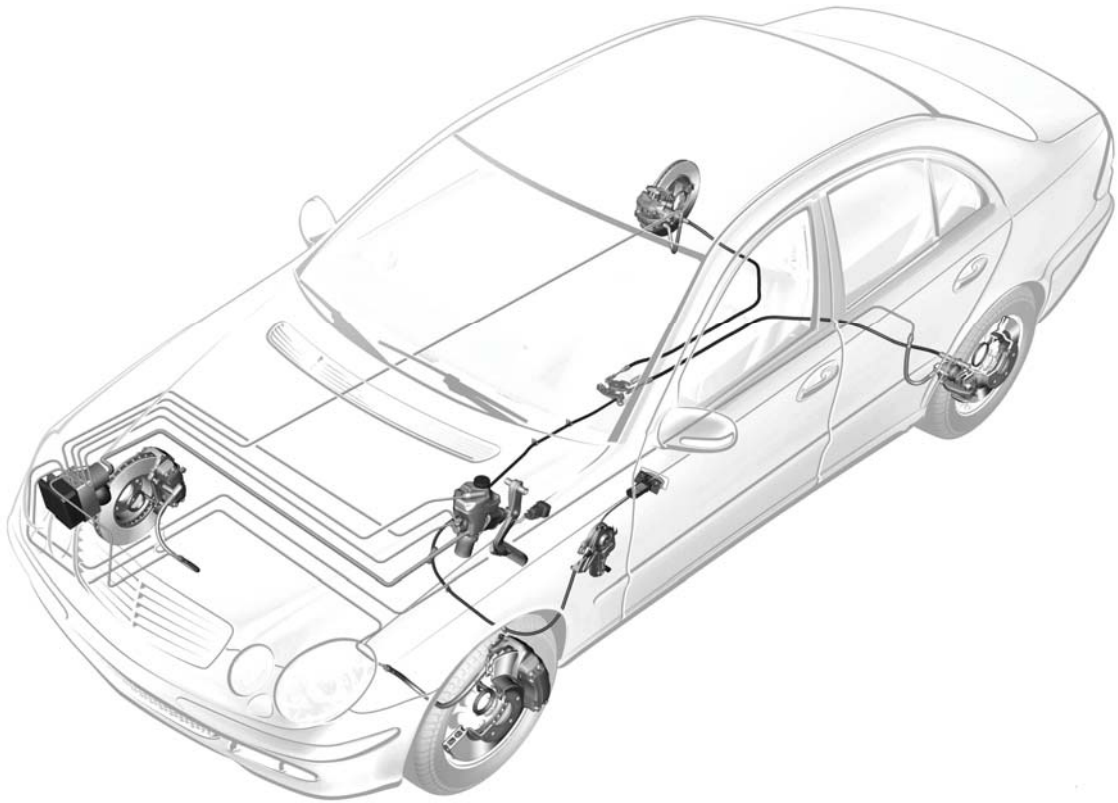
Mercedes-Benz

Sensotronic Brake Control (W211 SBC)



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To help avoid personal injury to you or others, and to avoid damage to the vehicle on which you are working, you must always refer to the latest Mercedes-Benz Technical Publication and follow all pertinent instructions when testing, diagnosing or making repair. Illustrations and descriptions in this training reference are based on preliminary information and may not correspond to the final US version vehicles. Refer to the official introduction manual and WIS when available.

WIS document numbers shown apply to WIS Version G.04.06 11/01 USA/CDN

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Evolution!

ABS (Anti lock Brakes 1984)

\+ ASR (Automatic Slip Regulation 1991)

\+ ETS (Electronic Traction System 1994)

\+ ESP (Electronic Stability Program 1996)

\+ BAS (Brake Assist System 1998)

= SBC (Sensotronic Brake Control 2002)

SBC = Sensotronic Brake Control, the next level of brake control !

ABS Function

ABS - prevents the wheels from locking up during braking, maintaining steerability and directional control during deceleration

ASR, EBR and ESP Functions

ASR (braking moment) - prevents drive wheel from spinning while driving.

EBR - reduces brake slip at the drive wheels during deceleration to ensure directional control.

ESP - prevents the vehicle from breaking away when oversteering or understeering.

Advantages of SBC

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

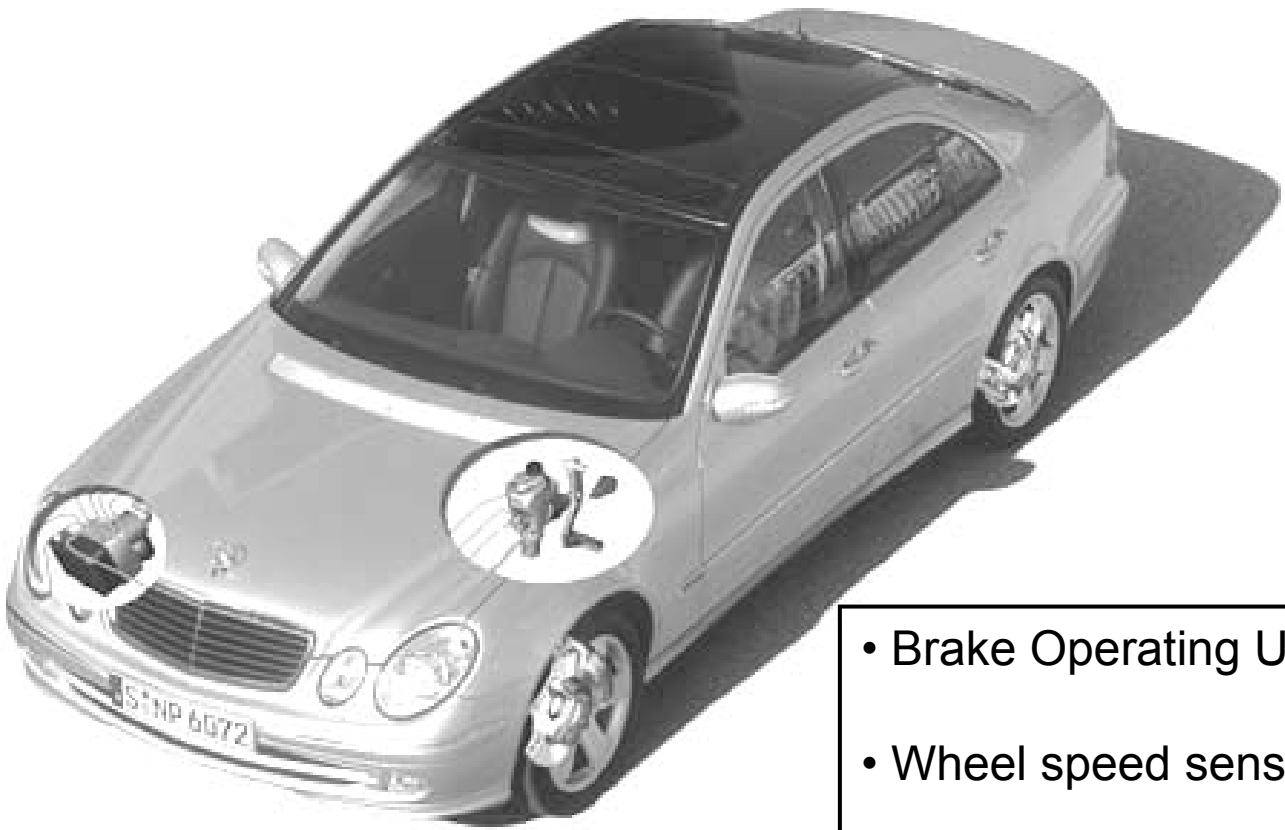
Advantages of SBC

- Optimal brake force distribution front to rear and side to side (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

