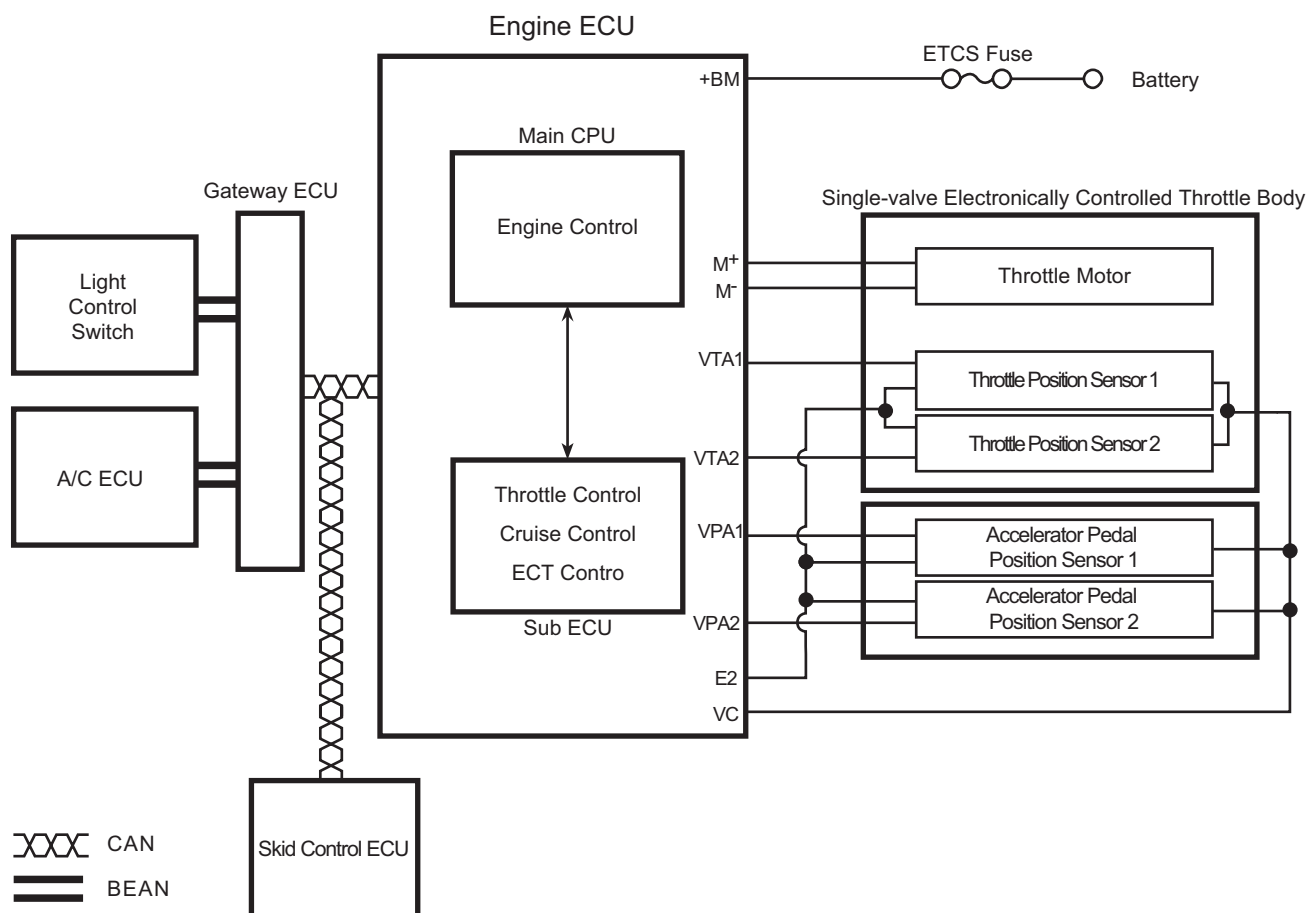


## ETCS-i (Electronic Throttle Control System-intelligent)

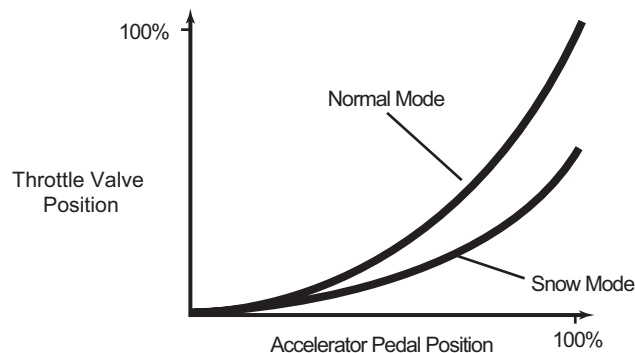
- In the conventional throttle body, the throttle valve opening is determined invariably by the amount of the accelerator pedal effort. In contrast, the ETCS-i uses the engine ECU to calculate the optimal throttle valve opening that is appropriate for the respective driving condition and uses a throttle control motor to control the opening.
- The functions of the ordinary throttle position control (nonlinear control), idle speed control (ISC), traction control (including VSC), and cruise control have been integrated in the single-valve electronically controlled throttle body.
- Excellent driving stability and comfort have been achieved by effecting integrated control with the power train, and vehicle stability has been ensured through cooperative control with the ECT and VSC systems.
- Two CPUs, one for the ETCS-i, and the other for the EFI control, monitor each other to ensure a reliable system.
- A dual system is used so that the vehicle can continue to operate in the event of a problem, thus ensuring reliability.



### ETCS-i Control

|                                                                       |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nonlinear Control                                                     | Normal-mode Control | Controls the throttle to an optimal throttle valve opening that is appropriate for the driving condition such as the amount of the accelerator pedal effort and the engine operating condition in order to realize excellent throttle control and comfort in all operating ranges.                                                                                                                                                                     |
|                                                                       | SNOW-mode Control   | In situations in which low- $\mu$ surface conditions can be anticipated, such as when driving in the snow, the throttle valve can be controlled to help vehicle stability while driving over the slippery surface. This is accomplished by turning on the SNOW switch of the pattern select switch, which, in response to the amount of the accelerator pedal effort that is applied, reduces the engine output from that of the normal driving level. |
| ECT + EFI + ETCS-i Integrated Control (Shift Shock Reduction Control) |                     | During the shifting of the ECT, this control regulates the throttle valve position in order to reduce the shift shock that occurs during shift up and down, and shorten the shifting duration.                                                                                                                                                                                                                                                         |
