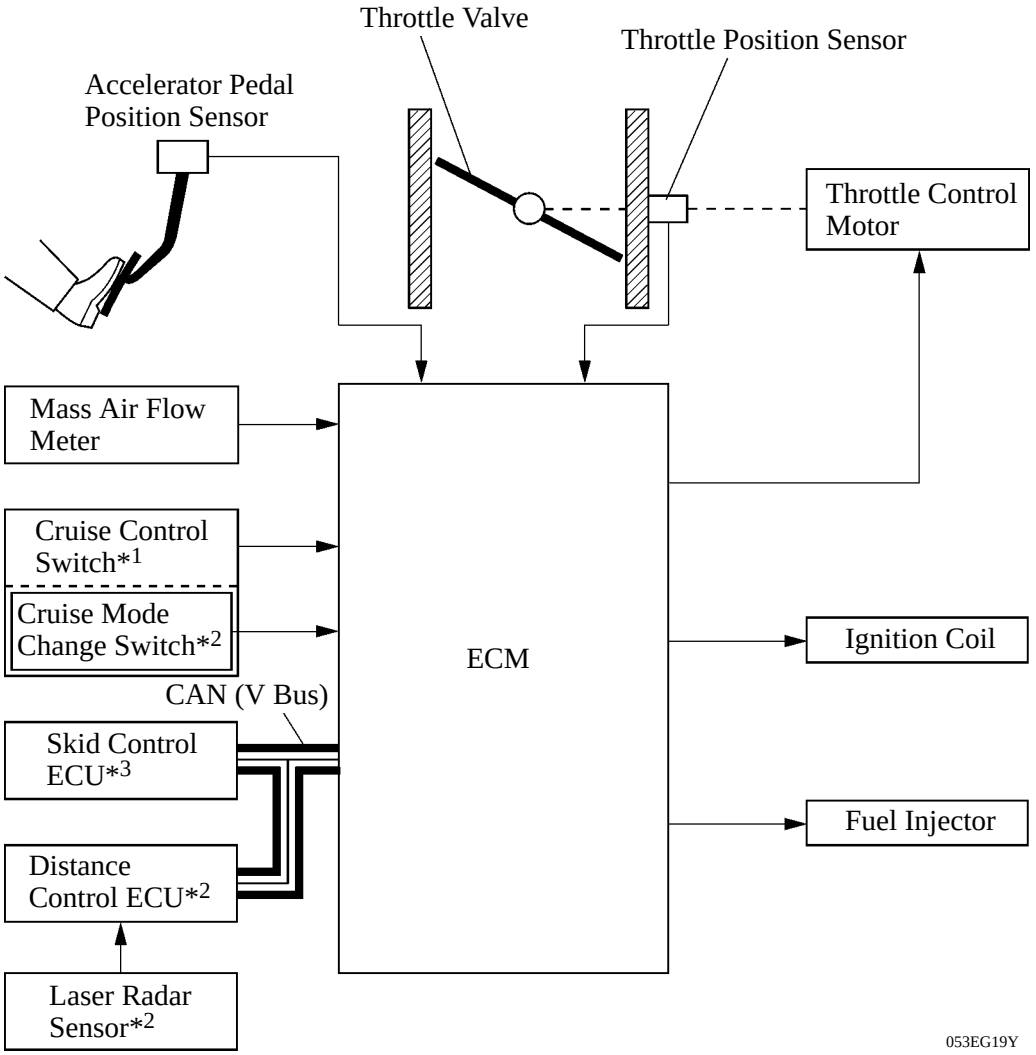
6. ETCS-i (Electronic Throttle Control System-intelligent)

General

In the conventional throttle body, the throttle valve angle is determined invariably by the amount of the accelerator pedal effort. In contrast, ETCS-i uses the ECM to calculate the optimal throttle valve angle that is appropriate for the respective driving condition and uses a throttle control motor to control the angle.

▶ System Diagram ◀



*1: Models with Cruise Control System
*2: Models with Dynamic Laser Cruise Control System
*3: Models with VSC (Vehicle Stability Control)

Control

1) General

The ETCS-i consists of the following functions:

