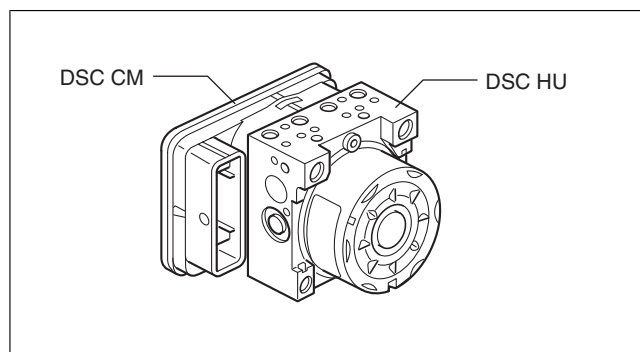


DSC HU/CM

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Outline

- A high reliability, reduced size and weight DSC HU/CM, integrating both the DSC HU and the DSC CM, has been adopted.



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DSC HU Part Purpose/Function

- According to DSC CM signals, the DSC HU controls (on/off) each solenoid valve and the pump motor, adjusts fluid pressure in each caliper piston, and actuates each function (ABS, EBD, TCS, DSC, brake assist control, vehicle roll prevention function, hill launch assist (HLA), roll over mitigation (ROM), TPMS, smart city brake support (SCBS)*, and secondary collision reduction (SCR)) of the DSC system.

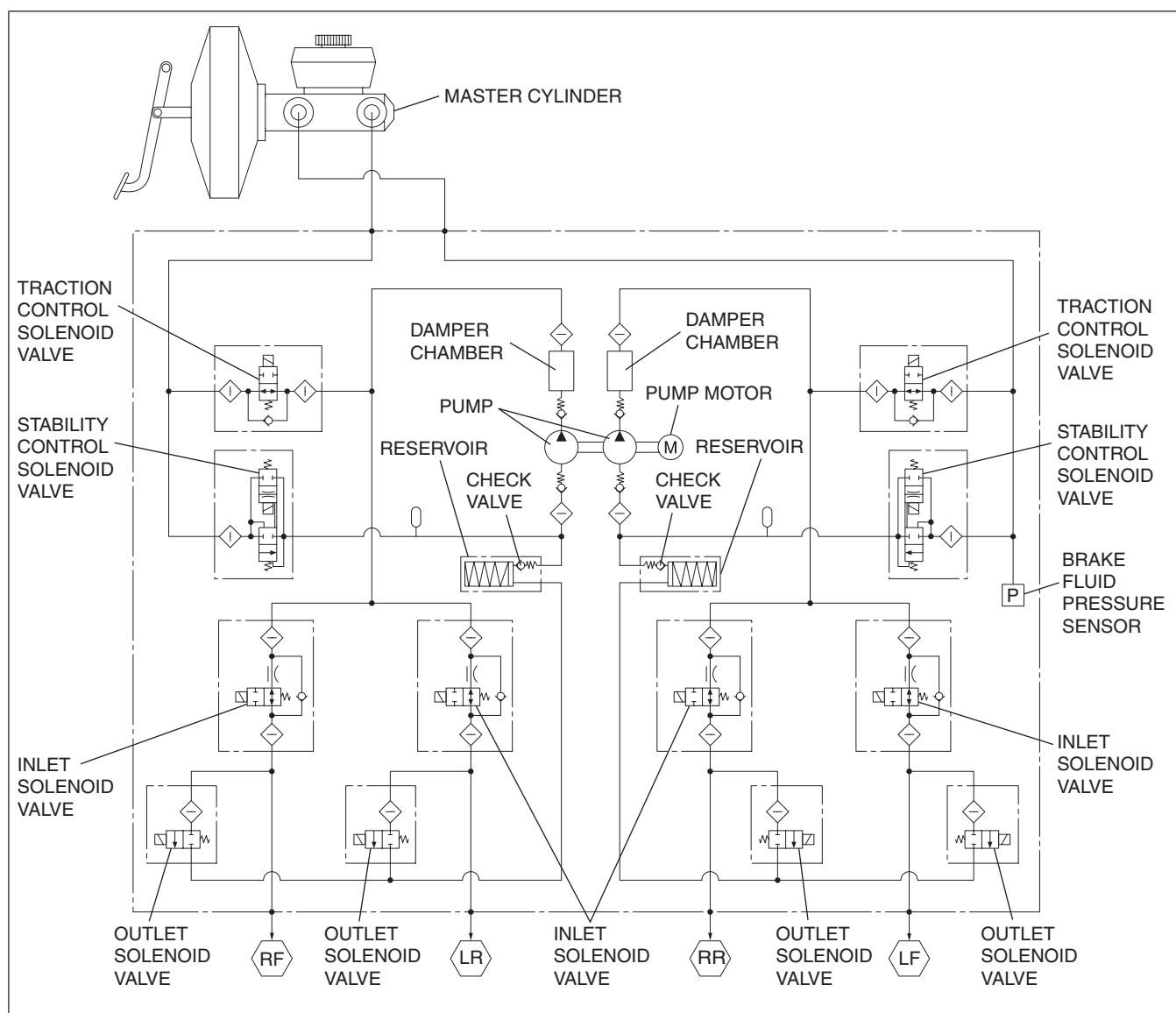
* : Vehicles with smart city brake support (SCBS)

