Mercedes-Benz

Electrical/Climate Control

Objectives

Students will be able to:

- explain the operation of cornering Fog Lamps
- locate major electrical components
- identify Automatic Climate Control system components
- explain removal process for the Instrument Cluster

Contents

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Cornering Fog Lamp (Optional)

Provides additional illumination during turning and in narrow corners

Apart from the usual main headlamps illumination, the fog lamps are also activated

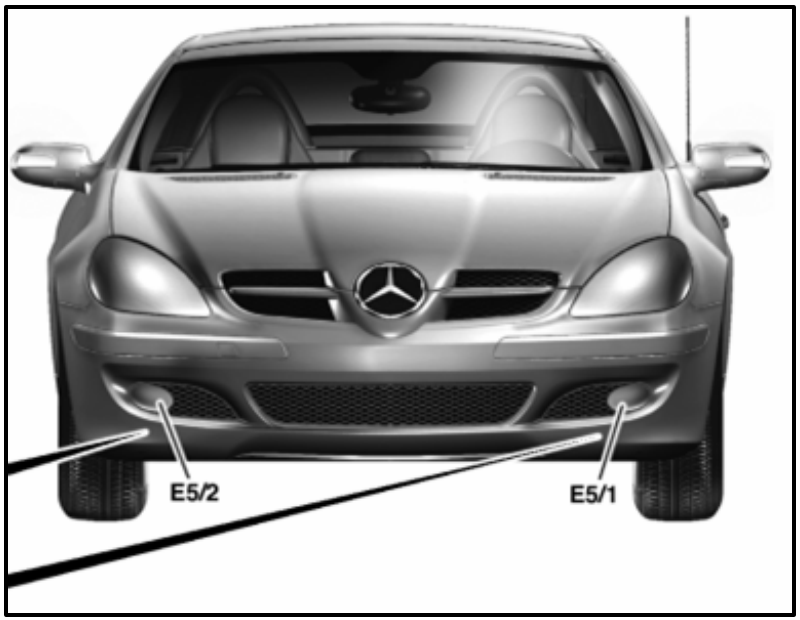
Enables improved sight of any obstacles in turns

Cornering Fog Lamp (Optional)

- Improves road surface lighting, in addition to normal low beam during turns
- Cornering Fog Lamp vehicles are equipped with special fog lights (61° versus 21° reflector)
- Available in conjunction with Bi-Xenon headlamps
- All functions related to this feature are controlled by Driver side SAM
  - Requires a unique Driver side SAM can not version code

Cornering Fog Lamp Function

- Fog light on inside of turn is activated under specific steering angle or turn signal requests
- Inverse activation if reverse gear engaged
- Soft dim activation and deactivation

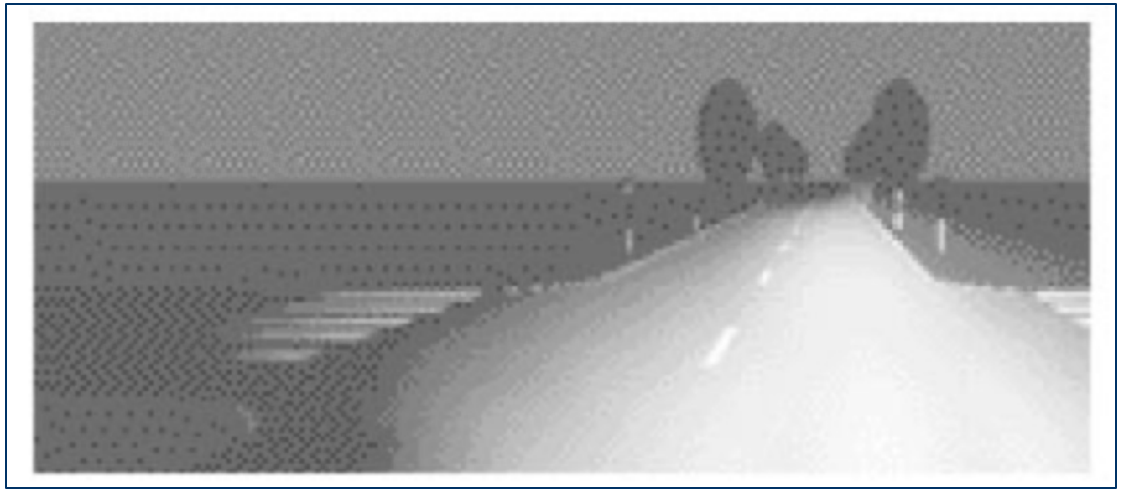


Cornering Fog Lamp Function

- Cornering Fog lamp is activated dependant on
  - Headlamps on or in Auto with rain/light sensor detecting darkness
  - Turn signal activation
  - Steering wheel angle
  - Vehicle Speed
  - Reverse gear

Cornering Fog Lamp

Cornering Fog Lamp Comparison



Road illumination without cornering fog lamp function

Road illumination with cornering fog lamp function

Note: Do not confuse with dynamic headlamps from W211

Cornering Fog Lamp Prerequisites

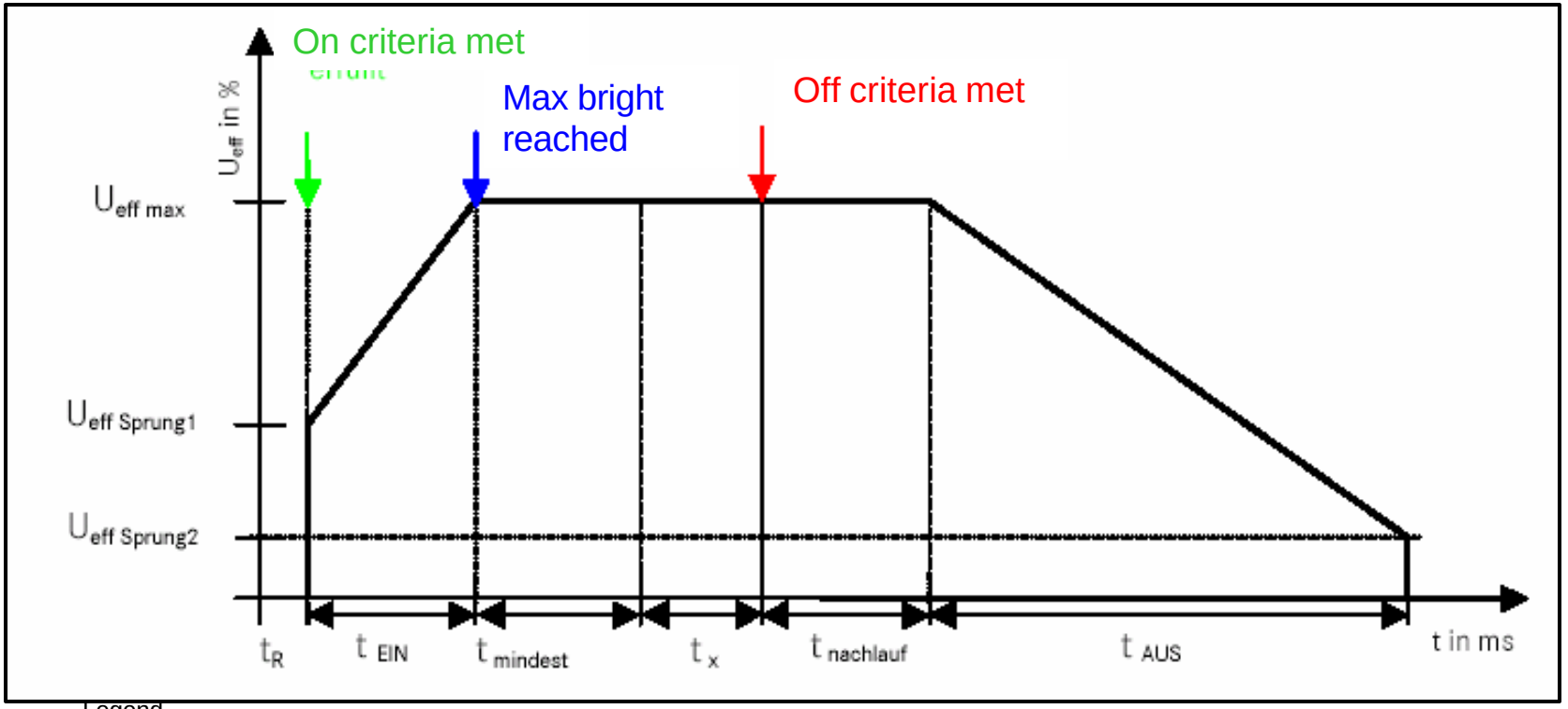
- Engine running (circuit 61 on, or engine >300rpm)
- Light switch in position “Auto” / “On”
- “Light On” from Rain/Light sensor (darkness for “Auto”)
- Vehicle speed < 25mph
- Cornering light request over turn signal (priority) and/or steering angle
- Activation of fog light in turn signal / steering direction

Cornering Fog Lamp Operation with Vehicle in Reverse

- Reverse gear engaged (>0,5 sec.)
- Cornering light activated by steering angle only
- Inverse activation of fog light to steering direction

Cornering Fog Lamp Dim Function

- Only one cornering fog lamp is activated at a time
  - Both may be on at the same time due to activation curve
  - Dim on and dim off times vary (off is longer)



Legend

t	Time in ms	t_X	Activation time (based on activation criteria)	U_{eff}	Effective Voltage
t_R	Reaction time (<100ms)	$t_{nachlauf}$	Run-on time (0-5s)	$U_{eff\ max}$	Maximum U_{eff}
t_{EIN}	On time (dim-on)	$t_{mindest}$	Minimum activation time (0-5s)	$U_{eff\ Sprung1}$	30% U_{eff} (dim-on)
t_{AUS}	Off time (dim-off)			$U_{eff\ Sprung2}$	Shut down U_{eff} (dim-off)

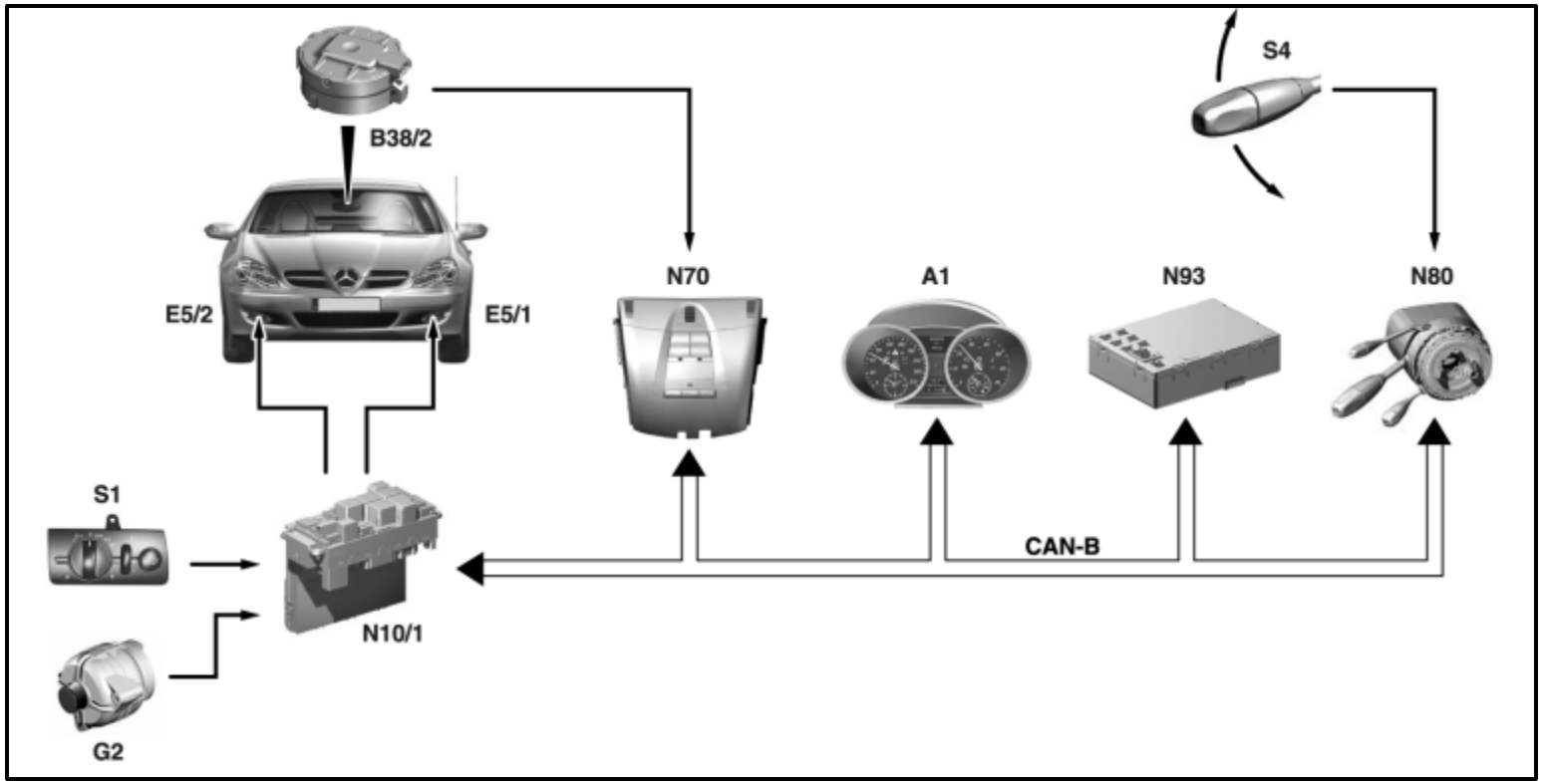
Cornering Fog Lamp Deactivation

- Immediate deactivation of cornering fog lamp (without dimming) if:
  - High Beam activated
  - Fog lights activated
  - Diagnostics
  - Hazard Flasher activated
  - Light switch turned to position 0