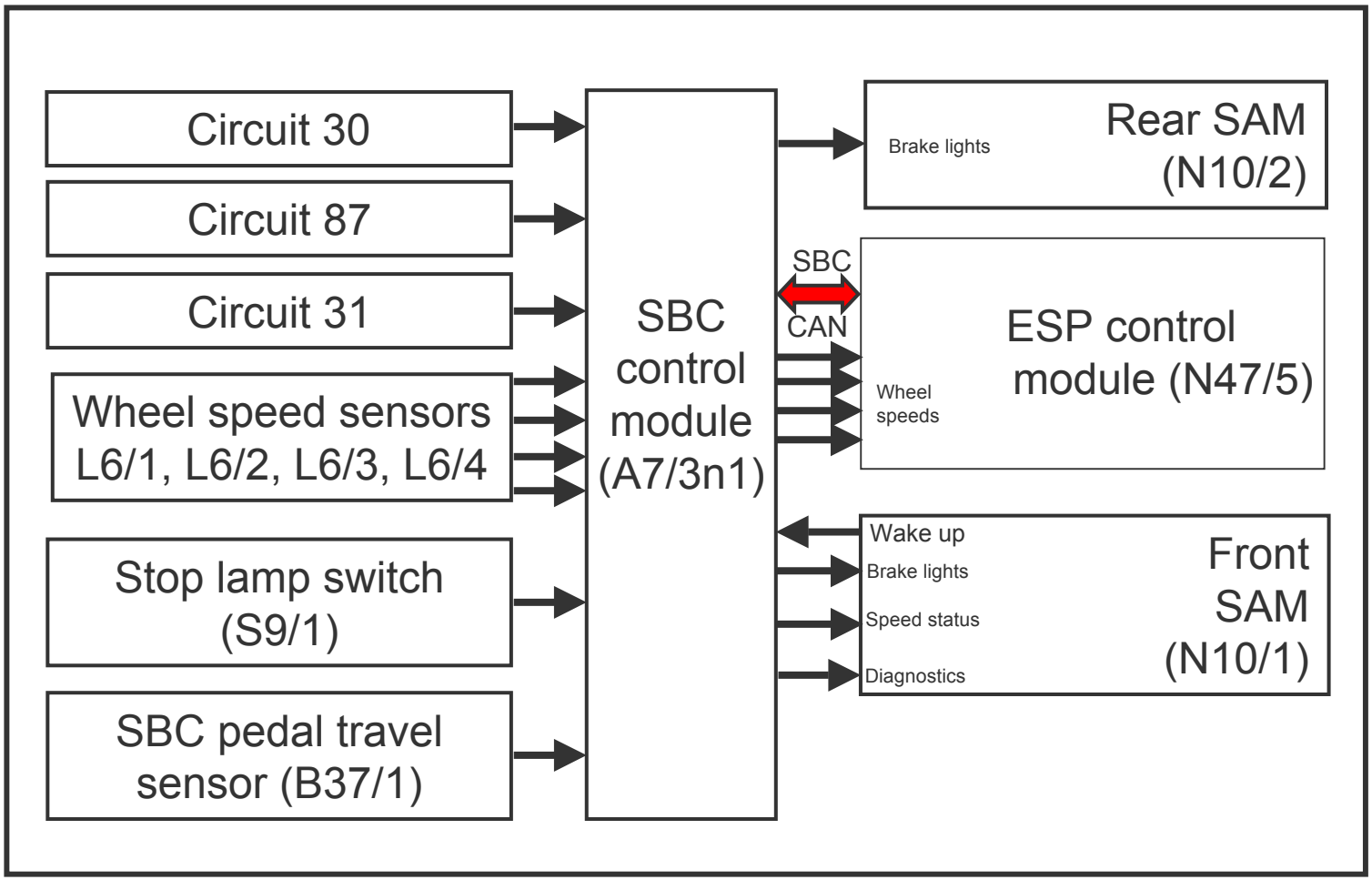
- Pressure reduction at standstill
  - – reduces stress on components
- Dry braking function
  - wiper input via CAN
  - ~every 7 to 14 minutes
  - brake actuation changes time interval

SBC Components

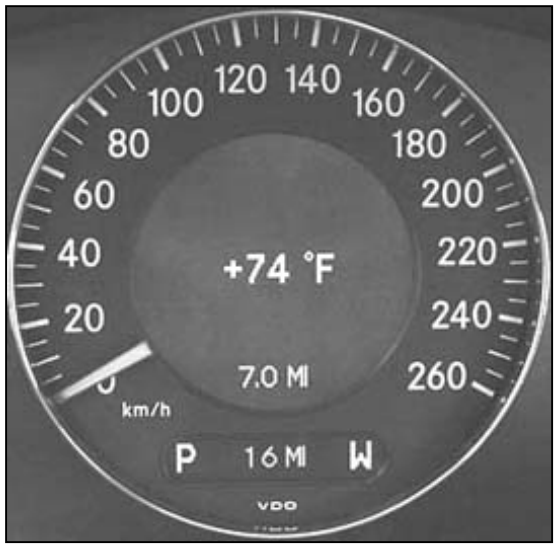


- Brake Operating Unit (BOU)
- Wheel speed sensors
- Traction System Hydraulic Unit A7/3

