

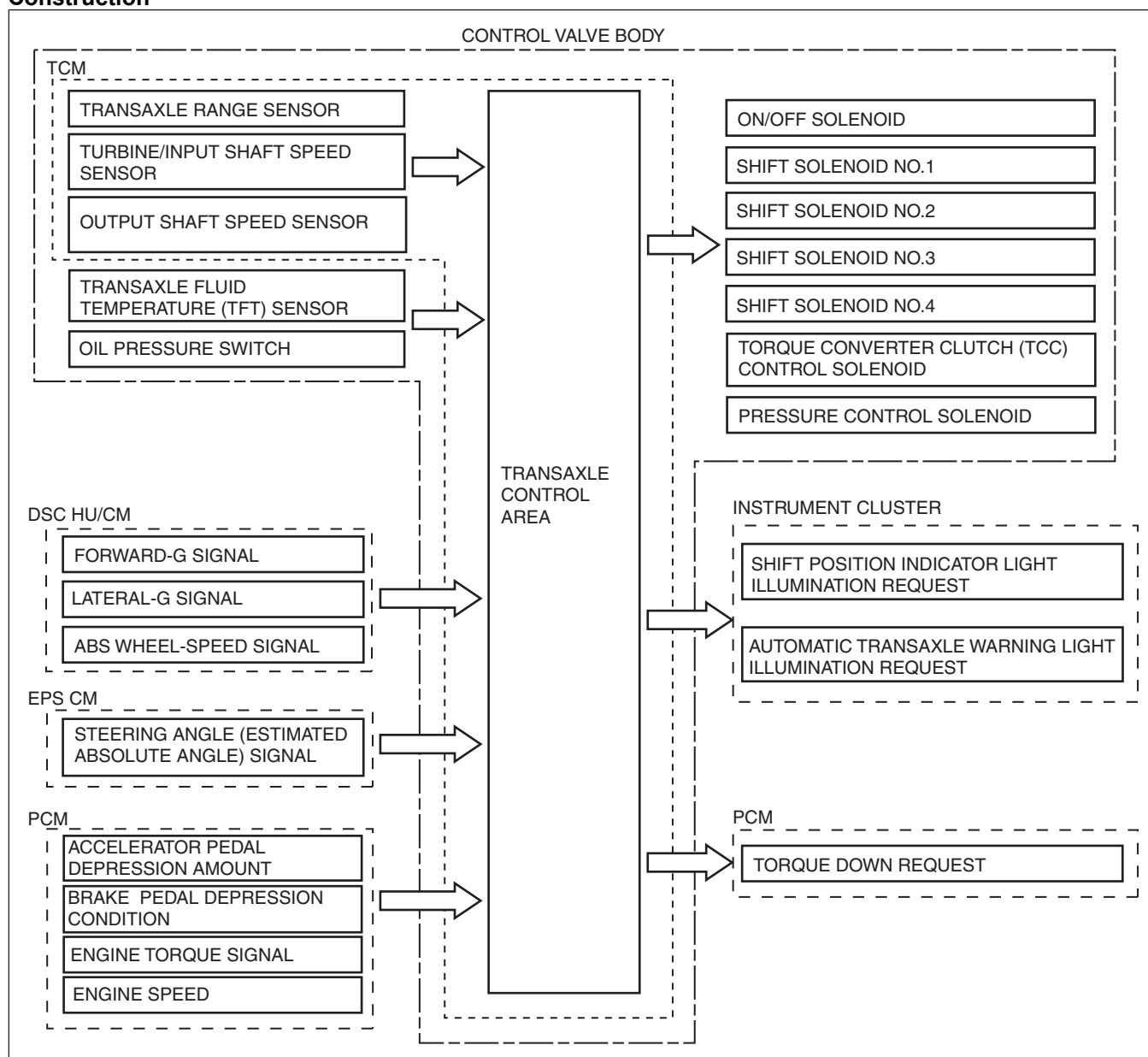
## SHIFT POINT CONTROL (AUTOMATIC SHIFT CONTROL) [FW6A-EL, FW6AX-EL]

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### Outline

- The TCM implements auto shift control according to the vehicle speed and accelerator pedal depression amount while in D position.
- When the vehicle is stopped with the selector lever is in the D position and the brake pedal depressed, the neutral idle control is performed which internally controls the automatic transaxle to be in the neutral condition while the selector lever is in the D position. When the brake pedal is being released, the clutch is engaged immediately and the automatic transaxle returns to the normal D position condition.
- When implementing the automatic shift control, the TCM determines the driving conditions based on each input signal and selects the drive mode appropriate to the driving conditions. In addition, information such as torque and gear changes is exchanged via PCM and CAN communication and control is performed so as to achieve optimum drive force according to the driving scenario.

### Construction



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### Operation

#### Driving range determination

- If a D position signal is input and an M position signal is not input, the TCM implements auto shift control.

#### Driving mode determination

- For the auto shift control, NORMAL mode is usually selected, however it automatically switches to driving mode depending on the driving conditions.

