■ELECTRONIC CONTROL SYSTEM

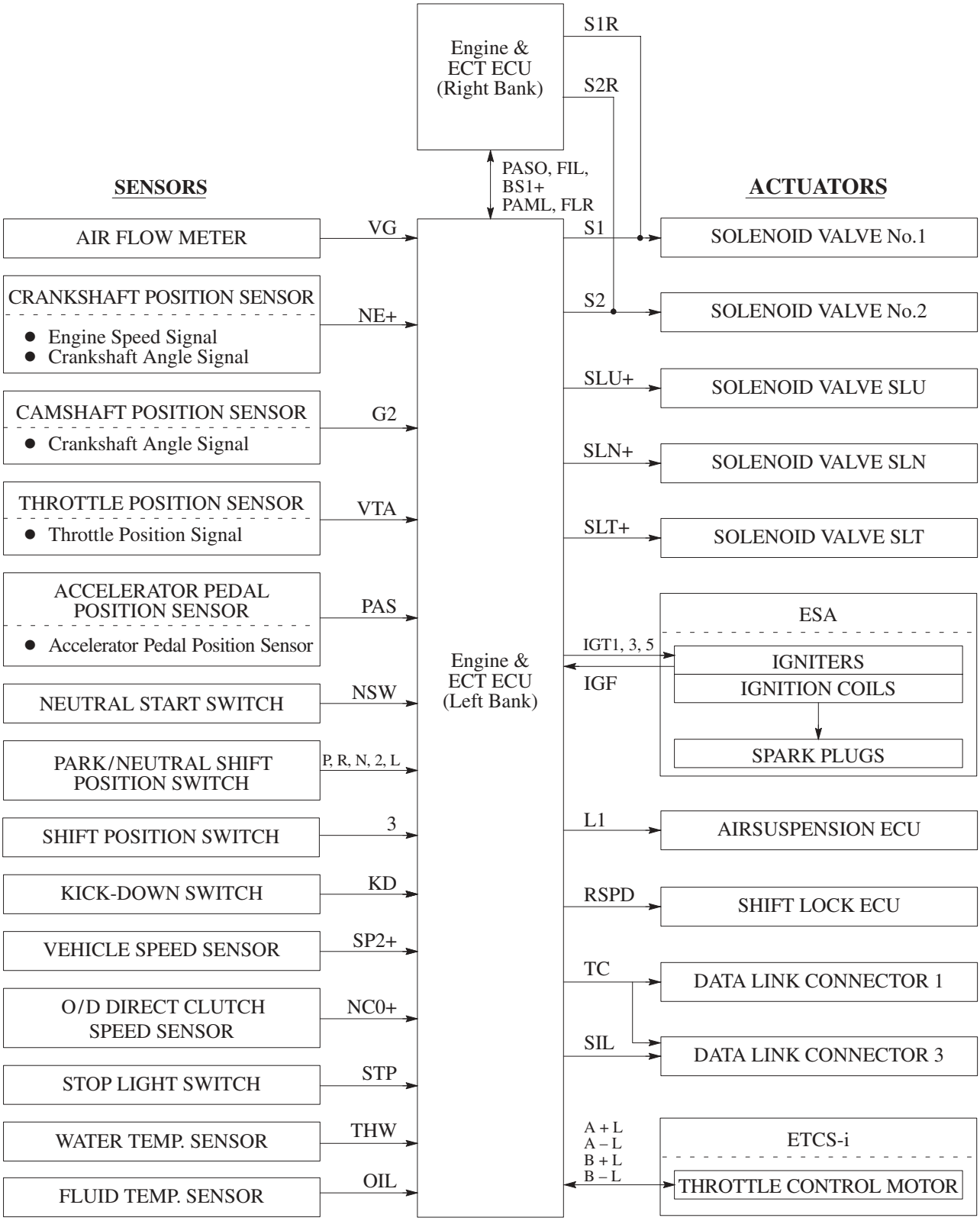
1. General

The electronic control system of the A342E automatic transmission consists of the controls listed below.

