

Air Injection System

1) General

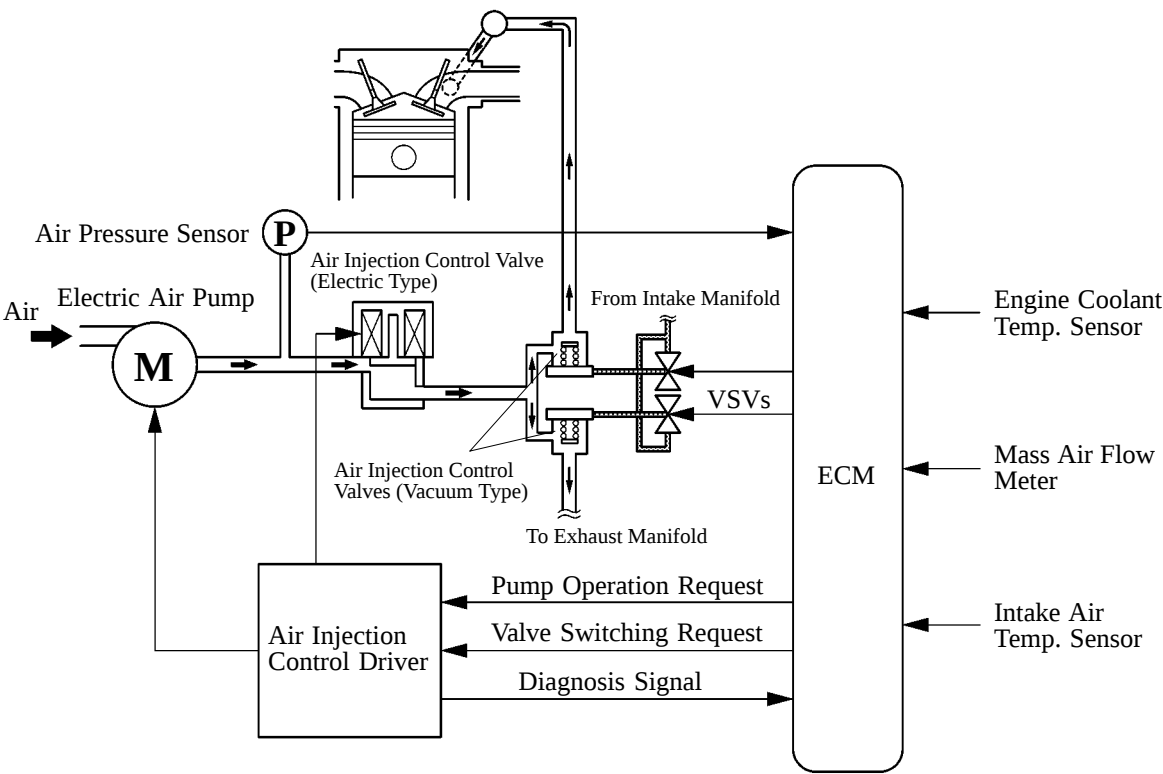
To ensure the proper warm-up performance of the TWC when starting a cold engine, an air injection system is used.

- This system consists of an electric air pump, an air injection control driver, two air injection control valves (vacuum type), an air injection control valve (electric type), and two VSVs.
- The ECM estimates the amount of air injected to the TWC (Three-Way catalytic Converter) based on signals from the mass air flow meter in order to regulate the air injection time.
- The air injection operates under the following operation conditions.

