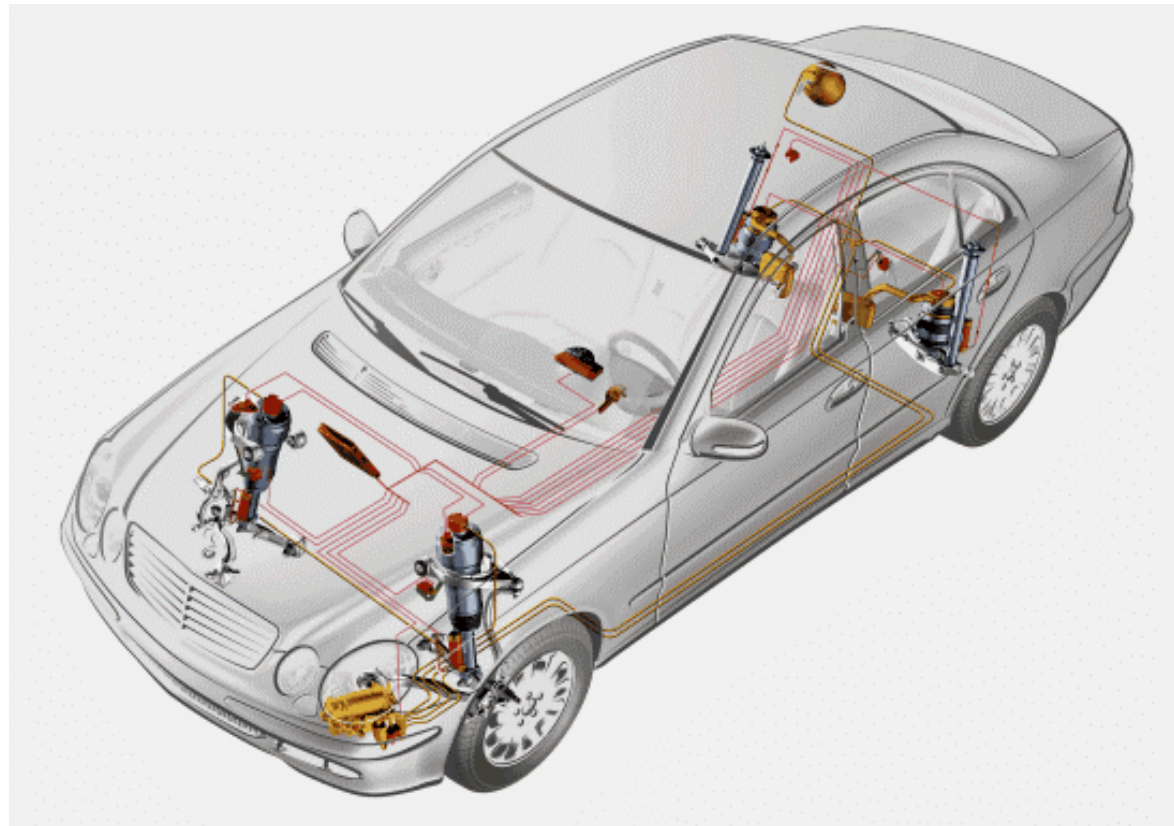




Mercedes-Benz

Semi-Active Air Suspension (SAS)



Std E500 (optional E320)

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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.

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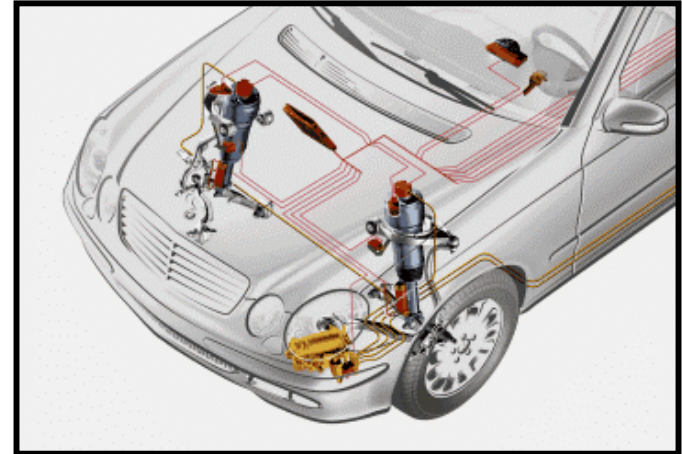
Printed in U. S.A.

SAS Advantages

- Improved driving safety and ride comfort due to:
 - Suspension ride height adaptation to vehicle load
 - Suspension dampening adaptation to road and driving style
 - Lower center of gravity (speed dependent)
 - Less aerodynamic drag (improved MPG)
 - Less up force on the front axle (anti-squat at rear axle)
- Driver control of:
 - Vehicle level
 - Dampening
- Driver information:
 - Vehicle raised function indicator lamps in switch
 - Sport dampening function indicator lamps in switch
 - Multi-function display of warning messages

SAS Function

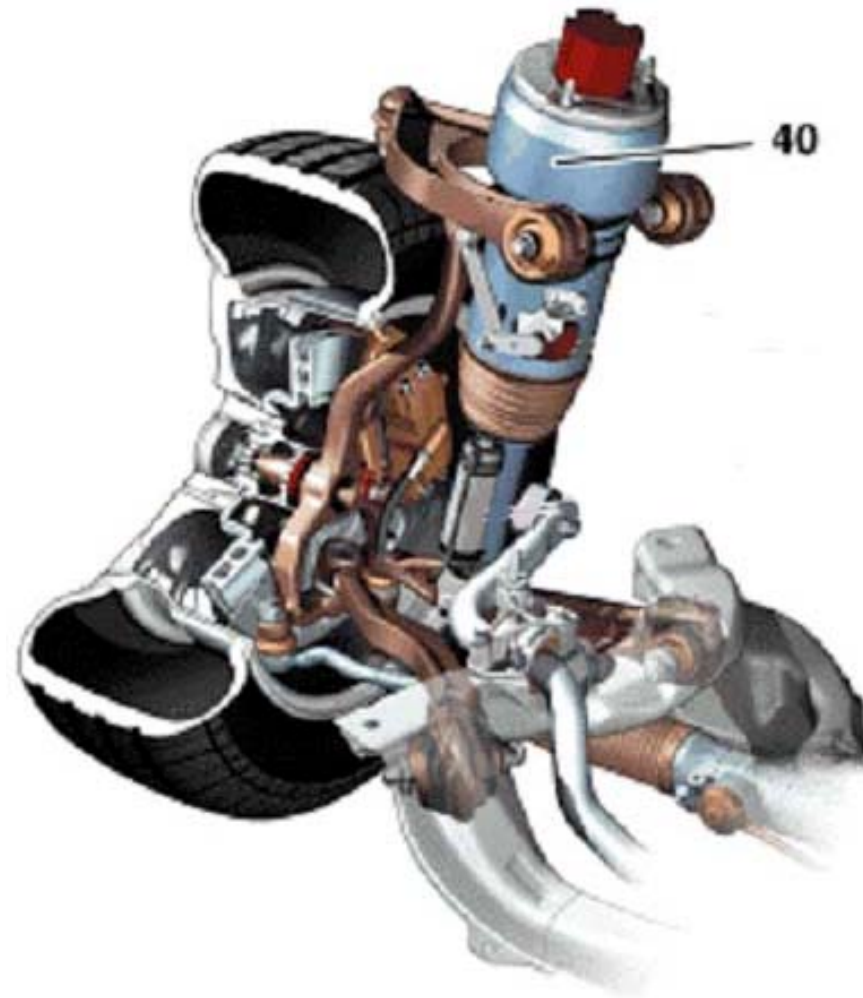
- SAS Dual Control System
 - Air suspension leveling
 - Air suspension dampening



- ADS II
 - Hydraulic dampening

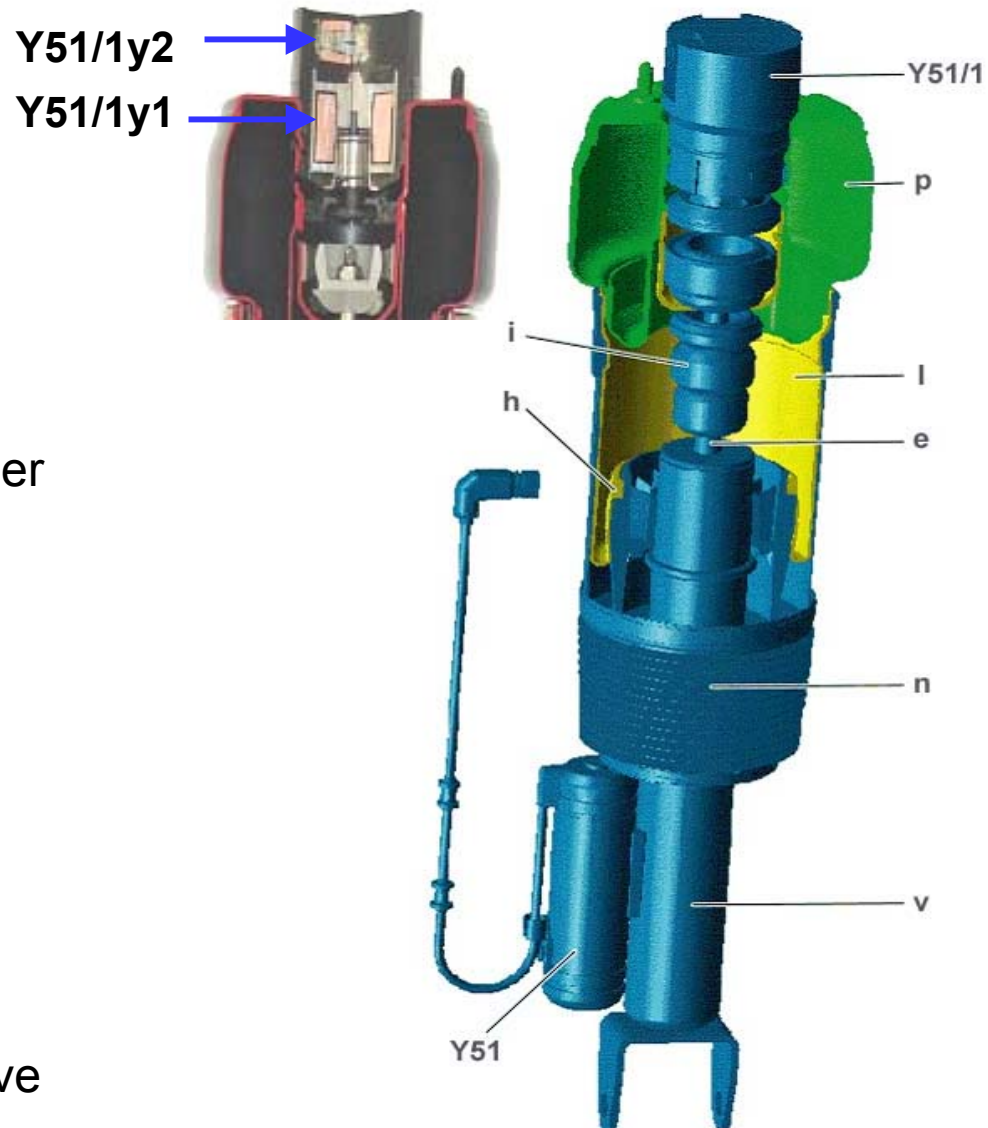


Front Air Spring / Strut

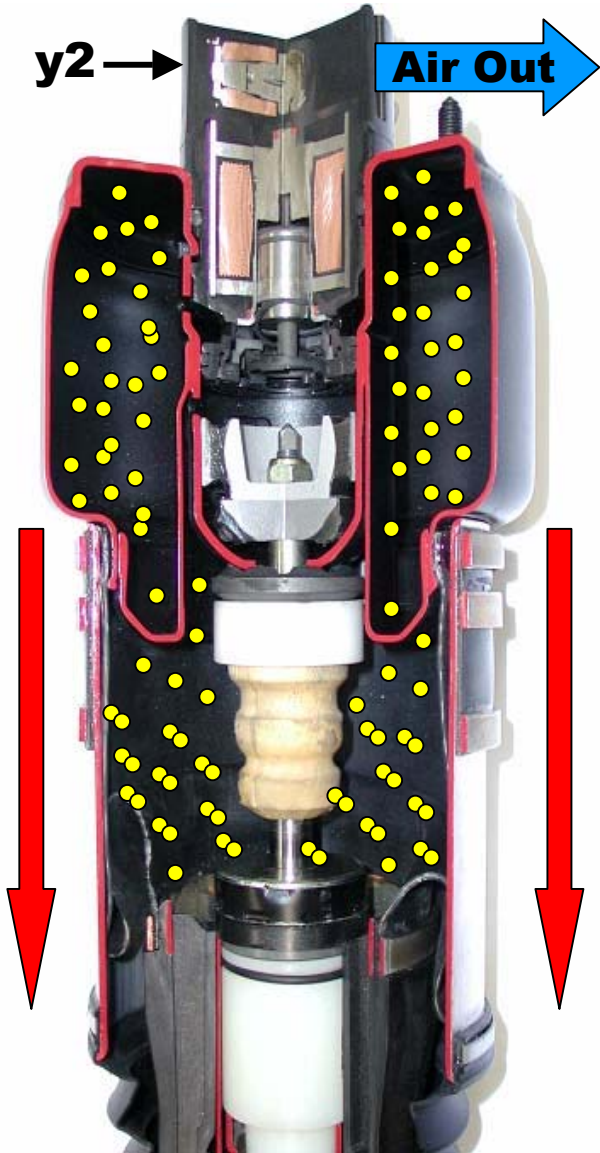


Front Air Spring Construction

- 40 Front air spring / strut
- Y51/1 LF spring strut valve unit
 - y1 Additional volume valve
 - y2 Level valve
- p Additional volume air chamber
- i Stop buffer
- l Air chamber
- e Piston rod
- h Air bellows
- n Protective boot
- v Shock absorber
- Y51 LF front axle dampening valve