DSC HU Part Construction

- The DSC HU mainly consists of the inlet/outlet solenoid valves, pump motor (pump), traction control solenoid valves, and stability control solenoid valves.

Function of main component parts

Part name	Function
Inlet solenoid valve	• Adjusts the fluid pressure in each brake system according to DSC HU/CM signals.
Outlet solenoid valve	• Adjusts the fluid pressure in each brake system according to DSC HU/CM signals.
Stability control solenoid valve	• Switches the brake hydraulic circuits during and according to normal braking, ABS and EBD control, TCS control, DSC control, and brake assist control.
Traction control solenoid valve	• Switches the brake hydraulic circuits during and according to normal braking, ABS and EBD control, TCS control, DSC control, and brake assist control.
Reservoir	• Temporarily stores brake fluid from the caliper piston to ensure smooth pressure reduction during ABS and EBD control, TCS control, and DSC control.
Pump	• Returns the brake fluid stored in the reservoir to the master cylinder during ABS and DSC control. • Increases brake fluid pressure and sends brake fluid to each caliper piston during TCS control and DSC control.
Pump motor	• Operates the pump according to DSC HU/CM signals.



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DSC HU Part Operation

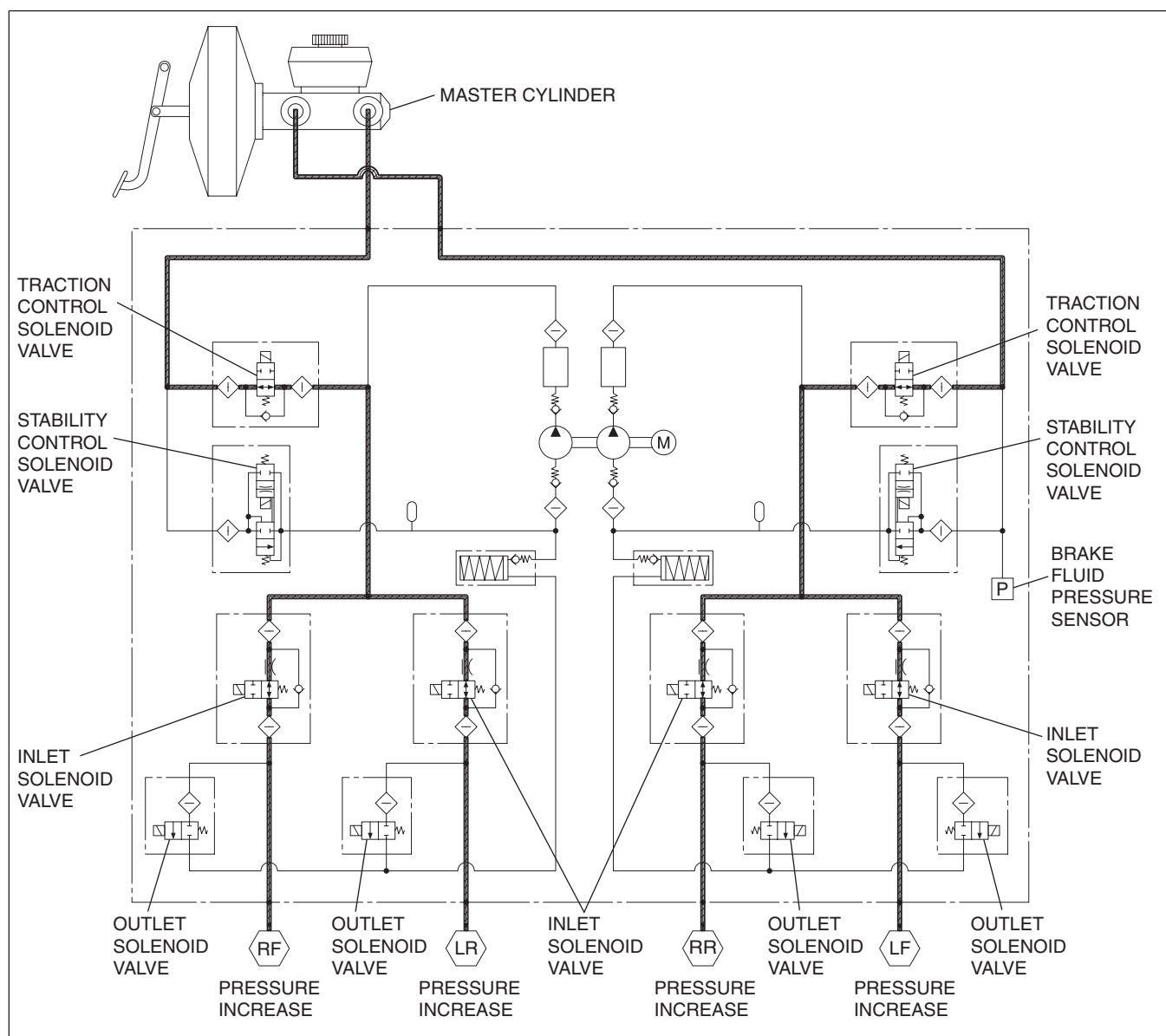
During normal braking

- During normal braking, the solenoid valves are not energized and all of them are off. When the brake pedal is depressed, brake fluid pressure is transmitted from the master cylinder, through the traction control solenoid and inlet solenoid valves, and then to the caliper piston.

Solenoid valve operation table

Traction control solenoid valve		Stability control solenoid valve		Inlet solenoid valve				Outlet solenoid valve				Pump motor, pump
LF—RR	RF—LR	LF—RR	RF—LR	LF	RF	LR	RR	LF	RF	LR	RR	
OFF (open)		OFF (closed)		OFF (open)				OFF (closed)				Stopped