► Operation Condition ◀

Engine Coolant Temp.	41 to 104°F (5 to 40°C)
Intake Air Temp.	41°F (5°C) or more

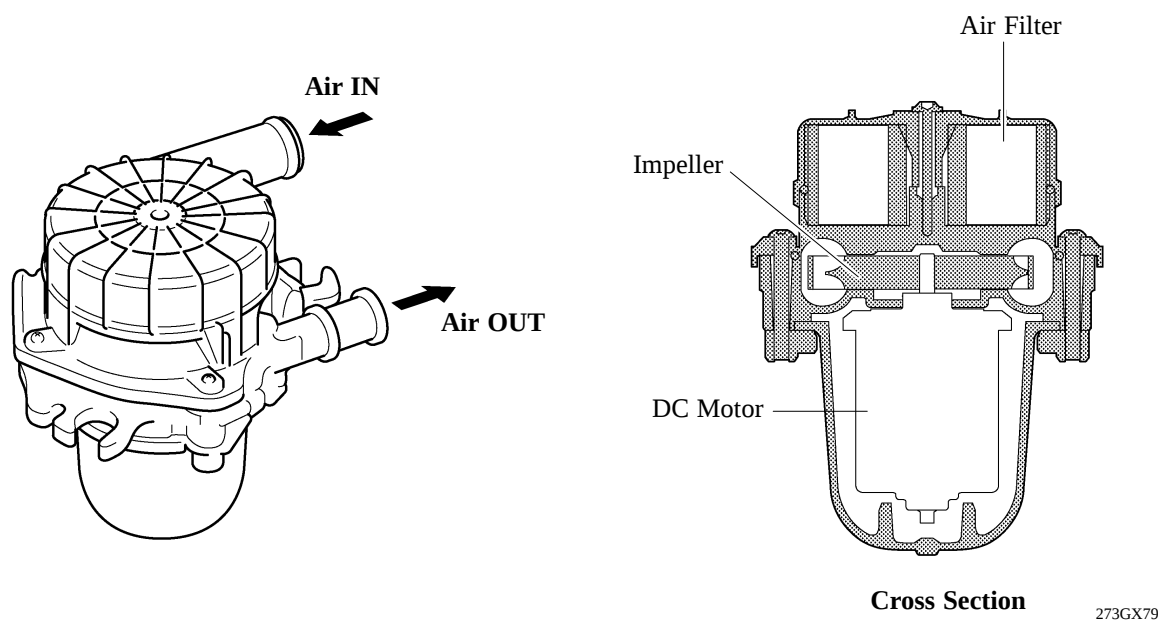
► System Diagram ◀



2) Construction and Function of Main Components

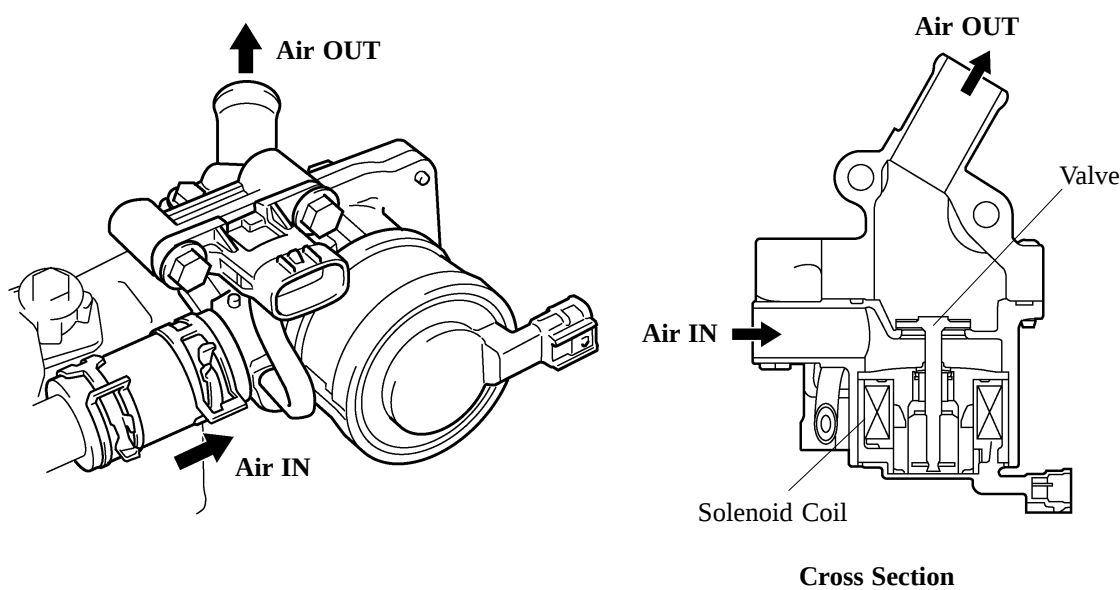
a. Electric Air Pump

- An electric air pump consists of a DC motor, an impeller and an air filter.
- The pump supplies air into an air injection control valve (electric type) through the impeller.
 - The air filter is maintenance-free.



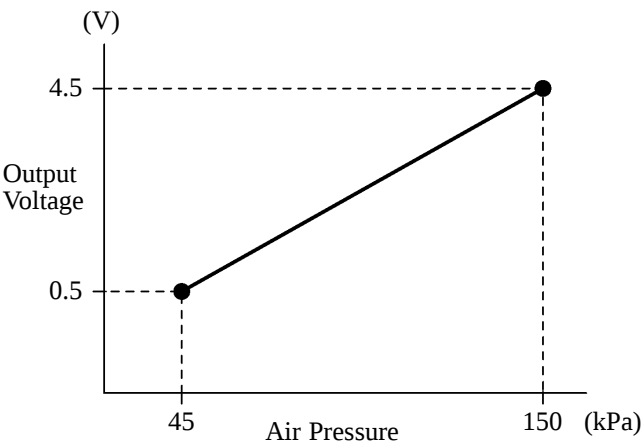
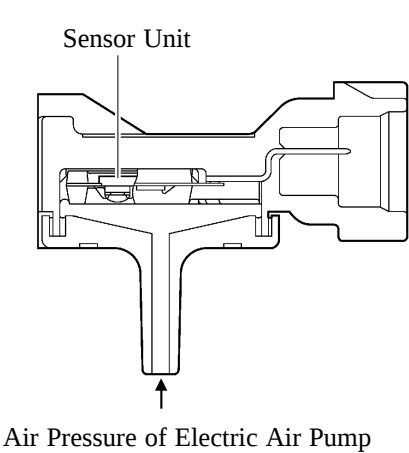
b. Air Injection Control Valve (Electric Type)