Level and Height Adjustment (y2)

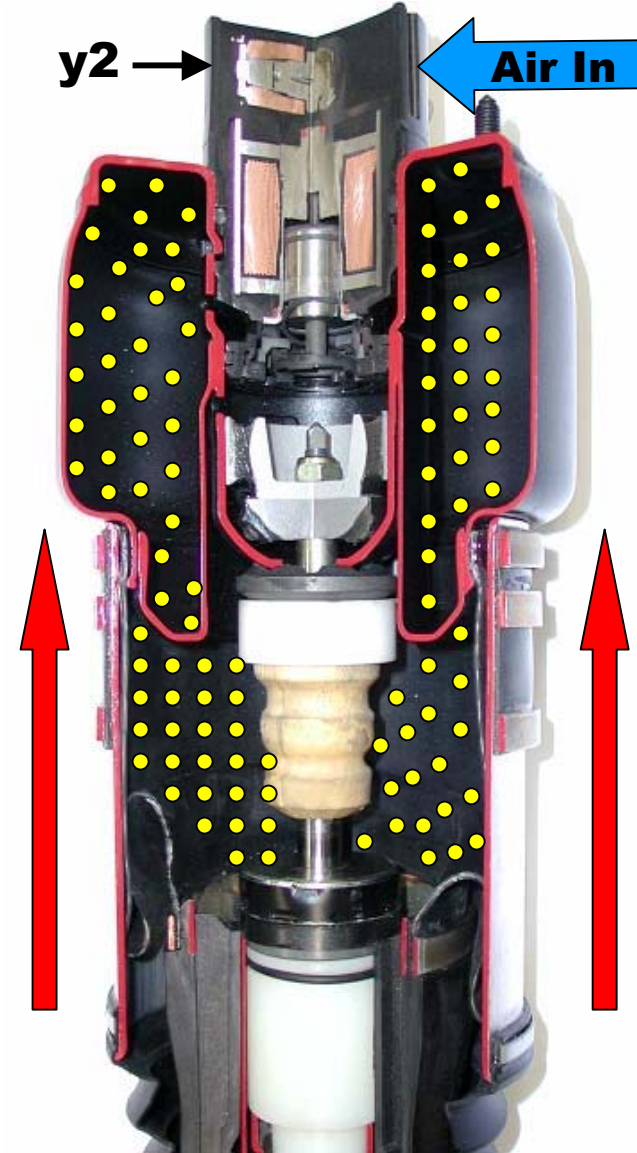


Lower

Solenoid (y2) energized (open) for ride height changes

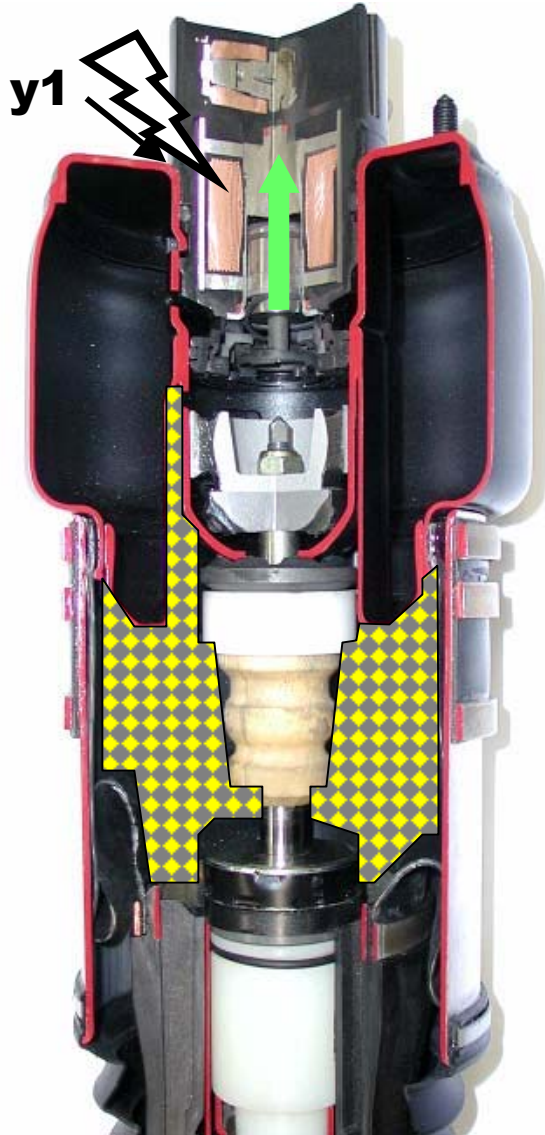
Note:

Closing y2 acts as the check valve. This will maintain air volume in spring / strut assembly.

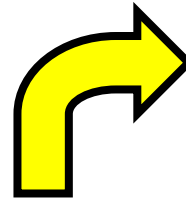
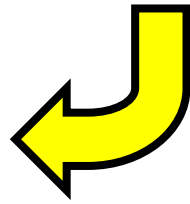


Raise

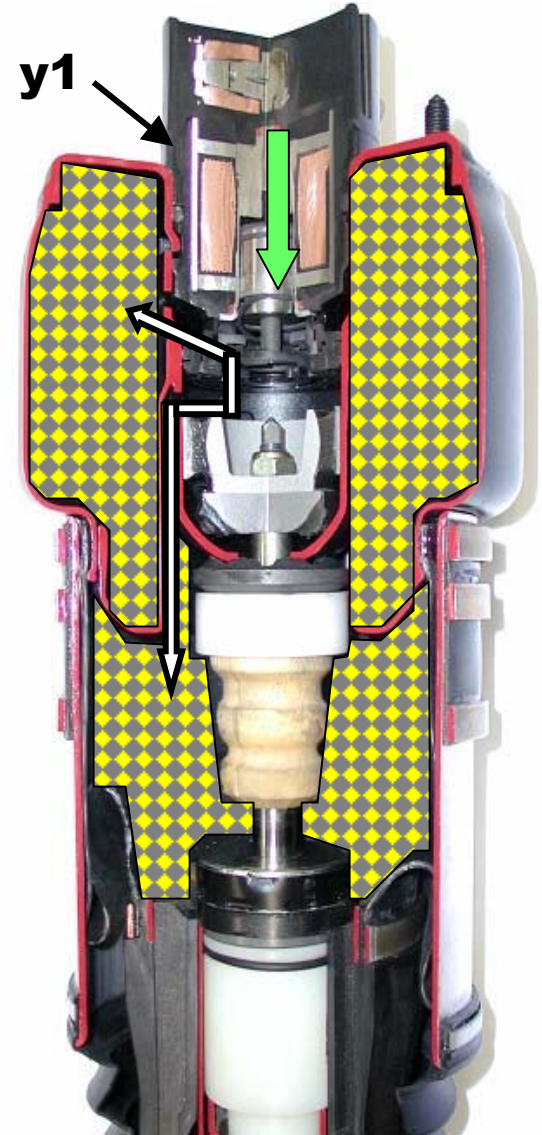
Air Spring Dampening (y1)



Solenoid (y1) closed
(energized)
one air chamber used,
less air volume to
compress = firmer

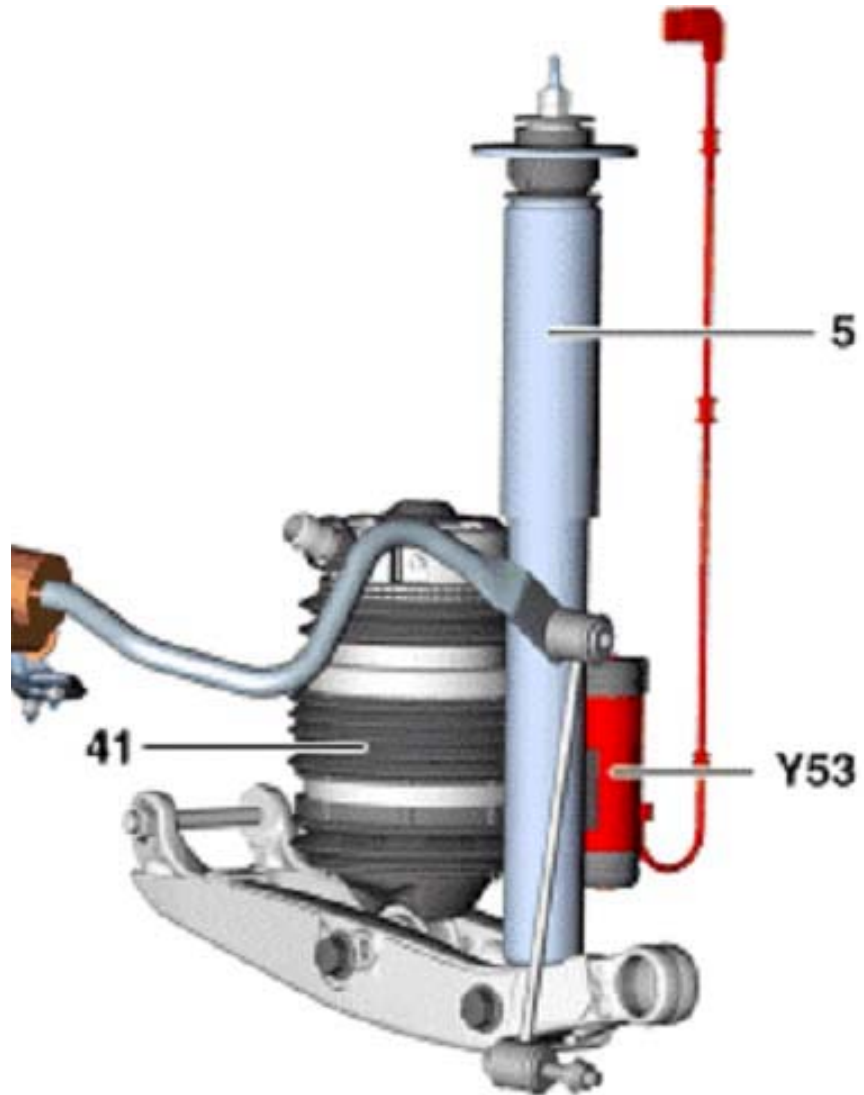


Solenoid (y1) open
(de-energized)
both air chambers
used, more air volume to
compress = softer

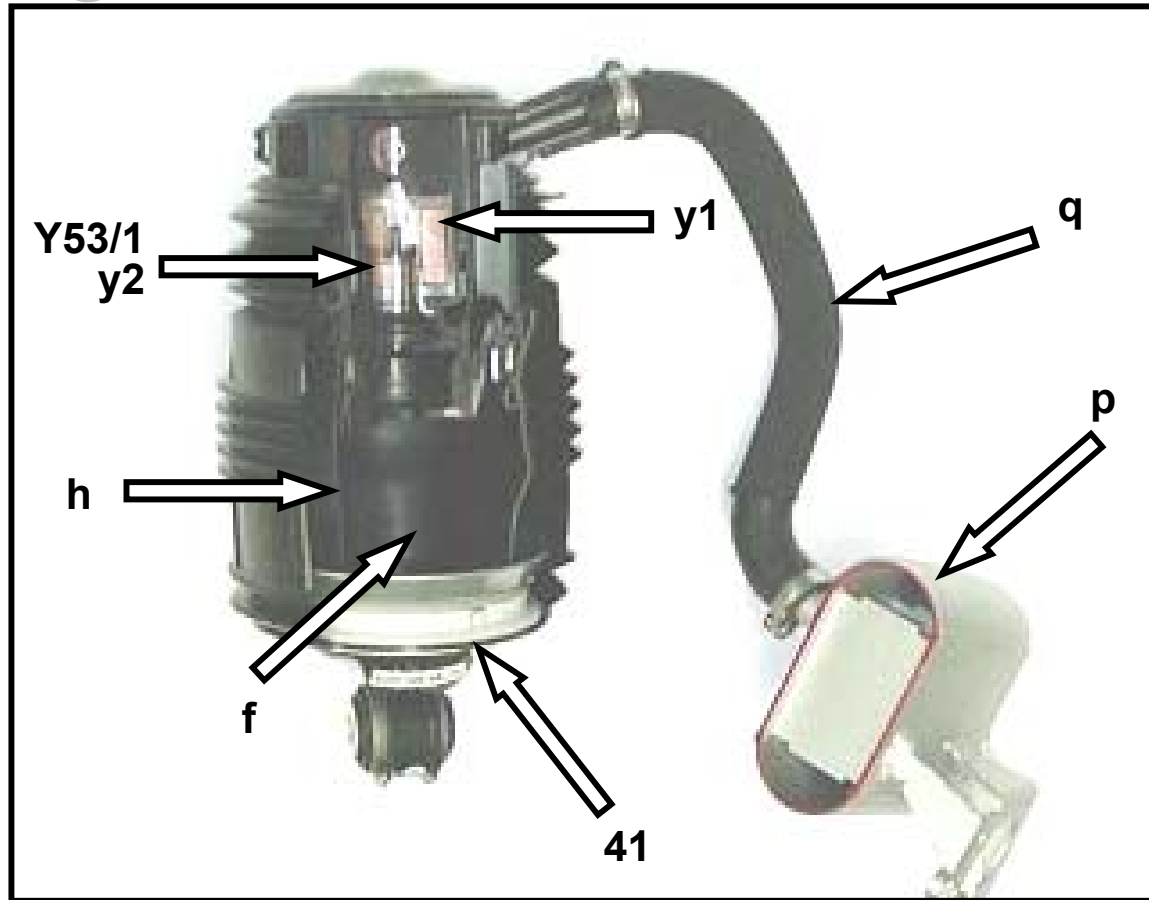


Rear Air Spring / Strut

- 41 - Rear air spring / strut
- 5 - Rear dampening shock
- Y53 - Rear ADS dampening valve



