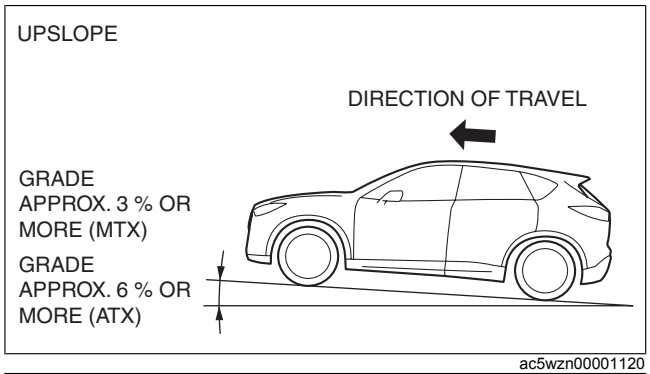
HILL LAUNCH ASSIST (HLA)

id041500104700

Purpose/Function

- The Hill Launch Assist (HLA) functions to assist in accelerating the vehicle from a stop on uphill slopes. When the vehicle is held at a stop by depressing the brake pedal on a slope with a grade of 6% or more, the brake fluid pressure is maintained even after the foot is released from the brake pedal to prevent the vehicle from rolling backwards. However, during i-stop control (engine off), the Hill Launch Assist (HLA) does not operate. Instead, the Vehicle Roll Prevention Function operates.



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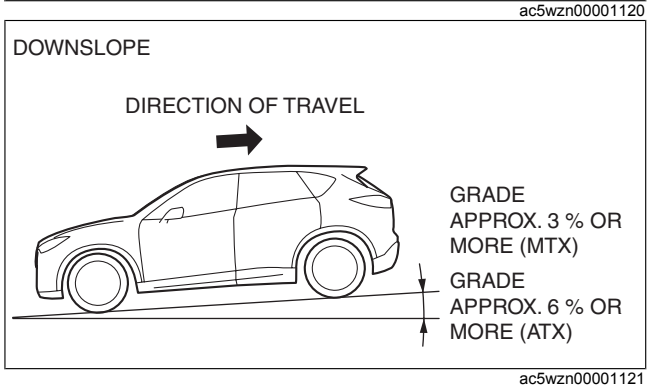
- The system automatically operates when the vehicle is stopped on a slope of approx. 3 % or more (changes slightly depending on load and vehicle conditions such as tire wear and air pressure). (MTX)
- The system automatically operates when the vehicle is stopped on a slope of approx. 6 % or more (changes slightly depending on load and vehicle conditions such as tire wear and air pressure). (ATX)



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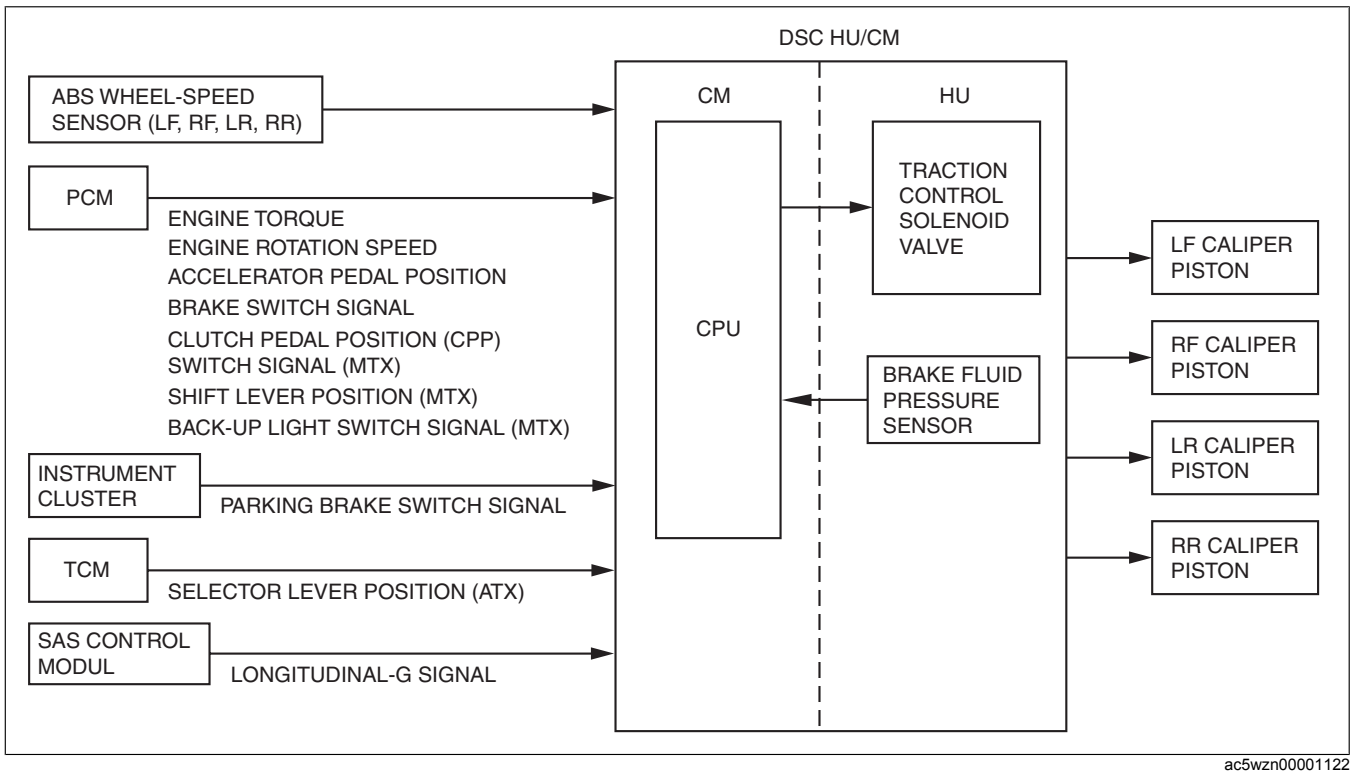
Structure

