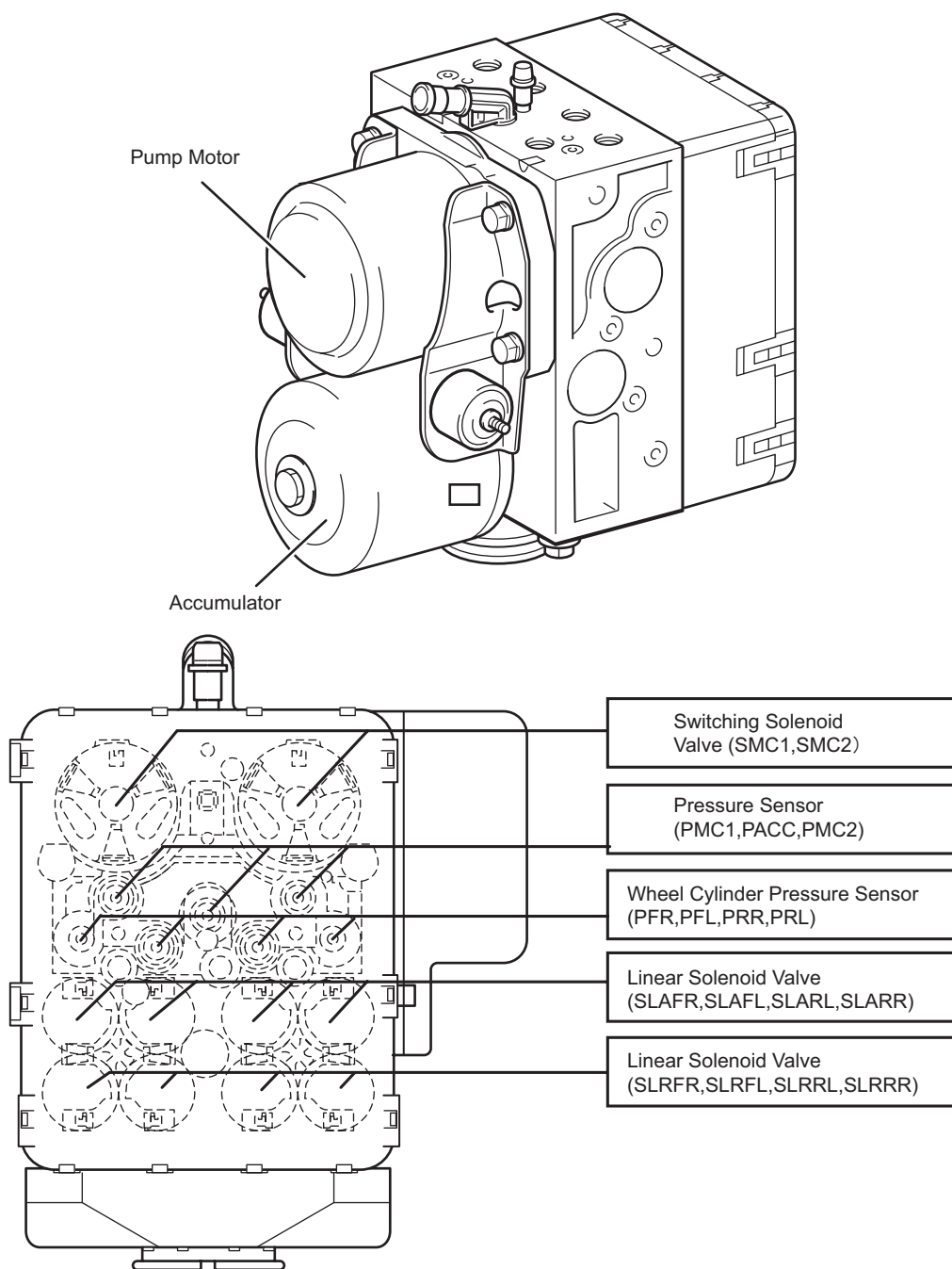
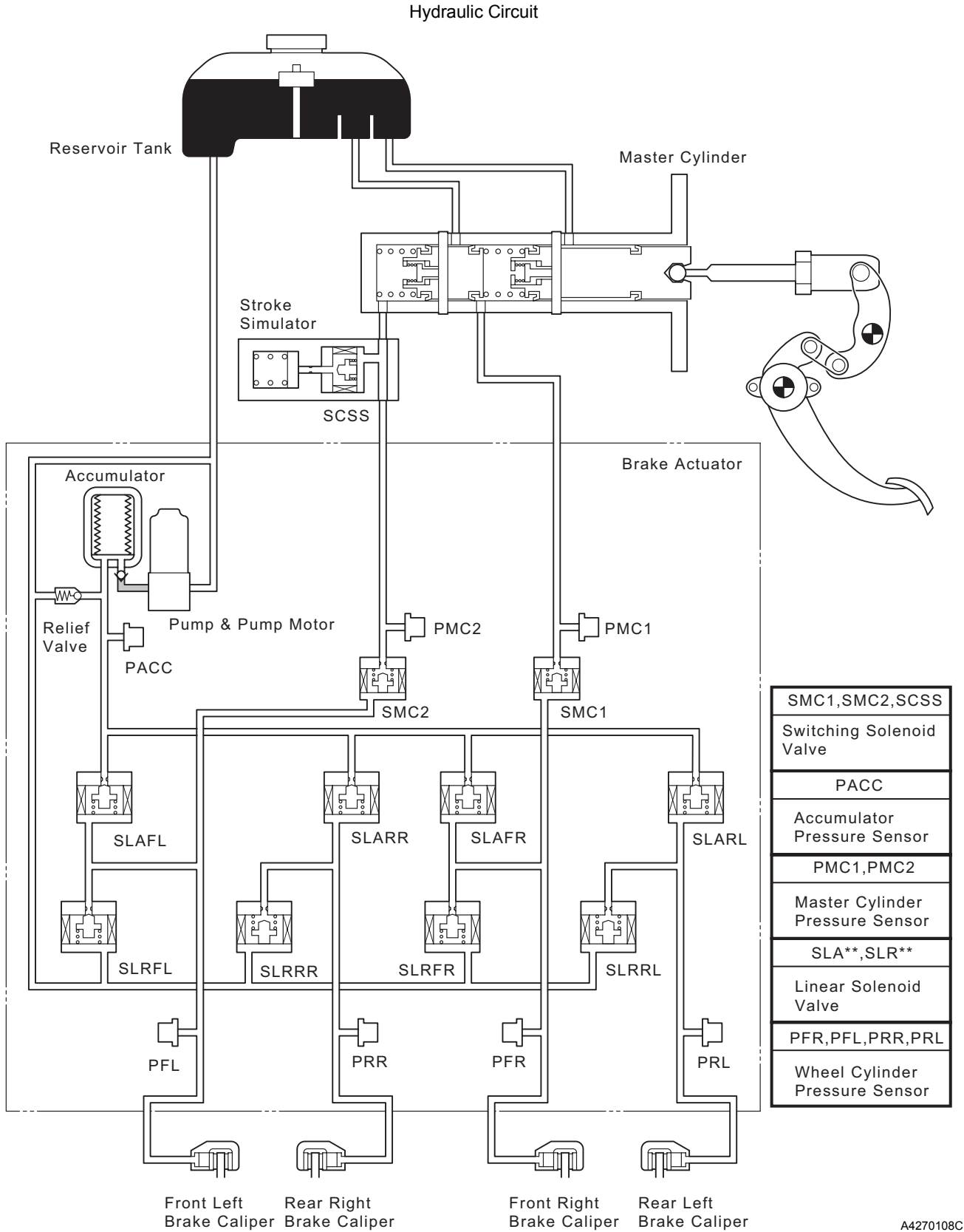