The air injection control valve (electric type) is operated by a solenoid coil to control air injection and prevent back-flow of exhaust gas. Opening timing of the valve is synchronized with operation timing of the electric air pump.



c. Air Pressure Sensor

The air pressure sensor consists of a semiconductor, which utilized the characteristics of 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 ECM in an amplified form.



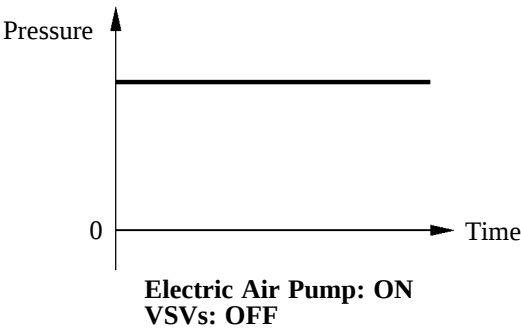
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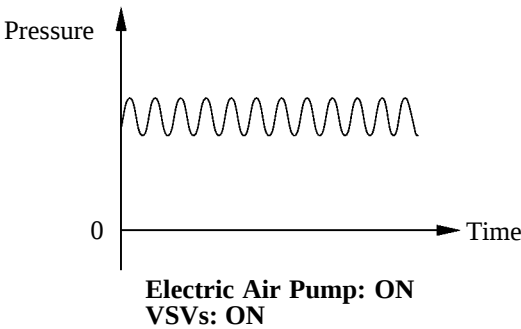
The ECM detects operation condition of the air injection system based on signals from the air pressure sensor as follows:

- 1) When the electric air pump is ON and the VSVs are OFF, the pressure is constant.
- 2) When the VSVs are turned ON with the electric air pump ON and all air injection control valves open, the pressure drops slightly and becomes unstable because of exhaust-pulse.
- 3) When the electric air pump is OFF and the VSVs are OFF, the pressure remains 0.
- 4) When the VSVs are turned OFF with the electric air pump ON and all air injection control valves open, the pressure drops below 0 and becomes unstable because of exhaust-pulse.