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- AAS (Active Adaptive Shift) mode: Automatically controls the optimum shift point according to the road conditions and the driver operation.
  - High ATF temperature mode: When the ATF temperature rises to a high temperature, the engine torque is restricted so that the increase in ATF temperature is suppressed to protect the transaxle.

#### **AAS (Active Adaptive Shift) mode operation**

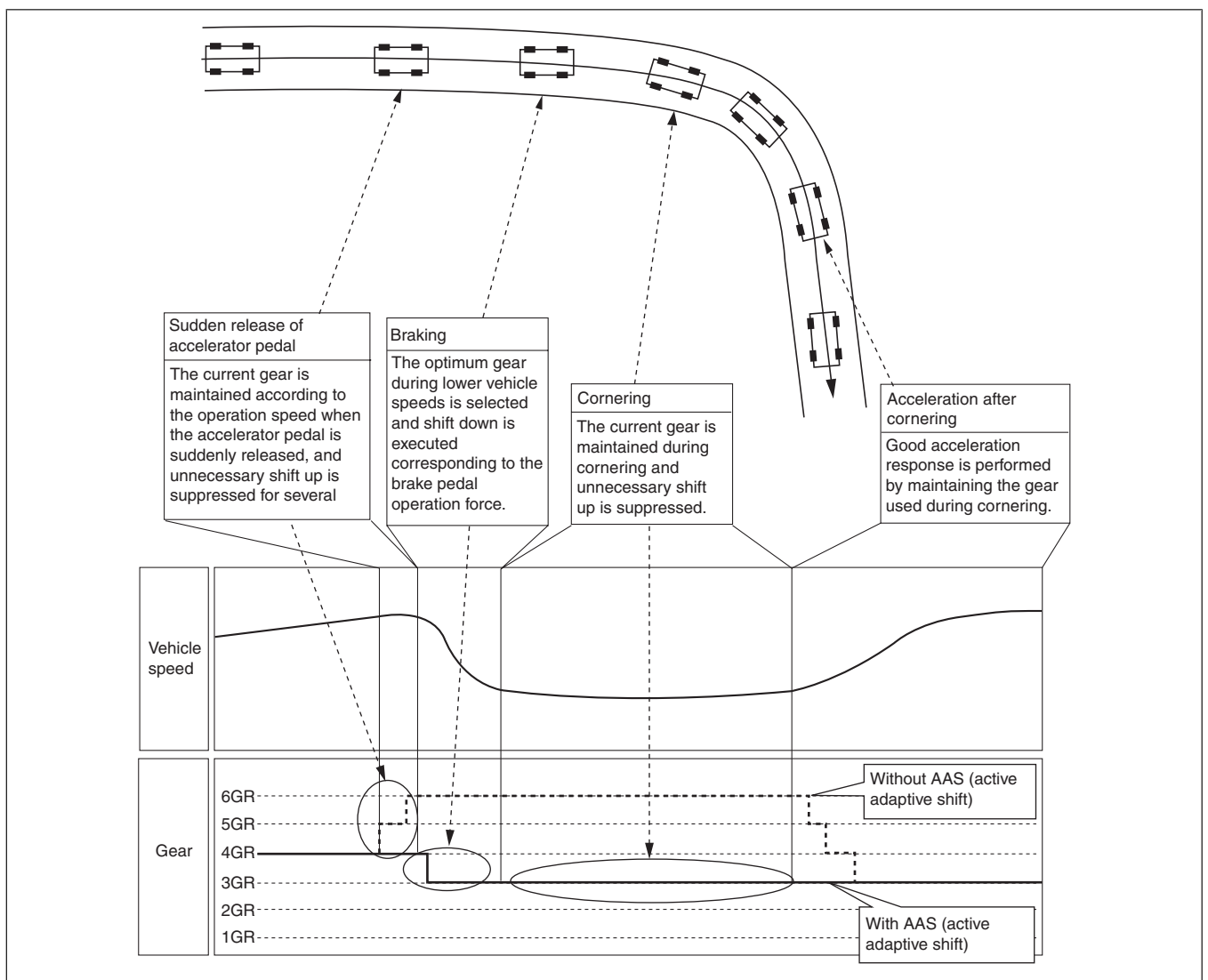
- Accelerator pedal fully closed suddenly and returned
  - When the accelerator pedal is fully closed and returned at a certain speed or more, shift-up is inhibited for specified time to improve speed control and reacceleration performance.
- Brake is strongly depressed
  - When decelerating at a certain speed or more, a lower gear is selected so that re-acceleration is performed smoothly.
  - During a shift change with the brake pedal depressed firmly, blipping control (synchronization to engine speed) is performed to shorten the shifting time.
- When cornering
  - While cornering at a turn with a radius of less than a specified value, shift up is suppressed to improve vehicle speed performance while cornering and reacceleration performance after cornering.
- During high degree of vehicle ascent/descent
  - During a certain level of vehicle ascent/descent, gears are selected appropriate to the driving conditions for driving comfort.
- During ascent
  - While ascending a slope of a certain grade or more, slope mode control prevents unnecessary shift-up by maintaining the appropriate gear.
- During descent
  - While descending a slope of a certain grade or more and depressing the brake pedal, the gears are appropriately shifted down according to the estimated slope angle for effective use of engine braking. As a result, frequent brake pedal operation is reduced.

