
AUTOHOLD

id041500107000

Outline

- The AUTOHOLD function reduces the load on the driver by maintaining the vehicle in a stopped condition even if the brake pedal is released while the vehicle is stopped.

Caution

- **The AUTOHOLD function is a system which maintains the vehicle in a stopped condition using the DSC brake fluid pressure hold function. Because the function is not for enhancing the tire performance, the vehicle cannot be stopped if the grip limit of the tires is exceeded. Therefore, the function may not be able to hold the vehicle on a steep or slippery road.**

Note

- i-stop operates also during the AUTOHOLD operation. For details on i-stop, refer to the "i-stop control". (See i-stop CONTROL.) (See i-stop CONTROL [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See i-stop CONTROL [SKYACTIV-G1+ 2.5].) (See i-stop CONTROL [SKYACTIV-D 2.2].)

Functions

- When the AUTOHOLD switch is on, the DSC HU/CM operates/releases the AUTOHOLD based on the input signal from the ABS wheel-speed sensor and the CAN-related module communication data.

AUTOHOLD display function

- The AUTOHOLD display function notifies the driver of the system conditions using the AUTOHOLD active indicator light, brake pedal operation demand indicator light (green), brake pedal operation demand warning light (red), AUTOHOLD warning beep, and multi-information display.

Structural View

PCM
(SKYACTIV-D 2.2)

DSC HU/CM
TCM

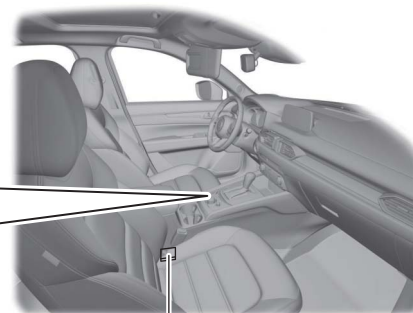
PCM (SKYACTIV-G 2.0, SKYACTIV-G 2.5, SKYACTIV-G1⁺ 2.5)