Brake Actuator

- The brake actuator consists of the following components: switching solenoid valves (SMC1, SMC2), accumulator pressure sensor (PACC), master cylinder pressure sensors (PMC1, PMC2), wheel cylinder pressure sensors (PFR, PFL, PRR, PRL), and linear solenoid valves (SLAFR, SLAFL, SLARL, SLARR, SLRFR, SLRFL, SLRRL, SLRRR).



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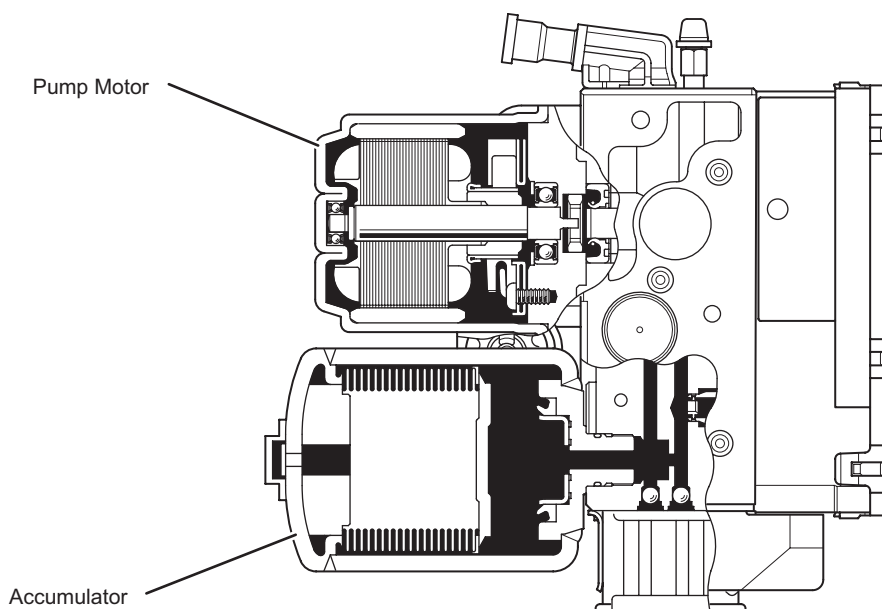


Main Components and Functions

	Item	Functions
Master Cylinder	Piston,Cylinder	Generates pressure in accordance with the pedal effort.
	Reservoir	Stores brake fluid for the master cylinder system and power supply system.
	Reservoir Level Warning Switch	Detects a drop in the brake fluid level in the reservoir.
Stroke Simulator	Stroke Simulator	Generates a natural pedal stroke in accordance with the pedal effort applied by the driver during system operation. (It is integrated in the master cylinder.)
	Stroke Simulator Cut Valve(SCSS)	Generates a natural pedal stroke in accordance with the pedal effort applied by the driver during system operation.
Brake Actuator	Pump & Motor	Draws brake fluid from the reservoir and supplies high hydraulic pressure to the accumulator.
	Accumulator	Accumulates the hydraulic pressure for the power supply system that is generated by the pump.
	Accumulator Pressure Sensor (PACC)	Monitors the accumulator hydraulic pressure and outputs control signals to the pump motor.
	Relief Valve	If the pump operates continuously due to a malfunction of the accumulator hydraulic pressure sensor, this valve relieves the pressure by returning the brake fluid to the reservoir, thus preventing excessively high pressure from developing in the power supply system.
	Master Cylinder Pressure Sensor(PMC1,PMC2)	Detects the hydraulic pressure that is generated in accordance with the pedal effort applied to the front and rear systems.
	Wheel Cylinder Pressure Sensor(PFR,PFL,PRR,PRL)	Detects the brake hydraulic pressure at the wheel cylinders.
	Switching Solenoid Valve (SMC1,SMC2)	Switches the brake hydraulic pressure passages depending on whether the normal brakes are used, or the ABS, TRC, VSC, or brake assist control is used.
	linear Solenoid Valve(SLA**,SLR**)	Controls the wheel cylinder hydraulic pressure during normal brake operation and ABS, TRC, VSC, and brake assist control. The SLA** solenoids are for pressure increase control, and the SLR** solenoids are for pressure decrease control.

