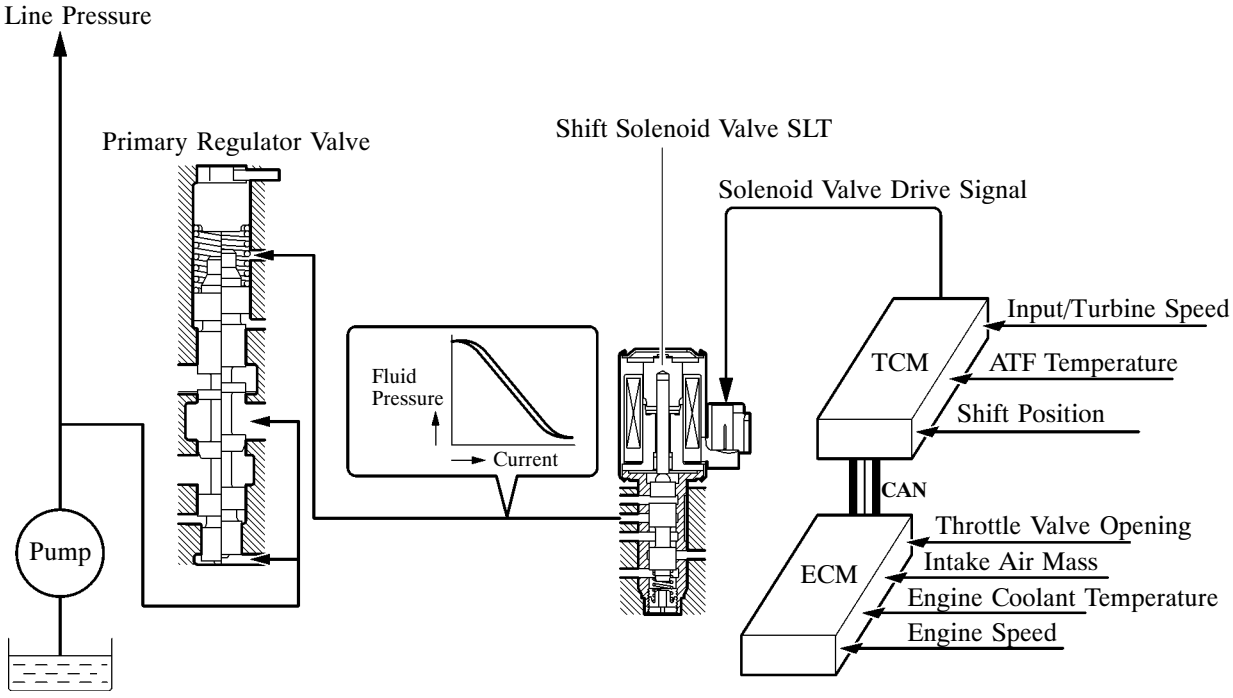
6. Line Pressure Optimal Control

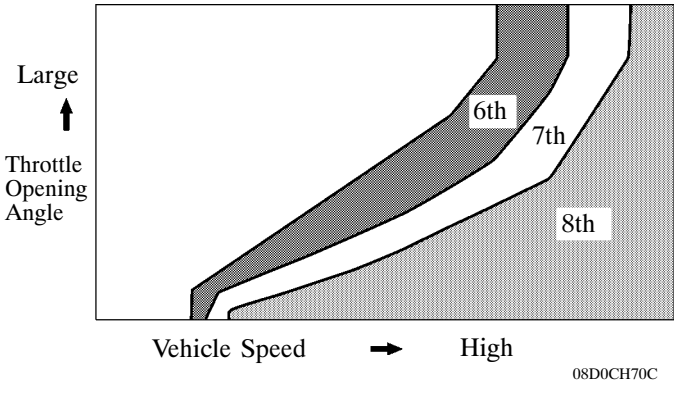
Through the use of the shift solenoid valve SLT, the line pressure is optimally controlled in accordance with the engine torque information, as well as with the internal operating conditions of the torque converter and the transmission.
Accordingly, the line pressure can be controlled minutely in accordance with the engine output, traveling condition, and the ATF temperature, thus realizing smooth shift characteristics and optimizing the workload of the oil pump (reducing unnecessary parasitic losses).



7. Lock-up Timing Control

The TCM uses lock-up timing control in order to improve the fuel consumption performance in 6th gear or higher when the shift lever is in D, or when D8, D7 or D6 range has been selected.

