■ SHIFT POINT CONTROL (AUTOMATIC SHIFT CONTROL) [GW6A-EL, GW6AX-EL]

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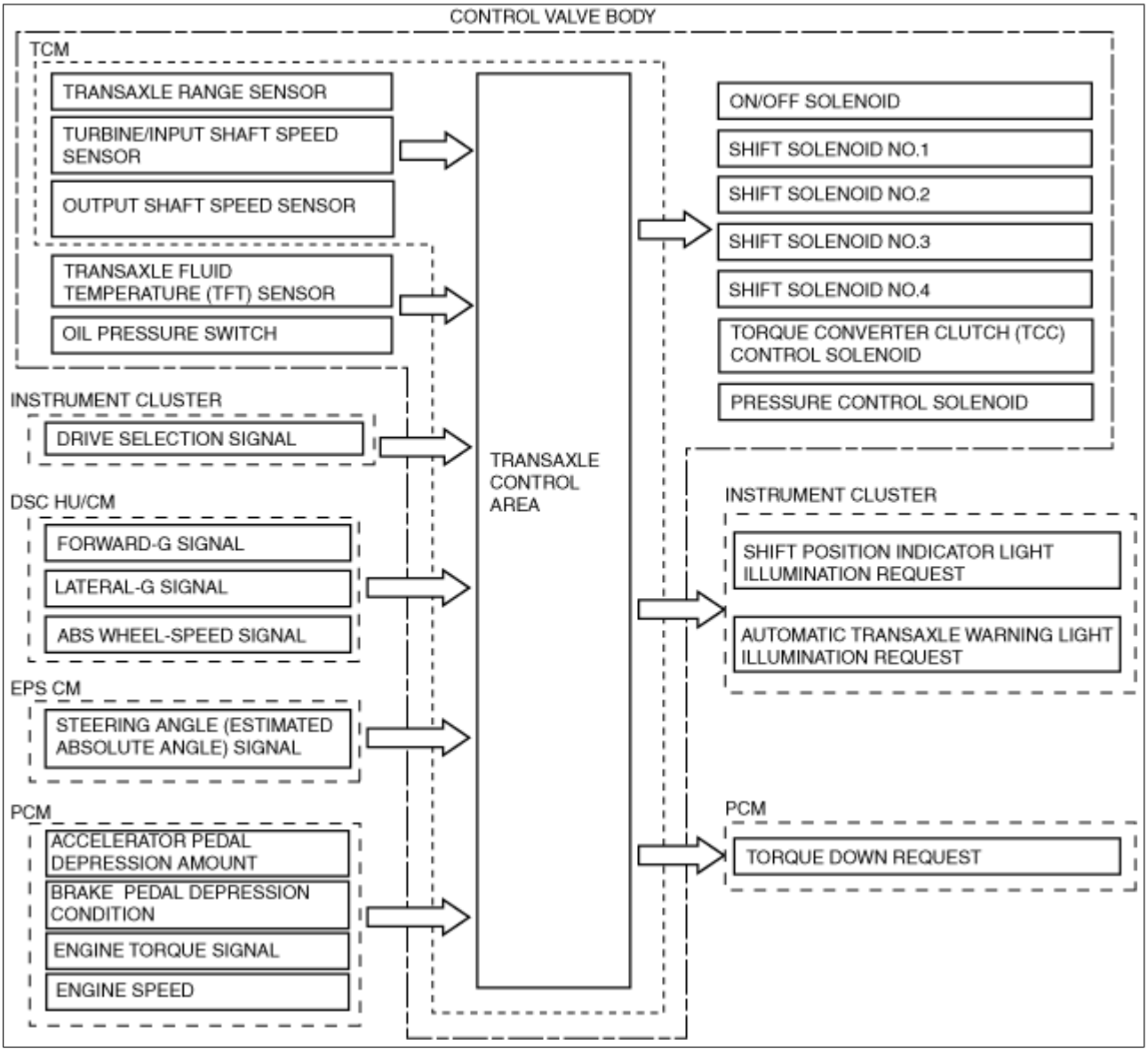
SKYACTIV-G 2.5T

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 SPORT mode is selected using the drive selection switch, a lower gear relative to normal mode is selected, and control is performed so that a higher operating force can be assured.
• 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

• Normal mode and SPORT mode can be selected using the drive selection switch and the following modes are switched automatically based on the driving conditions in conjunction with normal mode/SPORT mode.