Cornering Fog Lamp Faults

- Fault handling
  - Fault affecting only cornering fog lamp
    - IC message regarding unavailability of cornering light
  - Fault affecting fog light
    - IC message regarding corresponding fog light failure (Cornering light also unavailable but no message)

Cornering Fog Lamp Networking

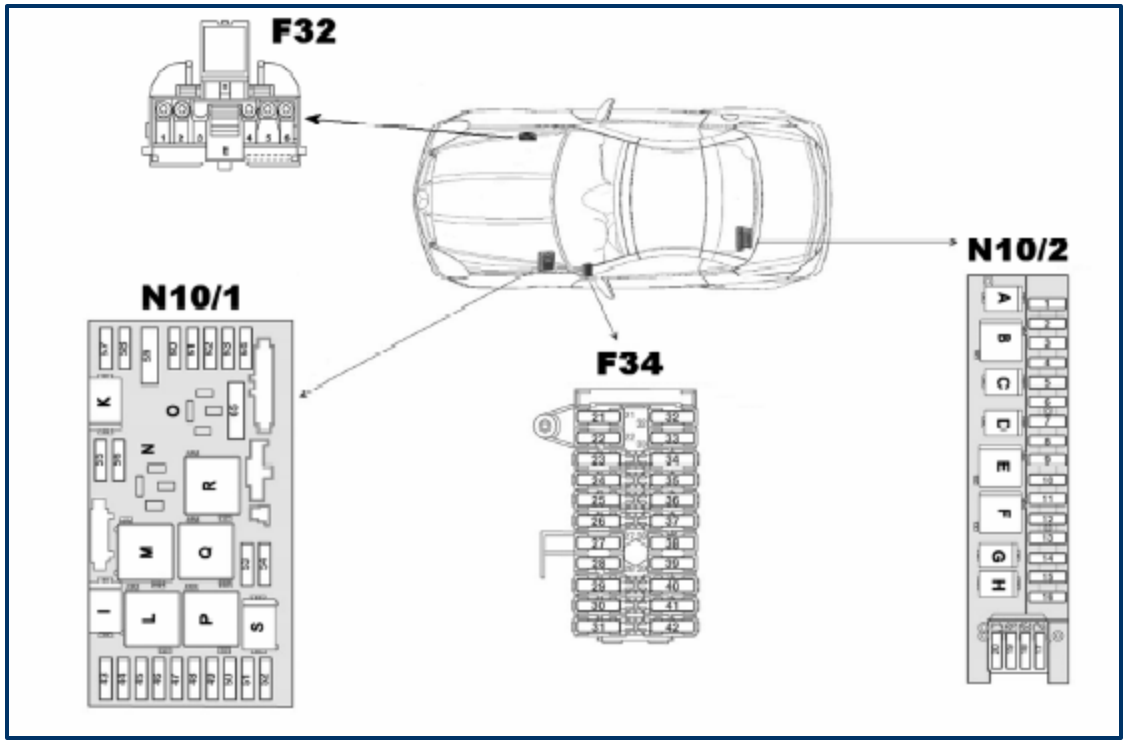


B38/2 Rain/light sensor
E5/1 Left fog lamp
E5/2 Right fog lamp
G2 Alternator

N10/1 Driver-side SAM control unit with fuse and relay module
N70 Overhead control panel control unit

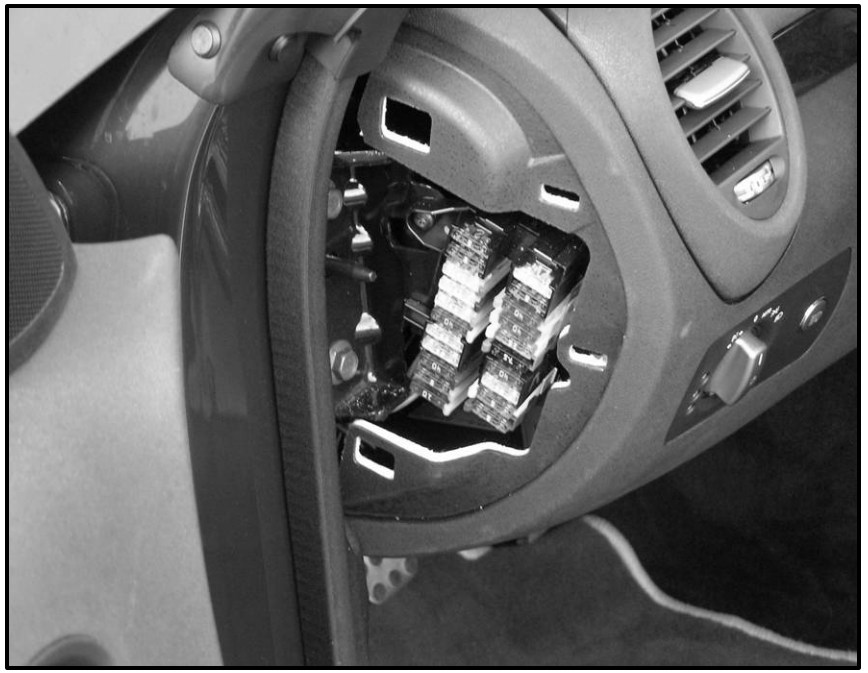
N80 Steering column module
N93 Central gateway control unit
S1 Exterior lamp switch
S4 Combination switch

Electrical



Fuse Locations

F32 – Pre-fuse box located in right engine compartment



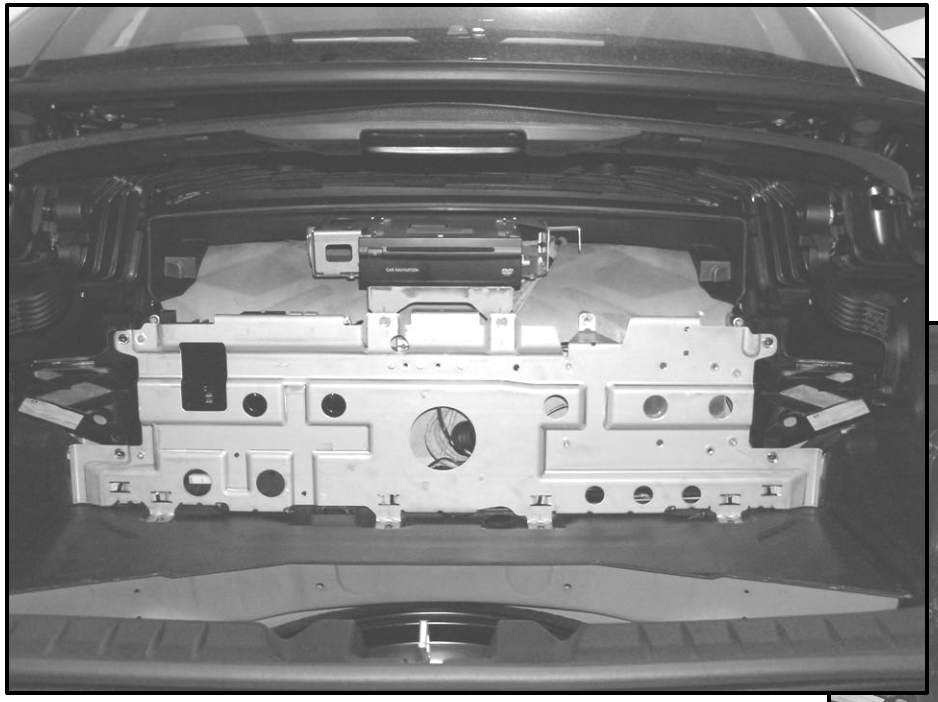
F34 – Interior fuse box located driver side IP

Fuse Locations

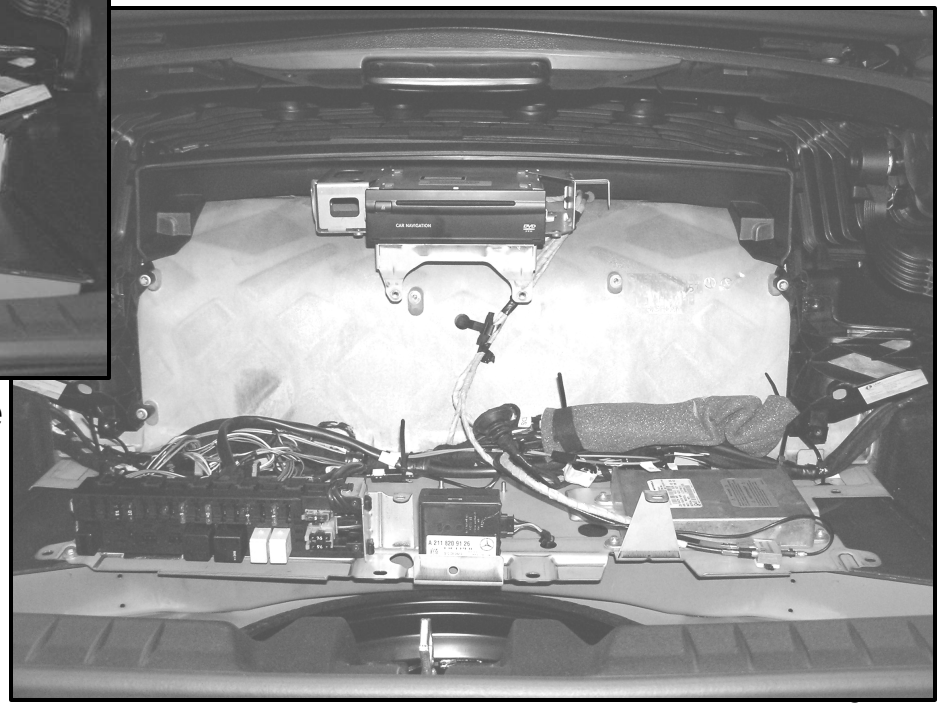
N10/1 – Driver side SAM located left engine compartment

Fuse Locations

- N10/2 SAM-Rear located in trunk module bridge



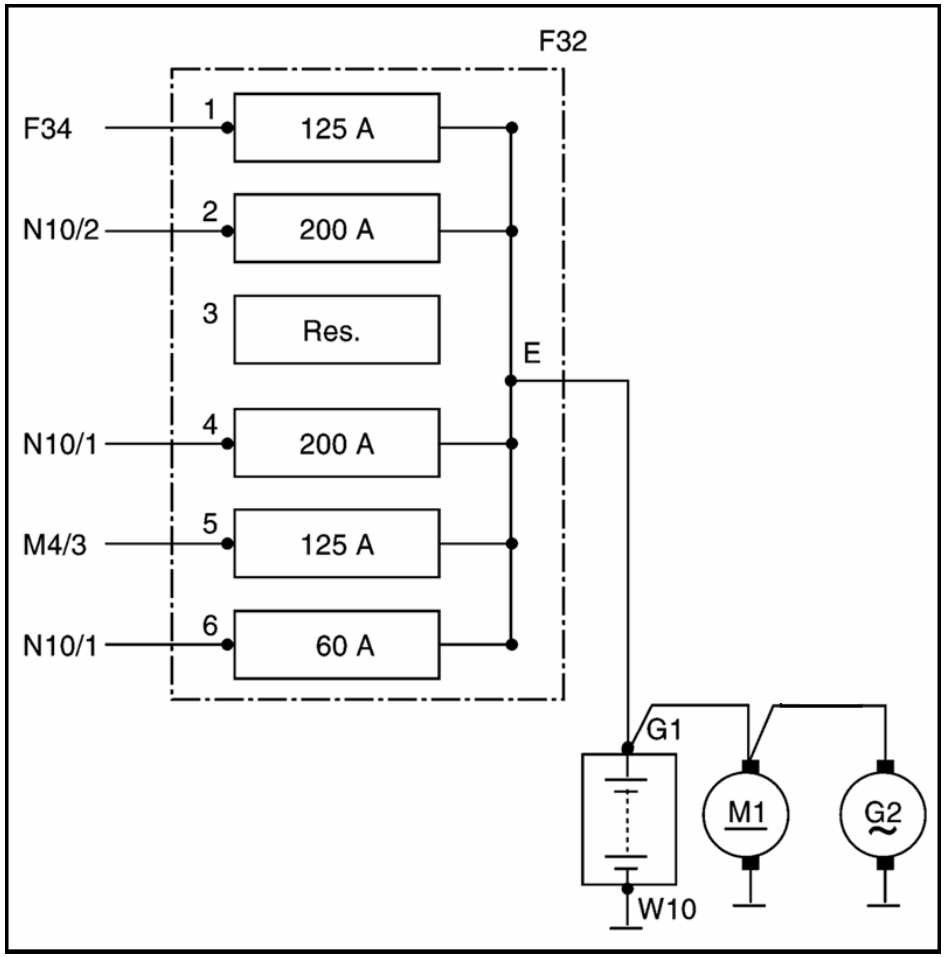
Trunk paneling removed, module bridge in place