Rear Air Spring / Strut Construction



41 - Rear air spring / strut

h - Air bellows

f - Air chamber

p - Additional volume air chamber

q - Connecting hose

Y53/1 - LR spring strut valve unit

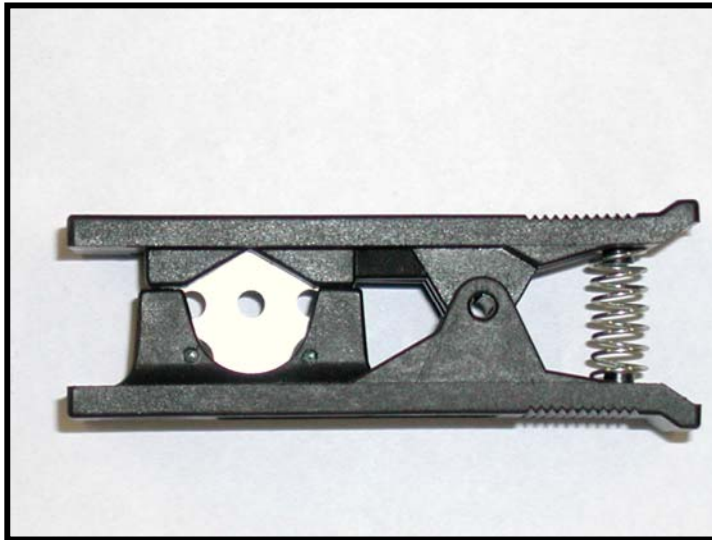
y1 - additional volume valve

y2 - level valve

AIRmatic Line Repair Kit

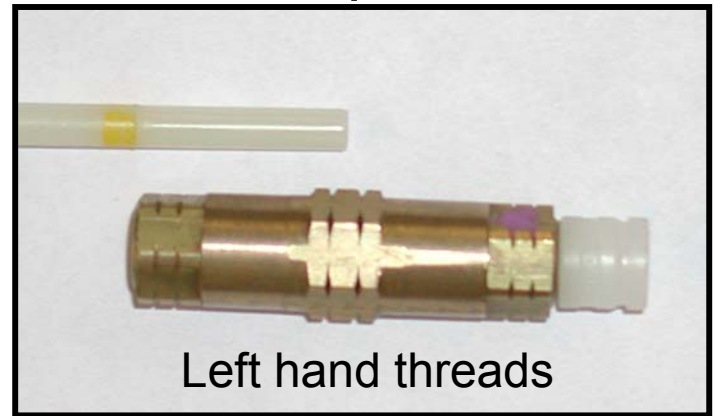
Note: Repairs can only be performed on the plastic lines routed from the air compressor (A9/1) to the rear air struts. Do not repair any line connected to the front air struts. Rear air lines must be cut to facilitate removal of rear air spring.

Line cutting knife



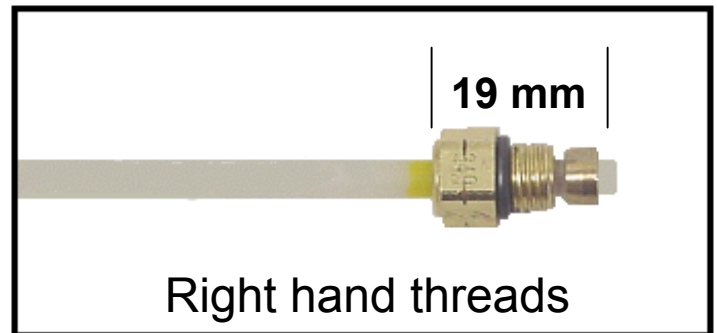
Part # A 000 589 12 28 00

Line repair kits



Left hand threads

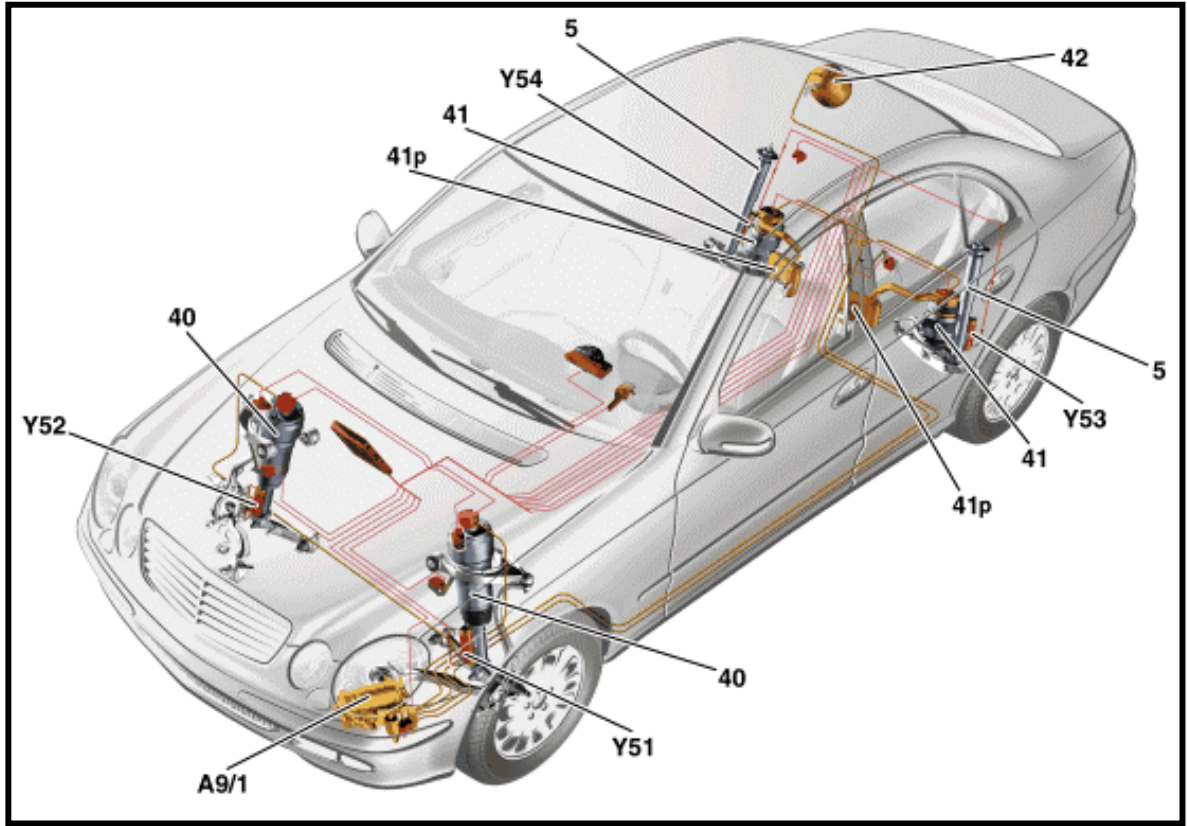
Part # A 000 327 01 69



Right hand threads

Part # A 000 327 00 69

SAS Pneumatic / Hydraulic Components



A9/1 - SAS compressor unit

40 - Front air spring strut

41 - Rear air spring strut

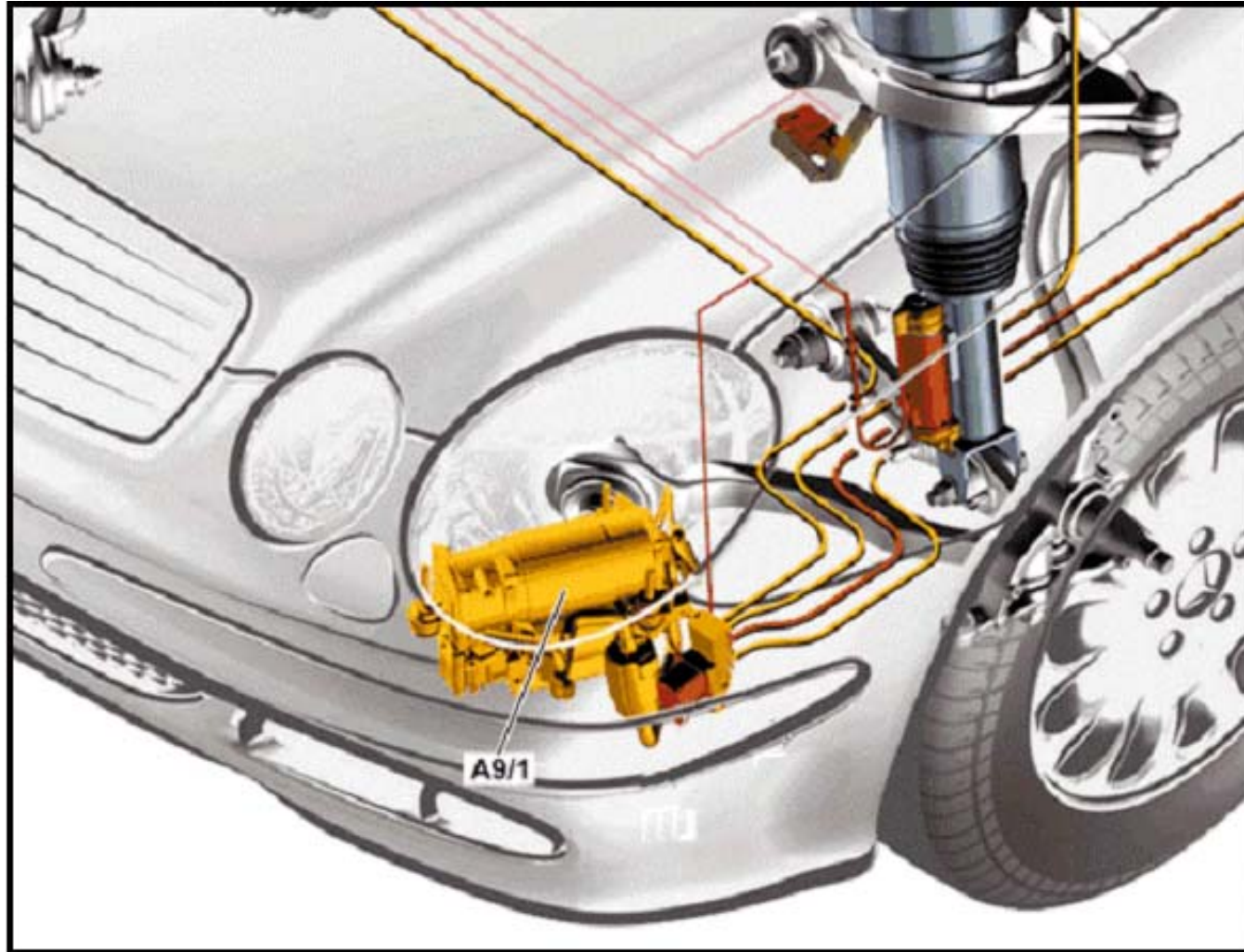
41p - Rear air spring additional volume reservoir

42 - SAS central reservoir

Y51, 52, 53, 54 - ADS dampening valves

5 - Rear shock absorber

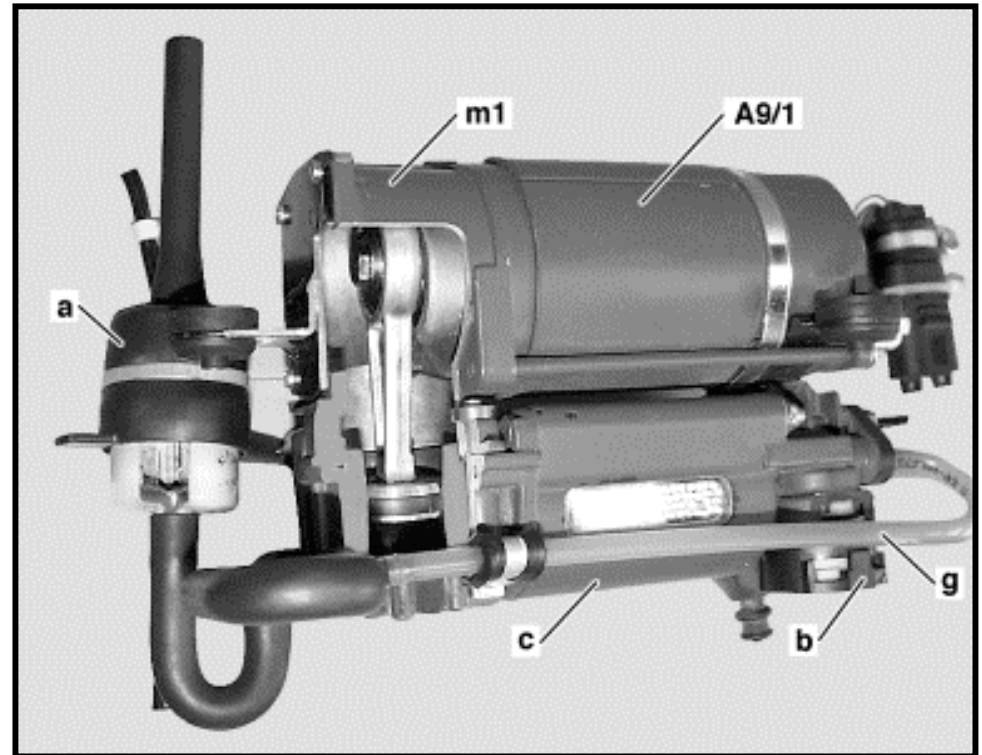
SAS Compressor Unit (A9/1)



