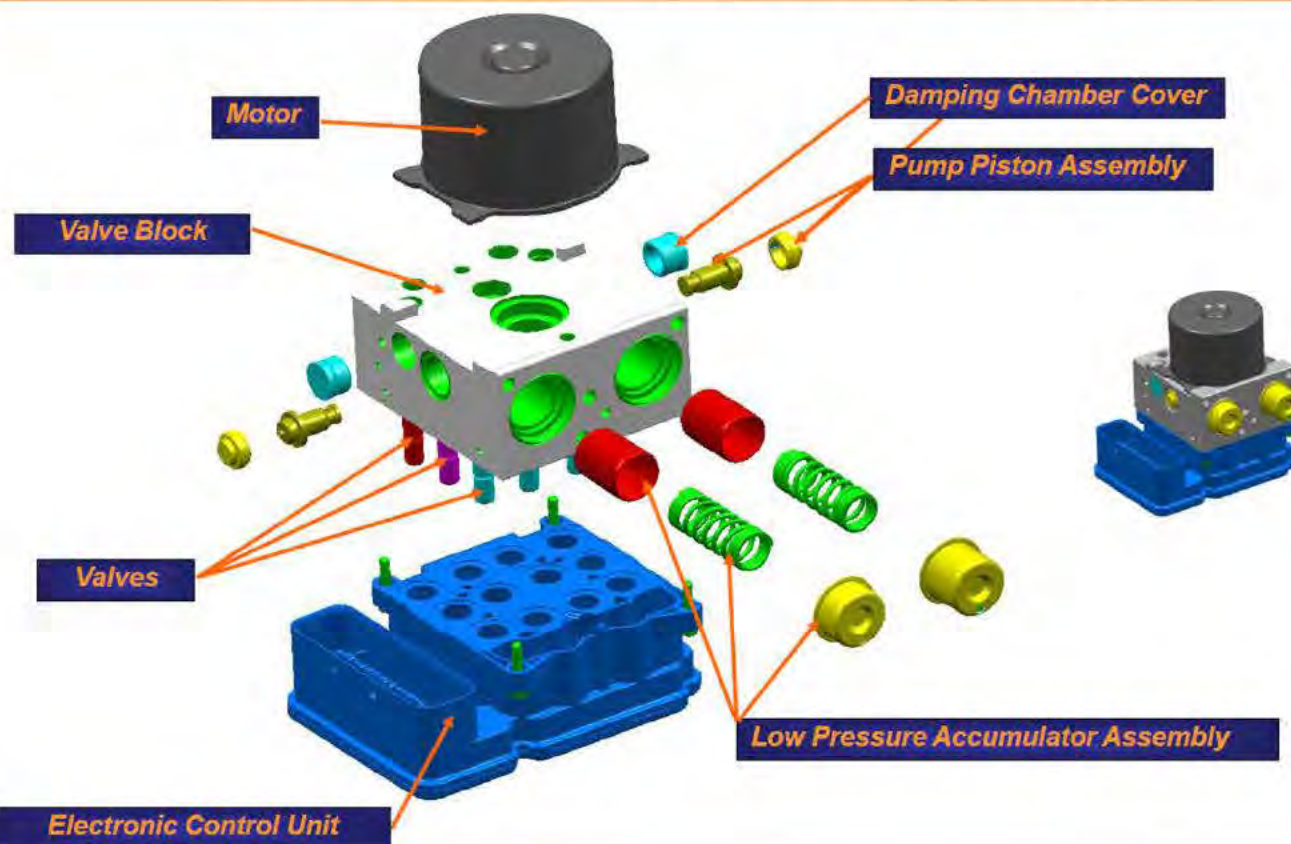


PE16-017

Appendix K

Mar. 9, 2017

ICU Assembly (HCU + ECU)