— 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.
— Low engine coolant temperature mode: If the engine coolant temperature is low, a gear lower than when in normal mode is selected.

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.
— The shift down control using the brakes may not operate under cold temperature condition.
— When driving on slippery roads such as snow covered roads, the shift down control using the brakes may not operate.

• 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 drive in a high-altitude area

— While driving in a high-altitude area, 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.

Note

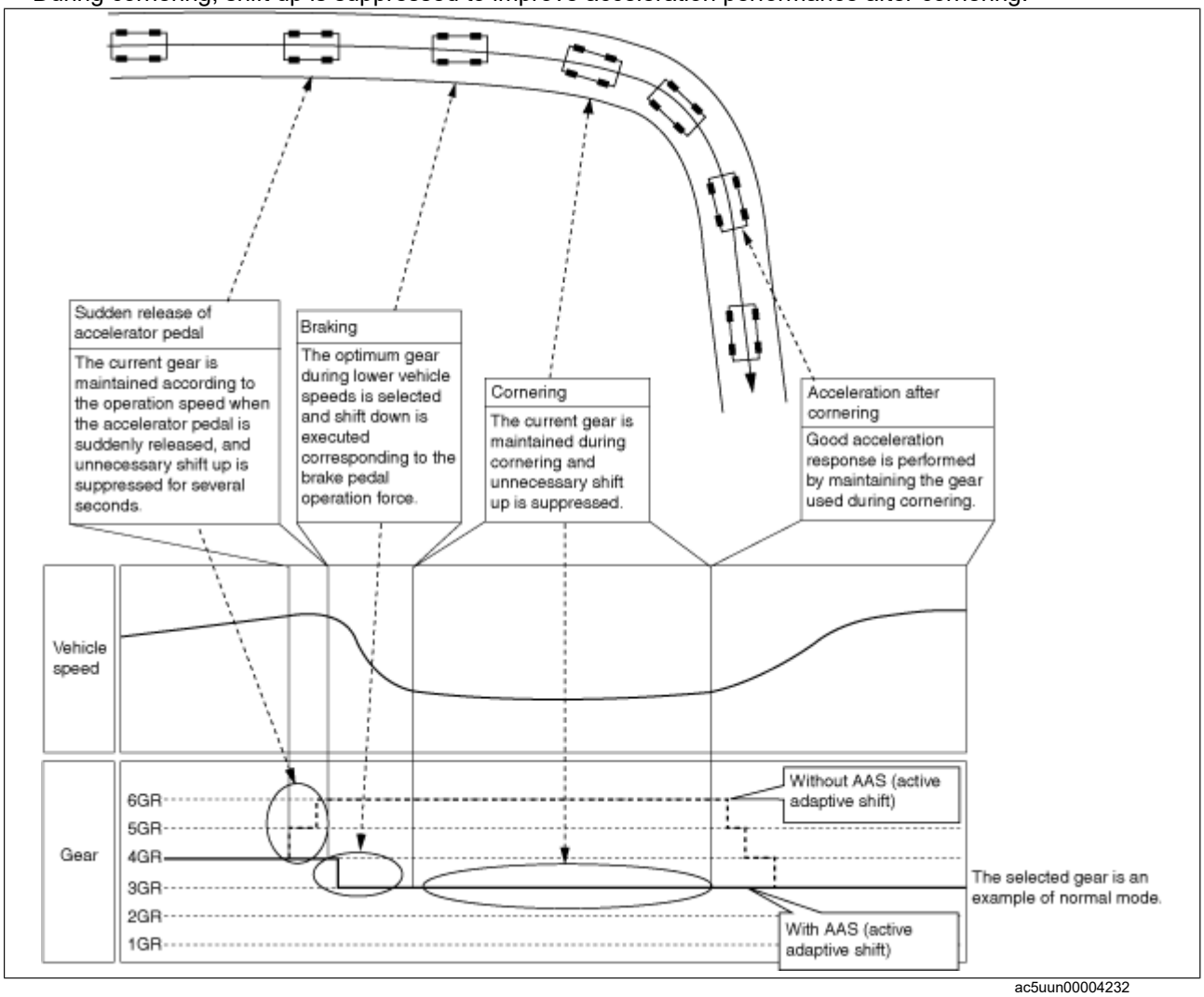
• When SPORT mode is selected, the AAS selects a lower gear compared to when normal mode is selected, and maintains it for a longer period of time.