Location: Left front wheel housing

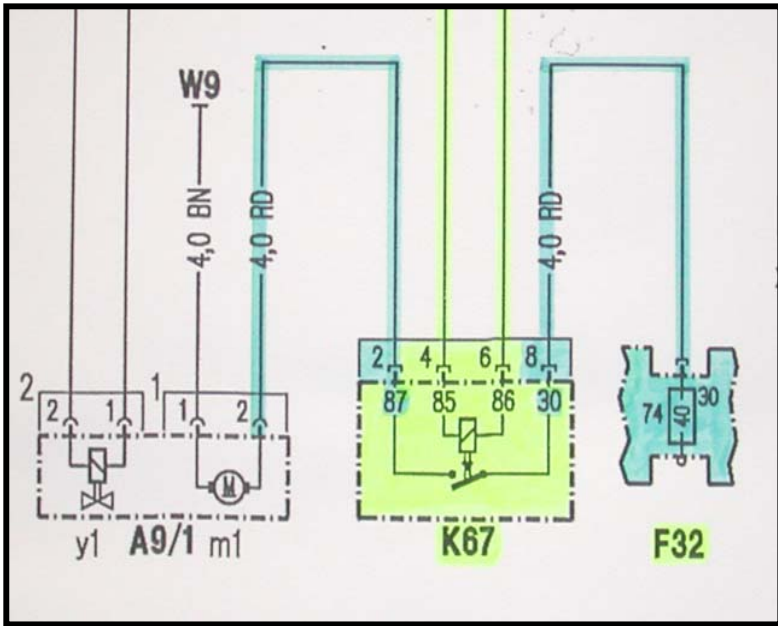
SAS Compressor Unit (A9/1)

- m1 - Air compressor motor
- a - Air cleaner
- b - Press. relief / residual press. valve
- c - Air drier
- g - Press. relief line

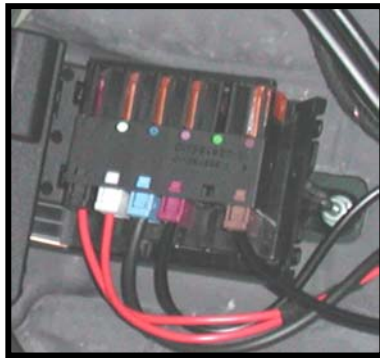


- Produces approximately 10-16 bar of pressure depending on altitude:
 - Sea Level ~16 bar
 - 4000 Meters ~10 bar
- Pressure relief set at 21 bar
- Peak current spike < 100A Continuous current < 35A

SAS Compressor Relay (K67)

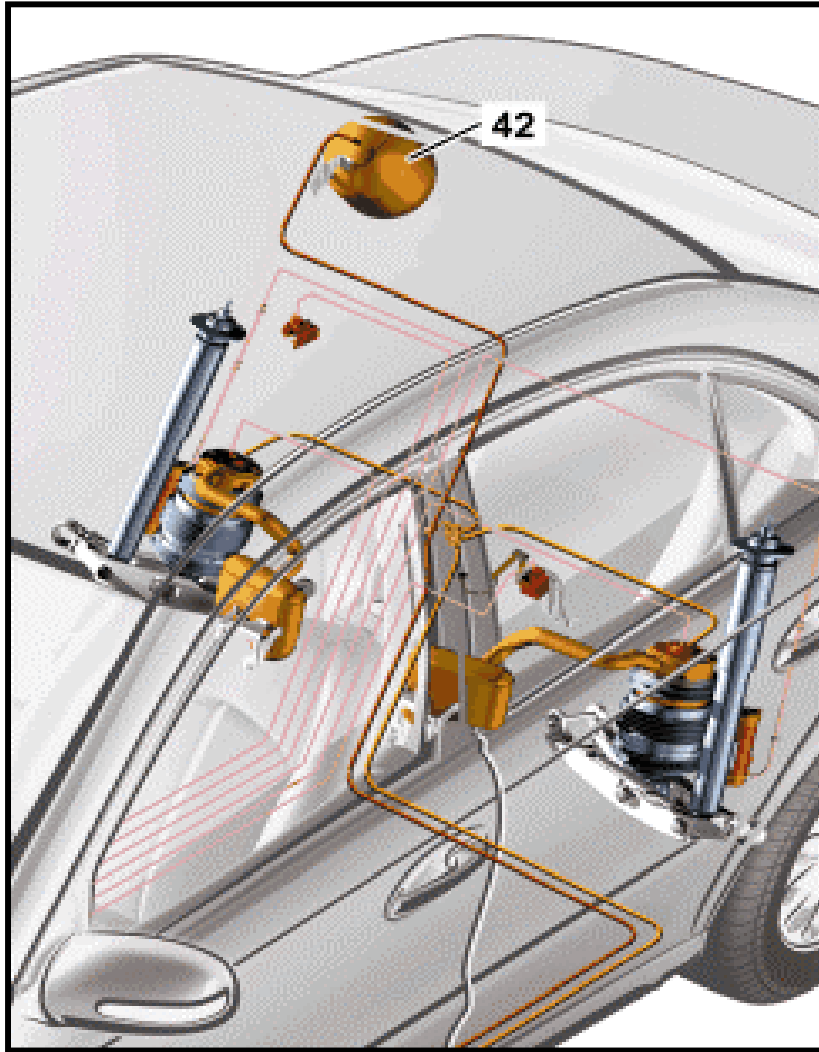


Location: Driver side SAM



Fuse location: F32 f74 passenger footwell

SAS Central Reservoir



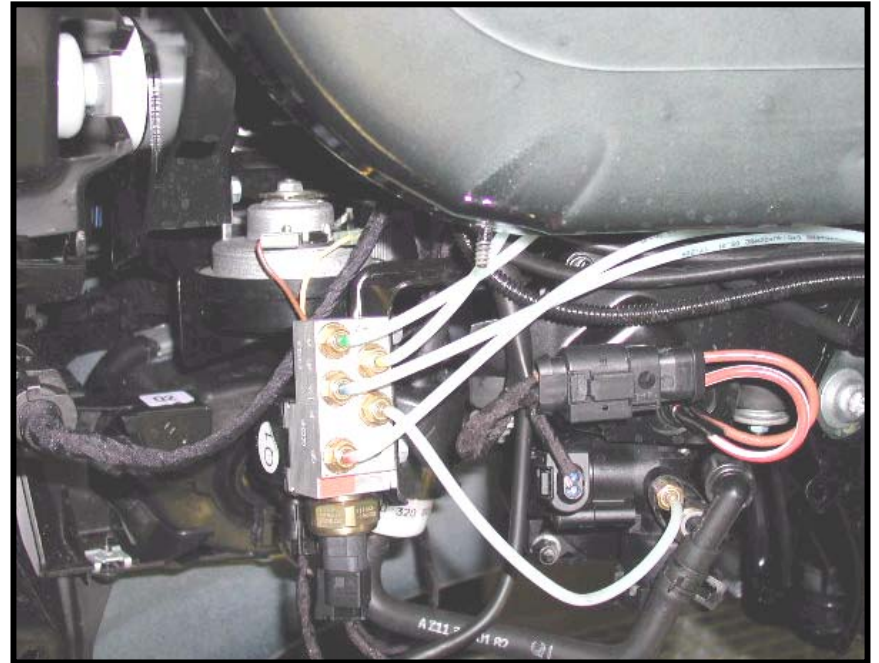
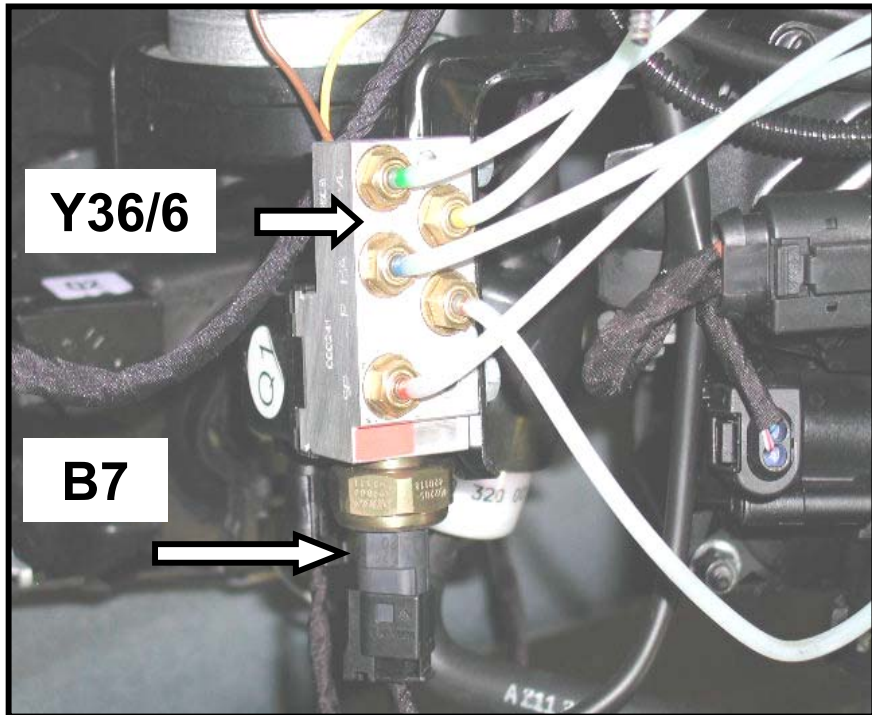
- Stores compressed air
- Reduces compressor cycling
- Supplies air during key off operations

Location: Trunk right side

Central Reservoir Charge Valve (Y36/6)

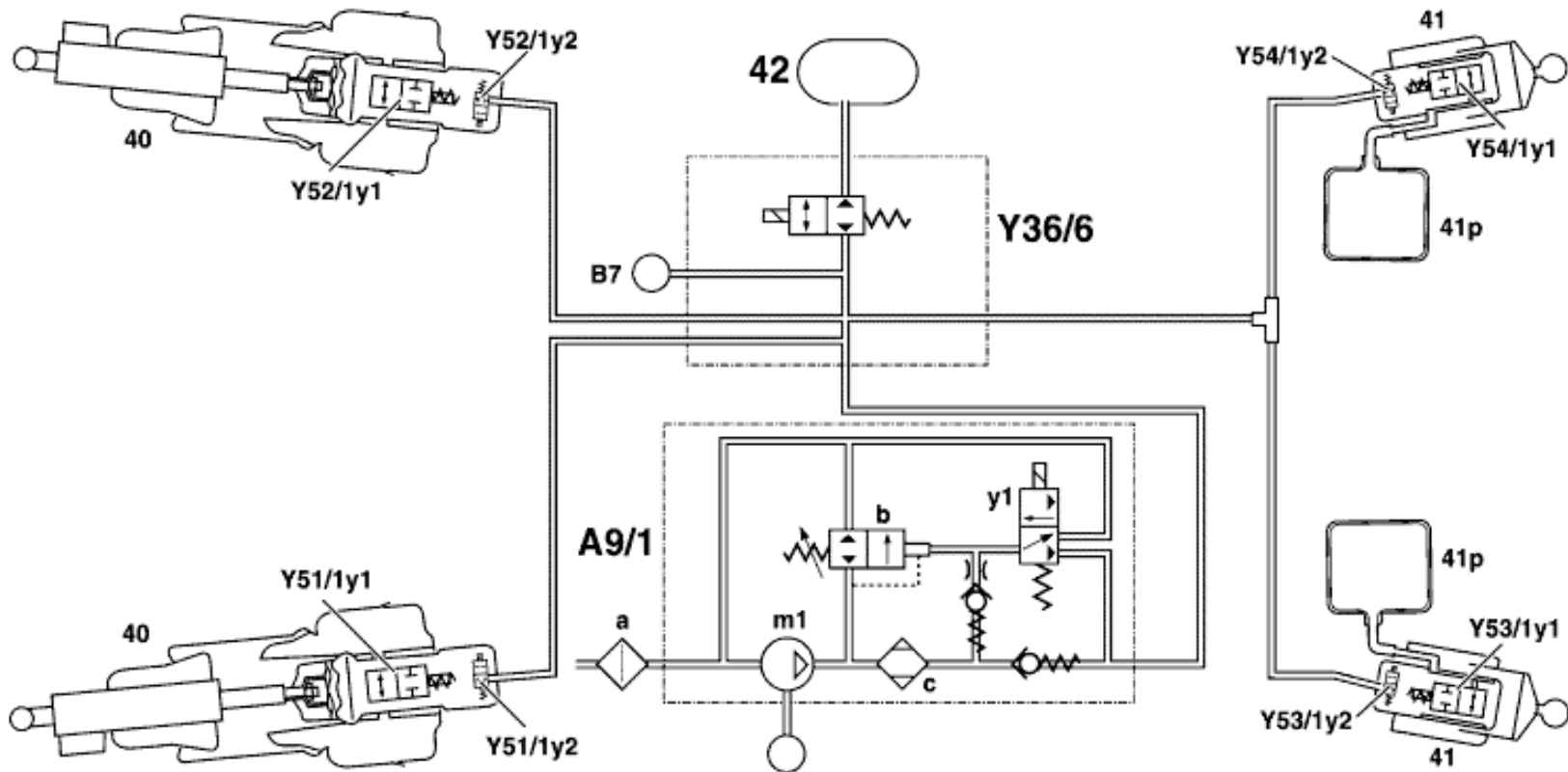
Y36/6 - Central reservoir charge valve

B7 - Central pressure sensor



Location: Under left front headlamp

SAS Function Diagram



SAS Function Diagram / Legend

A9/1 SAS compressor unit

- m1 compressor motor
- y1 compressor fill / vent valve
- b pressure relief valve (~21 bar)
- c drier
- a filter