Hydraulic Circuit Diagram



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During ABS and EBD control

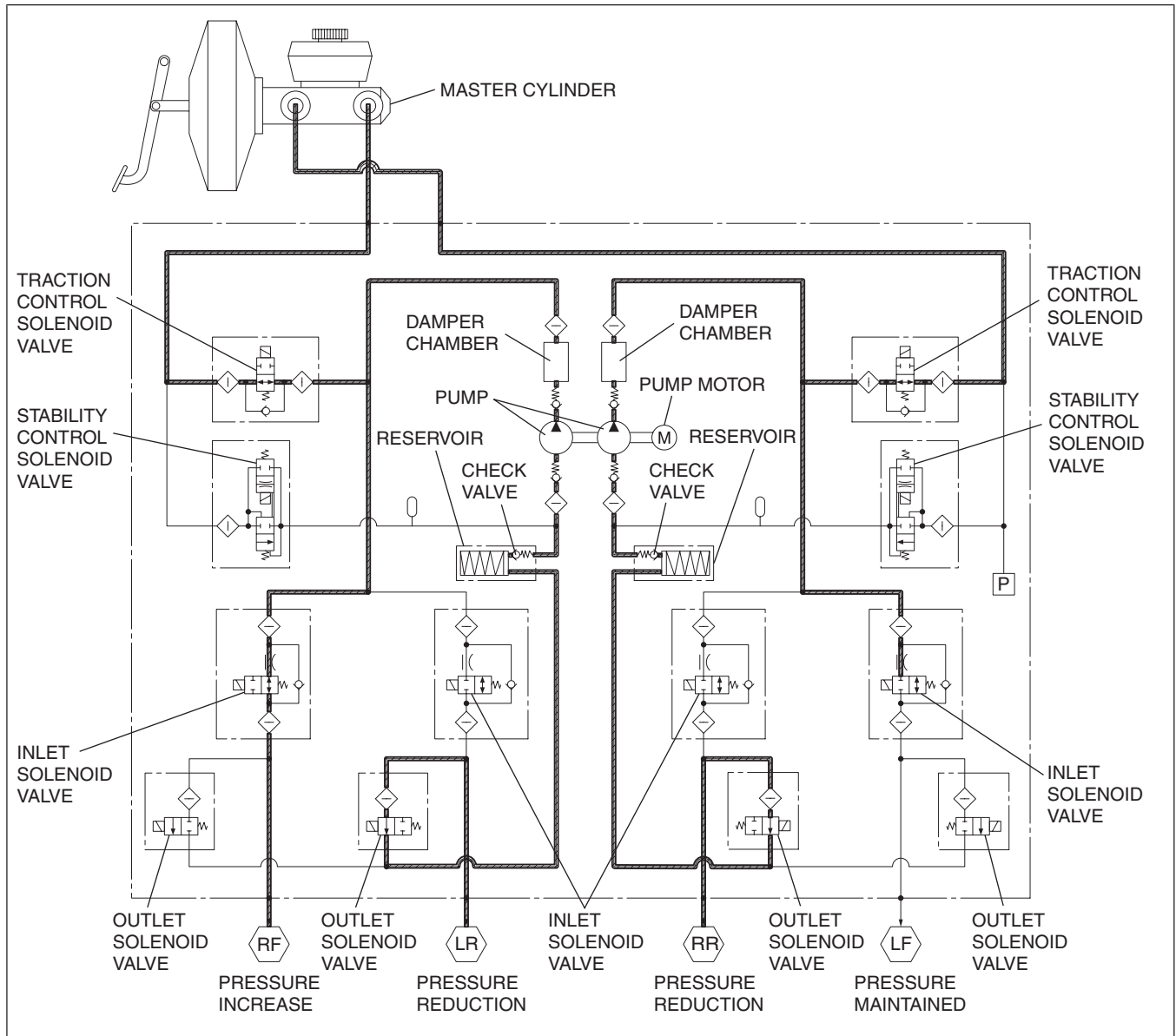
- During ABS and EBD control when wheel lock-up is about to occur, the traction control solenoid and stability control solenoid valves are not energized, and the inlet and outlet solenoid valves are energized and controlled in three pressure modes (increase, reduction or maintain), thereby adjusting brake fluid pressure. Brake fluid during pressure reduction is temporarily stored in the reservoir and afterwards the pump motor operates the pump to return the fluid to the master cylinder. (The following figure shows these conditions: right front wheel pressure increased, left front wheel pressure maintained, and both rear wheels pressure decreased.)