Block diagram



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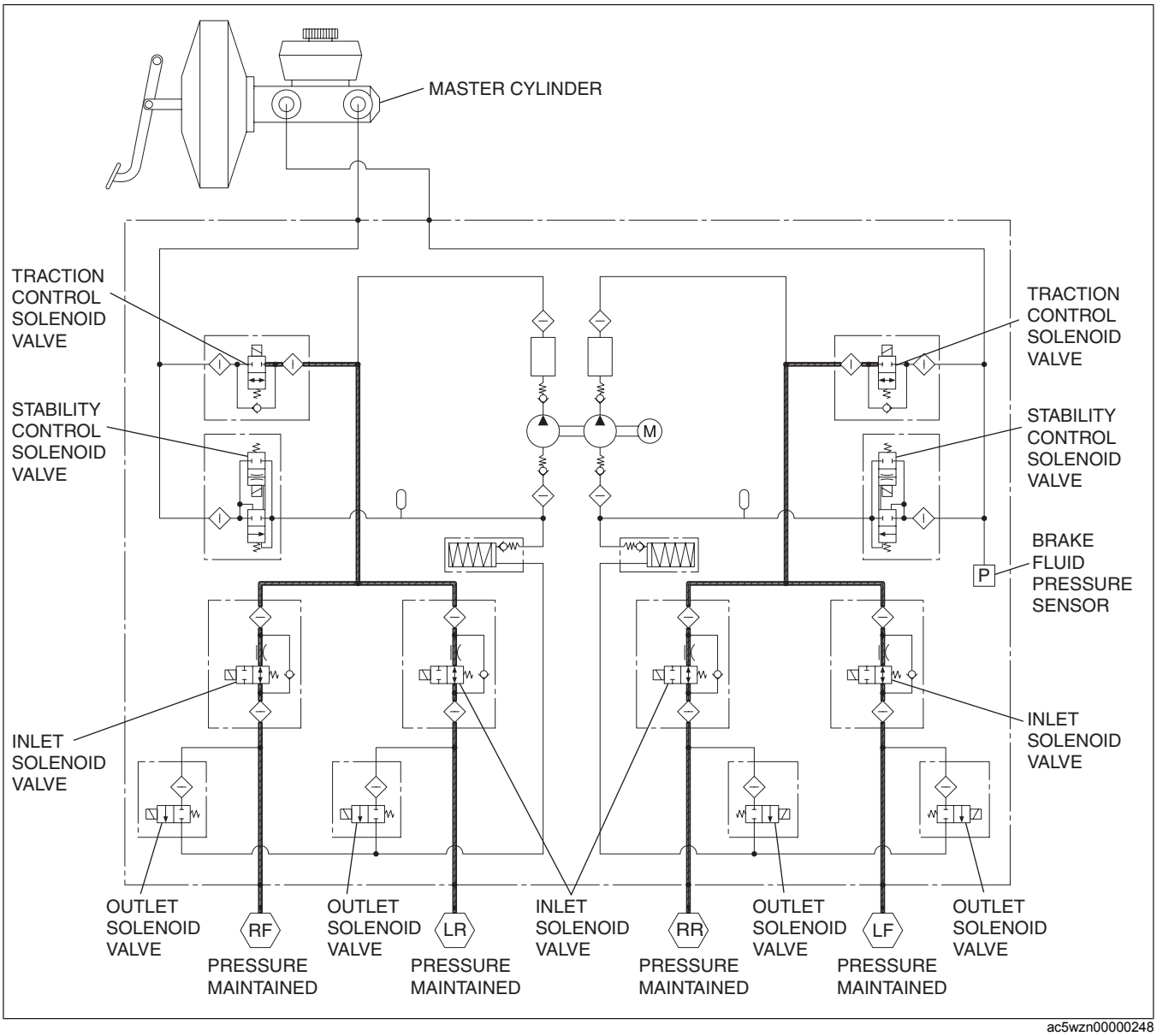
Hydraulic circuit diagram