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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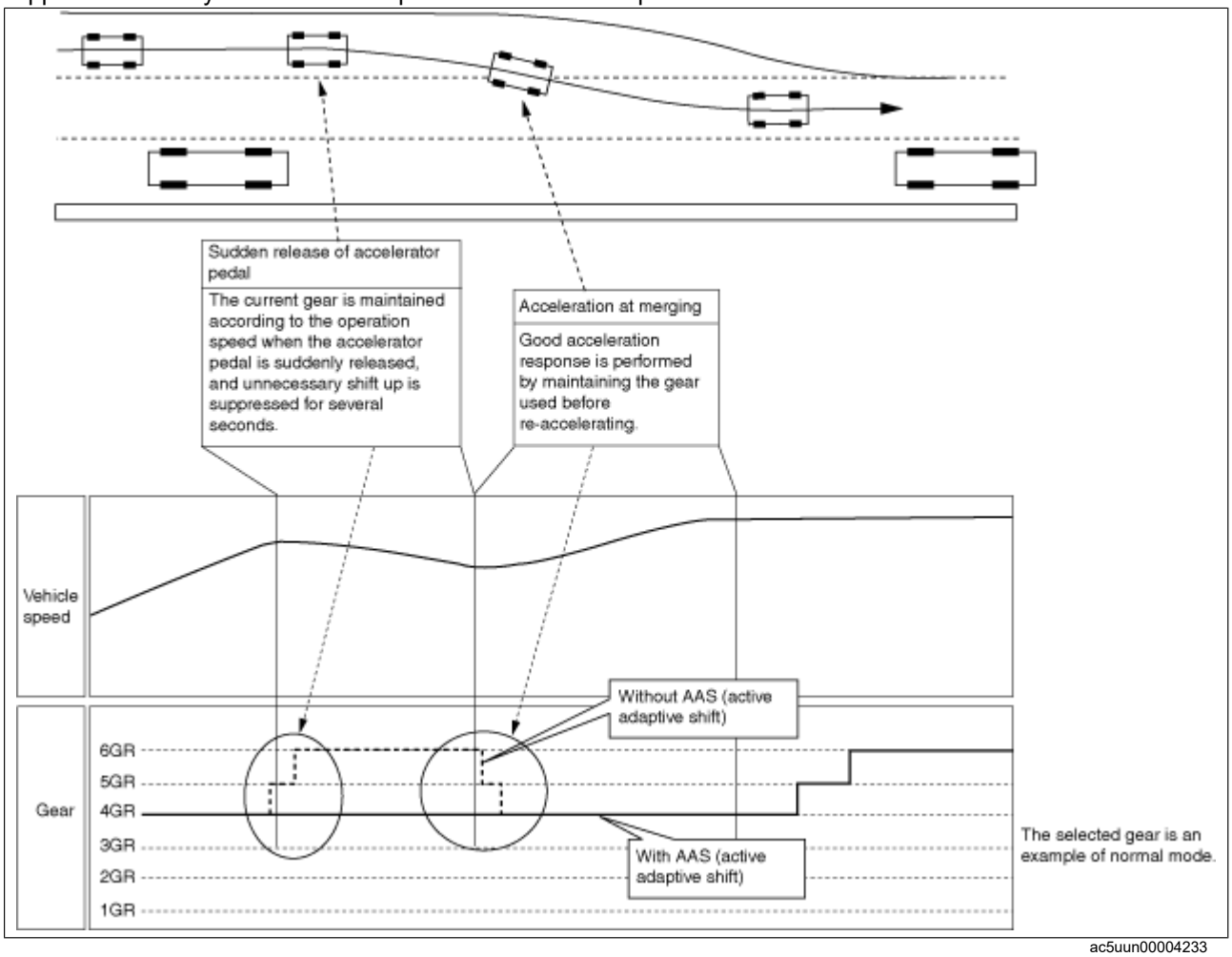
Ex. 2: Merging onto high speed expressways

