

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

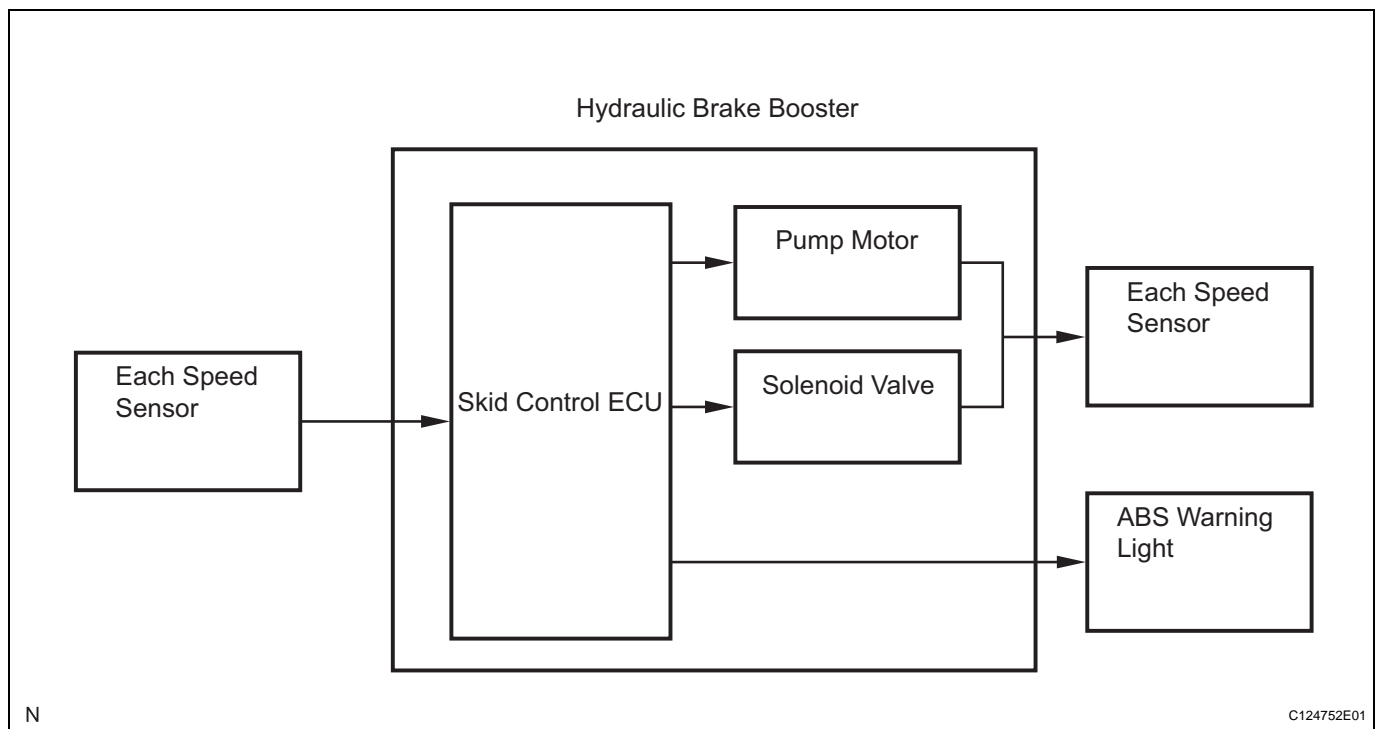
HINT:

- The skid control ECU forms a single unit with the hydraulic brake booster.
 - The yaw rate sensor and deceleration sensor are combined in a single unit. This unit communicates with the skid control ECU through CAN communication.
- (a) ABS with EBD & BA & TRAC & VSC operation
- (1) The skid control ECU determines the wheel slipping conditions by receiving signals from each speed sensor, the yaw rate and deceleration sensor and the steering angle sensor. The ECU controls the engine output torque using electronic throttle control, and the wheel brake pressure using the brake actuator, according to these signals.
 - (2) The SLIP indicator blinks and the skid control buzzer sounds to inform the driver that the VSC system is operating. The SLIP indicator also blinks when TRAC is operating, and the operation being performed is displayed.

2. ACTIVE SAFETY

- (a) ABS (Anti-lock Brake System)

The ABS helps prevent the wheels from locking when the brakes are applied firmly or when braking on a slippery surface.



