

AIR LINE

FUEL INJECTION (FUEL SYSTEM)

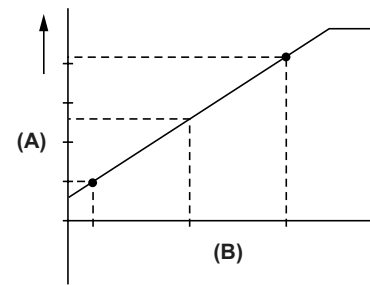
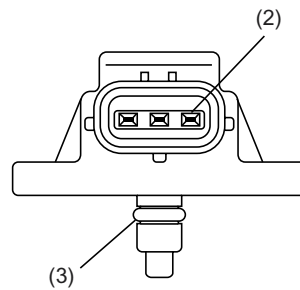
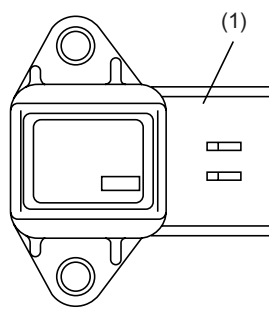
2. Air Line

A: GENERAL

The air filtered by the air cleaner enters the throttle body where it is regulated in the volume by the throttle valve and then enters the intake manifold. It is then distributed to each cylinder where the air is mixed with fuel injected by the injector. During idling operation, air flows into the cylinder through the idle air control solenoid valve, bypassing the throttle valve. This enables controlling the engine idling speed properly.

B: MANIFOLD ABSOLUTE PRESSURE SENSOR

The manifold absolute pressure sensor is attached to the top of the throttle body, and continuously sends to the engine control module (ECM) voltage signals that are proportional to intake manifold absolute pressures. The ECM controls the fuel injection and ignition timing based on the intake manifold absolute pressure signals in addition to other signals from many sensors and other control modules.



FU-00343

- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

FU(H4DOTC)-3

AIR LINE

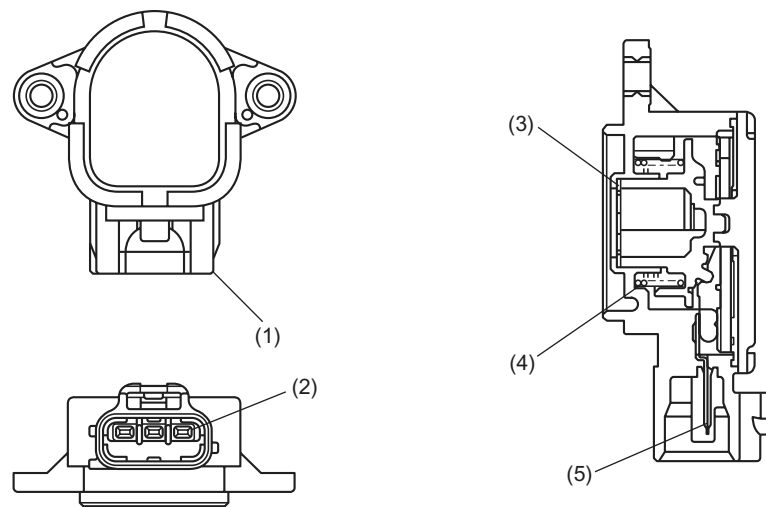
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C: THROTTLE BODY

- In response to operation of the accelerator pedal, the throttle valve in the throttle body opens/closes to regulate the volume of the air drawn into the combustion chamber.
- During idling the throttle valve is almost fully closed and the volume of air passing the throttle valve becomes less than the amount of air that pass through the idle air control solenoid valve.
- More than half of the air necessary for idling is supplied to the intake manifold via the idle air control solenoid valve which controls properly the engine idling speed, so the idling speed needs not be adjusted.