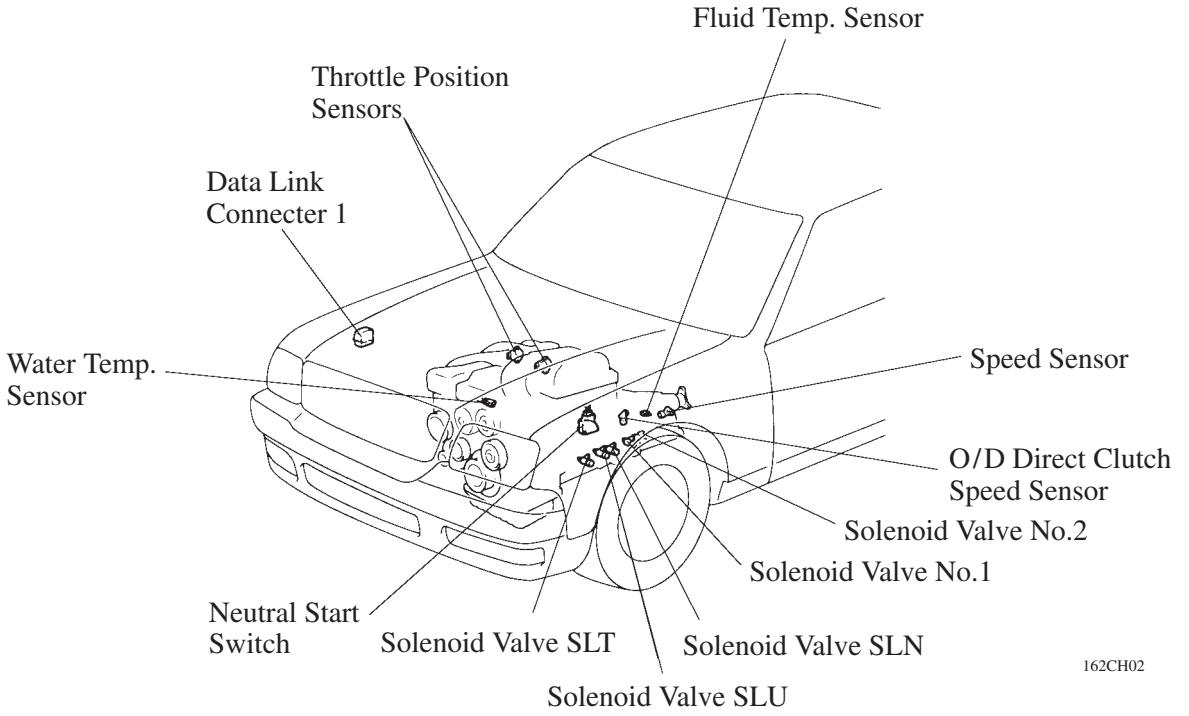
System	Function
Shift Timing Control	The engine & ECT ECU sends current to the solenoid valve No.1 and/or No.2 based on signals from each sensor and shifts the gear.
Lock-Up Timing Control	The engine & ECT ECU sends current to the solenoid valve SLU based on signals from each sensor and engages or disengages the lock-up clutch.
Lock-Up Pressure Control	The engine & ECT ECU gradually alters the current flow to solenoid valve SLU to provide smooth engagement and disengages of lock-up clutch.
Line Pressure Control	Based on the throttle opening angle and various signals, the engine & ECT ECU controls the throttle pressure by actuating the solenoid valve SLT in accordance with the engine output and condition, thus effecting a smooth shifting of gears.
Clutch Pressure Control	To achieve smooth shifting, the solenoid valve SLN controls the accumulator back pressure in order to finely regulate the hydraulic pressure that is applied to the clutch.
Engine Torque Control	Temporarily retards the engine ignition timing or closes the throttle valve to restrict the output torque, thus improving the shift feel during up or down shifting.
Shift Control in Uphill/Downhill Traveling	Controls to restrict the 4th up shift or to provide appropriate engine braking by a using the engine & ECT ECU to determine whether the vehicle is traveling uphill or downhill.
Self-Diagnosis	Alerts the driver by displaying a warning on the multi-information display in the combination meter if a malfunction is detected in the sensors or solenoids.
Fail-Safe	Controls other components that are operating normally to enable the vehicle to continue driving, if a malfunction occurs in the solenoid valves or sensors.