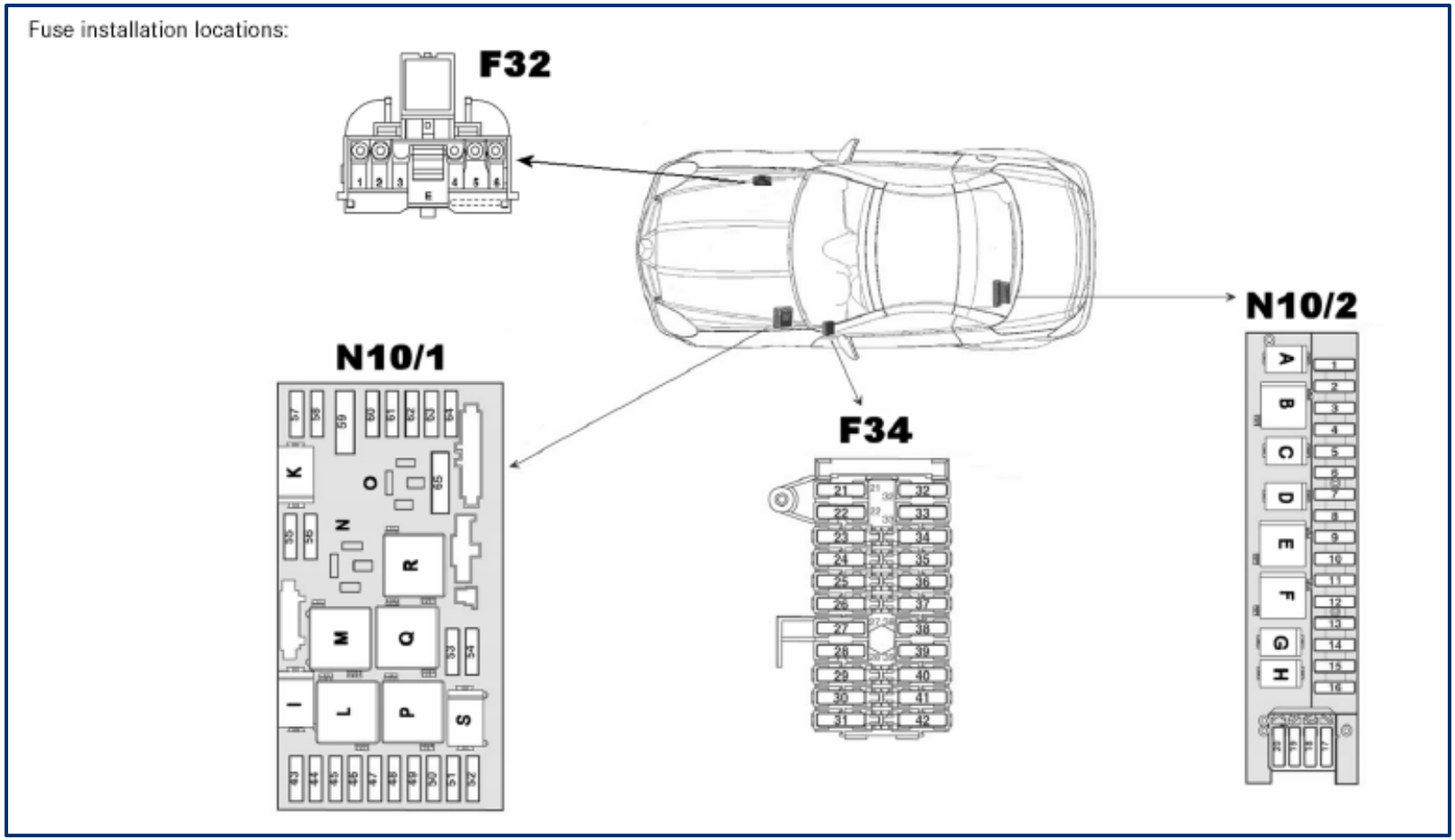
Trunk paneling removed, module bridge folded down

Fuse Assignments

F32 Front Pre-fuse box
F34 Interior Fuse box
G1 Battery
G2 Alternator
M1 Starter
M4/3 Electric Suction Fan
N10/1 SAM-Driver
N10/2 SAM-Rear
W10 Ground
(engine compartment)



Fuse and Relay Locations



Fuse Functions

Function	Fuse no.
Low beam	62,63
ABS	56,59,60
Airbag/sidebag control unit	45,49
Airbag indicator lamps	45,49
AIRSCARF (SE)	23,24,37
Antenna amplifier	8
Exit lamps (SE)	27,28
Stowage compartment illumination	13
Glove box illumination	47
Turn signal lamp, turn signal indicator	electronic
Stop lamp	electronic
CD changer	19
Dome lamp	22
Diagnostic socket	40,62
ATA (SE)	8,22,37
Electr. stability program	33[1],42[2],56,59,60
Fanfare horn	33[1],42[2],43
Rear power windows	21,32,39
Front power windows	27,28
High beam, high beam indicator	electronic
Garage door opener (SE)	22
Blower (air conditioning)	29,51
Transmission control (SE)	33[1],42[2],55,58,61
Glove box locking	15
Heated rear window	10
License plate illumination	electronic
Air conditioning	29,37,51
Instrument cluster	30,51
Convenience locking function	27,28
Fuel Pump	4
Steering wheel heater (SE)	31,33[1],42[2]
Steering wheel adjustment (SE)	33[1],34,42[2]
Steering lock	36
Headlamp range adjustment	51,55

Function	Fuse no.
Headlamp flasher	electronic
Make-up mirror	22
Engine fan	51
Residual engine heat exploitation	37,51
Engine control	36,53,54
Multifunction steering wheel	33[1],42[2]
Navigation system (SE)	19,41,64
Fog lamps	electronic
Rear fog lamp	electronic
Parktronic system (SE)	9,37
Radio systems	26,41,47,64
Rain sensor	22
Backup lamp	electronic
Switch illumination	27,28,37,50
Windshield washer pump	electronic
Windshield wiper	33[1],42[2],46
Headlamp cleaning system (SE)	electronic
Closing report	electronic
Seat heating	25,37
Passenger seat adjustment	35
Driver seat adjustment	34
Automatic dimming mirror (SE)	22,27
Mirror folding (SE)	27,28,37
Heated outside mirror	27,28
Mirror adjustment	27,28,37
Standing lamp/taillamp	electronic
Start enable	36,52,57
Filler cap unlocking	15
Telephone systems (SE)	3,16
Roof	21,37,38
Hazard warning switch	37
Central locking interior switch	37
Central Locking	15,27,28,37
Cigar lighter	47

Relay Functions

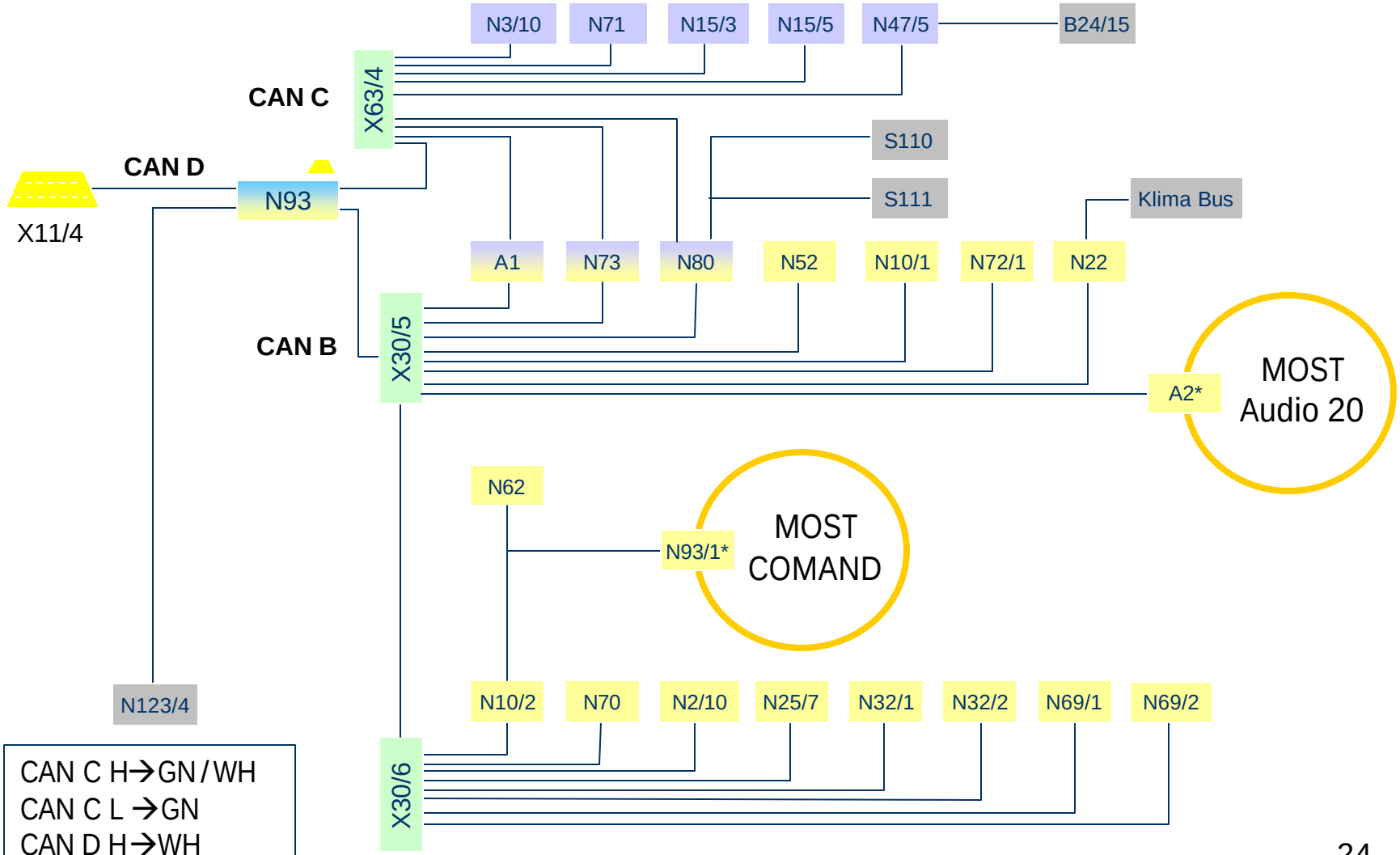
Relay distribution control module with fuse and front relay module (N10/1)

Relay	Designation	Housing color
I	Fanfare horn	black
K	T. 87, chassis	black
L	Wiper step ½	yellow
M	T. 15R	gray
N	CMT pump rod	black
O	Secondary air pump	gray
P	T. 15	black
Q	Wiper on/off	yellow
R	T. 87, engine	black
S	Starter	black

Relay distribution control module with fuse and rear relay module (N10/2)

