5. Emission Control System

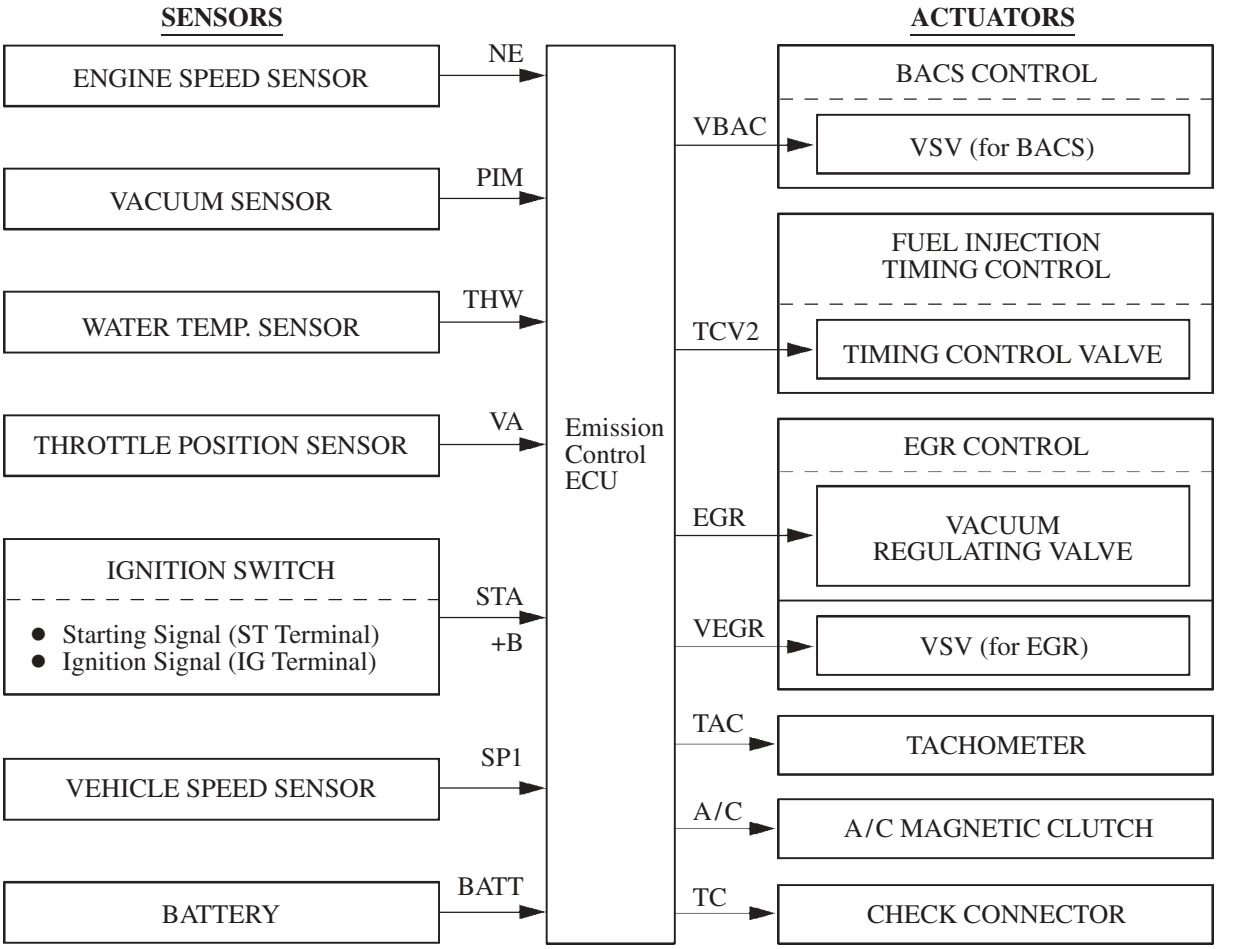
General

The engine control system of the 1HZ engine has following system.

System	Outline
Glow Plug Control	Controls the length of time when the current is applied to the glow plugs, in accordance with engine coolant temperature.
BACS Control (For details, see page 178)	Controls the vacuum that is applied to the BACS in accordance with the engine conditions, thus controlling the maximum injection volume and restraining the discharge of black smoke.
TCV Control (For details, see page 179)	Controls the fuel injection timing in accordance with the engine conditions.
EGR Control (For details, see page 180)	Controls the EGR volume via EGR valve in accordance with the engine condition.
Diagnosis (For details, see page 181)	When the emission control ECU detects a malfunction, the ECU diagnoses and memorizes the failed section.
Fail-Safe (For details, see page 181)	When the emission control ECU detects a malfunction, the ECU stops or controls the EGR control, fuel injection volume control and fuel injection timing control according to the data already stored in the memory.

