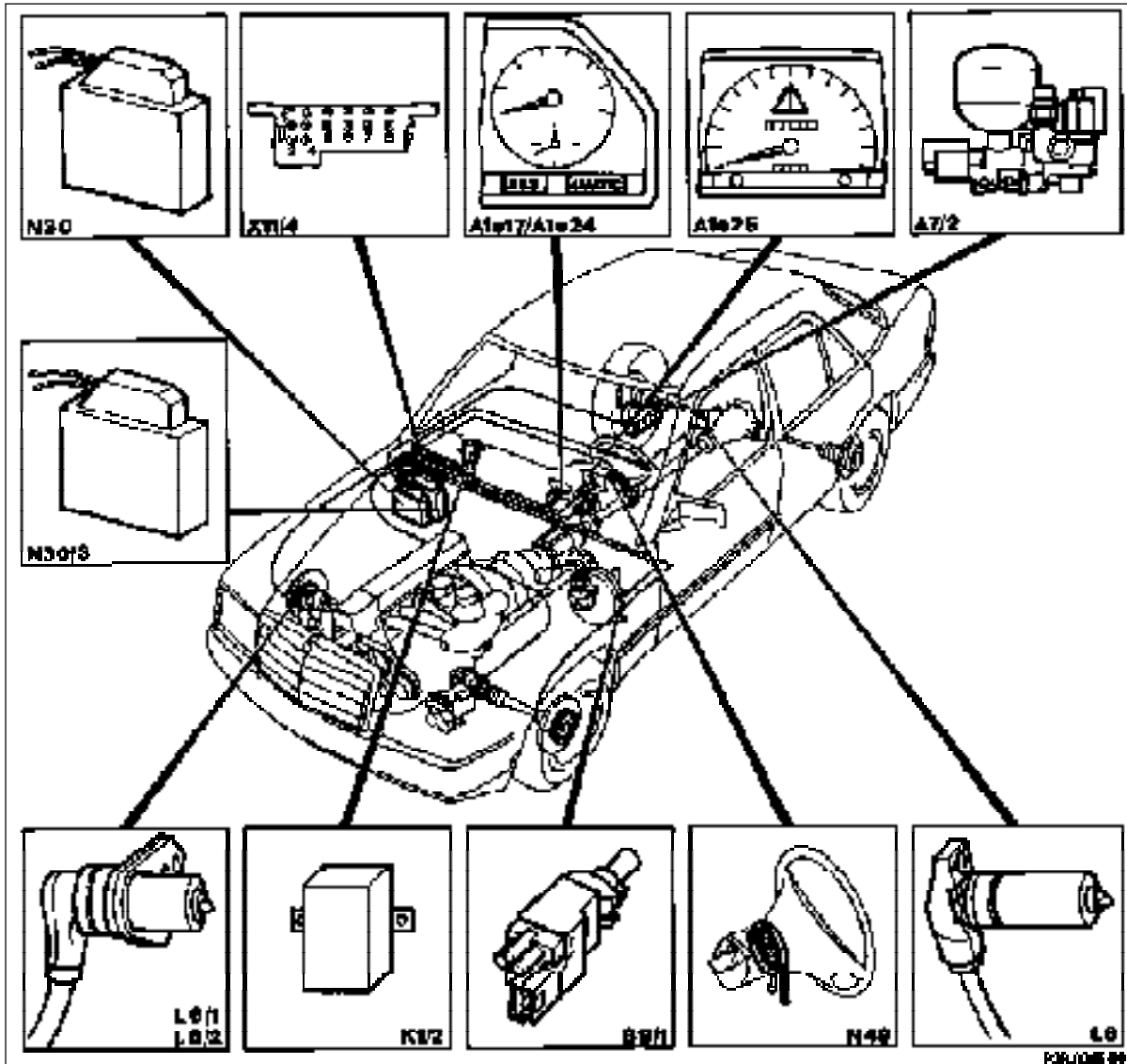


Electronic components



A1e17 ABS warning lamp  
 A1e24 ASD/4MATIC warning lamp  
 A1e25 ASD/4MATIC function indicator lamp  
 A7/2 4MATIC valve control unit  
 K1/2 Overvoltage protection relay 87E/87L/30a, (9-pin)

L6 Rear axle speed sensor  
 L6/11 Left and right front axle speed sensor  
 N30 ABS control unit  
 N30/3 4MATIC control unit  
 N49 Steering angle sensor  
 S9/1 Stop lamp switch (4MATIC/ASD)  
 X11/4 Test coupling for diagnosis, pulse readout (8-pin)

### Electronics function

The electronics control the engagement and disengagement of the four-wheel drive and differential locks. They switch the solenoid valves in the 4MATIC valve control unit (A7/2).