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Operation

- If all of the operationg conditions are met while the vehicle is stopped on a slope, the Hill Launch Assist (HLA) maintains brake fluid pressure to maintain vehicle stop condition (hold control).
- After the accelerator pedal is depressed, the required engine torque for accelerating vehicle on a slope is produced, the Hill Launch Assist (HLA) decreases brake fluid pressure according to road slope and engine torque for smooth startability. (release control)
- If the DSC system malfunction occurs, the Hill Launch Assist (HLA) operates the the slow release control or the fast release control depending on malfunction contents.

Note

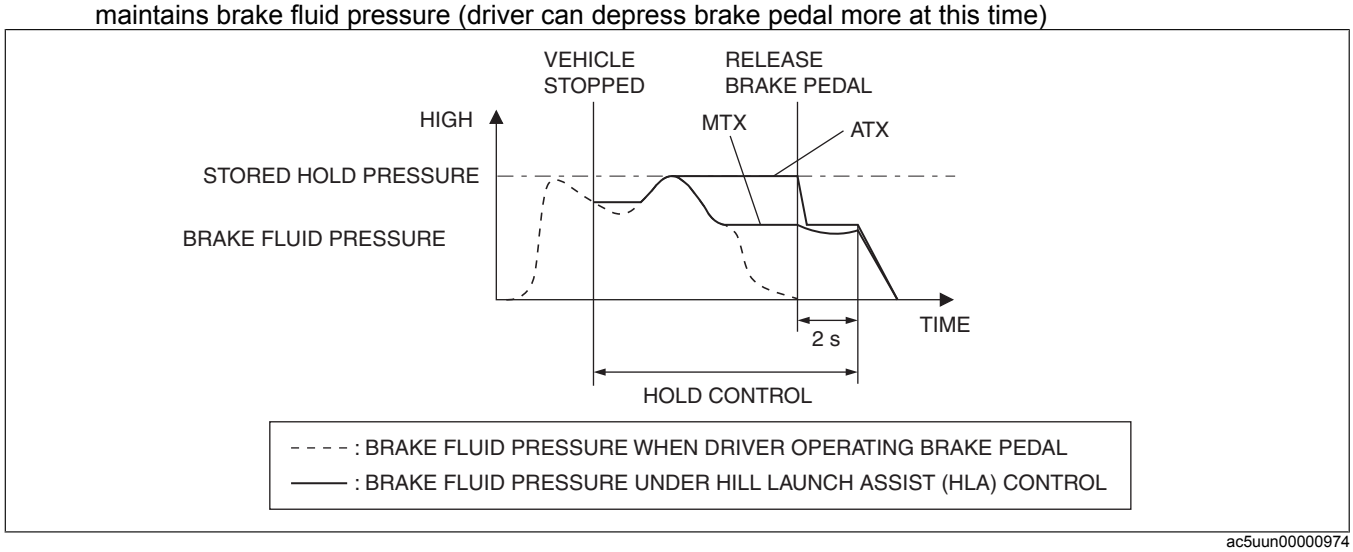
- The shift lever position is in the other than R position, the Hill Launch Assist (HLA) operates on a upslope. (MTX)
- The selector lever position is in the D/M position, the Hill Launch Assist (HLA) operates on a upslope. (ATX)
- The selector/shift lever position is in the R position, the Hill Launch Assist (HLA) operates on a downslope.
- The Hill Launch Assist (HLA) operates constantly without affecting the TCS OFF switch operation.
- When the parking brake is applied, the Hill Launch Assist (HLA) does not operate.
- When the DSC indicator light illuminates, the Hill Launch Assist (HLA) does not operate.