Construction

The configuration of the emission control system in 1HZ engine is shown in the following chart.



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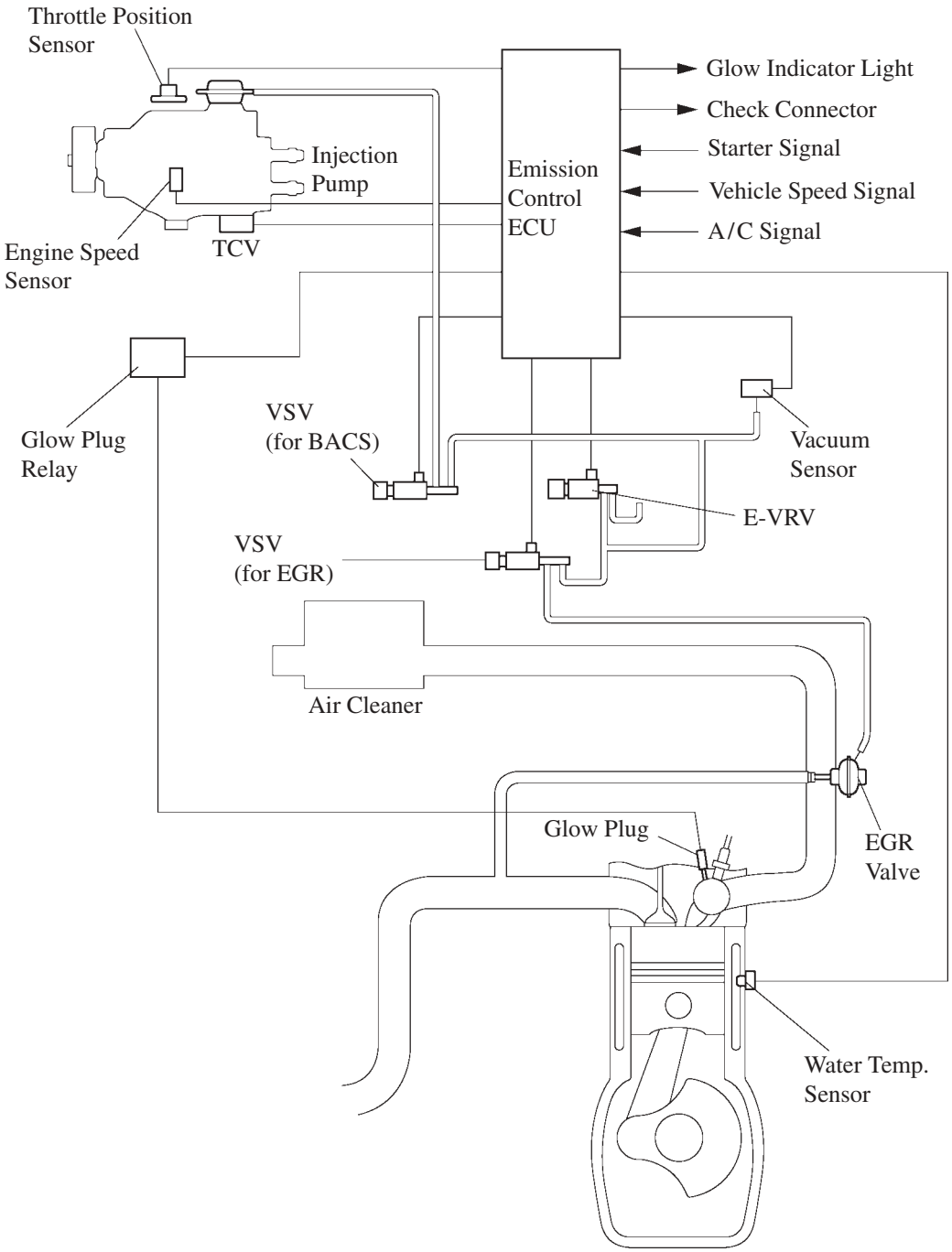
Emission Control System Diagram