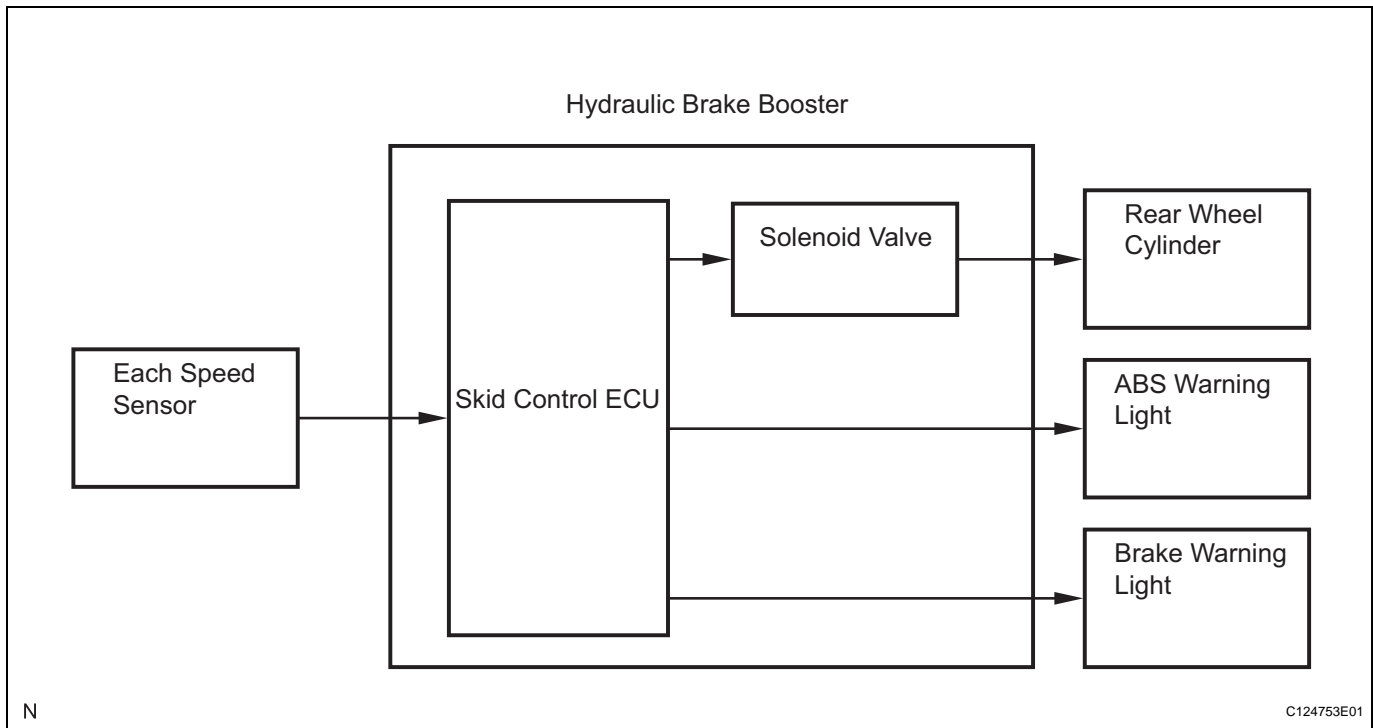
Operation description

The skid control ECU detects the wheel lock condition by receiving vehicle speed signals from each speed sensor, and sends control signals to the pump motor and solenoid valve. The pump motor and solenoid valve prevent the wheels from locking by controlling the oil pressure of each wheel cylinder.

The ABS warning light comes on when the ABS system malfunctions.

(b) EBD (Electronic Brake force Distribution)

The EBD control utilizes ABS, realizing proper brake force distribution between the front and rear wheels in accordance with the driving conditions. In addition, when braking while cornering, it also controls the brake forces of the right and left wheels, helping to control the vehicle behavior.



Operation description

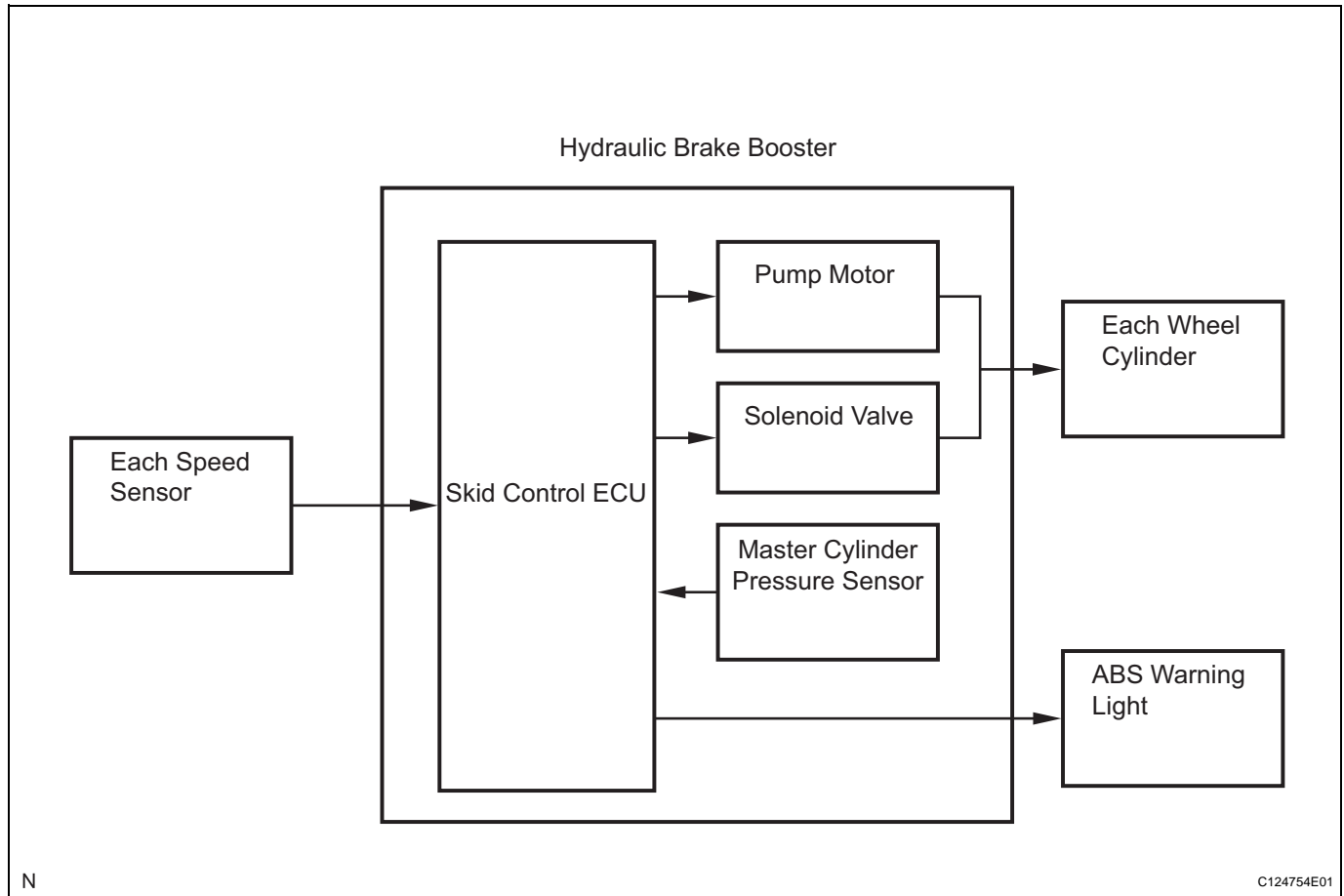
The skid control ECU receives the speed signals from each speed sensor to detect the slip condition of the wheels and sends the control signal to the solenoid.