D: THROTTLE POSITION SENSOR

- The throttle position sensor is mounted in the throttle body and linked to the throttle valve.
- The throttle position sensor sends the ECM voltage signal corresponding to the opening of the throttle valve. When the sensor's output voltage exceeds a predetermined level, the ECM interprets it as complete closure of the throttle valve. When the output voltage is at another predetermined level, the ECM recognizes that the throttle valve is at a wide open position. Since the output characteristics of the sensor change over years, the ECM is provided with a learning function to be able to interpret signals into throttle valve angles always correctly.



FU-00344

- (1) Connector
- (2) Terminal
- (3) Wave washer

- (4) Return spring
- (5) Terminal

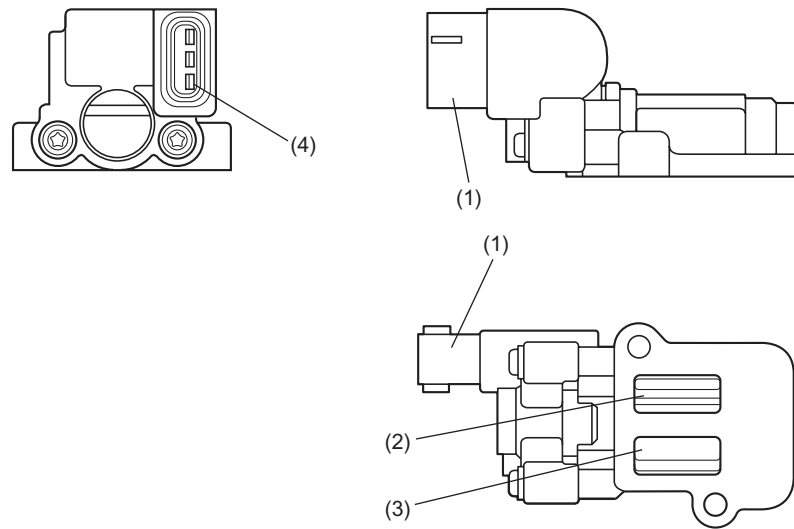
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E: IDLE AIR CONTROL SOLENOID VALVE

- The idle air control solenoid valve is located in the throttle body and regulates the amount of intake air that flows bypassing the throttle valve into the intake manifold during engine idling. It is activated by a signal from the ECM in order to maintain the engine idling speed at a target speed.
- The idle air control solenoid valve is a solenoid-actuated rotary valve consisting of a coil, rotary valve, spring and housing. The housing is an integral part of the throttle body and provided with a bypass air port whose opening area is changed by the rotary valve.



FU-00345

- (1) Connector
- (2) Outlet port

- (3) Inlet port
- (4) Terminal

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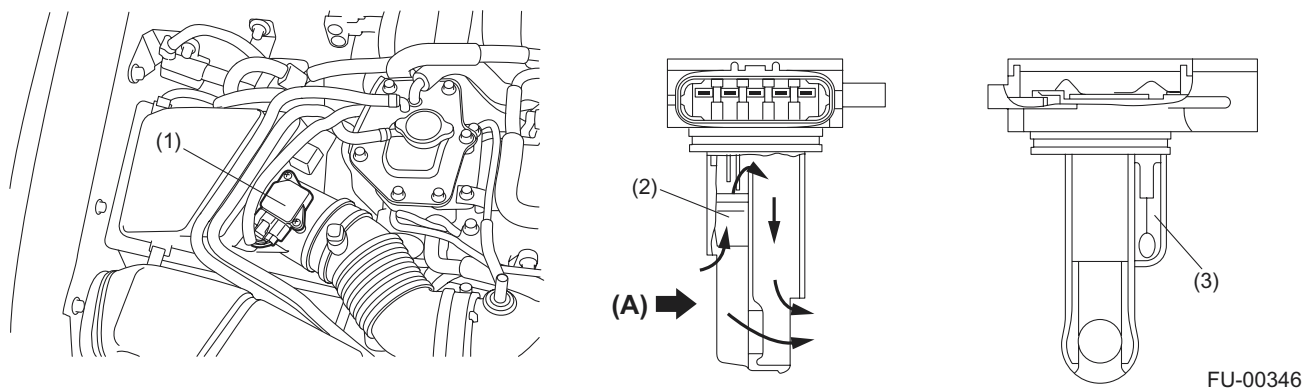
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F: MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR

The mass air flow and the intake air temperature sensors are integrated into a single unit. The unit is mounted on the air cleaner case and measures the amount as well as the temperature of the intake air.