Y36/6 Central reservoir solenoid valve

- b7 SAS pressure sensor

40 Front air spring strut

- Y51/1y1, Y52/1y1 air dampening solenoid
- Y51/1y2, Y52/1y2 level solenoid

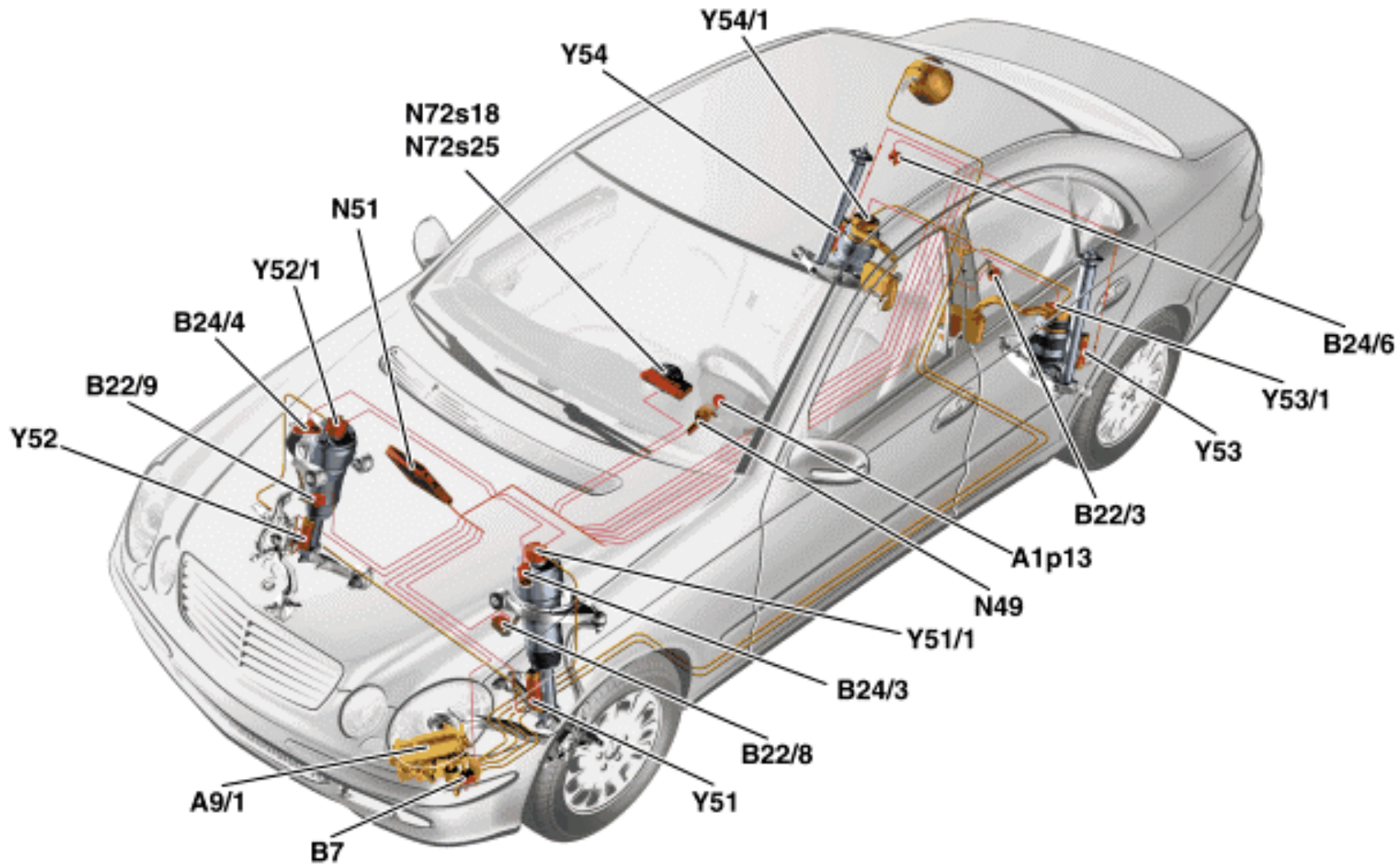
41 Rear air spring strut

- Y53/1y1, Y54/1y1 air dampening solenoid
- Y53/1y2, Y54/1y2 level solenoid

41p Rear air spring additional volume reservoir

42 SAS central reservoir

SAS Electrical Components



Electrical Components / Legend

A1p13 - IC multifunction display

A9/1 - SAS compressor unit

B7 - SAS pressure sensor

B22/3 - Rear level sensor

B22/8 - LF axle level sensor

B22/9 - RF axle level sensor

B24/3 - LF body acceleration sensor

B24/4 - RF body acceleration sensor

B24/6 - Rear body acceleration sensor

N49 - Steering angle sensor

N51 - SAS control module

N72s18 - Level adjustment switch

N72s25 - Comfort / sport switch

Y51 - LF ADS dampening valve

Y51/1 - LF SAS valves

Y52 - RF ADS dampening valve

Y52/1 - RF SAS valves

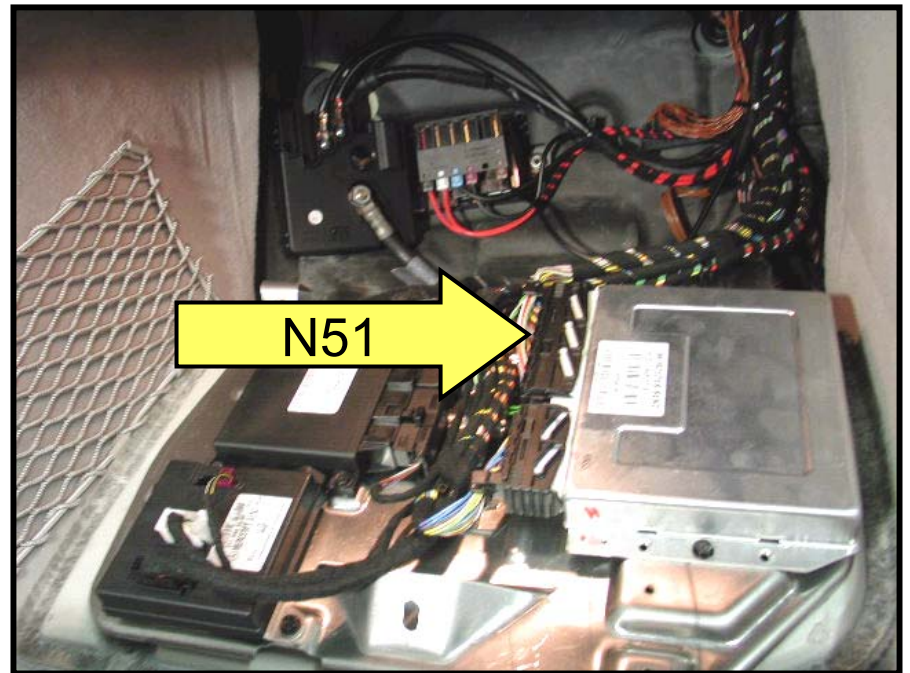
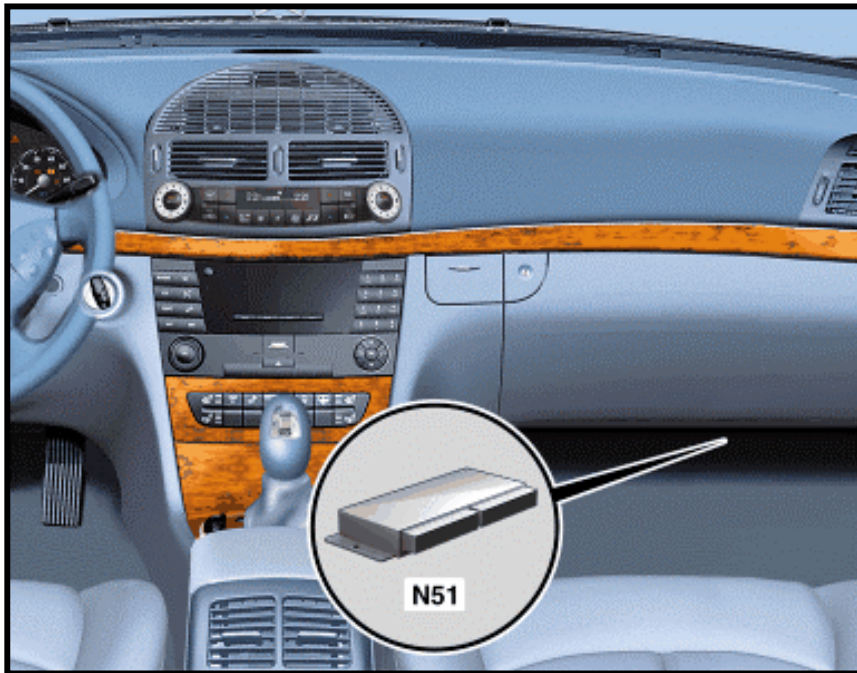
Y53 - LR ADS dampening valve

Y53/1 - LR SAS valves

Y54 - RR ADS dampening valves

Y54/1 - RR SAS valves

SAS Control Module (N51)



Location: Passenger footwell

SAS Wake-Up Function

Wake-up causes SAS module (N51) to monitor vehicle ride height and adjust as needed dependent on vehicle load changes.

Wake-up occurs with any one of the following inputs:

- EIS key activation
- Any door activation
- Trunk lid activation
- Park brake activation
- Stop lamp switch activation

Vehicle Level Notes

Wake-up Function

- if level is $>30\text{mm}$ lower than normal ($0\text{mm} \pm 10$) it will raise to normal level (if reservoir pressure >11 bar)
- if level is $>65\text{mm}$ lower than normal, it will be raised even with a reservoir pressure of <11 bar by the compressor (prerequisite battery voltage $>12.5\text{v}$) to -63mm (critical level)
- if level is $>10\text{mm}$ higher than normal, it will be lowered to normal

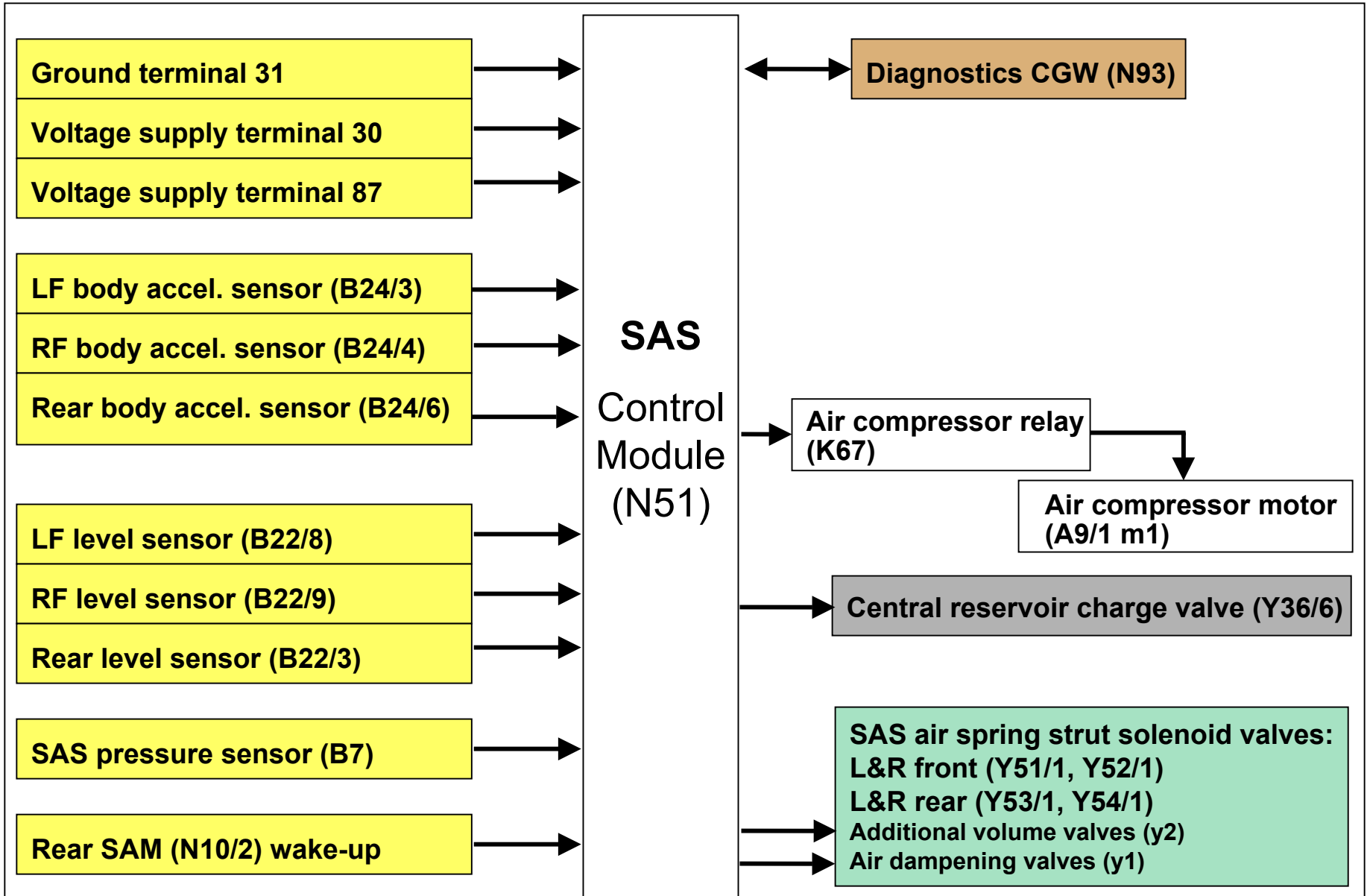
Normal Function (engine running)