▶ Lock-up Operating Range ◀



▶ Lock-up Operation Gears in Each Range ◀

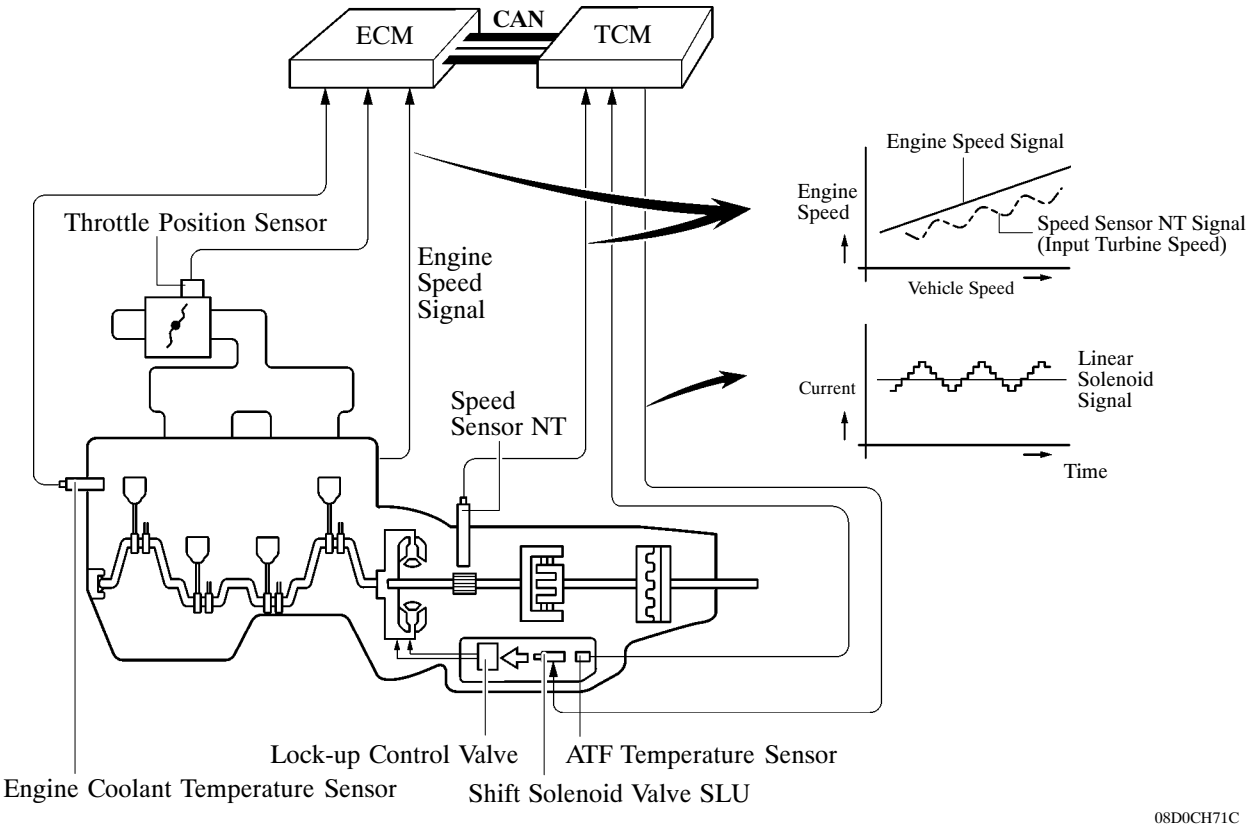
Gear \ Position or Range	D, D8	D7	D6
1st	×	×	×
2nd	×	×	×
3rd	×	×	×
4th	×	×	×
5th	×	×	×
6th	○	○	○
7th	○	○	—
8th	○	—	—

○: Available ×: Not available —: Not applicable

8. Flex Lock-up Clutch Control

In addition to the conventional lock-up timing control, flex lock-up clutch control is used.
In the low-to-mid-speed range, this flex lock-up clutch control regulates the shift solenoid valve SLU to provide an intermediate mode between the ON/OFF operation of the lock-up clutch in order to improve the energy transmitting efficiency in this range.
As a result, the operating range of the lock-up clutch has been increased and fuel economy has been improved.

- During acceleration, flex lock-up clutch control operates in 4th gear or higher when the shift lever is in D, or when D8, D7, D6, D5 or D4 range has been selected.
- During deceleration, flex lock-up clutch control operates in 5th gear or higher when the shift lever is in D, or when D8, D7, D6, or D5 range has been selected.
- Even when the vehicle is decelerating (the accelerator pedal is released), flex lock-up clutch control operates. Therefore, the fuel-cut area of the engine has been expanded and fuel-economy has been improved.