Continental Automotive Systems
Electronic Brake and Safety Systems

5 / Autor / Druckdatum © Continental AG

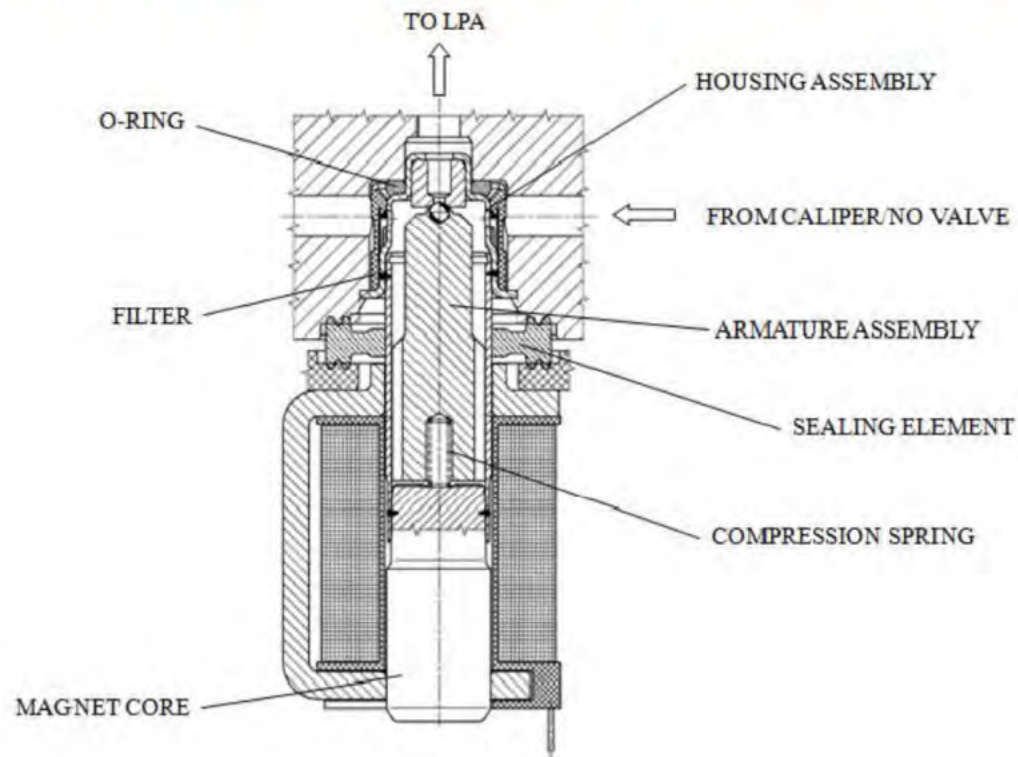
Continental

ABS vs.TCS/ ESC

	ABS		TCS / ESC
Valve Block	Aluminum Housing 8 valve	≠	Aluminum Housing 12 valve
FA normally open valves	2x Class C	=	2x Class C
RA NO valves	2x Class E	=	2x Class E
FA normally closed valves	2x Class C	=	2x Class C
RA NC valves	2x Class E	=	2x Class E
TCS Isolation Valves	N/A	≠	2 x TCS
Electronic Shuttle Valves	N/A	≠	2 x ESV
E-motor	Class 2.0 ABS	≠	Class 2.1 ESC
Pump	ABS Pump	≠	ESC Pump
Low pressure accumulator	2x 3cc	=	2x 3cc
Pressure Sensor	N/A	≠	1x Pressure Sensor
Damping Chamber	2x w/orifice	=	2x w/orifice