The solenoid valve controls the oil pressure of the rear wheel cylinder and divides the control power appropriately between the front and rear wheels and the right and left wheels.

Both of the ABS and the brake warning lights come on when the EBD system malfunctions.

(c) BA (Brake Assist)

The primary purpose of the brake assist system is to provide an auxiliary brake force to assist drivers who cannot generate a large enough brake force during emergency braking, thus helping to maximize the vehicle's brake performance.

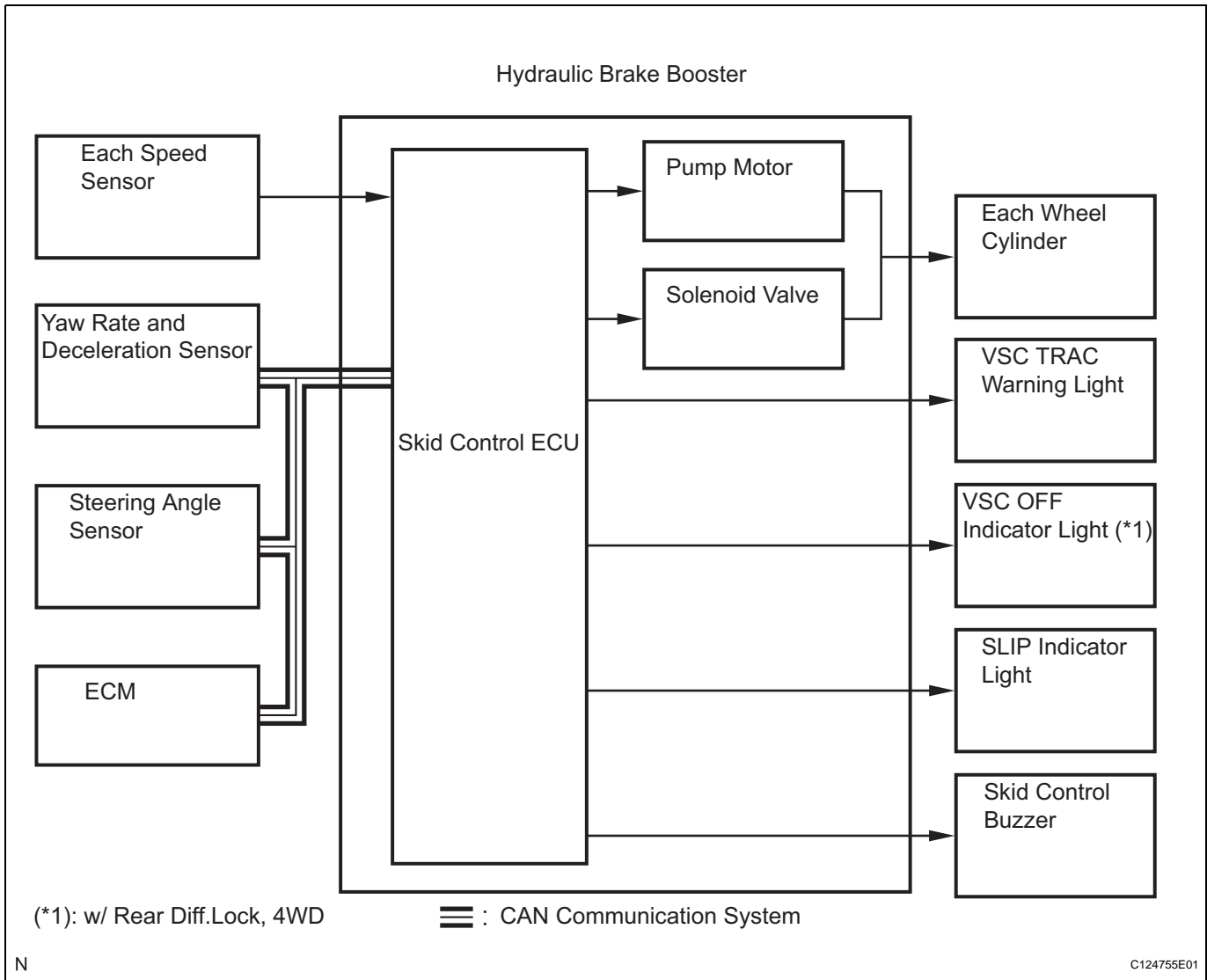


Operation description

The skid control ECU receives the speed signal from each speed sensor and the oil pressure signal from the master cylinder pressure sensor to determine whether brake assist is necessary or not. If brake assist is necessary, the skid control ECU sends control signals to the pump motor and solenoid. The pump and the solenoid valve then control the pressure applied to each wheel cylinder. The ABS warning light comes on when the BA system malfunctions.