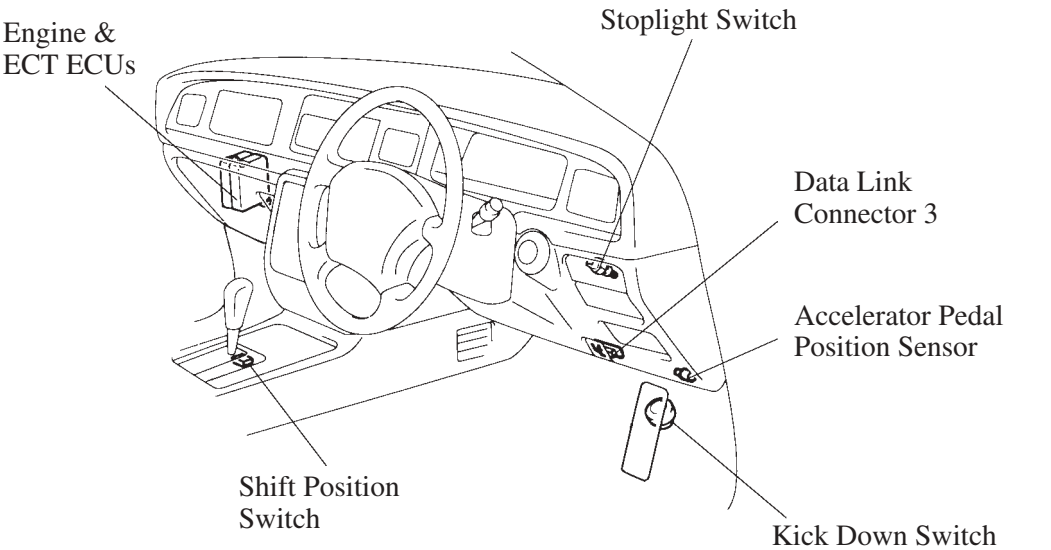
2. Construction

The configaration of the electronic control system in the A342E is as shown in the following chart.