Note: = means exact same part number

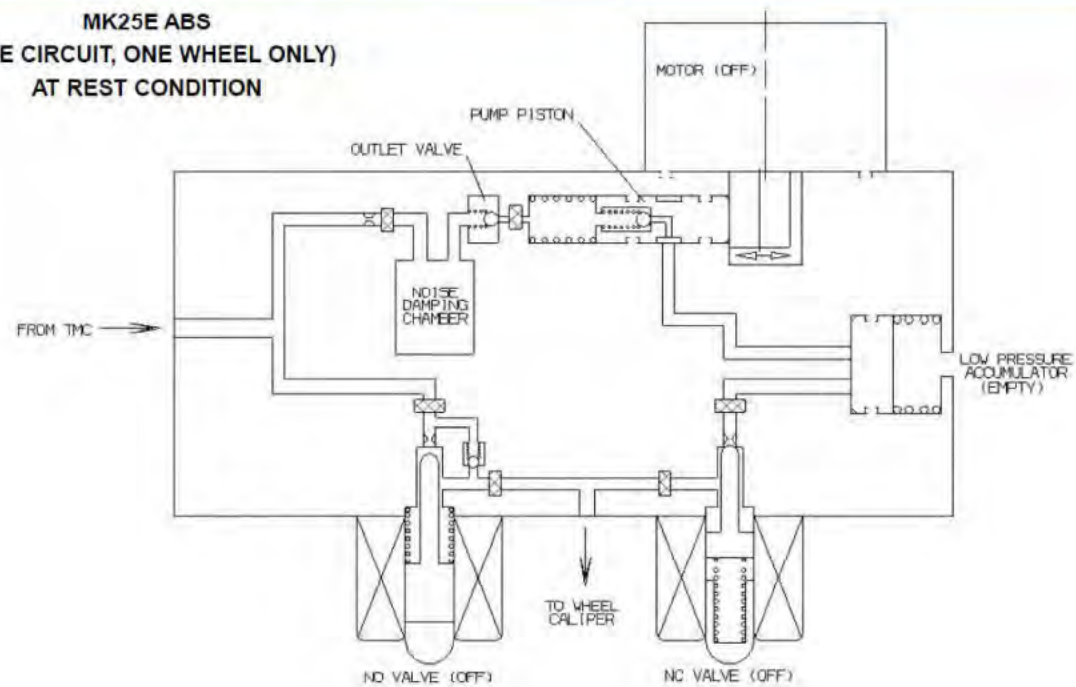
MK25E NC VALVE ASSEMBLY



ABS Operation

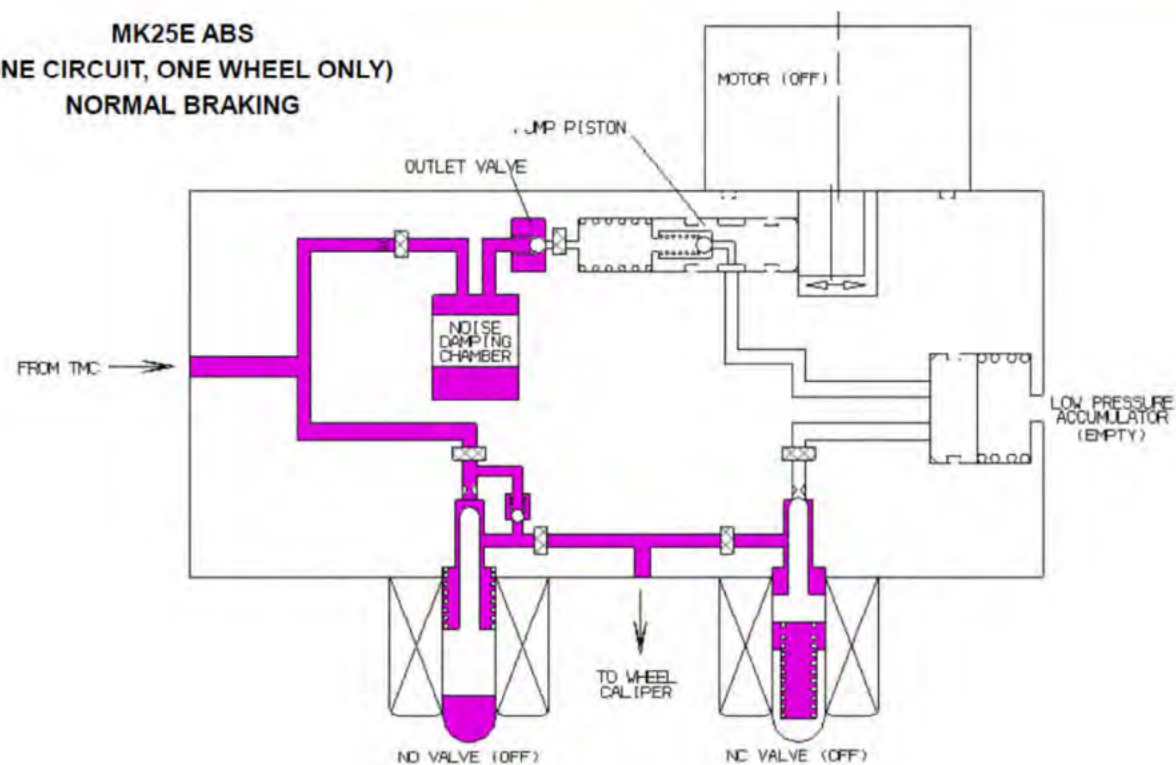
- ▶ When one or more wheels approach lock during braking, the corresponding NO valve is closed and the NC valve is opened. This closes off the fluid supply from the TMC and releases fluid to the LPA, which decreases wheel brake pressure. The pump is also turned on to return fluid from the LPA to the TMC connection.
- ▶ To obtain optimum braking, it is desirable to operate just on the verge of wheel lock. Therefore, pressure is built back up until the wheels approach lock again. To increase pressure, the NC valve closes and NO valve opens allowing fluid flow into the wheel brake. Since pressure is actually decreased and increased gradually in pulses, there is also a pressure hold phase where both NO and NC valves are closed. This isolates the wheel brake from the rest of the brake system. This cycle of pressure reduction/build is repeated throughout the stop or until ABS control is no longer needed. During the ABS event, the two rear wheels are always controlled at the same pressure for stability.
- ▶ At the end of ABS, the LPA's must be emptied so that they are ready to absorb fluid during the next event. This can be done several ways depending on vehicle software: by continuing to run the pump after the stop, by running the pump during the next acceleration (noise reduction), or by opening the NC valves during the next acceleration.
- ▶ The pedal pulsation typically felt during ABS is the result of the fluid flowing in and out of the TMC. This is due to pump operation (rapid pulsation driving back the TMC pistons) and valve switching allowing fluid flow to the wheel brakes intermittently.

