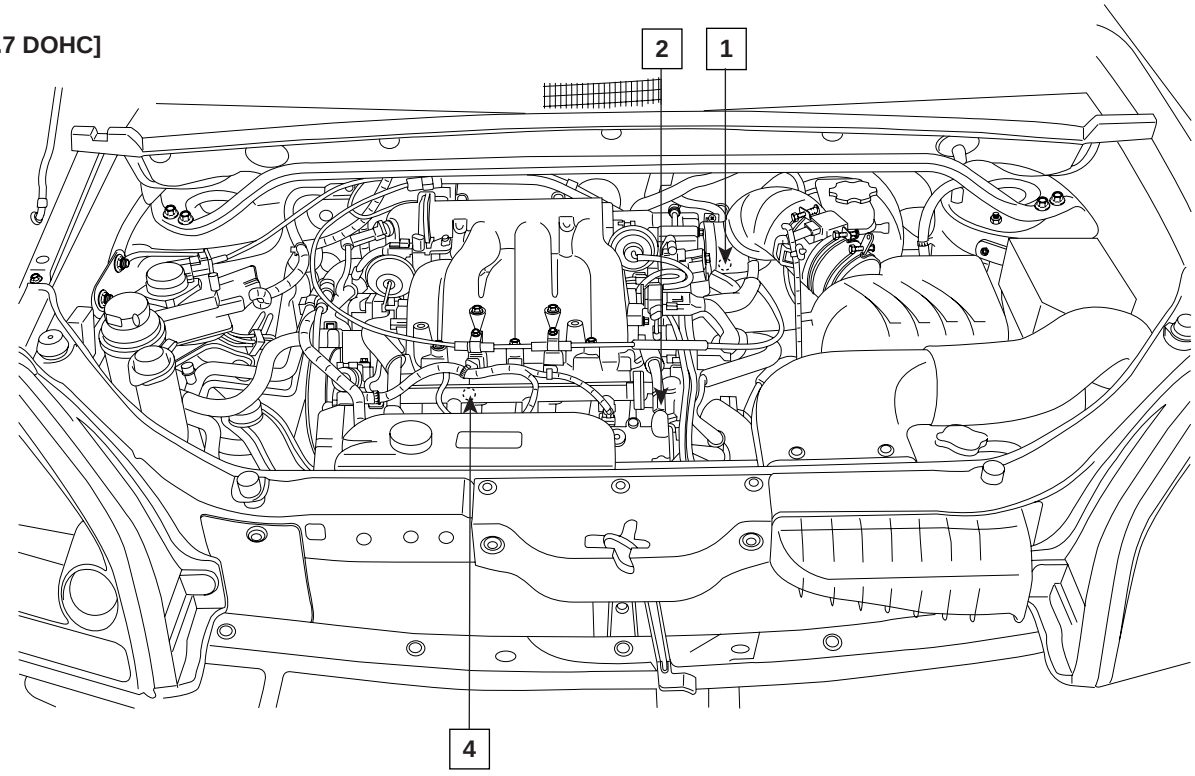
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COMPONENTS LOCATION E41CF1D8

[2.0 DOHC]



[2.7 DOHC]

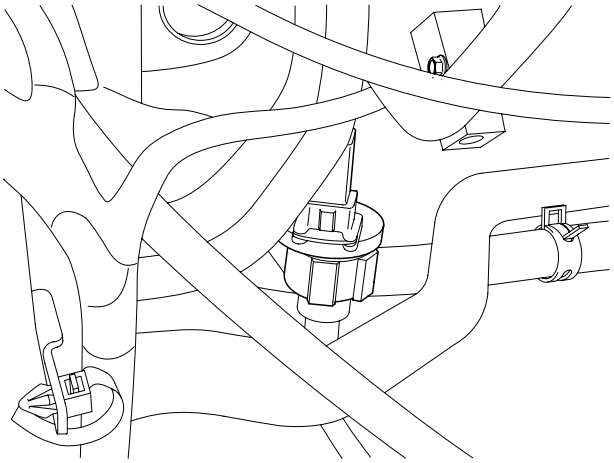
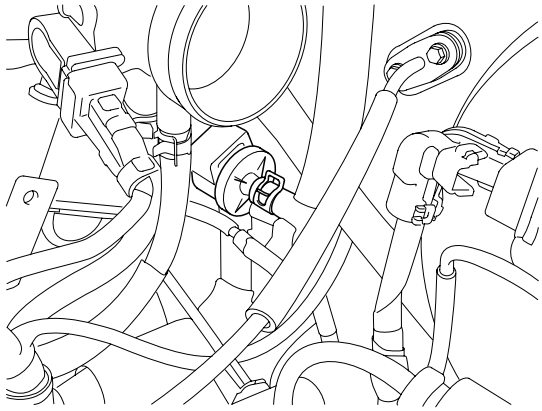
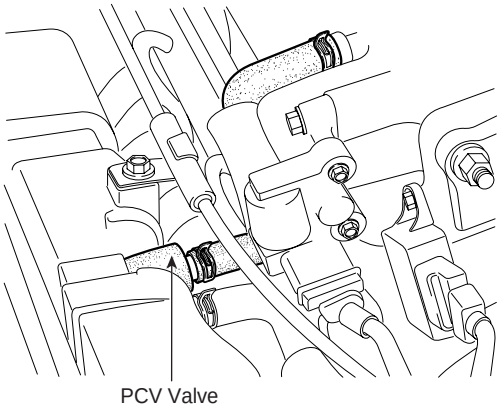
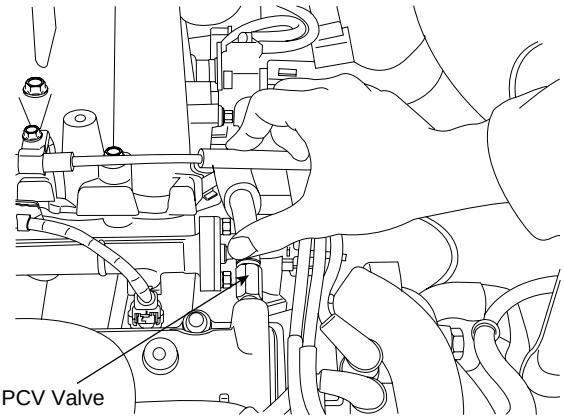
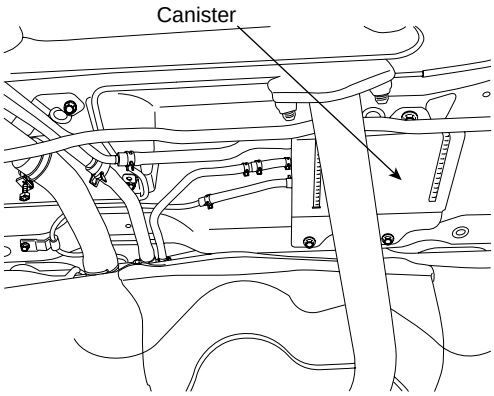
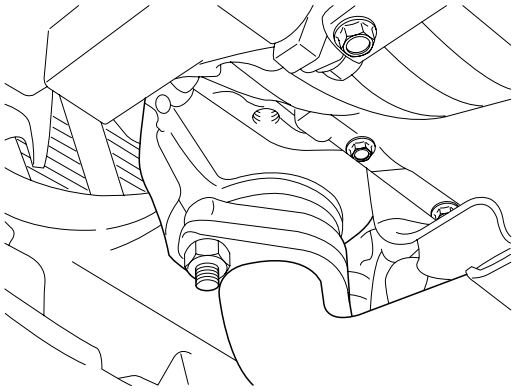