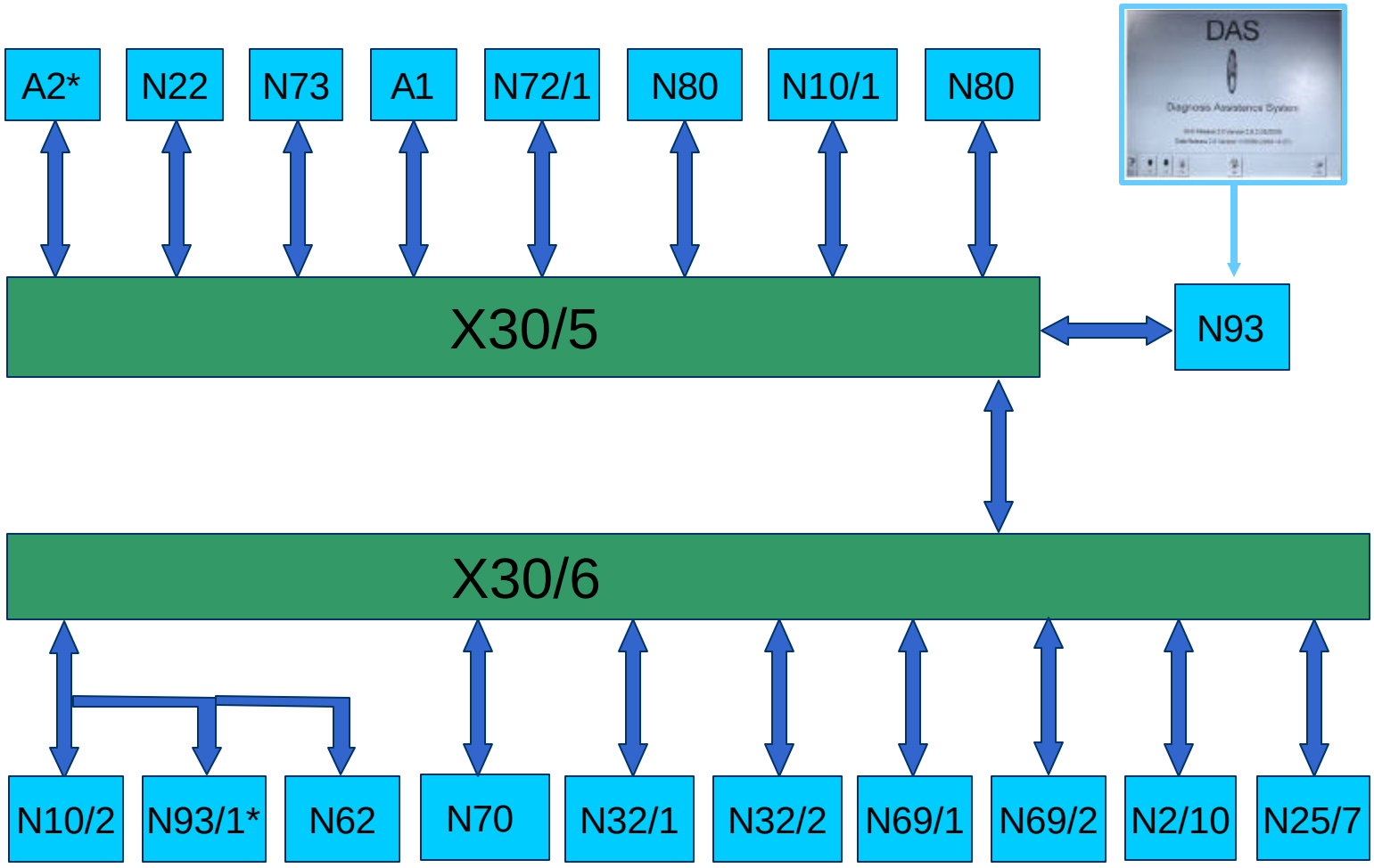
Relay no.	Designation	Housing color
A	Fuel pump	black
B	T. 15 R	gray
C	AMG engine	black
D	Reserve relay 1	yellow
E	Heated rear window	black
F	Interior light	black
G	Tank cap lock (Polwende relay)	yellow
H	Tank cap lock (Polwende relay)	yellow

Networking Map - Vehicle



* Either Audio 20 or Audio Gateway installed

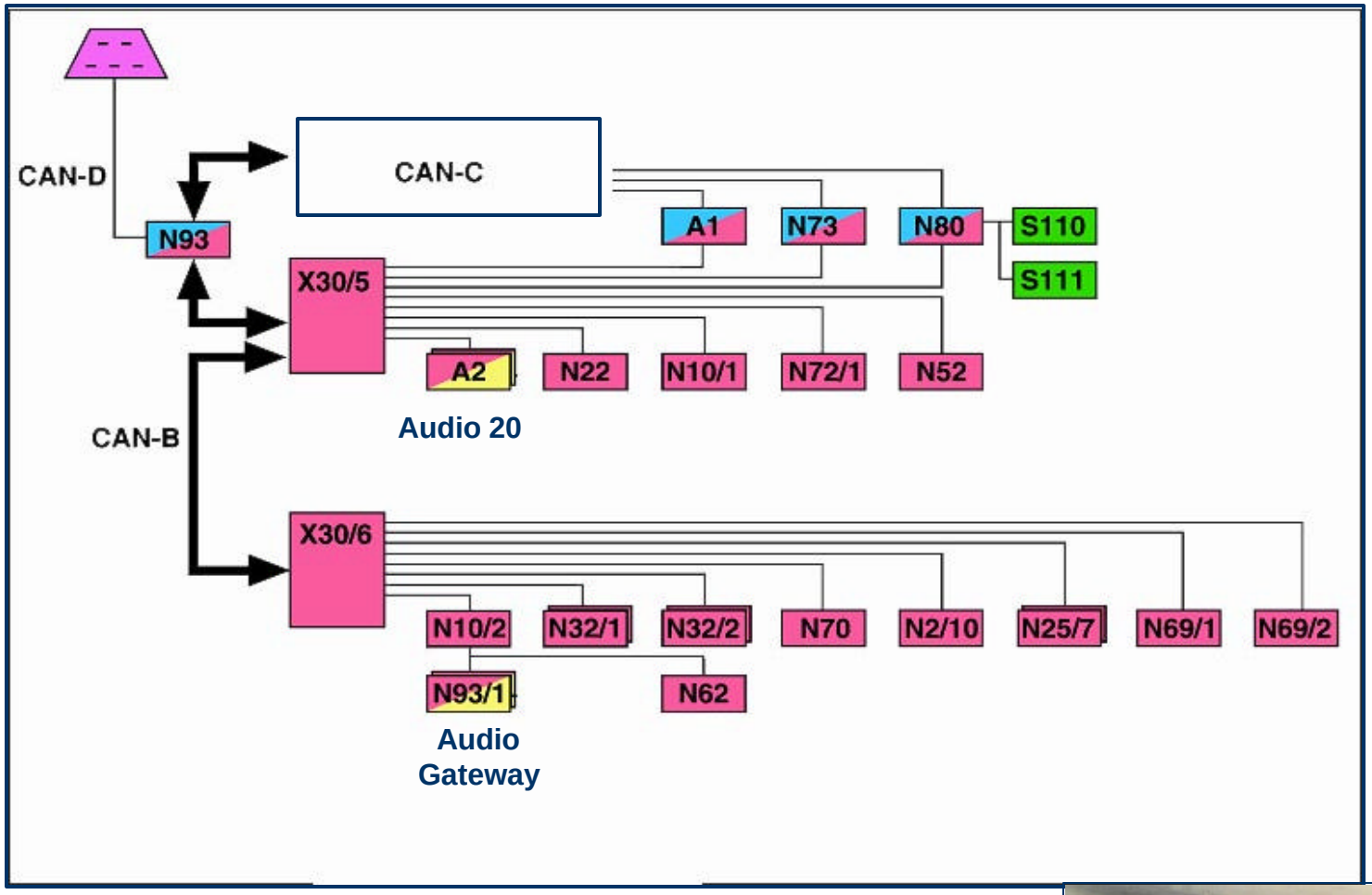
Networking Map – CAN B



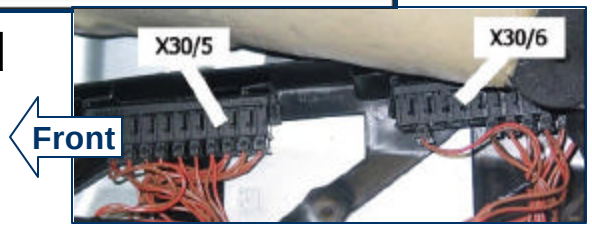
CAN H (BN/RD) except Jumper X30/5 to X30/6 (BN/BK) / CAN L (BN)

* Either Audio 20 or Audio Gateway installed

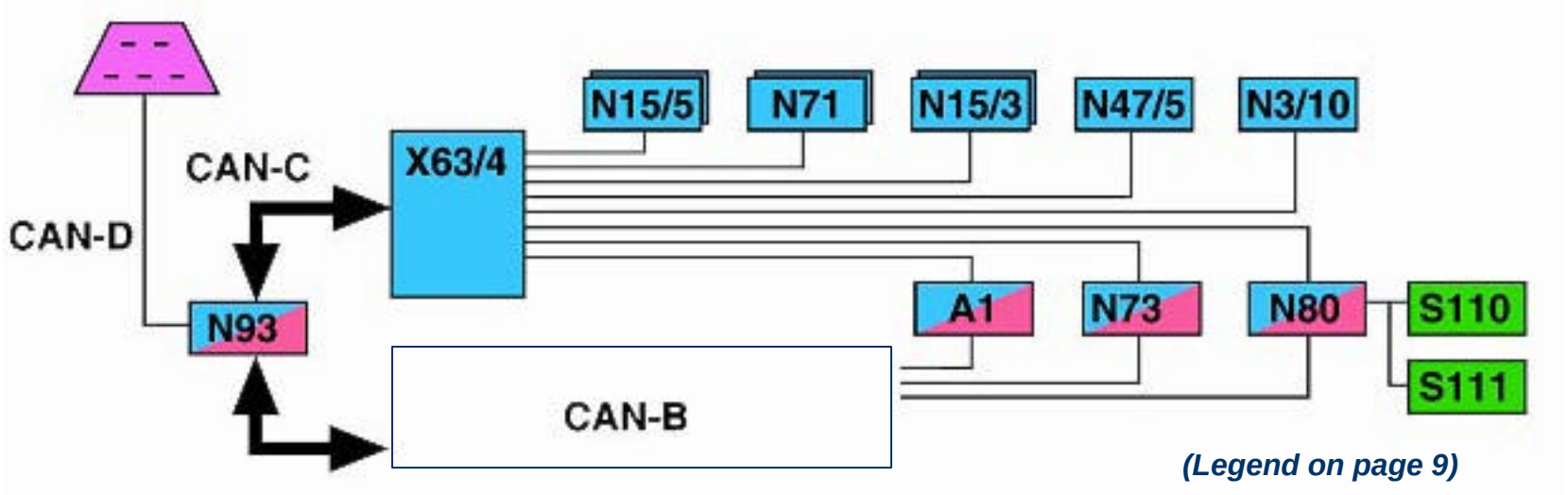
CAN B



- All diagnosis is through Central Gateway (N93) and CAN D
- X30/5 & X30/6 located to right of driver's door sill
- Either Audio 20 or Audio Gateway will be present



CAN C



(Legend on page 9)

= Diagnostic socket

- All diagnosis is through Central Gateway (N93) and CAN D,
- X63/4 located at driver's A-pillar

Networking Map - Legend

CAN B

A1 - Instrument cluster (IC)
A2 - Radio
N2/10 - Supplemental restraint system (SRS)
N10/1 - Driver SAM
N10/2 - Rear SAM 1
N22 - Automatic air conditioning (AAC)
N25/7 - SH, AIRSCARF and steering wheel heater control unit
N32/1 - LF Electric seat adjustment (ESA)
N32/2 - RF Electric seat adjustment (ESA)
N52 - Roof operation control unit
N62 - Parktronic (PTS)
N69/1 - LF Door control module (DCM)
N69/2 - RF Door control module (DCM)
N69/3 - LR Door control module (DCM)
N69/4 - RR Door control module (DCM)
N70 - Front overhead control module (OCP)
N72/1 - Upper control panel (UCP)
N73 - Electronic ignition switch (EIS)
N80 - Steering column module (SCM)
N93 - Central gateway (CGW)
N93/1 - Audio Gateway control unit
X30/5 - CAN B network connector
X30/6 - CAN B network connector

CAN C

A1 - Instrument cluster (IC)
N3/10 - Motor electronics (ME)
N15/3 - Electronic transmission control (ETC)
N15/5 - Electronic shifter module (ESM)
N47/5 - Electronic stability program (ESP)
N71 - Headlamp Range adjustment control module (HRA)
N73 - Electronic ignition switch (EIS)
N80 - Steering column module (SCM)
N93 - Central gateway (CGW)
X63/4 - CAN C network connector