Solenoid valve operation table

	Traction control solenoid valve		Stability control solenoid valve		Inlet solenoid valve				Outlet solenoid valve				Pump motor, pump
	LF—RR	RF—LR	LF—RR	RF—LR	LF	RF	LR	RR	LF	RF	LR	RR	
During pressure increase mode	OFF (open)		OFF (closed)		OFF (open)				OFF (closed)				Stopped
During pressure maintain mode	OFF (open)		OFF (closed)		ON (closed)				OFF (closed)				Stopped

	Traction control solenoid valve		Stability control solenoid valve		Inlet solenoid valve				Outlet solenoid valve				Pump motor, pump
	LF-RR	RF-LR	LF-RR	RF-LR	LF	RF	LR	RR	LF	RF	LR	RR	
During pressure reduction mode	OFF (open)		OFF (closed)		ON (closed)				ON (open)				Operating

Hydraulic Circuit Diagram



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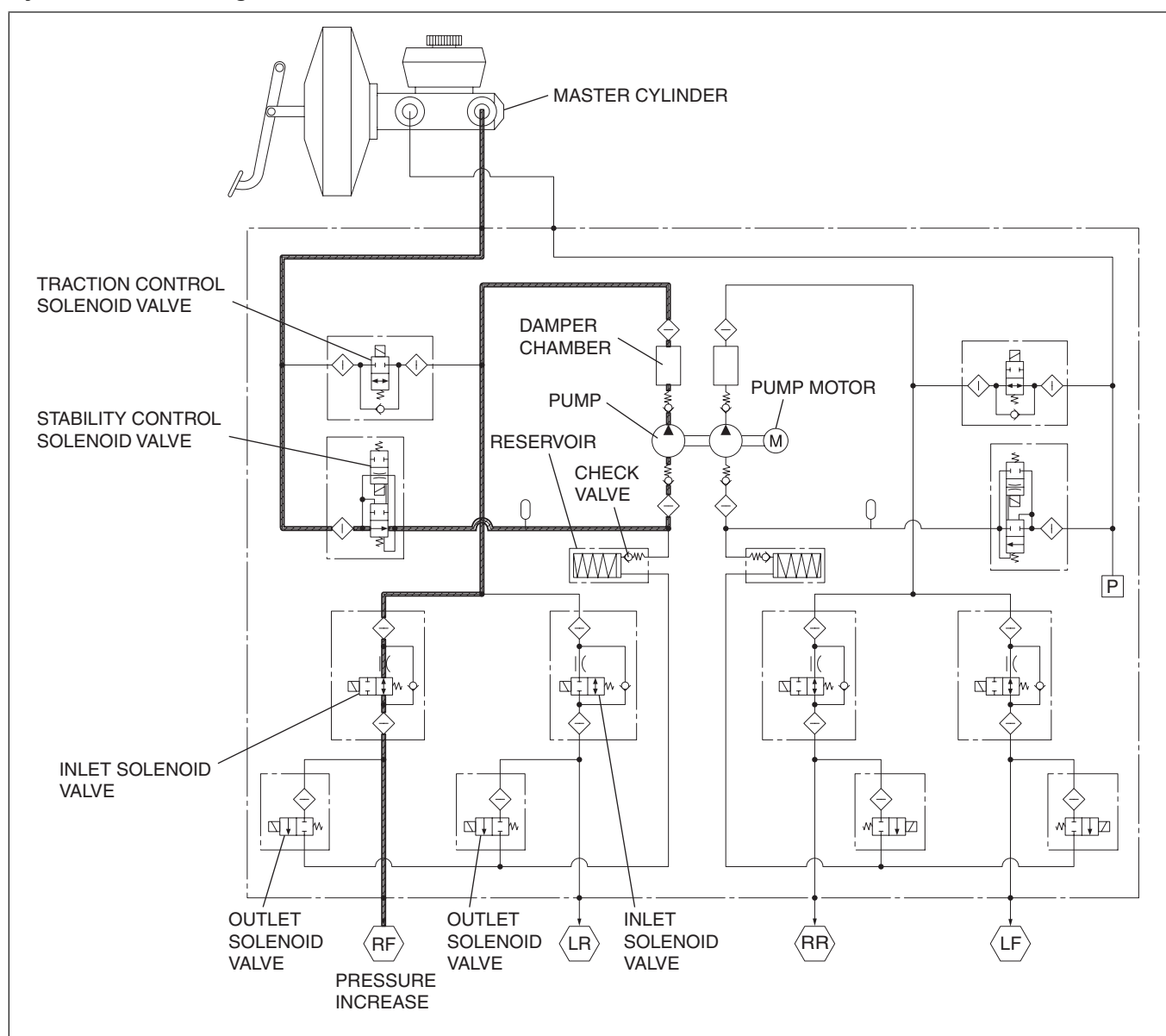
During DSC control (to suppress oversteer tendency) and TCS control