1	Purge Control Solenoid Valve (PCSV)	3	Canister
2	PCV Valve	4	Catalytic Converter

EGQE603A

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1. Purge Control Solenoid Valve (PCSV) [2.0 DOHC]	1. Purge Control Solenoid Valve (PCSV) [2.7 DOHC]
 EGQE501V	 EGQE501W
2. PCV Valve [2.0 DOHC]	2. PCV Valve [2.7 DOHC]
 EGQE603B	 EGQE010C
3. Canister	4. Catalytic Converter
 EGQE013B	 EGQE501A

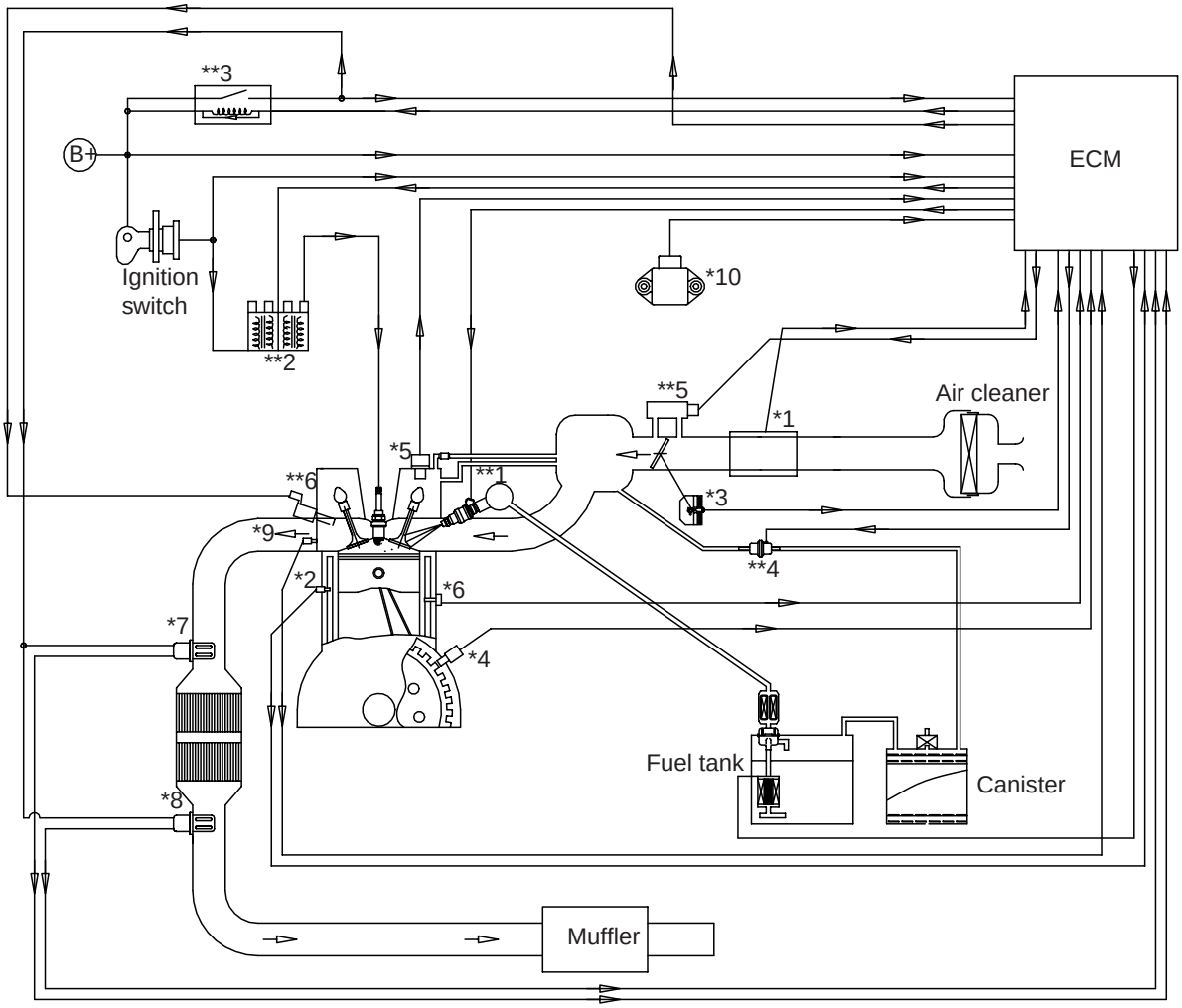
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SCHEMATIC DIAGRAM E93E19EE

[2.0 DOHC,UNLEADED]

INPUT		OUTPUT
*1. Mass Air Flow Sensor (MAFS) & Intake Air Temp. Sensor (IATS) *2. Engine Coolant Temp. Sensor (ECTS) *3. Throttle Position Sensor (TPS) *4. Crankshaft Position Sensor (CKPS) *5. Camshaft Position Sensor (CMPS) *6. Knock Sensor (KS) *7. Heated Oxygen Sensor (H02S)-FR *8. Heated Oxygen Sensor (H02S)-RR *9. Oil Temp. Sensor (OTS) *10. Wheel speed Sensor	⇨ E C M ⇨	**1. Fuel Injector **2. Ignition Coil **3. Main Relay **4. Purge Control Solenoid Valve (PCSV) **5. Idle Speed Actuator (ISCA) **6. Oil Control Valve (OCV)