Hold control

- Control conditions (all of the following conditions met):
  - — Engine speed is at a certain value or more
  - — All doors are fully closed

— Slope of **approx. 3 % or more** (MTX)
— Slope of **approx. 6 % or more** (ATX)
— Wheel speed is **0 km/h {0 mph}**
— Parking brake not operated
— Accelerator pedal not depressed
— Not fail-safe mode is present
— Upslope: The selector lever position is in the D/M position (ATX)
— Upslope: The shift lever position is in the position other than R (MTX)
— Downslope: The selector/shift lever position is in the R position
— Brake pedal is depressed and brake fluid pressure is at a certain value or more
— Clutch pedal depressed (MTX)

• Control description:
— If all of the control conditions are met, the DSC HU/CM controls the traction control solenoid valve and maintains brake fluid pressure (driver can depress brake pedal more at this time)



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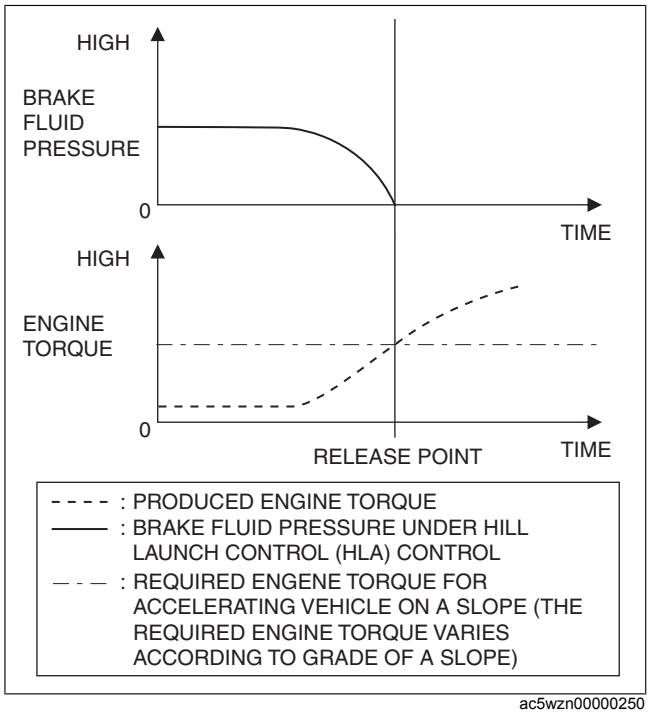
— If the brake pedal is released, brake fluid pressure (hold-pressure stored in memory) is maintained for a maximum of **2 s**.

Release control

• Control condition:
— After the accelerator pedal is depressed, the required engine torque for accelerating vehicle on a slope is produced

• Control description:
— Brake fluid pressure being maintained is lowered depending on produced engine torque.



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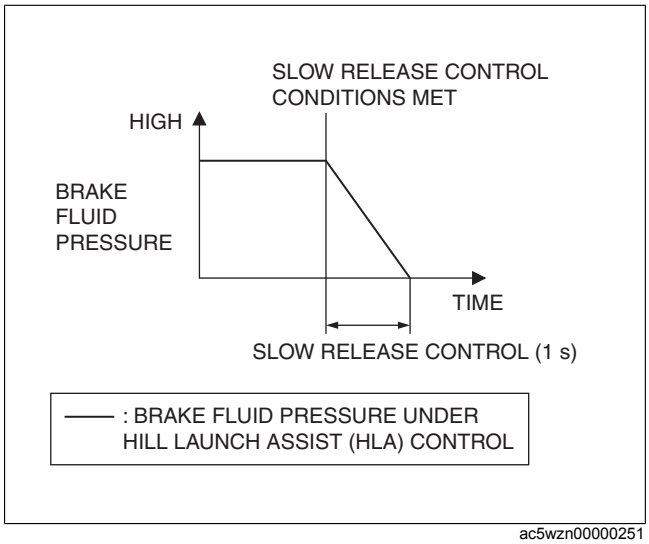
Slow release control

- Control condition (one or more of following conditions are met):
  - — Parking brake applied
  - — Clutch pedal released (MTX)
  - — DSC HU/CM has malfunction (performs slow release control only if solenoid valve control is available)
  - — Slope of **1.0 % or less** (MTX)
  - — Slope of **4.0 % or less** (ATX)
  - — **2 s** have elapsed with brake pedal released
- Control description
  - — Brake fluid pressure being maintained is lowered in 1 s



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Fast release control

- Control condition
  - — DSC HU/CM has malfunction and solenoid valve control is not available
- Control description
  - — Brake fluid pressure being maintained is reduced to **0 kPa {0 mmHg, 0 inHg}** immediately