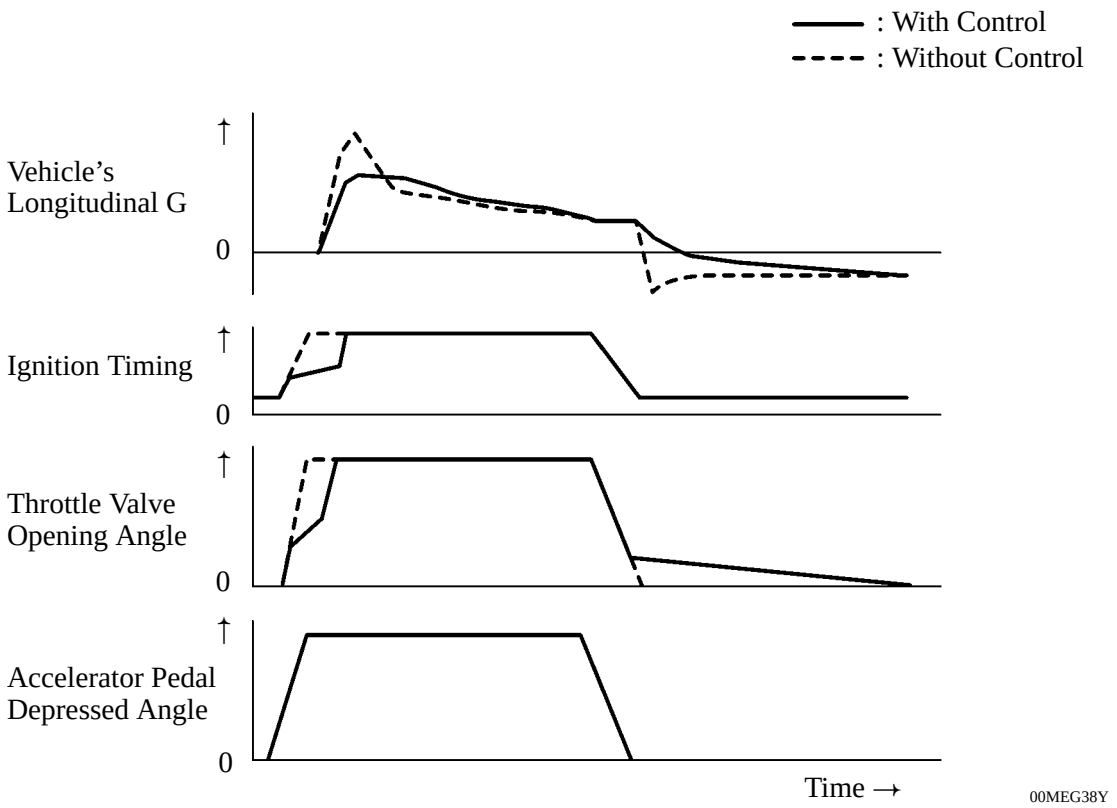
- Normal Throttle Control (Non-linear Control)
- ISC (Idle Speed Control)
- TRAC (Traction Control)*1
- VSC (Vehicle Stability Control)*1
- Cruise Control*2
- Dynamic Laser Cruise Control*3

*1: Models with VSC
*2: Models with Cruise Control System
*3: Models with Dynamic Laser Cruise Control System

2) Normal Throttle Control (Non-linear Control)

Controls the throttle to an optimal throttle valve angle that is appropriate for the driving condition such as the amount of the accelerator pedal effort and the engine speed in order to realize excellent throttle control and comfort in all operating ranges.

▶ Conceptual Diagrams of Engine Control During Acceleration and Deceleration ◀



3) Idle Speed Control

The ECM controls the throttle valve in order to constantly maintain an ideal idle speed.

4) TRAC Throttle Control*1

As part of the TRAC system, the throttle valve is closed by a demand signal from the skid control ECU if an excessive amount of slippage is created at a driving wheel, thus facilitating the vehicle in ensuring excellent vehicle stability and driving force.

5) VSC Coordination Control*1

In order to bring the effectiveness of the VSC system control into full play, the throttle valve angle is controlled by effecting a coordination control with the skid control ECU.

6) Cruise Control*2

An ECM with an integrated cruise control ECU directly actuates the throttle valve for operation of the cruise control.

