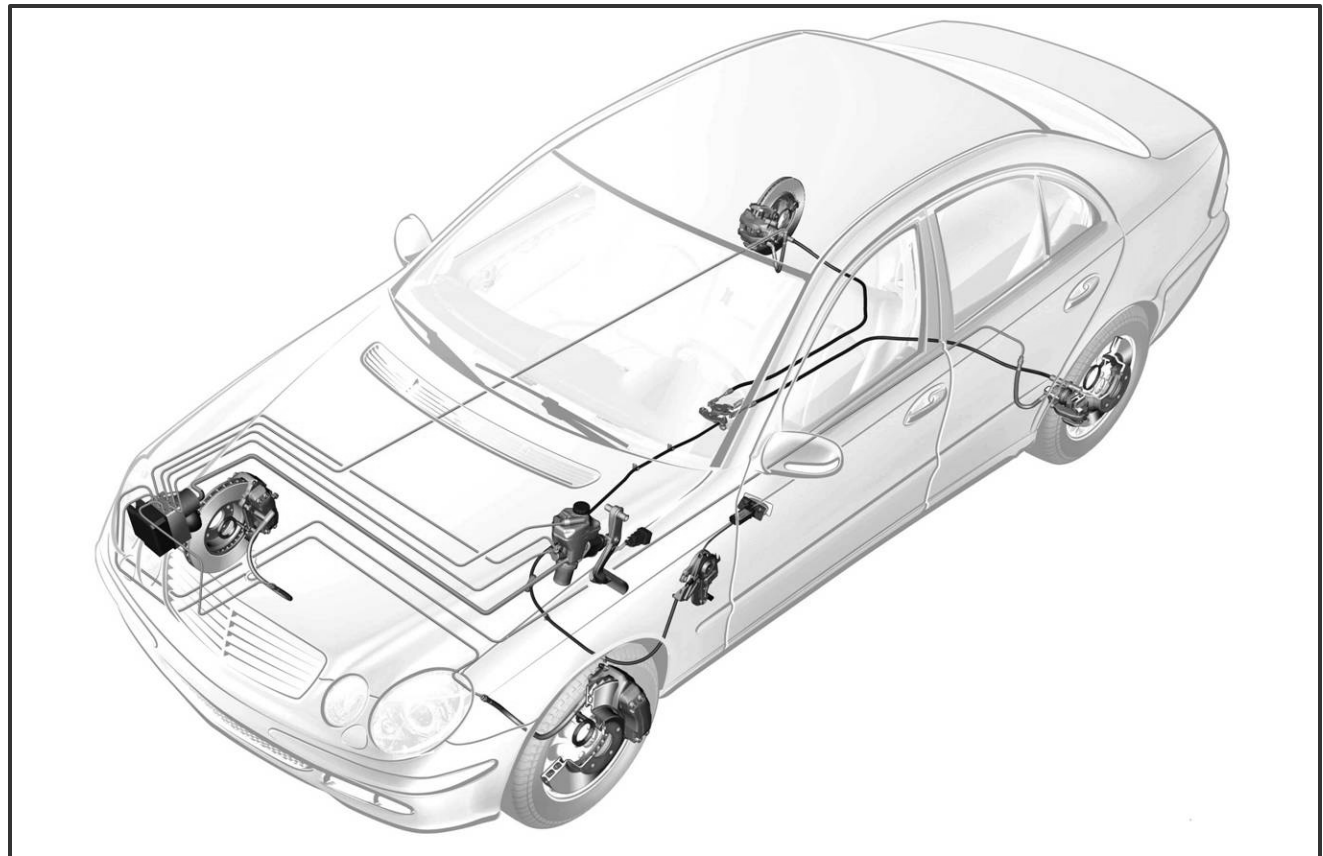




Mercedes-Benz

# Sensotronic Brake Control (SBC)



R230 and W211: Starting MY2003

1

# Objectives

At the end of this presentation, you should be able to:

1. Explain the function of and purpose for SBC
2. Describe the customer interface with SBC
3. List the hydraulic and electronic components used for SBC
4. Describe how the “normal” feel of the brake pedal is maintained
5. Explain emergency operation of the SBC braking system
6. Describe “temperature compensation”
7. Explain “Deactivation” and describe when it is necessary to do it
8. “Activate” the SBC system
9. Locate tools and the proper procedure for bleeding brakes

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# Contents

Advantages of SBC	5
Driving with SBC	8
SBC components	13
Brake operating unit (BOU)	17
Traction system hydraulic unit	27
Three pressure stages	32
Temperature Compensation	38
Deactivation	39
System activation	42
Bleeding the system	49

# SBC Incorporates these Functions:

ABS (Anti lock Brakes 1984)

- + ASR (Automatic Slip Regulation 1991)
- + ETS (Electronic Traction System 1995)
- + ESP (Electronic Stability Program 1996)
- + BAS (Brake Assist System 1998)

# Advantages of SBC

- Improves metering of required brake pressure
  - each wheel can be precisely controlled
- Improved BAS function
  - monitors release of accelerator pedal and application of brake
  - maximum pressure available immediately
  - pre-filling of system (overcoming play)
  - when the BAS function is anticipated, slight pressure is applied

# Advantages of SBC

- Electronic Brake Proportioning: EBP
  - allows brake proportioning front to back and side to side
- No pedal vibration during ABS operation
  - eliminates “distraction” to the driver during critical moments
  - indicator light in instrument cluster signals traction loss
- Improved driving dynamics: ABS, ASR, and ESP
  - faster response to brake request inputs

# Advantages of SBC

- Pressure reduction at standstill
  - reduces stress on components
- Dry braking function
  - wiper input via CAN
  - ~every 7 to 14 minutes
  - brake actuation changes time interval



# Driving with SBC - Wake-Up

SBC is functional as soon as it is “wakened” by:

- opening a door (via CAN)
  - operating the central locking system (via CAN)
  - depressing the brake pedal
  - turning key to position 1
  - operating parking brake
- The Wake-Up may be followed by a Pre-Drive self  
Check performed by SBC



# Driving with SBC – Pre-Drive Check (PDC)

When SBC performs a PDC after a "wake-up", the following are checked:

**Warning! Pressure is applied to brake calipers (~60 bar)**

- reservoir pressure (if low, it will be corrected by running the high pressure charge pump in the hydraulic unit)
- pressure sensors
- control valves
- leak tests
- operational checks

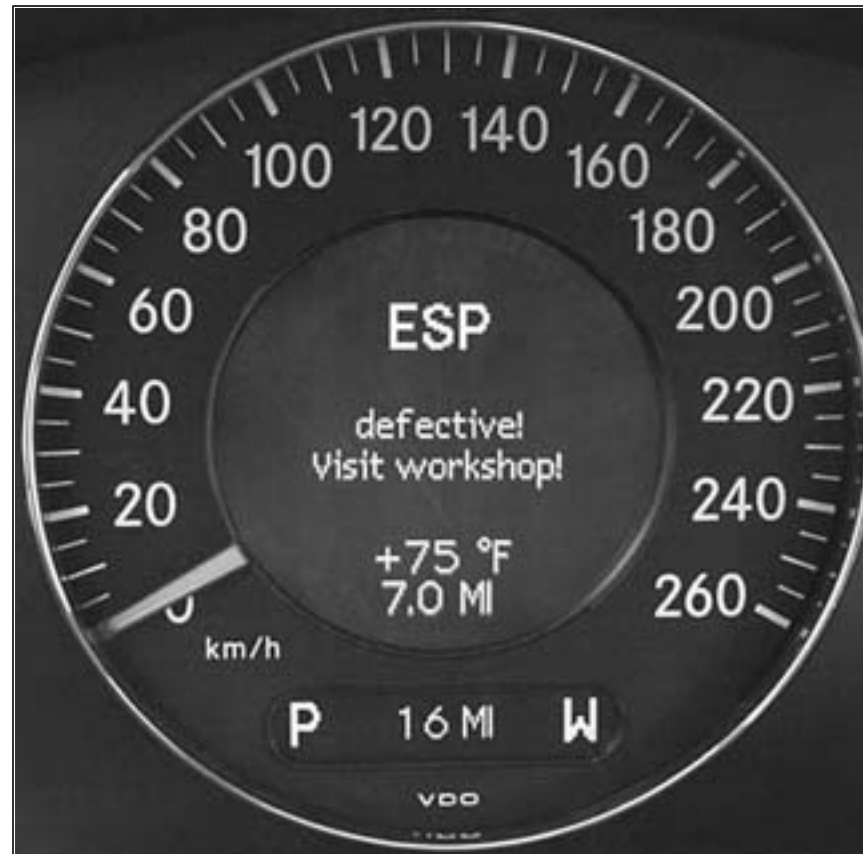
*Note: self-tests are constantly conducted during driving (~ once every 16 brake applications)*

# Driving with SBC – Delayed Off Function

Time that SBC remains operational after use:

- with vehicle stationary and was locked = 20 seconds
- with vehicle stationary and ignition in “0”,  
brake pedal not operated = 2 minutes
- with vehicle stationary, ignition in “0”,  
brake pedal operated in delayed off phase and  
released again = 4 minutes

# Warning Display



Complete ESP control module failure -  
Instrument cluster will scroll through failure displays

# Warning Display

SBC control module failure



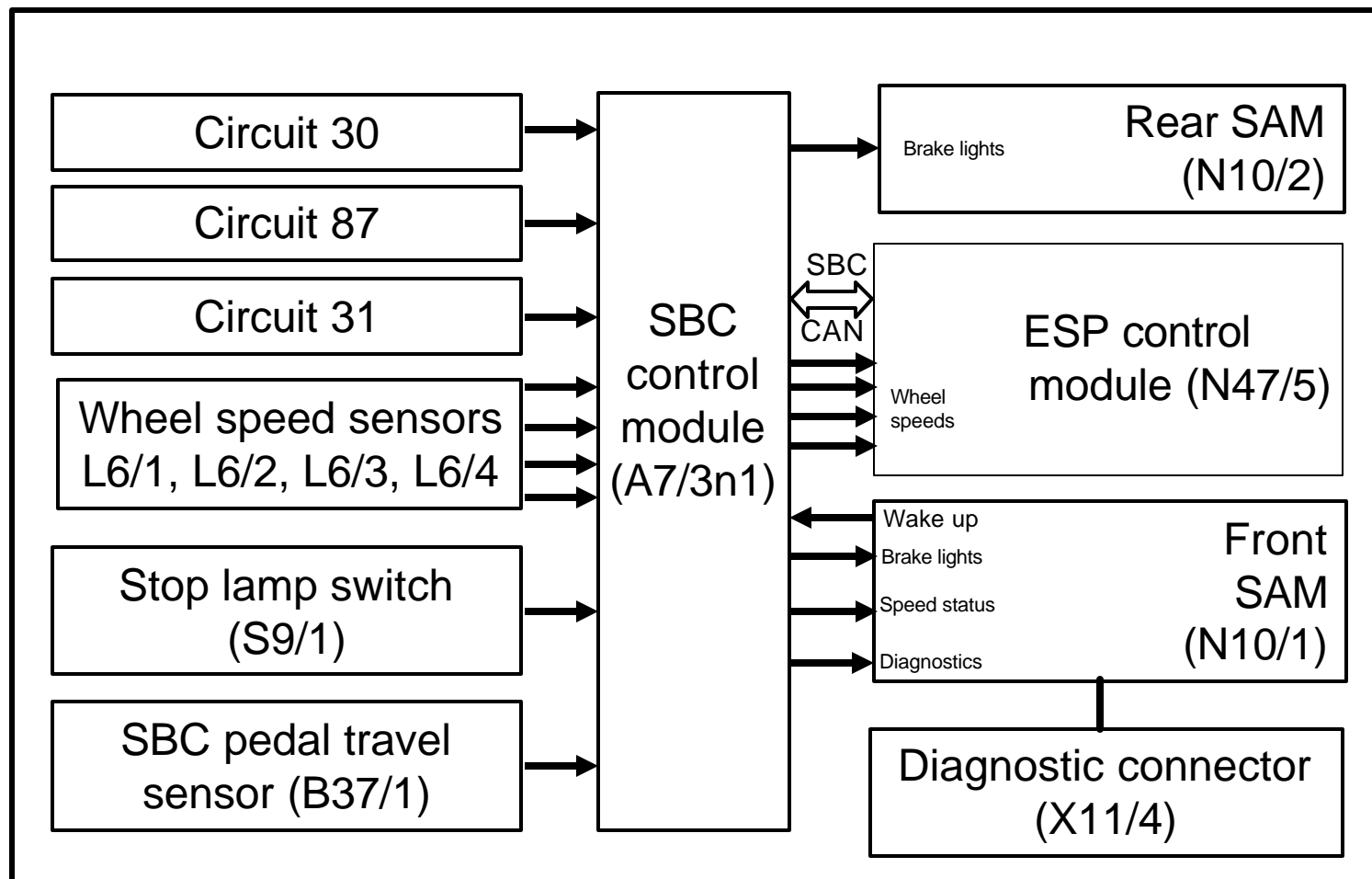
Certain faults will trigger audible signal

# SBC Components

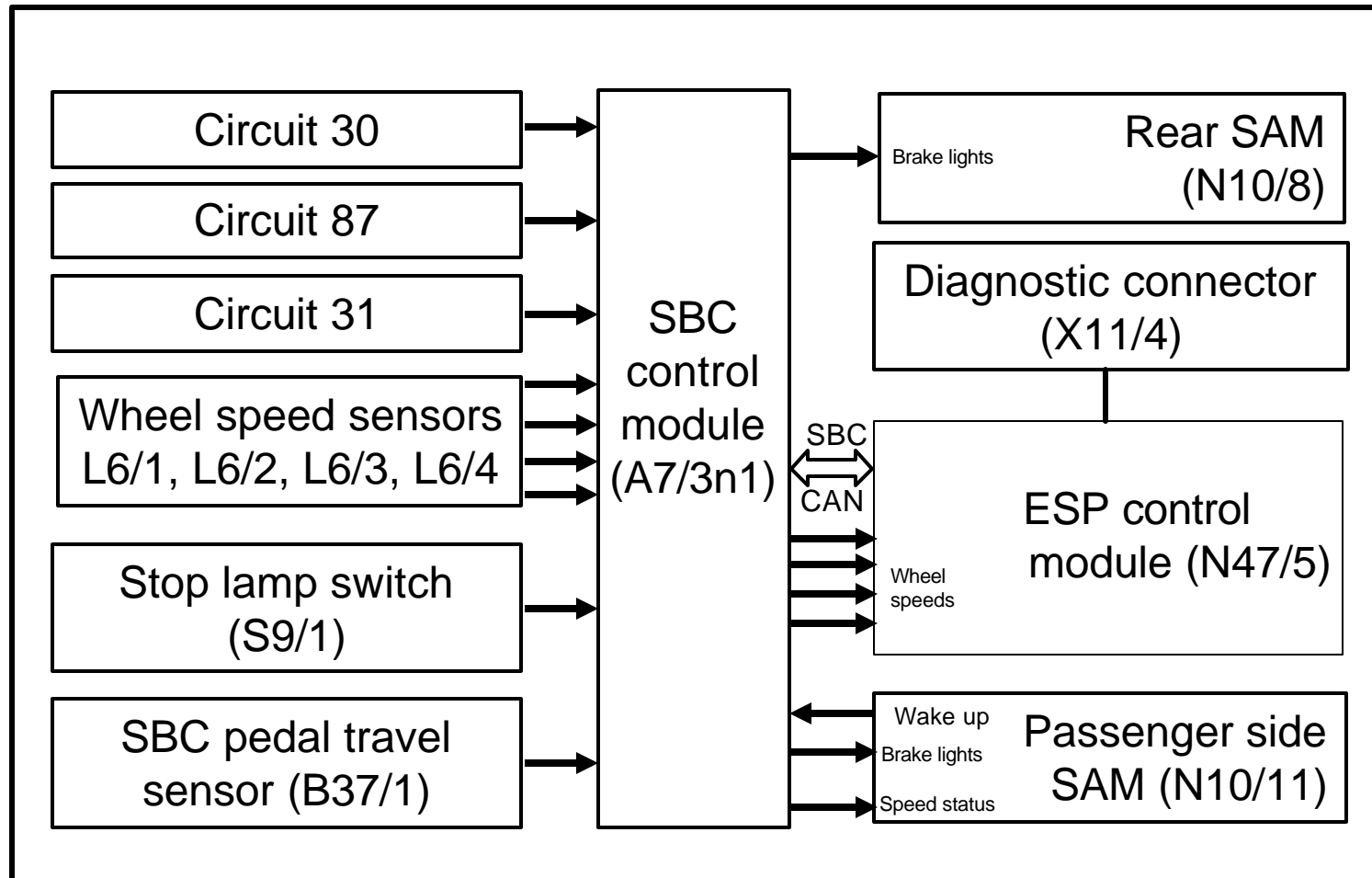


- Brake Operating Unit (BOU)
- Wheel speed sensors
- Traction System Hydraulic Unit (A7/3)