3. Layout of Main Components

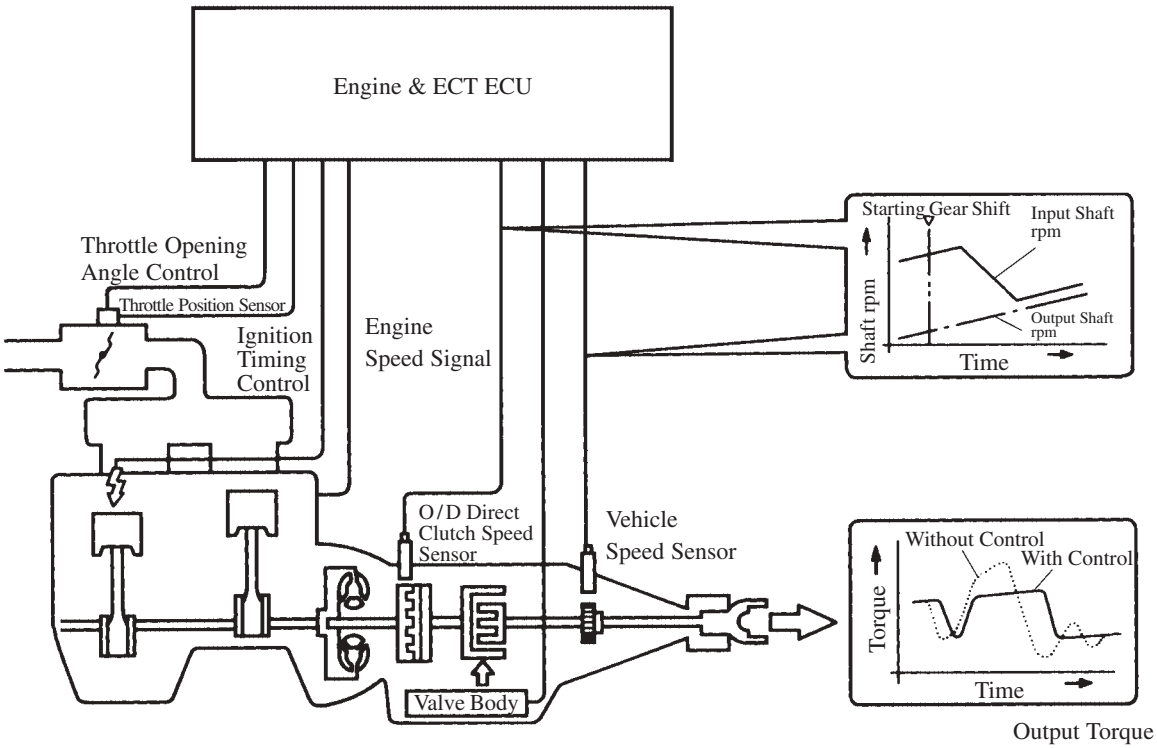




5. Function of Engine & ECT ECU

Engine Torque Control

The engine torque control is a system that retards the ignition timing or closes the throttle valve during shifting in order to temporarily reduce the engine's output torque. This enables the clutches in the transmission to engage smoothly and thus reduces the fluctuation of torque in the output shaft during shifting.
Torque control starts when a change in rpm is detected in the overdrive direct clutch speed sensor. Torque control ends when the system forecasts the timing in which the shifting will be completed by comparing the rpm in the vehicle speed sensor and the rpm in the overdrive direct clutch sensor.



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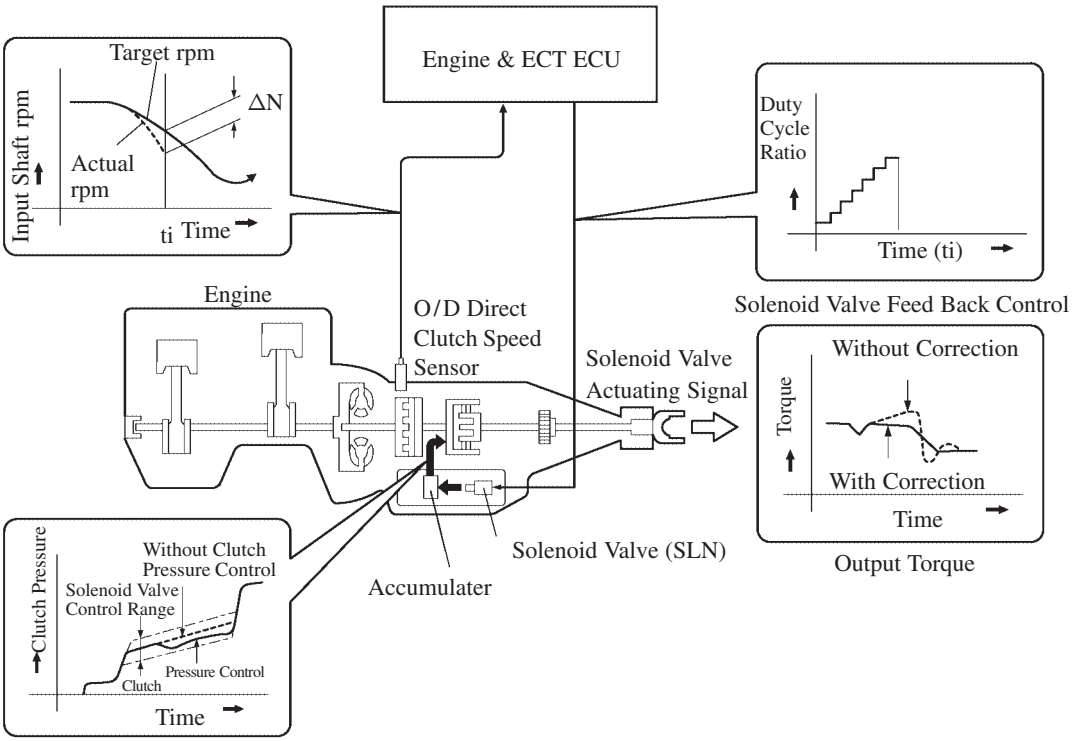
Clutch Pressure Control