(d) VSC (Vehicle Stability Control)

The VSC system helps prevent the vehicle from slipping sideways as a result of strong front wheel skid or strong rear wheel skid during cornering.



Operation description

The skid control ECU determines the vehicle condition by receiving signals from the speed sensors, yaw rate and deceleration sensor and steering angle sensor. The skid control ECU controls the engine torque through the ECM via CAN communication, and the oil pressure through the pump and solenoid valve.

The SLIP indicator light blinks and the skid control buzzer sounds when the system is operating. Both the VSC TRAC warning light and the VSC OFF indicator light (w/ rear diff. lock, 4WD) come on when the VSC system malfunctions.

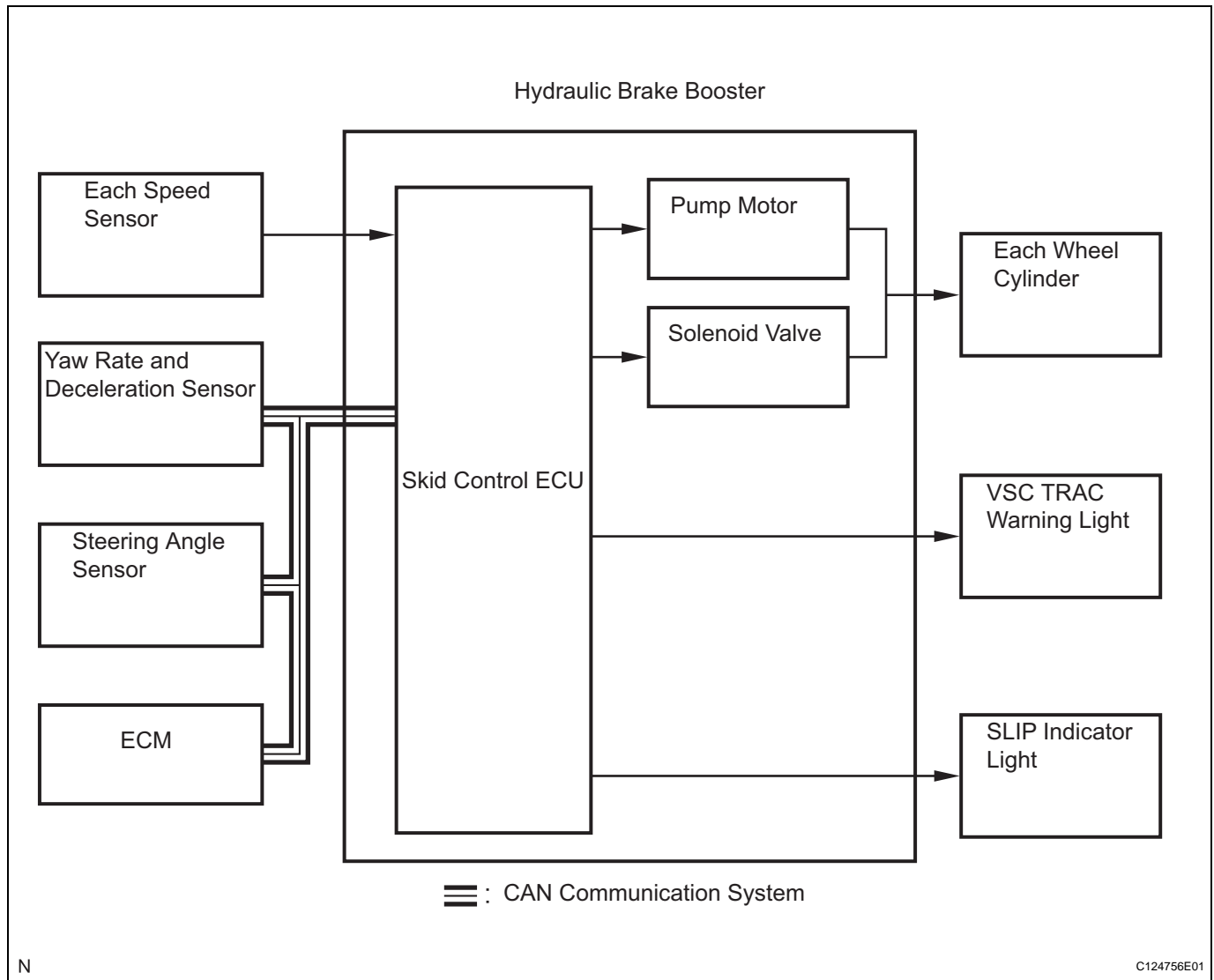
3. DRIVING PERFORMANCE

(a) TRAC (Traction Control)

The TRAC system helps prevent the drive wheels from slipping if the driver presses down on the accelerator pedal excessively when starting off or accelerating on a slippery surface.