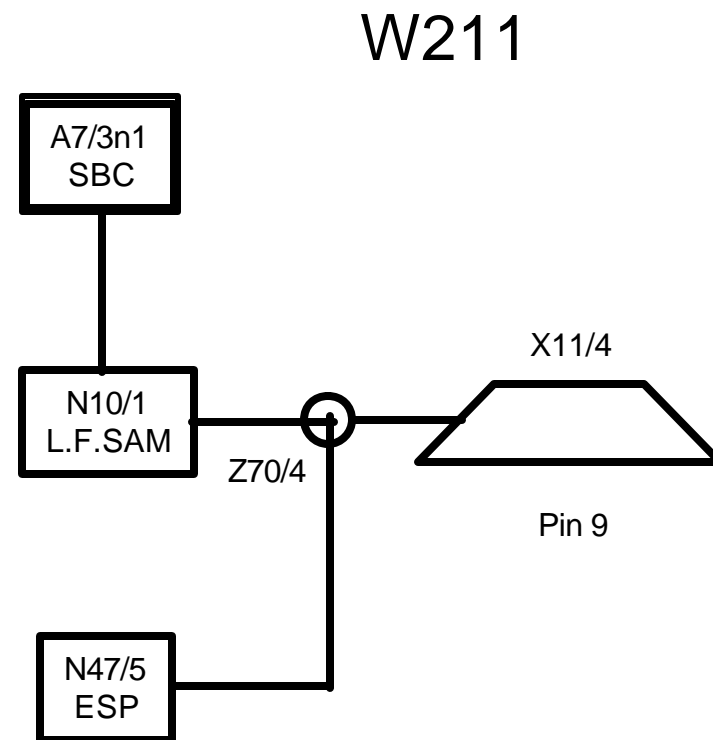
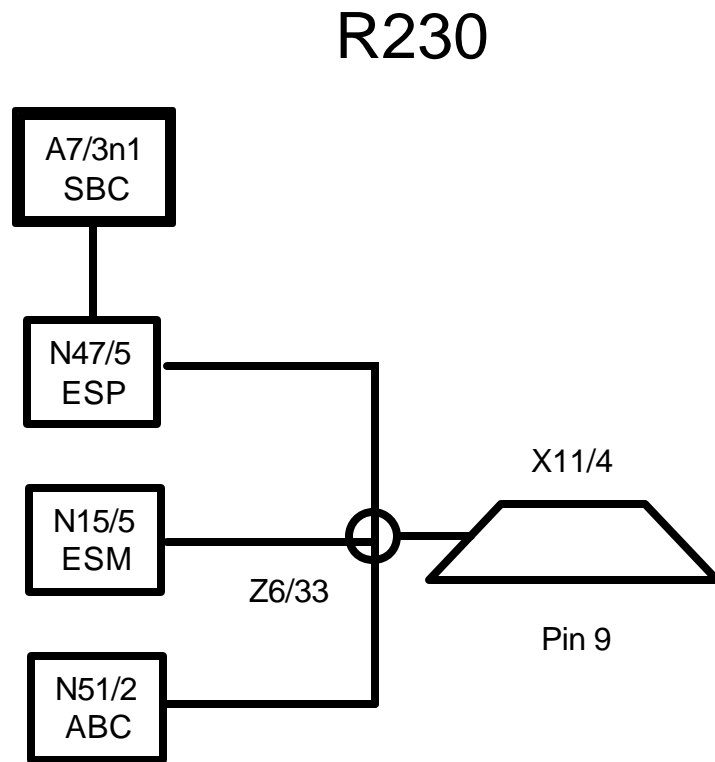
# W211 System Overview



# R230 System Overview

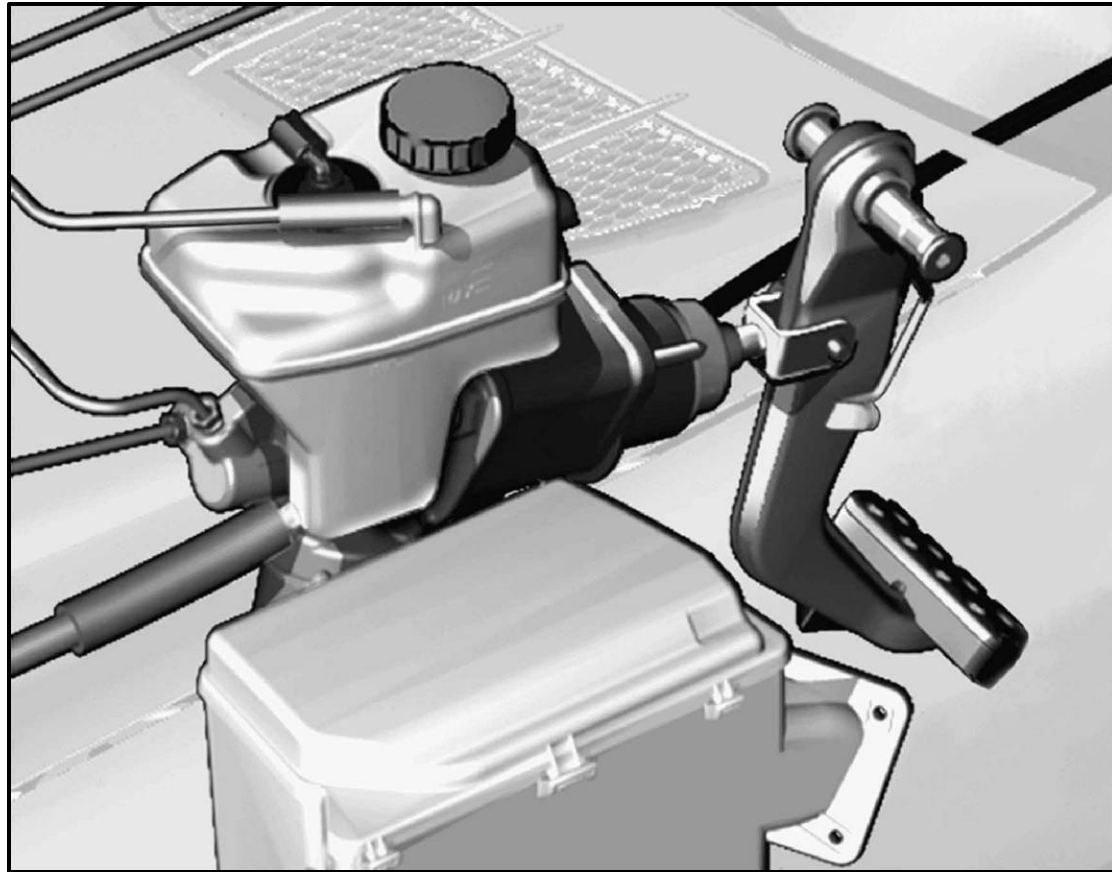


# X11/4 Diagnosis Connection

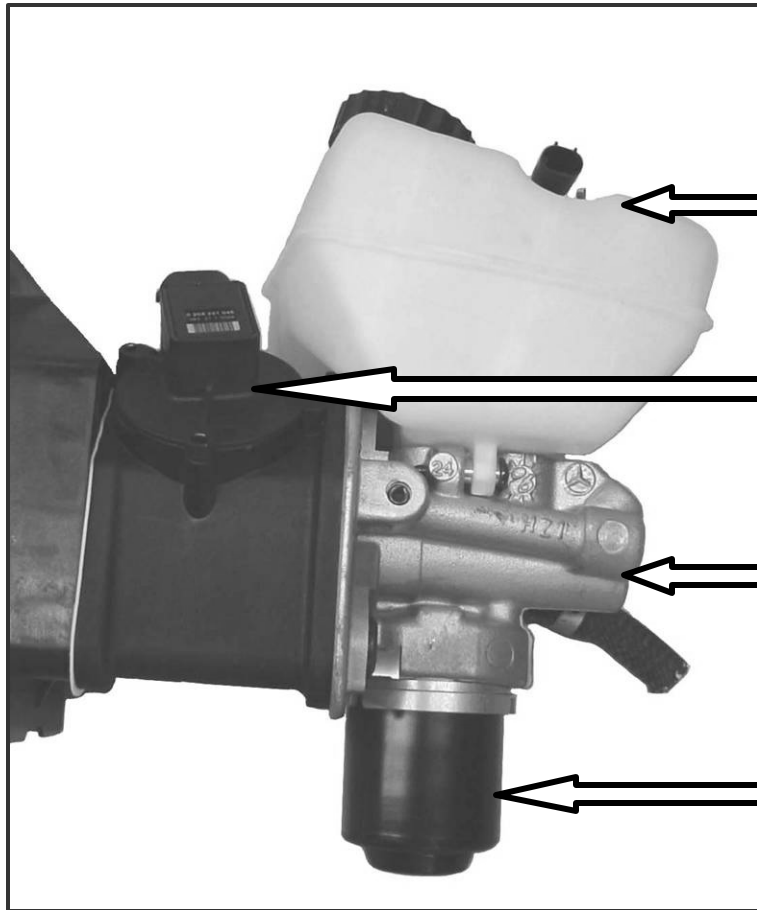




# Brake Operating Unit - (BOU)



# Brake Operating Unit

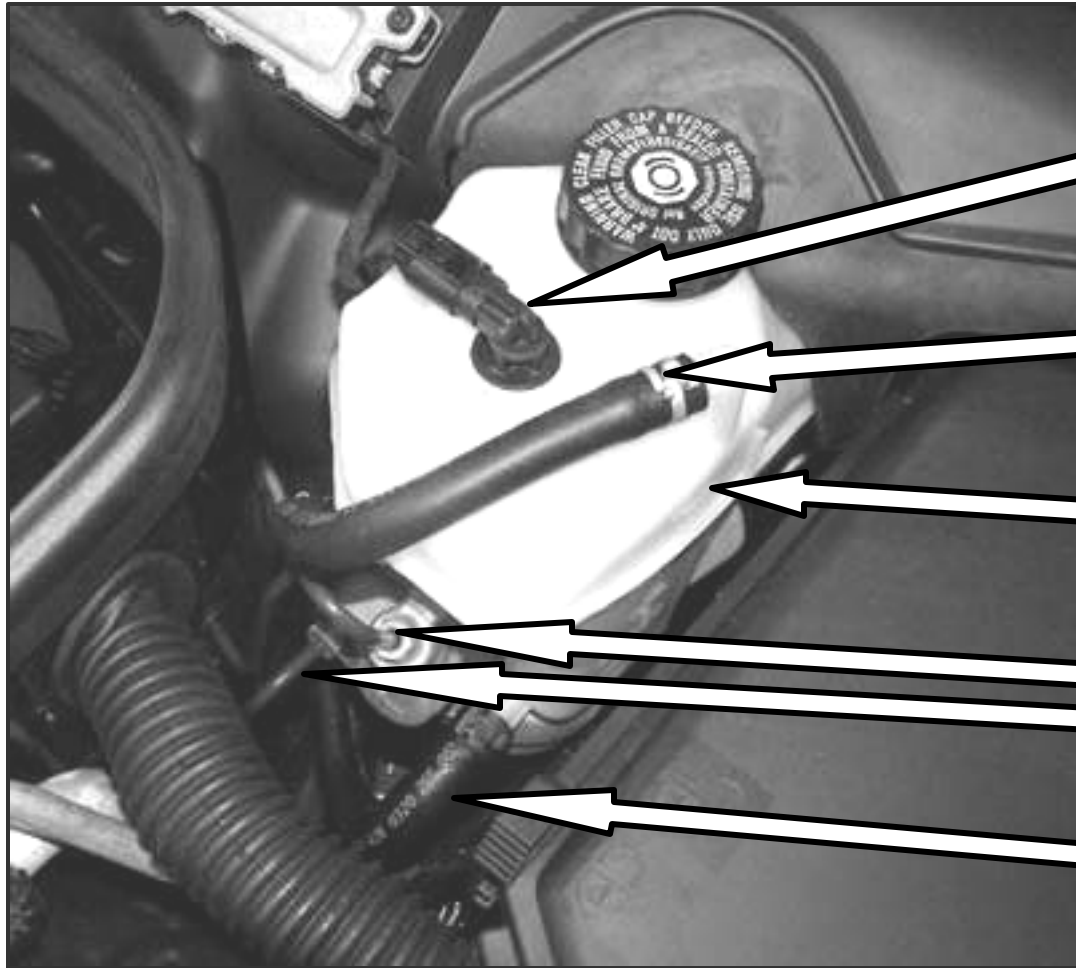


The Brake Operating Unit (BOU) consists of the following:

- Brake fluid reservoir  
(Do not overfill!)
- SBC pedal value sensor
- Tandem master cylinder
- Brake pressure simulator

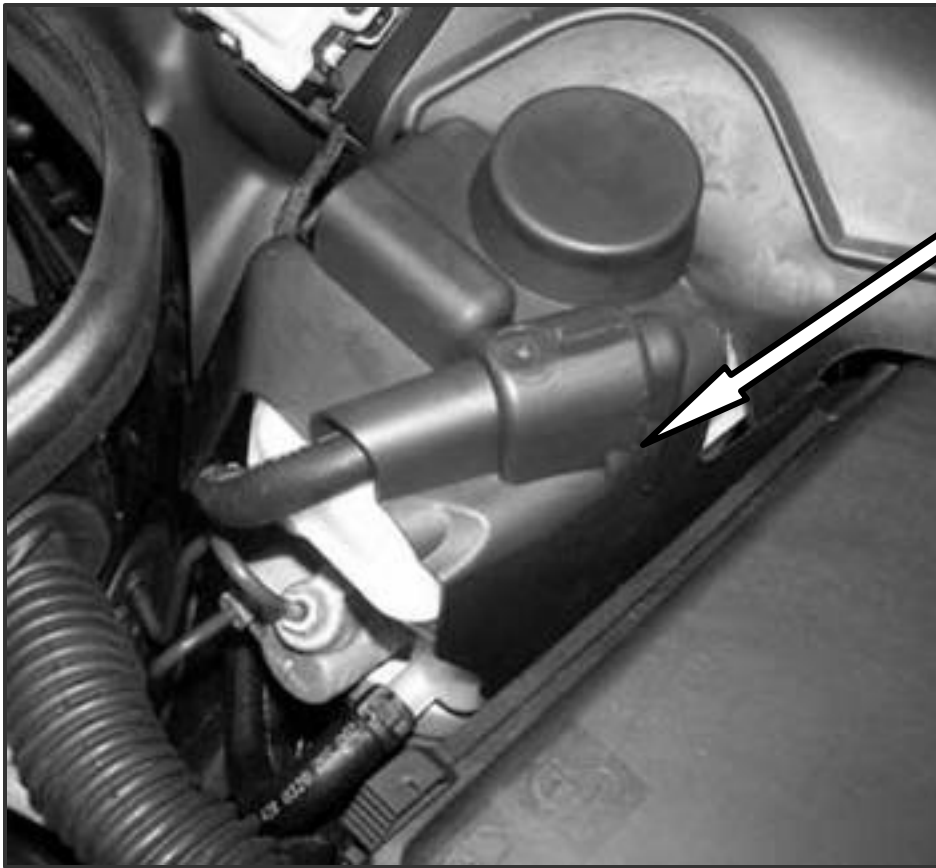
(Note: no vacuum booster)

