

5. Main Components of Engine Control System

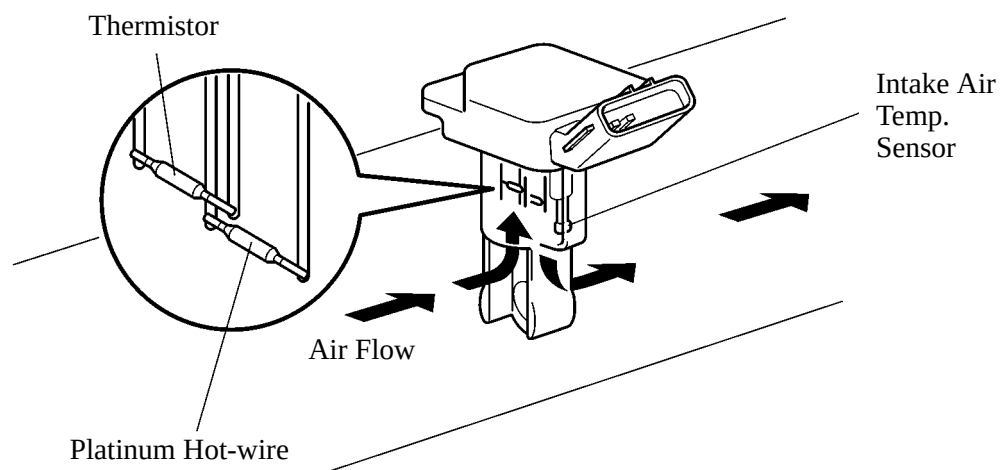
General

The following table compares the main components.

Components	New		Previous	
	Outline	Quantity	Outline	Quantity
ECM	32-bit CPU	1	16-bit CPU	1
Mass Air Flow Meter	Hot-wire Type	1	←	
Crankshaft Position Sensor (Rotor Teeth)	Pick-up Coil Type (36-2)	1	←	
VVT Sensor [Bank 1] (Rotor Teeth)	Pick-up Coil Type (3)	1	←	
VVT Sensor [Bank 2] (Rotor Teeth)	Magnetic Resistance Element Type (3)	1	Pick-up Coil Type (3)	1
Throttle Position Sensor	Linear Type	1	←	
Accelerator Pedal Position Sensor	Linear Type	1	—	
Knock Sensor	Built-in Piezoelectric Type	2	←	
Air Fuel Ratio Sensor (Bank 1, Sensor 1) (Bank 2, Sensor 1)	with Heater Type	2	←	
Oxygen Sensor (Bank 1, Sensor 2) (Bank 2, Sensor 2)	with Heater Type	2	with Heater Type	1
Injector	12-Hole Type	6	4-Hole Type	6