HINT:

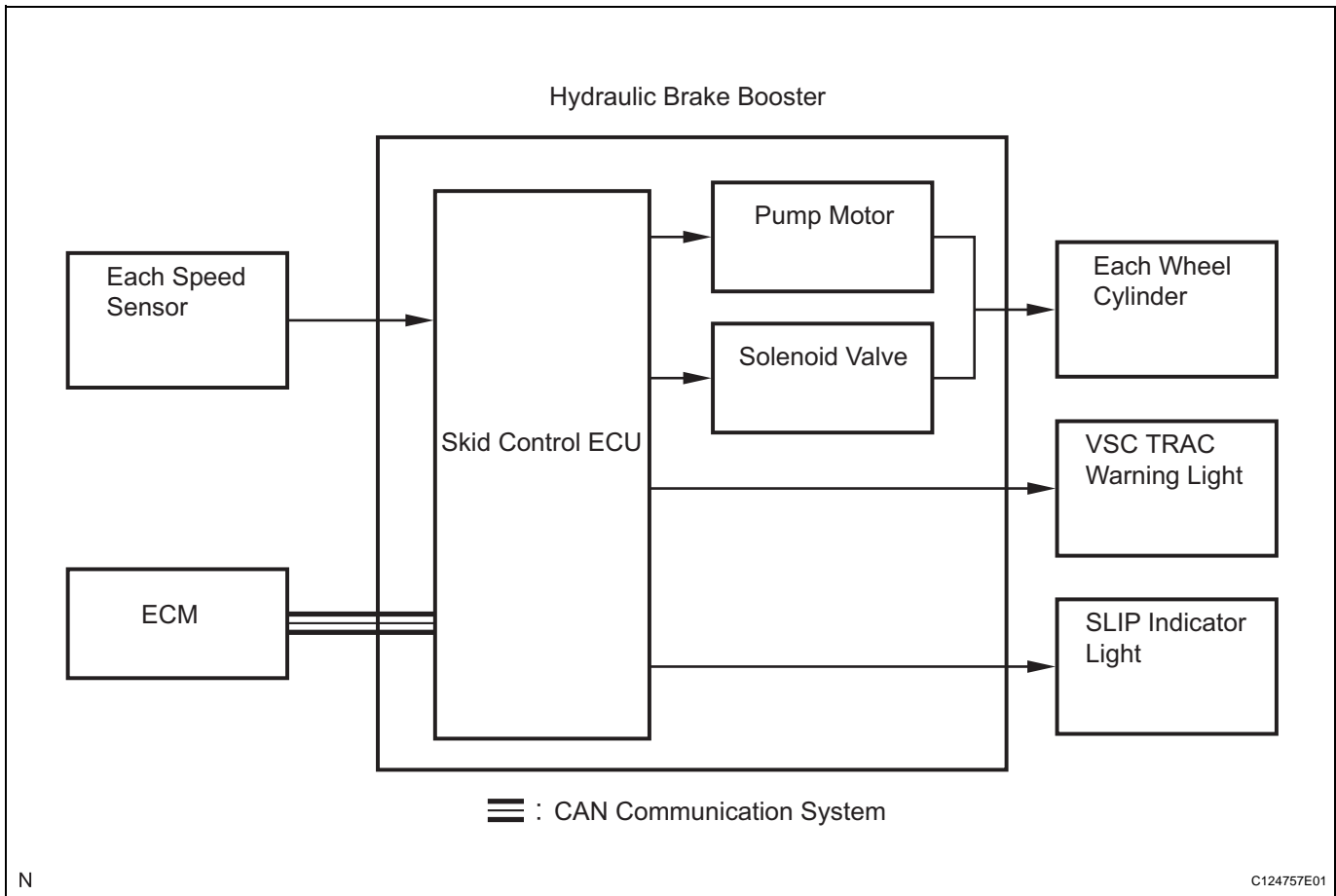
The TRAC system operates when 2WD mode is selected (4WD vehicles only).



Operation description

The skid control ECU detects the vehicle's slip condition by receiving signals from the speed sensors and ECM via CAN communication. The skid control ECU controls the engine torque through the ECM via CAN communication, and the oil pressure through the pump and solenoid valve. The SLIP indicator light blinks when the system is operating. Both the VSC TRAC warning light and SLIP indicator light come on when the TRAC system malfunctions.

- (b) A-TRAC (Active Traction Control) (4WD)
 During rugged off-road driving, this function controls the engine output and the brake fluid pressure that is applied to slipping wheels, and distributes the drive force that would have been lost through the slippage to the remaining wheels in order to achieve a LSD (Limited Slip Differential) effect. As a result, the vehicle's off-road drivability and ability to free itself from moguls have been increased.
 HINT:
 The A-TRAC system operates when 4WD mode is selected (4WD vehicles only).