Pump Motor, Accumulator

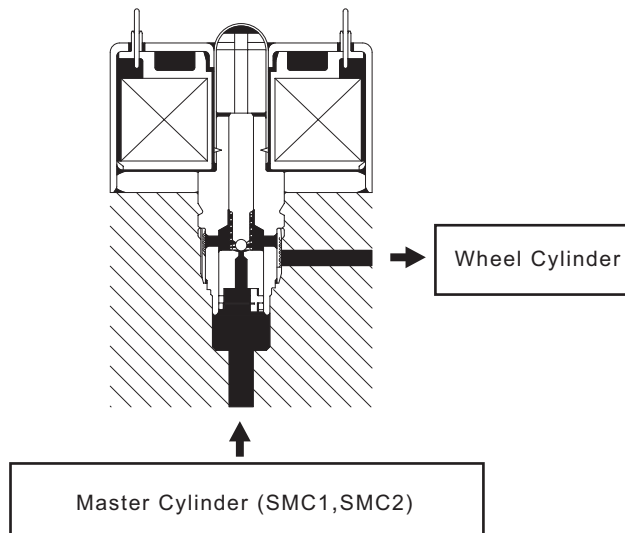
- An electric pump motor is used. The accumulator consists of a metal bellows that seals in nitrogen, and accumulates hydraulic pressure generated by the pump. When the pressure sensor (PACC) detects a drop in the accumulator hydraulic pressure, the skid control ECU causes the contact points of the motor relay to close, allowing the pump motor to operate.
- The pump motor transmits its rotational force to the pump camshaft. Because the camshaft is eccentric to the rotational axis, the pistons in the cylinders that are located along the outer circumference of the camshaft move reciprocally with the rotational movement of the camshaft. A piston draws brake fluid as it moves towards the center and discharges pressurized brake fluid as it moves outward. The discharged brake fluid travels through the check valve and accumulates in the accumulator.
- By performing the aforementioned actions, the pump generates hydraulic pressure (high pressure) for the power supply system that is needed for normal braking, and for the ABS, TRC, VSC, and brake assist operations. When the pressure sensor (PACC) detects a further drop in the accumulator hydraulic pressure, the system illuminates the brake warning light and sounds the buzzer. Then, when the pressure sensor (PACC) detects that the accumulator hydraulic pressure has risen, the system stops the operation of the pump motor. If the pump operates continuously due to a malfunction of the accumulator hydraulic pressure sensor, the relief valve opens to prevent an excessive increase in the pressure.



Switching Solenoid Valve

- The skid control ECU outputs control signals to open and close the valves to switch the brake fluid passages. Two switching solenoids (SMC1, SMC2) are provided, to turn ON and OFF the hydraulic passages from the master cylinder to the wheel cylinders.

SMC1, SMC2



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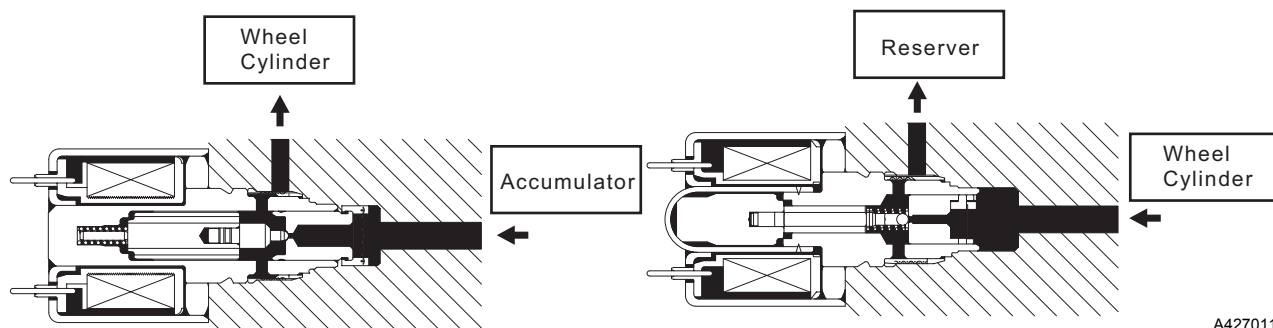
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Linear Solenoid Valve

- The skid control ECU outputs control signals to open and close the valves to control the hydraulic pressure to the wheel cylinders. Two control solenoids are provided per wheel. Thus, a total of eight solenoids are provided for the four wheels. The SLA** solenoids are for pressure increase control, and the SLR** solenoids are for pressure decrease control.

SLA**, SLRF*

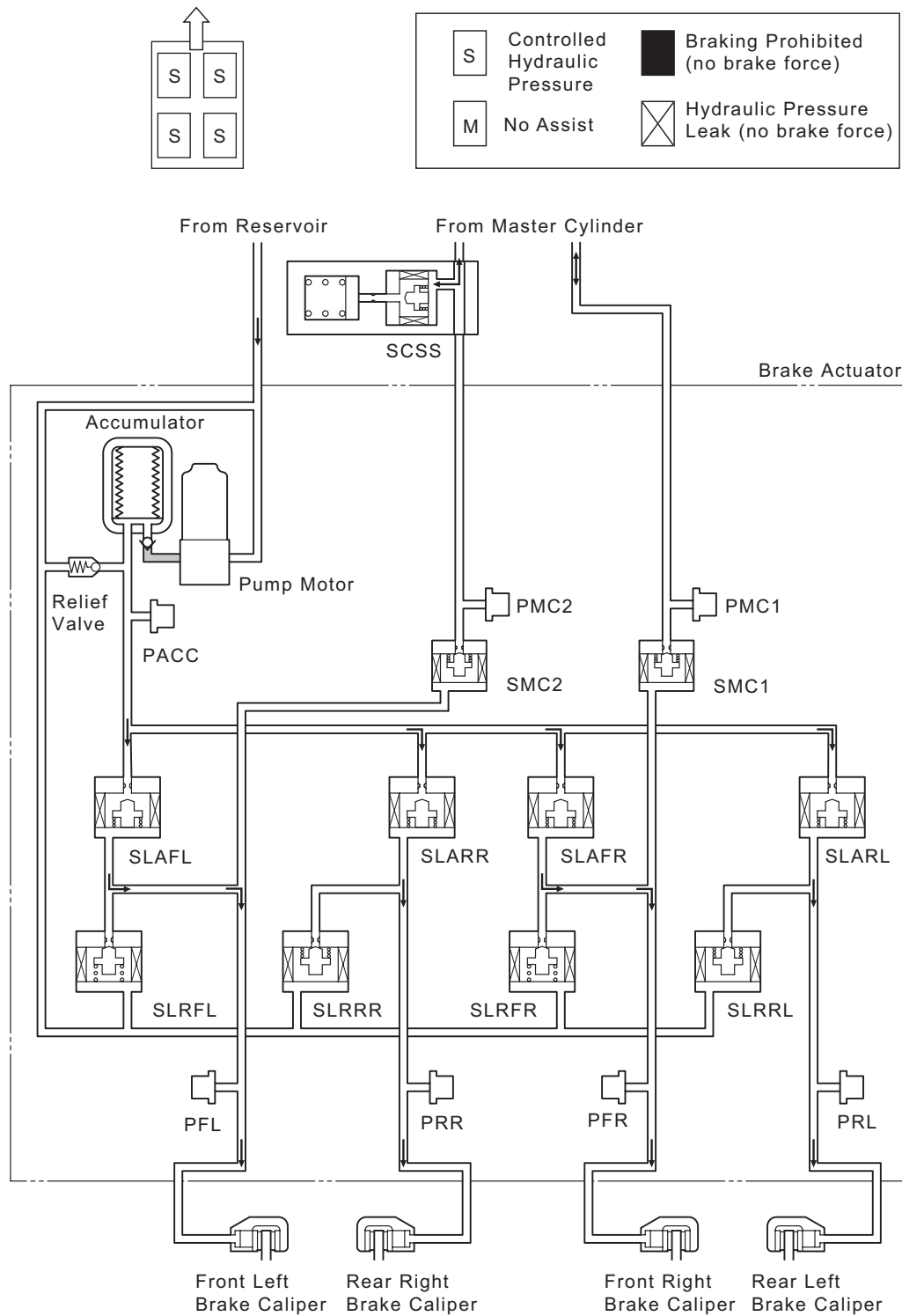
SLRR*



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System Operation (Normal Operation)