CAN D

N93 - Central gateway (CGW)
N123/4 - Digital Tele Aid (LCT)
X11/4 - Diagnostic connector

Other

B24/15 - Micromechanical yaw rate sensor
S110 - Left steering wheel multi-function keys
S110 - Right steering wheel multi-function keys
X30/5 - CAN distributor CAN B left
X30/6 - CAN distributor CAN B cockpit
X63/4 - CAN distributor CAN C

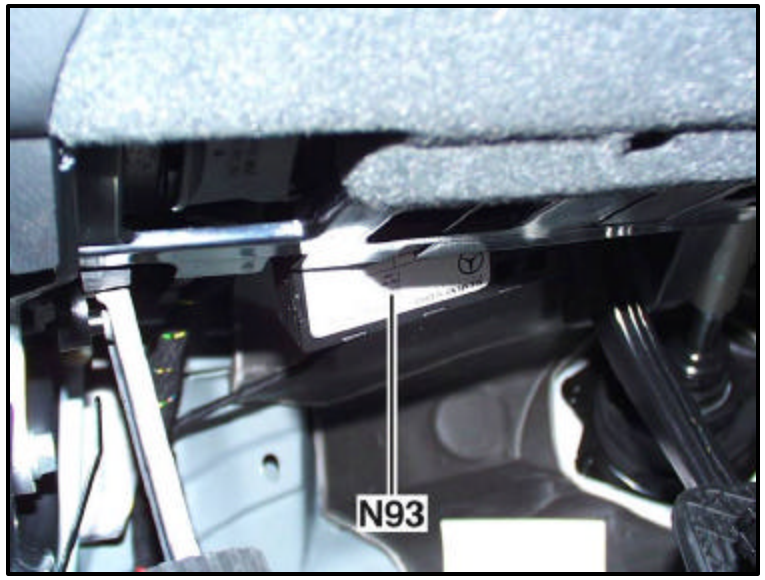
Indicates discreet wire to diagnostic connector X11/4

CAN B & CAN C control module

Other type of network connection
- CAN D
- Private Bus
- LIN Bus

Networking – Central Gateway

- Central Gateway (CGW – N93) Tasks
  - Primary gateway between CAN B and CAN C
  - Gateway between CAN B and CAN D
    - Only if version coding set to Tele AID present



Location: Driver under dash panel

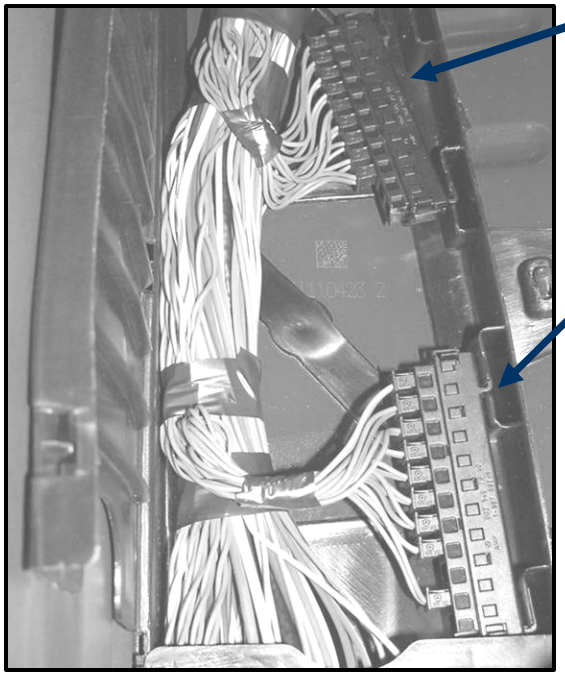
Networking – Central Gateway

- Diagnostics gateway between CAN D and CAN B/C
  - CAN B → Global diagnostic request possible with ignition Off
  - CAN C → Individual diagnostic request possible with ignition On only
- Master Version Coding
- Maintenance Interval Indicator
- Check Engine Light

Networking – CAN Connectors

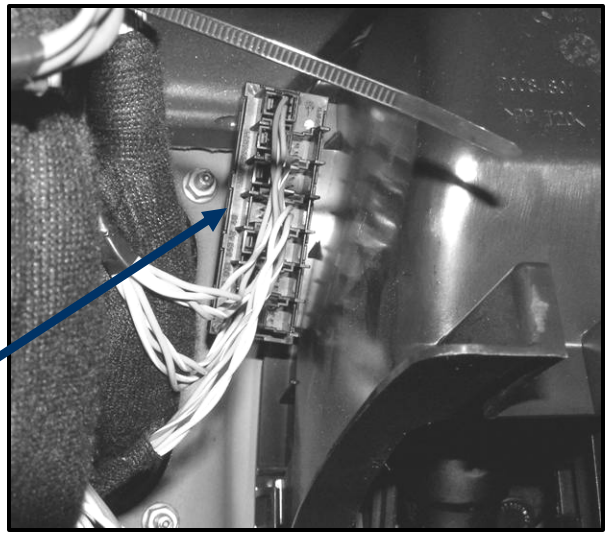
X30/5 CAN B Connector

X30/6 CAN B Connector



Location: Wiring through left side, under carpet

X63/4 CAN C Connector



Location: Firewall left side, next to pedal cover

Review

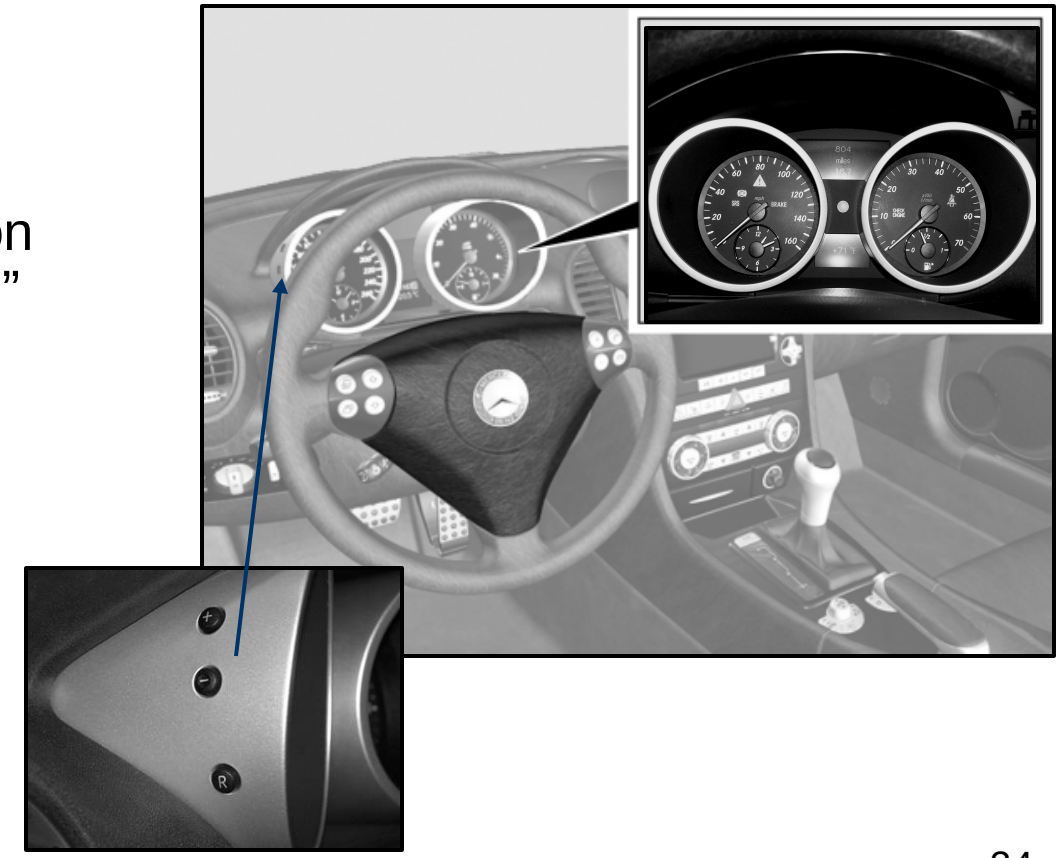
1. What type of CAN is NOT used on the R171?
   a. CAN-A
   b. CAN-B
   c. CAN-C
   d. CAN-KB

2. Where would you find the three CAN voltage distributors on the R171?

Instrument Cluster

Instrument Cluster

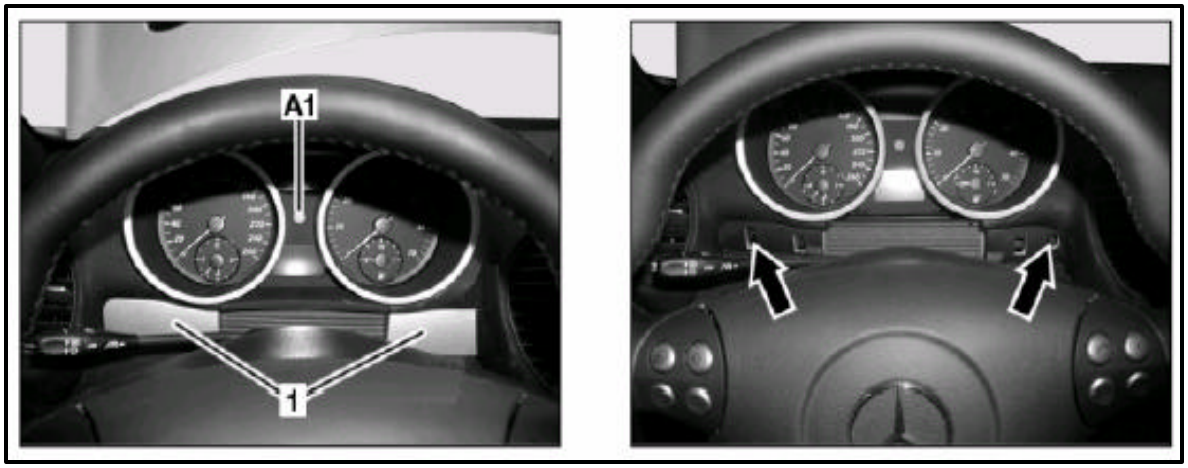
- 2 enclosed dial type gauges in cylinder shaped tubes
- 2 multifunction displays
- 3 adjuster buttons located on left side of IC, “+” “-” and “R” used to regulate the illumination, reset the trip odometer and ASSYST



Instrument Cluster

- Instrument cluster wake up takes place through:
  - opening and closing driver door
  - switching on headlamps
  - switching on ignition
  - pressing side adjusters