System Overview



Warning Display



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

Warning Display

SBC control module failure

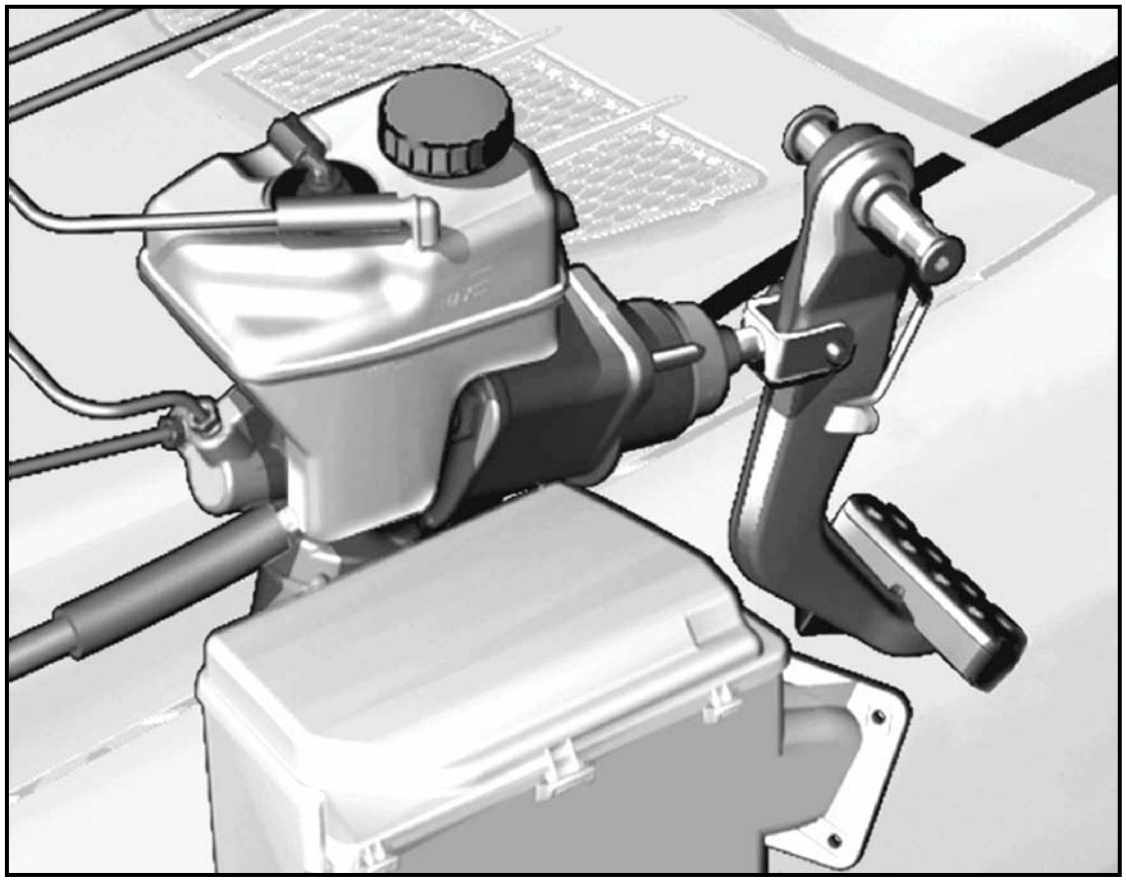
Certain faults will trigger audible signal

Quick Quiz

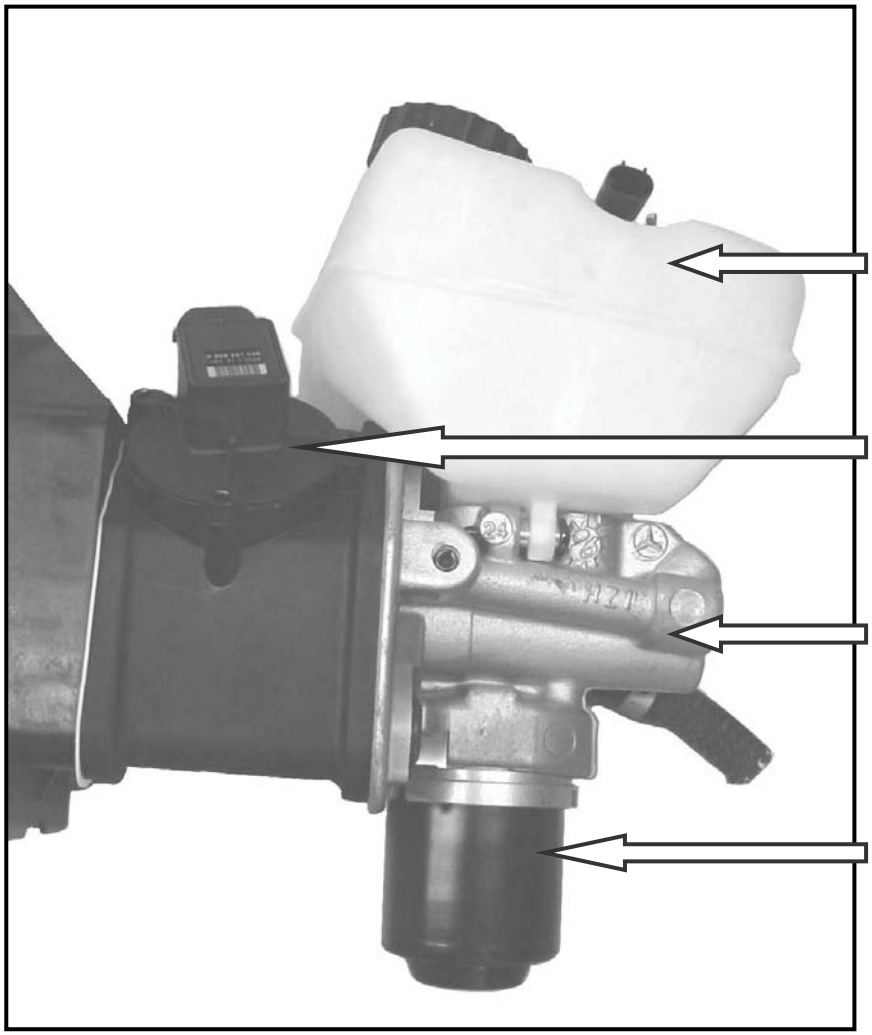
Q1. The 211 has how many wheel speed sensors?

A1. _____

Brake Operating Unit - (BOU)