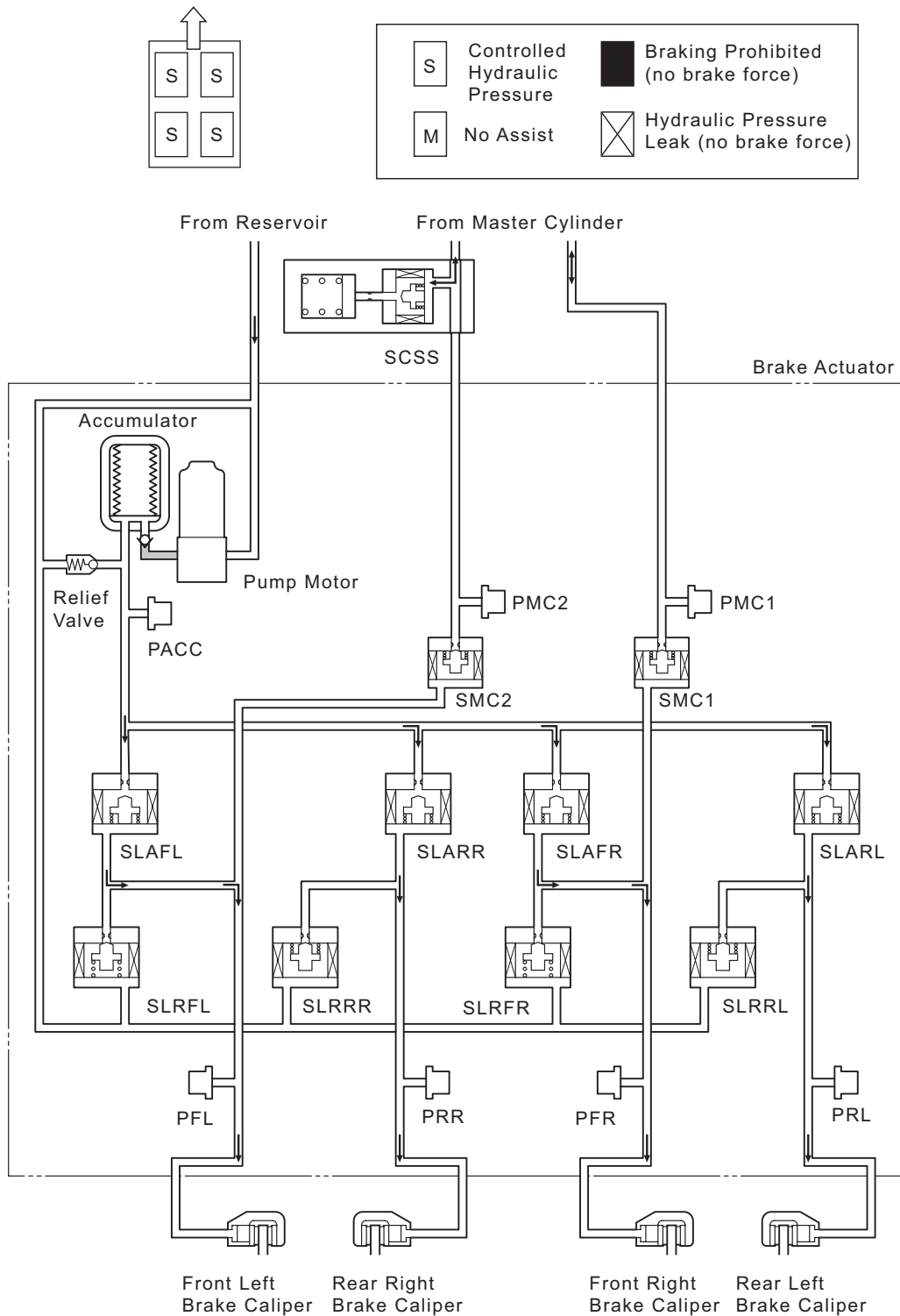
- The SMC1 and SMC2 solenoid valves are closed and the hydraulic pressure circuits to the wheel cylinders become independent. In this state, the system controls the SLA** and SLR** solenoid valves to increase, hold, and decrease the hydraulic pressure to the wheels.