ELECTRIC PARKING BRAKE
CONTROL MODULE



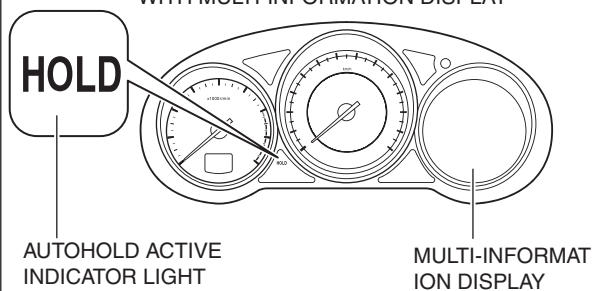
AUTO HOLD SWITCH



SAS CONTROL MODULE

INSTRUMENT CLUSTER

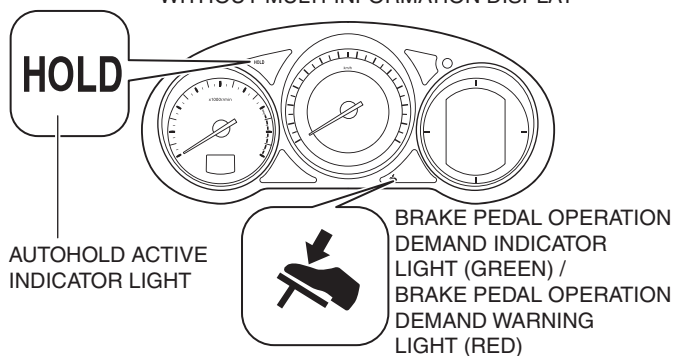
WITH MULTI-INFORMATION DISPLAY



AUTOHOLD ACTIVE
INDICATOR LIGHT

MULTI-INFORMAT
ION DISPLAY

WITHOUT MULTI-INFORMATION DISPLAY



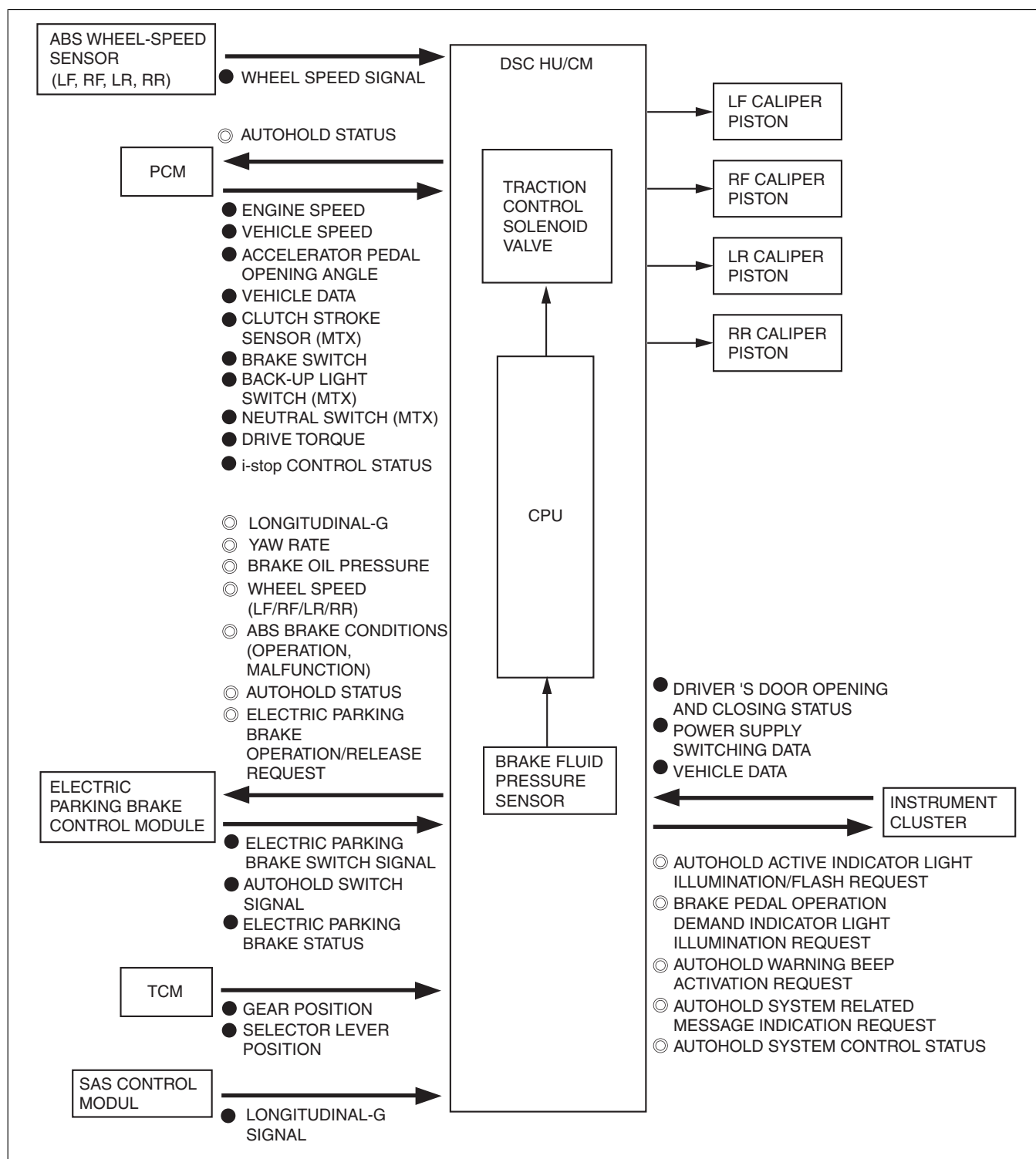
AUTOHOLD ACTIVE
INDICATOR LIGHT

BRAKE PEDAL OPERATION
DEMAND INDICATOR
LIGHT (GREEN) /
BRAKE PEDAL OPERATION
DEMAND WARNING
LIGHT (RED)

The diagram illustrates a complex hydraulic system for a vehicle, likely a heavy-duty truck or bus. At the top, a **MASTER CYLINDER** is shown with two output ports. The system is divided into two main sections, each with its own **TRACTION CONTROL SOLENOID VALVE** and **STABILITY CONTROL SOLENOID VALVE**. A central pump unit, labeled **M**, is connected to the system. A **BRAKE FLUID PRESSURE SENSOR** (P) is also present. The system includes multiple **INLET SOLENOID VALVE**s and **OUTLET SOLENOID VALVE**s for various wheels, including **RF** (Right Front), **LR** (Left Rear), **RR** (Right Rear), and **LF** (Left Front). Each wheel assembly also features a **PRESSURE MAINTAINED** indicator. The diagram uses standard hydraulic symbols for solenoid valves, pumps, and pressure sensors.

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Block diagram



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- The AUTOHOLD consists of the following parts.

Part name	Functions
DSC HU/CM	(See DSC HU/CM.)
Electric parking brake control module	(See ELECTRIC PARKING BRAKE CONTROL MODULE.)
PCM	(See PCM [SKYACTIV-G 2.0, SKYACTIV-G 2.5].) (See PCM [SKYACTIV-G1+ 2.5].) (See PCM [SKYACTIV-D 2.2].)
TCM	(See TCM [FW6A-EL, FW6AX-EL].)
SAS control module	(See SAS CONTROL MODULE [STANDARD DEPLOYMENT CONTROL SYSTEM].) (See SAS CONTROL MODULE [TWO-STEP DEPLOYMENT CONTROL SYSTEM].)