# Master Cylinder



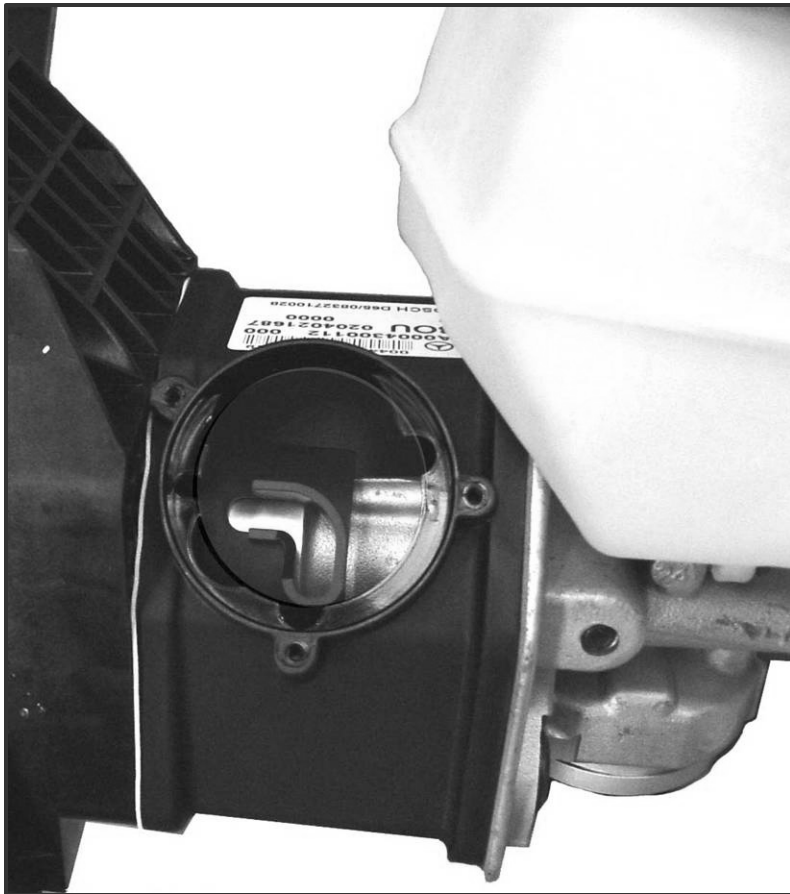
- Fluid level sensor
- Fluid return line
- Do not overfill
- Hydraulic lines to SBC
- Supply hose to SBC

# Fluid Reservoir Cover



- Ultraviolet protection (211 only)

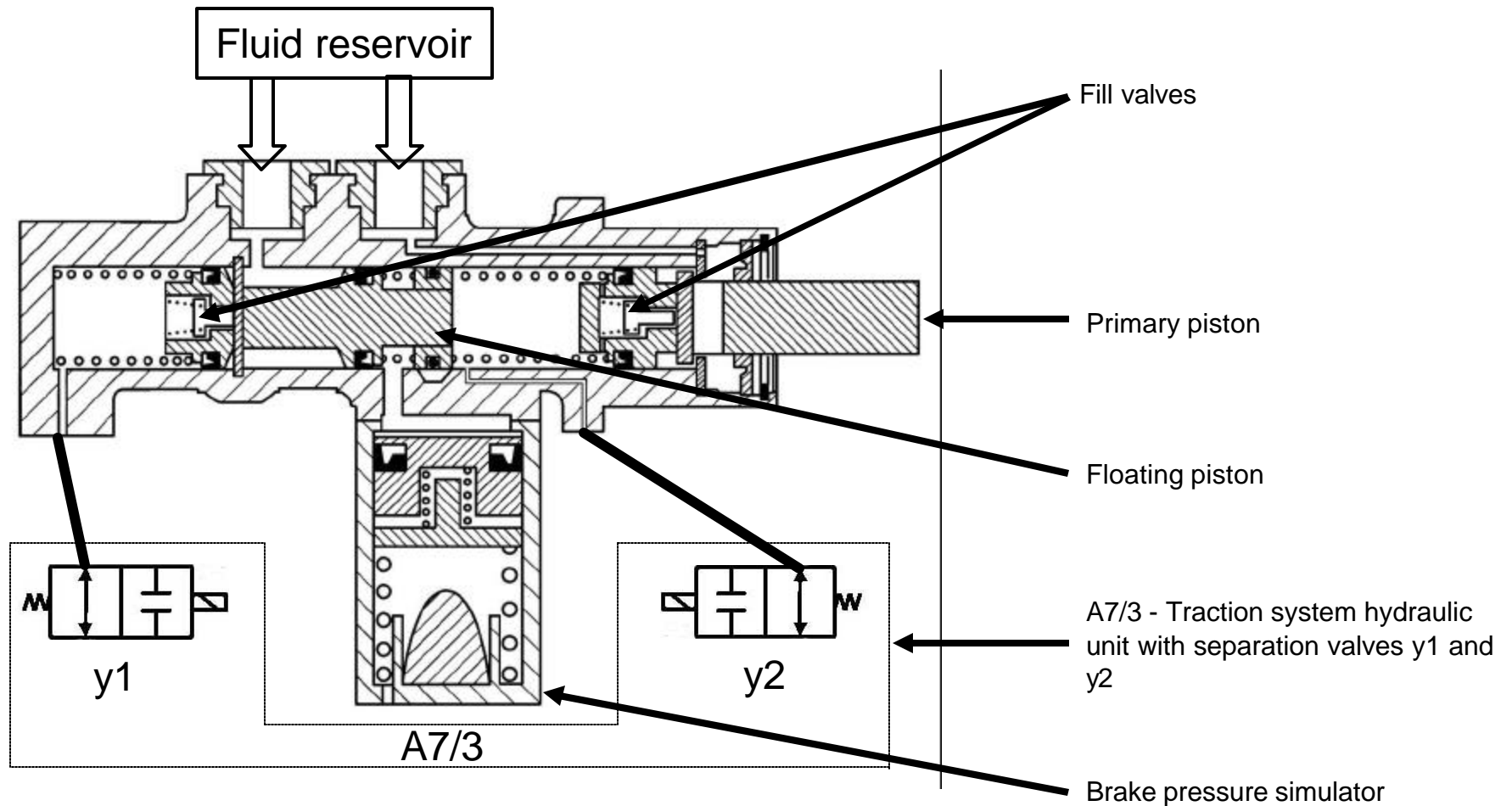
# Pedal Value Sensor - (B37/1)



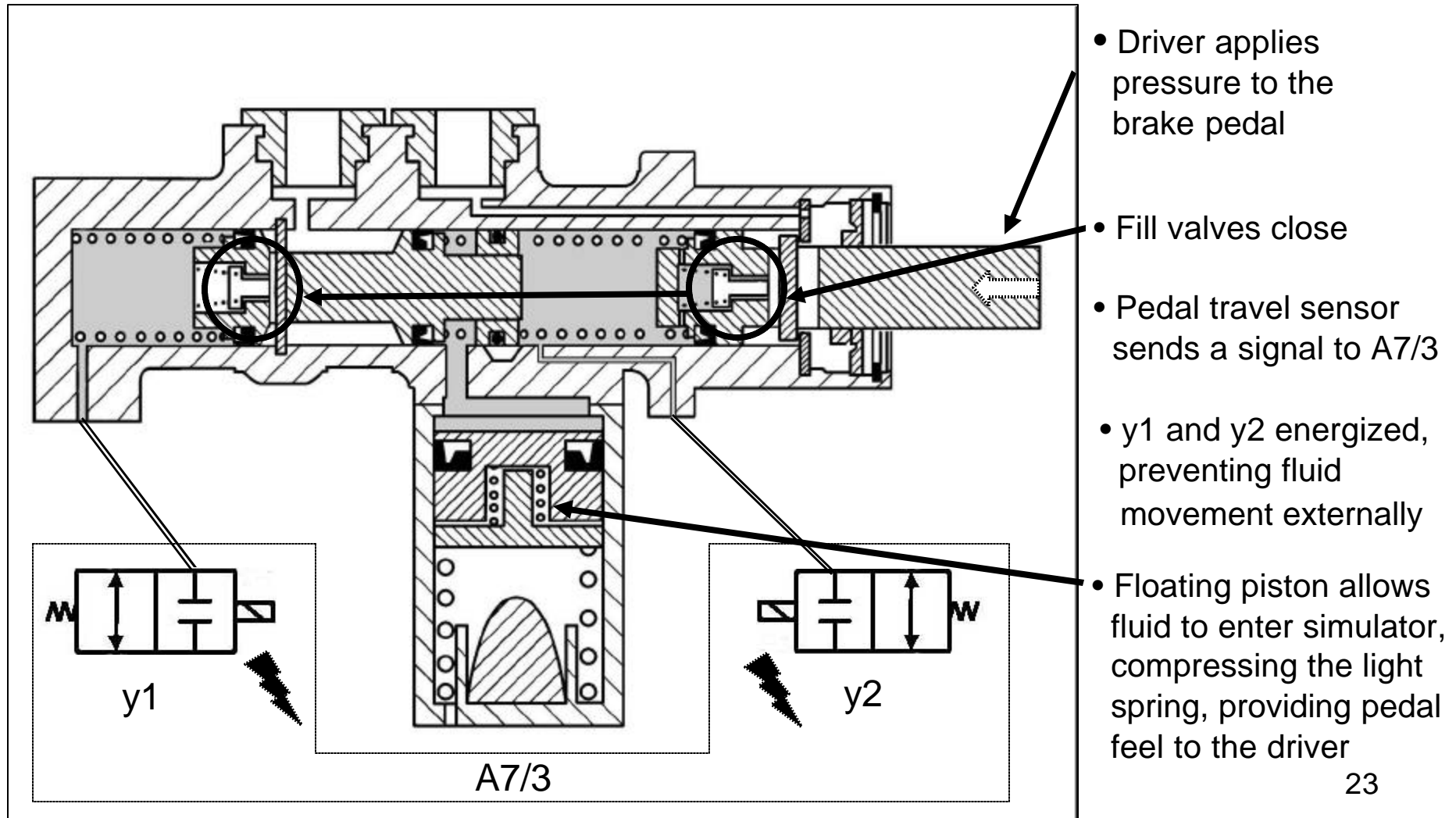
- Contains two hall effect sensors
- Converts pedal travel value to an electrical signal
- Provides input to SBC control module A7/3



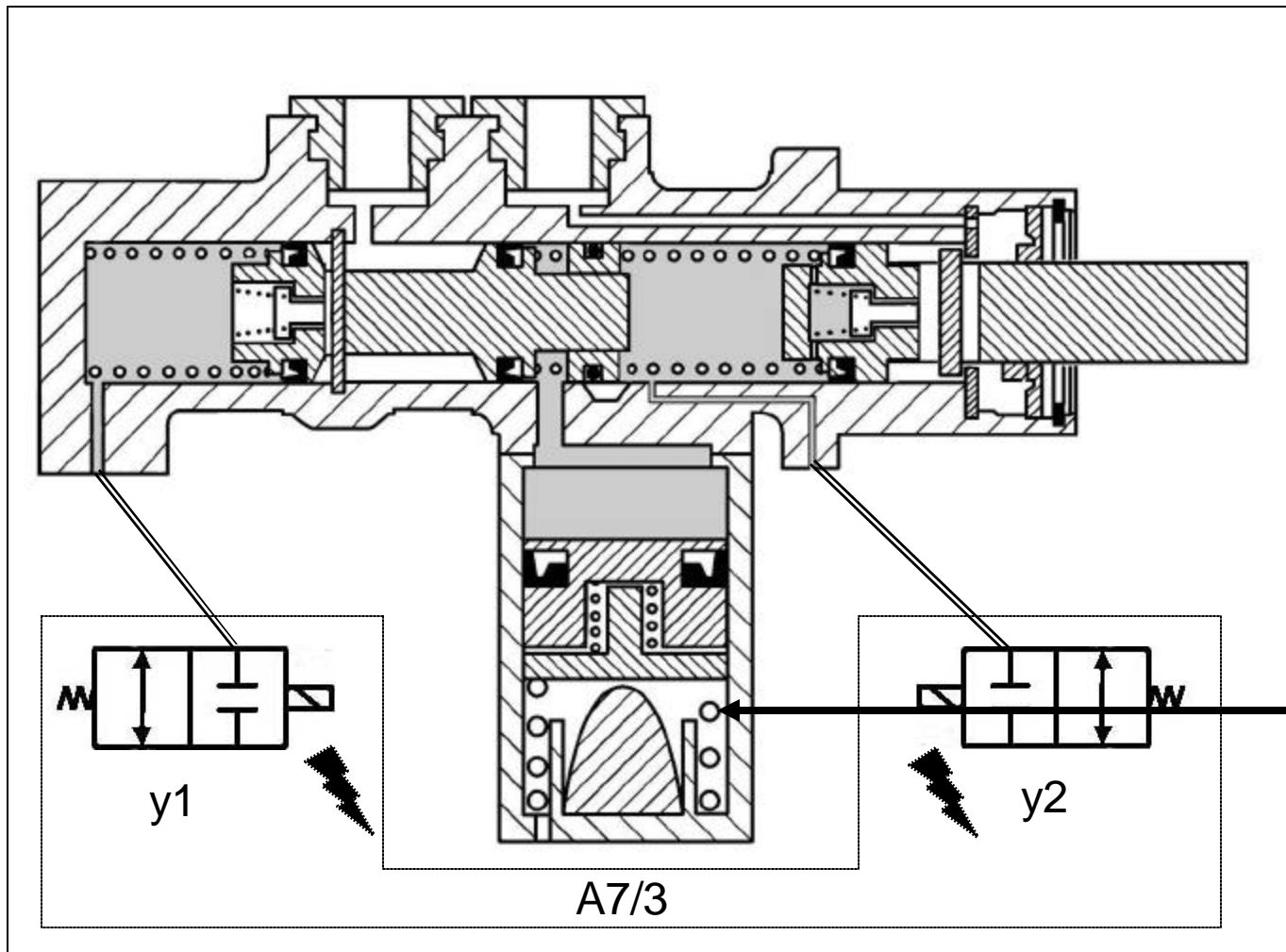
# BOU Tandem Master Cylinder



# Normal Braking - Light Pressure



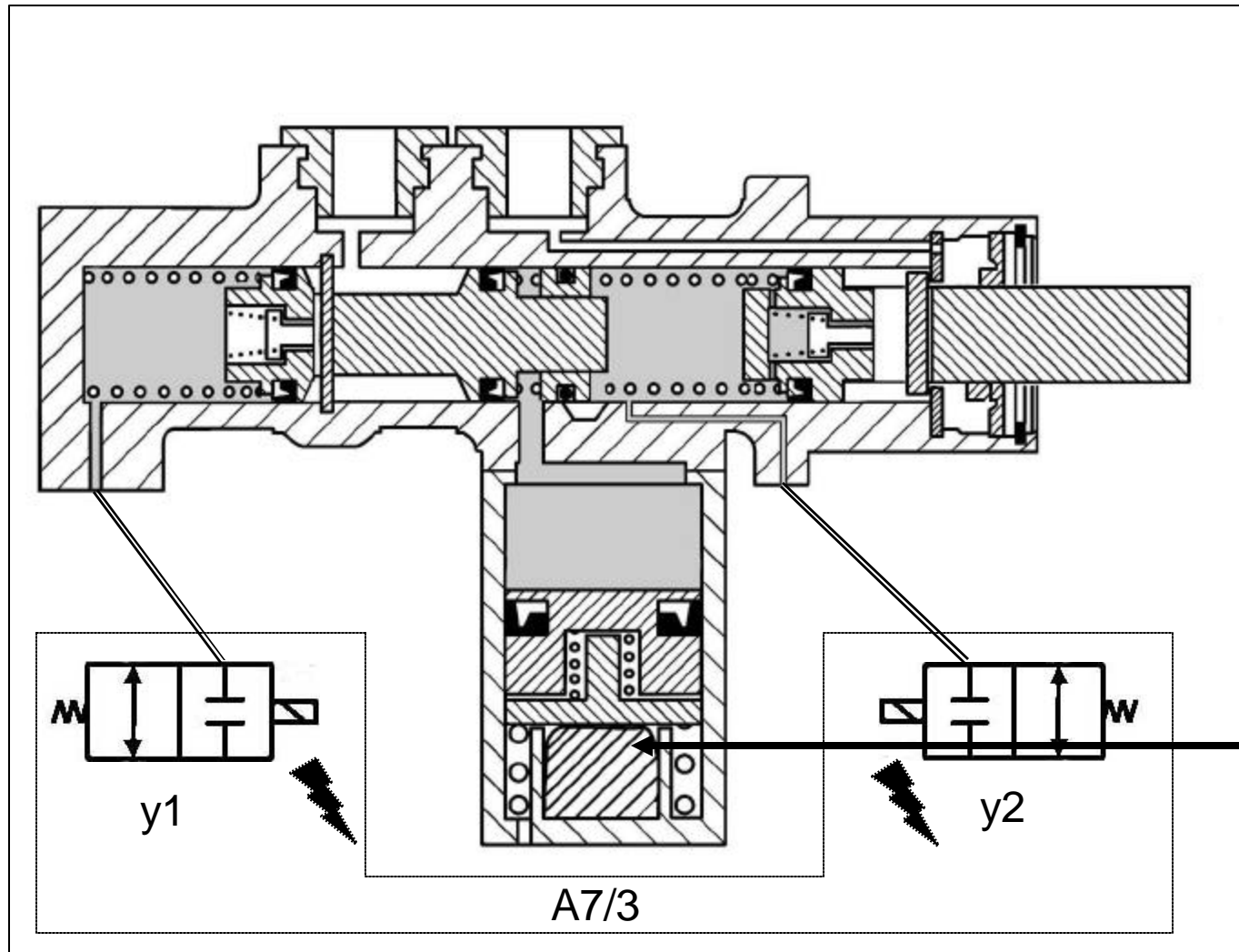
# Normal Braking - Increased Pressure



- Increasing pedal travel causes the larger spring to compress, providing harder pedal feel