Main Component of Emission Control System

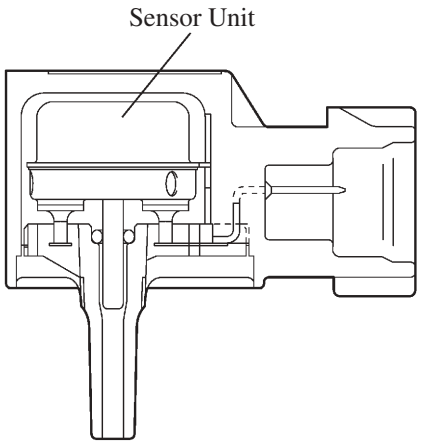
1) General

The main components of the emission control system are as follows:

Components	Outline	Quantity
Vacuum Sensor	Semiconductor Type	1
Engine Speed sensor (Rotor Teeth)	Pick-Up Coil Type (37)	1
Throttle Position Sensor	Linear Type	1
Water Temperature Sensor	Thermistor Type	1

2) Vacuum Sensor

The vacuum sensor consists of a semiconductor, which utilizes the characteristic of a silicon chip that changes its electrical resistance when pressure is applied to it. The sensor converts the pressure into an electrical signal, and sends it to the emission control ECU in an amplified form.



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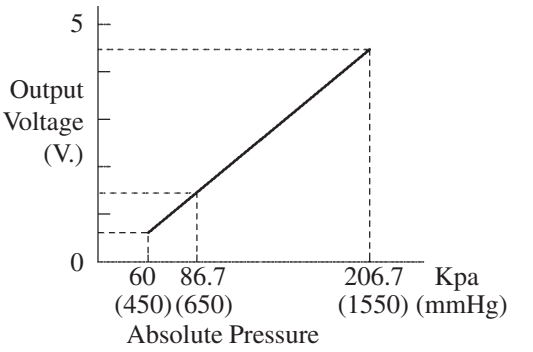

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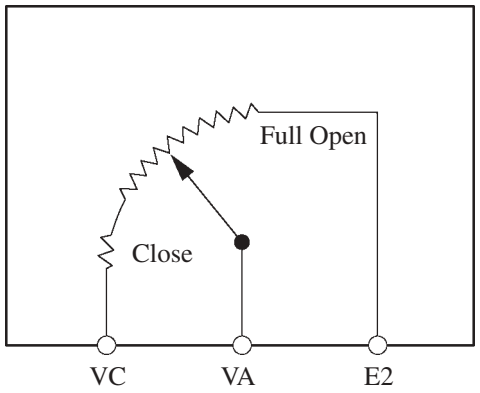
3) Throttle Position Sensor

The throttle position sensor is mounted on the adjusting lever of the injection pump. It converts the accelerator opening into voltage and sends it as the throttle position signal to the ECU. A 5V constant voltage is applied to the VC terminal from the emission control ECU. As the contact point slides along the resistor in accordance with the accelerator opening, voltage is applied to the VA terminal in proportion to this angle.



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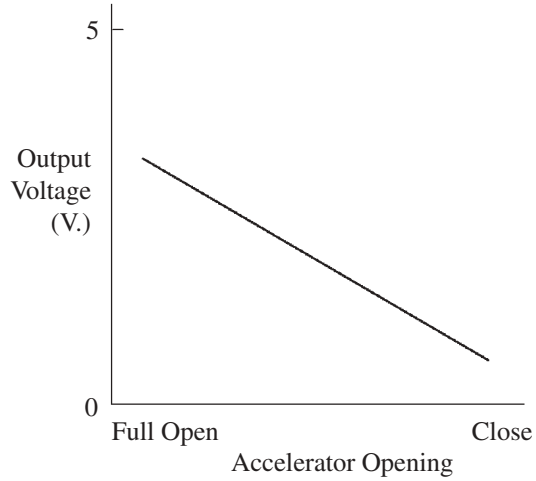

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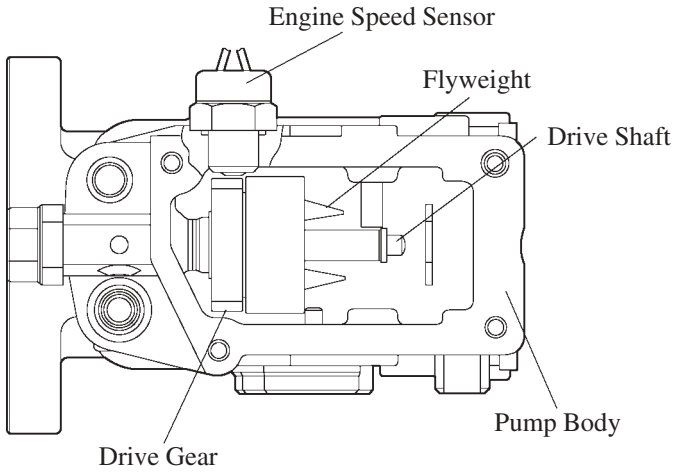
4) Engine Speed Sensor

The engine speed is detected by way of the flyweight gear teeth (37 teeth), which is driven by the drive shaft of the injection pump, and the pick-up coil of the engine speed sensor.