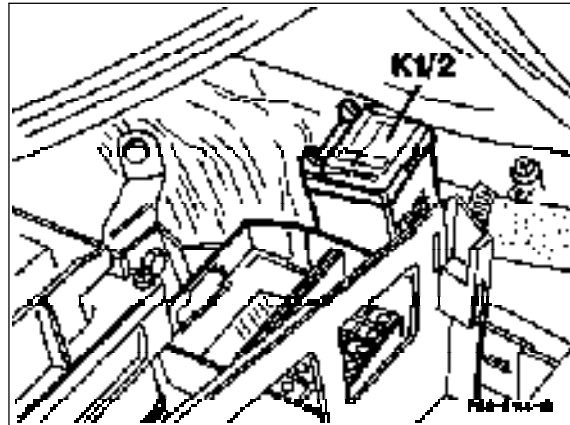
The electronics consist of the following components:

- Voltage supply
- Rear axle speed sensor (L6)
- Left and right front axle speed sensors (L6/1/2)
- Steering angle sensor (N49)
- Stop lamp switch (4MATIC/ASD) (S9/1)
- 4MATIC control unit (N30/3)

### Voltage supply

The voltage supply for the electronics is via the overvoltage protection relay (K1/2). It is in the right of the components compartment.

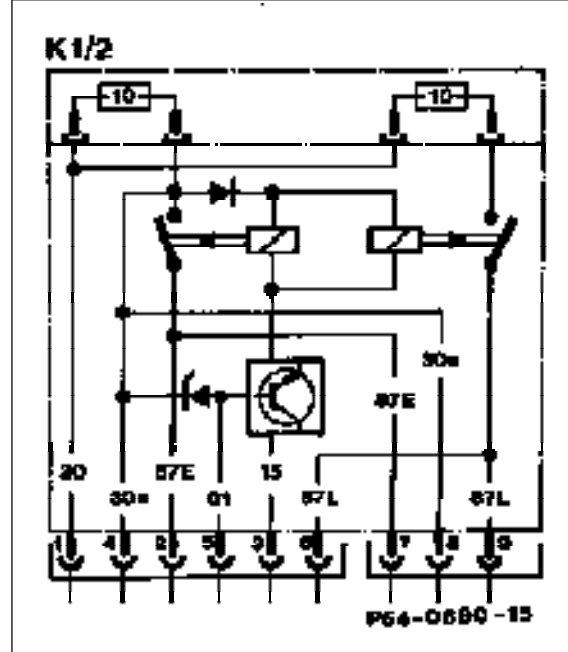
K1/2 Overvoltage protection relay 87E/87L/30a (9-pin) (series K1/1)



Battery voltage is continuously supplied to terminal 30. A 10 A fuse is installed between terminal 30 and 30a. The fault memory is continuously supplied with voltage via terminal 30a. When the ignition is switched on, the relays are controlled by electronics via terminal 15. In this way the ABS (N30) and 4MATIC (N30/3) control units are supplied with voltage via terminal 87E and additional equipment via terminal 87L.

Overvoltage protection is achieved by means of a 22 volt Zener diode. Voltage peaks above 22 volts which occur upstream of the overvoltage protection are switched directly to ground by the Zener diode.

An overload is prevented by fuses. Terminals 87E and 87L are fused separately.