**MK25E ABS
(ONE CIRCUIT, ONE WHEEL ONLY)
AT REST CONDITION**



THIS CONDITION DENOTES A SITUATION WHERE THERE IS NO SPIN OR SLIP ON ANY OF THE WHEELS RELATIVE TO THE REFERENCE SPEED, AND NO BRAKE PRESSURE IS APPLIED.

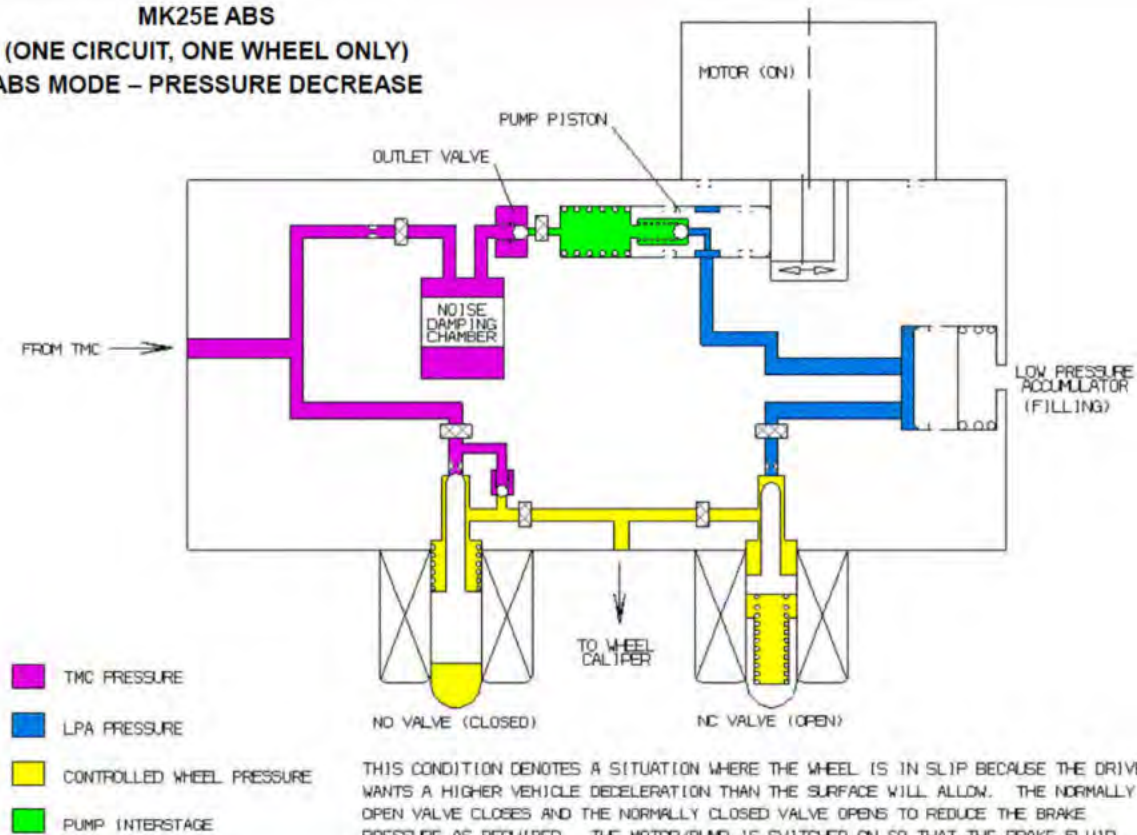
**MK25E ABS
(ONE CIRCUIT, ONE WHEEL ONLY)
NORMAL BRAKING**