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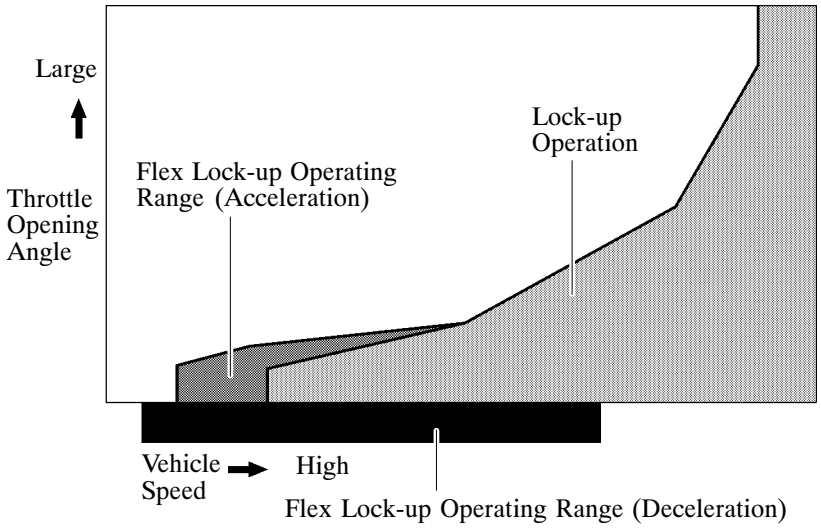
▶ Flex Lock-up Operating Range ◀



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▶ Flex Lock-up Operation ◀

Gear \ Position or Range	D, D8	D7	D6	D5	D4
1st	×	×	×	×	×
2nd	×	×	×	×	×
3rd	×	×	×	×	×
4th	○	○	○	○	○
5th	○*	○*	○*	○*	—
6th	○*	○*	○*	—	—
7th	○*	○*	—	—	—
8th	○*	—	—	—	—

○: Operates ×: Does not operate —: Not applicable

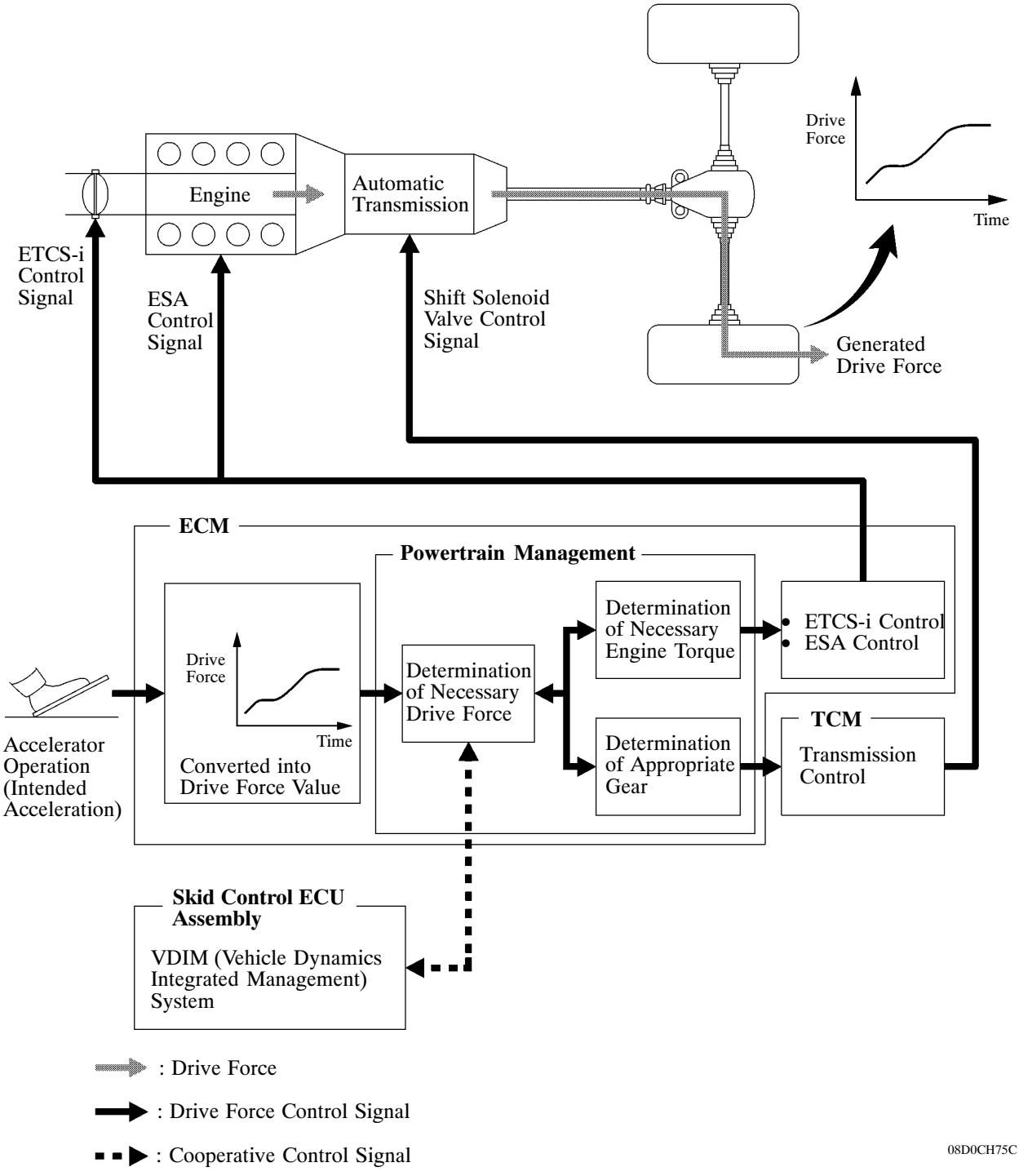
*: Flex lock-up clutch control also operates during deceleration

