



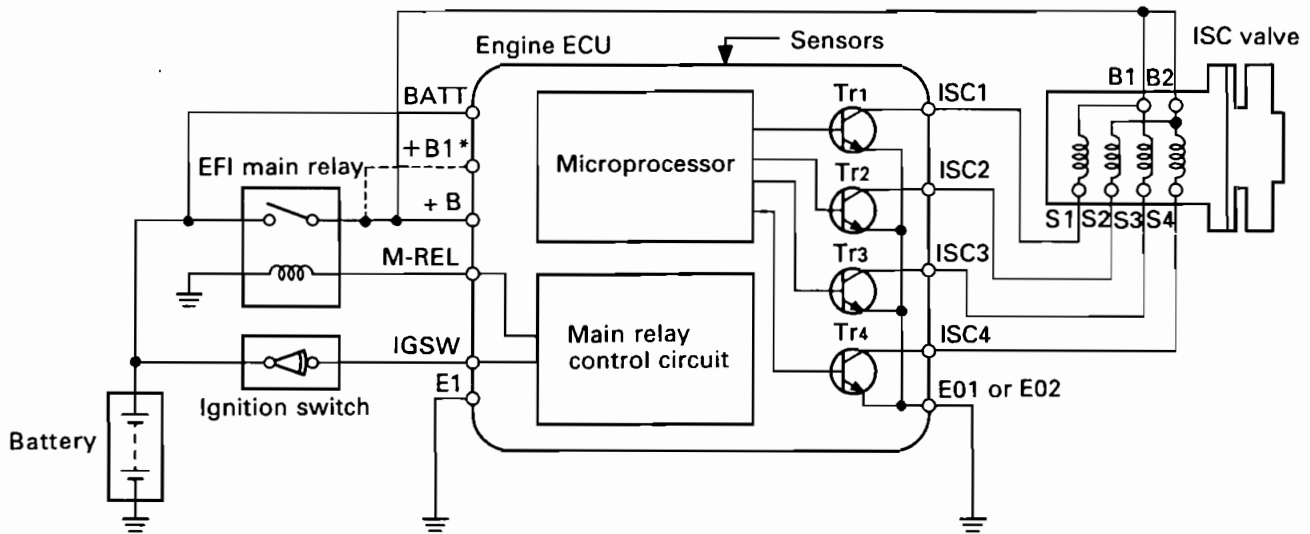
FUNCTIONS OF ENGINE ECU

1. STEPPER MOTOR TYPE ISC VALVE

This type of ISC valve is connected to the Engine ECU as shown in the following diagram. Target idling speeds for each coolant temperature and air conditioner operating state are stored in the ECU's memory.

When the ECU judges from the throttle valve

opening angle and vehicle speed signals that the engine is idling, it switches on Tr₁ to Tr₄, in that order, in accordance with the output of those signals. This sends current to the ISC valve coil, until the target idling speed is reached.



* Some models only

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STARTING SET-UP

When the engine is stopped (no NE signal to the ECU), the ISC valve opens fully (to the 125th step) to improve startability when the engine is restarted.

- Main Relay (ISC Valve Set-up) Control

The supply of power to the ECU and ISC valve must be continued for a few moments, even after the ignition switch is turned off, in order to allow the ISC valve to be set up (fully opened) for the next engine start-up. Therefore, the ECU outputs 12 V from the M-REL terminal until the ISC valve is set up, in order to keep the main relay on. Once set-up is complete, it cuts off the flow of current to the main relay coil.

CONDITIONS	CURRENT TO MAIN RELAY
Ignition switch on	ON
Ignition switch off (ISC valve set-up is complete)	ON ↓ OFF

RELEVANT SIGNAL

- Engine speed (NE)

NOTE

Stepper motor type ISC valves will enter a hold state when the power is interrupted. As a result, they are stopped at the position where they were when the power was interrupted.

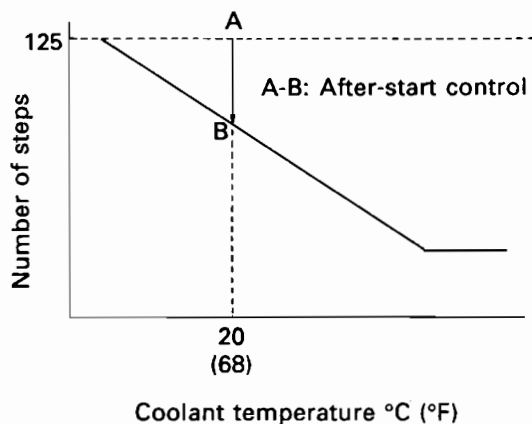


AFTER-START CONTROL

Due to the previous set-up of the ISC valve, the amount of air passing through the ISC valve during starting is the maximum amount possible. This allows the engine to start easily.