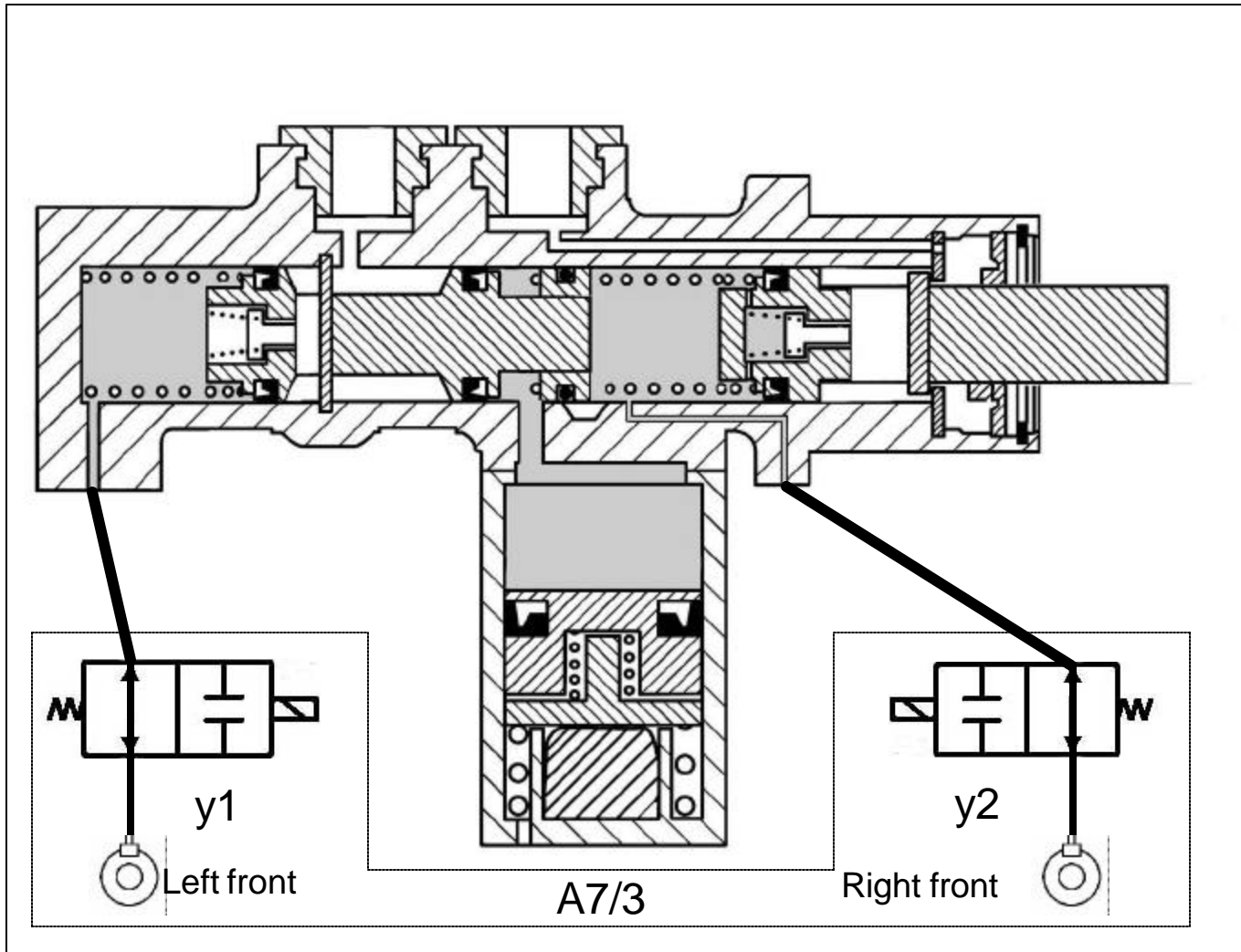


# Normal Braking - Strongest Feedback



- Further pedal travel causes piston to compress rubber bumper, providing greatly increased pedal pressure

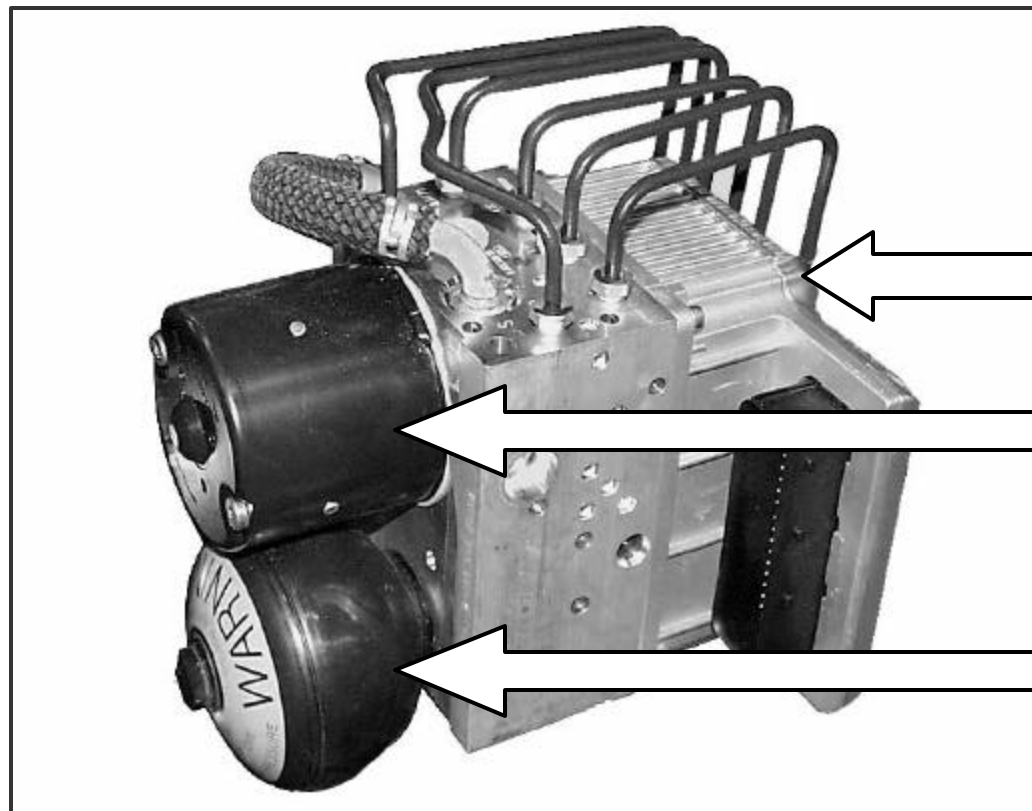
# Emergency Operation



- All electrical functions canceled
- Hydraulic pressure created with NO power assist
- Pressure directed through A7/3 y1 and y2 to ....

Left Front and Right Front calipers only!

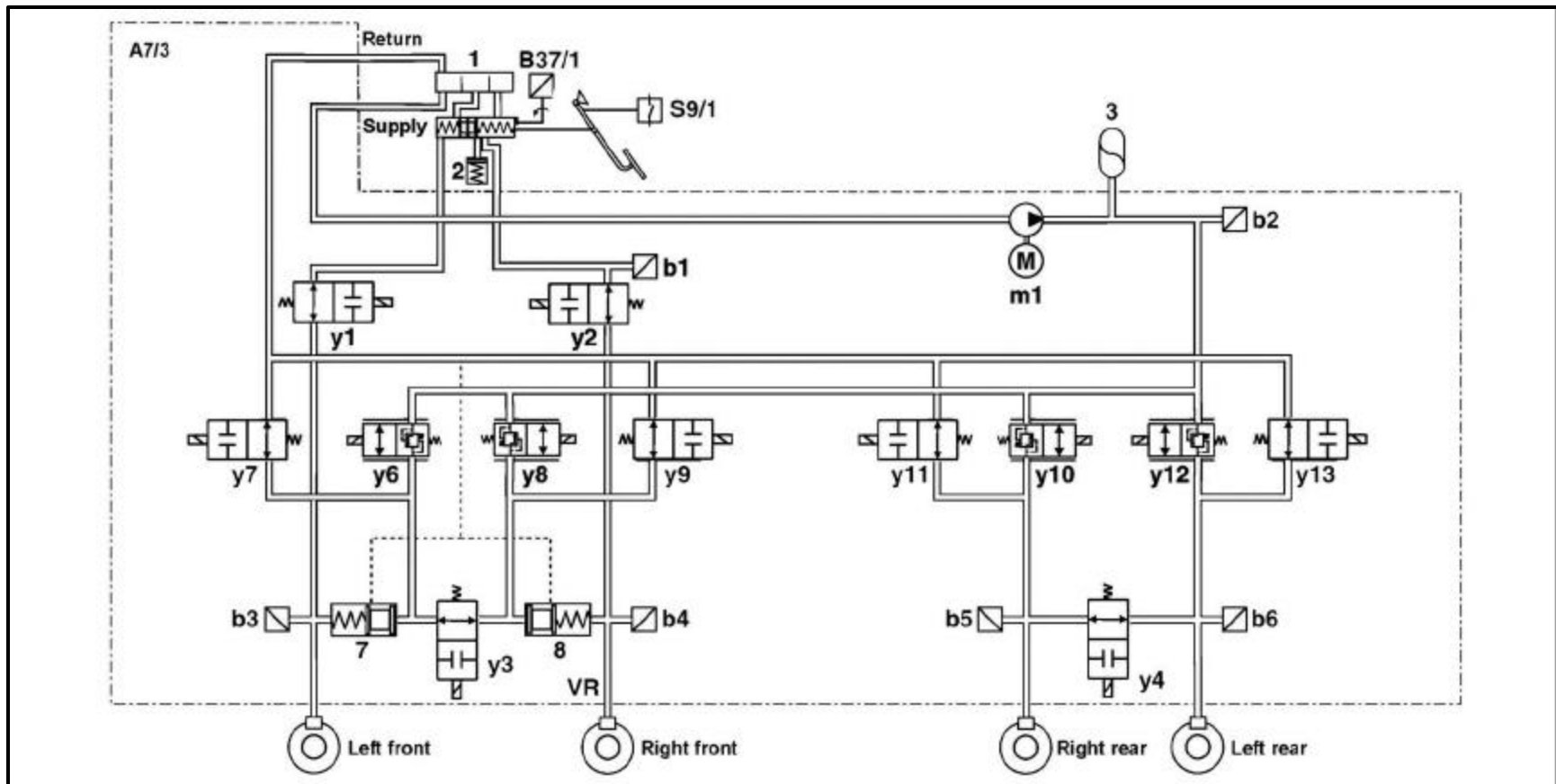
# Traction System Hydraulic Unit (A7/3)



Consists of:

- SBC control module (A7/3n1)
- High pressure charge pump (A7/3m1)
- Pressure reservoir