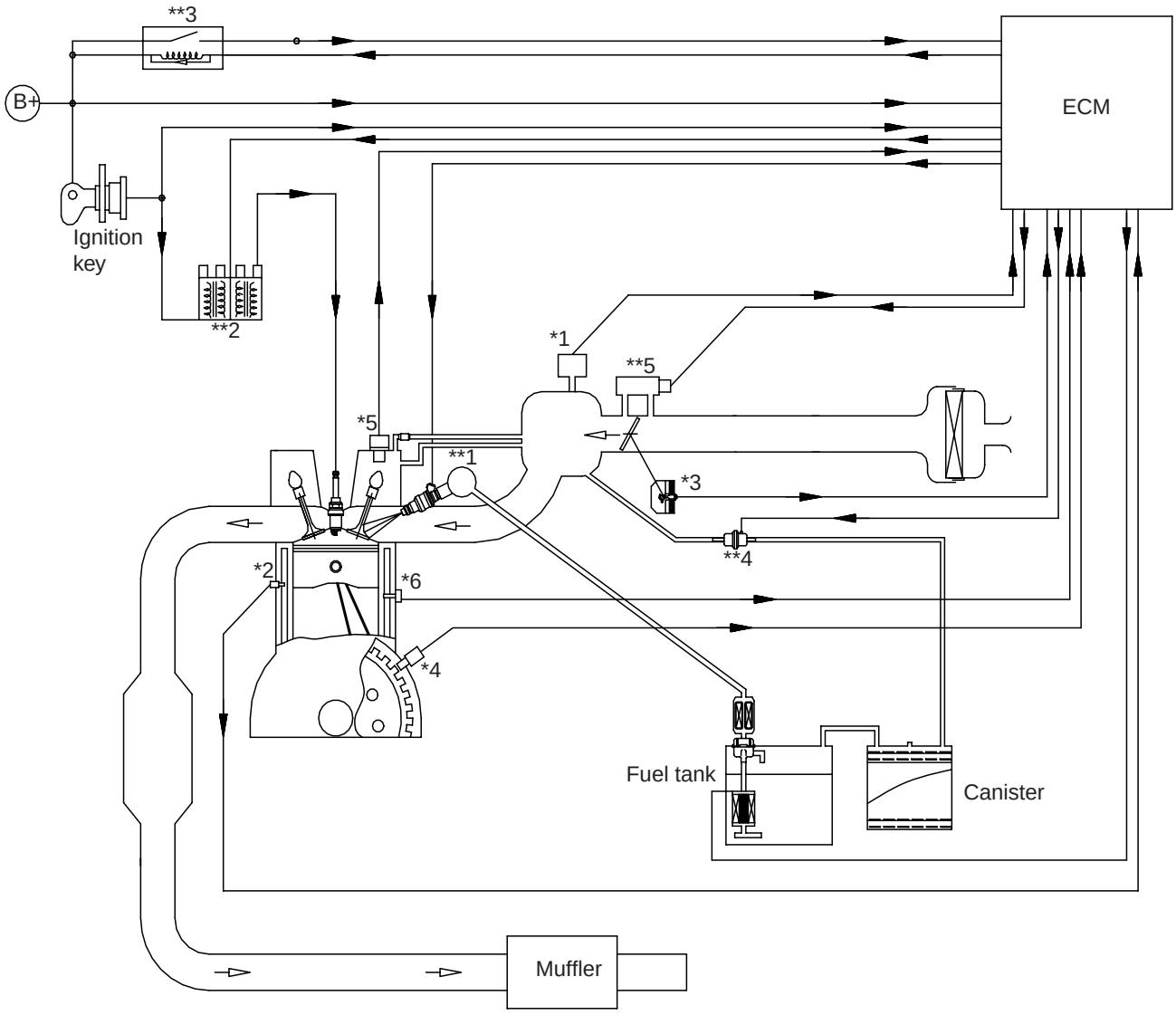
LEGE006F

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[2.0 DOHC, LEADED]

INPUT		OUTPUT
*1. Manifold Absolute Pressure Sensor (MAPS) & Intake Air Temp. Sensor (IATS) *2. Engine Coolant Temp. Sensor (ECTS) *3. Throttle Position Sensor (TPS) *4. Crankshaft Position Sensor (CKPS) *5. Camshaft Position Sensor (CMPS) *6. Knock Sensor (KS)	⇨ E C M ⇨	**1. Fuel Injector **2. Ignition Coil **3. Main Relay **4. Purge Control Solenoid Valve (PCSV) **5. Idle Speed Actuator (ISCA)



LEGE006H

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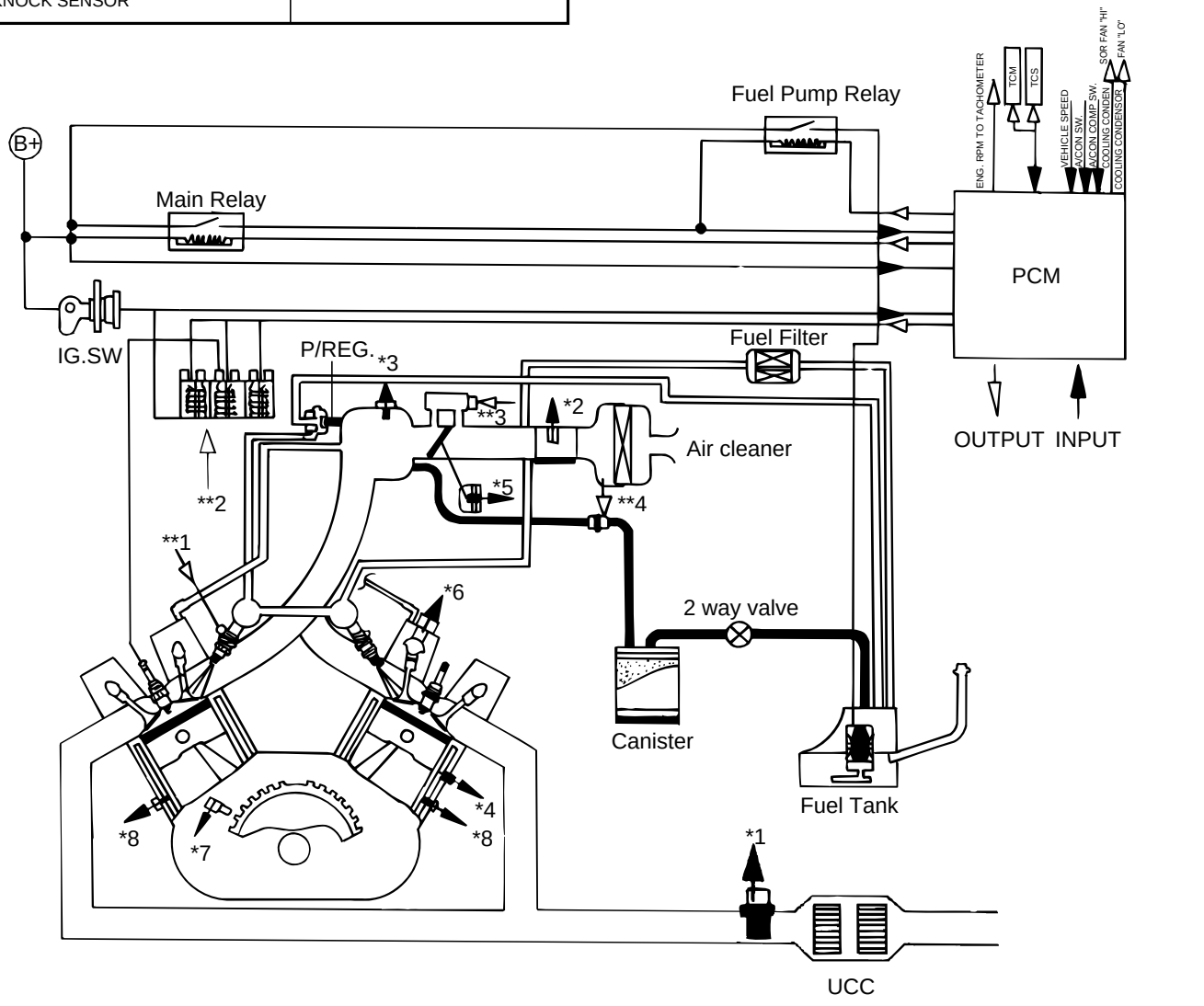
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[2.7 DOHC, LEADED]

*1. HEATED OXYGEN SENSOR (H02S) *2. HOT FILM SENSOR *3. INTAKE AIR TEMP. SENSOR (IAT SENSOR) *4. ENGINE COOLANT TEMP. SENSOR (ECT SENSOR) *5. THROTTLE POSITION SENSOR (TP SENSOR) *6. CAMSHAFT POSITION SENSOR (CMP SENSOR) *7. CRANKSHAFT POSITION SENSOR (CKP SENSOR) *8. KNOCK SENSOR	o IGNITION SWITCH o BATTERY VOLTAGE o VEHICLE SPEED SENSOR o COOLER LOAD SIGNAL o "PNP" SWITCH (A/T ONLY) o FUEL PUMP RELAY SIGNAL

PCM

**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



PCM : Powertrain Control Module
EVAP : Evaporative Emission
UCC : Under floor catalytic converter