However, after the engine has started, its speed would rise too high if the ISC valve were kept fully open, so when the engine reaches a certain speed (this speed being determined by the temperature of the coolant) during or after starting, the ECU begins sending signals to the ISC valve, causing it to close from step 125 (fully open) to a point determined by the coolant temperature.

For example, if the coolant temperature is 20°C (68°F) during starting, the ISC valve will gradually close from the fully-open position (step 125, or point A) to point B when engine speed reaches the predetermined level.



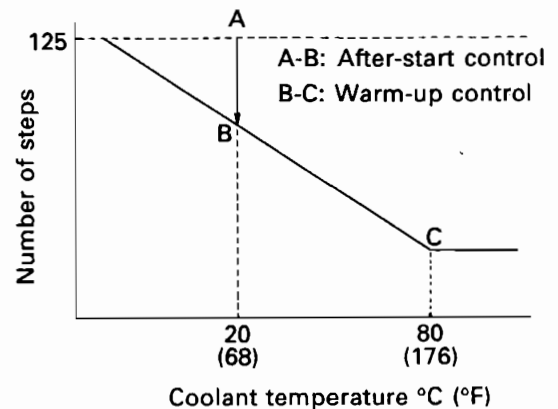
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RELEVANT SIGNALS

- Engine speed (NE)
- Coolant temperature (THW)
- Throttle position (IDL)
- Vehicle speed (SPD)

WARM-UP (FAST-IDLE) CONTROL

As the coolant warms up, the ISC valve continues to gradually close from the point to which it closed during starting. When the coolant temperature reaches about 80°C (176°F), fast-idle control by the ISC valve ends.



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RELEVANT SIGNALS

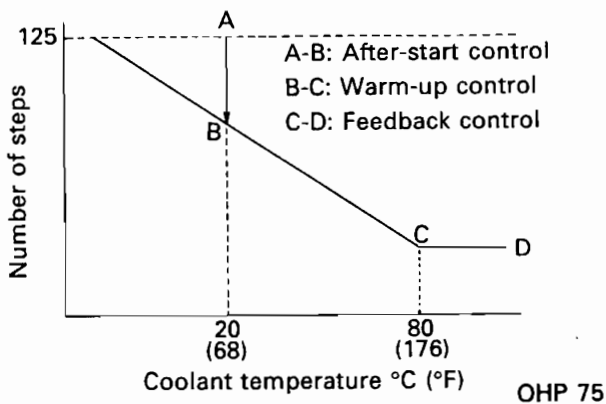
- Engine speed (NE)
- Coolant temperature (THW)
- Throttle position (IDL)
- Vehicle speed (SPD)



FEEDBACK CONTROL

Feedback control is carried out when the idle contact is on, the vehicle speed is below a predetermined speed, and the coolant temperature is about 80°C (176°F).

If the difference between the actual engine speed and the target speed stored in the memory of the ECU is more than 20 rpm, the ECU sends a signal to the ISC valve, telling it to increase or decrease the volume of air passing through the bypass passage so that the actual engine speed will match the target speed.



Target speeds also differ depending on engine conditions, such as whether the neutral start switch is on or off, and whether the air conditioner switch is on or off.

NOTE

Stepper motor type ISC valves also control idle up of the air conditioner.

RELEVANT SIGNALS

- Engine speed (NE)
- Throttle position (IDL)
- Vehicle speed (SPD)
- Coolant temperature (THW)
- Air conditioner (A/C)
- Neutral start switch (NSW)

ENGINE SPEED CHANGE ESTIMATE CONTROL

Immediately after the neutral start switch or air conditioner switch is operated, the engine load also changes. To prevent the engine speed from changing because of this, the ECU sends signals to the ISC valve to open or close it by a fixed amount *before* changes in the engine speed can occur.

RELEVANT SIGNALS

- Engine speed (NE)
- Neutral start switch (NSW)
- Throttle position (IDL)
- Vehicle speed (SPD)
- Air conditioner (A/C)

ELECTRICAL LOAD IDLE-UP CONTROL

Since the generating capacity of the alternator increases when an electrical load is applied, the Engine ECU opens the step position by a certain number of steps in order to increase the idle speed when there has been a voltage drop at the +B terminal or IGSW terminal or when a signal has been applied to the LP terminal, DFG terminal or ELS terminal.

RELEVANT SIGNALS

- Electrical load (LP, DFG, or ELS)
- Engine speed (NE)
- Throttle position (IDL)
- Vehicle speed (SPD)

OTHER CONTROLS

In addition to the above controls, some engines are also provided with a control in which the ISC valve operates like a dashpot during deceleration, and a control in which the ISC valve opens slightly when the oil pressure switch goes on.