- level will be corrected if level deviates $>10\text{mm}$ after opening a door or trunk
- while driving, the vehicle level will adjust if deviation $>20\text{mm}$
- while driving, every 15 minutes the level is adjusted to within $\pm 10\text{mm}$ of normal ride height

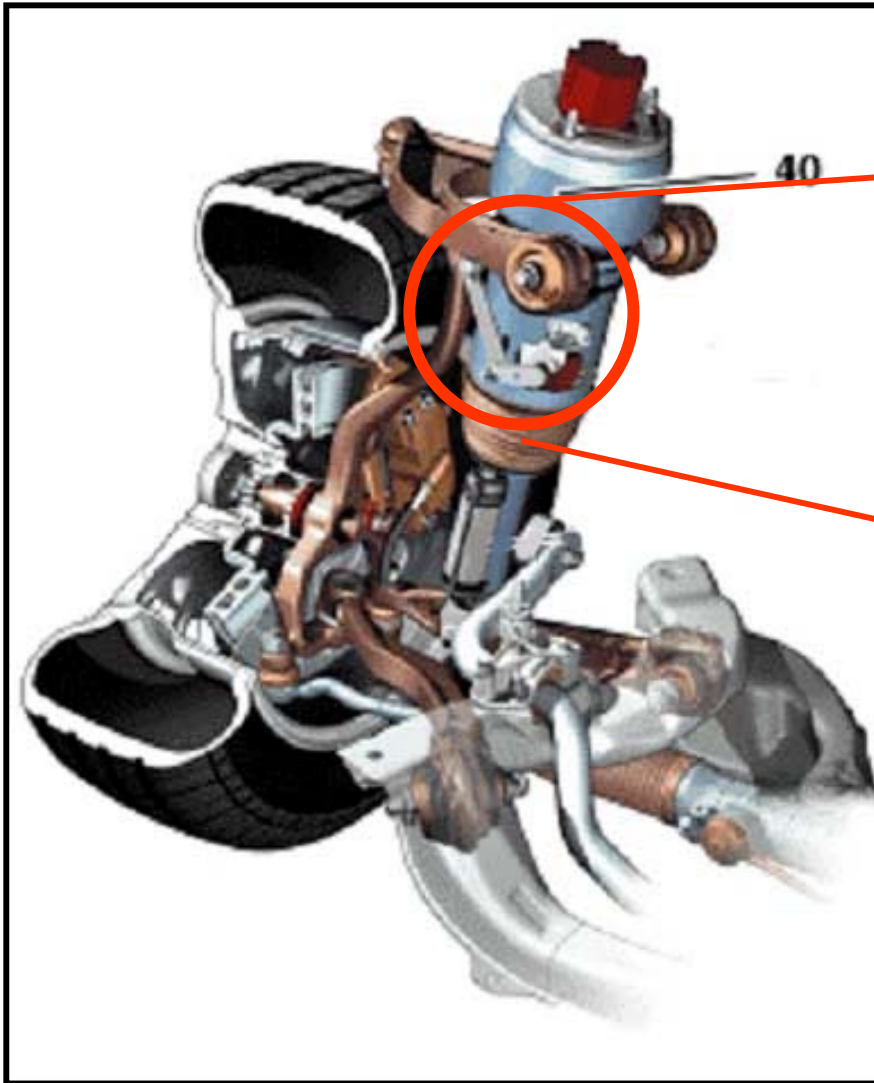
Locking Function

- if wheels are unloaded when vehicle stationary, strut valves remain closed

SAS Discreet Inputs / Outputs (for AIRmatic function)



Front Level Sensors (B22/8,9)

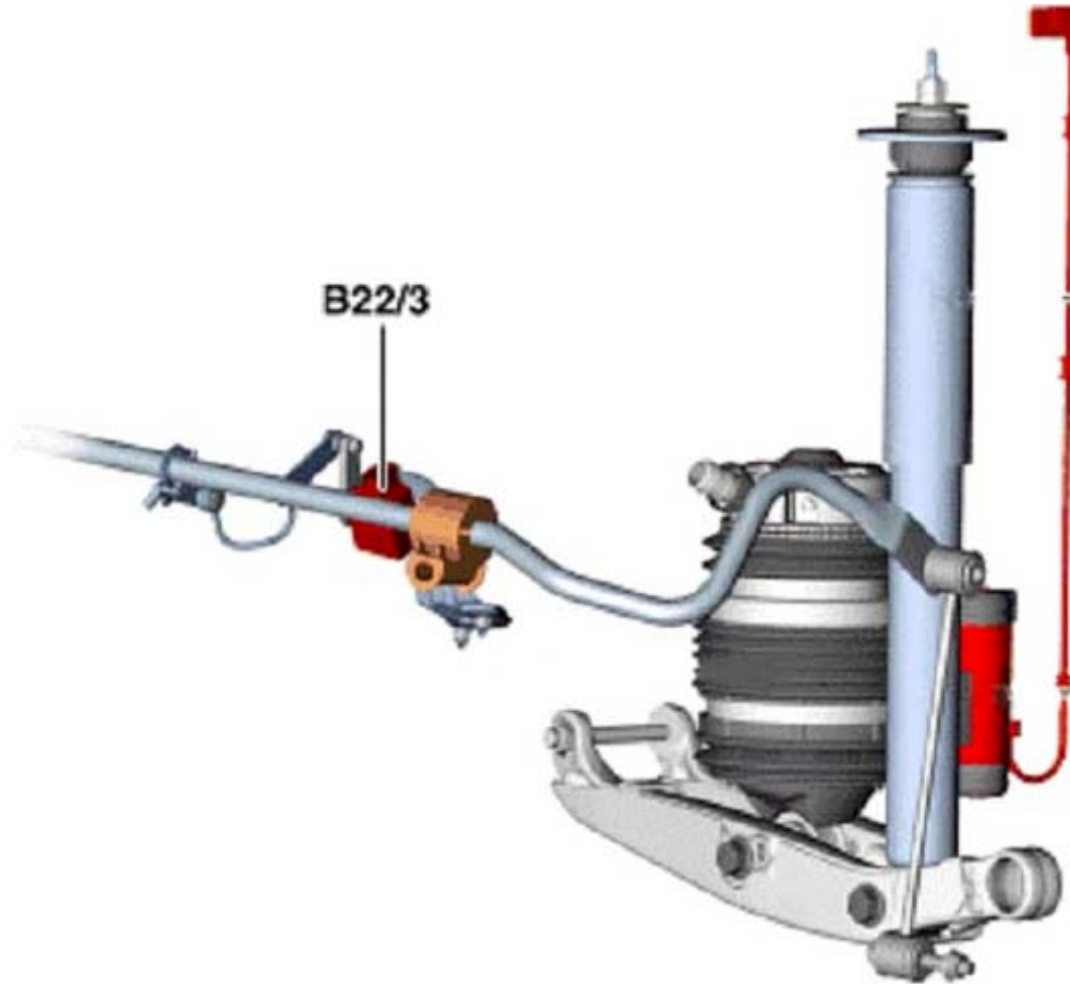


Each sensor contains:

- 2 Hall effect sensors
- Redundant signal

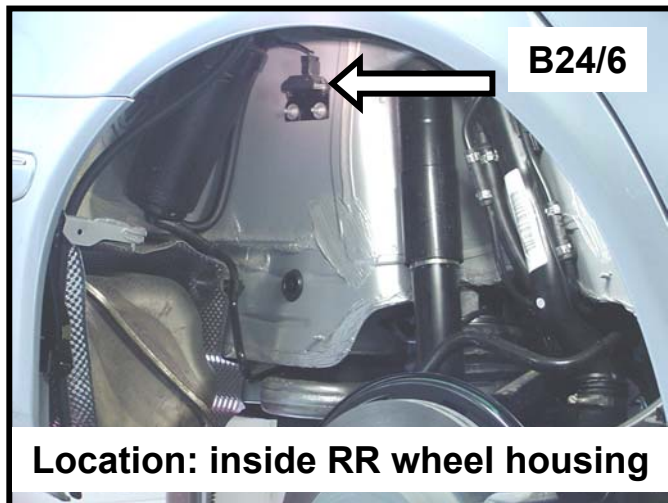
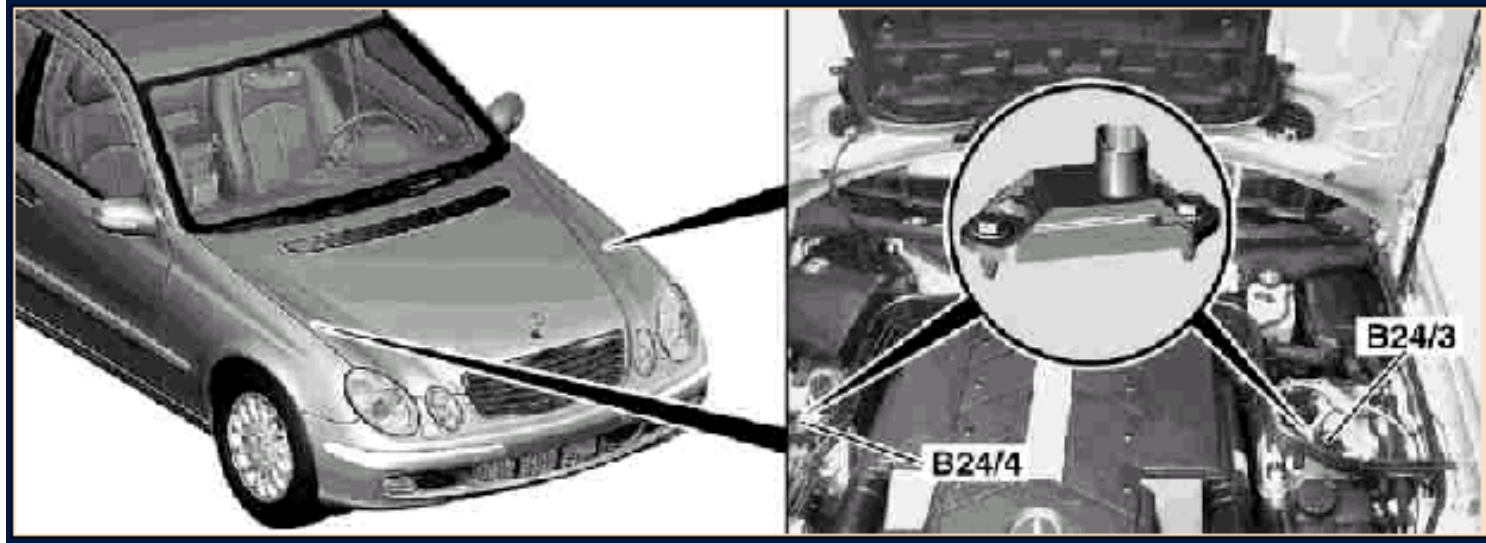
Location: Front upper control arm

Rear Level Sensor (B22/3)



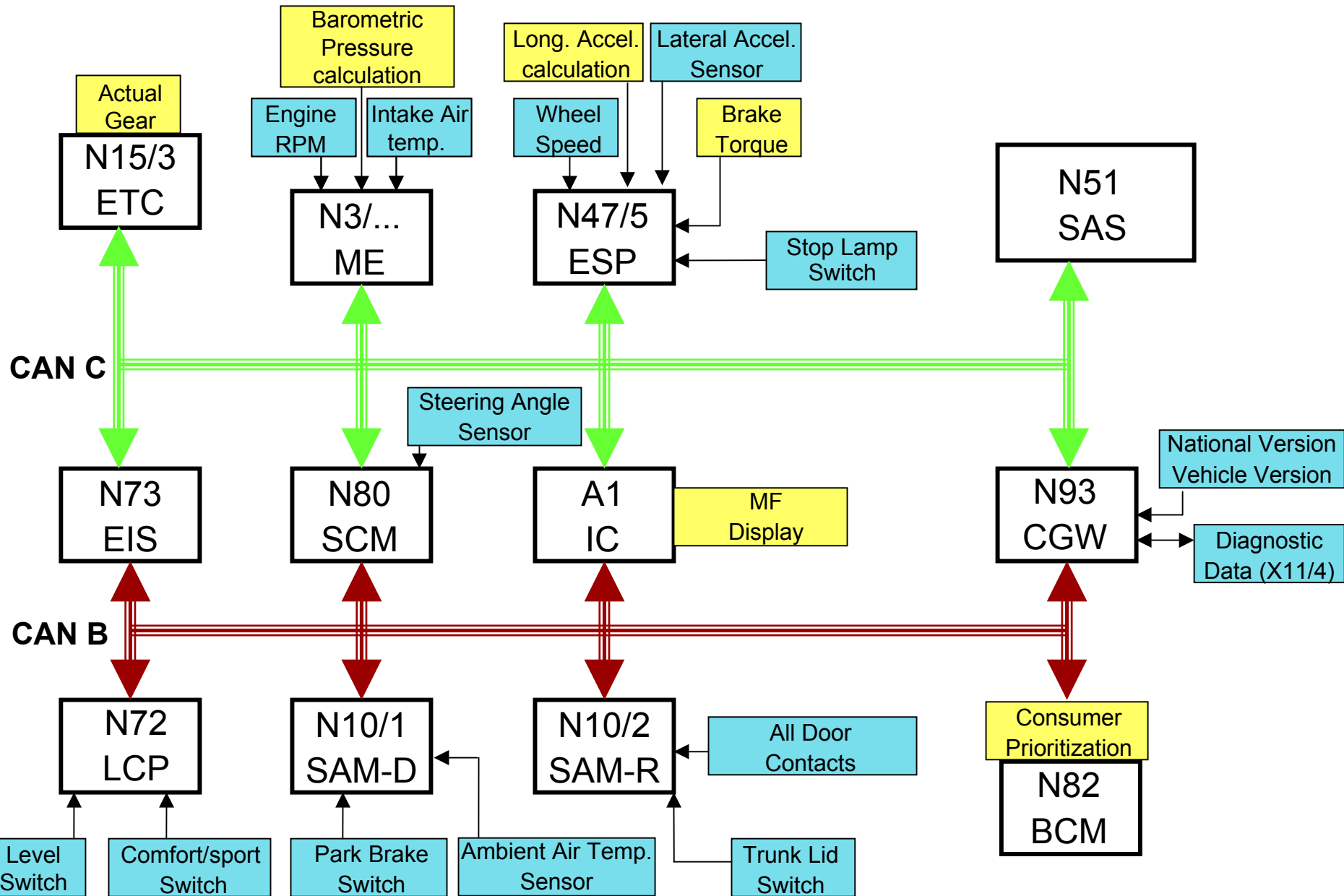
Location: Rear stabilizer bar

Body Acceleration Sensors (B24/3,4,6)