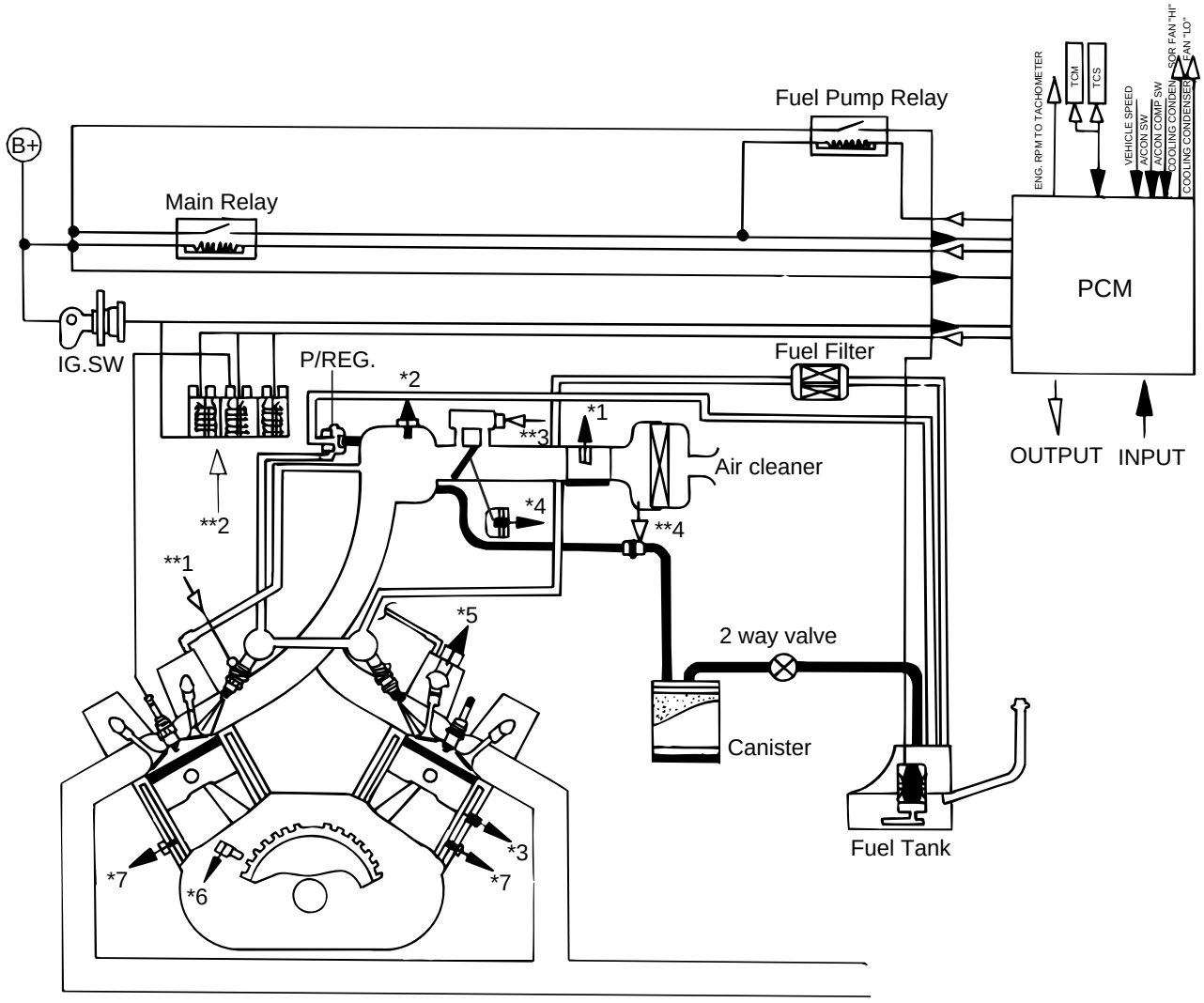
EGQE603D

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[2.7 DOHC, UNLEADED]

*1. HOT FILM SENSOR *2. INTAKE AIR TEMP. SENSOR (IAT SENSOR) *3. ENGINE COOLANT TEMP. SENSOR (ECT SENSOR) *4. THROTTLE POSITION SENSOR (TP SENSOR) *5. CAMSHAFT POSITION SENSOR (CMP SENSOR) *6. CRANKSHAFT POSITION SENSOR (CKP SENSOR) *7. KNOCK SENSOR	o IGNITION SWITCH o BATTERY VOLTAGE o VEHICLE SPEED SENSOR o COOLER LOAD SIGNAL o "PNP" SWITCH (A/T ONLY) o FUEL PUMP RELAY SIGNAL o VARIABLE REGISTER	⇨ PCM ⇨	**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



PCM : Powertrain Control Module
EVAP : Evaporative Emission

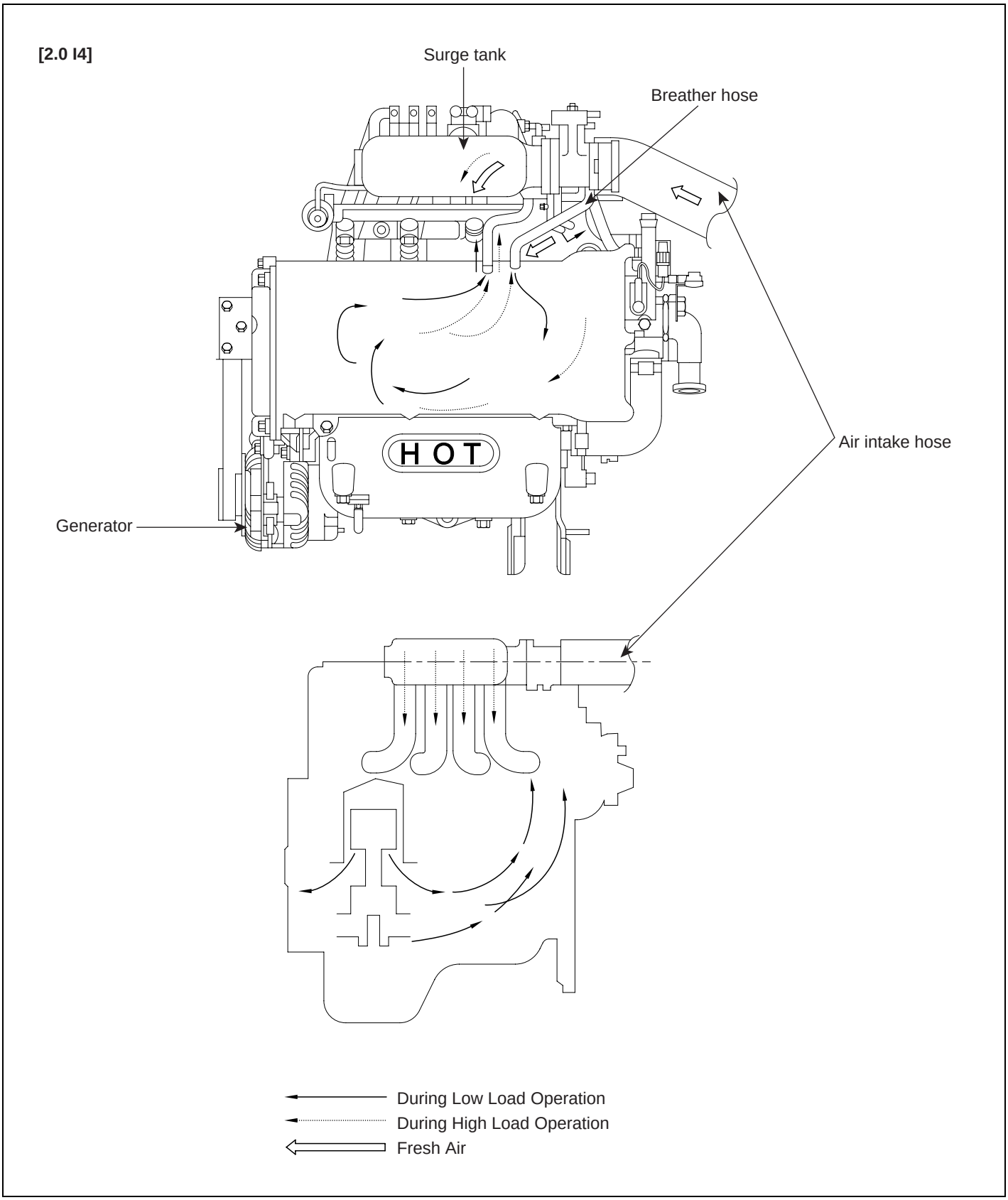
EGQE603C

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CRANKCASE EMISSION CONTROL SYSTEM