Brake Operating Unit



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

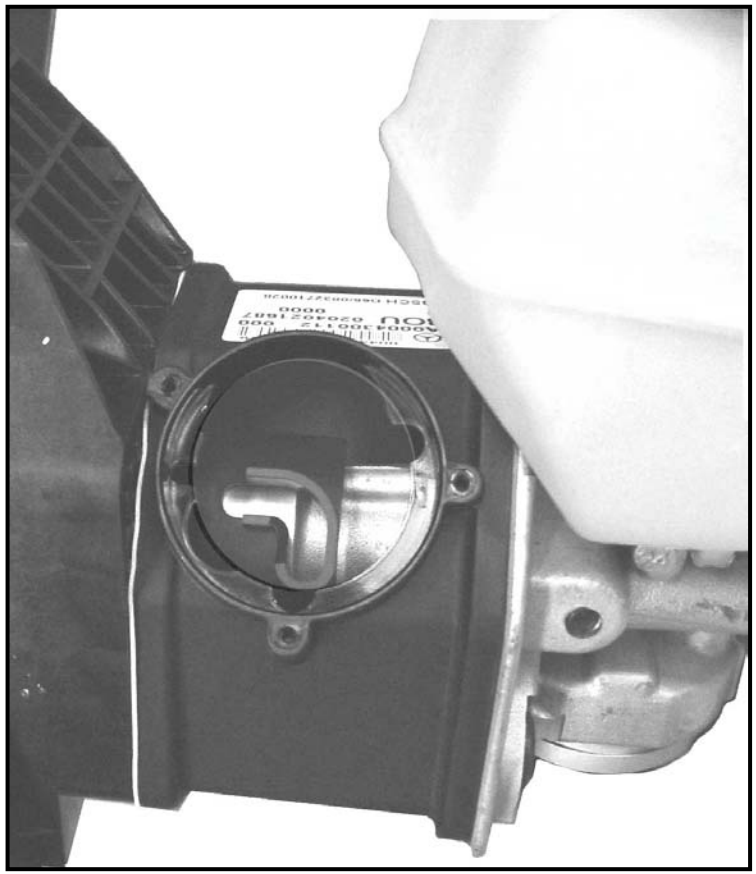
- Brake fluid reservoir
  (Do not overfill!)
- SBC pedal value sensor (B37/1)
- Tandem master cylinder
- Brake pressure simulator
  (Note: no vacuum booster)

Fluid Reservoir

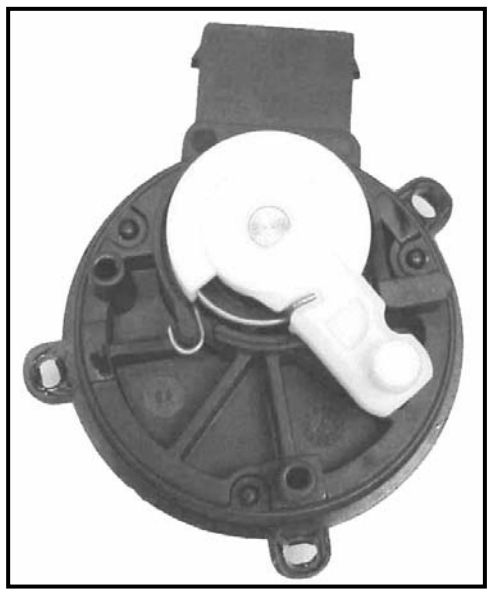
- Do not overfill!