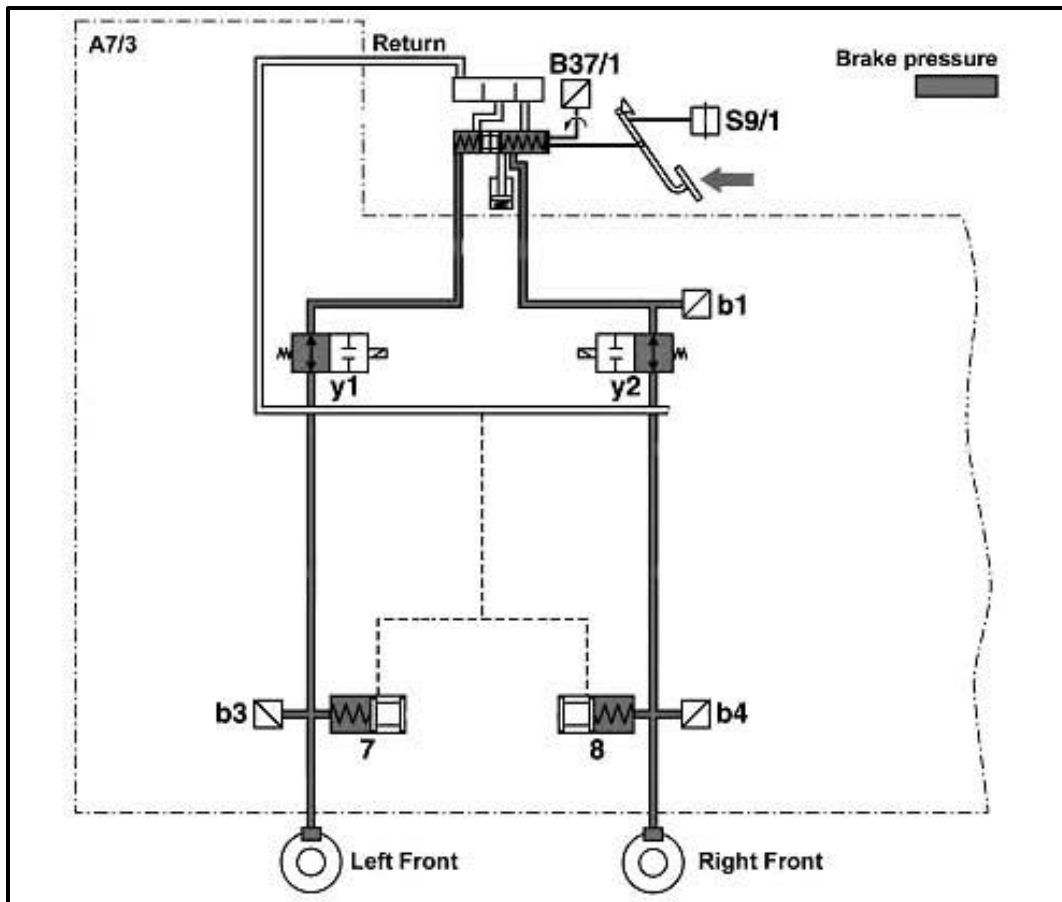
# Traction System Hydraulic Unit A7/3



# Legend

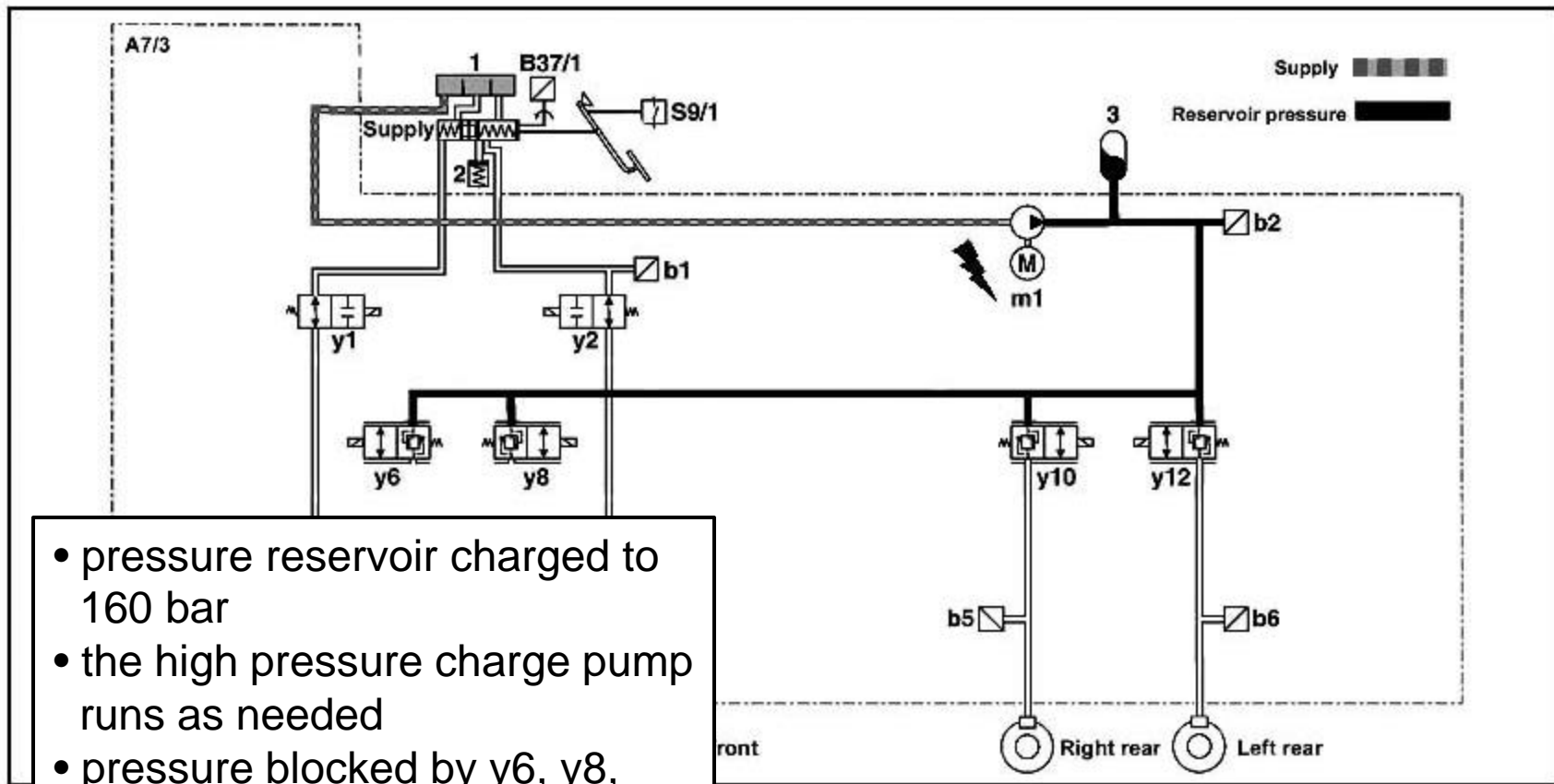
1	Brake Operating Unit	A7/3y1	Left front separation valve
2	Brake pressure simulator	A7/3y2	Right front separation valve
3	Pressure reservoir	A7/3y3	Front axle balance valve
7	Left front media separator (dividing piston)	A7/3y4	Rear axle balance valve
8	Right front media separators (dividing piston)	A7/3y6	Left front intake control valve
A7/3	Traction system hydraulic unit	A7/3y7	Left front outlet control valve
A7/3b1	Front axle pre-pressure sensor	A7/3y8	Right front intake control valve
A7/3b2	Reservoir pressure sensor	A7/3y9	Right front outlet control valve
A7/3b3	Left front pressure sensor	A7/3y10	Left rear intake control valve
A7/3b4	Right front pressure sensor	A7/3y11	Left rear outlet control valve
A7/3b5	Left rear pressure sensor	A7/3y12	Right rear intake control valve
A7/3b6	Right rear pressure sensor	A7/3y13	Right rear outlet control valve
A7/3m1	High-pressure charge pump	B37/1	SBC pedal value sensor
		S9/1	Stop lamp switch (4-pin)

# Emergency Operation Circuit



- Pressure applied directly to front calipers
- y1 and y2 not energized
- b1, b3, and b4 pressure sensors may provide information to SBC control module
- Media separator/Dividing piston 7 and 8 isolate emergency circuit from normal circuit

# Brake Pressure Supply



- pressure reservoir charged to 160 bar
- the high pressure charge pump runs as needed
- pressure blocked by y6, y8, y10, y12

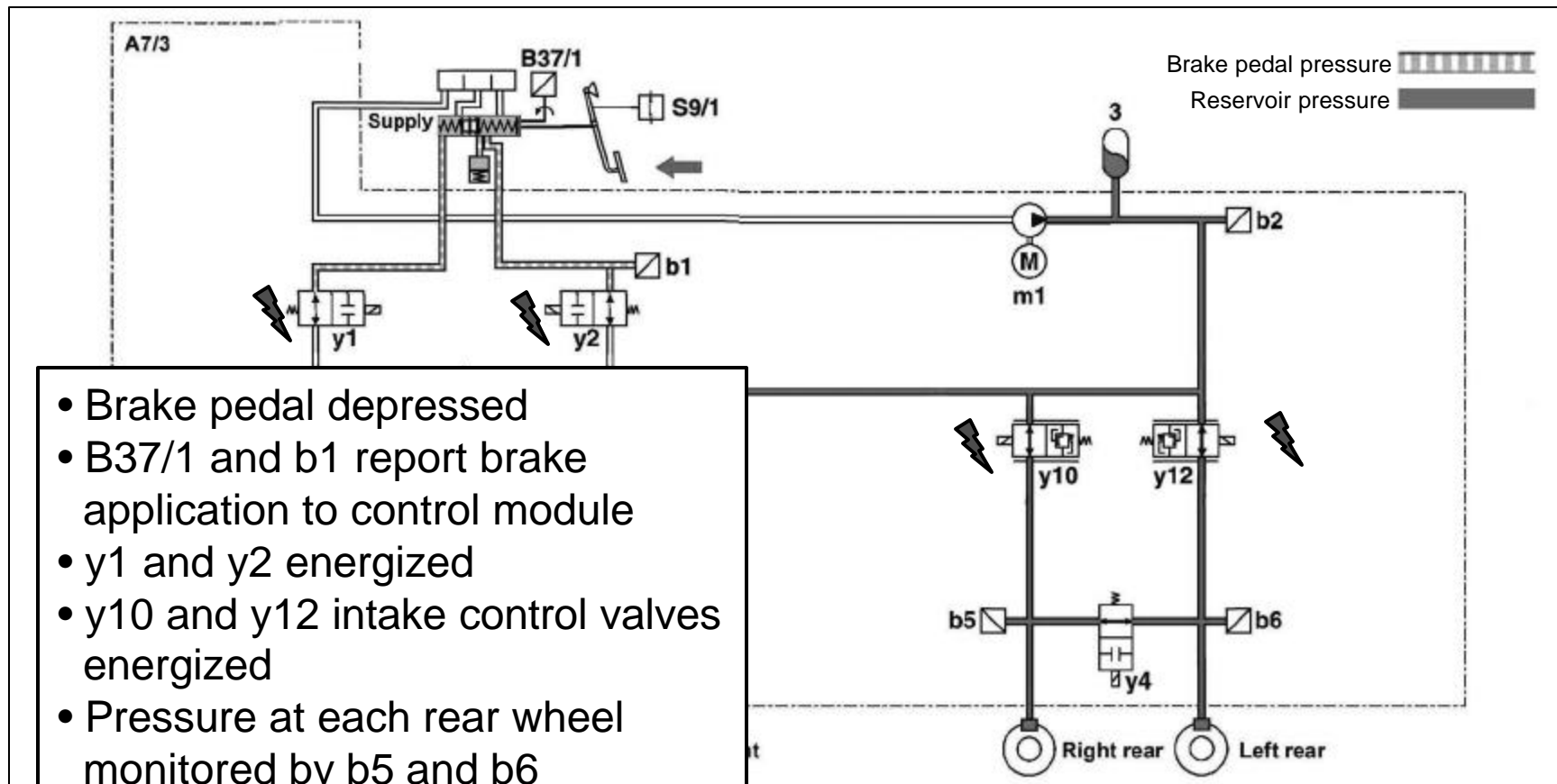
# Three Pressure Stages

Same pressure stages as used with ABS functions:

- Pressure apply
- Pressure hold
- Pressure release

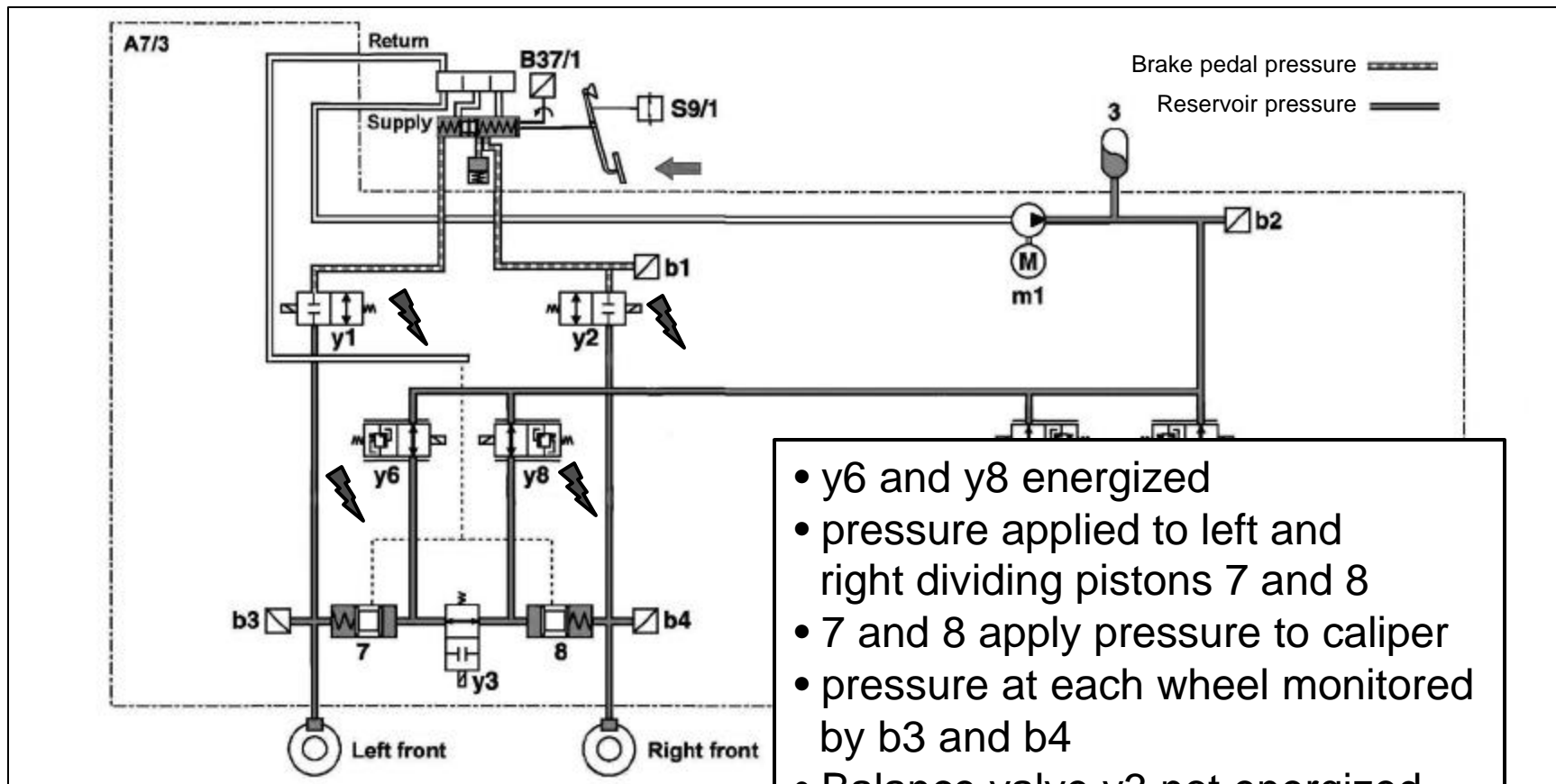


# Pressure Apply - Rear Wheels



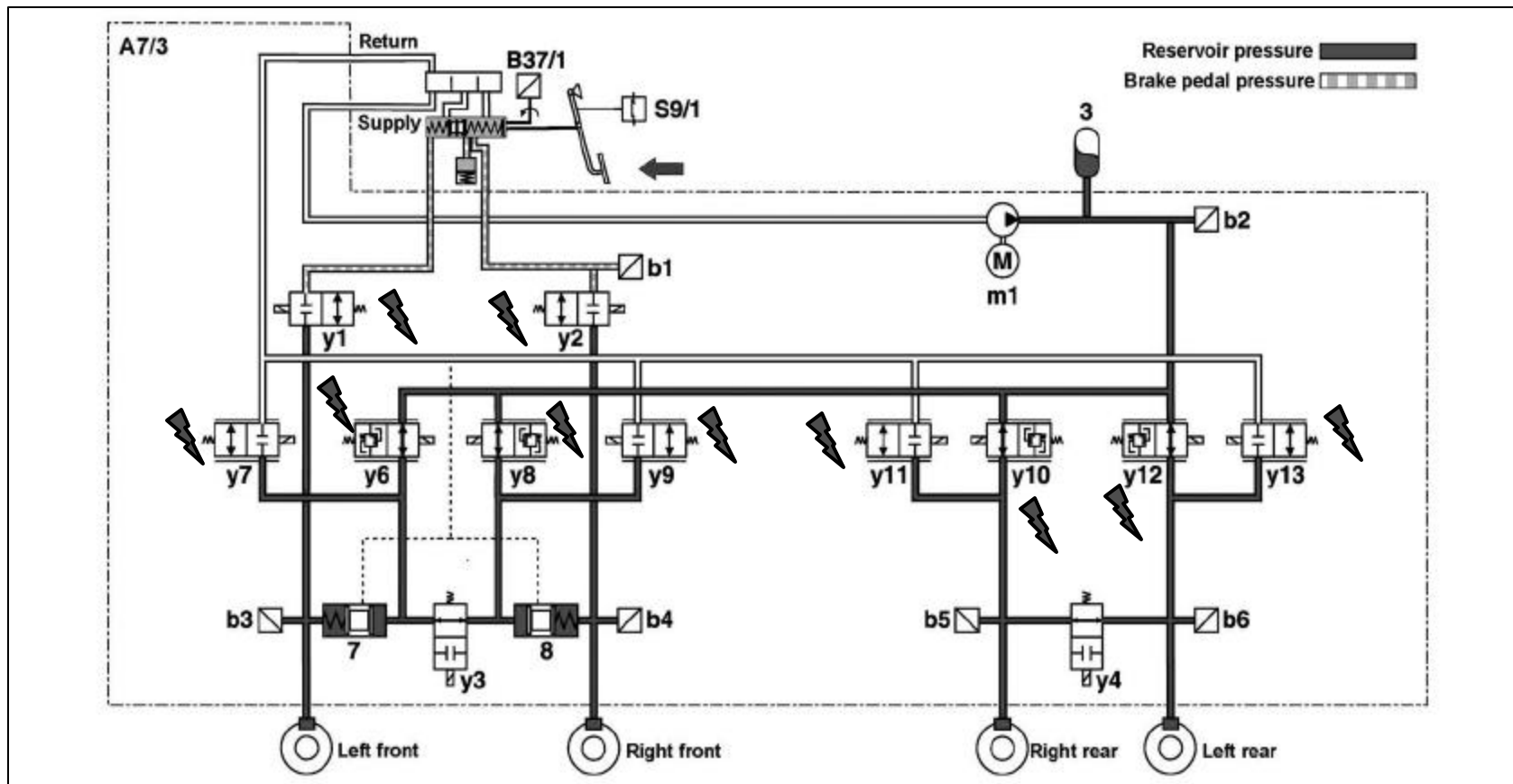
GF42.50-P-4000-04S33  
GF42.46-P-1000SL  
GF42.46-P-4500-02SL

# Pressure Apply - Front Wheels



- y6 and y8 energized
- pressure applied to left and right dividing pistons 7 and 8
- 7 and 8 apply pressure to caliper
- pressure at each wheel monitored by b3 and b4
- Balance valve y3 not energized