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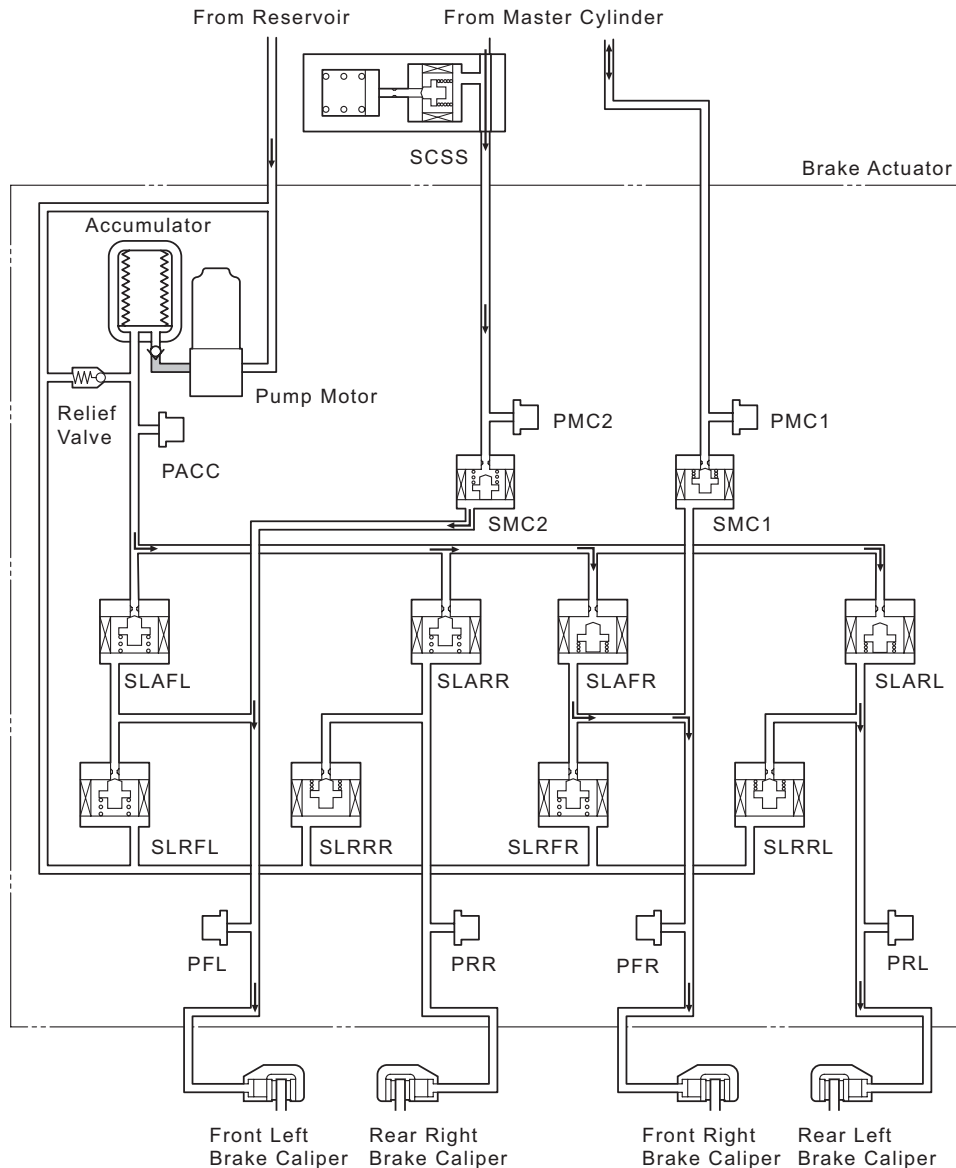
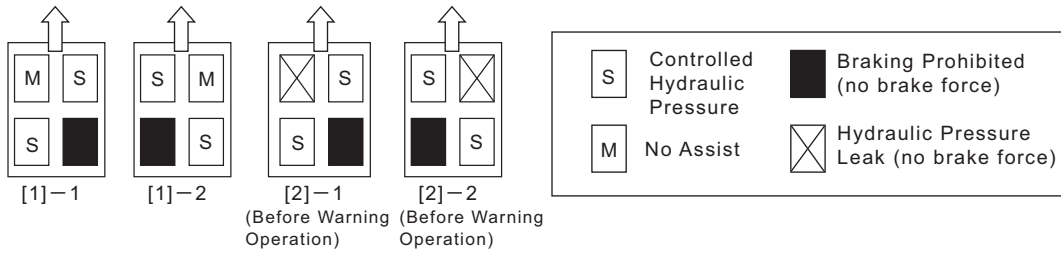
System Operation (Backup Operation During a Failure) Four Wheel Braking

- The system maintains the control of hydraulic pressure to the four wheels in case of a failure in the pedal input sensor (brake pedal stroke sensor, master cylinder pressure sensor) signal, a malfunction in the backup power, or a voltage drop in the vehicle power (12V).



System Operation (Backup Operation During a Failure) Diagonally Opposite Two Wheel Braking + One Wheel Static Pressure

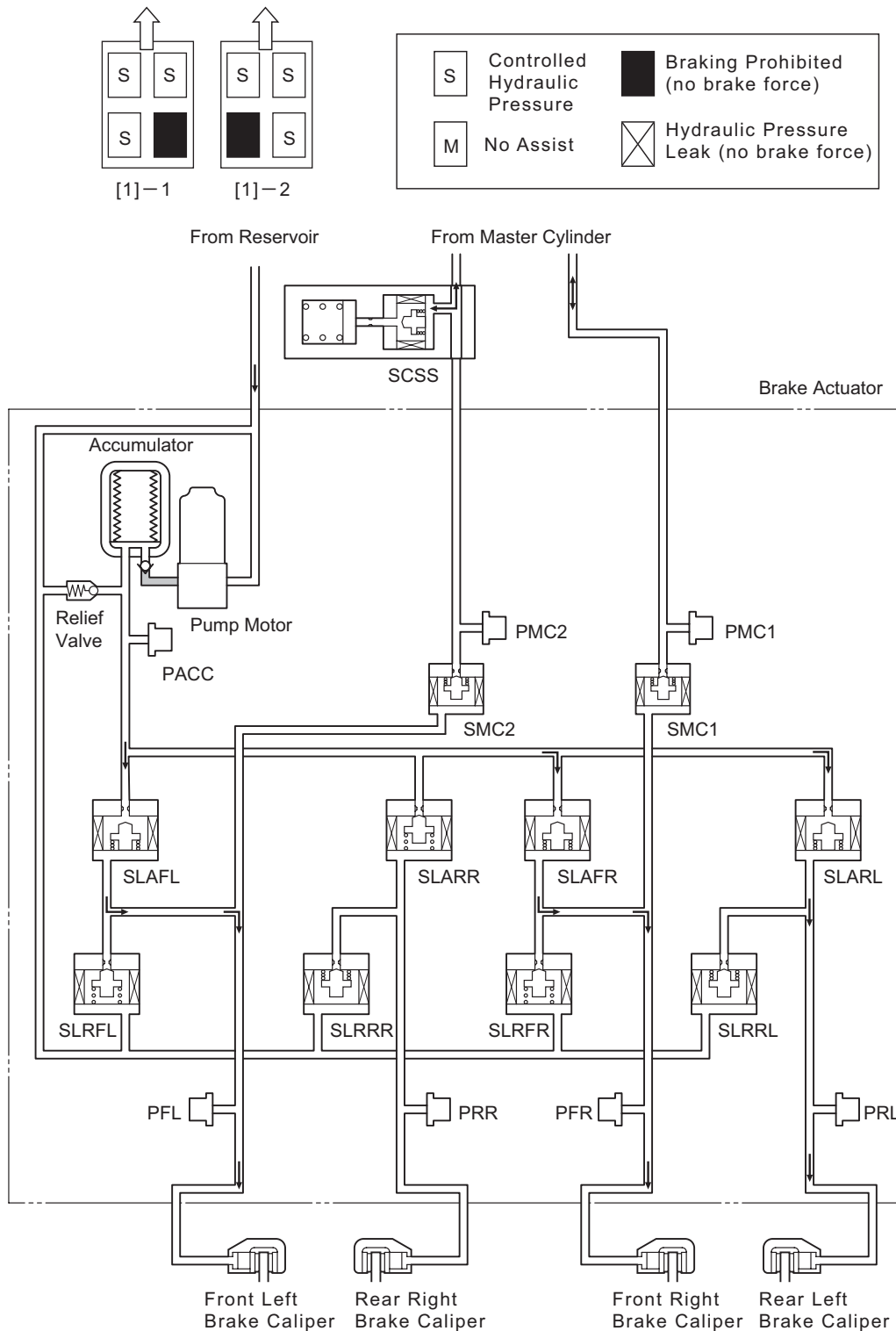
- The system controls the hydraulic pressure to the two diagonally opposite wheels and applies a no-assist brake to one front wheel if any one of the following conditions occurs: a failure in the front wheel system hydraulic pressure sensor (PF*), a malfunction in the control portion of the skid control ECU from the left front wheel to the right rear wheel, a malfunction in the pressure increase or pressure decrease solenoid valve (SLAF*, SLRF*), switching solenoid valve (SMC*), or stroke simulator cut valve (SCSS).