- Ultraviolet protection

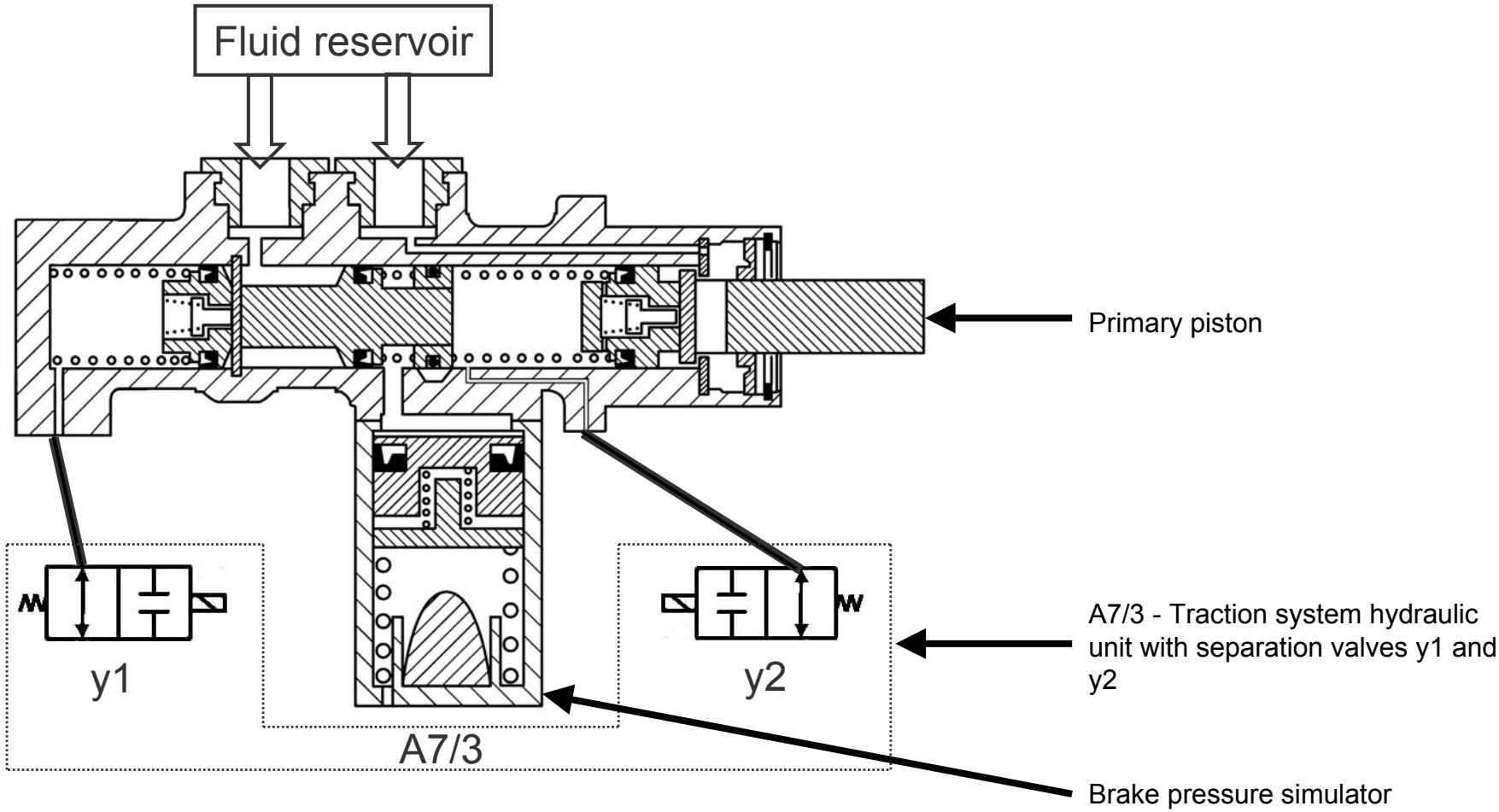
Pedal Value Sensor - B37/1



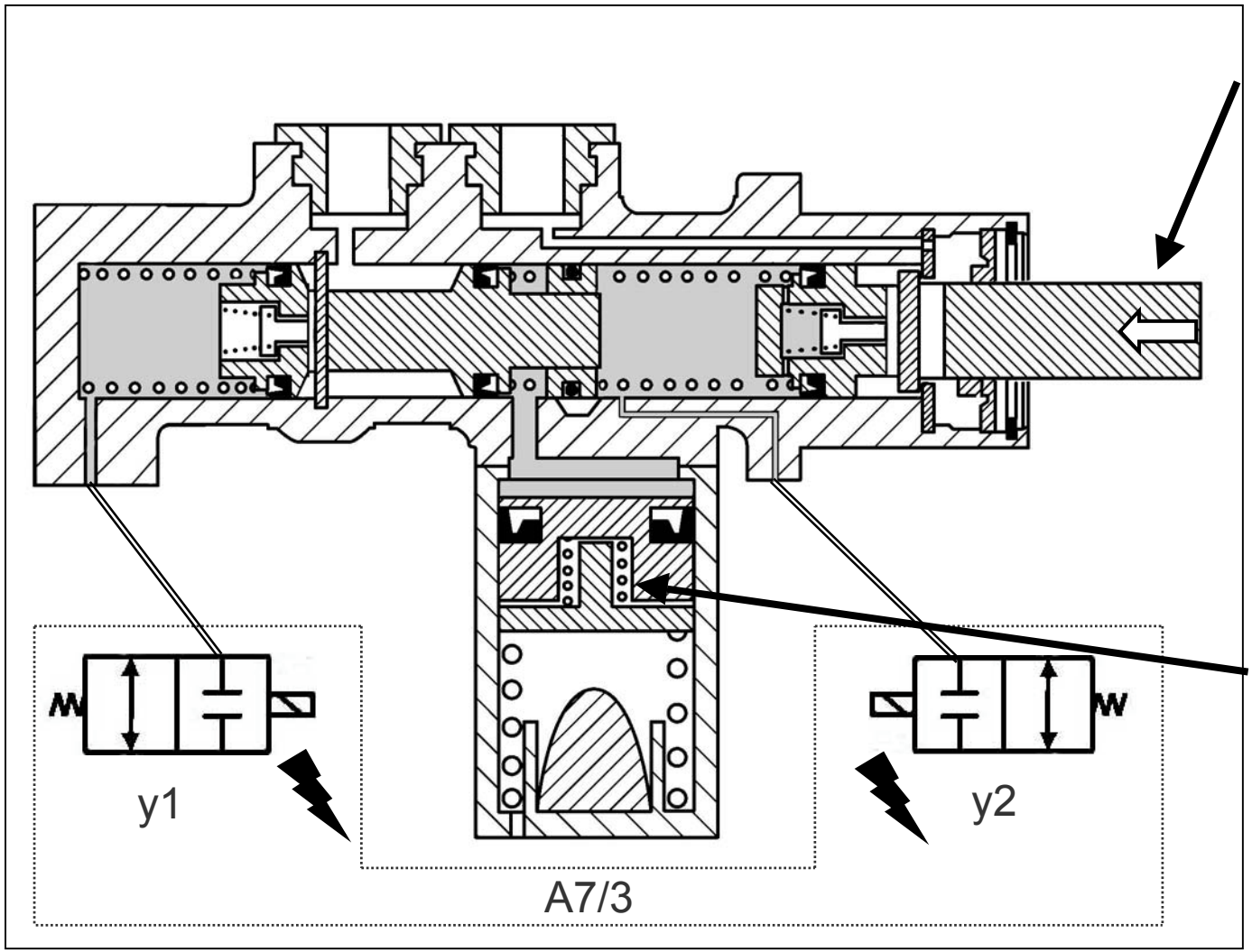
- Contains two Hall Effect sensors
- Converts pedal travel to electrical signal
- Provides input to SBC control module A7/3