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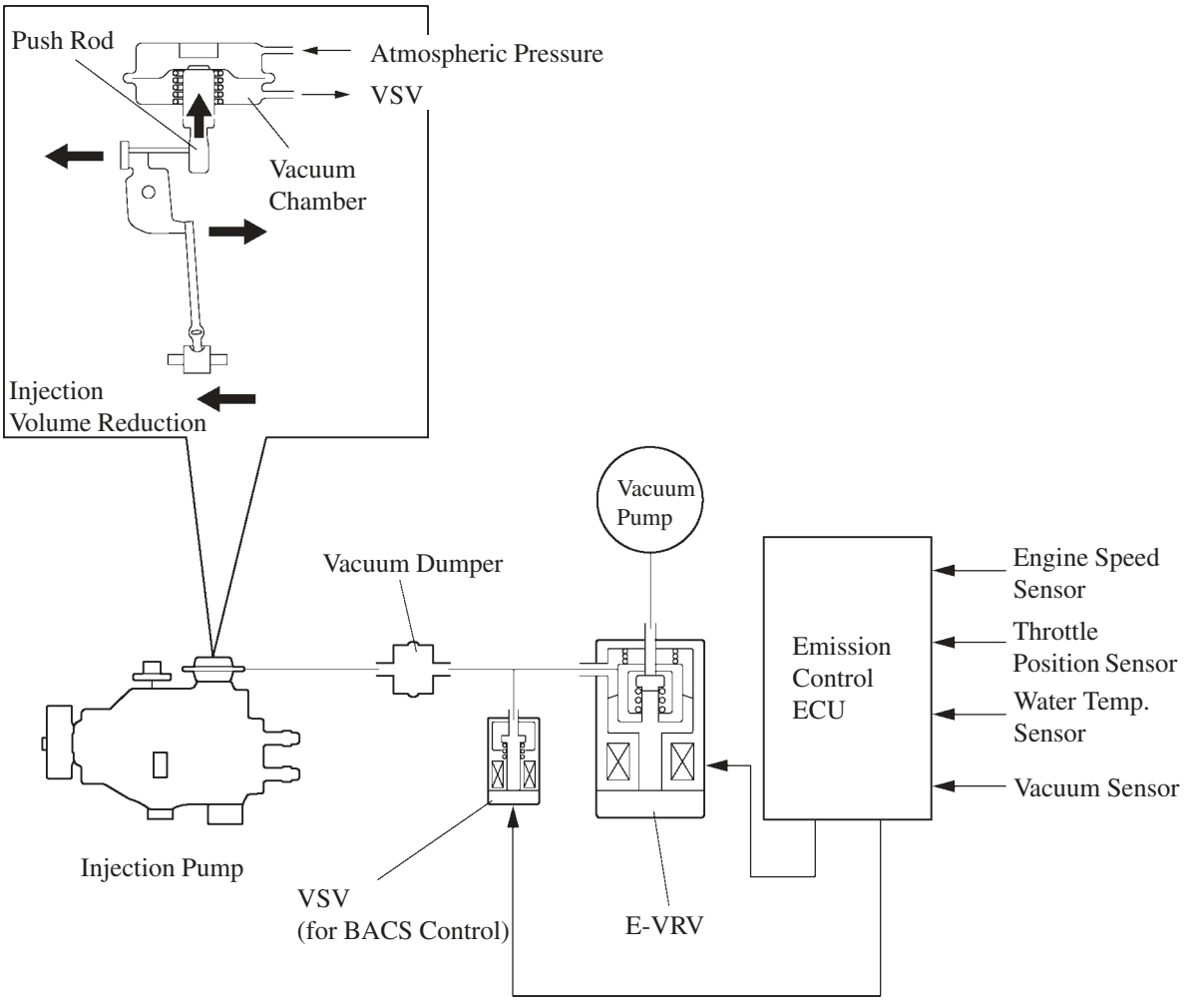
BACS Control

- When the intake air volume decreases while the vehicle is being driven at high altitudes, the emission control ECU, by way of the E-VRV, reduces the vacuum that acts on the bottom of the vacuum chamber diaphragm. Accordingly, the pushrod lifts up and the spill ring moves in the direction to reduce the injection volume, in order to reduce the maximum injection volume and restrain the discharge of black smoke.
- During sudden acceleration, the emission control ECU calculates the target BACS vacuum valve in accordance with the signals from the sensors (which determine the conditions of the engine). Then, by way of the E-VRV and VSV (for BACS), the emission control ECU controls the vacuum that acts on the bottom of the vacuum chamber diaphragm in order to control the maximum injection volume and restrain the discharge of black smoke.