*The above illustration shows the [1]-1 state.

System Operation (Backup Operation During a Failure) Three Wheel Braking

- The system applies the brakes at three wheels, excluding the area with a malfunction, if a failure occurs in a rear wheel system hydraulic pressure sensor (PR*), or a malfunction occurs in a pressure increase or pressure decrease solenoid valve (SLAR*, SLRR*).



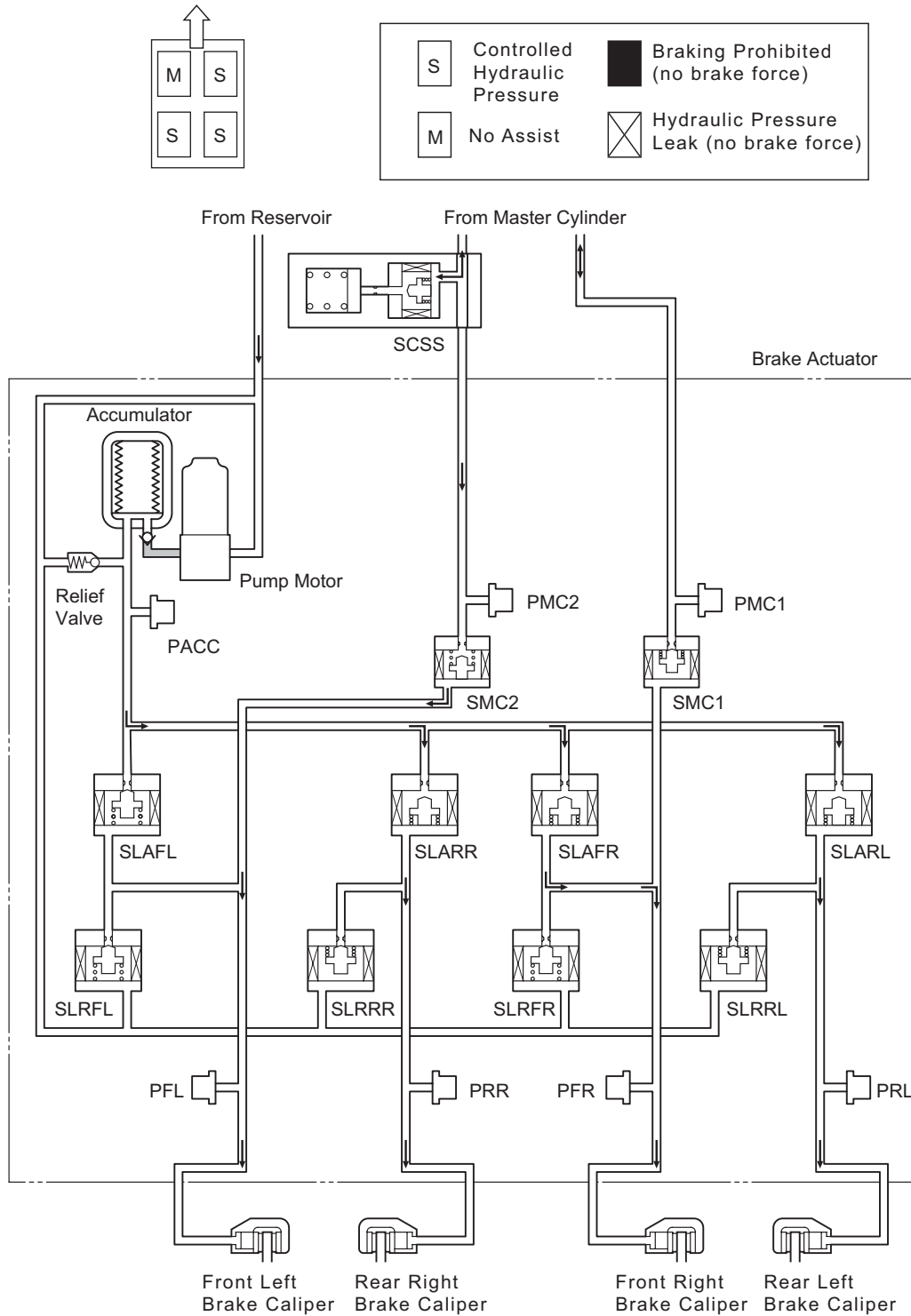
* The above illustration shows the [1]-1 state.