Part name	Functions
Instrument cluster	(See INSTRUMENT CLUSTER.)
AUTOHOLD switch	(See AUTOHOLD SWITCH.)
AUTOHOLD active indicator light	(See AUTOHOLD ACTIVE INDICATOR LIGHT.)
AUTOHOLD warning beep	(See AUTOHOLD WARNING BEEP.)
Brake pedal operation demand indicator light (green)	(See BRAKE PEDAL OPERATION DEMAND INDICATOR LIGHT (GREEN).)
Brake pedal operation demand warning light (red)	(See BRAKE PEDAL OPERATION DEMAND WARNING LIGHT (RED).)

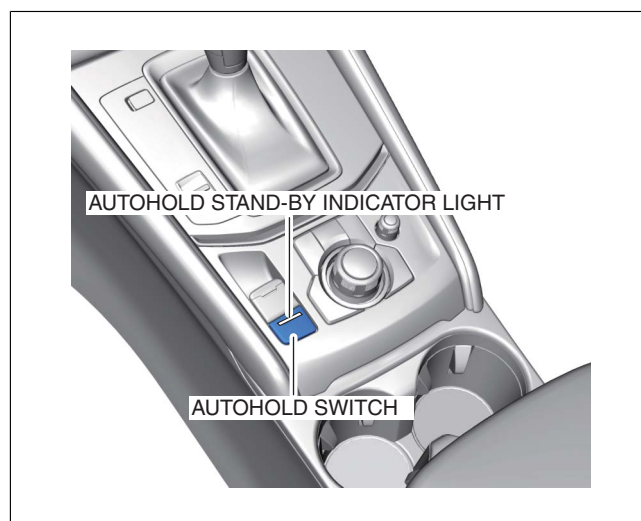
Operation

AUTOHOLD control table

Control	Content
AUTOHOLD stand-by control	The AUTOHOLD function enters the stand-by condition when the AUTOHOLD switch is pressed with all of the operation conditions met, and the function becomes operable.
Electric parking brake request control	When the electric parking brake operation conditions are met during hold/pressure increase control, the DSC C/M sends an electric parking brake request signal to the electric parking brake control module, and operates the electric parking brake.
Hold/pressure increase control	The vehicle is held in the stopped position by maintaining/increasing the brake fluid pressure and operating the brake of each wheel.
Pressure decrease control	Decreases the brake fluid pressure and releases the brakes.
Drive-off control	Determines that the driver is attempting to accelerate the vehicle from a stop during hold/pressure increase control, and releases the brakes.

AUTOHOLD stand-by control

- When the AUTOHOLD switch is pressed with all of the following conditions met, the AUTOHOLD stand-by indicator light turns on and AUTOHOLD becomes operable.
 - AUTOHOLD stand-by indicator light is turned off
 - AUTOHOLD switch is normal
 - Ignition is switched ON (engine on or engine off by i-stop control)
 - Driver's seat belt is fastened
 - Driver's door is closed
 - DSC system is normal
 - Electric parking brake system is normal
- When the AUTOHOLD switch is pressed again while the AUTOHOLD is not operating with the AUTOHOLD stand-by indicator light turned on, the AUTOHOLD indicator light turns off and the function is disabled.



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Note

- If the AUTOHOLD switch is malfunctioning while the AUTOHOLD stand-by indicator light is turned on, the AUTOHOLD indicator light turns off and the function is disabled.