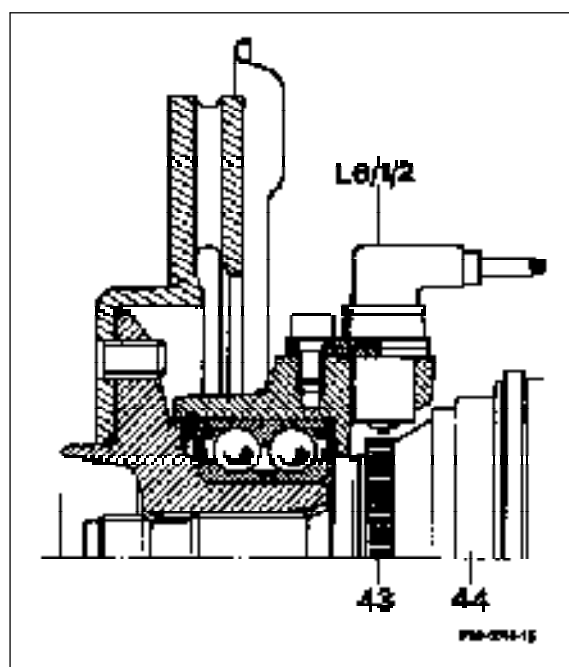
#### Wheel speed sensors (L6, L6/1/2)

The wheel speed sensors (L6, L6/1/2) comprise a magnet core and a coil. A toothed rotor moves in the magnetic field of the wheel speed sensor. The teeth of the rotor interrupt the magnetic field when turning. Each tooth induces a voltage pulse in the coil of the wheel speed sensor. The pulses are transmitted to the 4MATIC control unit (N30/3) which determines the speed from the number of pulses.

### Front axle wheel speed sensors (L6/1/2)

The front axle wheel speed sensors (L6/1/2) are located in the steering knuckle. The rotor tothing (43) is machined in the front axle drive shaft (44) in the case of the 4MATIC.

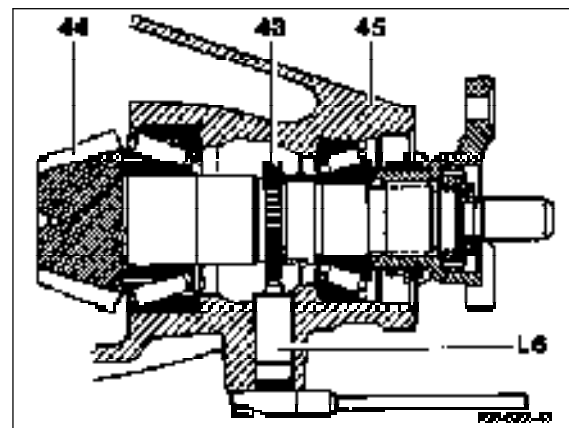
- 43 Rotor
- 44 Front axle drive shaft
- L6/1/2 Left/right front axle speed sensor



### Rear axle wheel speed sensor (L6)

The rear axle speed sensor (L6) is located in the rear axle casing (45). The rotor (43) is pressed on to the bevel pinion (44).

Asuitable rotor with a different number of teeth is required for each rear axle ratio. The mean speed of both rear wheels is determined via the speed sensor (L6) on the rear axle.