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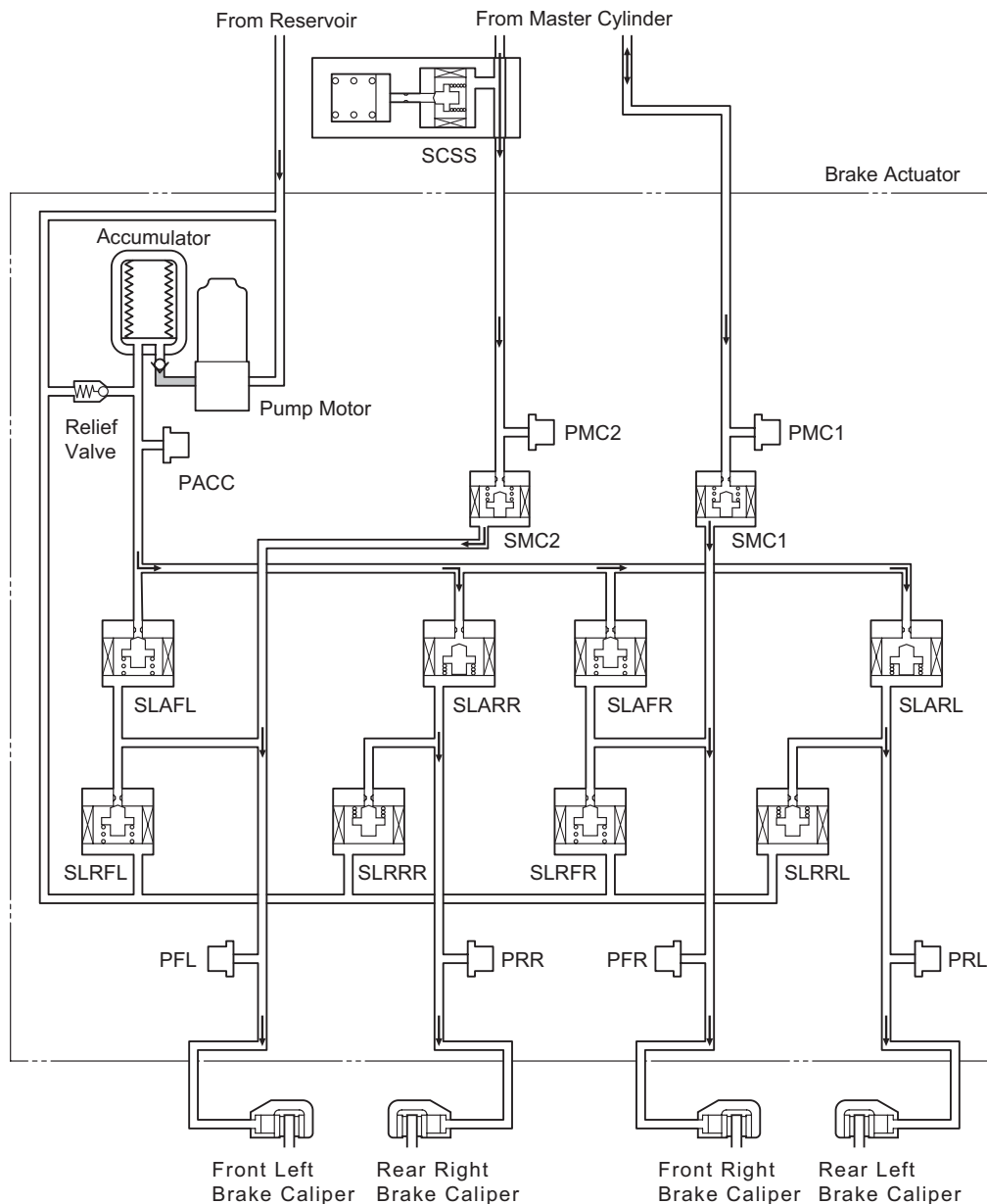
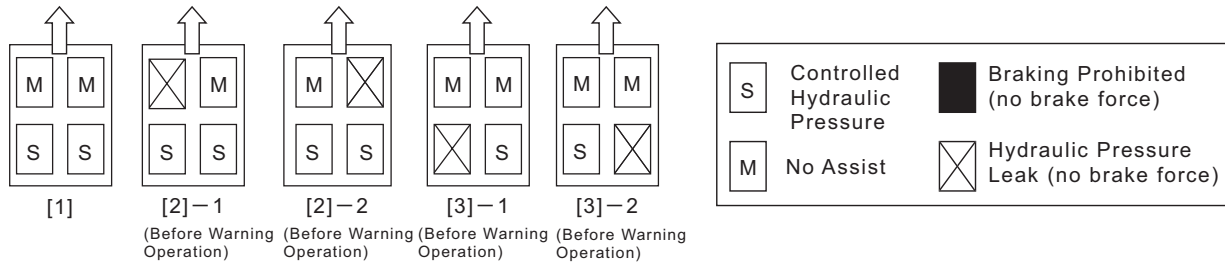
System Operation (Backup Operation During a Failure) Three Wheel Braking + One Wheel Static Pressure

- The system applies no-assist braking to the left front wheel only, if a malfunction occurs in the skid control ECU.



System Operation (Backup Operation During a Failure) Front Two Wheels Static Pressure + Rear Two Wheels Braking

- The system switches to the [1] braking pattern if a failure occurs in the accumulator pressure sensor signal or a malfunction occurs in the pipe from the master cylinder to the brake actuator. The system switches to the [2]-1·2 braking pattern if a malfunction occurs in the pipe in the front wheel system, or to the [3]-1·2 braking pattern if a malfunction occurs in the pipe in the rear wheel system.