This control regulates the clutch pressure by controlling the accumulator back pressure through the use of the solenoid valve SLN.
By detecting the progress of the shifting from the overdrive direct clutch speed sensor signal, this control finely regulates the clutch pressure to reach a prescribed target value that achieves an optimal rpm fluctuation. This process corrects the variances in the clutch pressure and friction characteristics in order to realize stable shifting characteristics.



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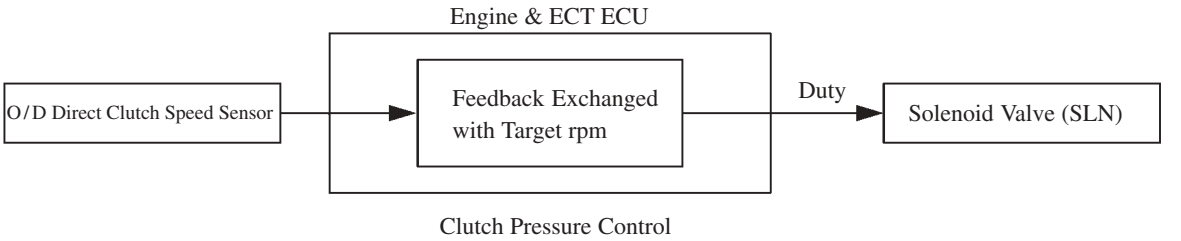

Clutch Pressure Control

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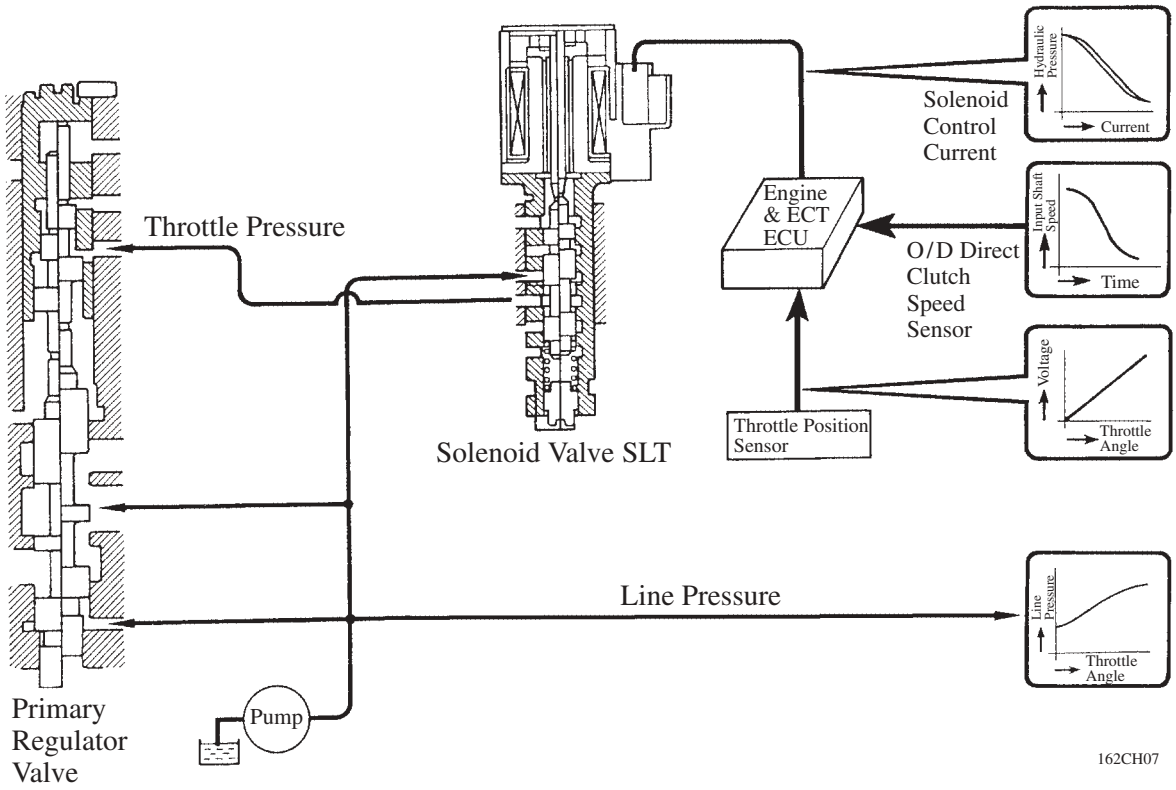
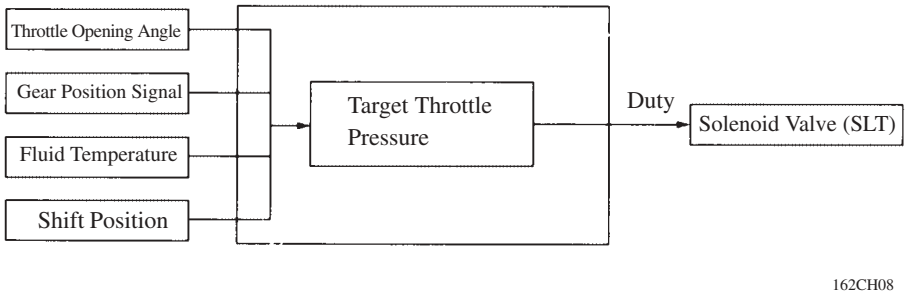
Line Pressure Control