- When a large oversteer tendency or driving wheel spin is determined, the traction control solenoid and stability control solenoid valves are energized, switching the hydraulic circuits. At the same time, the pump motor is actuated to operate the pump, thereby increasing pressure by supplying brake fluid pressure to the caliper piston of the outer front wheel or the slipping driving wheel. Also at this time, the inlet solenoid valve of the inner rear wheel is energized and the hydraulic circuit of this wheel is closed.
- After a pressure increase, brake fluid pressure is adjusted using the three pressure modes (reduction, maintain, increase) so that the target wheel speed is obtained. (The following figure shows a left turn, or control of right front wheel spin (during pressure increase mode).)

Solenoid valve operation table

	Traction control solenoid valve		Stability control solenoid valve		Inlet solenoid valve				Outlet solenoid valve				Pump motor, pump
	LF—RR	RF—LR	LF—RR	RF—LR	LF	RF	LR	RR	LF	RF	LR	RR	
During pressure increase mode	OFF (open)	ON (closed)	OFF (closed)	ON (open)	OFF (open)		ON (closed)	OFF (open)	OFF (closed)				Operating
During pressure maintain mode	OFF (open)	ON (closed)	OFF (closed)		OFF (open)	ON (closed)		OFF (open)	OFF (closed)				Stopped
During pressure reduction mode	OFF (open)	ON (closed)	OFF (closed)		OFF (open)	ON (closed)		OFF (open)	OFF (closed)	ON (open)	OFF (closed)		Operating