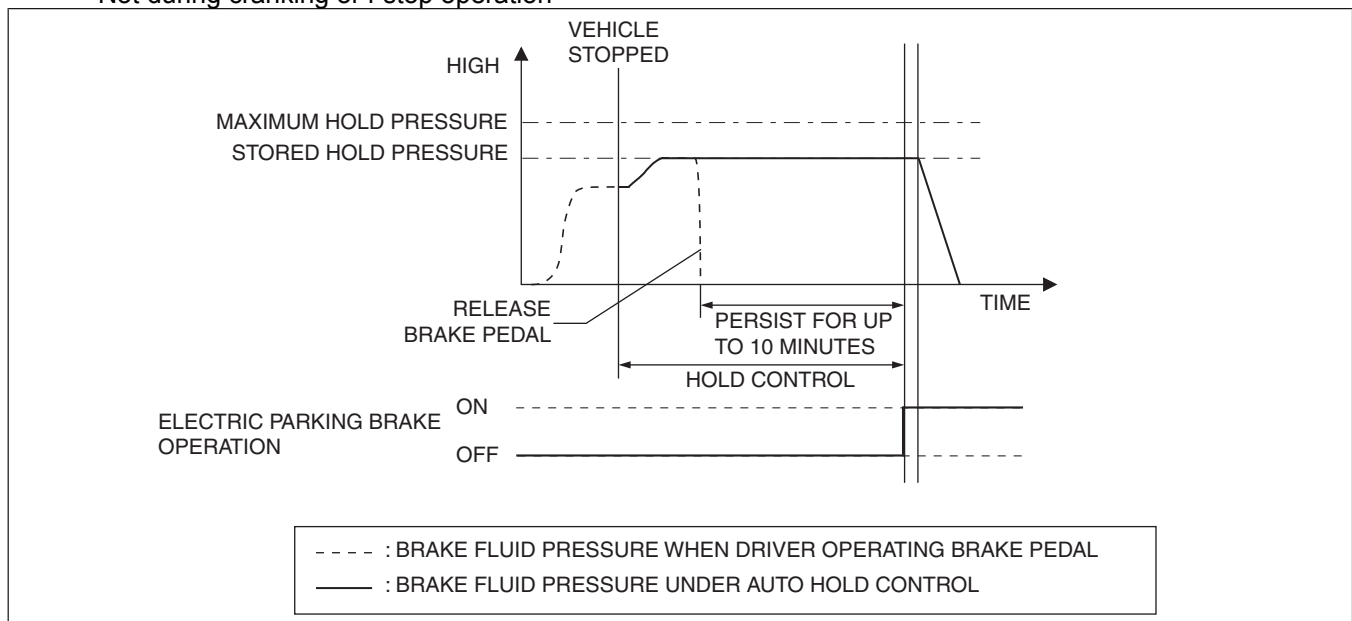
Hold control

- When all of the following conditions are met, the DSC HU/CM determines that the vehicle is stopped and performs hold control.
 - AUTOHOLD switch is on
 - Ignition is switched ON (engine on or engine off by i-stop control)
 - Wheel speed is 0 km/h
 - Brake fluid pressure is specification or more after depressing brake pedal
 - Accelerator pedal is released
 - Electric parking brake system is normal
 - Electric parking brake is released
 - Electric parking brake switch is not operated
 - Driver seat belt is fastened
 - Driver's door is closed
 - Yaw rate is specification or less (vehicle is stopped)

- Shift lever is in position other than reverse gear, or inclination of vehicle rear is 3% or more when reverse gear is selected (MTX)
- Inclination of vehicle rear is 10% or more while the selector lever is in R position, or the selector lever is in a position other than R. (ATX)
- When all of the operation conditions are met, the DSC HU/CM controls the traction control solenoid valve, maintains the brake fluid pressure and operates each wheel brake to stop the vehicle. In addition, the AUTOHOLD indicator light turns on.
- If the driver forcefully depresses the brake pedal and the brake fluid pressure increases, the increased brake fluid is maintained. In addition, the DSC HU/CM continuously maintains hold control for a maximum of 10 min, and operates the electric parking brake.

Pressure increase control

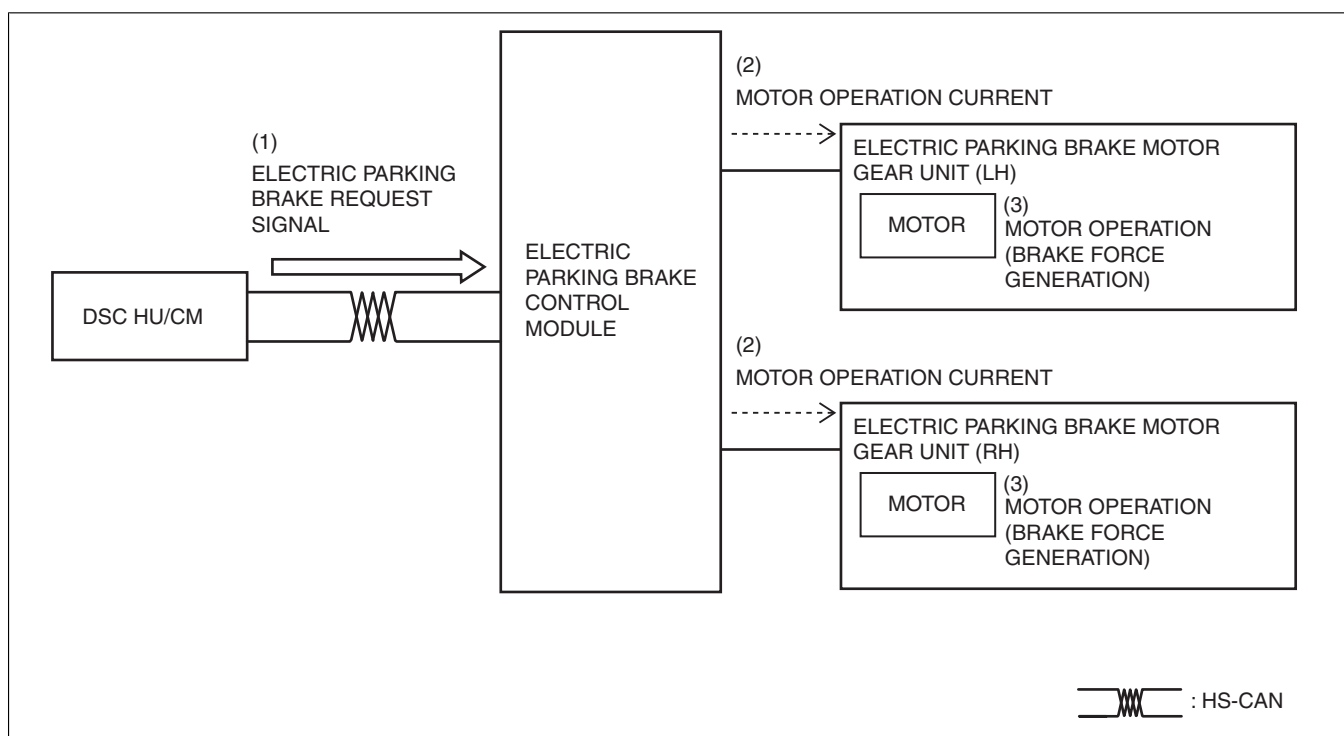
- When all of the following conditions are met during AUTOHOLD operation, the DSC HU/CM performs pressure increase control.
 - Wheel speed fluctuation from three wheels or more is detected
 - Brake pedal is released
 - Accelerator pedal is released
 - Not during cranking or i-stop operation