Operation description

The SLIP indicator light blinks when the system is operating. Both the VSC TRAC warning light and SLIP indicator light come on when the A-TRAC system malfunctions.

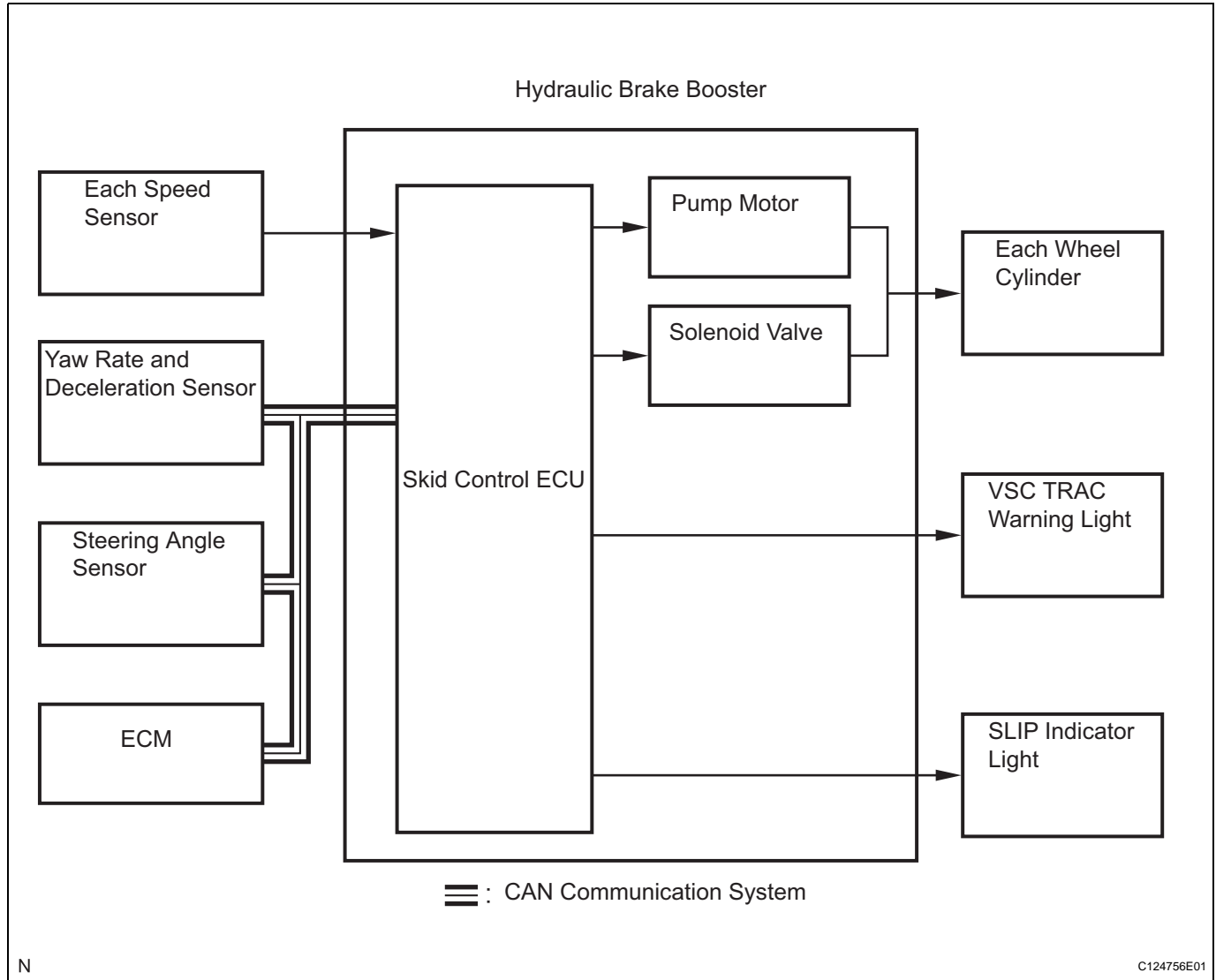
- (c) AUTO-LSD (Auto Limited Slip Differential)
 When the vehicle enters 2WD mode, the AUTO LSD operates with the AUTO LSD switch on and the accelerator pedal depressed.
 The TRAC system restrains brake pressure and reduces differential move, thus transmitting the drive torque to the other drive wheel to ensure stability under the following conditions:
- Wheels run off the road.

- Drive wheels run idle when starting on a slope with one wheel on snow/ice.

HINT:

Depressing the brake pedal cancels control of the AUTO LSD system.

The AUTO LSD system operates when 2WD mode is selected (4WD vehicles only).