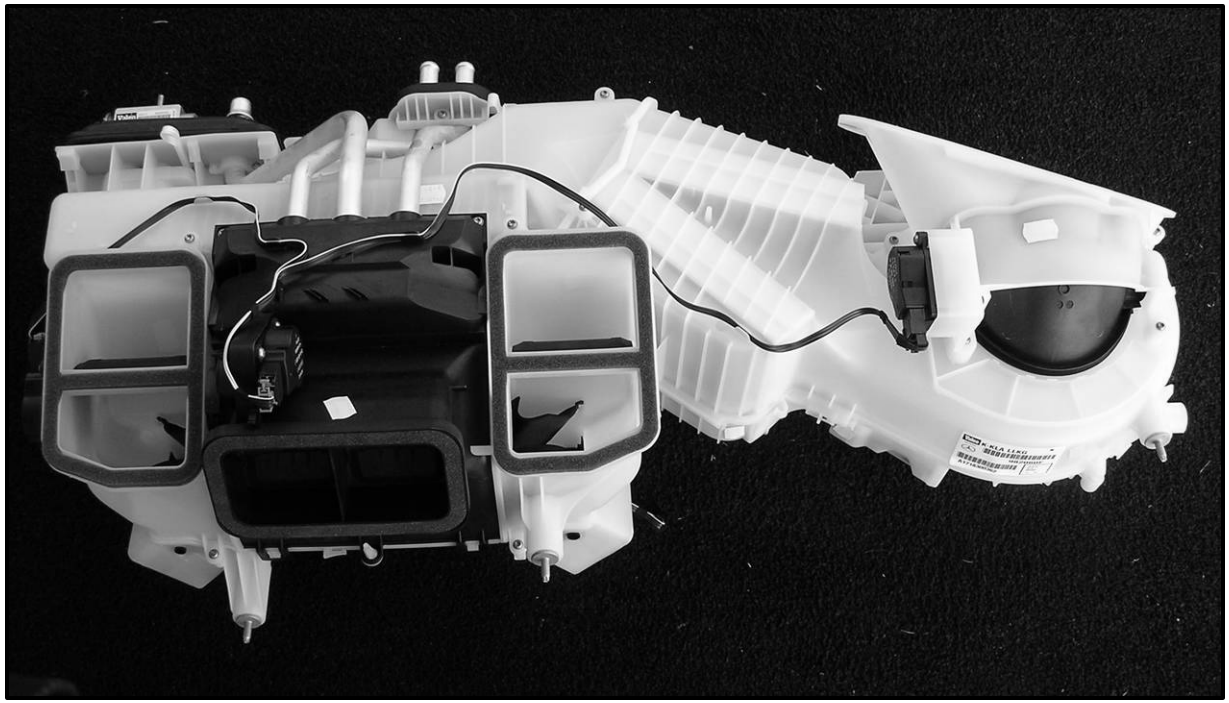
Instrument Cluster Service Tip



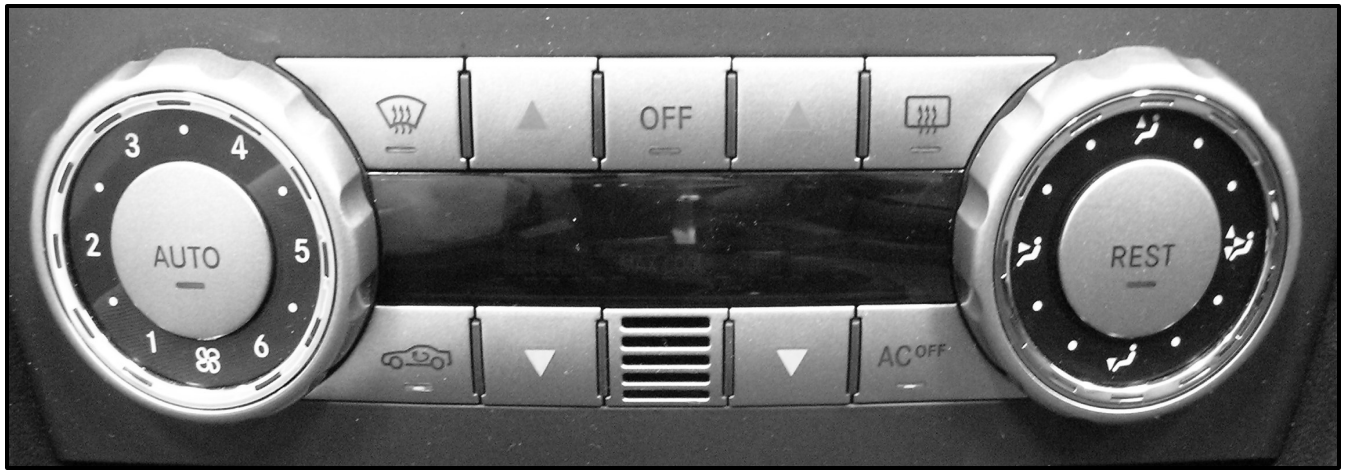
The instrument cluster on the SLK can be removed as follows:

- Unclip both trim strips (marked with 1)
- Unlock by pressing using a long thin object (1/4” extension 6” long) in the now exposed holes (marked with an arrow).
- Pull cluster carefully forwards!

Comfort Automatic Air Conditioning Thermotronic C-AAC

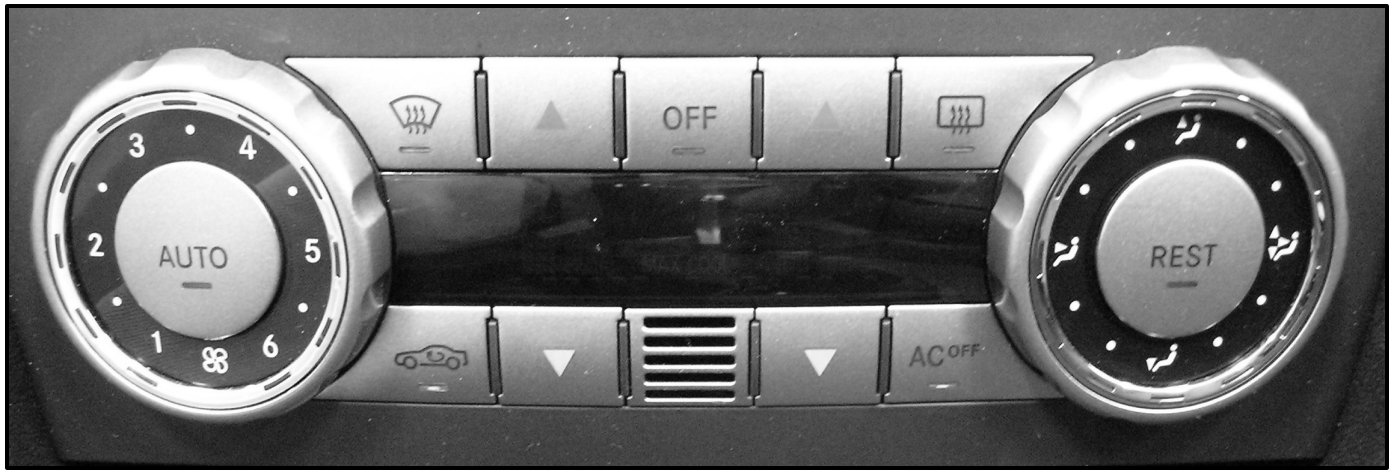


C-AAC Control Unit (N22/7)



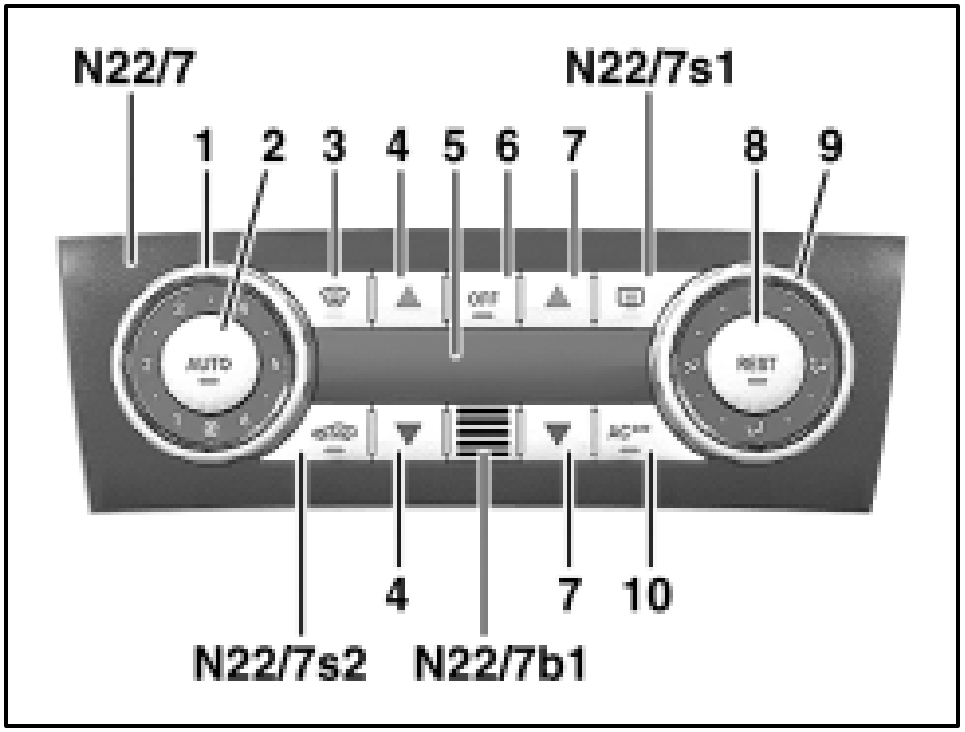
- The C-AAC control and operating unit (N22/7) in the center console provides the following controls:
  - Separate left and right cold/warm interior temperature selection
  - Switching the air conditioning system on and off
  - Manual blower control

C-AAC Control Unit (N22/7)



- Manual air distribution
- Automatic blower control and air distribution
- Recirculated air mode
- Activation of residual engine heat utilization with ignition switched off
- Front and rear window defrost

C-AAC Control Unit (N22/7)