COMPONENTS ECD7E672

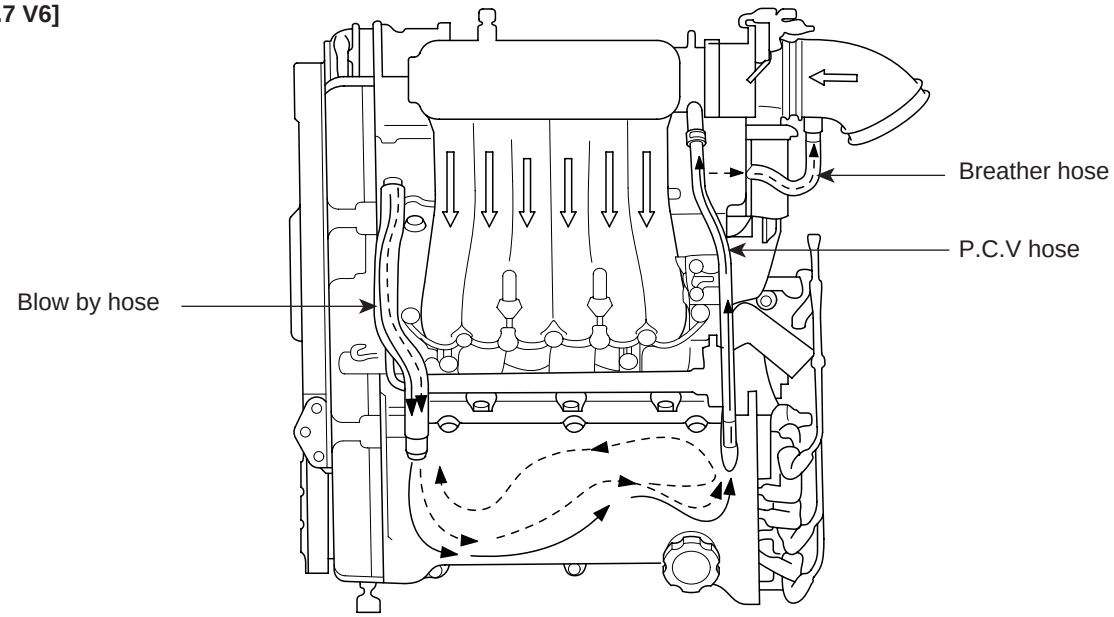


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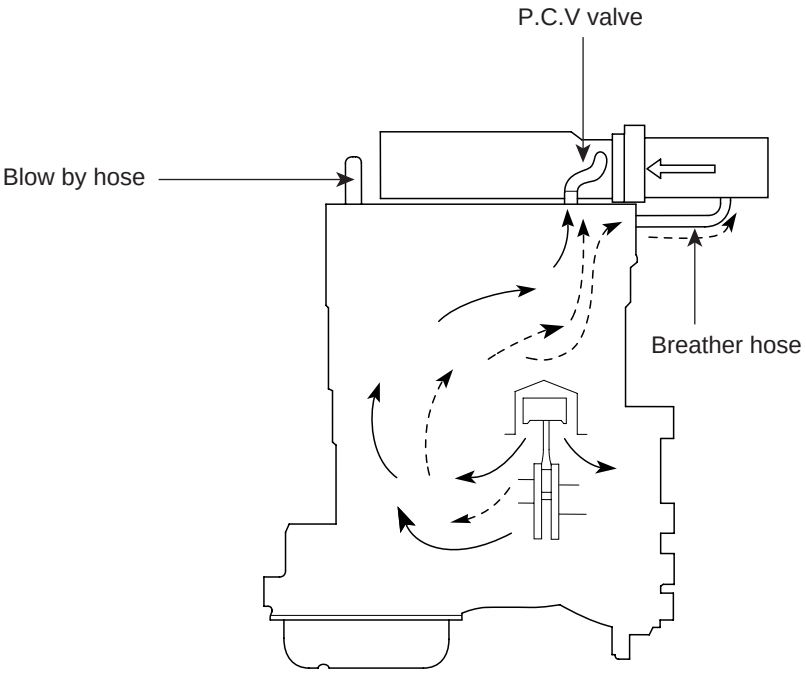
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[2.7 V6]



<Front>



<Rear>

During low load operation

During high load operation

Fresh air

EGQE013A

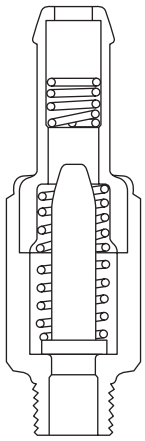
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POSITIVE CRANKCASE VENTILATION (PCV) VALVE

OPERATION E045CC8B

Intake manifold side (No vacuum)

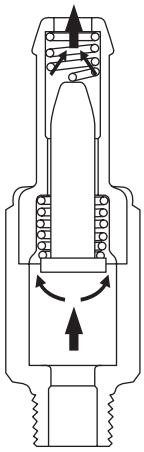


Rocker cover side

BEGE001S

Engine condition	Not running
PCV valve	Not operating
Vacuum passage	Restricted

Intake manifold side (High vacuum)

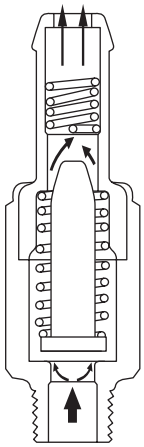


Rocker cover side

BEGE001T

Engine condition	Idling or decelerating
PCV valve	Fully operating
Vacuum passage	Small

Intake manifold side (Moderate vacuum)

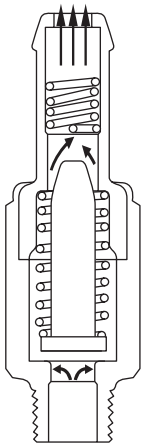


Rocker cover side

BEGE001U

Engine condition	Normal operation
PCV valve	Properly operating
Vacuum passage	Large

Intake manifold side (Low vacuum)



Rocker cover side

BEGE001V

Engine condition	Accelerating and high load
PCV valve	Slightly operating
Vacuum passage	Very large

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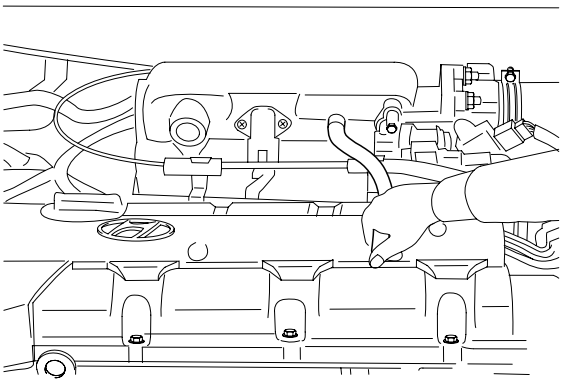
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REMOVAL EBF2D1F6

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.

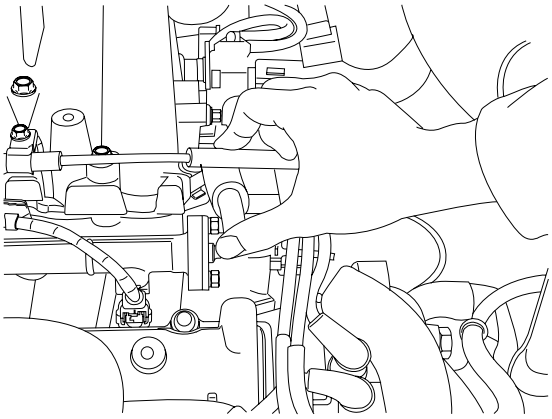
참고

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



<2.0l4>

EGQE603E



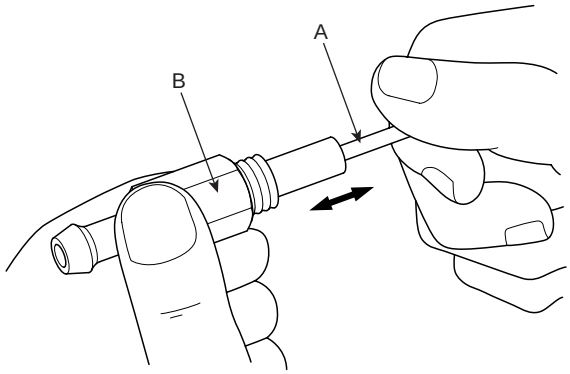
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EGQE010B

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

INSPECTION E7B58F85

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.