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Electric parking brake request control

- When any of the following conditions is met during hold/pressure increase control, the DSC HU/CM sends an electric parking brake request signal to the electric parking brake control module.
 - Ignition is switched OFF
 - Driver seat belt is unfastened
 - Driver's door is opened from closed condition
 - Approx. 10 min or more have elapsed from start of hold/pressure increase control
 - Electric parking brake is normal and vehicle is moving even if pressure increase control is performed
 - Engine is stalled
 - Continuous hold/pressure increase control is not possible
 - Malfunction occurred in AUTOHOLD system
- When the electric parking brake control module receives an electric parking brake request signal, the electric parking brake operates and the electric parking brake indicator light turns on. (See ELECTRIC PARKING BRAKE INDICATOR LIGHT, ELECTRIC PARKING BRAKE WARNING LIGHT.)



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- The DSC HU/CM decreases the brake fluid pressure after operating the electric parking brake.
- When the brake fluid pressure is reduced, the AUTOHOLD active indicator light turns off.

Note

- For the electric parking brake release conditions, refer to the [ELECTRIC PARKING BRAKE] (electric parking brake release and electric parking brake automatic release). (See ELECTRIC PARKING BRAKE.)

Pressure decrease control

- When all of the following conditions are met during hold/pressure increase control, the DSC HU/CM determines that it is not necessary to operate AUTOHOLD and reduces the brake fluid pressure.

MTX

- Driver depresses clutch pedal and reverse gear is selected
- The DSC HU/CM determines that the vehicle is on a flat road or the inclination of the vehicle front is approx. 3% or more based on the longitudinal-G signal from the SAS control module.

ATX

- Driver selects R position
- The DSC HU/CM determines that the vehicle is on a flat road or the inclination of the vehicle front is approx. 6% or more based on the longitudinal-G signal from the SAS control module.
- Vehicle roll prevention function control request signal from PCM is not sent

- When the brake fluid pressure is reduced, the AUTOHOLD indicator light turns off.

Drive-off control

- When any of the following conditions is met with the ignition switched ON (engine on or engine off by i-stop control) during hold/pressure increase control, the DSC HU/CM determines that the driver is attempting to accelerate the vehicle from the stop and performs drive-off control.