 TMC PRESSURE

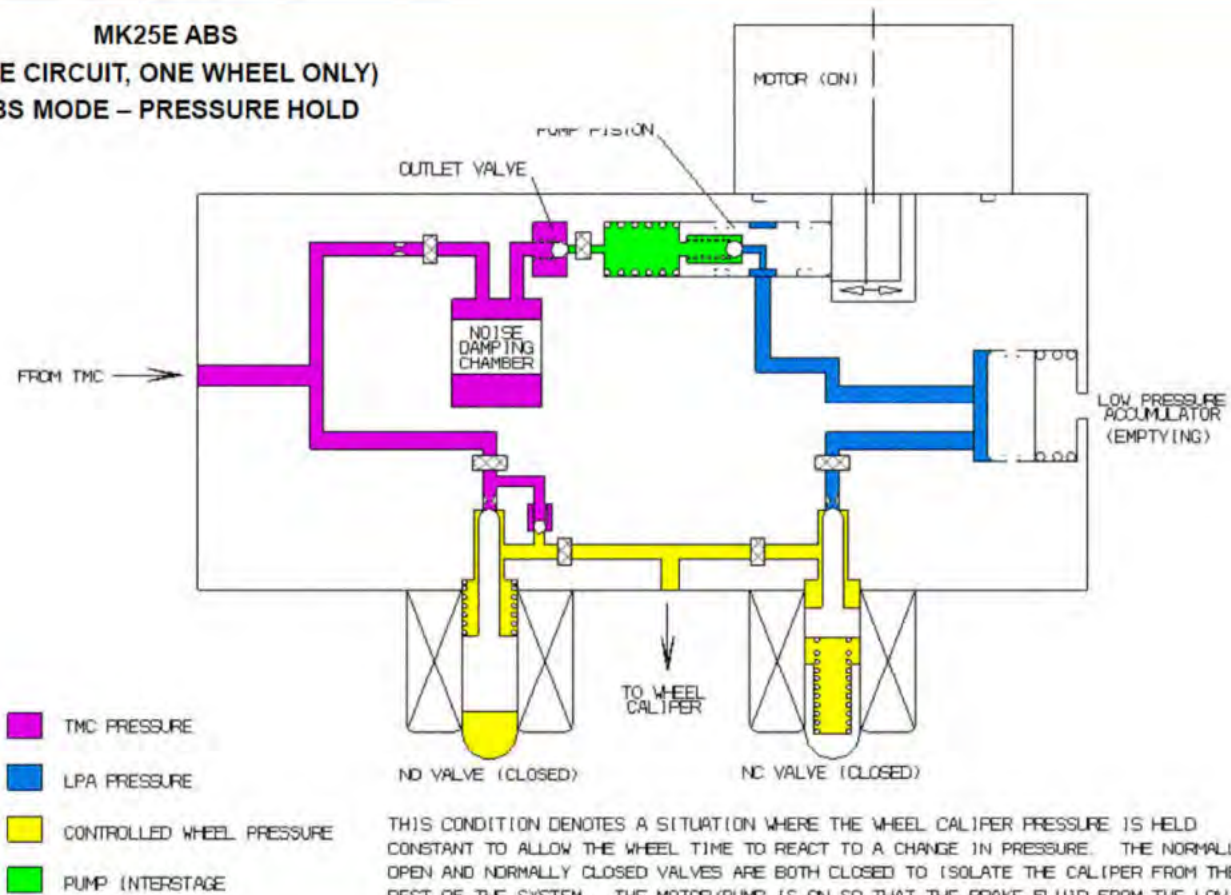
THIS CONDITION DENOTES A SITUATION WHERE NO WHEEL SPIN OR SLIP IS OCCURRING RELATIVE TO THE REFERENCE SPEED. THE DRIVER IS APPLYING THE BRAKE PEDAL TO BUILD PRESSURE IN THE BRAKES TO STOP THE VEHICLE.