9. Powertrain Integrated Control

General

DRAMS (Driving Response and Acceleration Management System) is adopted for this vehicle. This system integrally controls the engine, transmission and other driving related controls. By integrally controlling the engine and automatic transmission using this system, quick response and a high quality driving feel in accordance with the driver's intentions is achieved, such as when accelerating or decelerating or during gear shifts.

▶ DRAMS System Diagram ◀



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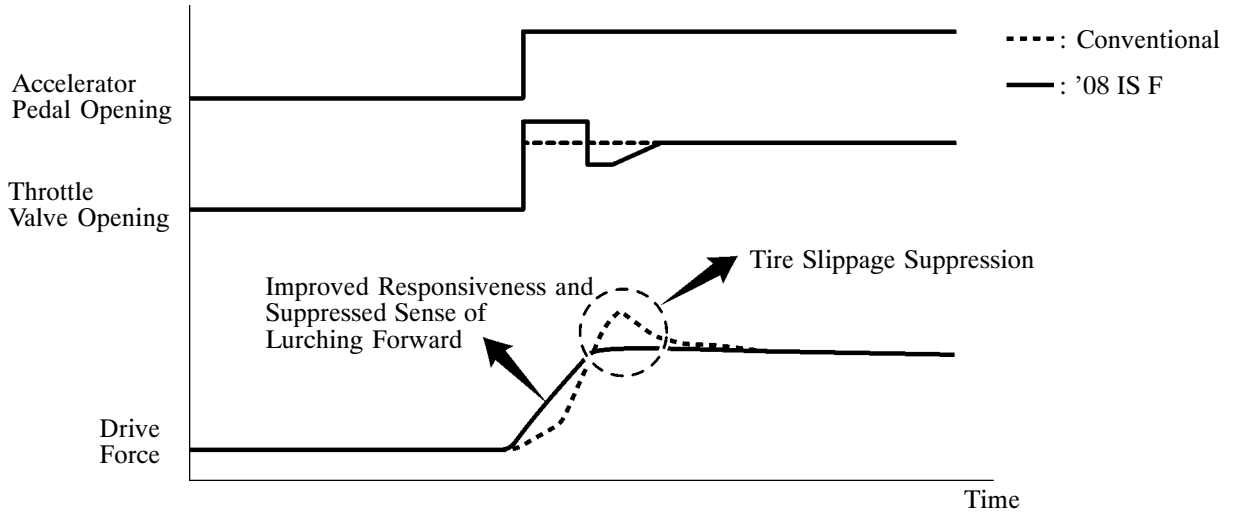
Throttle Control at Launch

The engine output is optimally controlled with ETCS-i (Electronic Throttle Control System-intelligent) in real-time according to the transient force from the torque converter when the vehicle is launched. This achieves a “suppressed sense of lurching forward”, “tire slippage suppression” and “improved responsiveness”, ensuring excellent launch performance.