This control actuates the solenoid valve SLT to control the throttle pressure. It actuates the solenoid valve SLT in accordance with the throttle opening angle, gear position signal, fluid temperature, and the shift position, in order to effect throttle pressure control. As a result, a highly precise and finely tuned control of line pressure can be effected in accordance with the engine output and condition. By finely regulating the hydraulic pressure in this manner according to the extent of shifting, smooth shifting characteristics have been realized.





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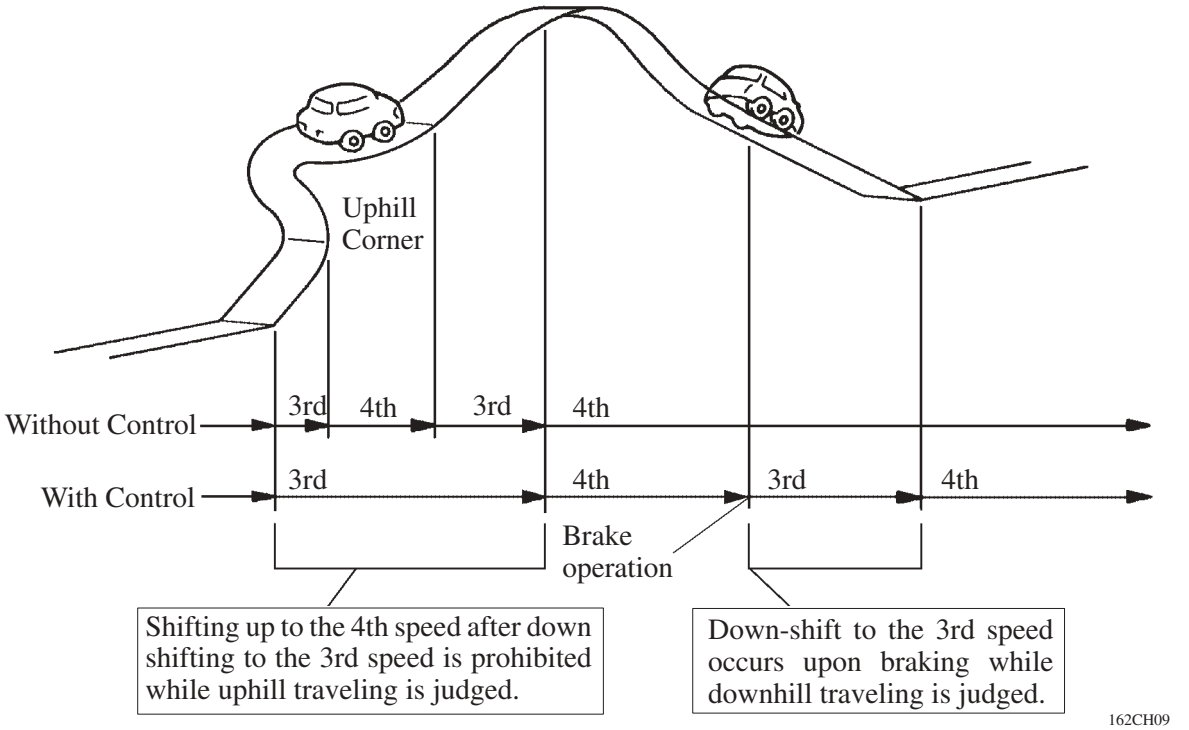
Shifting Control in Uphill / Downhill Traveling