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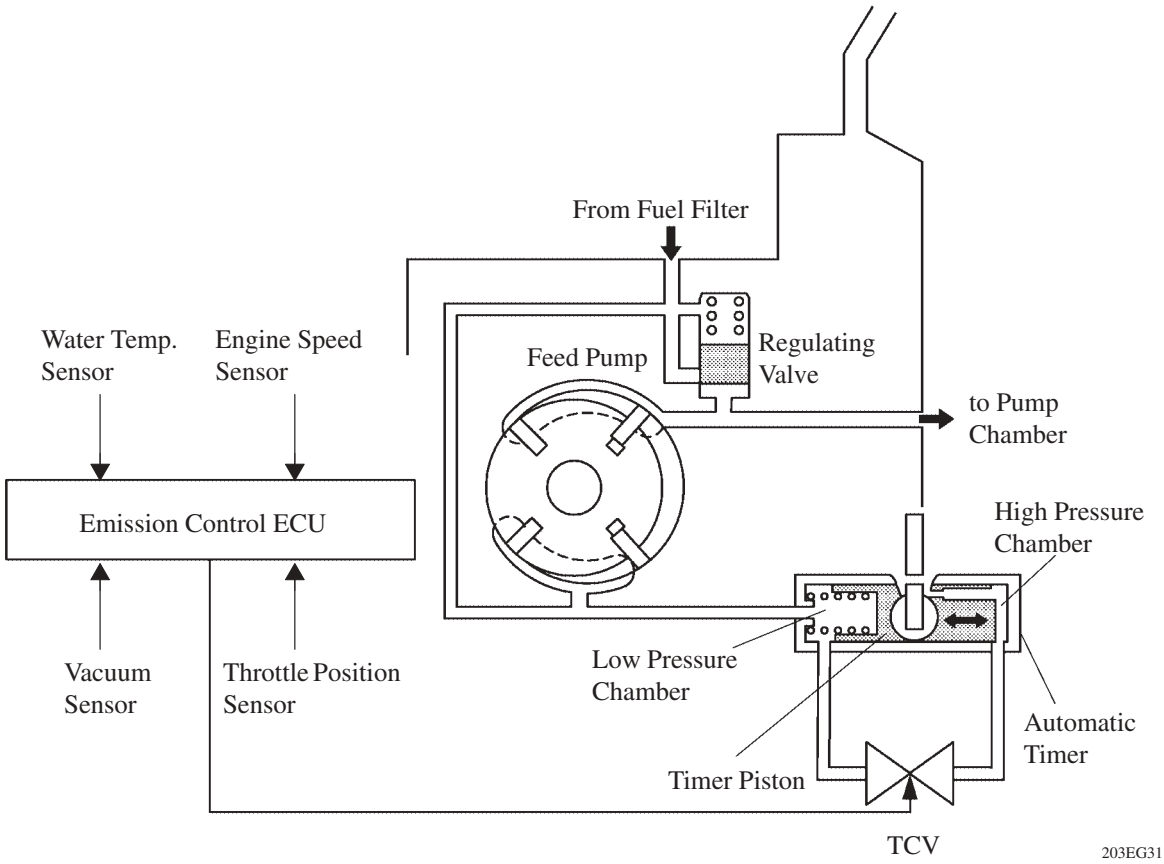
TCV Control