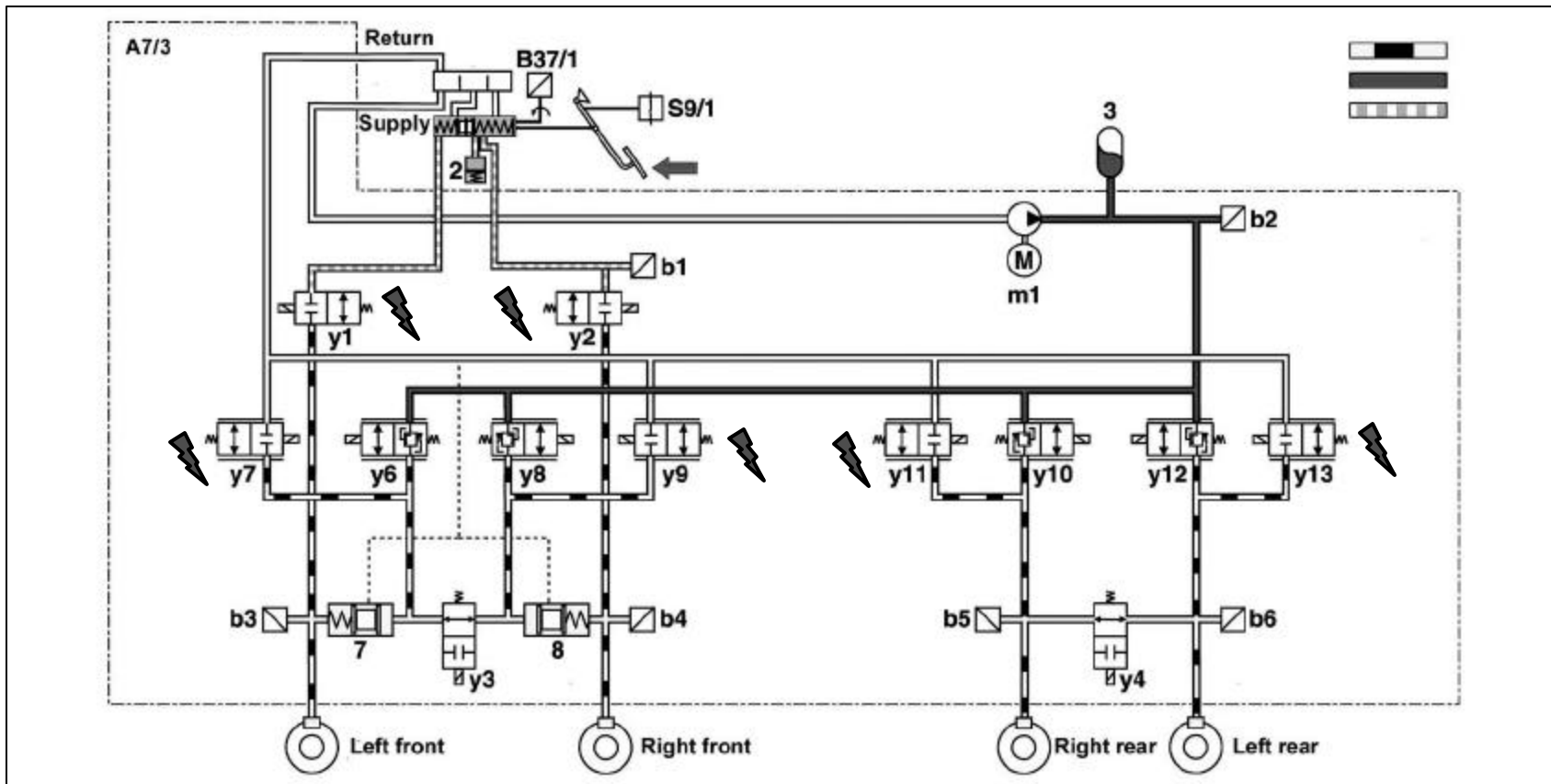
# Pressure Apply - All Wheels



- Outlet control valves y7, y9, y11, y13 energized

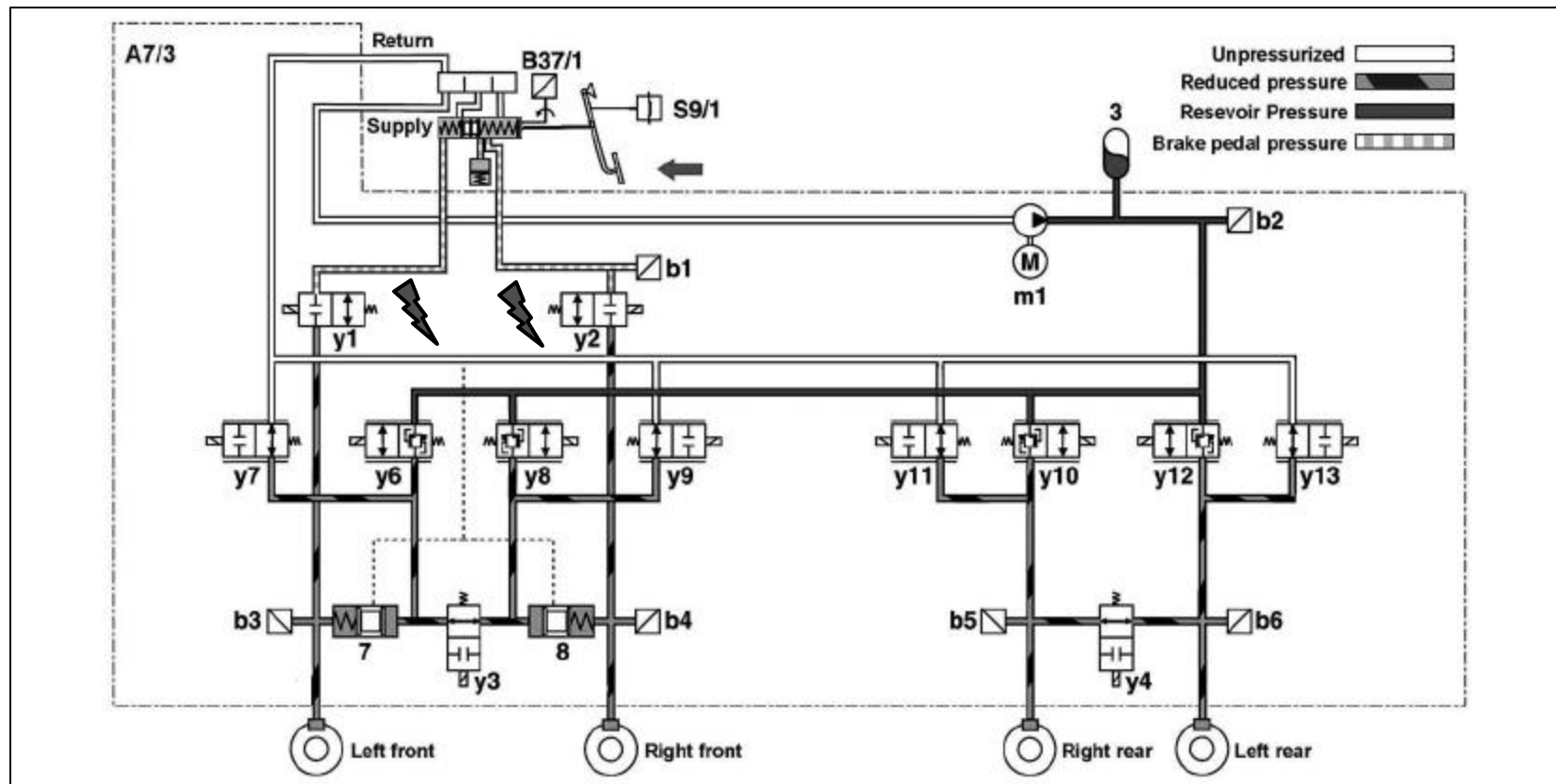
# Pressure Hold - All Wheels

- y6, y8, y10, y12 de-energized

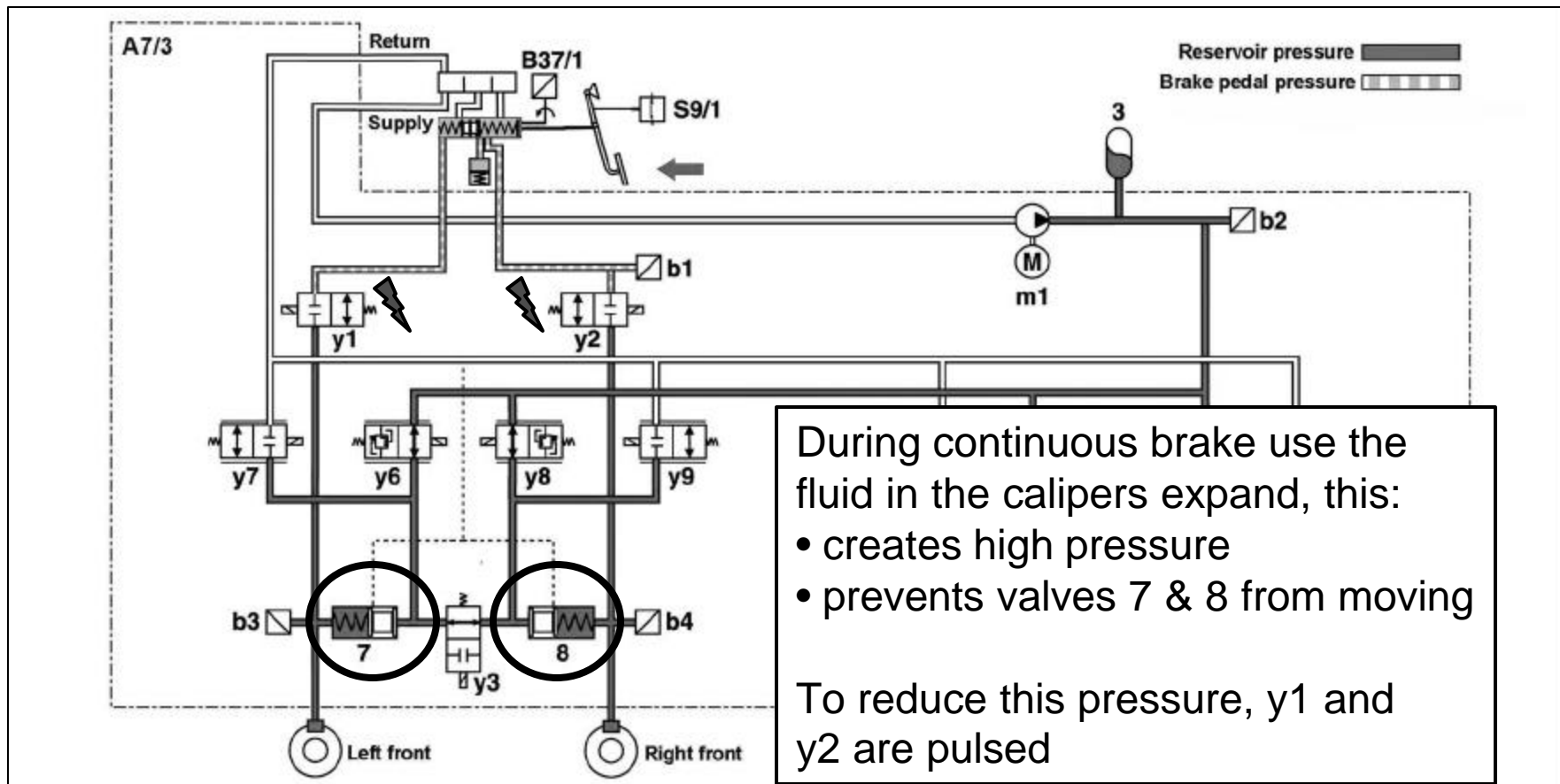


# Pressure Reduction - All Wheels

- y7, y9, y11, y13 de-energized



# Temperature Compensation



# Deactivation

SBC must be deactivated with SDS before any work is performed on the system. This will prevent the pre-drive check from being automatically performed which could cause injury.

Deactivating the system will:

- empty the pressure reservoir  
(a lower pressure with no volume may be retained)
- prevent the charge pump from operating
- Note: the warning buzzer is deactivated when accessing SBC with the SDS.

# Deactivation

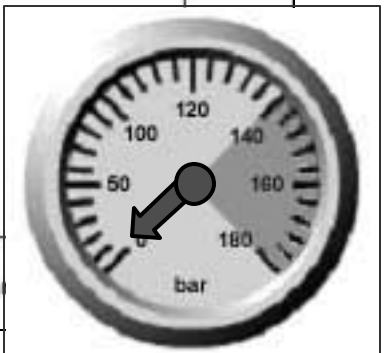
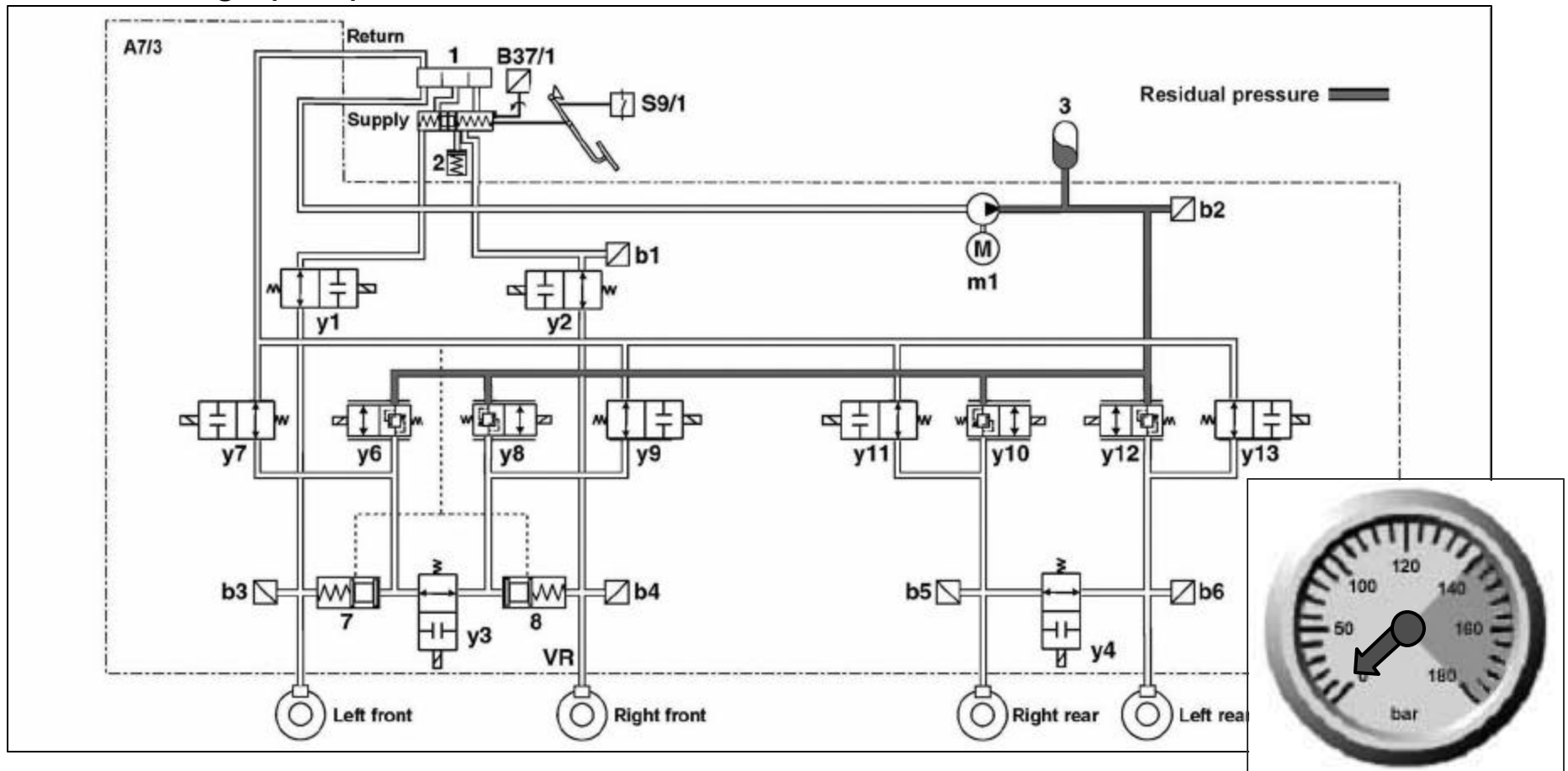
SBC must be deactivated *PRIOR* to:

- working on the hydraulic system
- removing or installing brake pads
- replacing rotors
- replacing the pressure reservoir
- replacing the BOU
- replacing the SBC hydraulic unit (A7/3)



# Deactivation

Charge pump disabled and accumulator fluid returned to the reservoir!