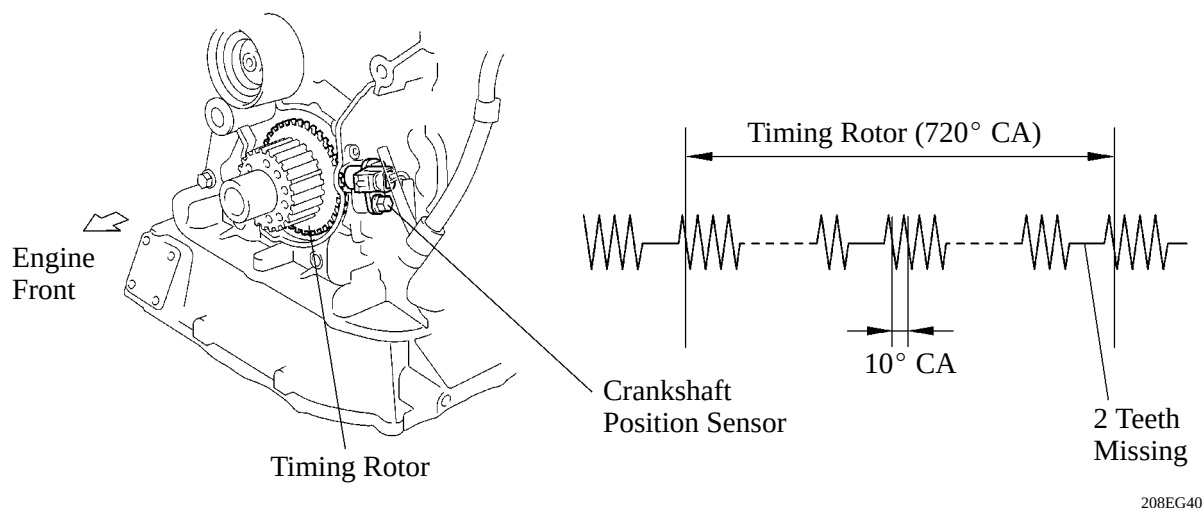
Mass Air Flow Meter

- This mass air flow meter, which is a plug-in type, allows a portion of the intake air to flow through the detection area. By directly measuring the mass and the flow rate of the intake air, the detection precision has been improved and the intake air resistance has been reduced.
- This mass air flow meter has a built-in intake air temperature sensor.



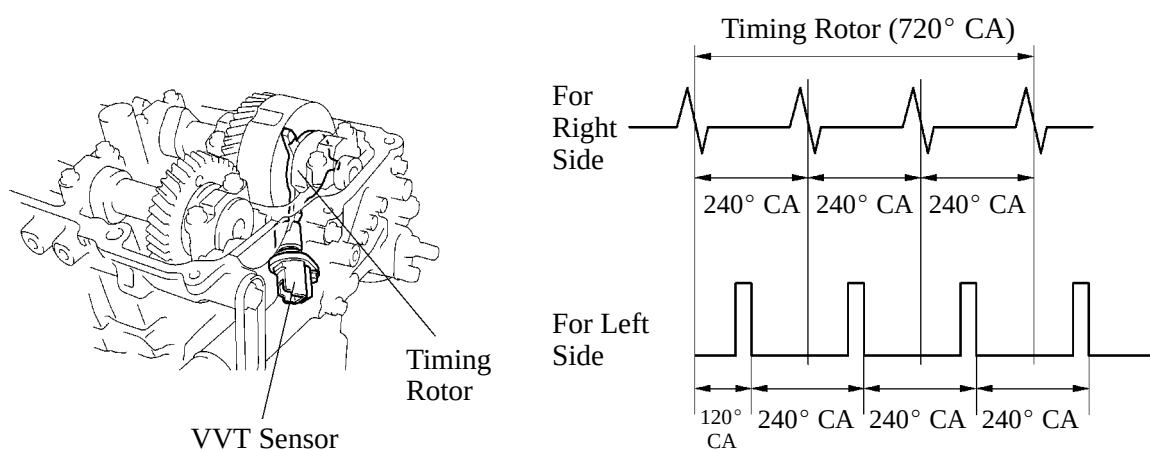
Crankshaft Position Sensor

The timing rotor of the crankshaft consists of 34 teeth, with 2 teeth missing. The crankshaft position sensor outputs the crankshaft rotation signals every 10° , and the missing teeth are used to determine the top-dead-center.



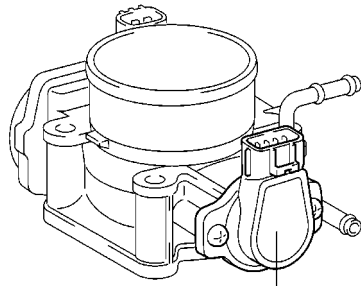
VVT Sensor

The magnetic resistance element type VVT sensor is mounted on the left side of cylinder head and the conventional type VVT sensor is mounted on the right side of cylinder head. To detect the camshaft position, a timing rotor that is provided on the VVT-i controller is used to generate 3 pulses for every 2 revolutions of the crankshaft.

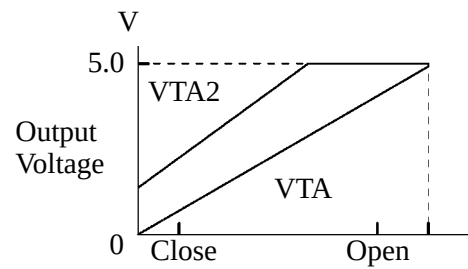
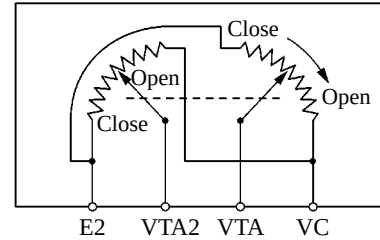


Throttle Position Sensor

This sensor converts the throttle valve opening angles into electronic signals with two differing characteristics and outputs them to the ECM. One is the VTA signal that linearly outputs the voltage along the entire range of the throttle valve opening angle. The other is the VTA 2 signal that outputs an offset voltage.