— 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.



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Note

• When SPORT mode is selected, the AAS selects a lower gear compared to when normal mode is selected, and maintains it for a longer period of time.

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	DRAIN
R	—	Reverse	3.990				×		×		CLOSE	CLOSE	OPEN	OPEN	CLOSE	DRAIN
N		—	—				×				CLOSE	CLOSE	CLOSE	OPEN	CLOSE	DRAIN
D/M	NORMAL/ SPORT	1GR	3.487	×	×		×			⊗	OPEN	CLOSE	CLOSE	OPEN	OPEN	DRAIN
		2GR	1.992	×	×			×			OPEN	OPEN	CLOSE	CLOSE	OPEN	SUPPLY
		3GR	1.449	×	×				×		OPEN	CLOSE	OPEN	CLOSE	OPEN	SUPPLY
		4GR	1.000	×	×	×					OPEN	CLOSE	CLOSE	OPEN	OPEN	SUPPLY
		5GR	0.707	×		×			×		CLOSE	CLOSE	OPEN	OPEN	OPEN	SUPPLY
		6GR	0.600	×		×		×			CLOSE	OPEN	CLOSE	OPEN	OPEN	SUPPLY

× : Operating
⊗ : Transmits torque only during driving operation
— : Not applicable
OPEN: Engages the line pressure to the clutch pressure
CLOSE: Drains the clutch pressure
SUPPLY: Engages the output port and the supply port
DRAIN: Engages the output port and the drain port (Drains the output port)

Shift solenoid No.1: Normally closed type
Shift solenoid No.2: Normally closed type
Shift solenoid No.3: Normally open type
Shift solenoid No.4: Normally open type
TCC control solenoid: Normally closed type
ON/OFF solenoid: Normally open type (Engages the output port and the supply port)