- 43 Rotor
- 44 Bevel pinion
- 45 Rear axle casing
- L6 Rear axle speed sensor

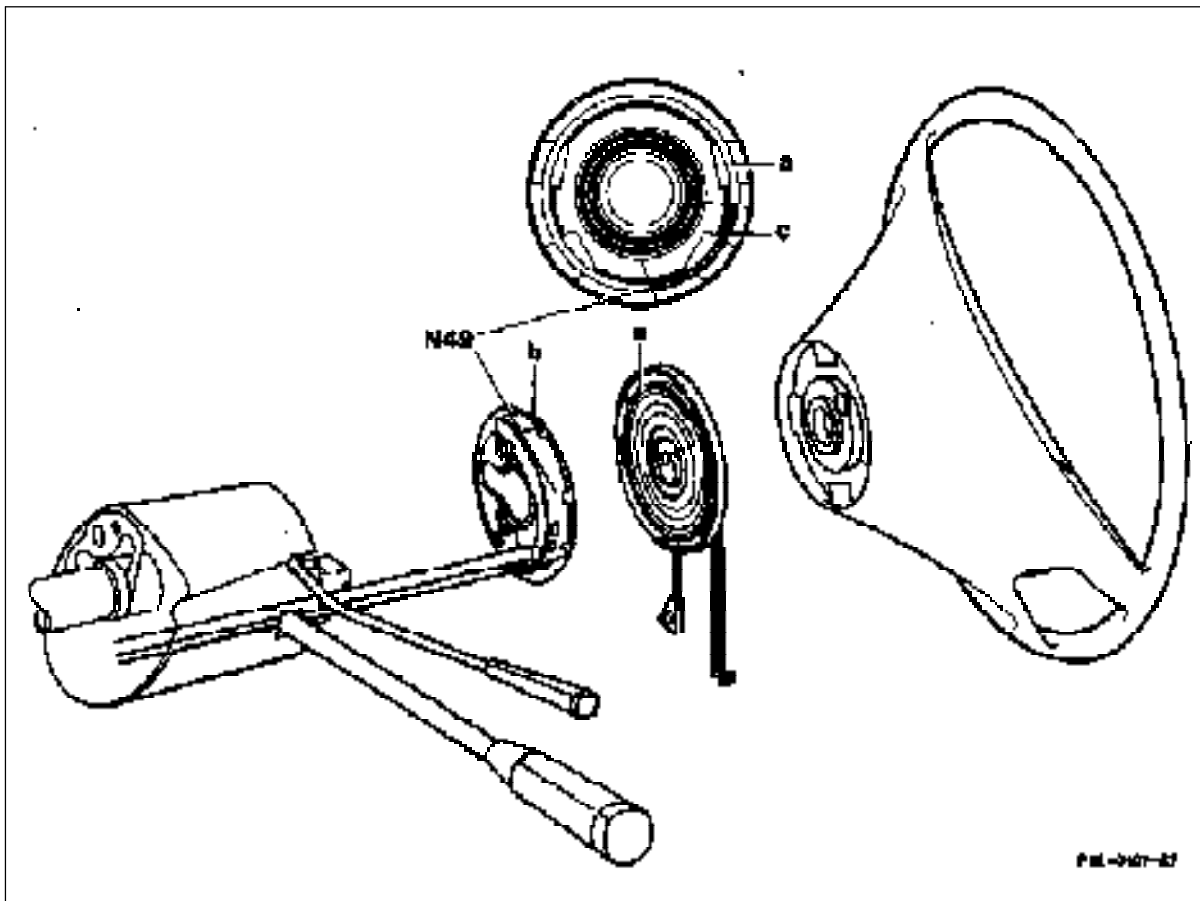
### Steering angle sensor(N49)

The steering angle sensor (N49) is located beneath the steering wheel. It senses the steering movements and transmits them to the 4MATIC control unit (N30/3).

The steering angle sensor (N49) comprises 72 magnets (c) and two Hall-effect sensors (b). Hall-effect sensors are semi-conductor elements whose electrical characteristics are influenced by magnetic fields.

The magnets are embedded in a plastic slip ring (a) on the underside of the impact absorber. The two Hall-effect sensors (b) are offset. Thus different signals arise between left and right steering lock.

The 4MATIC control unit (N30/3) compares the input signals to specified values and engages the four-wheel drive in the event of lateral skid.



N49 Steering angle sensor  
a Plastic slip ring

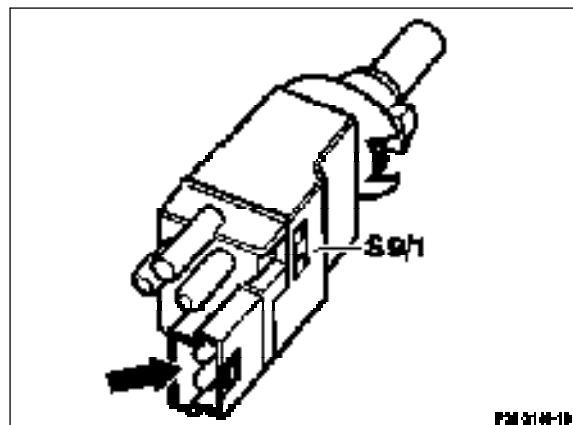
b Hall-effect sensor  
c Magnets

#### Stop lamp switch (4MATIC/ASD) (S9/1)

The stop lamp switch (4MATIC/ASD) (S9/1) has an additional contact (arrow) for the 4MATIC. The stop lamp contact has one plug connection of 4 mm Ø and an auxiliary contact of 2.5 mm Ø.