EGQE603J

INSTALLATION E23D36FF

Install the PCV valve and tighten to the specified torque.

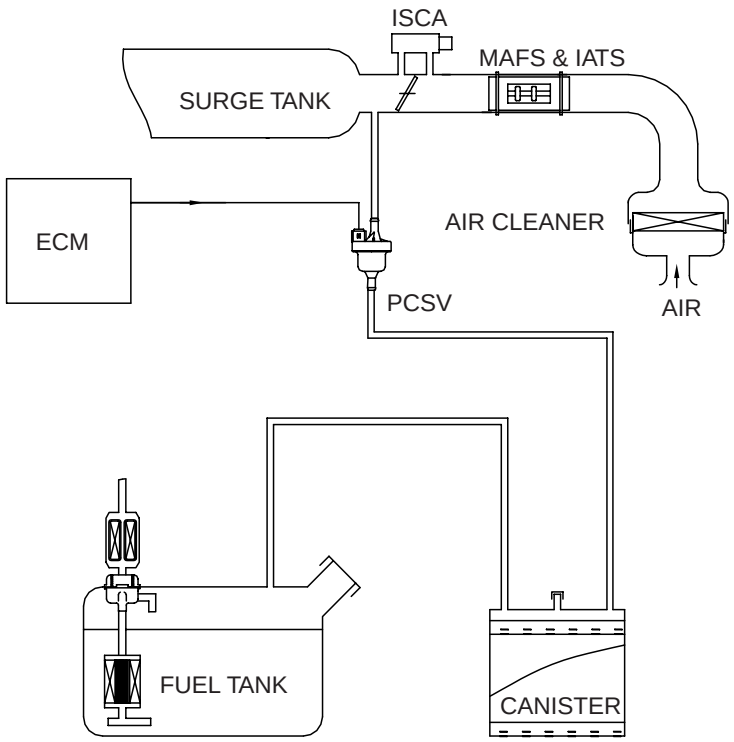
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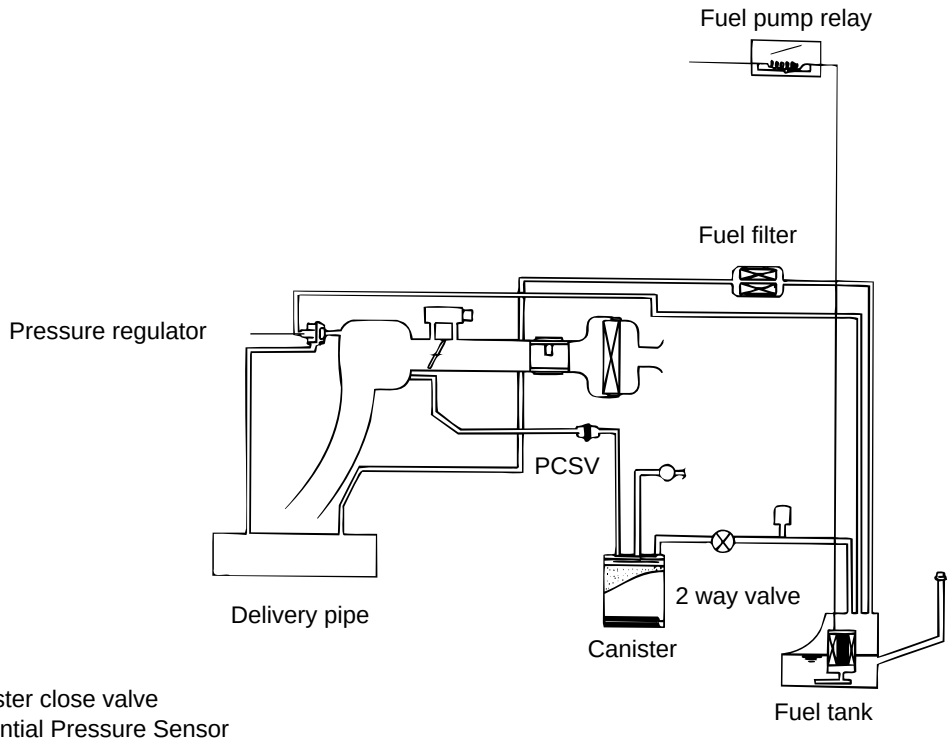
EVAPORATIVE EMISSION CONTROL SYSTEM

COMPONENTS E82B0CAA

[2.0I4]



[2.7 V6]



CCV : Caonister close valve
DPS : Differential Pressure Sensor
PCSV : Purge Control Solenoid Valve

EGQE603F

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INSPECTION EF2CC51F

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		

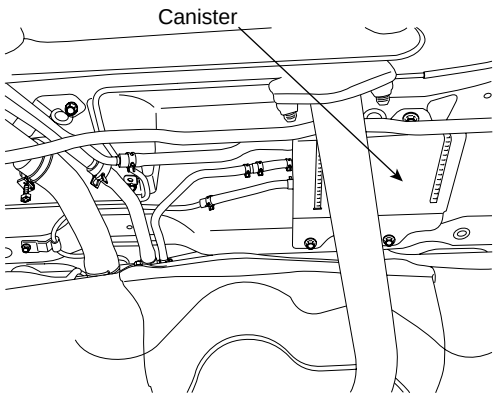
WHEN ENGINE IS WARM

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

EVAPORATIVE (EVAP) CANISTER

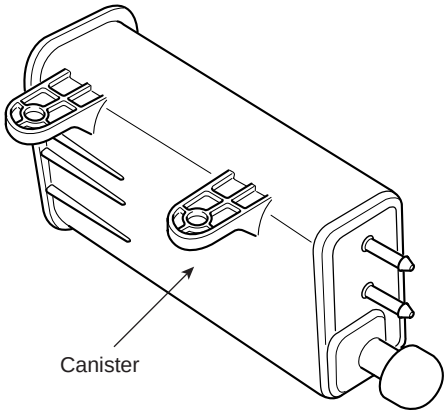
INSPECTION EF30291D

1. Look for loose connections, sharp bends or damage to the fuel vapor lines.



EGQE013B

2. Look for distortion, cracks or fuel leakage.
3. After removing the EVAP. canister, inspect for cracks or damage.



EGQE013C

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EVAPORATIVE (EVAP) CANISTER PURGE SOLENOID VALVE

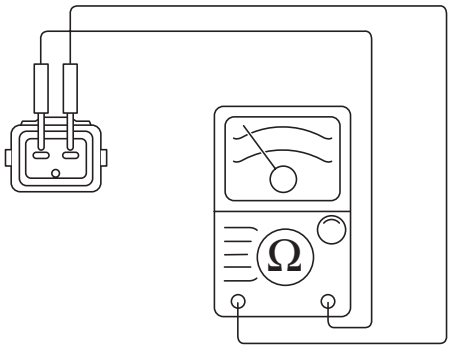
INSPECTION ECCAE6BA

참고

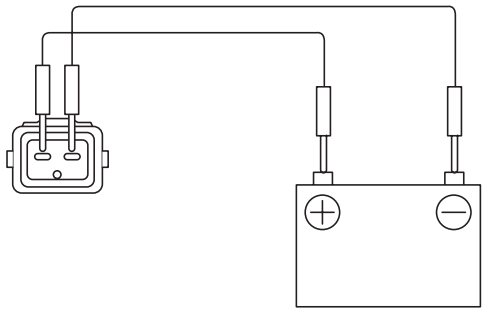
When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.