MTX

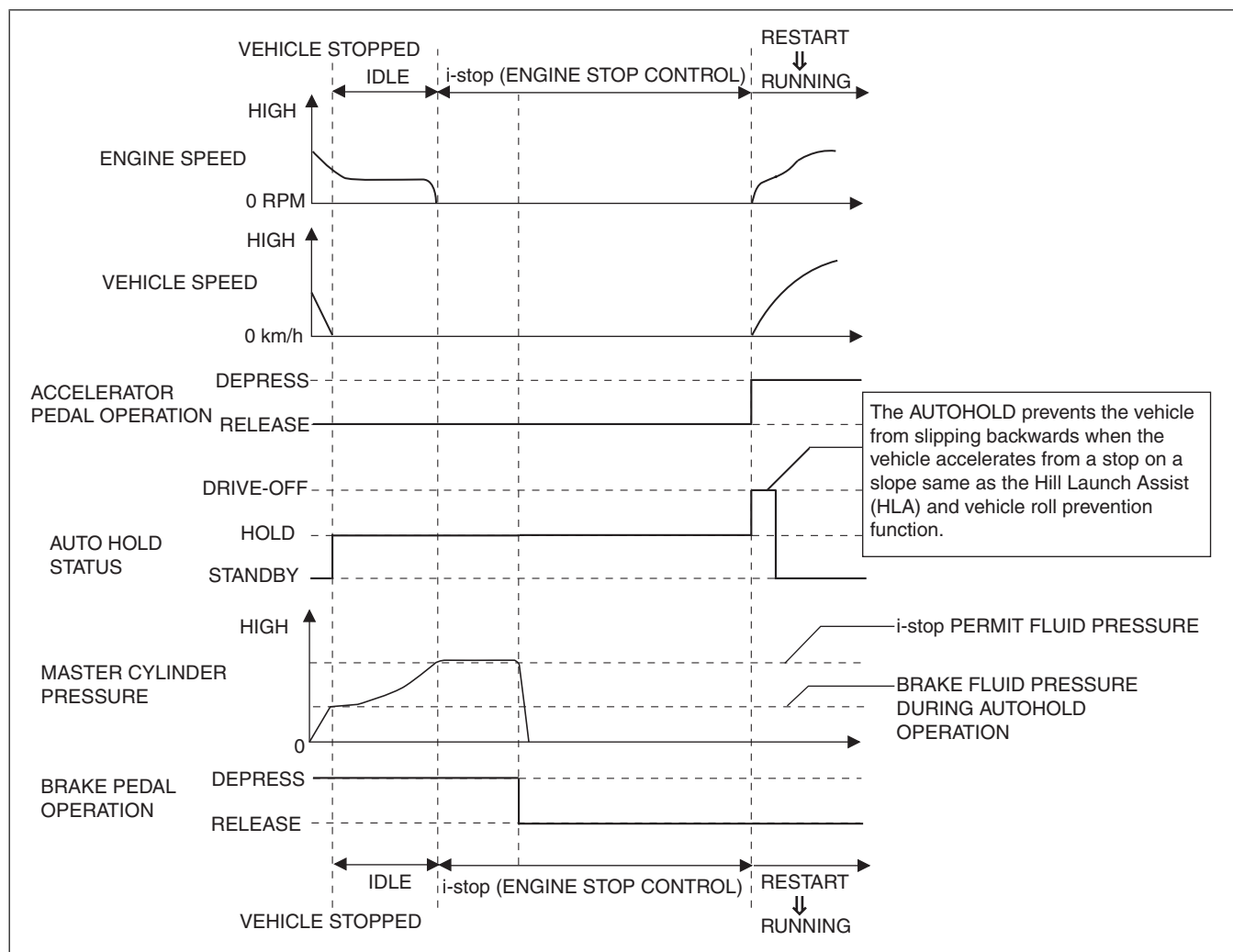
- Advance or reverse gear is selected and drive torque required for acceleration occurs by accelerator pedal or clutch pedal operation
- Accelerator pedal is depressed to specification or more with a forward gear or the reverse gear selected on level road
- A forward gear is selected with vehicle front pitched downward at 3% or more, and accelerator pedal is depressed to specification or more

ATX

- D or R position is selected, accelerator pedal is depressed to specification or more, and drive torque required for acceleration occurs
- Drive torque signal from PCM is in error, however accelerator pedal is depressed to specification or more
- If the engine torque signal sent from the PCM is the specification or more, the DSC HU/CM determines that the vehicle can be accelerated from the stop and decreases the brake fluid pressure. The time under which brake fluid pressure reduction is performed changes depending on the longitudinal-G signal (slope) from the SAS control module.