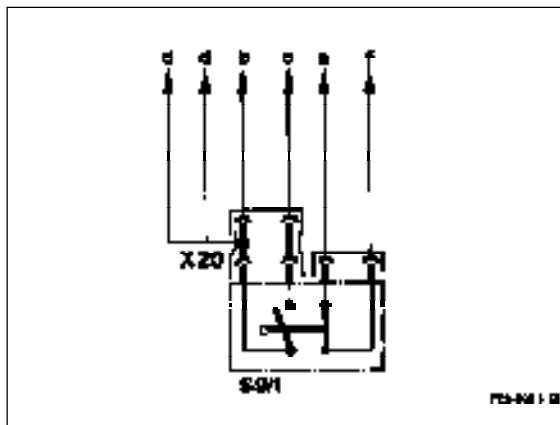
When the service brake is operated, the stop lamp contact is closed and the auxiliary contact is opened.

S9/1 Stop lamp switch (4MATIC/ASD)



When the service brake is operated, the 4MATIC control unit (N30/3) receives a signal via a cable (d) whereby the 4MATIC is switched off. The second cable de-energizes the ABS control unit (N30).

The effect of the auxiliary contact is that when the brake pedal is operated, the rear axle differential lock valve (A7/2y3) is switched off in each case and the rear axle lock releases even if there is a fault in the stop lamp contact or 4MATIC control unit (N30/3).



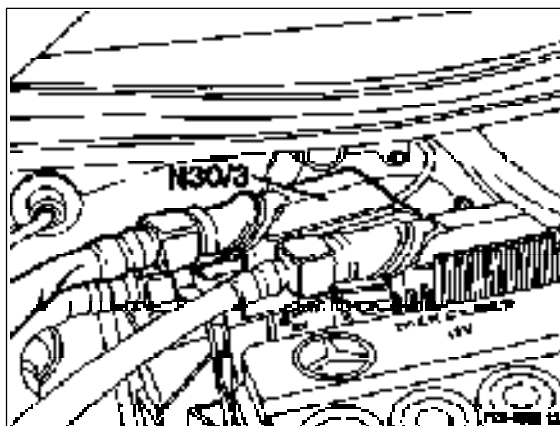
- S9/1 Stop lamp switch (4MATIC/ASD)
- X20 Intermediate plug connector, stop lamp switch (2-pin)
- b Stop lamp
- c Fuse box, fuse 5 (terminal 15)
- d 4MATIC control unit (N30/3) and ABS control unit (N30)
- e Overvoltage protection (terminal 87L)
- f Rear axle differential lock valve (A7/2y3)

#### 4MATIC control unit (N30/3)

The 4MATIC control unit (N30/3) is located in the right of the components compartment. It processes all input signals and controls the solenoid valves (A7/2y) in the 4MATIC valve control unit (A7/2).

The entire signal conditioning and processing is performed digitally.

N30/3 4MATIC control unit



**Note**

Since 07/90 a 4MATIC control unit has been installed with a modified logic section.

The 4MATIC control unit (N30/3) is divided up into the functions:

- Signal conditioning section
- Logic section
- Safety circuit
- Display control and fault memory

**Signal conditioning section**

In the signal conditioning section, input signals are filtered and converted into a form which can be evaluated for the logic section.

**Logic section**

The logic section compares the input signals with each other and with predetermined characteristics.

It thus determines:

- Drive skid
- Acceleration
- Vehicle speed
- Lateral skid
- Holding time

A calibrating device in the logic section compensates for different tire rolling radii and sets the steering angle to zero point straight ahead, thus eliminating the tolerance effect of axle geometry and tires.

**Safety circuit**

The job of the safety circuit is to recognize defective signals in the 4MATIC control unit (N30/3) and faults in electronic components which are located externally, as well as a pressure drop in the hydraulic system.

If a fault is detected, the 4MATIC switches to shift stage 0. The fault is stored in the 4MATIC control unit (N30/3) and indicated by the warning lamp coming on.

The safety circuit also constantly monitors the battery voltage. If the battery voltage is less than 10.5 V, the system is switched off until the voltage has attained its nominal value again.

**Display control and fault memory**

Refer to Diagnosis Manual Chassis Volume 2 - 8.1, 4MATIC.