7) Dynamic Laser Cruise Control*3

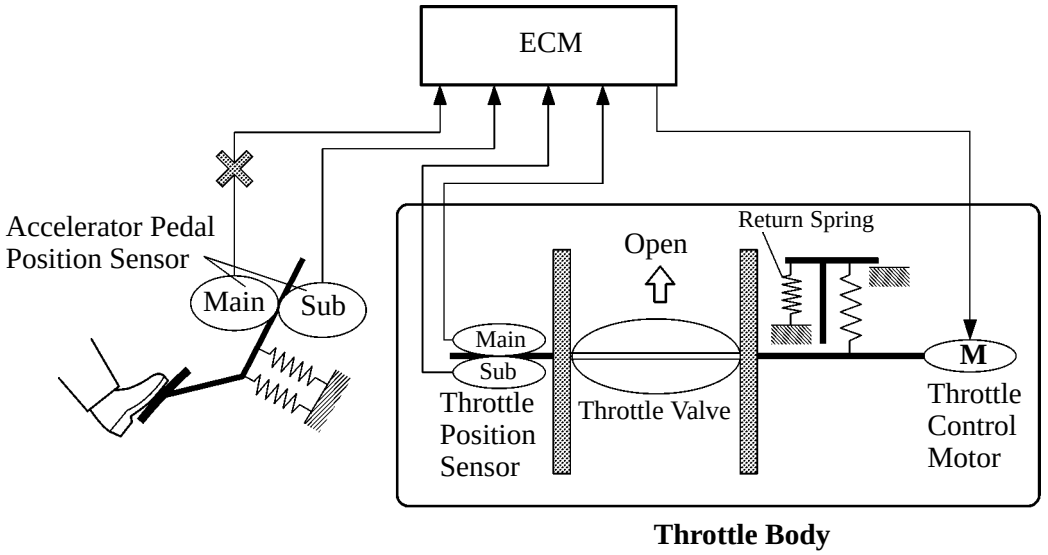
The dynamic laser cruise control uses a laser radar sensor and the distance control ECU to determine the distance of the vehicle driven ahead, its direction, and relative speed. Thus, the system can effect decelerator control, follow-up control, constant speed control, and accelerator control. To make these controls possible, the ECM controls the throttle valve.

*1: Models with VSC
*2: Models with Cruise Control System
*3: Models with Dynamic Laser Cruise Control System

Fail-safe of Accelerator Pedal Position Sensor

The accelerator pedal position sensor comprises two (main, sub) sensor circuits.

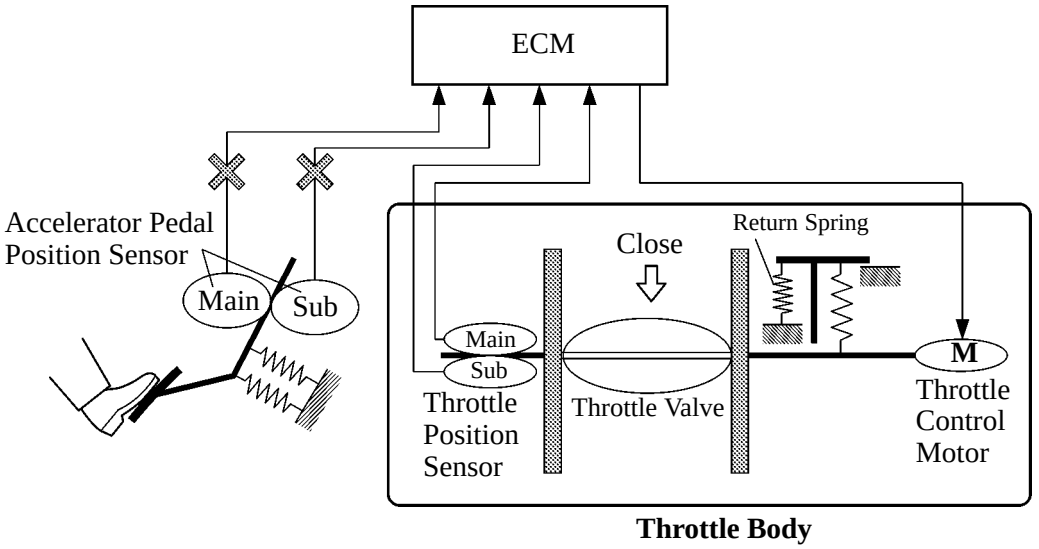
- If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between these two sensor circuits and switches into the limp mode. In the limp mode, the remaining circuit is used to calculate the accelerator pedal opening, in order to operate the vehicle under limp mode control.



Throttle Body

D13N08

- If both circuits malfunction, the ECM detects the abnormal signal voltage from these two sensor circuits and discontinues the throttle control. At this time, the vehicle can be driven within its idling range.



Throttle Body

D13N09

Fail-safe of Throttle Position Sensor

The throttle position sensor comprises two (main, sub) sensor circuits.

- If a malfunction occurs in either of the sensor circuits, the ECM detects the abnormal signal voltage difference between these two sensor circuits, cuts off the current to the throttle control motor, and switches to the limp mode.
- Then, the force of the return spring causes the throttle valve to return and stay at the prescribed opening. At this time, the vehicle can be driven in limp mode while the engine output is regulated through the control of the fuel injection and ignition timing in accordance with the accelerator opening.
- The same control as above is effected if the ECM detects a malfunction in the throttle control motor system.