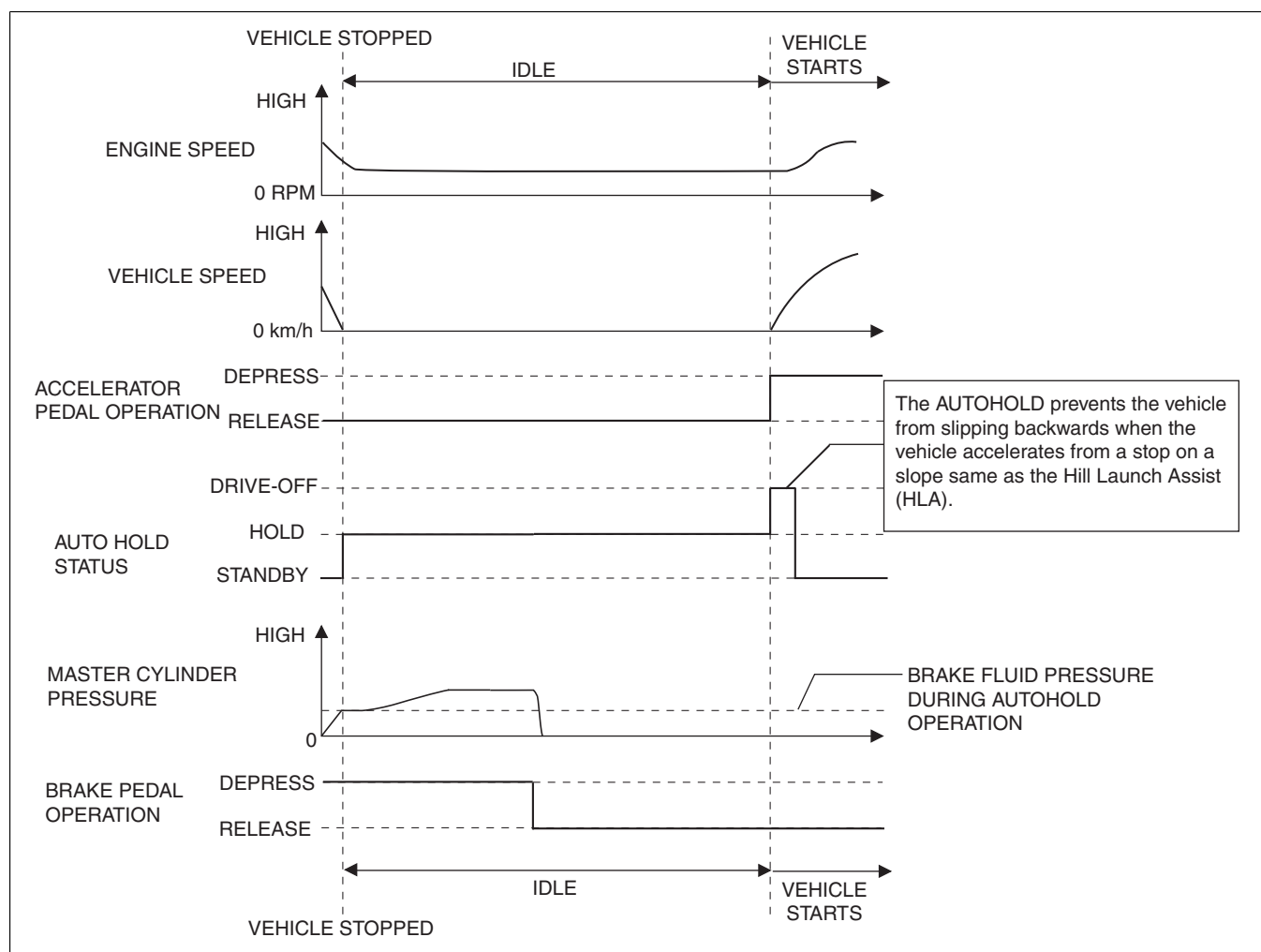
- When the brake fluid pressure is reduced, the AUTOHOLD active indicator light turns off.

With i-stop



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Without i-stop



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System malfunctioning

DSC system malfunction

- If the hold/pressure increase control cannot be performed due to a malfunction in the DSC system, the DSC HU/CM performs the following controls.

AUTOHOLD switch off

- Inhibits the AUTOHOLD.

AUTOHOLD switch on

During AUTOHOLD non-operation

- Inhibits the AUTOHOLD.

During hold/pressure increase control

- The DSC HU/CM sends an electric parking brake request signal immediately. When the electric parking brake operates, the DSC HU/CM inhibits the AUTOHOLD after reducing the maintained brake fluid pressure.

Note

- If a malfunction in the DSC system occurs and a malfunction in the electric parking brake occurs at the same time during hold/pressure increase control, the brake fluid pressure may be reduced with the electric parking brake not operated. At this time, the DSC HU/CM sends a brake pedal operation demand warning light (red) flash request signal/AUTOHOLD warning sound request signal to the instrument cluster.

During drive-off control and pressure reduction control for certain period of time

- Inhibits the AUTOHOLD after the brake fluid pressure reduction is completed.

Electric parking brake system malfunction

- If there is a malfunction in the electric parking brake, the DSC HU/CM performs the following controls.

AUTOHOLD switch off

- Inhibits the AUTOHOLD.