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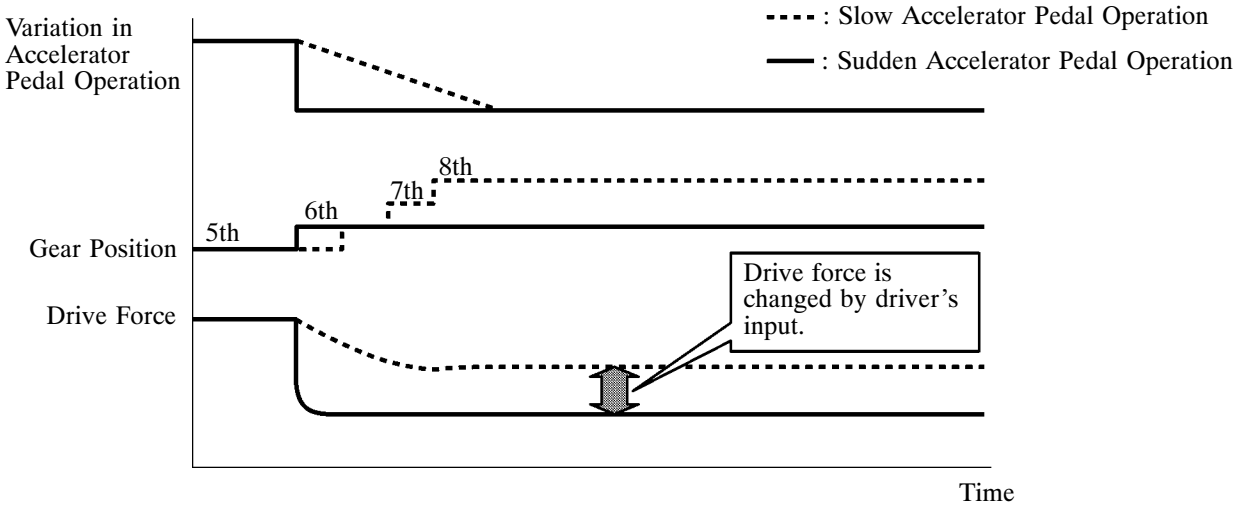
Deceleration Force Control

The ECM determines the gear position when the accelerator pedal is OFF (released completely) in accordance with the way the accelerator pedal is released (suddenly or slowly) during deceleration. In this way, unnecessary upshifts and downshifts are prevented when the accelerator pedal is OFF and subsequent smooth acceleration is ensured, matching the driver’s intentions.



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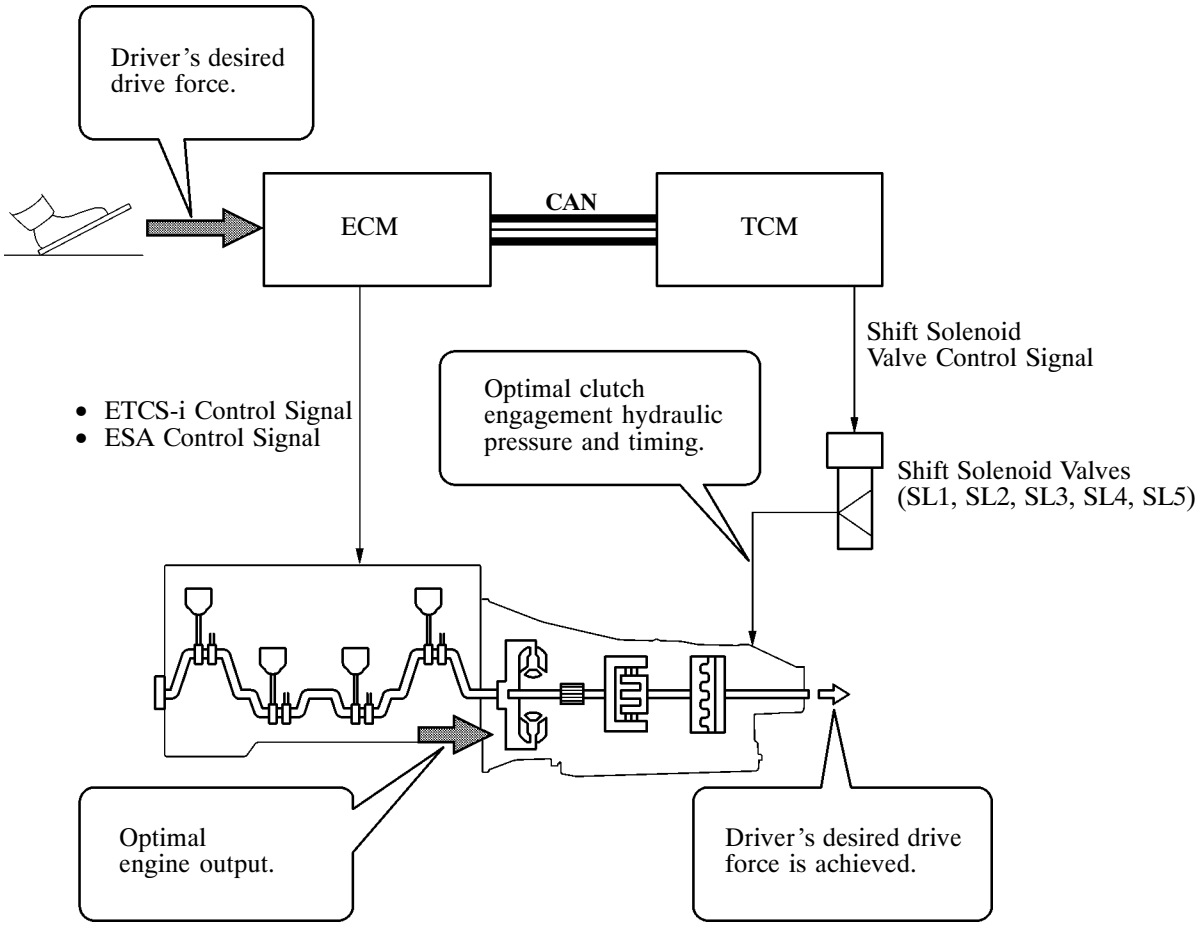
Transient Shifting Control