1. Disconnect the vacuum hose from the solenoid valve.
2. Detach the harness connector.
3. Connect a vacuum pump to the nipple to which the red-striped vacuum hose was connected.
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



EGQE603H



EGQE603G

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

PCSV coil resistance (Ω) :
24.5 ~ 27.5 Ω at 20 °C (68 °F)

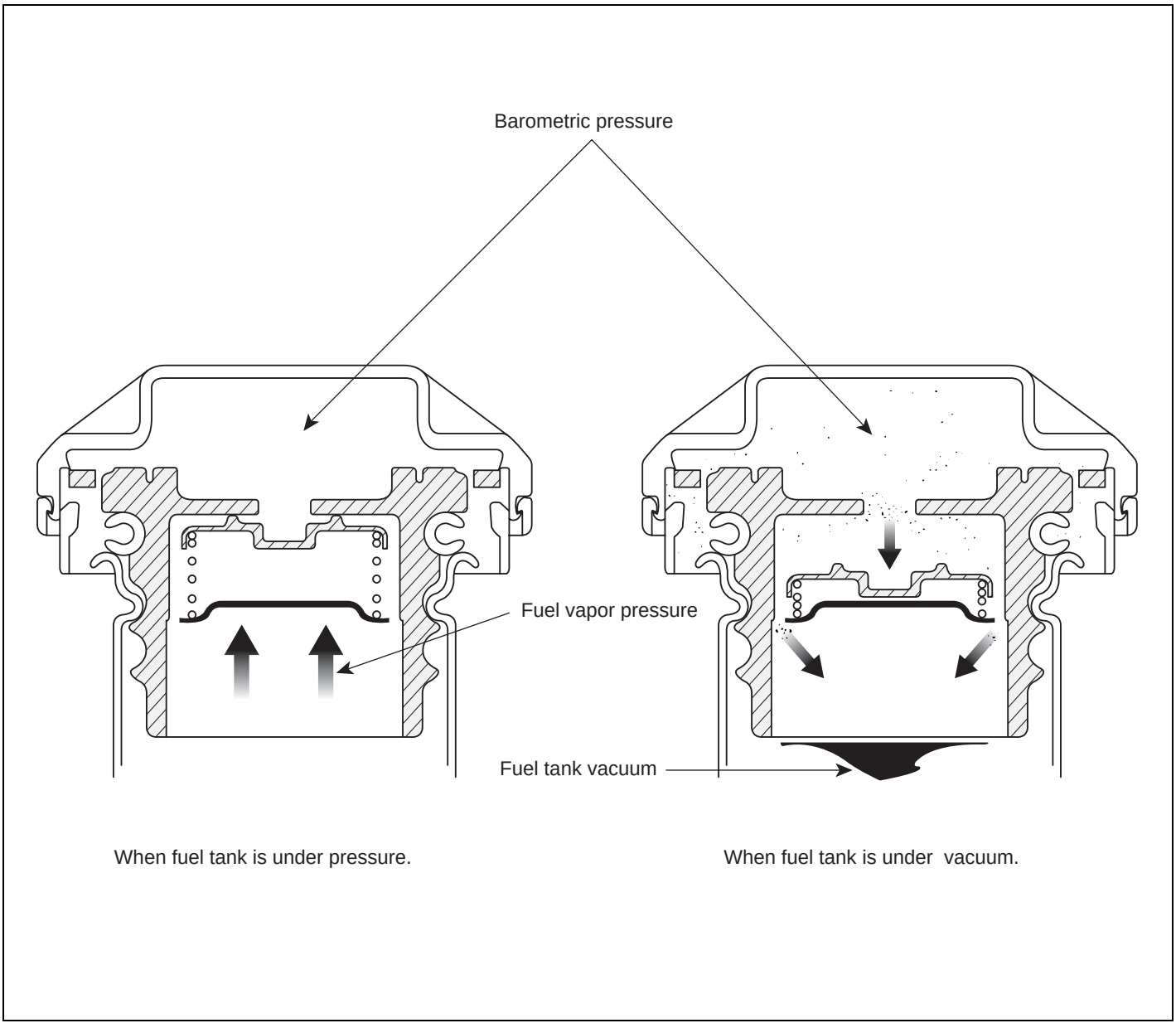
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FUEL FILLER CAP

DESCRIPTION EDA1E427

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 retchet produces a loud clicking noise indicating the seal has been set.



LEGE015A

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EXHAUST EMISSION CONTROL SYSTEM

DESCRIPTION E38D61CC

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]

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.

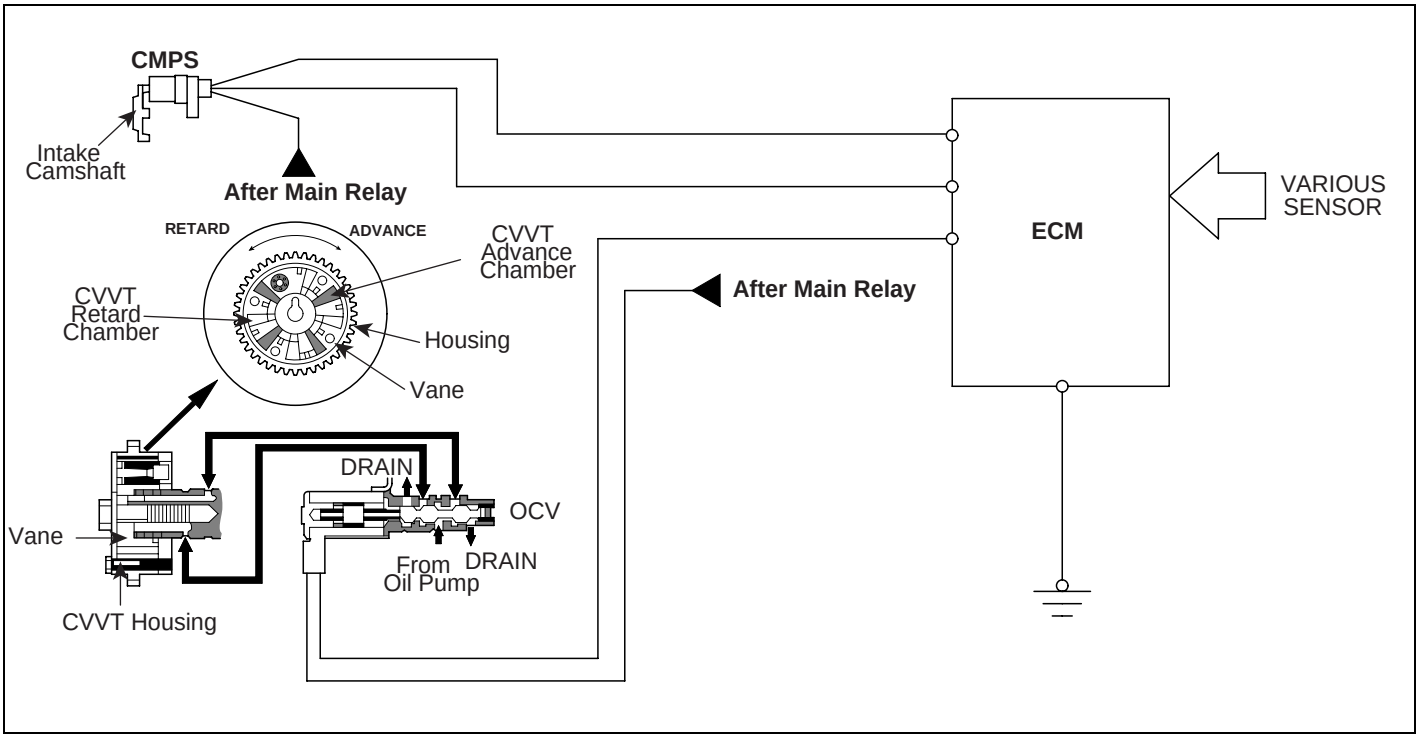
2. Closed Loop air/fuel ratio is adjusted by the ECM based on information supplied by the oxygen sensor.