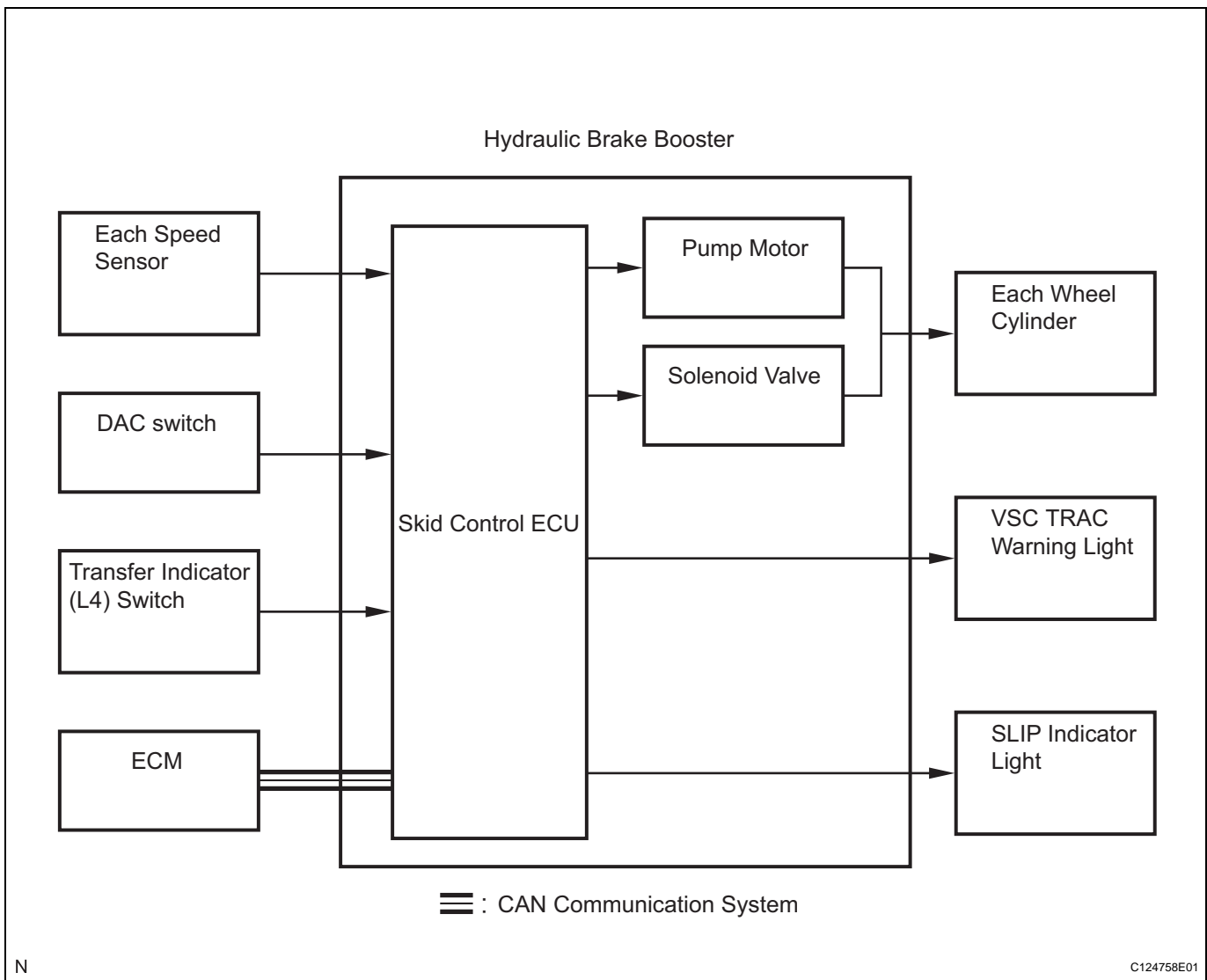
Operation description

The SLIP indicator light blinks and the AUTO LSD indicator light comes on when the system is operating.

Both the VSC TRAC warning light and SLIP indicator light come on when the AUTO LSD system malfunctions.

- (d) DAC (Downhill Assist Control) (4WD)
 When the DAC switch is pressed with the transfer in low (L4) range and without the accelerator and brake pedals in operation, the DAC activates 4-wheel hydraulic pressure control, in order to maintain a constant low vehicle speed without causing the wheels to become locked. Thus, the vehicle can descend steep hills in a stable manner.
HINT:
 Depressing the accelerator and brake pedals cancels control of the DAC system.
 Begins operating when driving down slopes at a speed of 16 mph (25 km/h) or less with the engine brake applied.

BC



Operation description

The SLIP indicator light blinks and the DAC indicator light and BRAKE warning light come on when the system is operating.

The VSC TRAC warning light comes on and the DAC indicator light blinks when the DAC system malfunctions.

(e) HAC (Hill-start Assist Control)