Through integrated control with ETCS-i (Electronic Throttle Control System-intelligent) and ESA (Electronic Spark Advance), and electronic control of the engagement and release speed of clutch and brake hydraulic pressures, excellent response and shift shock reduction have been achieved.



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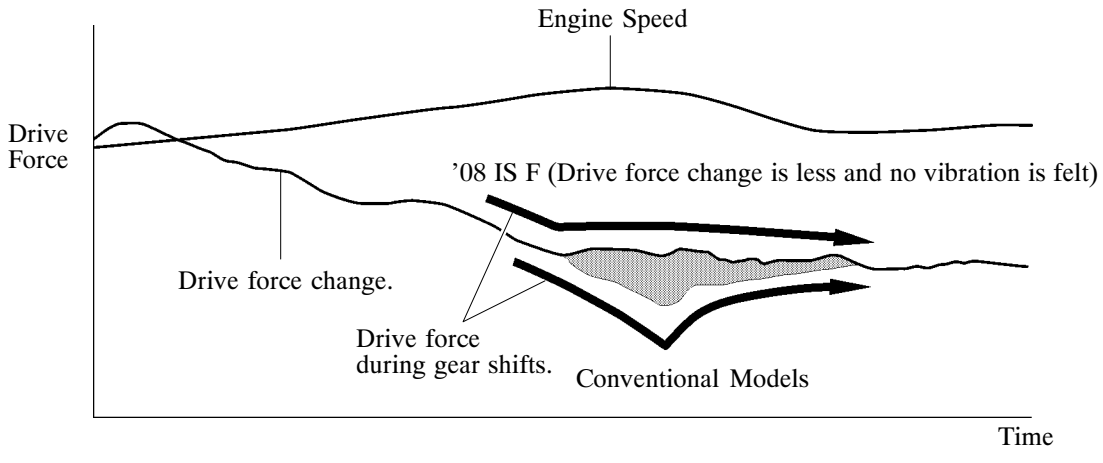
- Engine torque control used during gear shifts has been added to the cooperative control of the engine torque control and clutch hydraulic pressure control performed during gear shifts. This enhances gear engagement characteristics during gear shifts and achieves smooth gear changes.