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CONTINUOUS VARIABLE VALVE TIMING

COMPONENTS E8161C5E

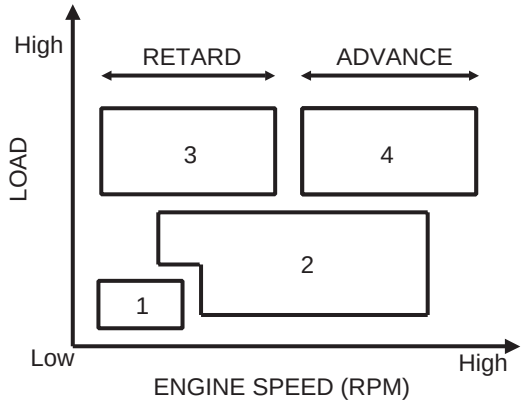


BEGE001P

DESCRIPTION EE1FF9CB

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.



Driving Condition	Intake Valve Timing	Effect
Light load (1)	Retard	Stable combustion
Part load (2)	Advance	Enhanced fuel economy and exhaust emissions
High load& Low rpm (3)	Advance	Enhanced torque
High load& High rpm (4)	Retard	Enhanced Power

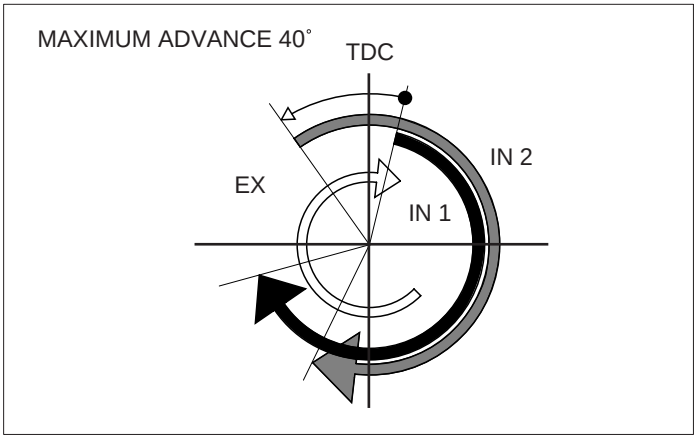
BEGE001Q

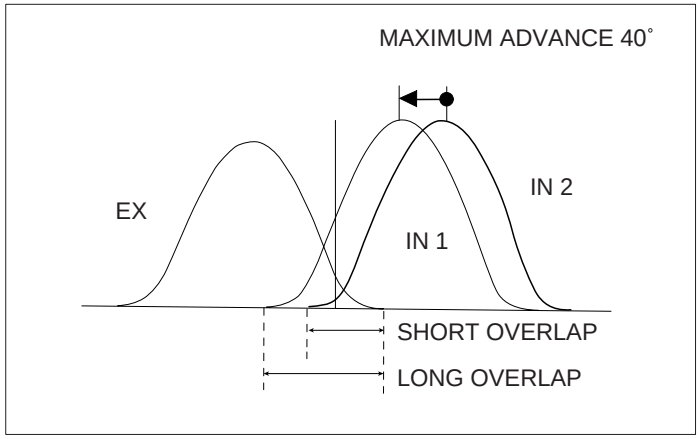
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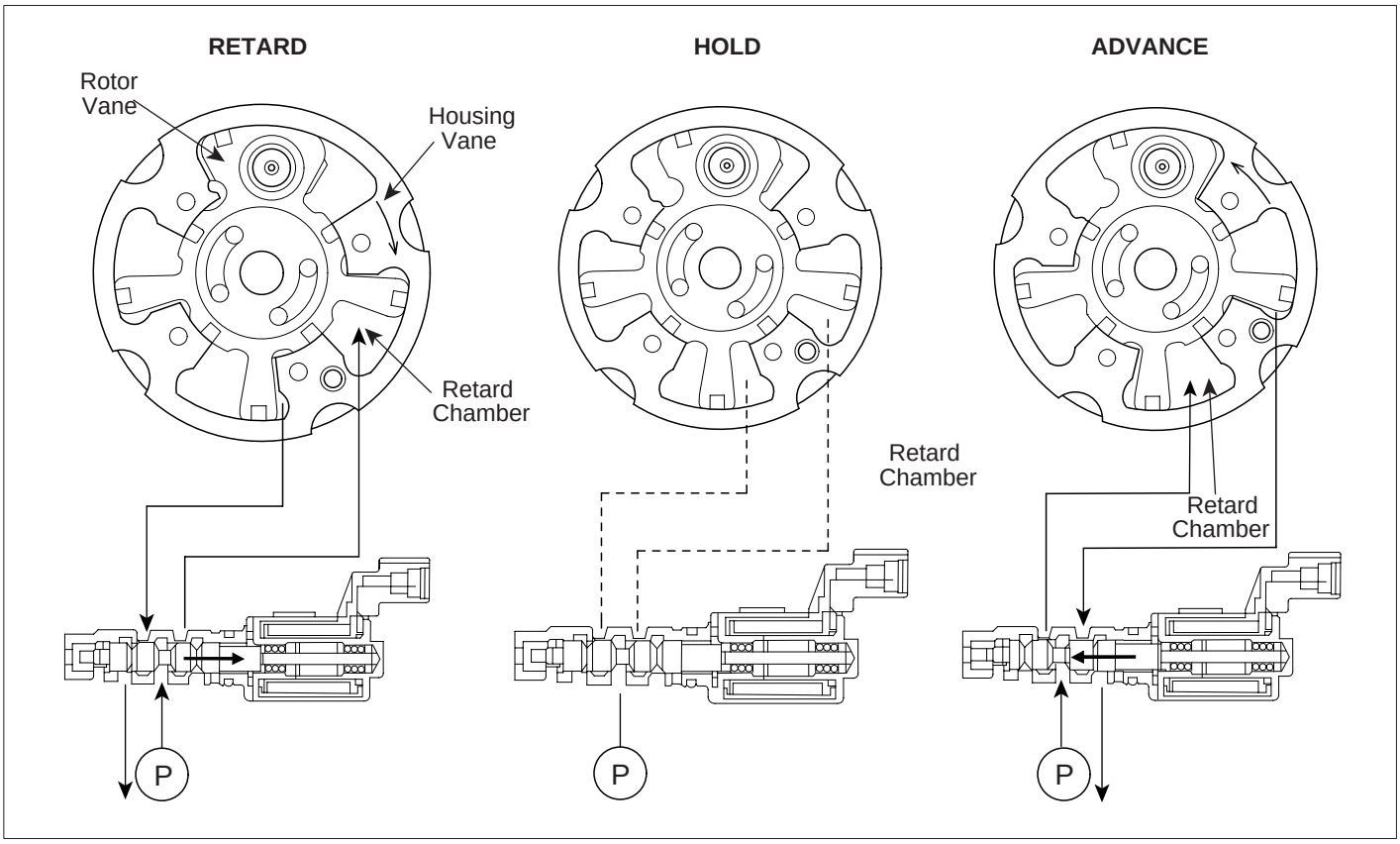
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OPERATION EB294647

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 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.







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

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