N22/7 AAC comfort pushbutton control unit

N22/7B1 In-car temperature sensor

N22/7S1 Rear window defroster switch

N22/7S2 Recirculated air pushbutton

1 Blower setting switch

2 Automatic control switch

3 Defrost button

4 Left temperature rocker

5 Display

6 ON/OFF button

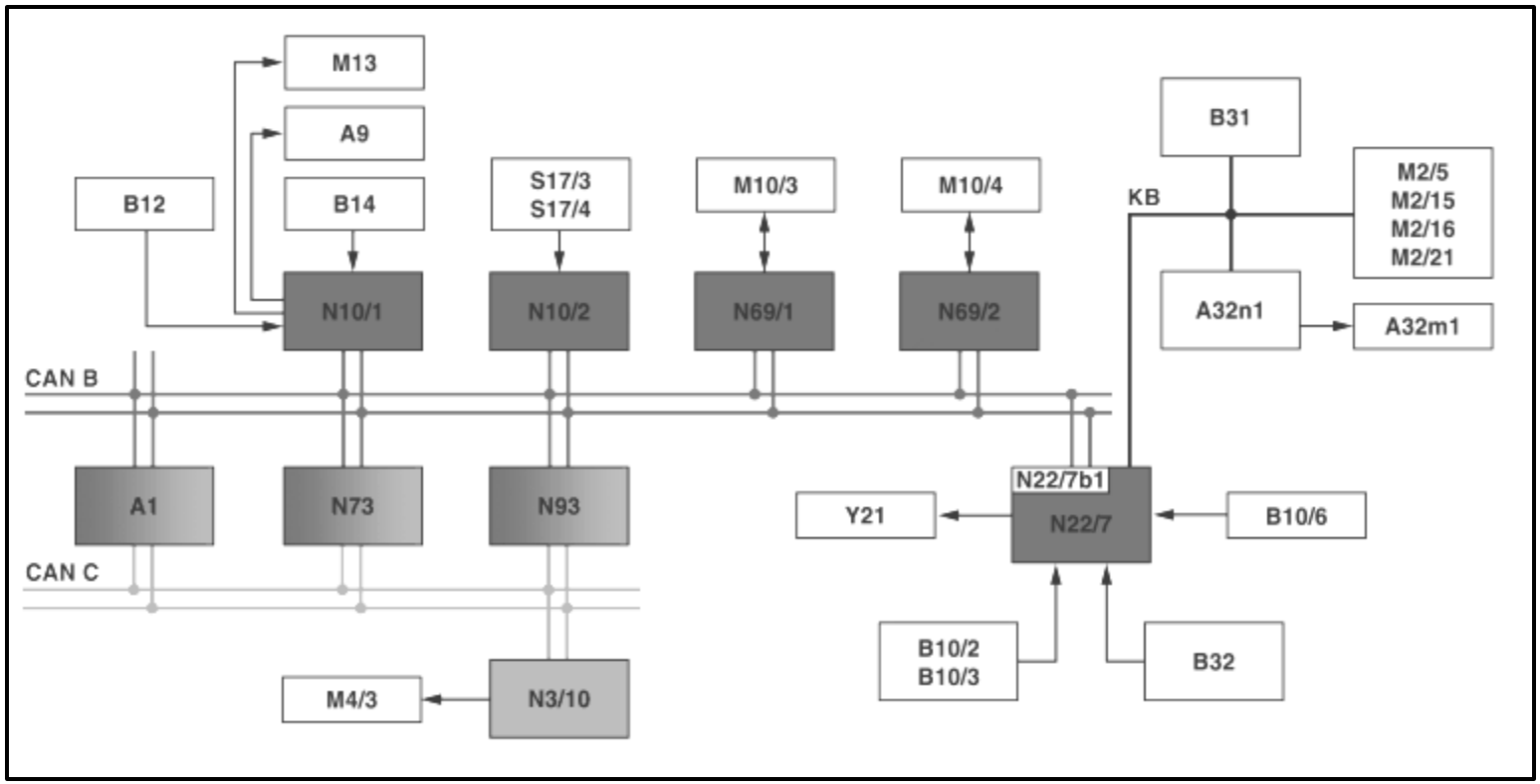
7 Right temperature rocker

8 Residual heat button

9 Air distribution switch

10 AC OFF button

C-AAC Networking



- MODELS 171.4 with CODE (581b) Convenience automatic air conditioning

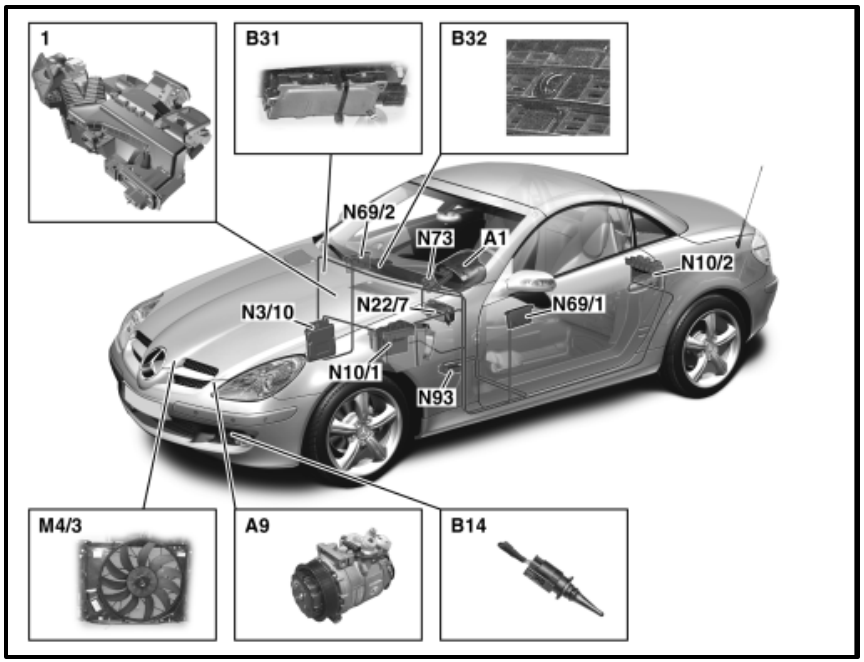
Networking Legend

A1 Instrument cluster
A9 AC compressor
A32M1 Blower motor
A32n1 Blower regulator
B10/2 Left heat exchanger temperature sensor
B10/3 Right heat exchanger temperature sensor
B10/6 Evaporator temperature sensor
B12 Refrigerant pressure sensor
B14 Ambient temperature display temperature sensor
B31 Multifunction sensor
B32 Sun sensor
M2/5 Fresh air and recirculated air flap actuator motor M2/15 Left and right footwell flaps positioning motor
M2/16 Left and right defroster flaps positioning motor
M2/21 Fresh air flaps positioning motor
M4/3 Electric suction fan engine/ A/C
M10/3 Left front power window motor
CAN B Controller area network bus class B (interior) (CAN-B)
CAN C Controller area network bus class C (engine compartment) (CAN-C)
KB AC bus
M10/4 Right front power window motor
M13 Coolant circulation pump
N3/10 ME-SFI [ME] control module
N10/1 Driver-side SAM control unit with fuse and relay module
N10/2 Rear SAM control unit with fuse and relay module N22/7 AAC comfort pushbutton control unit
N22/7B1 In-car temperature sensor
N69/1 Left door control module
N69/2 Right door control unit
N73 DI control unit
N93 Central gateway control unit
S17/3 Left door contact switch
S17/4 Right door contact switch
Y21 Duovalve

Thermotronic C-AAC Operation

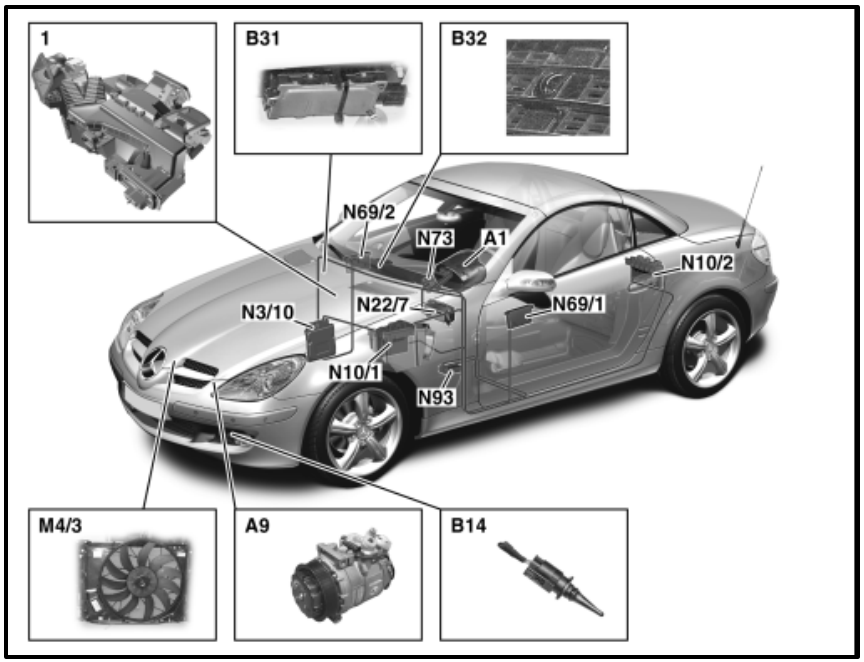
Signals available for the electronic control and regulation of the interior vehicle temperature:

- Interior temperature via in-car temperature sensor (N22/7b1) in the C-AAC control unit (N22/7)
- Refrigerant pressure via refrigerant pressure sensor (B12) from driver-side SAM (N10/1)
- Intensity and angle of sun rays from the sun sensor (B32) via the C-AAC control unit (N22/7)



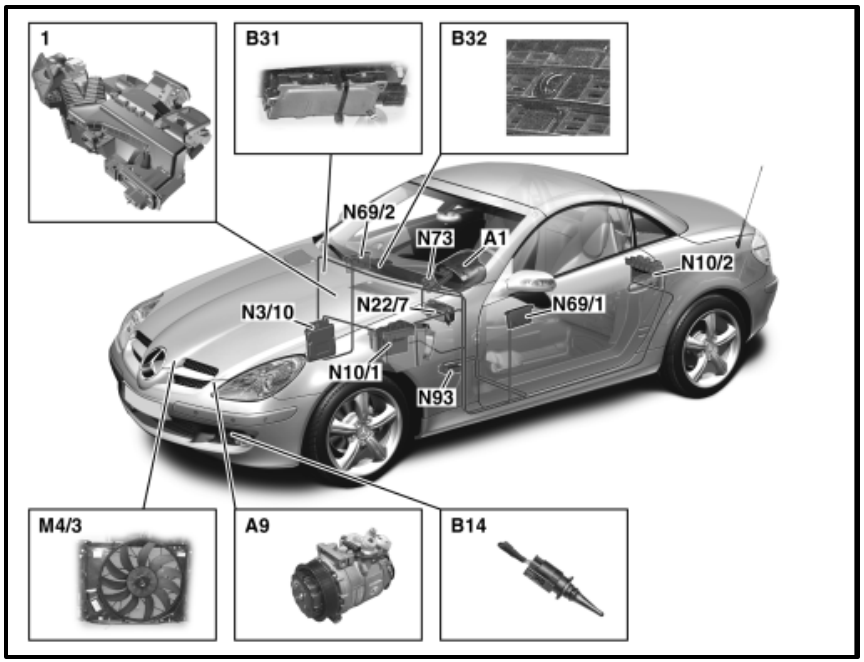
Thermotronic C-AAC Operation

- Temperature in the air flow from the left and right heat exchanger temperature sensors (B10/2) and (B10/3) from the C-AAC control unit (N22/7)
- Outside temperature by the outside temperature sensor (B14) via the driver-side SAM (N10/1)
- Position of the left and right front power window motors (M10/3), (M10/4) via the left and right door control units (N69/1), (N69/2)



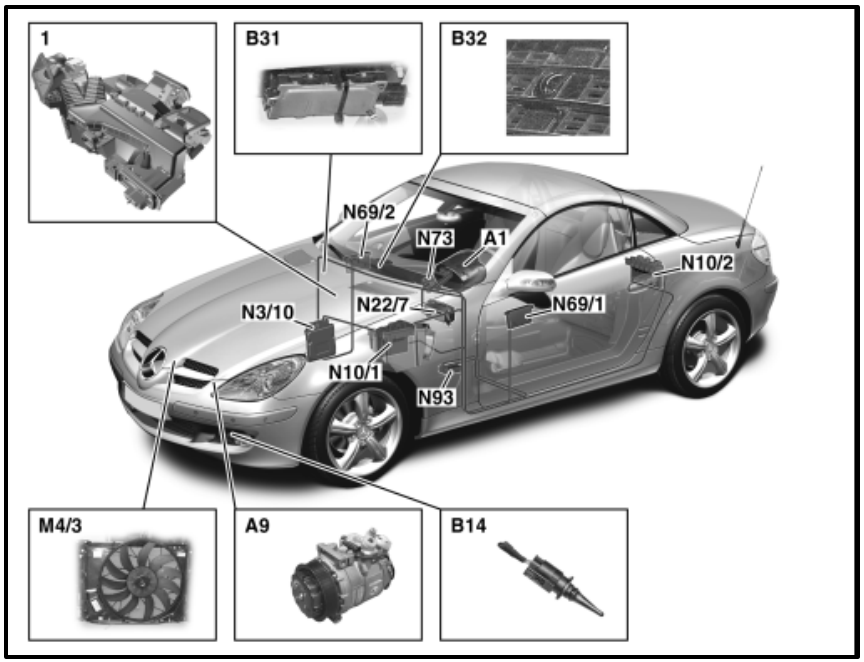
Thermotronic C-AAC Operation

- Position of the doors by the left and right door contact switches (S17/3) and (S17/4) via the rear SAM (N10/2)
- Engine speed and the actuation of the electric suction fan/AC motor (M4/3) via ME 9.7 (N3/10)
- Battery voltage via the electronic ignition switch (N73)

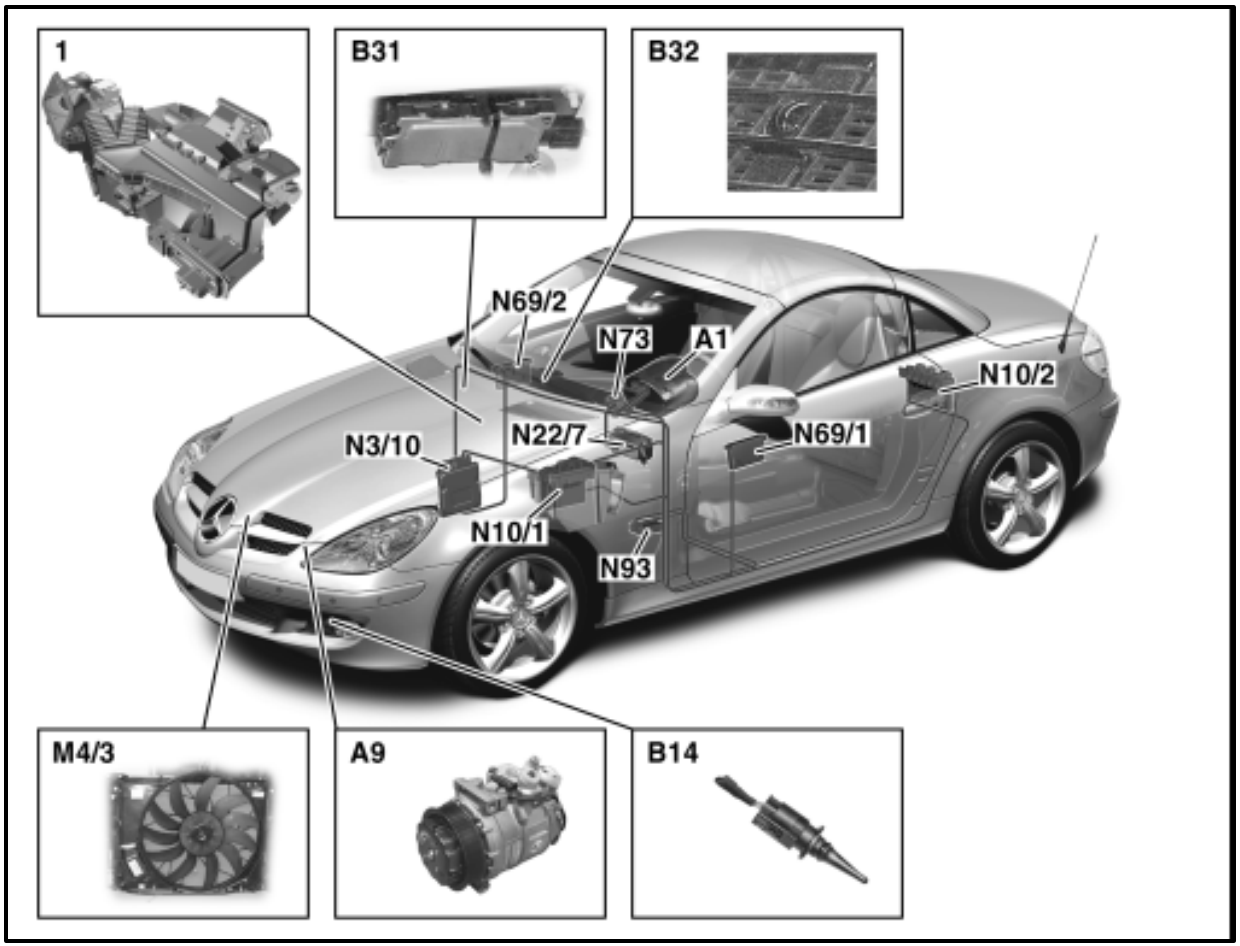


Thermotronic C-AAC Operation

- Humidity, ambient temperature and pollutant concentration from the multifunction sensor (B31) via the C-AAC control unit (N22/7)
- Evaporator temperature by the evaporator temperature sensor (B10/6) via the C-AAC control unit (N22/7)
- Vehicle speed via the instrument cluster (A1).