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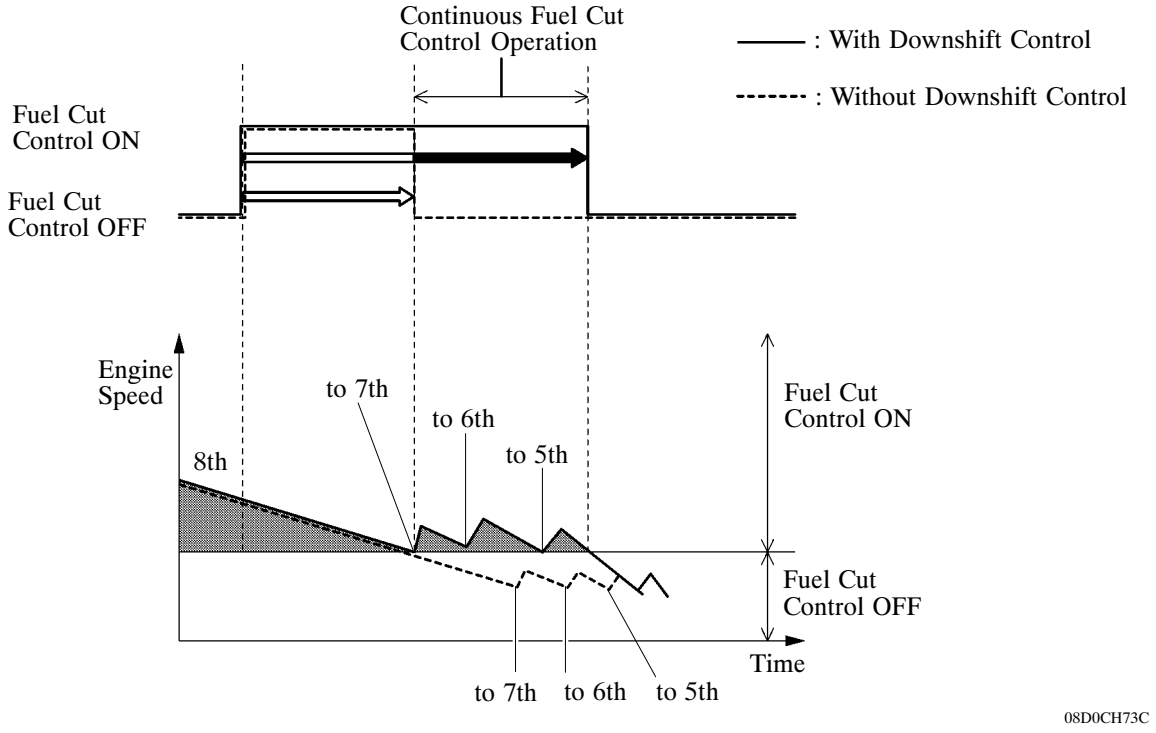
10. Coast Downshift Control

As a result of coast downshift control, downshifts are performed to maintain sufficient engine speed to avoid ending fuel cut control. Thus, fuel cut time is extended and fuel economy is achieved.

- In this control, when slowing with the transmission in 8th gear, the transmission downshifts from 8th to 7th, 7th to 6th and then 6th to 5th before fuel cut control ends, so that fuel cut control can continue operating. In addition, the TCM performs downshifts when the vehicle is decelerated from both 6th and 7th gears.

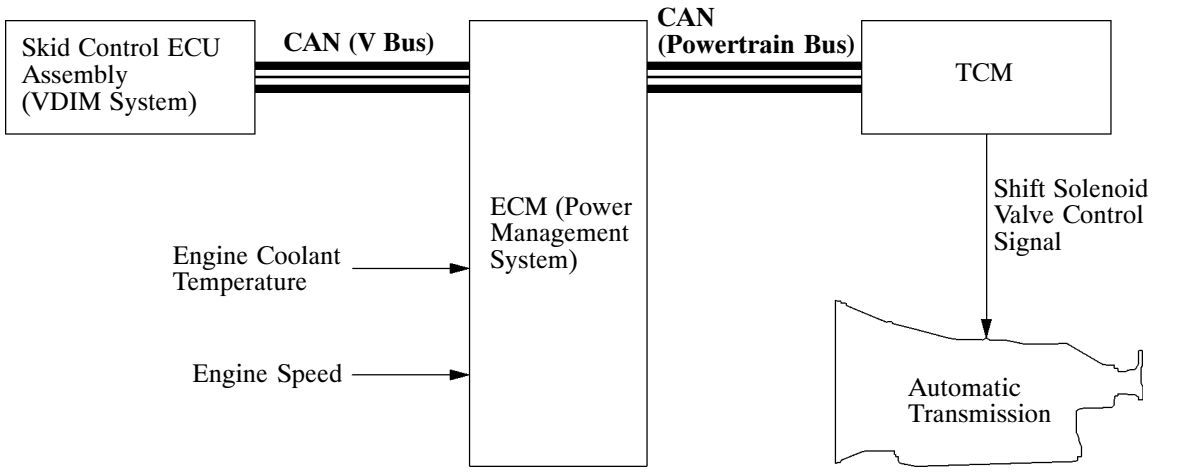


11. 2nd Gear Start-off and Stop Control

When the engine idle speed is high while the engine is warming up and when the road surface is slippery, 2nd gear start-off and stop control for low-friction roads is automatically used in order to enhance control of drive force using the accelerator.

- When the VDIM (Vehicle Dynamics Integrated Management) system determines that the road surface is slippery from information such as an indication of a slipping tire, the power management system selects 2nd gear for starting off and stopping.
- If the VDIM system determines that the vehicle is not on a low-friction road surface, or the engine has finished warming up, 1st gear will once again be used for starting off and stopping as normal.
- When the shift lever is in the M position, 1st gear (M1) would usually be selected for starting off and stopping. However, when this control is performed, 2nd gear (M2) will automatically be selected.