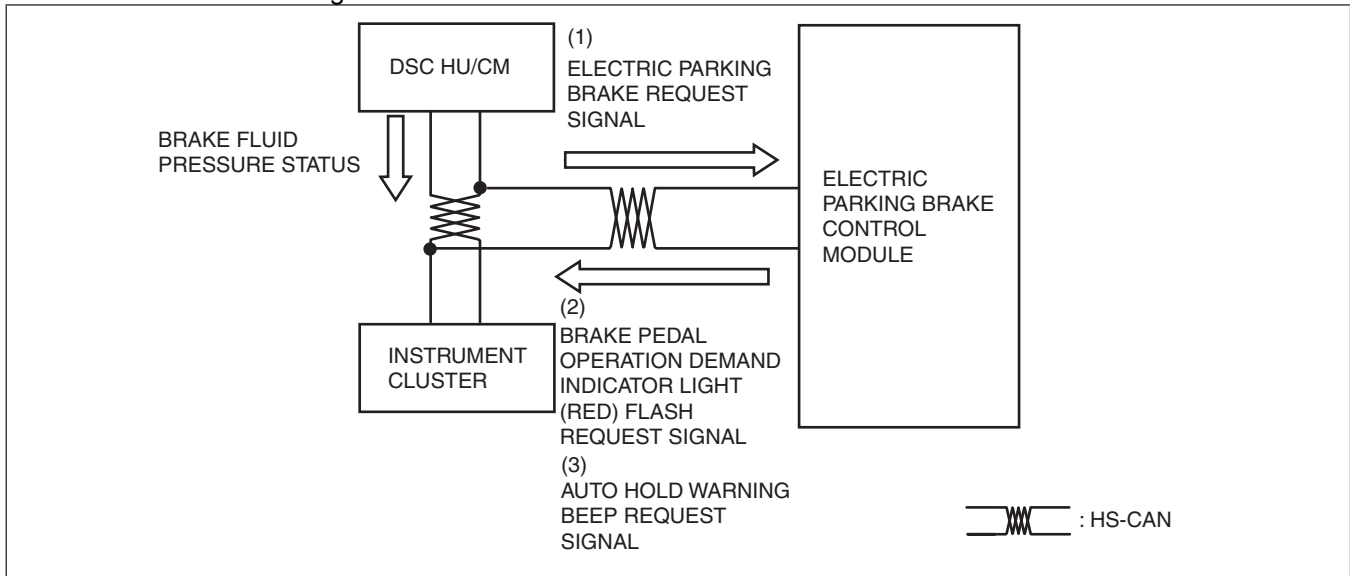
AUTOHOLD switch on

During AUTOHOLD non-operation

- Inhibits the AUTOHOLD.

During hold/pressure increase control

- Inhibits the AUTOHOLD after the drive-off control is completed.
- The DSC HU/CM receives (1) a signal from the electric parking brake control module that the electric parking brake operation is impossible, and it sends a brake pedal operation demand warning light (red) flash request signal (2)/AUTOHOLD warning sound request signal (3) to the instrument cluster.
- When the instrument cluster receives the brake pedal operation demand warning light (red) flash request signal (2) and the AUTOHOLD warning beep request signal (3), it flashes the brake pedal operation demand warning light (red) and activates the AUTOHOLD warning beep. (See BRAKE PEDAL OPERATION DEMAND WARNING LIGHT (RED).) (See AUTOHOLD WARNING BEEP.)
- The instrument cluster flashes the brake pedal operation demand warning light (red) for 5 s and the AUTOHOLD warning sound is activated.



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AUTOHOLD warning function operation

- Under the following conditions, the AUTOHOLD function sends a warning request signal via CAN transmission to the instrument cluster. The instrument cluster turns on the brake pedal operation demand indicator light (green), flashes the brake pedal operation demand warning light (red), and the AUTOHOLD warning sound is activated according to vehicle conditions.
- When the instrument cluster receives a warning request signal, it displays a warning indication on the multi-information display.

Condition	AUTOHOLD active indicator light	Brake pedal operation demand indicator light (green)	Brake pedal operation demand warning light (red)	multi-information display	AUTOHOLD warning beep
AUTOHOLD is operating	On	—	—	—	—
During AUTOHOLD operation, brake pedal is not depressed and AUTOHOLD switch is pressed	On	On	—	—	—

Condition	AUTOHOLD active indicator light	Brake pedal operation demand indicator light (green)	Brake pedal operation demand warning light (red)	multi-information display	AUTOHOLD warning beep
Indicates when there is a problem with the brake related system while the vehicle is being held in a stop position by the AUTOHOLD function or during the Mazda Radar Cruise Control with Stop & Go function (MRCC with Stop & Go function) stop hold control.	On (Turns off after reducing brake fluid pressure)	—	Flash	Brake Hold Unavailable Depress Brake to Hold Position	—
Indicates the possibility of the vehicle not being held in the stopped position by the AUTOHOLD function, such as on steep slopes.	On	—	Flash	Incline Too Steep Vehicle May Not Be Able to Hold Stopped Position	—
Indicates when the cancel operation is done without depressing the brake pedal while the vehicle is being held in the stopped position by the AUTOHOLD function or during the stop hold control of the Mazda Radar Cruise Control with Stop & Go function (MRCC with Stop & Go function).	On	—	Flash	Brake Pedal Must Be Depressed to Deactivate Auto Hold System	—