C-AAC Components



C-AAC Component Legend

1 - Comfort automatic air conditioning housing

A1 - Instrument cluster

A9 - AC compressor

B14 - Ambient temperature display temperature sensor

B31 - C-AAC multifunction sensor

B32 - Sun sensor

M4/3 - Electric suction fan engine/ A/C

N3/10 - ME-SFI [ME] control module

N10/1 - Driver-side SAM control unit with fuse and relay module

N10/2 - Rear SAM control unit with fuse and relay module

N22/7 - AAC comfort pushbutton control unit

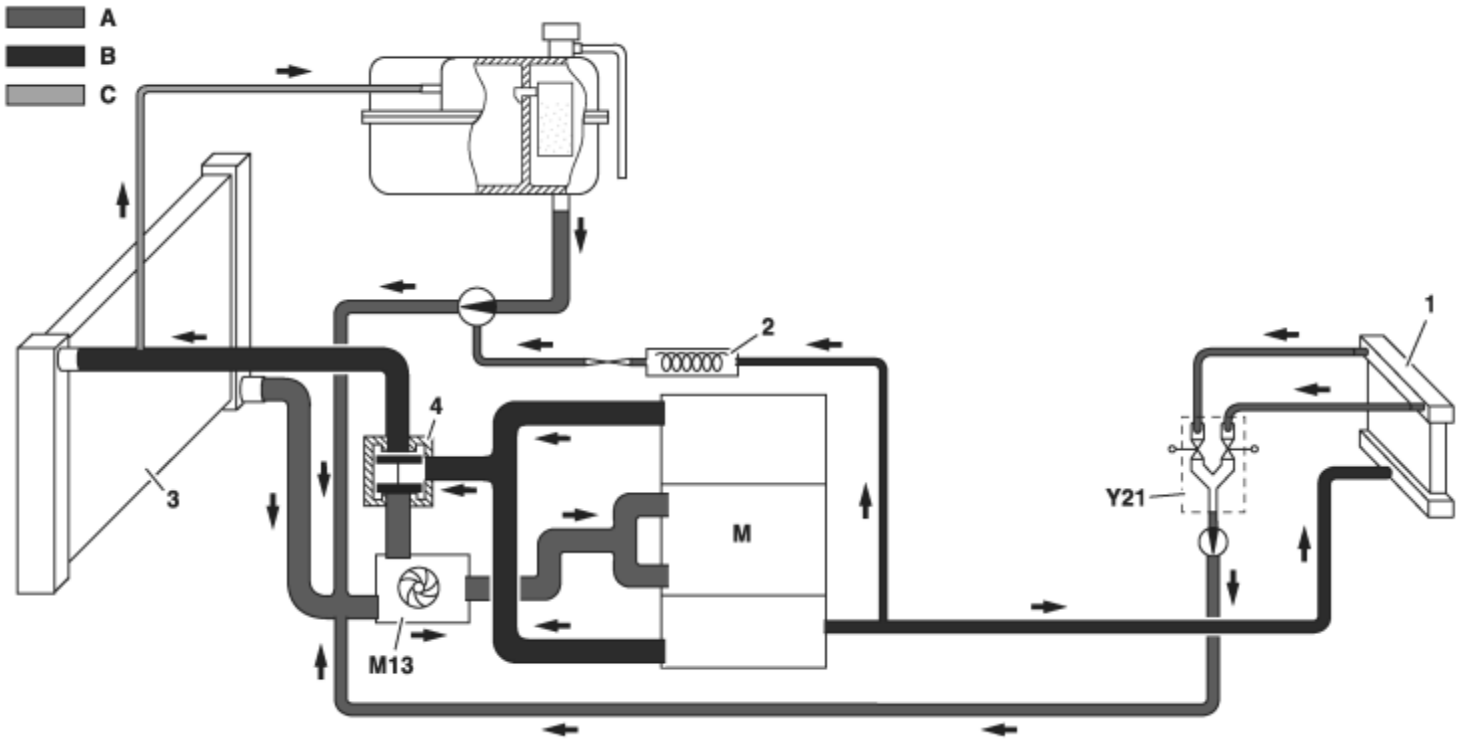
N69/1 - Left door control module

N69/2 - Right door control unit

N73 - DI control unit

N93 - Central gateway control unit

C-AAC Heating Circuit



1 Heating system heat exchanger
2 Window washer fluid heater coil (with code (875) heated windshield washer system)
3 Radiator

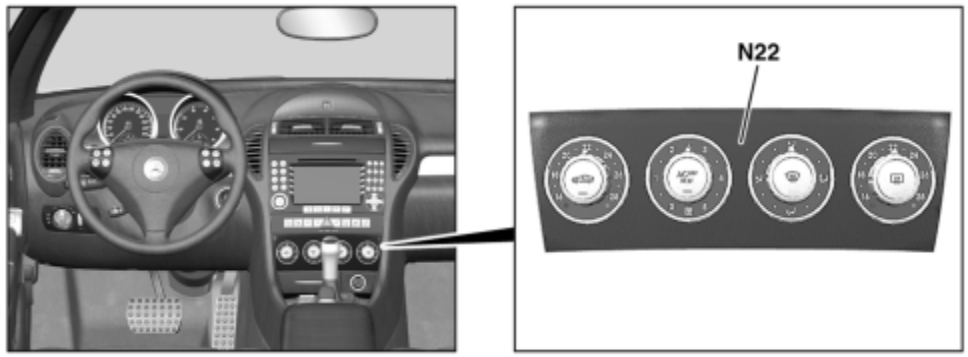
4 Coolant thermostat

M13 Coolant circulation pump
Y21 Duovalve

A Coolant return flow
B Coolant feed
C Vent line
M Engine

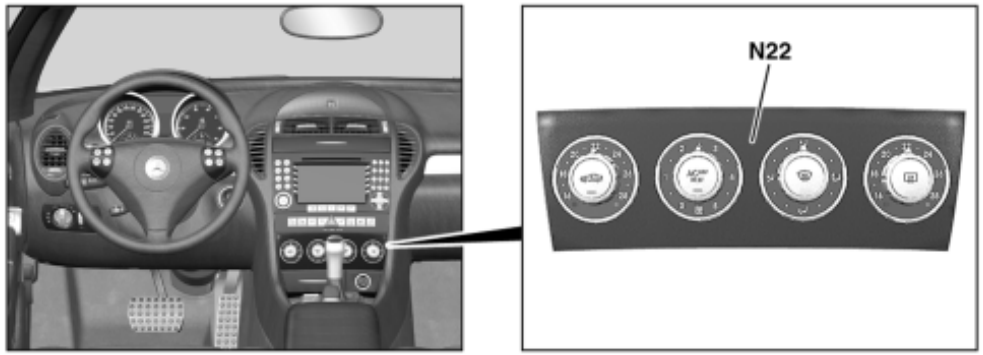
AAC Control Unit (N22)

- AAC control and operating module (N22) actuates all air conditioning functions for the vehicle interior
- Separate interior temperature cold/warm selection for the driver and passenger sides
- Switching the air conditioning system on and off
- Manual blower control
- Manual air distribution



AAC Control Unit (N22)

- Recirculated air mode
- Residual engine heat utilization with ignition switched off
- Defrost function
- Rear window heater



AAC Control Unit (N22)

- The AAC control unit (N22) actuates the following:
  - Via discreet wire:
    Duovalve
  - Via the AC bus:
    blower regulator, fresh air and recirculated air flap actuator motor, left and right footwell flaps actuator motor and the left and right defroster flaps actuator motor

AAC Control Unit (N22)

- The following sensor signals are read in by the AAC control unit (N22):

  – Via discreet wire:

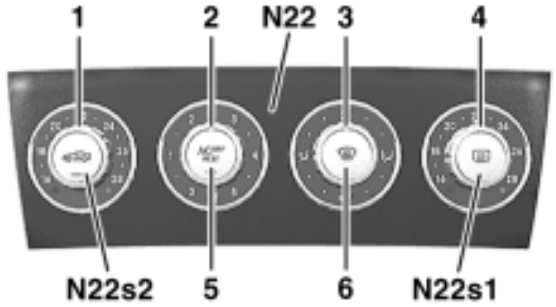
    the left heat exchanger temperature sensor, the right heat exchanger temperature sensor and the evaporator temperature sensor

  – Via the AC BUS:

    the dew point sensor

AAC Control Unit

1 Left temperature selector
2 Blower setting switch
3 Air distribution switch
4 Right temperature selector
5 Residual heat or air conditioning on/off button
6 Defrost button



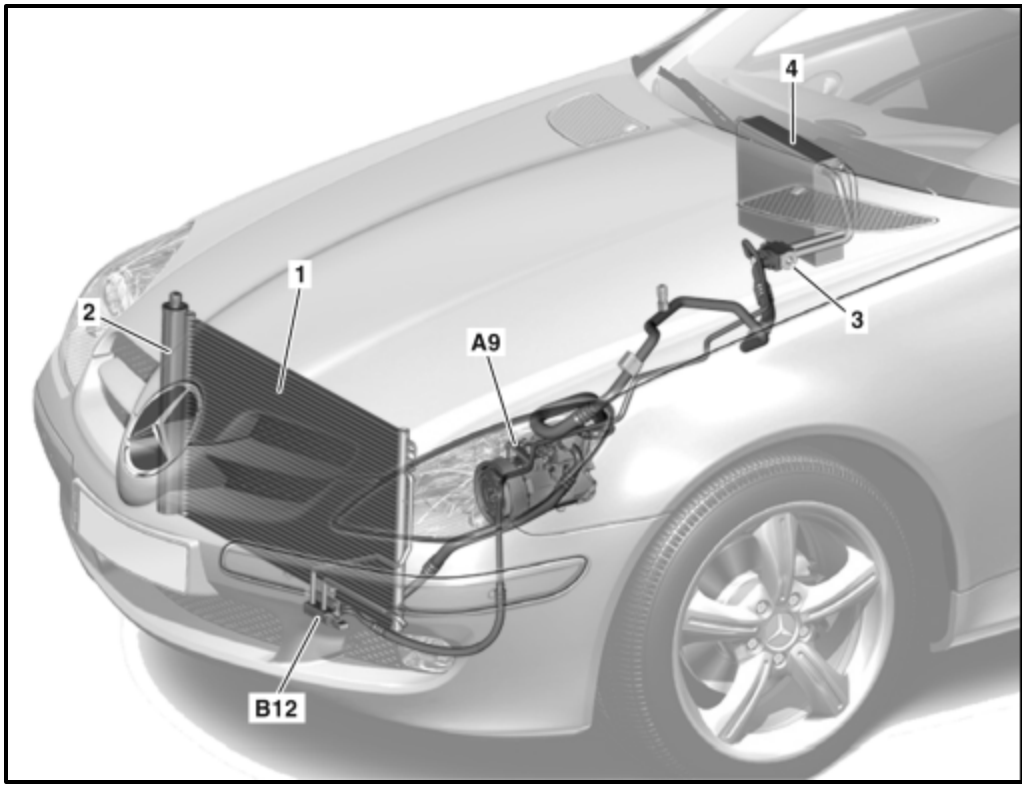
N22 AAC pushbutton control unit
N22S1 Rear window defroster switch
N22S2 Recirculated air switch

Refrigerant Pressure Sensor

A refrigerant pressure sensor is used for the C-AAC and AAC systems

Monitors refrigerant pressure

Refrigerant temperature sensor is not used



1 - Condenser
2 - Drier cartridge
3 - Expansion valve
4 - Evaporator

A9 - AC compressor
B12 - Refrigerant pressure sensor


Questions?