▶ System Diagram ◀



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▶ Examples of Control (Only when engine is warming up) ◀

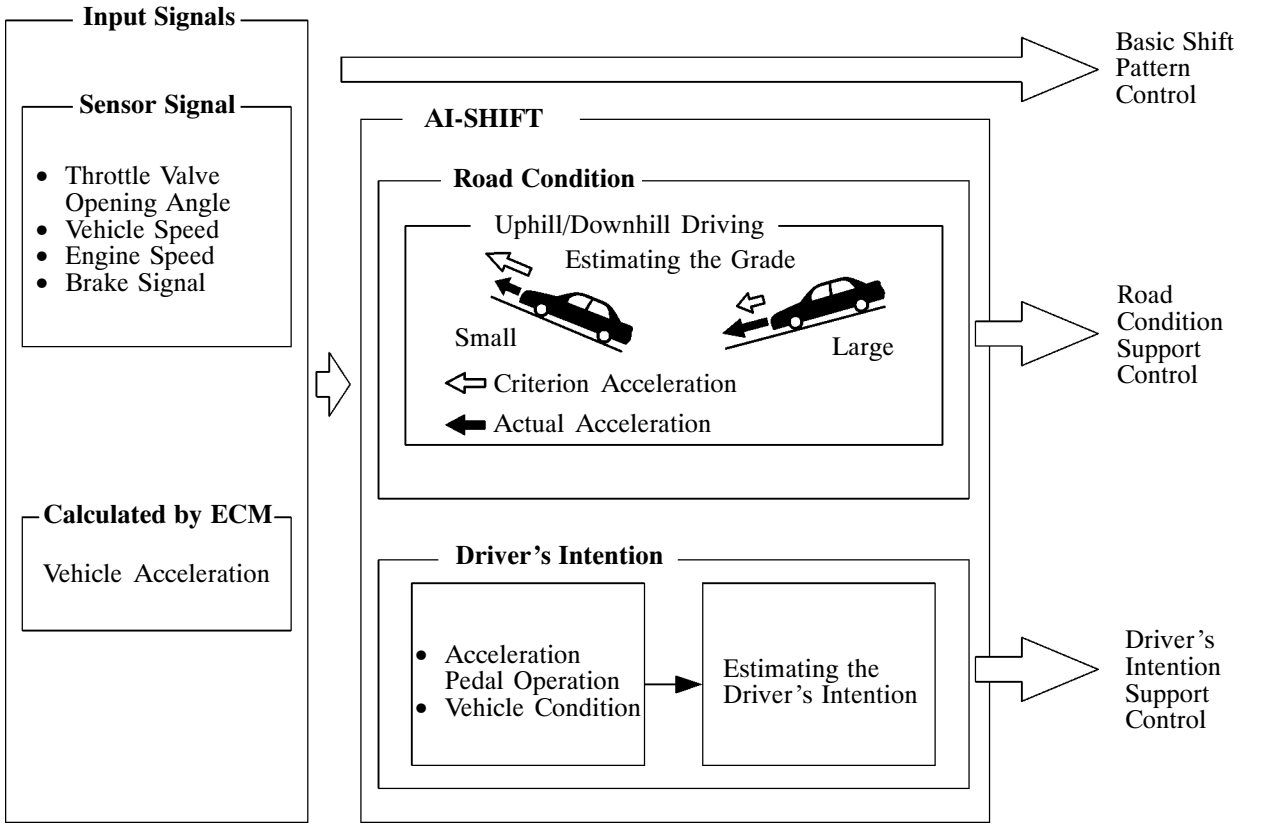
TRAC operates when the vehicle starts off.	If TRAC operates when the vehicle starts off in 1st gear, the gear will be changed to 2nd immediately to reduce driving force transmitted to the tires.
ABS operates before the vehicle stops.	If ABS operates before the vehicle stops, the transmission only shifts down to 2nd gear. Even after the vehicle stops, 2nd gear is maintained. In this case, 2nd gear will be used when the vehicle starts off.

12. AI-SHIFT Control

General

AI (Artificial Intelligence)-SHIFT control is adopted to automatically change the shift pattern based on road conditions and the driver's intentions. AI-SHIFT control, in addition to SPORT, Normal and SNOW mode selection carried out by the driver, enables comfortable driving to be achieved.

- The AI-SHIFT control includes a road condition support control and a driver's intention support control.
- The AI-SHIFT control determines optimal transmission control based on input signals and automatically changes the shift pattern.
- AI-SHIFT control is effect only with the shift lever in the D position, based on the accelerator and brake operation data. AI-SHIFT control will be canceled when the driver selects the M position.



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