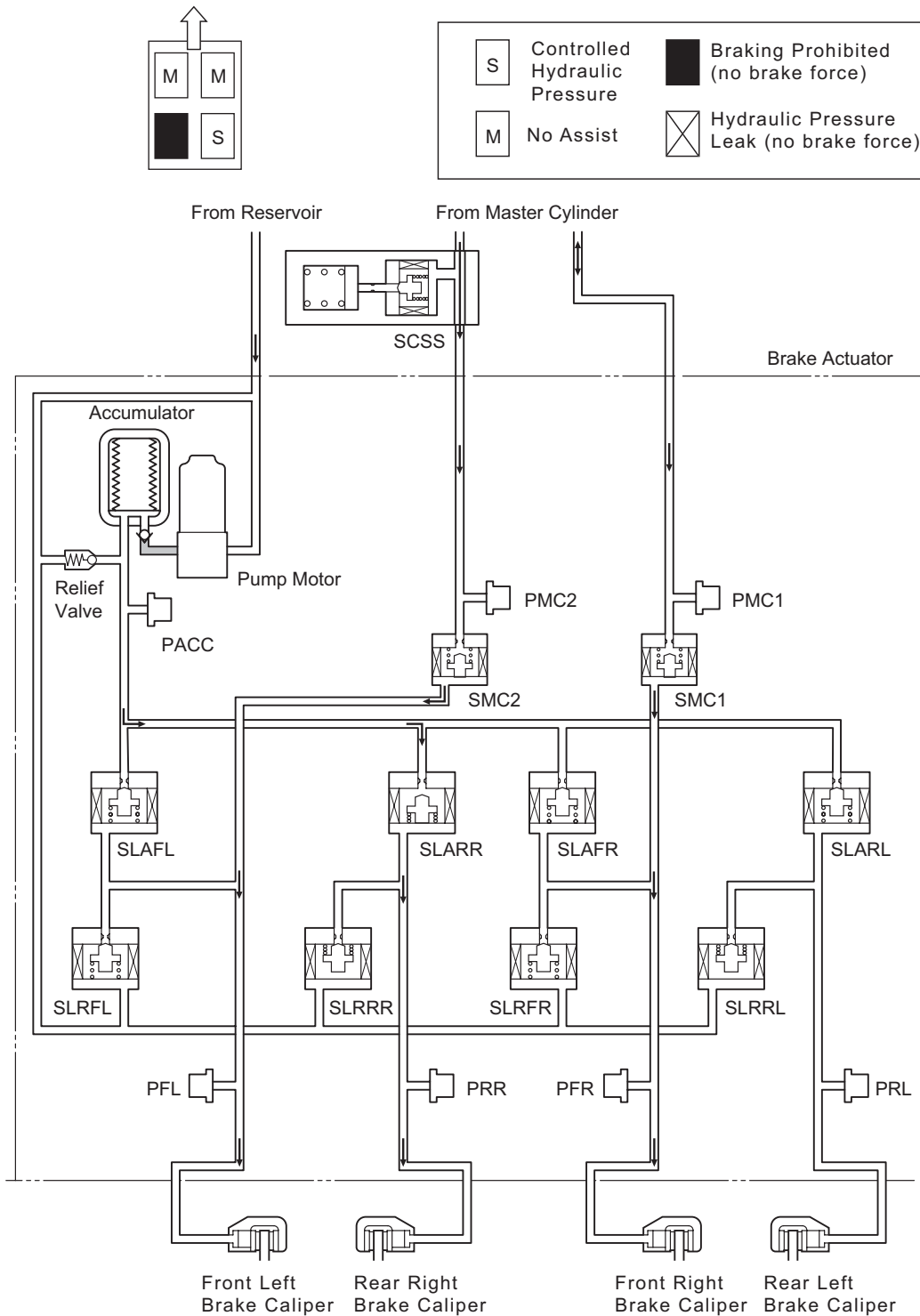


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* The above illustration shows the [1] state.

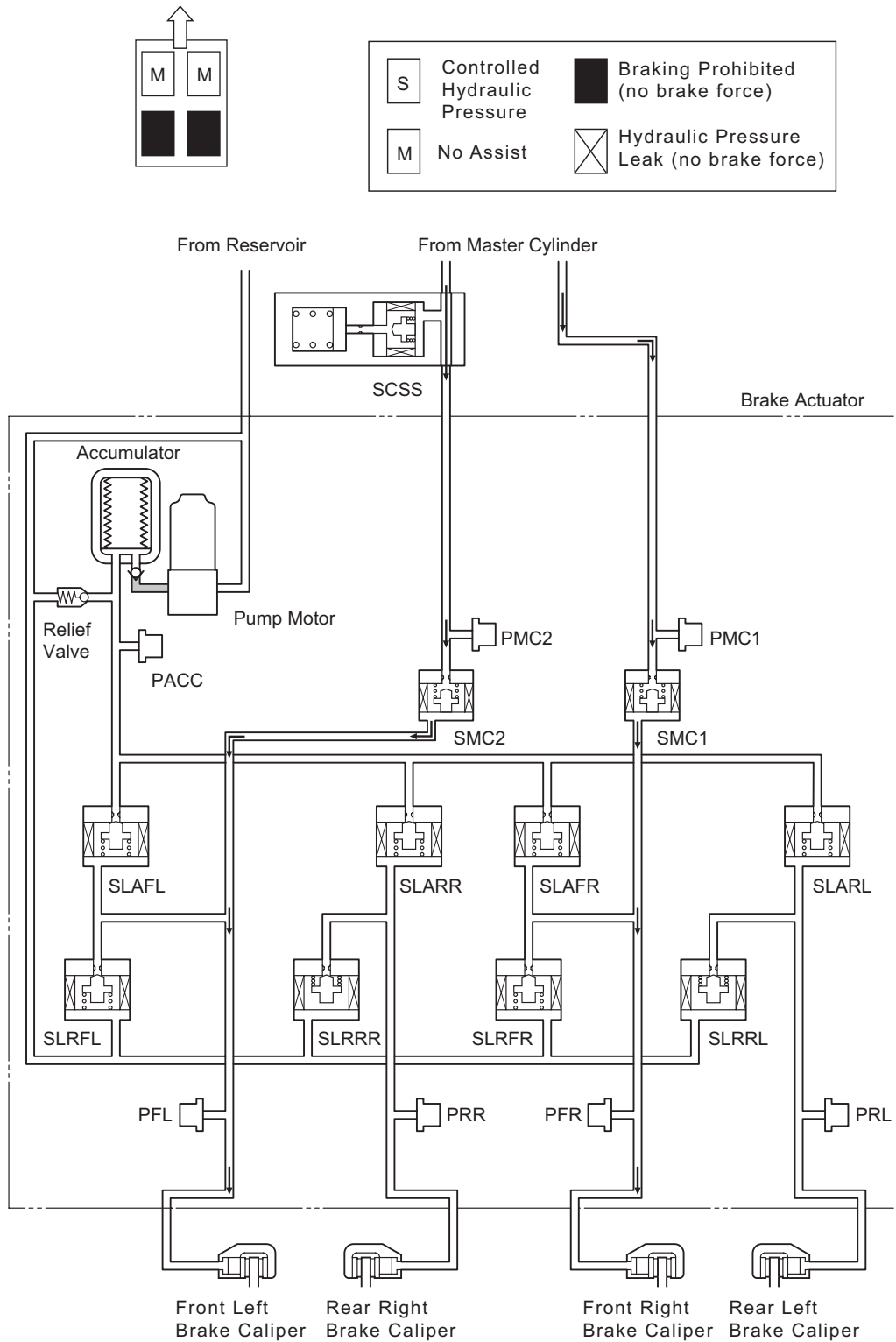
System Operation (Backup Operation During a Failure) Front Two Wheels Static Pressure + Rear One Wheel Braking

- The system switches the front two wheels to no-assist braking and the right rear wheel to controlled hydraulic pressure if a malfunction occurs in the control portion of the skid control ECU from the right front wheel to the left rear wheel.



System Operation (Backup Operation During a Failure) Front Two Wheels Static Pressure

- The system applies no-assist braking only to the front two wheels if the system stops due to a malfunction in the vehicle power (12V) or power supply system (pump motor, accumulator, etc.).



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