**MK25E ABS
(ONE CIRCUIT, ONE WHEEL ONLY)
ABS MODE – PRESSURE DECREASE**

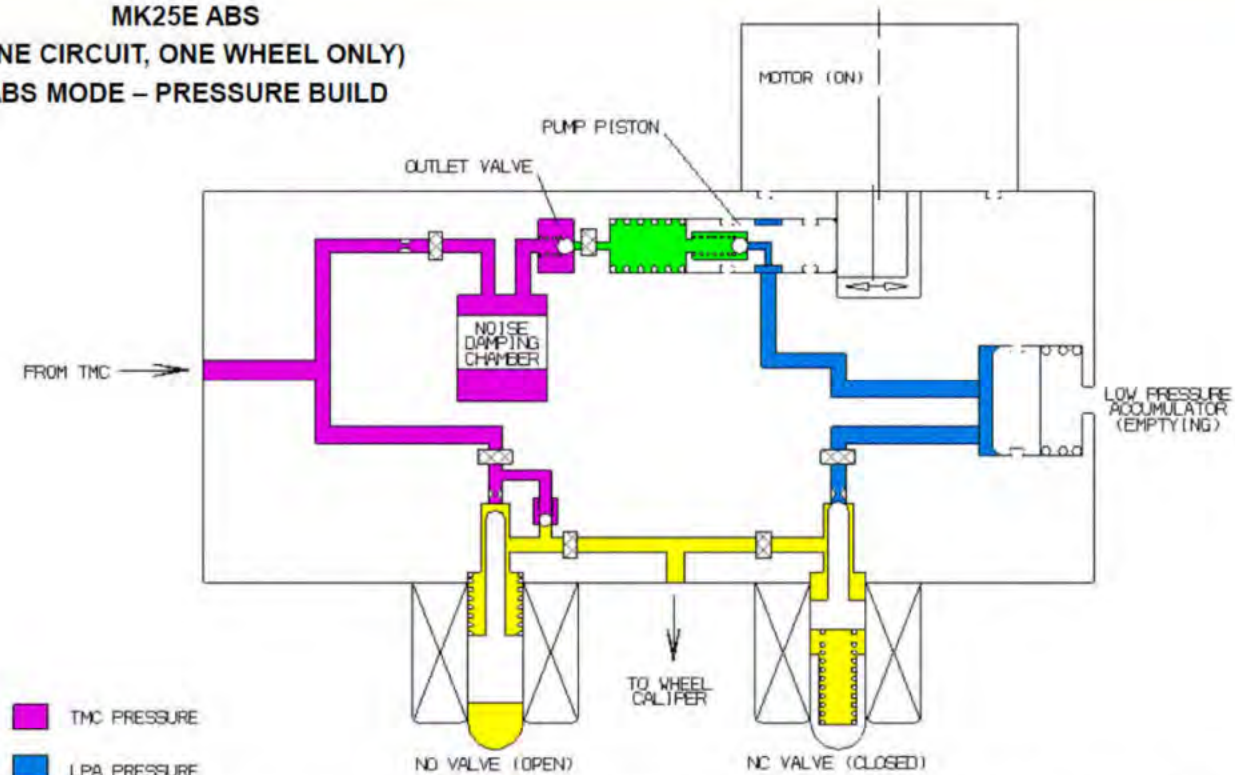


THIS CONDITION DENOTES A SITUATION WHERE THE WHEEL IS IN SLIP BECAUSE THE DRIVER WANTS A HIGHER VEHICLE DECELERATION THAN THE SURFACE WILL ALLOW. THE NORMALLY OPEN VALVE CLOSSES AND THE NORMALLY CLOSED VALVE OPENS TO REDUCE THE BRAKE PRESSURE AS REQUIRED. THE MOTOR/PUMP IS SWITCHED ON SO THAT THE BRAKE FLUID FROM THE LOW PRESSURE ACCUMULATORS IS RETURNED TO THE TANDEN MASTER CYLINDER (TMC) CIRCUITS.

**MK25E ABS
(ONE CIRCUIT, ONE WHEEL ONLY)
ABS MODE – PRESSURE HOLD**



**MK25E ABS
(ONE CIRCUIT, ONE WHEEL ONLY)
ABS MODE – PRESSURE BUILD**



THIS CONDITION DENOTES A SITUATION WHERE THE WHEEL SLIP IS UNDER CONTROL AND CALIPER PRESSURE IS BEING INCREASED TO ACHIEVE MAXIMUM BRAKING. THE NORMALLY OPEN AND NORMALLY CLOSED VALVES ARE BOTH OFF TO BUILD CALIPER PRESSURE. THE MOTOR/PUMP IS ON SO THAT ANY BRAKE FLUID FROM THE LOW PRESSURE ACCUMULATORS IS RETURNED TO THE TANDEM MASTER CYLINDER (TMC) CIRCUITS. THE PUMPED FLUID CAN GO DIRECTLY TO THE WHEEL DUE TO THE (OPEN) NORMALLY OPEN VALVE.