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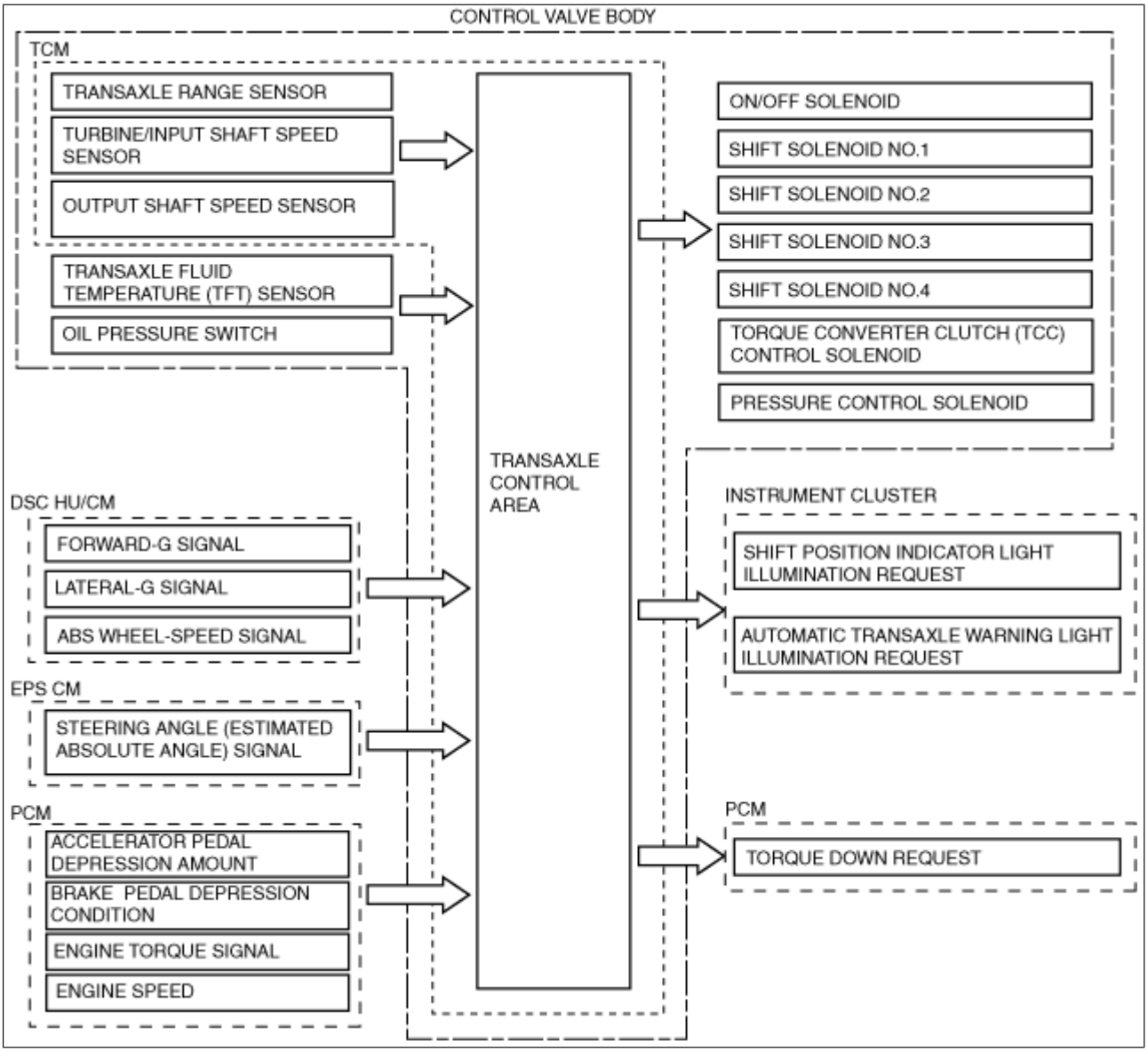
SKYACTIV-D 2.2

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.

— 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.
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— 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.