#### **AAS (active adaptive shift) operation scenario and effect**

- The AAS (active adaptive shift) is a mode which estimates the driving environment and drive's intentions according to the vehicle driving conditions and the drive's operations, and selects the optimum gear for driving.

##### **Ex.1: Cornering**

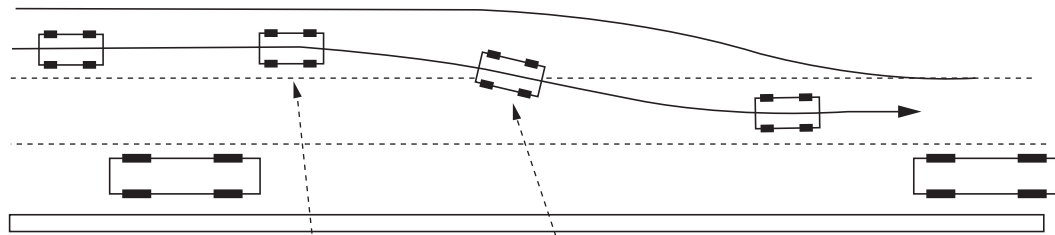
- During cornering, shift up is suppressed to improve acceleration performance after cornering.



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## Ex. 2) Merging onto high speed expressways

- In a scenario such as temporarily decelerating while merging onto a high speed expressway, shift up is suppressed directly afterwards to improve re-acceleration performance.

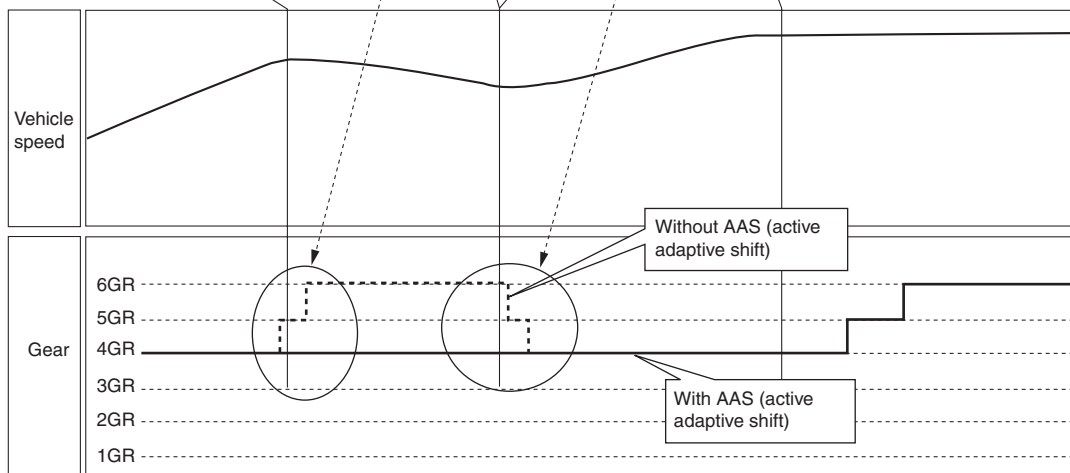


Sudden release of accelerator pedal

The current gear is maintained according to the operation speed when the accelerator pedal is suddenly released, and unnecessary shift up is suppressed for several seconds.

Acceleration at merging

Good acceleration response is performed by maintaining the gear used before re-accelerating.



## Automatic transaxle operation chart

Position	Mode	Gear position	Gear ratio	TCC	Operation of powertrain parts						Operation of shift solenoid					
					Low clutch	High clutch	Low and reverse brake	2-6 brake	R-3-5 brake	One-way clutch	Shift solenoid No.1	Shift solenoid No.2	Shift solenoid No.3	Shift solenoid No.4	TCC control solenoid	ON/OFF solenoid
P	-	-	-				×				CLOSE	CLOSE	CLOSE	OPEN	CLOSE	OFF
R	-	Reverse	3.893				×		×		CLOSE	CLOSE	OPEN	OPEN	CLOSE	OFF
N		-	-				×				CLOSE	CLOSE	CLOSE	OPEN	CLOSE	OFF
D/M	NORMAL	1GR	3.552	×	×		×			⊗	OPEN	CLOSE	CLOSE	OPEN	OPEN	OFF
		2GR	2.022	×	×			×			OPEN	OPEN	CLOSE	CLOSE	OPEN	ON
		3GR	1.452	×	×				×		OPEN	CLOSE	OPEN	CLOSE	OPEN	ON
		4GR	1.000	×	×	×					OPEN	CLOSE	CLOSE	OPEN	OPEN	ON
		5GR	0.708	×		×			×		CLOSE	CLOSE	OPEN	OPEN	OPEN	ON
		6GR	0.599	×		×		×			CLOSE	OPEN	CLOSE	OPEN	OPEN	ON

× : Operating

⊗ : Transmits torque only during driving operation

OPEN: Engages the line pressure to the clutch pressure

CLOSE: Drains the clutch pressure

ON: Engages the output port and the supply port

OFF: Engages the output port and the drain port (Drains the output port)