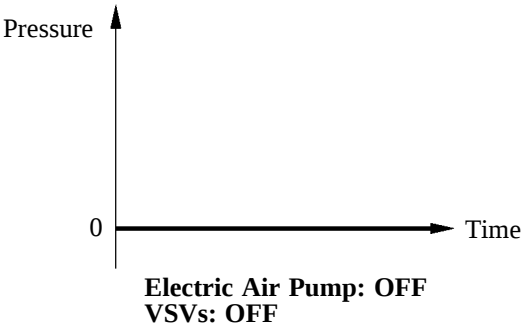
Example: 1



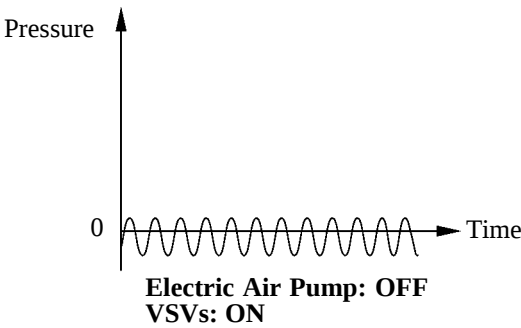
Example: 2



Example: 3

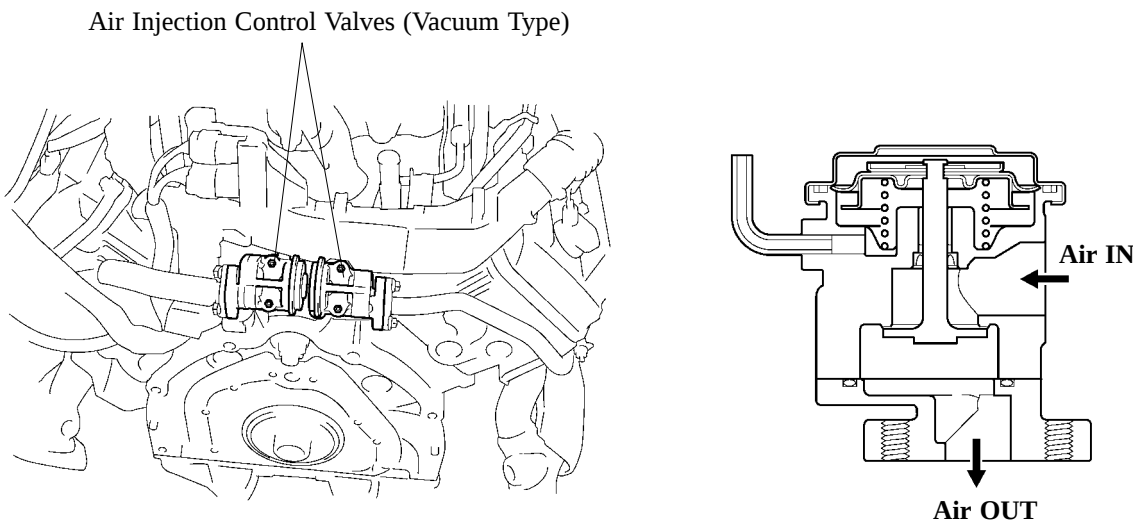


Example: 4



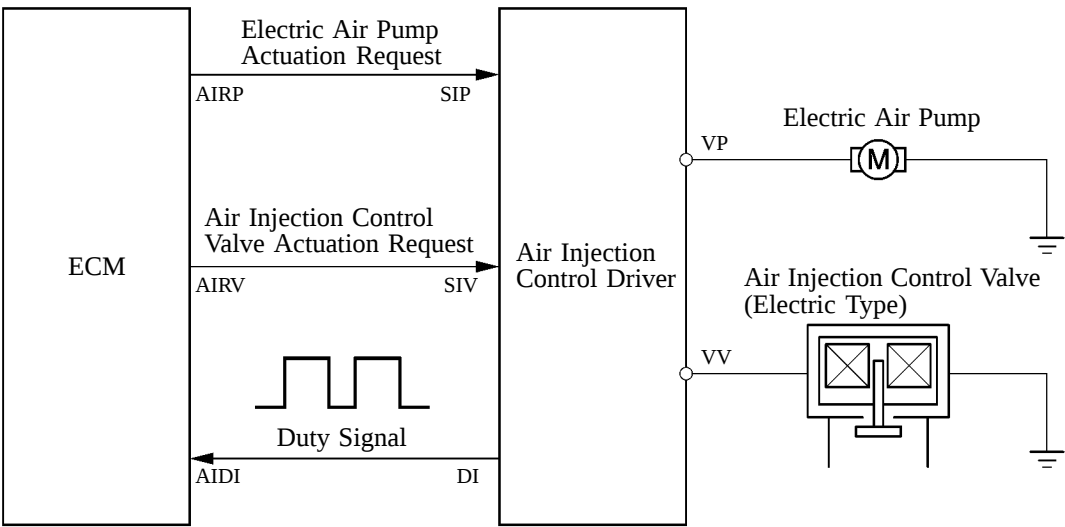
d. Air Injection Control Valve (Vacuum Type)

The air injection control valve (vacuum type) switches according to the vacuum pressure introduced by VSV.



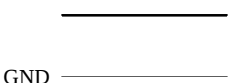
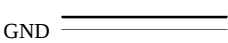
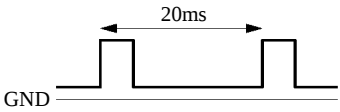
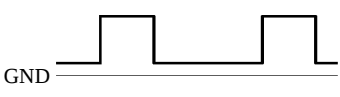
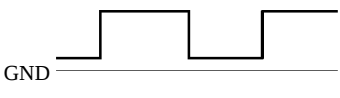
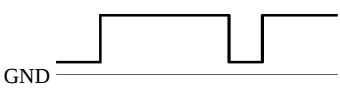
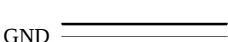
e. Air Injection Control Driver

- The air injection control driver uses semiconductor. Activated by the ECM, this driver actuates the electric air pump and the air injection control valve.
- The air injection control driver also detects failures in the input and output circuits at the air injection driver and transmits the failure status to the ECM via duty cycle signals.



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► DI Terminal Output ◀

Condition	AIRP	AIRV	Output (Duty Signal)
Open circuit in line between AIDI and DI terminals.	-	-	 GND 273GX28
Failure in line between ECM terminals and air injection control driver.			 GND 273GX29
Output failure at air injection control driver. (Failure in electric air pump actuation circuit)	-	-	 GND 273GX30
Output failure at air injection control driver. (Failure in air switching valve actuation circuit)	-	-	 GND 273GX31
Overheat failure of air injection control driver.	-	-	 GND 273GX32
Normal	ON	ON	 GND 273GX33
	OFF	OFF	 GND 273GX29
	ON	OFF	
	OFF	ON	