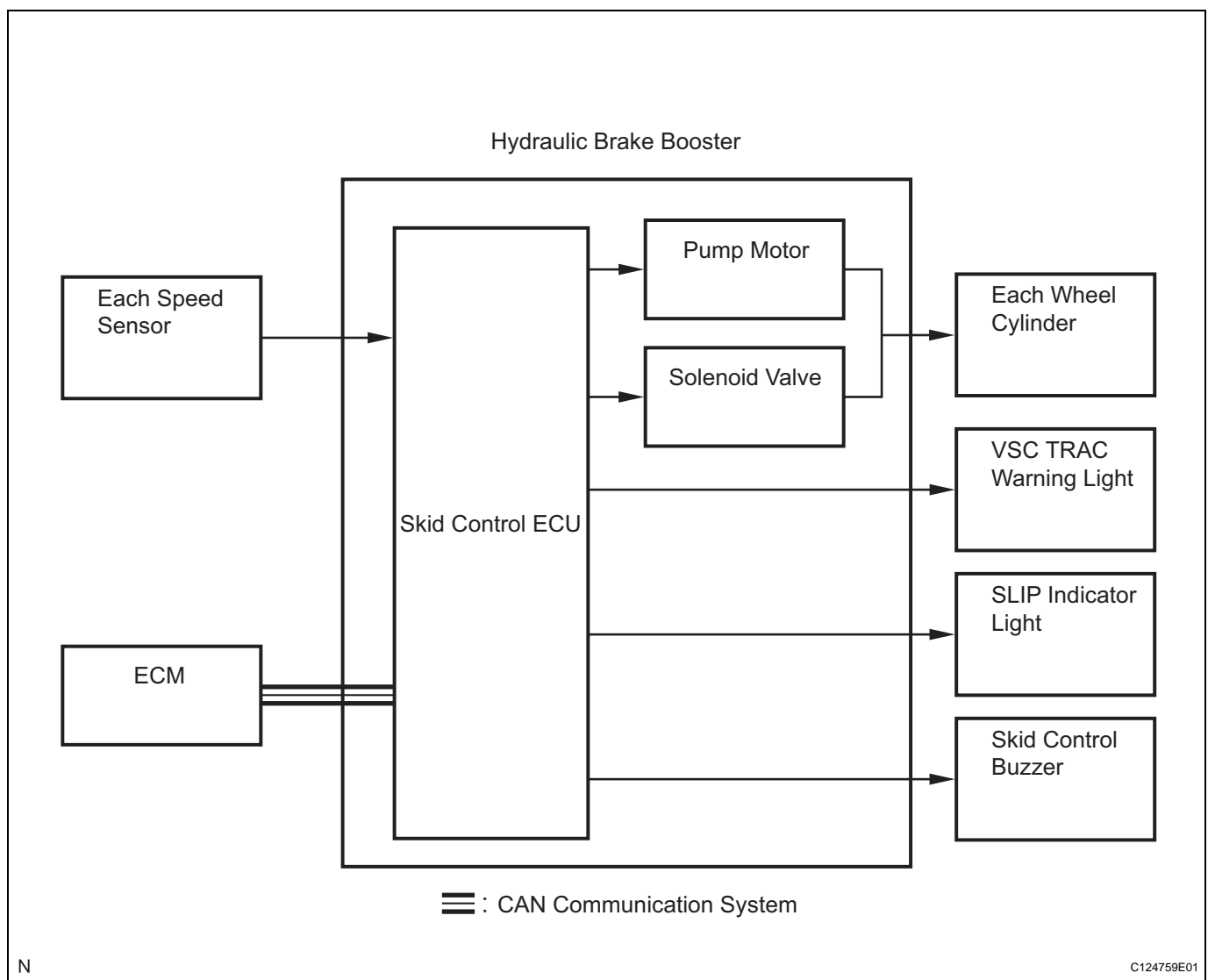
When the vehicle starts off on a steep hill, HAC detects the backward descent of the vehicle and effects 4-wheel hydraulic pressure control to reduce the speed of the vehicle.

For a Maximum of 5 seconds after the control starts, fluid pressure is gradually released and the control is complete.

HINT:

Depressing the brake pedal cancels control of the HAC system.

Does not operate when the shift lever is in the P position or N position, or when the vehicle is running/rolling back up a slope with the shift lever in the R position.



Operation description

The SLIP indicator light blinks, the BRAKE warning light comes on, and the skid control buzzer sounds when the system is operating.

The VSC TRAC warning light comes on when the HAC system malfunctions.

4. FUNCTION OF COMPONENTS

Components	Function
Speed sensor	Detects wheel speed of each wheel.
Hydraulic brake booster	Upon receiving brake control signal from skid control ECU, controls hydraulic circuit and sends hydraulic pressure to each wheel. Master cylinder solenoid (skid control ECU) removable.
Master cylinder solenoid Skid control ECU	Detects vehicle condition based on signals from sensors and sends brake control signal to hydraulic brake booster.
Motor relay	Supplies power source to pump motor.
Solenoid relay	Supplies power source to each solenoid.
ABS warning light	Illuminates to inform driver that skid control ECU has detected ABS system malfunction and terminated ABS system operation.
BRAKE warning light	Illuminates to inform driver that skid control ECU has detected BRAKE system malfunction.
VSC TRAC warning light	Illuminates to inform driver that skid control ECU has detected VSC system malfunction and terminated VSC system operation.
SLIP indicator light	Blinks to inform driver that TRAC or VSC in operation.
Yaw rate and deceleration sensor	Detects vehicle's yaw rate and deceleration and sends signal to skid control ECU.
Master cylinder pressure sensor	Built into hydraulic brake booster. Detects pressure inside master cylinder.
Steering angle sensor	Detects steering wheel's steering angle and amount of movement, then sends signal to skid control ECU.
ECM	<ul style="list-style-type: none"> Sends sensor signals (throttle opening angle, engine rpm) to skid control ECU. Engine controlled based on traction control signal from skid control ECU.