Hydraulic Circuit Diagram



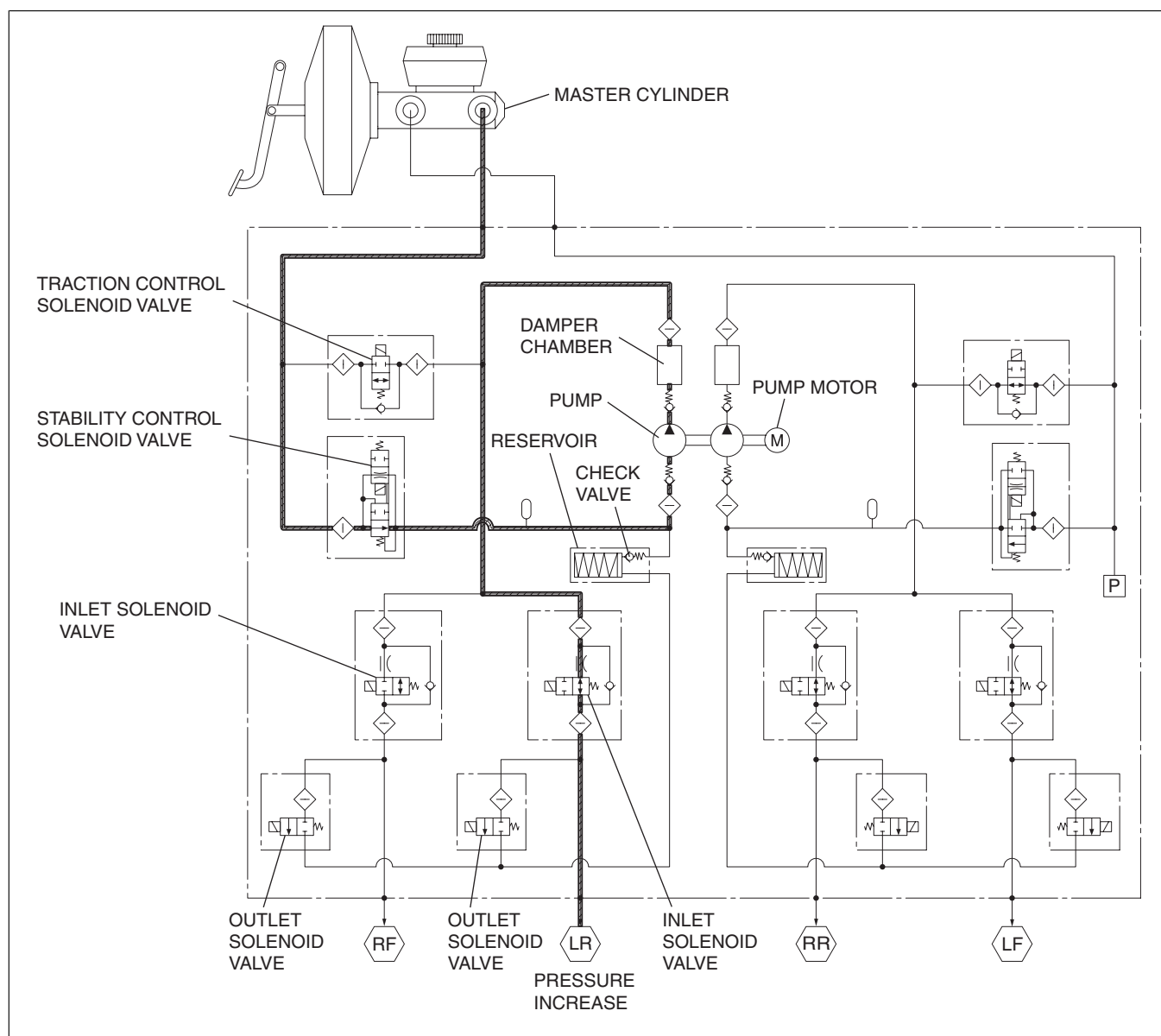
During DSC control (to suppress understeer tendency)

- When a large understeer tendency is determined, the traction control solenoid and stability control solenoid valves are energized, switching the hydraulic circuits. At the same time, the pump motor is actuated to operate the pump, supplying brake fluid pressure from the reservoir to the inner rear caliper piston. Also at this time, the inlet solenoid valve of the outer front wheel is energized and the hydraulic circuit of this wheel is closed.
- After a pressure increase, brake fluid pressure is adjusted using the three pressure modes (reduction, maintain, increase) so that the target wheel speed is obtained. (The following figure shows control during a left turn during pressure increase mode.)

Solenoid valve operation table

	Traction control solenoid valve		Stability control solenoid valve		Inlet solenoid valve				Outlet solenoid valve				Pump motor, pump
	LF—RR	RF—LR	LF—RR	RF—LR	LF	RF	LR	RR	LF	RF	LR	RR	
During pressure increase mode	OFF (open)	ON (closed)	OFF (closed)	ON (open)	OFF (open)	ON (closed)	OFF (open)		OFF (closed)				Operating
During pressure maintain mode	OFF (open)	ON (closed)	OFF (closed)		OFF (open)	ON (closed)		OFF (open)	OFF (closed)				Stopped
During pressure reduction mode	OFF (open)	ON (closed)	OFF (closed)		OFF (open)	ON (closed)		OFF (open)	OFF (closed)	ON (open)		OFF (closed)	Operating