- Measures vertical oscillations of the chassis
- Translates mechanical movements into voltage signals
- Influences ADS II dampening functions

SAS CAN Data

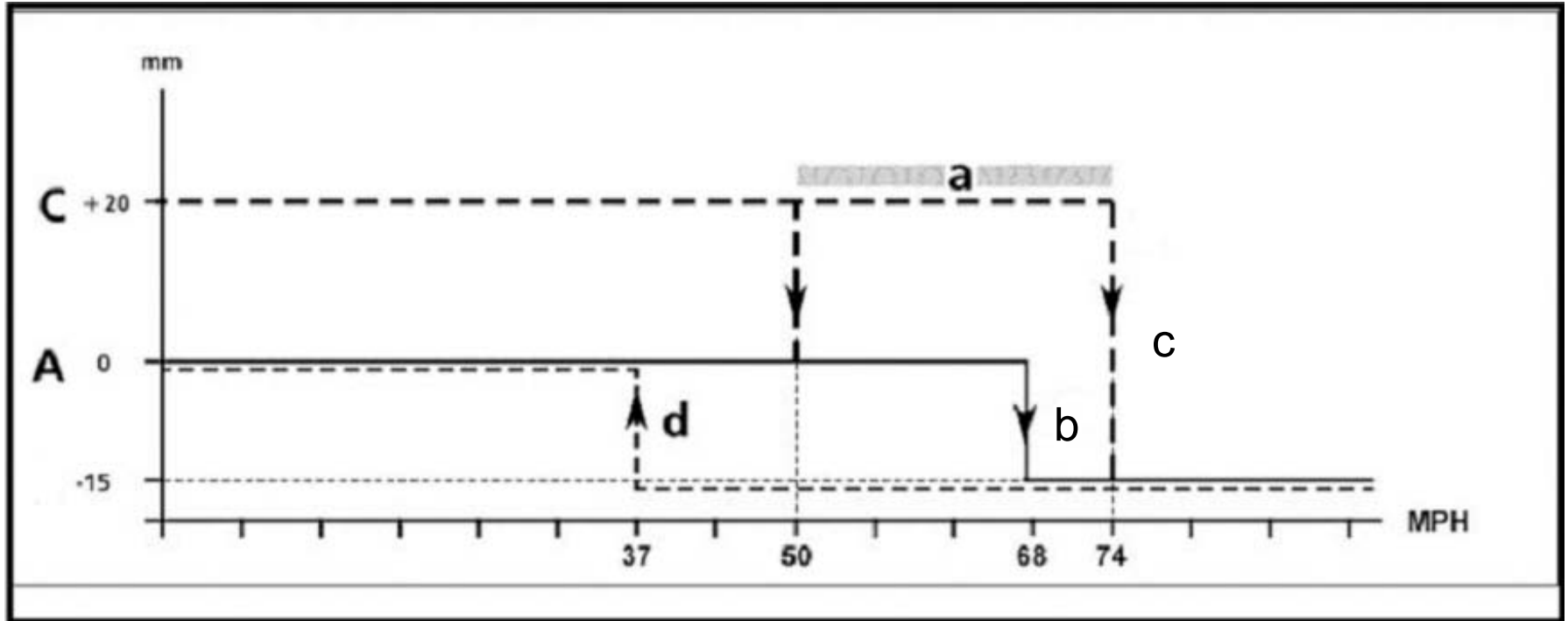


Level Adjustment Switch (N72s18)

- Raises the vehicle above normal level
- Wired to LCP (N72)
- Input to SAS (N51) via CAN B
- N72 controls LED activation



Level Adjustment Parameters



A - Normal ride height up to 68 mph, then lowers (b) to -15mm

d - vehicle height will rise to normal height at 37 mph

C - Raised ride height (+20mm).

a - lowers to -15mm if vehicle speed between 50 and 74 mph for 5 minutes

c - lowers to -15mm if vehicle speed greater than 74 mph

Note: Raised height cancelled once vehicle lowered.

ADS II

In addition to the two stages of dampening (air volume) that the SAS air suspension system provides, the ADS II system adds another four stages of dampening (hydraulically).

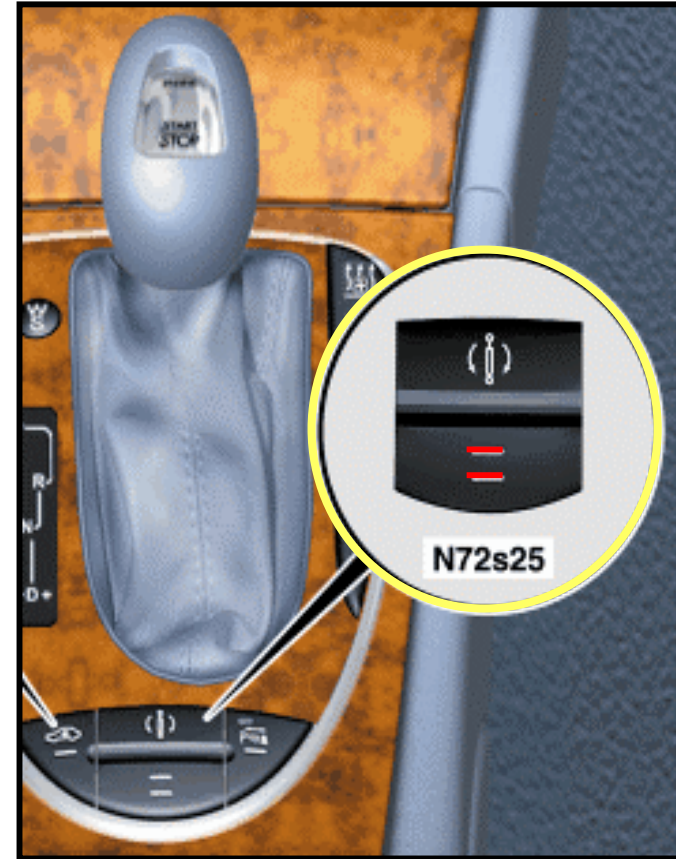
Under normal driving conditions the SAS control module will control the dampening stages automatically based on sensor inputs.

Driver can manually choose different stages by pressing the Comfort / Sport switch (N72s25) next to the gear shifter.

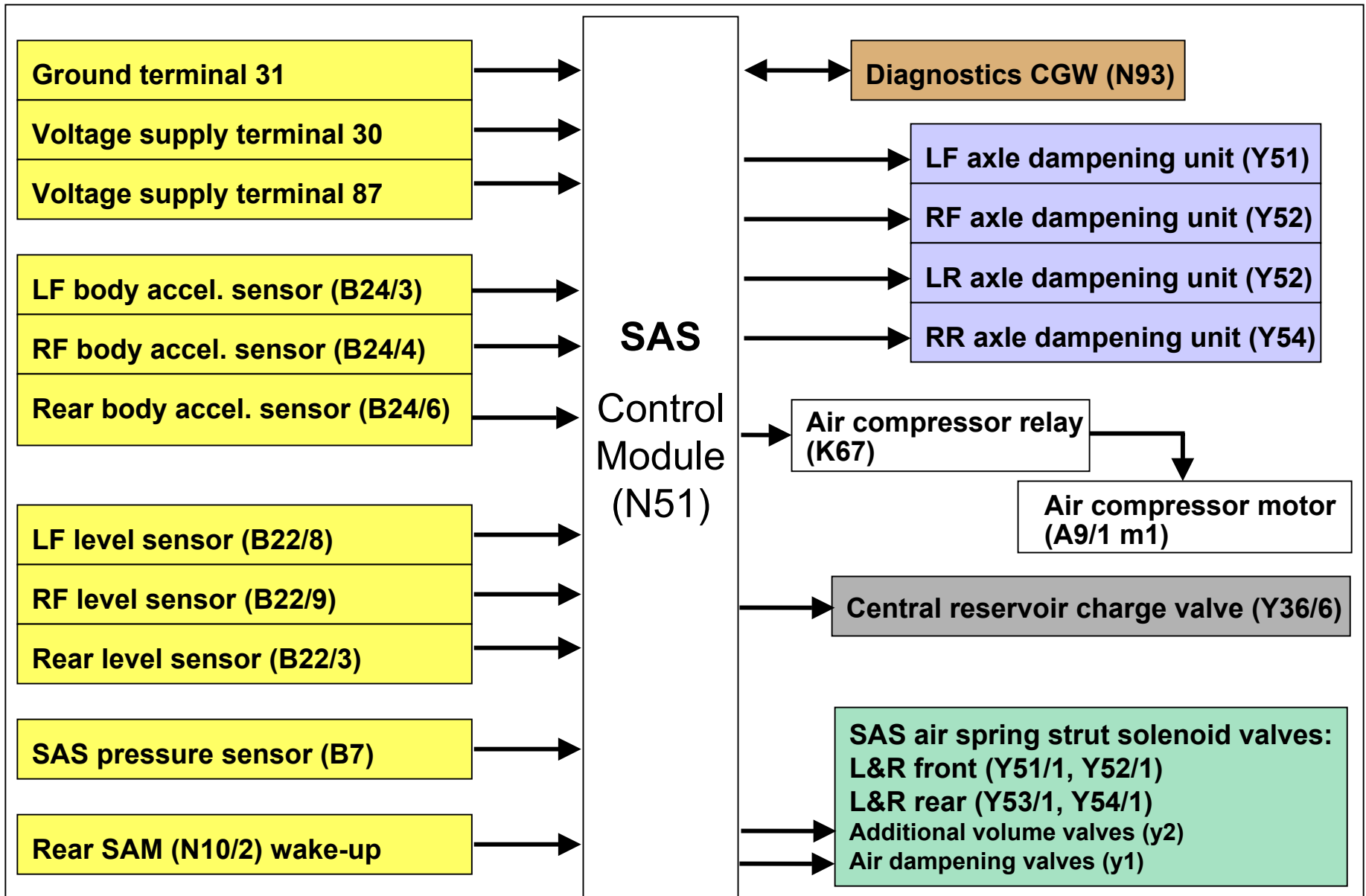


ADS II Comfort / Sport Switch (N72s25)

- LED's off, comfort setting
- Sport setting #1
 - 1 LED illuminated
 - SAS reduced air dampening volume (firmer)
 - ADS II dampening controlled automatically
- Sport setting #2
 - 2 LED's illuminated
 - SAS reduced air dampening volume (firmer)
 - ADS II, stage 3 or 4 dampening, as required
- Wired to LCP (N72)
- Input to SAS (N51) via CAN B
- N72 controls LED activation



SAS Discreet Inputs / Outputs (for ADS II function)