BOU Tandem Master Cylinder

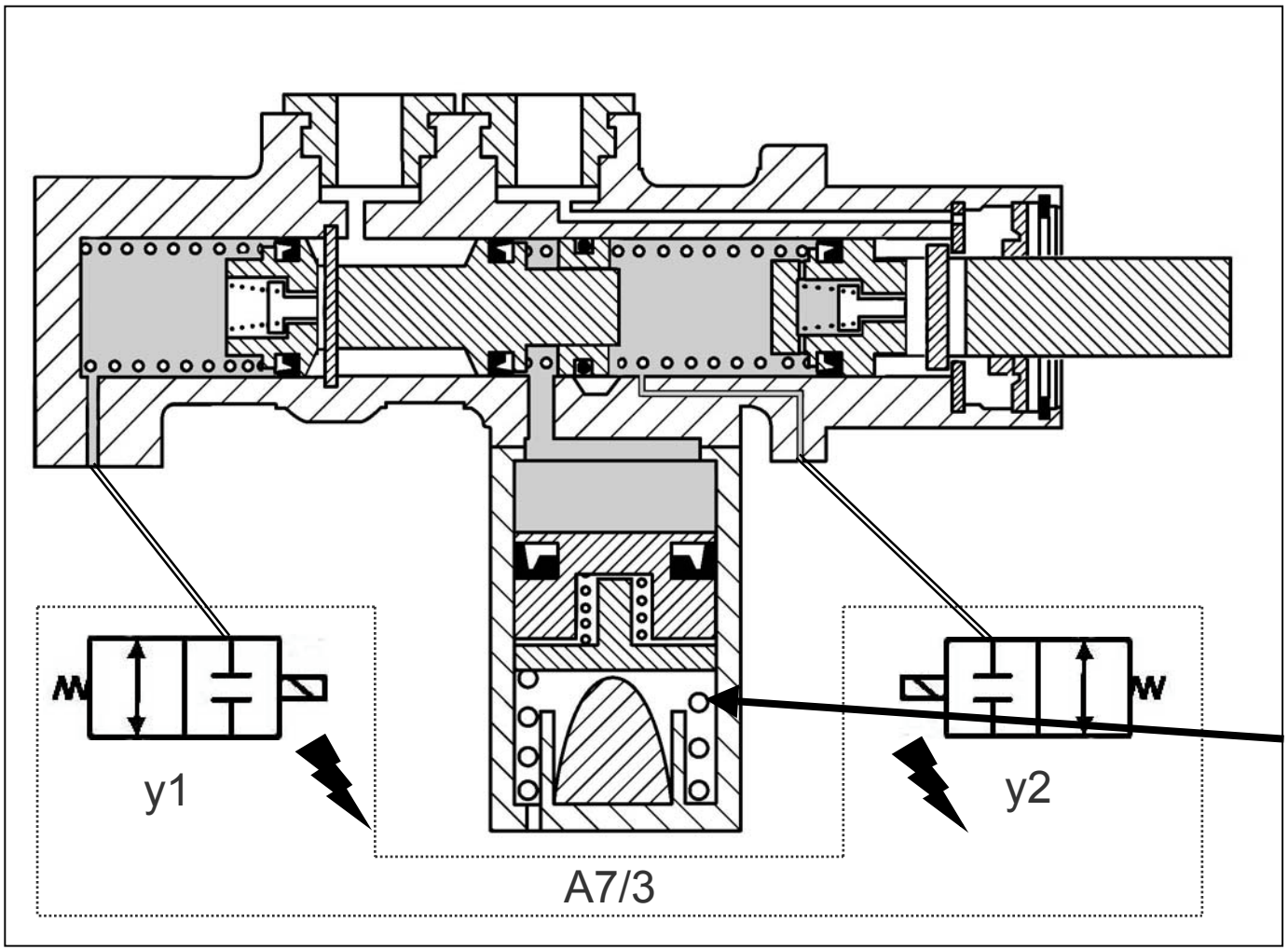


Normal Braking - Light Pressure



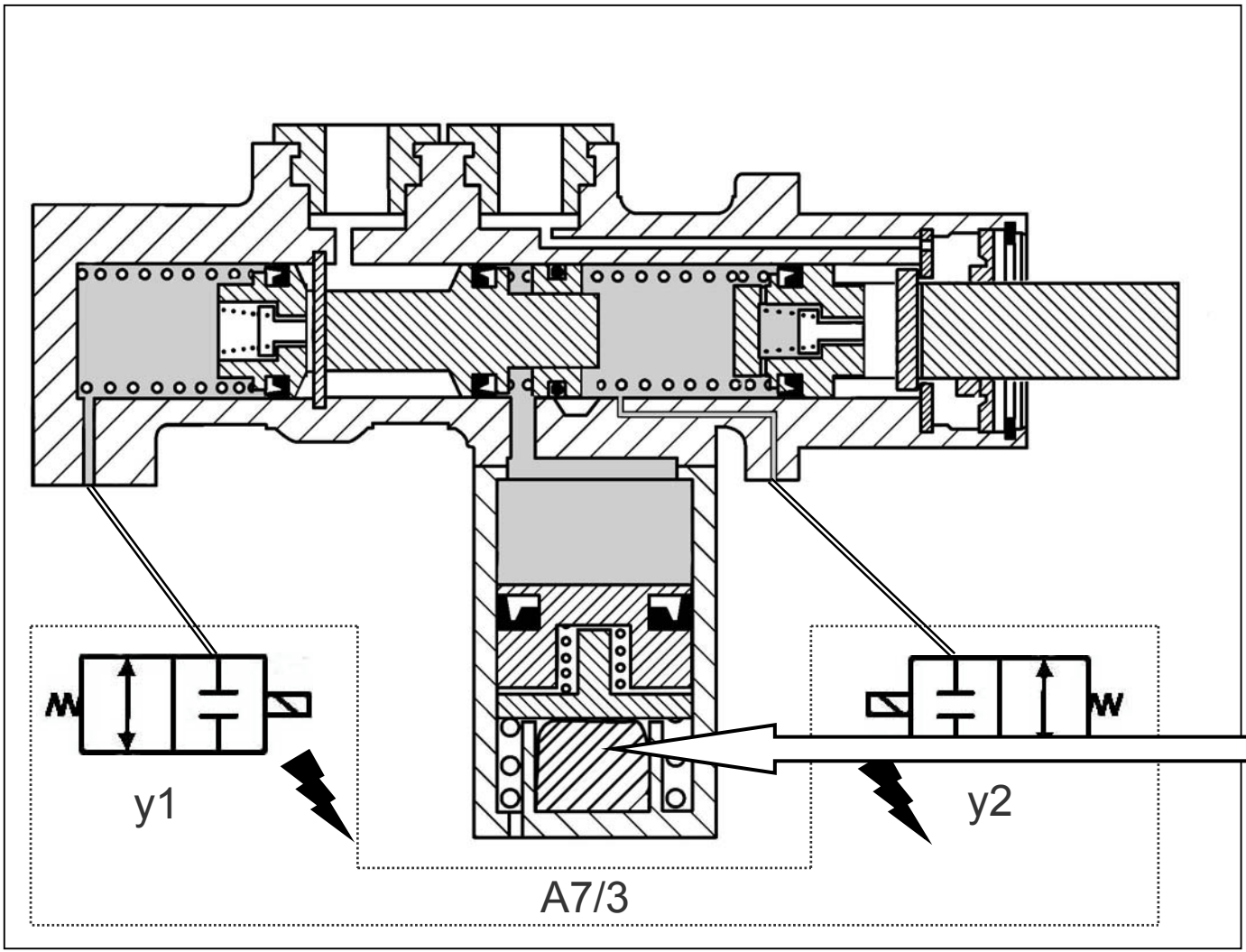
- Driver applies pressure to the brake pedal
- y1 and y2 energized, preventing fluid movement externally
- Floating piston allows fluid to enter simulator, compressing the light spring, providing pedal feel to the driver

Normal Braking - Increased Pressure



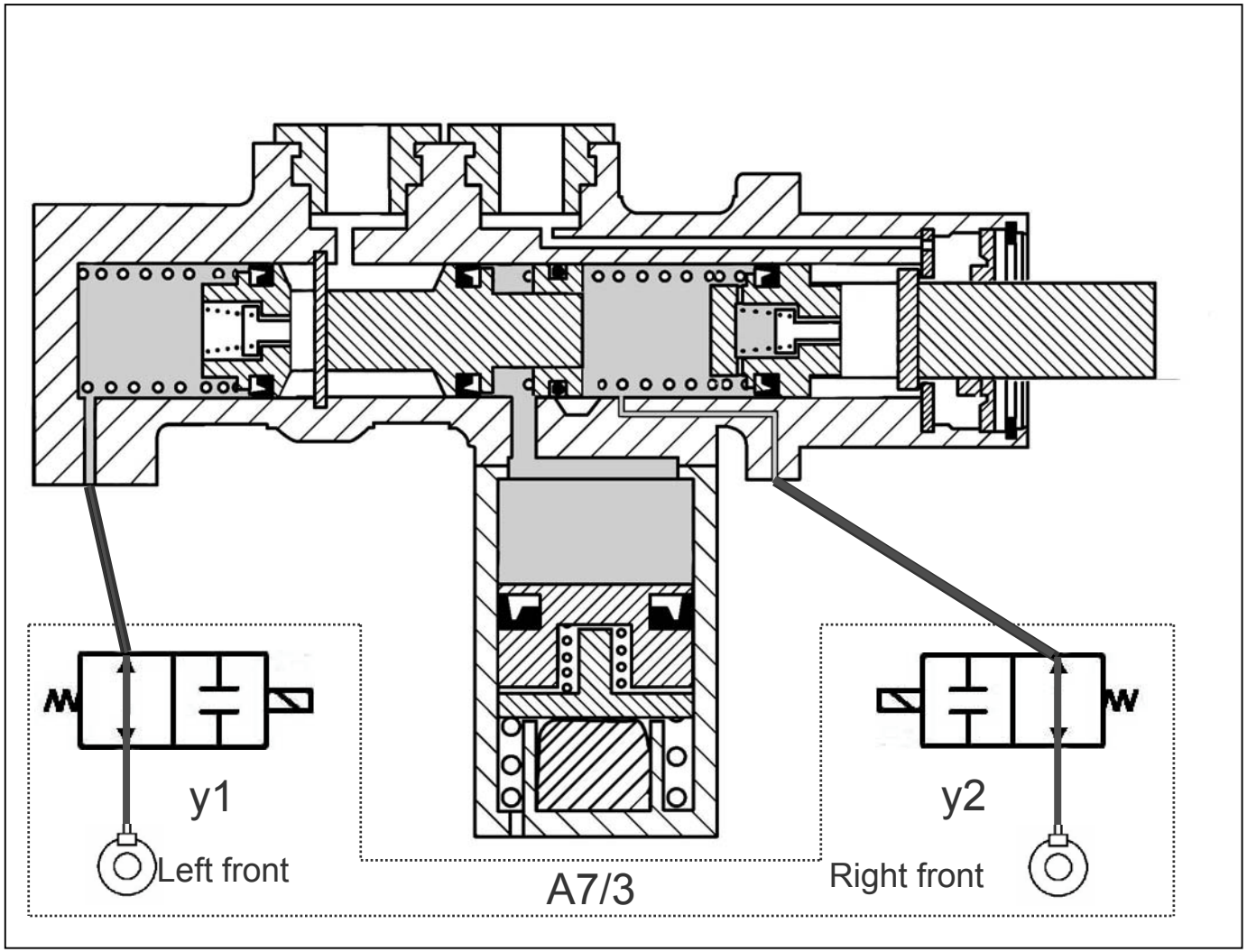
- Increasing pedal travel causes the larger spring to compress, providing harder pedal feel