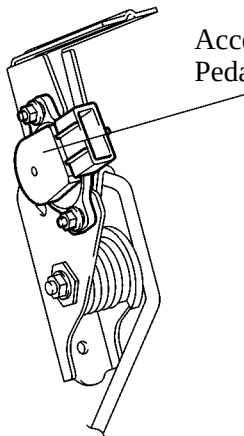
Throttle Position Sensor



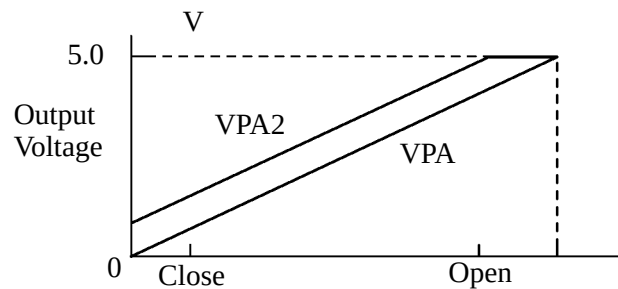
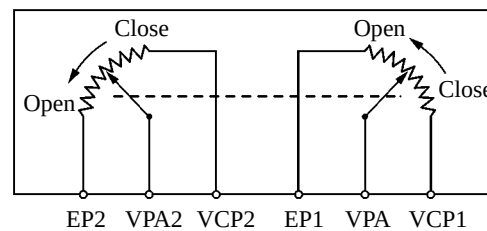
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Accelerator Pedal Position Sensor

This sensor converts the accelerator pedal depressed angles into electric signals with two differing characteristics and outputs them to the ECM. One is the VPA signal that linearly outputs the voltage along the entire range of the accelerator pedal depressed angle. The other is the VPA2 signal that outputs an offset voltage.



Accelerator
Pedal Position Sensor

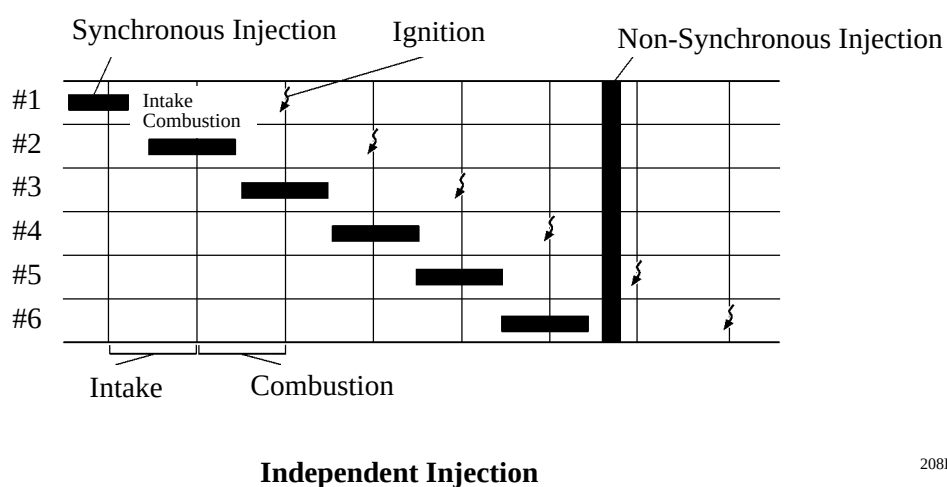


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6. SFI (Sequential Multiport electronic Fuel Injection) System

- An L-type SFI system directly detects the intake air mass with a hot wire type mass air flow meter.
- An independent injection system (in which fuel is injected once into each cylinder for each two revolution of the crankshaft) has been adopted.
- There are two types of fuel injection:
 - a) One is synchronous injection in which corrections based on the signals from the sensors are added to the basic injection duration so that injection occurs always at the same timing.
 - b) The other is non-synchronous injection in which injection is effected by detecting the requests from the signals of the sensors regardless of the crankshaft angle.

Furthermore, to protect the engine and improve fuel economy, the system effects fuel cutoff in which the injection of fuel is stopped temporarily in accordance with the driving conditions.



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7. ESA (Electronic Spark Advance)

This system selects the optimal ignition timing in accordance with the signals received from the sensors and sends the (IGT) ignition signal to the igniter. The default ignition timing is set to 5° BTDC.