Pressure at A7/3b2

# System Activation

Activation must be performed anytime the system has been deactivated, *BEFORE* the engine is started!

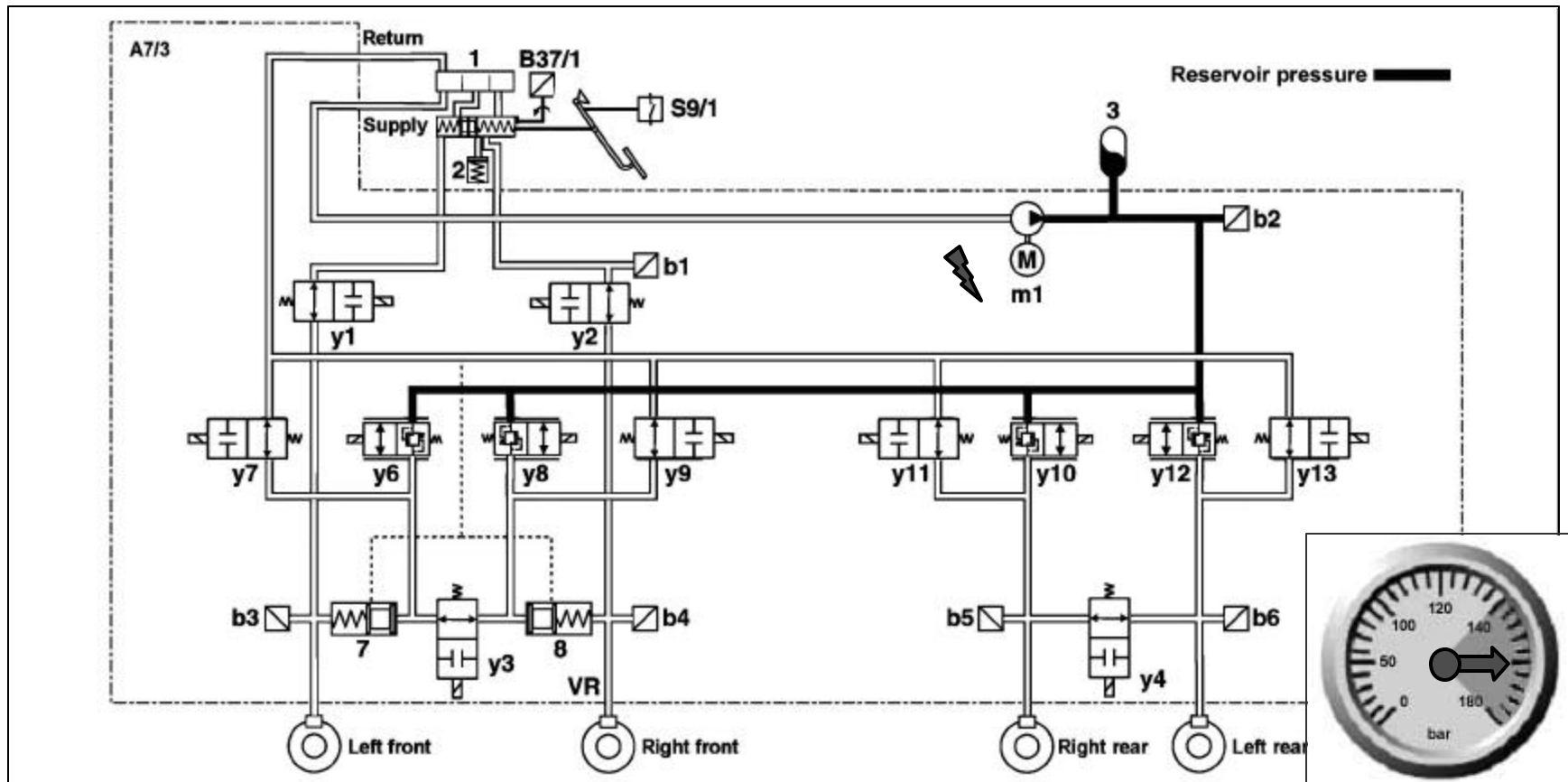
Failure to activate will prevent proper operation and create fault codes!

Activating SBC with SDS will:

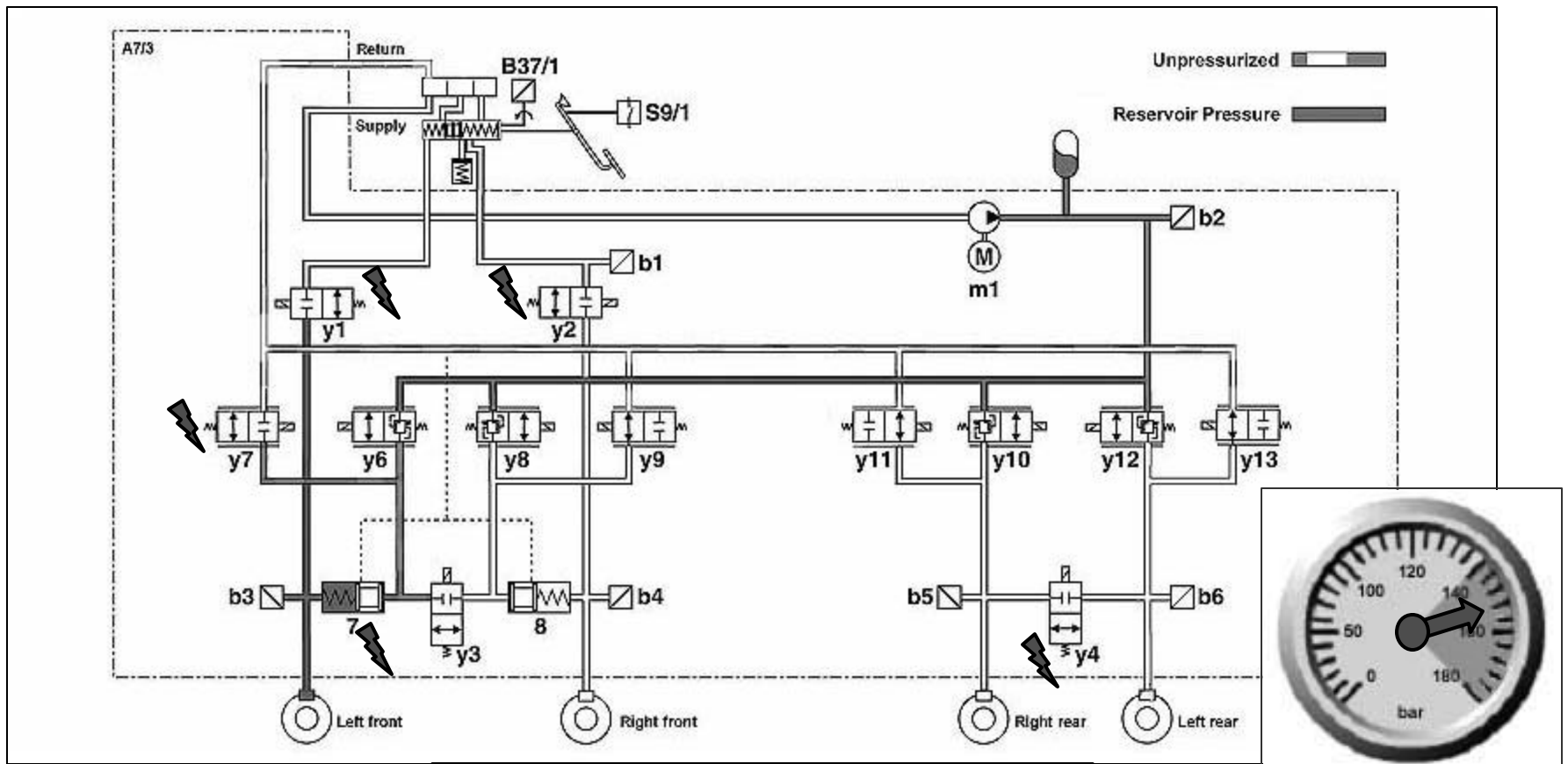
- charge the accumulator
- perform a Predrive Check
- move the pads towards the rotors with ~60 bar pressure
- erase the fault memory

(Note: may have to activate several times to position the brake pads)