The measured amount and temperature are converted into electrical signals and sent to the ECM. The ECM uses these signals to control injection and ignition timing as well as the fuel injection amount.



(1) Mass air flow and intake air temperature sensor

(A) Air

(2) Mass air flow sensor

(3) Intake air temperature sensor

G: TUMBLE GENERATOR VALVE

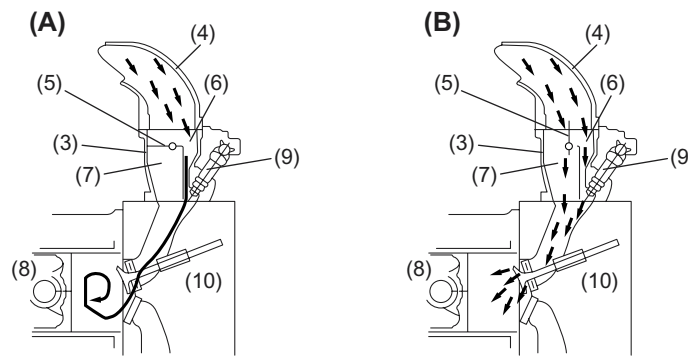
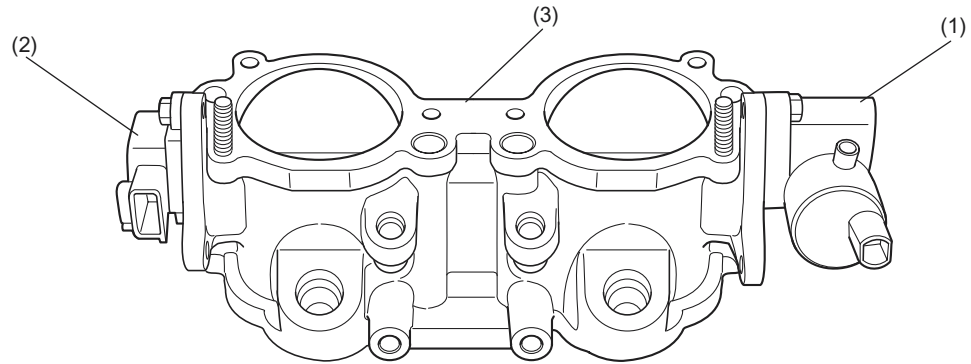
- A tumble generator valve is provided on each engine bank, between the intake manifold and intake air ports. The right bank tumble generator valve has butterfly valves for the #1 and #3 cylinders and the left bank tumble generator valve has those for the #2 and #4 cylinders. The two butterfly valves in each tumble generator valve are fitted on a single shaft that is driven by an actuator.

- The tumble generator valves are controlled by the ECM according to the coolant temperature and the time elapsed after start of the engine. When the engine is started, the butterfly valves are moved to the closing ends. In this state, the intake air flows at very high speeds passing through narrowed passages in the directions determined by the individual intake air ports in the cylinder head. This creates tumbling air motions in the cylinders, which enables lean mixtures to be ignited and thus harmful exhaust emissions to be reduced during engine start. The tumble generator valves are fully open when the engine is operating at an ordinary driving speed, allowing intake air to flow without being changed in direction and velocity.

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FU-00998

- (A) Activated
- (B) Not activated
- (1) Actuator
- (2) Tumble generator valve position sensor
- (3) Tumble generator housing
- (4) Intake manifold
- (5) Tumble generator valve
- (6) Tumble generating air passage
- (7) Intake main air passage
- (8) Piston
- (9) Injector
- (10) Cylinder Head

FU(H4DOTC)-7