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!

Quick Quiz

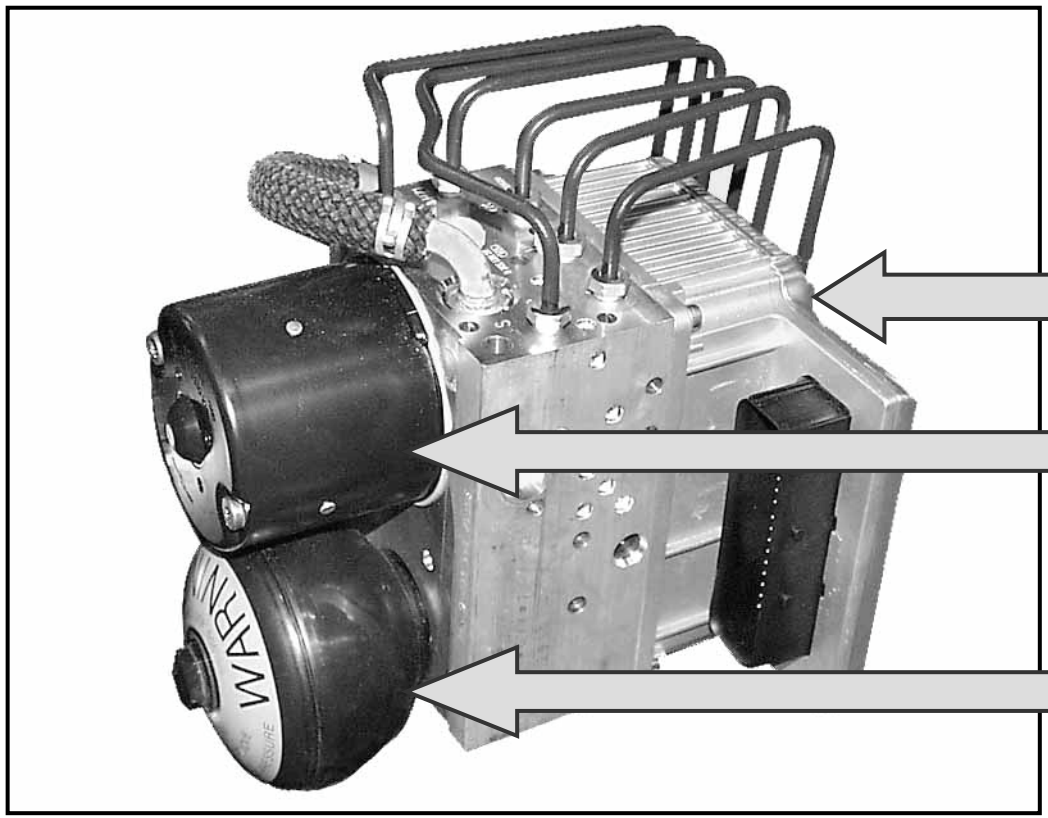
Q1. Why is there a plastic cover over the brake reservoir?

A1. _____

Q2. Which wheels will have the brakes applied during a major failure?

A2. _____

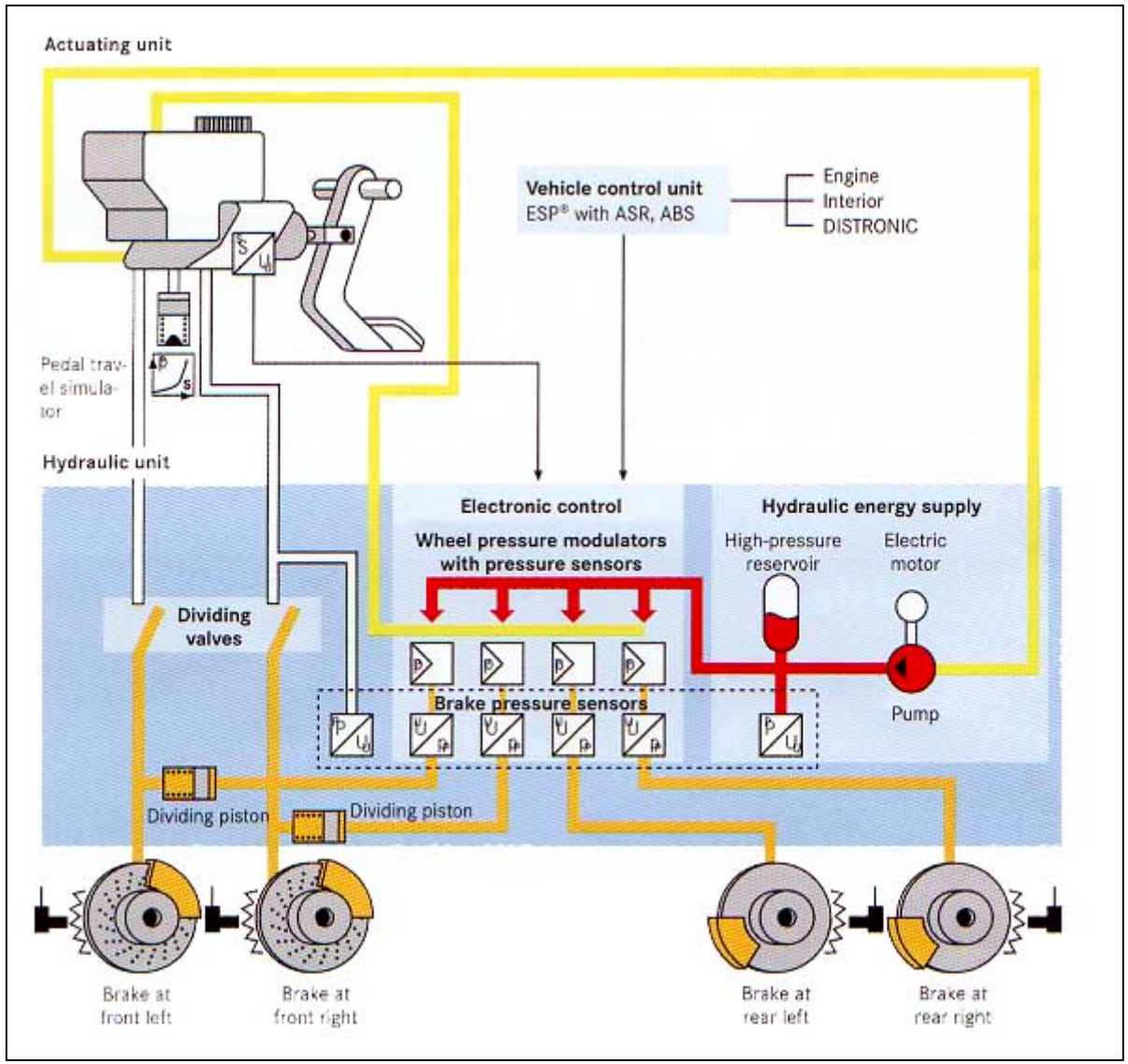
Traction System Hydraulic Unit (A7/3)