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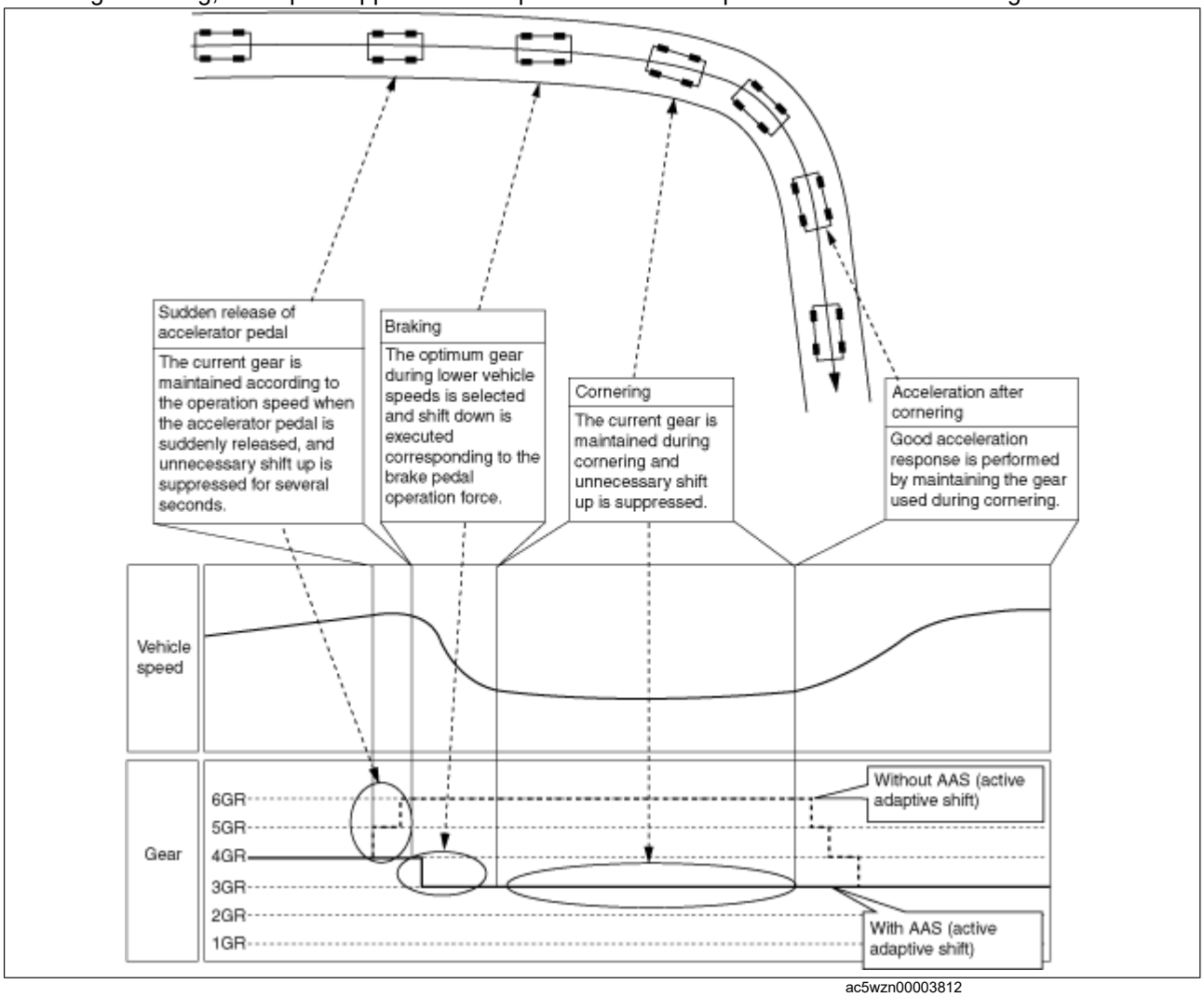