Hydraulic Circuit Diagram



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DSC CM Part Function

- The DSC CM makes calculations using signals input from each sensor, and outputs a brake fluid pressure control signal to the DSC HU to actuate DSC system functions. It also outputs an engine output control signal to the PCM.
- The DSC HU/CM controls the following functions:

Function table

Function name	Contents
ABS control function	Controls brake fluid pressure when braking to maintain directional stability, ensure steerability, and reduce stopping distance.
Electronic brakeforce distribution (EBD) control function	Constantly controls proper distribution of brake fluid pressure to the front and rear wheels according to vehicle load, road surface, and vehicle speed conditions to prevent early lock-up of the rear wheels.
TCS control function	Controls traction to within the road surface friction limit and according to road and driving conditions to improve starting and acceleration performance, and safety.
DSC control function	Suppresses strong over-steer and under-steer tendencies when turning by controlling engine output and braking of each wheel to assure driving safety.
Roll over mitigation (ROM) control function	Suppresses vehicle attitude due to overspeed during evasive steering or cornering by controlling engine speed and wheel braking to improve vehicle stability during cornering.

Function name	Contents
Brake assist control function	<ul style="list-style-type: none"> • The brake pedal depression speed and force is calculated from the brake fluid pressure sensor signal. If it exceeds the specification, an emergency braking situation is determined and a higher amount of hydraulic pressure than the normal specified amount is generated in the hydraulic unit and supplied to each wheel based on the activation of each solenoid valve, pump motor, and pump. • If a condition is detected in which emergency braking is anticipated by the change in speed of the accelerator pedal position, the gap between the brake pad and disc plate is reduced to enhance the response when braking.
Vehicle roll prevention function	<ul style="list-style-type: none"> • For detailed information on the vehicle roll prevention function, refer to VEHICLE ROLL PREVENTION FUNCTION. (See VEHICLE ROLL PREVENTION FUNCTION.)
Hill launch assist (HLA) control function	<ul style="list-style-type: none"> • For detailed information on the hill launch assist (HLA), refer to HILL LAUNCH ASSIST (HLA). (See HILL LAUNCH ASSIST (HLA).)
Tire pressure monitoring system (TPMS) control function	<ul style="list-style-type: none"> • For detailed information on the TPMS, refer to TIRE PRESSURE MONITORING SYSTEM (TPMS). (See TIRE PRESSURE MONITORING SYSTEM (TPMS).)
Smart city brake support (SCBS) control function (vehicles with smart city brake support (SCBS))	<ul style="list-style-type: none"> • For detailed information on the smart city brake support (SCBS), refer to SMART CITY BRAKE SUPPORT (SCBS). (See SMART CITY BRAKE SUPPORT (SCBS).)
Secondary collision reduction (SCR) control function	<ul style="list-style-type: none"> • For detailed information on the secondary collision reduction (SCR), refer to SECONDARY COLLISION REDUCTION (SCR). (See SECONDARY COLLISION REDUCTION (SCR).)
CAN communication function	<ul style="list-style-type: none"> • Outputs the vehicle speed signal and DSC system warning control data via CAN lines.
On-board diagnostic system	<ul style="list-style-type: none"> • A function that allows important parts of the DSC control system to perform self-diagnosis. In case a malfunction occurs, the warning lights illuminate to alert the driver, and at the same time a DTC is stored in the DSC HU/CM. • When a malfunction is determined as a result of the on-board diagnostic test, system control is suspended or limited to prevent any dangerous situation while driving.
Automatic configuration function	<ul style="list-style-type: none"> • When the ignition is switched to ON or the engine is started after the DSC HU/CM have been replaced, the DSC CM reads data from the instrument cluster via CAN communication to perform automatic configuration.

Block diagram