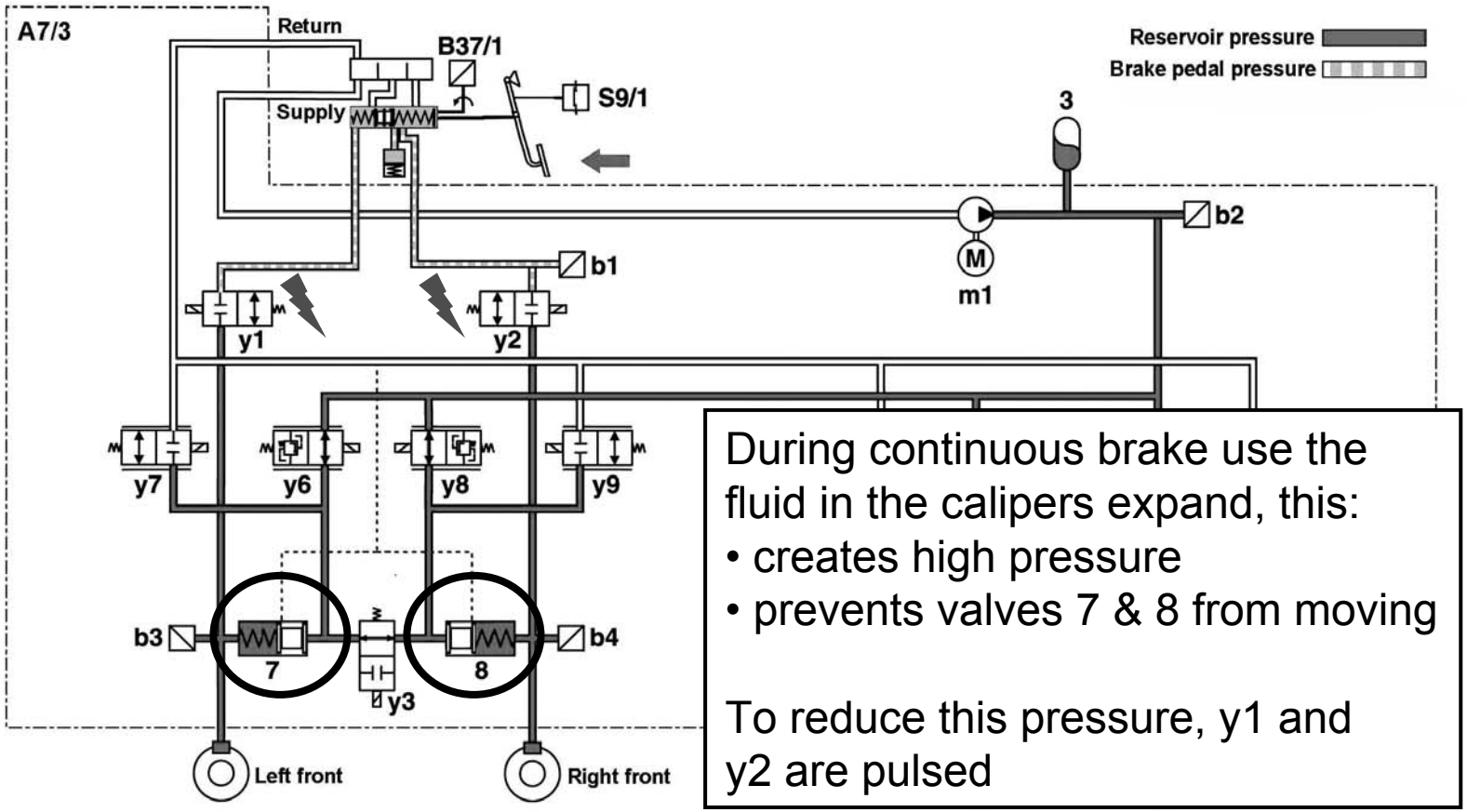
Consists of:

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

SBC Hydraulic Function



Temperature Compensation



During continuous brake use the fluid in the calipers expand, this:

- creates high pressure
- prevents valves 7 & 8 from moving

To reduce this pressure, y1 and y2 are pulsed

Wake-up

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

- opening a door
- operating the central locking system
- depressing the brake pedal
- turning the key to position 1
- operating the parking brake

The wake up signal comes from the left front SAM

Predrive Check (PDC)

SBC may perform a PDC after wake up, the following are checked:

- reservoir pressure (and corrected if necessary)
- pressure sensors (~ 60 bar of pressure applied to each wheel)
- control valves
- leak tests
- operational checks

The PDC is cancelled if the driver operates the accelerator.

Self-test are constantly conducted during driving. (About every 16 brake applications.)

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

Deactivation

The system must be deactivated with SDS before working on the system to prevent the Predrive Check (PDC) from being performed and possibly causing 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)

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)

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

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-0004-01T	Inspecting brake pads
AR42.10-P-0010-02R	Carrying out bleeding operation
AR42.10-P-0012R	Bleeding Brake System with SDS
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