1) General

With shifting control in uphill/downhill traveling, the engine & ECT ECU calculates the throttle opening angle and the acceleration rate to determine whether the vehicle is in the uphill or downhill state. While driving uphill on a winding road with ups and downs, the 4th upshift is restricted to ensure a smooth drive. Also, if a brake application is detected while the engine & ECT ECU judges a downhill travel in 4th, the transmission automatically downshifts to 3rd in order to provide an appropriate engine brake.
In addition, while the engine & ECT ECU judges a downhill travel, it restricts the travel in 3rd without keeping the brake application.

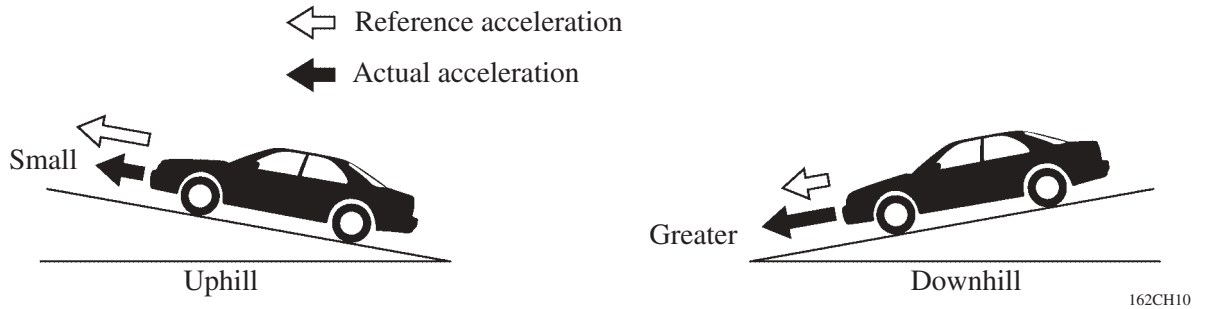


2) Uphill/Downhill Judgment

The actual acceleration calculated from the speed sensor signal is compared with the reference acceleration stored in the engine & ECT ECU to judge uphill or downhill traveling.
The engine & ECT ECU judges an uphill travel if the actual acceleration is smaller than the reference acceleration, and restricts the 3rd to 4th upshift after a 4th to 3rd downshift has occurred. Also, the engine & ECT ECU judges a downhill travel if the actual acceleration is greater than the reference acceleration, and restricts the 4th upshift while traveling in 3rd. If a brake application is detected while traveling in 4th, it downshifts to 3rd. Similar to the starting judgment, the reversion judgment is made through comparison to the vehicle acceleration that serves as reference.

Actual Acceleration < Reference Acceleration

Actual Acceleration > Reference Acceleration



Fail-Safe

Controls other components that are operating normally to enable the vehicle to continue driving, if a malfunction occurs in the solenoid valves or sensors. If a malfunction occurs in the left bank engine & ECT ECU, control is effected by the simplified shift control system provided in the right bank engine & ECT ECU to enable the vehicle to operate.