ADS II Shock Absorber



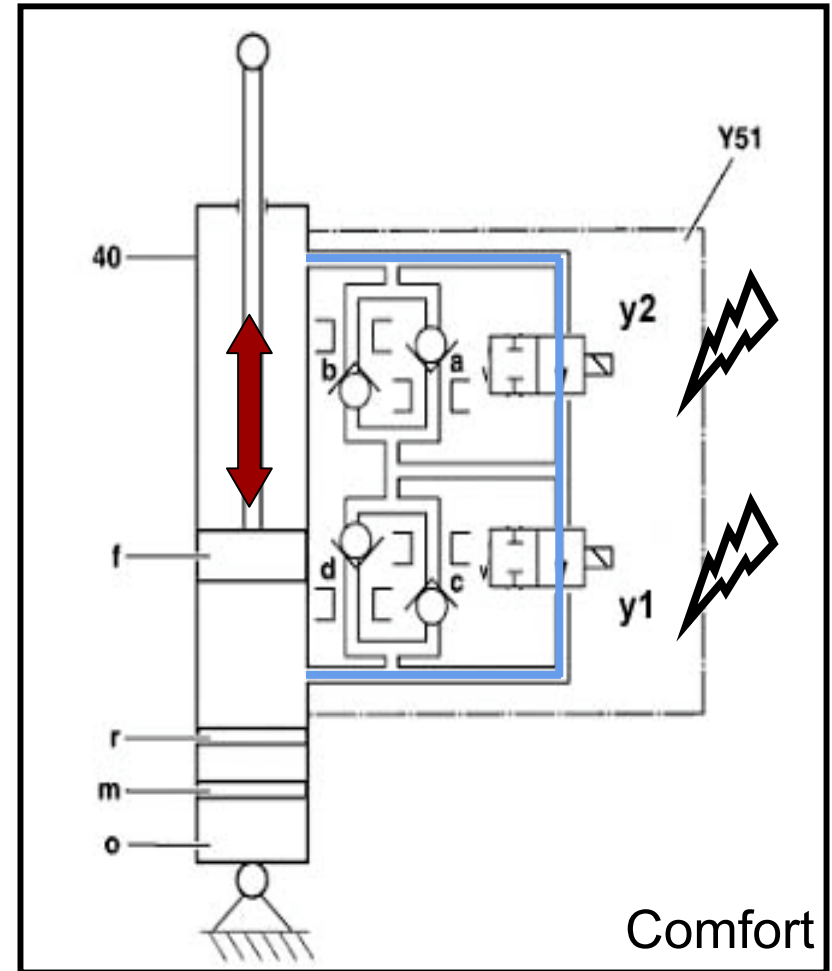
Movement



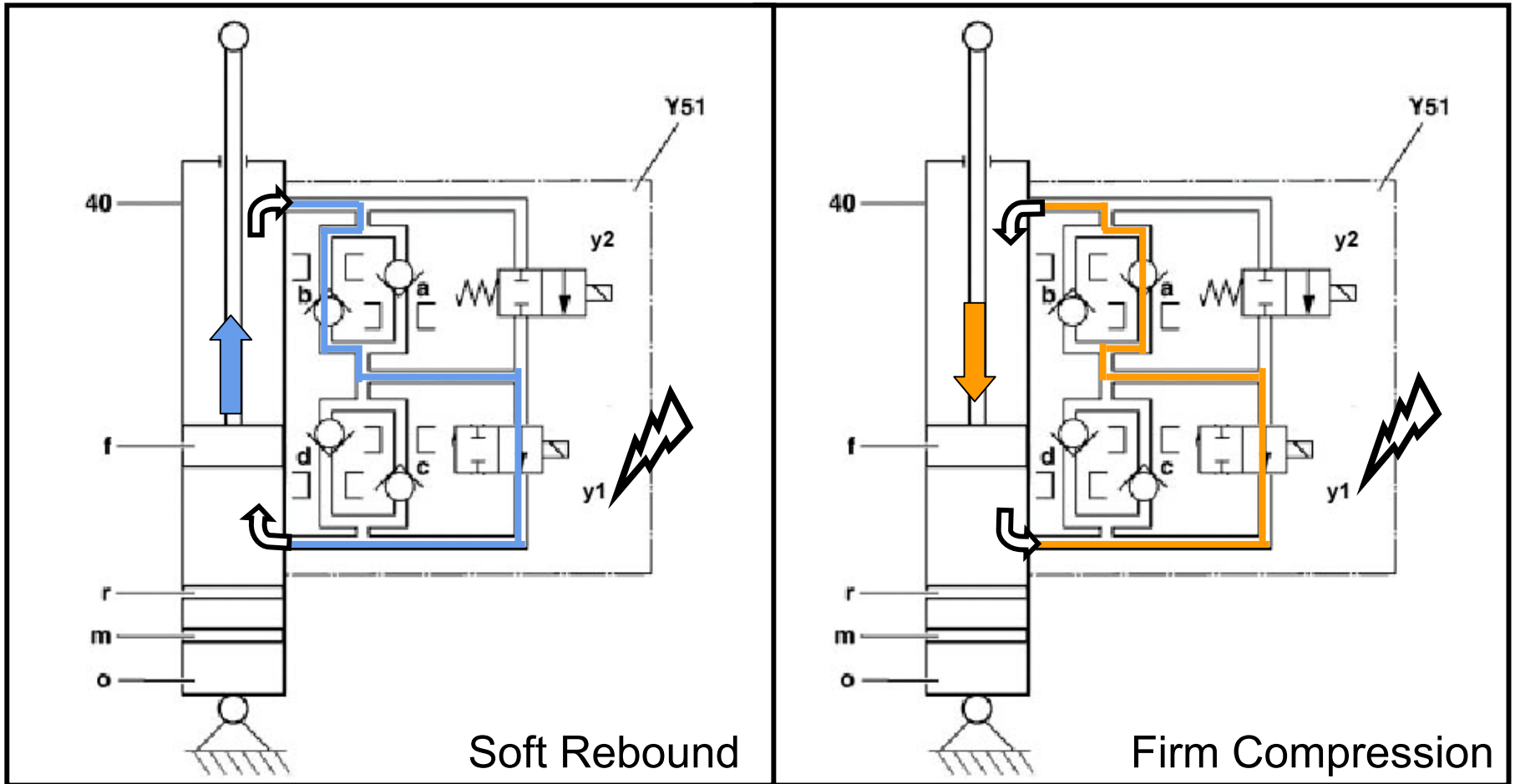
Oil flow

ADS II Dampening Stage 1

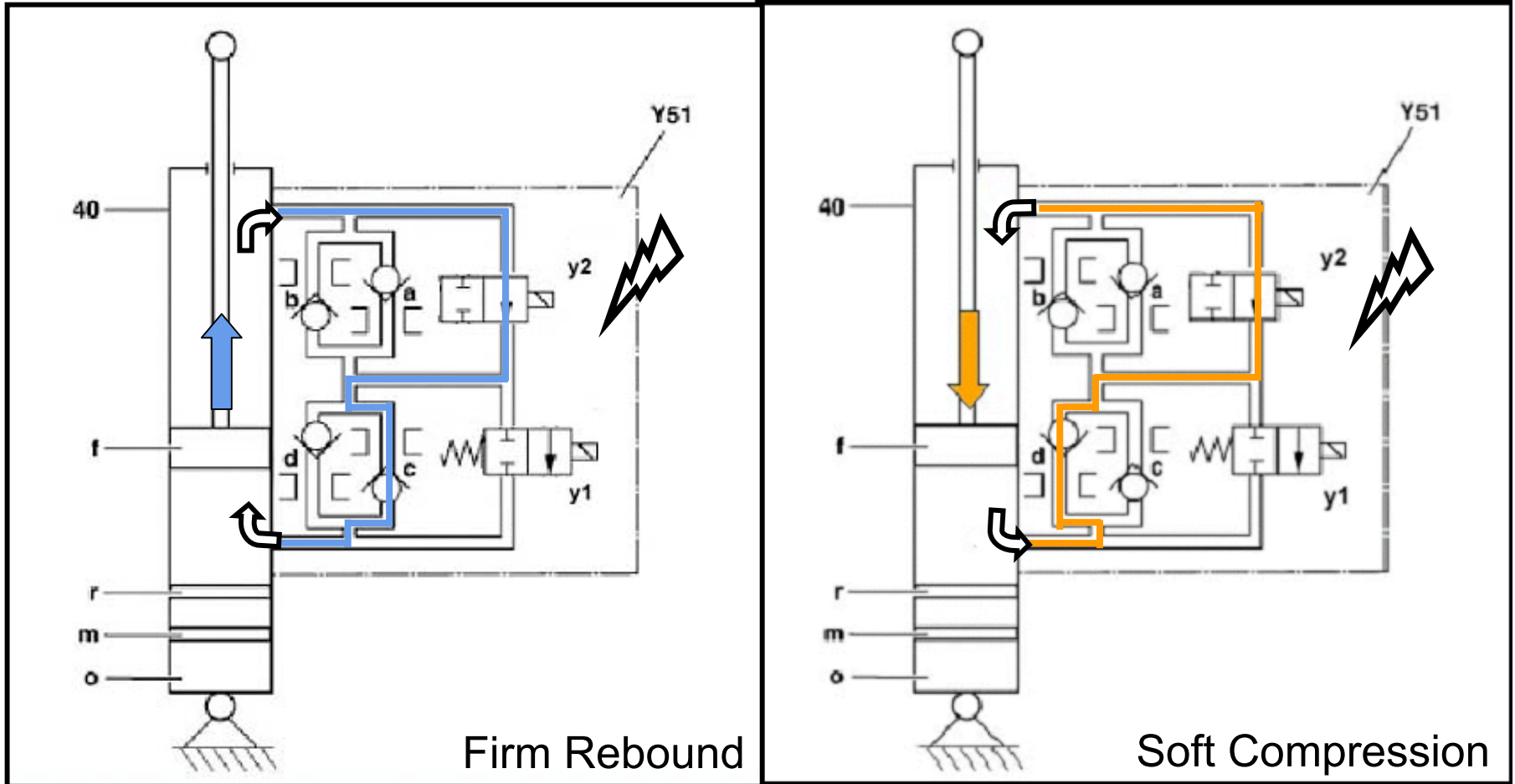
- 40 - Shock absorber
- f - Shock absorber piston
- Y51 - ADS II dampening valve
- y1 - solenoid valve
- y2 - solenoid valve
- a - more restrictive check valve
- b - less restrictive check valve
- c - more restrictive check valve
- d - less restrictive check valve



ADS II Dampening Stage 2



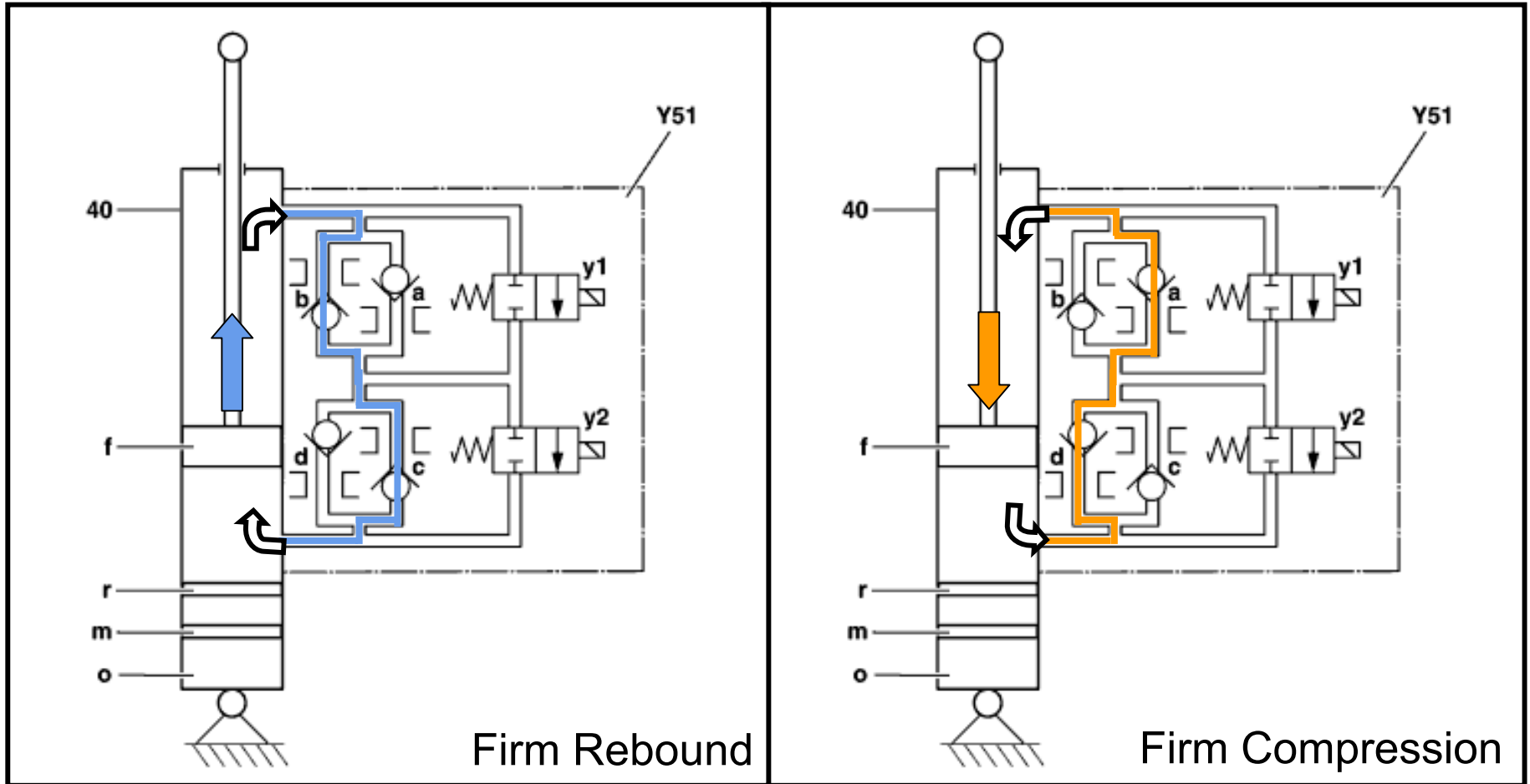
ADS II Dampening Stage 3



Firm Rebound

Soft Compression

ADS II Dampening Stage 4



Note: When braking ADS II defaults to stage 4

211 SAS vs. 220 AIRmatic Suspension

211 SAS	220 AIRmatic
<ol style="list-style-type: none">1. Front air springs w/ integrated dual air chamber and ADS II Shock absorber with dampening valves2. Rear air springs with remote mounted additional air chamber3. Separate rear shock absorber w/ integrated ADS II dampening valves4. National version coding stored in CGW (N93)5. Re-designed solenoid valve block (Y36/6) with 1 valve6. Pressure reservoir (new location right side trunk)7. 2 stage Comfort / Sport switch	<ol style="list-style-type: none">1. Front air springs w/single air chamber and ADS II Shock absorber with dampening valve2. Rear air springs w/single air chamber3. Shock absorbers are integrated in rear air springs w/ADS II dampening valves4. National version coding stored in EIS (N73)5. Solenoid valve block (Y36/6) with 5 valves6. Pressure reservoir left front wheel housing under headlamp7. 1 or 2 stage Comfort / Sport switch. (depending on model year)

Towing Blocks

P32.00-2022-09