# System Activation

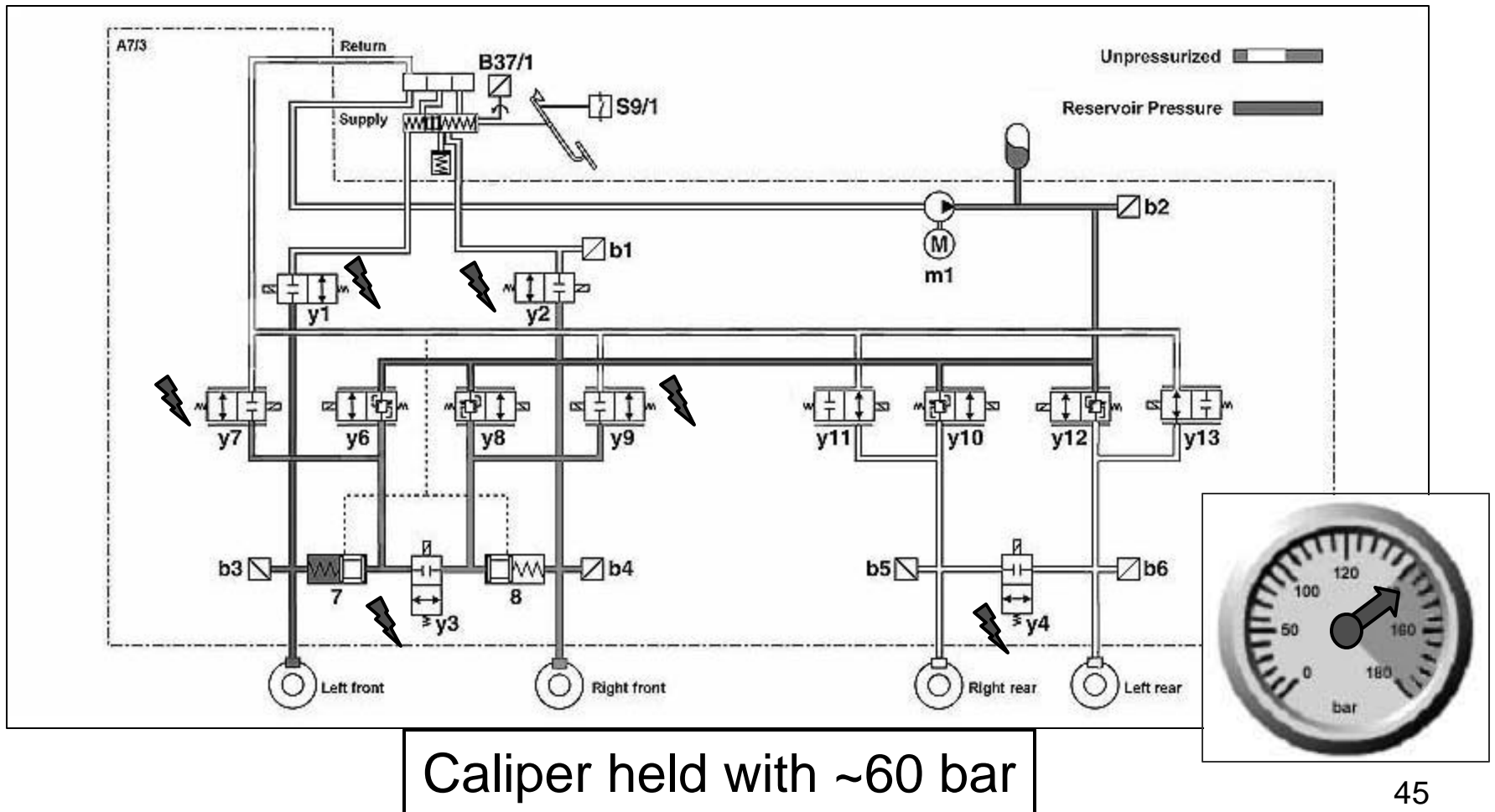


# Activation - Left Front

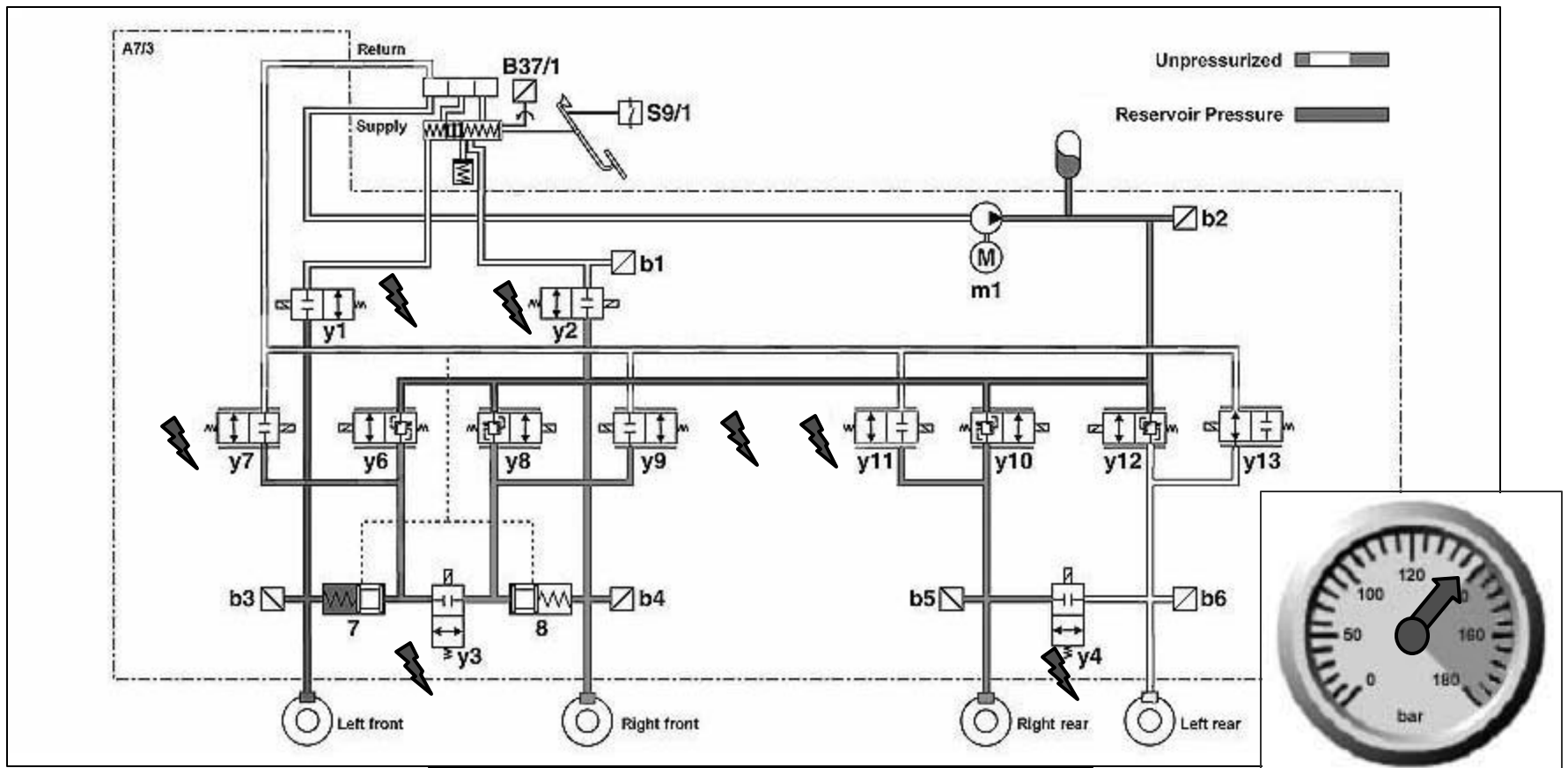


Caliper held with ~60 bar

# Activation - Right Front

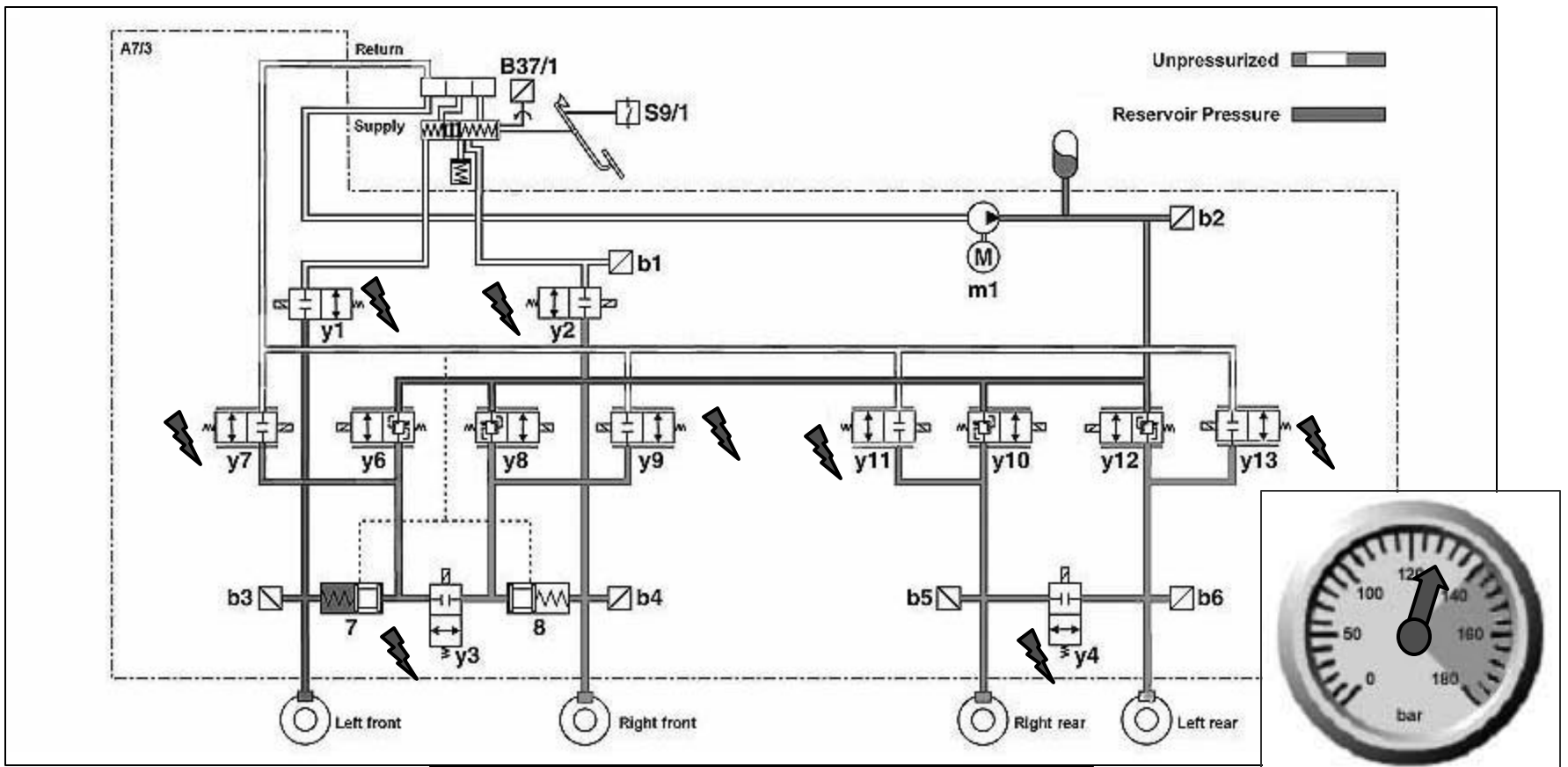


# Activation - Right Rear



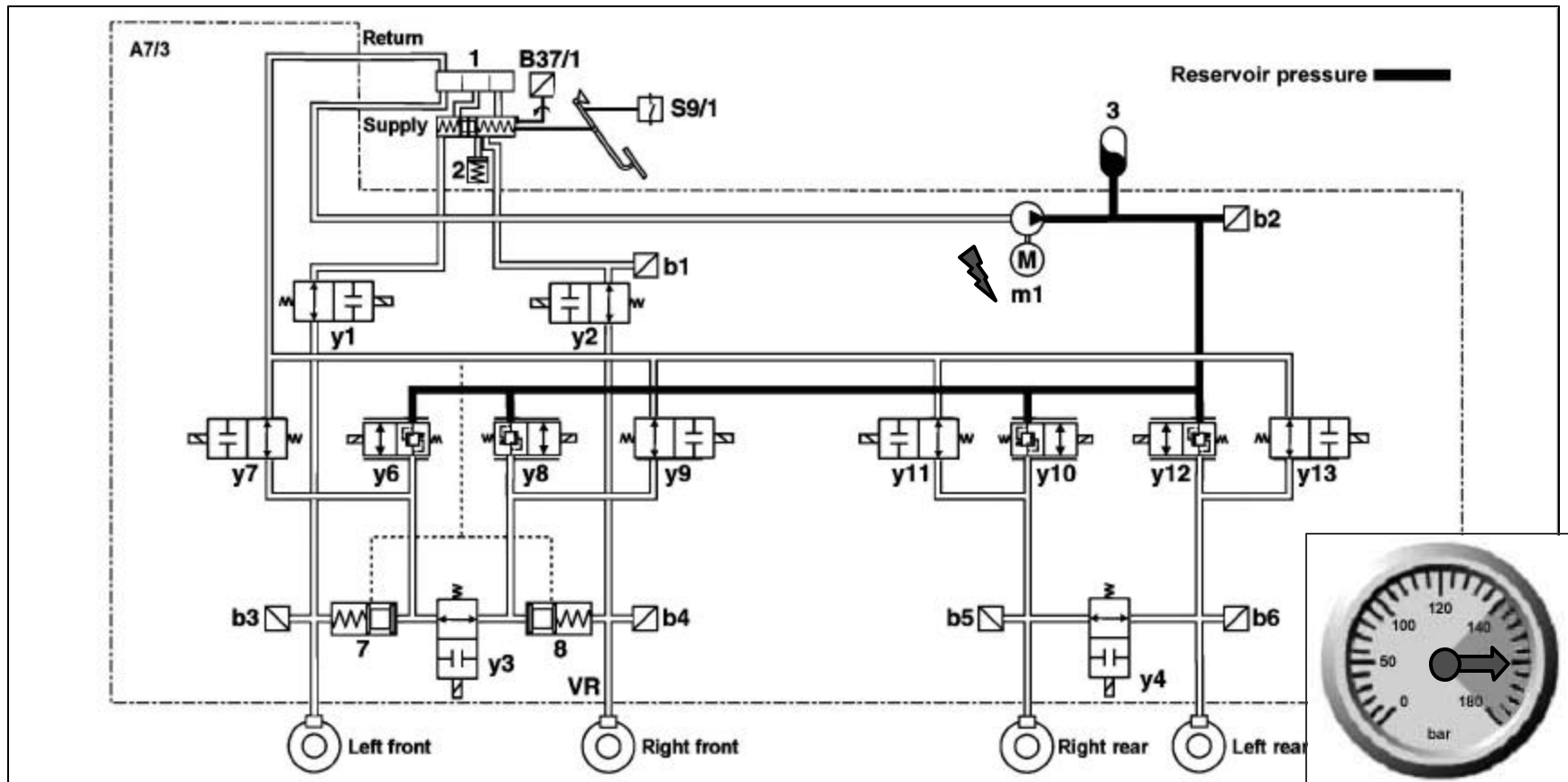
Caliper held with ~60 bar

# Activation - Left Rear



Caliper held with ~60 bar

# Activation - Recharge



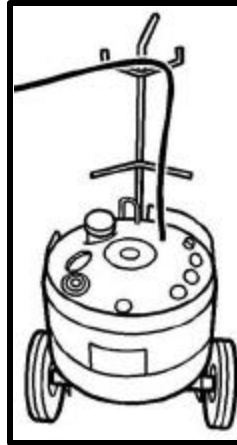
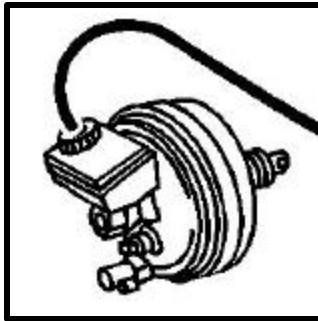


# Bleeding the Brake System

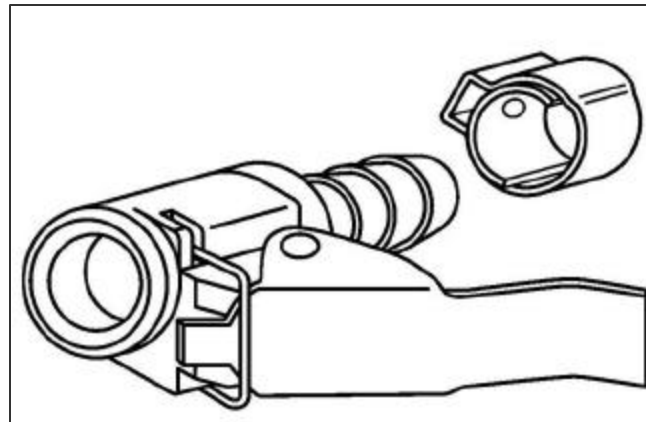
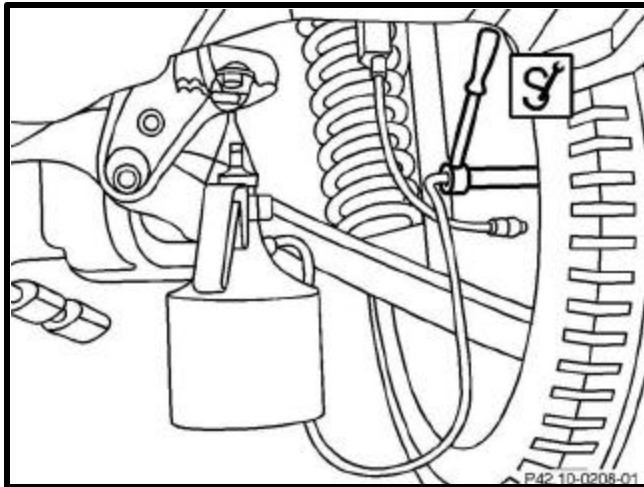
Proper system bleeding is critical!  
Follow directions in SDS

- Bleeding must be performed using the SDS
- Pressure at bleeder valves will exceed 100 bar  
(Hold the bleeder hose securely)
- Bleeding may require ~1.5 hours
- Bleeding may use ~ 1.5 liters of brake fluid

# Equipment Required



- Pressure bleeder
- Adapters
- Fluid receptacle
- SDS - follow instructions carefully



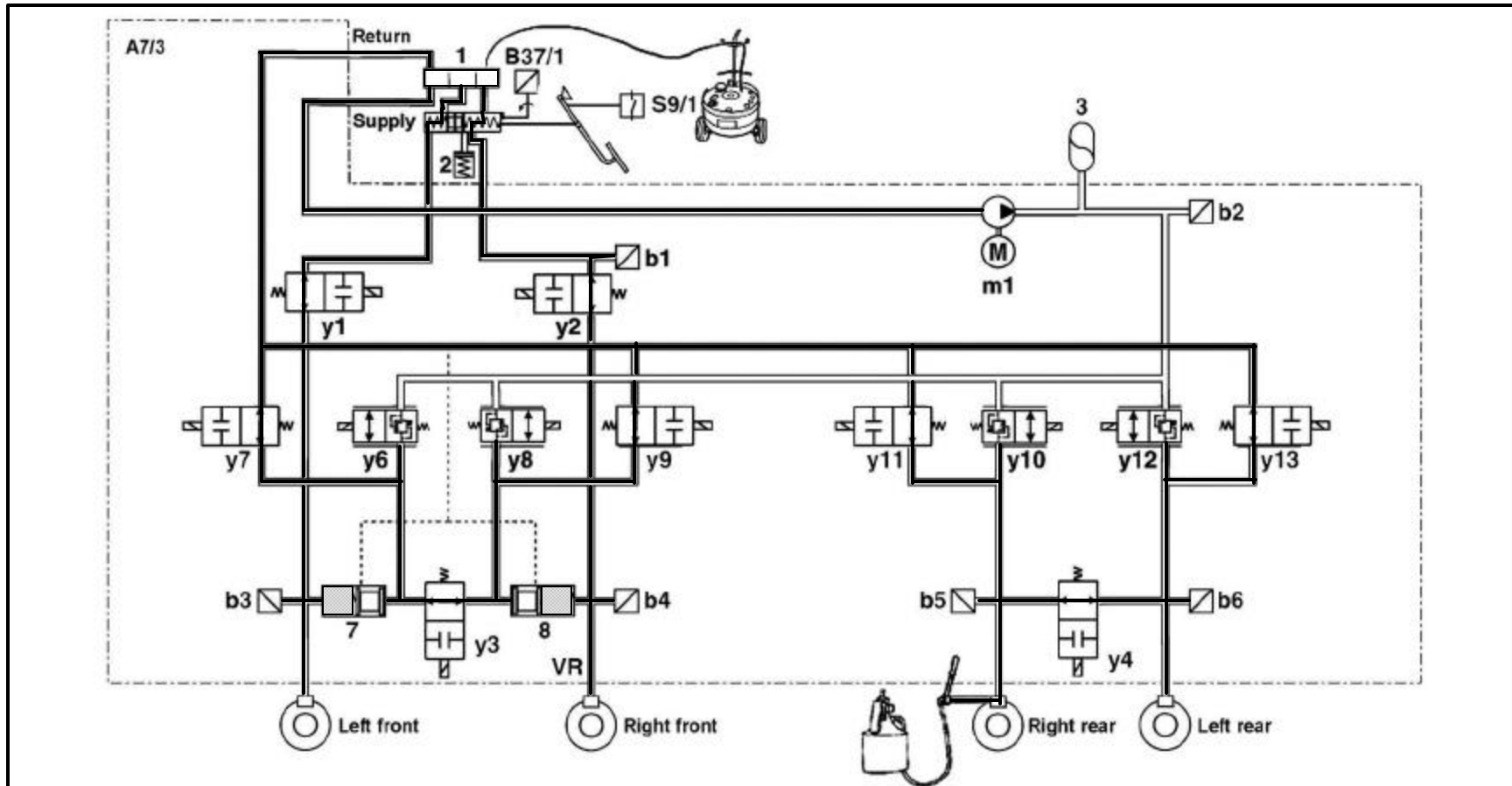
211 589 01 91 00

**CAUTION:**  
Extremely high pressure at bleeder!

AR42.10-P-0010-02R 50  
AR42.10-P-0012R  
WS42.00-P-0048B

# Bleeding the Brake System

Connect equipment and follow steps in SDS



# Acronym List

(Used in This Handout.)

ABS - Anti-lock Brake System  
ASR - Anti Slip Regulation  
BAS - Brake Assist System  
BOU - Brake Operating Unit  
CAN - Controller Area Network  
EBP - Electronic Brake Proportioning  
EBR - Electronic Brake Regulation  
E-Gas - Electronic Accelerator  
ESP - Electronic Stability Program  
ETS - Electronic Traction System  
PDC - Predrive Check  
SAM - Signal Acquisition Module  
SBC - Sensotronic Brake Control

# Appendix

AR42.10-P-0010I	Carrying out bleeding operation
AR42.10-P-0012R	Bleeding system with Star Diagnosis
GF42.45-P-0001-04SL	ESP driver information
GF42.45-P-0001SL	ESP function
GF42.45-P-2000SL	ESP brake moment control
GF42.45-P-3500SL	ASR control mode function
GF42.46-P-0001SL	SBC function
GF42.46-P-1000SL	SBC Normal braking function
GF42.46-P-2000SL	SBC additional braking functions
GF42.46-P-3000SL	SBC braking with malfunction
GF42.46-P-4200-03SL	BOU function
GF42.46-P-4210SL	SBC pedal value sensor
GF42.46-P-4500-02SL	SBC control module – task
GF42.50-P-4000-03S	Hydraulic unit design
GF42.50-P-4000-04S	Hydraulic unit function
GF42.50-P-4000S	Hydraulic unit task/location/function
WS42.00-P-0048B	EHB adaptor

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