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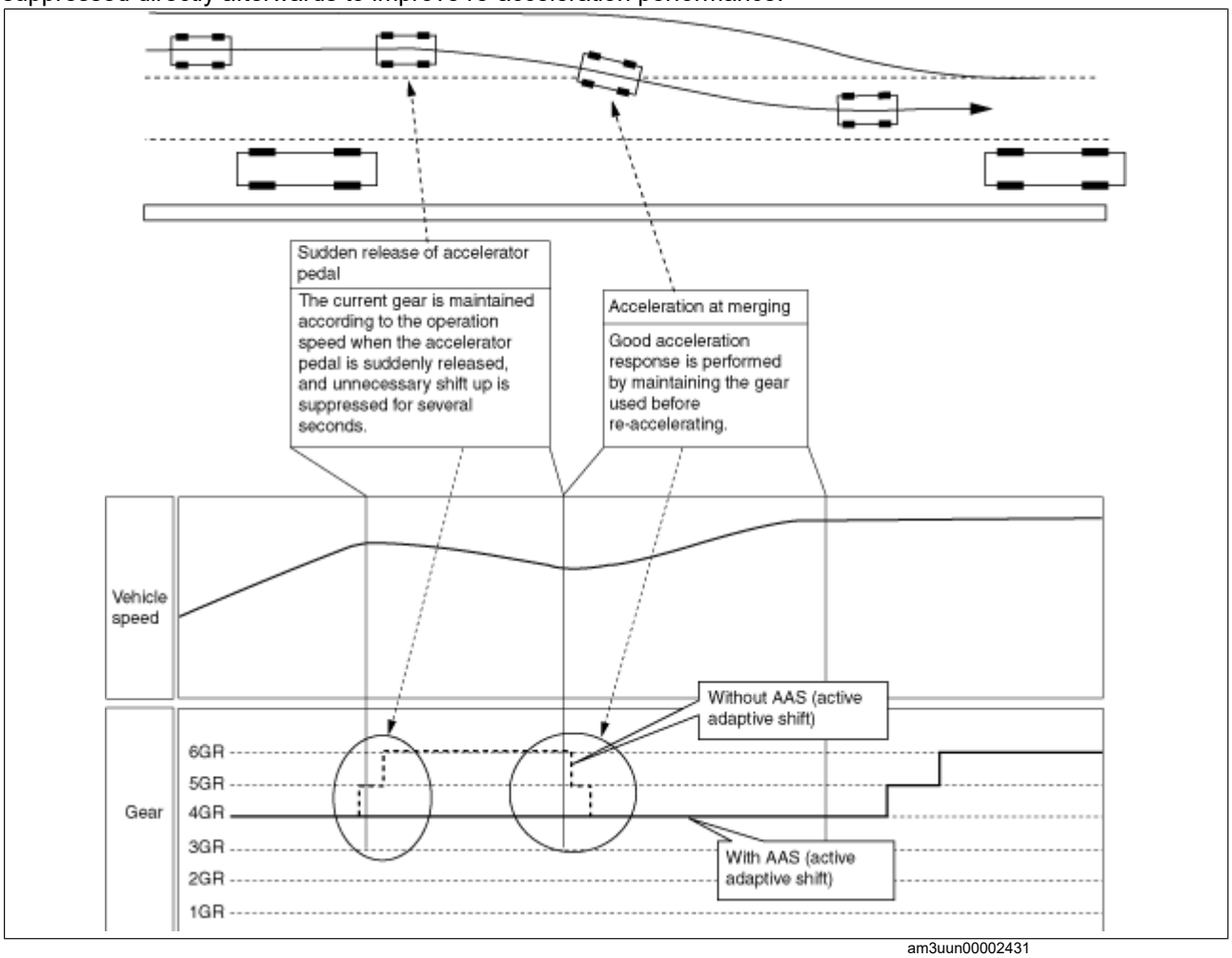

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Automatic transaxle operation chart

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P	—	—	—				×				CLOSE	CLOSE	CLOSE	OPEN	CLOSE	DRAIN
R	—	Reverse	3.990				×		×		CLOSE	CLOSE	OPEN	OPEN	CLOSE	DRAIN
N		—	—				×				CLOSE	CLOSE	CLOSE	OPEN	CLOSE	DRAIN
D/M	NORMAL	1GR	3.487	×	×		×			⊗	OPEN	CLOSE	CLOSE	OPEN	OPEN	DRAIN
		2GR	1.992	×	×			×			OPEN	OPEN	CLOSE	CLOSE	OPEN	SUPPLY
		3GR	1.449	×	×				×		OPEN	CLOSE	OPEN	CLOSE	OPEN	SUPPLY
		4GR	1.000	×	×	×					OPEN	CLOSE	CLOSE	OPEN	OPEN	SUPPLY
		5GR	0.707	×		×			×		CLOSE	CLOSE	OPEN	OPEN	OPEN	SUPPLY
		6GR	0.600	×		×		×			CLOSE	OPEN	CLOSE	OPEN	OPEN	SUPPLY

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