| Maximum Speed Control                                                 |                     | When the vehicle speed reaches 240 km/h, this control closes the throttle valve to suppress the increase of vehicle speed.                                                                                                                                                                                                                                                                                                                             |
| TRC (VSC) + ETCS-i Cooperative Control (models equipped with VSC)     |                     | In order to bring the effectiveness of the VSC system control into full play, the throttle valve opening angle is controlled by effecting a coordination control with the skid control ECU.                                                                                                                                                                                                                                                            |
| Idle Speed Control                                                    |                     | Controls the fast idle speed in accordance with the water temperature, and the idle speed after the engine has been warmed up. It controls the idle speed by regulating the fuel injection volume and the throttle position.                                                                                                                                                                                                                           |

Relationship Between Amount of Accelerator Pedal Effort and Throttle Valve Position



A4270098P

### VVT-i System

- The VVT-i system is designed to control the intake camshaft within a wide range of 45° (of crankshaft angle) to provide a valve timing that is optimally suited to the engine condition, thus realizing improved torque in all the speed ranges and fuel economy, and reduce exhaust emissions.
- In proportion to the engine speed, intake air volume, throttle position and engine coolant temperature, the engine ECU calculates an optimal valve timing under each driving condition and control the camshaft timing oil control valve. In addition, engine ECU uses signal from the VVT sensors and the crankshaft position sensor to detect the actual valve timing, thus performing feedback control to achieve the target valve timing.