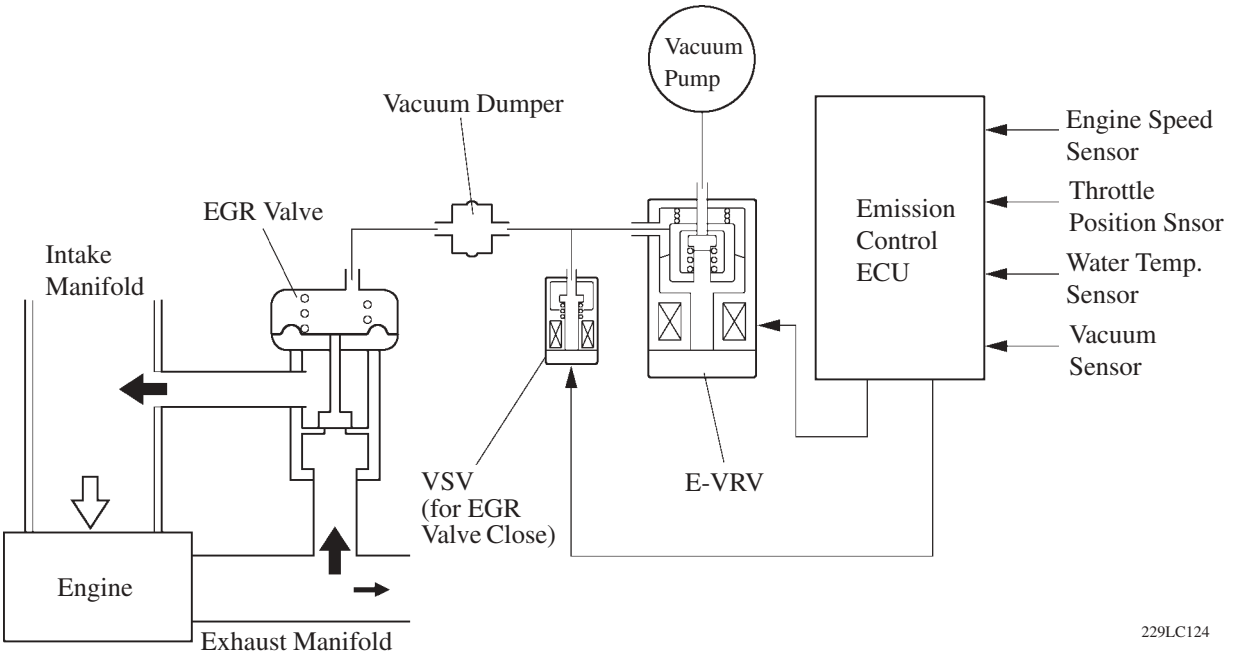
The TCV uses an automatic timer to optimize the timing advance control in accordance with the signals from the emission control ECU. As a result, it restrains the discharge of black smoke while the engine is operating at partial load.

- Engine operating at a full load:
  The TCV is inactive during a full load operation. Therefore, as with the previous model, the fuel pressure that is applied to the timer piston is mechanically controlled by way of the feed pump and the regulating valve in order to control the injection timing.
- Engine operating at a partial load:
  The TCV controls the fuel pressure that is applied to the timer piston in accordance with the signals from the emission control ECU in order to control the injection timing towards the retard side.



EGR System

- This system is designed to reduce and control NOx formation due to a slight reduction of peak temperature in the engine combustion chamber, which is accomplished by introducing a small amount of inert gas into intake manifold.
- By sensing the engine driving conditions, the emission control ECU electrically operates both the E-VRV and VSV (for EGR valve close), which controls the magnitude of vacuum introduced into diaphragm of EGR valve.



Diagnosis

- When the emission control ECU detects a malfunction, the emission control ECU makes a diagnosis and memorizes the failed section. Furthermore, glow indicator light in the combination meter illuminates or blinks to inform the driver. The emission control ECU will also store the DTC (Diagnosis Trouble Code) of the malfunctions.
- The DTC can be accessed by connecting the SST (09843-18020) to the check connector terminal TE1 and E1, and reading the blinking of the glow indicator light.

▶ DTC List ◀

DTC No.	Detection Item	DTC No.	Detection Item
13	Engine Speed Sensor Circuit Malfunction	42	Vehicle Speed Sensor Signal Circuit Malfunction
22	Water Temp. Sensor Circuit Malfunction	43	Starter Signal Circuit Malfunction
31	Vacuum Sensor Circuit Malfunction	51	Switch Condition Signal Circuit Malfunction
41	Throttle Position Sensor Circuit Malfunction	71	EGR System Malfunction

Fail Safe

When the emission control ECU detects a malfunction, the emission control ECU stops or controls the EGR, BACS, TCV control according to the data already stored in the memory.

▶ Fail Safe Control List ◀

Location of Malfunction	Description of Control
Water Temp. Sensor	● Stops EGR control ● Stops BACS control ● Stops TCV control
Throttle Position sensor	
Vacuum Sensor	
Engine Speed Sensor	